INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
for
NAVAL RESEARCH LABORATORY INSTALLATIONS

Washington, D.C., Chesapeake Bay Detachment, and Pomonkey, Maryland

Prepared for:
Naval Research Laboratory
Washington, D.C.

Prepared by:
Geo-Marine, Inc.
2713 Magruder Blvd., Suite D
Hampton, Virginia 23666

Final
December 2008

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Prepared for:
Naval Research Laboratory
Washington, D.C.

Activity Point of Contact:
Ms. Michele Hepler

Prepared by:
Geo-Marine, Inc.
2713 Magruder Blvd., Suite D
Hampton, Virginia 23666

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EXECUTIVE SUMMARY

The Department of Defense (DoD) manages approximately 25 million acres of land in the United States. Each military installation that has suitable habitat for conserving and managing natural ecosystems is required to prepare, maintain, and implement an Integrated Natural Resources Management Plan (INRMP). This INRMP was prepared to encompass three Naval Research Laboratory (NRL) installations, specifically NRL-Washington D.C., NRL – Chesapeake Bay Detachment, and NRL - Pomonkey in accordance with DoD Instruction 4715.3 – Environmental Conservation Program, Navy Series OPNAVINST 5090.1C – Environmental and Natural Resources Program Manual, 16 U.S. Code (USC) §670a-f – Sikes Act, as amended, and 32 Code of Federal Regulations (CFR) Part 190 – DoD Natural Resources Management Program.

This INRMP is a long-term planning document that guides implementation of the natural resources program to ensure support of the installation mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity. This plan documents the research mission, baseline condition of natural resources, impacts to natural resources due to the military mission, the management approaches to conserve and enhance natural resources, and lists specific projects aimed at protecting and enhancing natural resources.

In accordance with the Sikes Act, this INRMP was prepared in cooperation with the Secretary of the Department of Interior, acting through the Director of the U.S. Fish and Wildlife Service (USFWS), and the heads of Maryland Department of Natural Resources (MDNR), and the District of Columbia Department of the Environment (DDOE), Fisheries & Wildlife Division. Because of this coordination effort, the INRMP reflects the mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources. Future involvement of the state and federal wildlife agencies will ensure continued mutual agreement and cooperation in managing the natural resources at the three NRL installations outlined above. Evaluation of the successes and issues resulting from INRMP implementation will be facilitated by the web-based Metrics Builder tool on the Navy Natural Resources Data Call Station website (https://clients.emainc.com/dcs/navfac/index.asp).

Resource-specific natural resources program elements have been developed to address relevant issues at the NRL installations. Existing conditions, baseline survey data, current management practices, and recommended management actions have been described for each program element. Management program elements covered in this INRMP include:

Rare, Threatened, and Endangered Species Management
Fish and Wildlife Management
Land Management
Migratory Bird Management
Invasive Species Management
Coastal / Marine Management

Floodplains Management
Forest Management

The management actions and projects identified in this INRMP are intended to help NRL installation commanders manage natural resources effectively, to ensure station lands remain available and in good condition, to support the military mission, and to ensure compliance with relevant environmental regulations. These actions incorporate the principles of ecosystem management and are consistent with Navy policy on sustainable, multiple use of natural resources on Navy property.

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
APHIS-WS	Animal and Plant Health Inspection Service-Wildlife Services
BASH	Bird Aircraft Strike Hazard
BMPs	Best Management Practices
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIN	Course Identification Number
CNIC	Commander, Navy Installations Command
CNO	Chief of Naval Operations
CNRMA	Commander Navy Region Mid-Atlantic
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DoD	Department of Defense
DoDI	Department of Defense Instruction
DDOE	District of Columbia Department of the Environment
EFH	Essential Fish Habitat
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPR	Environmental Projects Request
ERL	Environmental Readiness Level
ESA	Endangered Species Act
FR	Federal Register
GIS	Geographic Information System
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
IRP	Installation Restoration Program
MBTA	Migratory Bird Treaty Act
MDNR	Maryland Department of Natural Resources
MDE	Maryland Department of the Environment
MILCON	Military Construction
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NAVFAC	Naval Facilities Command
Navy	Department of Navy
NDW	Naval District Washington
NEPA	National Environment Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service

ACRONYMS AND ABBREVIATIONS (cont'd)

NPDES	National Pollution Discharge Elimination System
NRL	Naval Research Laboratory
NRL-CBD	NRL Chesapeake Bay Detachment
NRL-DC	NRL Washington, D.C.
NRL-POM	NRL Pomonkey
NWPs	Nationwide Permits
OMB	Office of Management and Budget
ONR	Office of Naval Research
OPNAVINST	Chief of Naval Operations Operating Instruction
OSD	Office of the Secretary of Defense
P2	Pollution Prevention
PIF	Partners in Flight
PPA	Pollution Prevention Act
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RPM	Remedial Project Manager
SECNAVINST	Secretary of the Navy Instruction
SOP	Standard Operating Procedure
sq	Square
SWAP	State Wildlife Action Plan
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WAP	Wildlife Action Plan

1. OVERVIEW

A. Purpose

To facilitate the natural resources program, Naval Research Laboratory (NRL) must prepare and implement an Integrated Natural Resources Management Plan (INRMP) encompassing its locations: Washington, D.C. (NRL-DC); Chesapeake Bay Detachment, Maryland (NRL-CBD); and Pomonkey, Maryland (NRL-POM). The purpose of the INRMP is to ensure consistency with the use of military installations to support military preparedness, while providing for: the conservation and rehabilitation of natural resources on military installations; the sustainable multipurpose use of the resources including hunting, fishing, trapping, and non-consumptive uses; and public access to military installations within safety and military security requirements (Sikes Act). The INRMP must also ensure that natural resources management practices comply with all pertinent laws and regulations and are in accordance with the Department of Navy (Navy) policy to incorporate ecosystem management as the basis for planning and management.

B. Scope

This INRMP addresses natural resources management on those lands and near-shore areas at the NRL installations that are:

- Owned by the United States and administered by the Navy;
- Used by the Navy via license, permit, or lease for which the Navy has been assigned management responsibility;
- Withdrawn from the public domain for use by the Navy for which the Navy has been assigned management responsibility; and
- Leased lands on the installation and areas occupied by non-Department of Defense (DoD) entities.

This INRMP primarily concerns natural resources management of the undeveloped, natural areas at the three NRL installations, but also applies to natural resource issues in developed areas such as support, administrative, and recreational areas.

C. Goals and Objectives

This INRMP is a long-term planning document that guides implementation of the natural resources program to help ensure support for the installation mission, while protecting and enhancing natural resources and providing a variety of outdoor recreational opportunities for station personnel. Goals of the INRMP are to:

- Identify the responsible parties and stakeholders concerned with natural resources management;

- Describe the current and future research mission and its requirements and constraints on natural resources;
- State the policies, management philosophy, and objectives of natural resources management;
- Provide information regarding the existing biological and physical conditions and the desired future conditions of the installations and the surrounding area;
- Identify key natural resource management issues and concerns at the installations and in the surrounding area;
- Identify and describe projects and management actions required to meet the objectives of natural resources management while ensuring no net loss in the capability of installation lands to support the research mission; and
- Identify scheduling priorities and funding opportunities for the implementation of natural resources projects and management actions.

D. Responsibilities

The roles and responsibilities for Navy natural resources management are described in OPNAVINST 5090.1C and in the Navy guidance for INRMP development and implementation (DoN 2006). A summary of responsibilities for natural resources management at NRL installations follows.

Chief of Naval Research, who reports to the Assistant Secretary of the Navy, Research Development and Acquisition, serves as the principle leader to provide policy, guidance, and resources for the development, revision, and implementation of INRMPs. Chief of Naval Research must also approve all INRMP projects before INRMPs are submitted to regulatory agencies for signature.

The responsibilities of the Commanding Officer for the NRL installations are to ensure preparation, completion, and implementation of an INRMP and to systematically apply conservation practices set forth in the plan. It is the Commanding Officer's responsibility to act as steward of installation natural resources and to integrate natural resources requirements into the day-to-day decision-making process; involve appropriate operational and training commands in the INRMP review process to ensure no net loss of research mission; and endorse the INRMP via Commanding Officer signature.

Naval Research Laboratory Washington, D.C., Chesapeake Bay Detachment and Pomonkey are all components of NRL rather than stand alone installations. As a result, environmental compliance and other support for these installations are provided by NRL-DC for all NRL field sites.

The NRL Natural Resources Manager is primarily responsible for implementing this INRMP and coordinating with other personnel at the installations. Some of the implementation

responsibilities include identifying personnel, internal or external to the installation, with expertise to perform the work identified; identifying the appropriate funding source to accomplish the projects; and ensuring installation personnel are familiar with the contents of this INRMP. The Natural Resources Manager is also responsible for ensuring this plan is reviewed in coordination with the U.S. Fish and Wildlife Service (USFWS), the Maryland Department of Natural Resources (MDNR), and the District of Columbia Department of the Environment (DDOE), Fisheries & Wildlife Division.

E. Authority

In accordance with Department of Defense Instruction (DoDI) 4715.3, Chief of Naval Operations Operating Instruction (OPNAVINST) 5090.1C, Naval Facilities Procedural Manual 73 (NAVFAC P-73), and 16 U.S. Code (USC) §670a-f (Sikes Act), the Department of the Navy (Navy) is required to implement and maintain a balanced and integrated program for the management of natural resources.

F. Research Mission

NRL-DC was officially established on July 2, 1923, as the Naval Experimental and Research Laboratory. Over the past 85 years, the facility has grown from a modest beginning of five buildings and a few hand-picked scientists representing major research areas (radio and underwater sound) to its present status as the "Corporate Laboratory of the Navy." Current resources include a main laboratory (NRL-DC) expanded to 131 acres, 8 field sites, 111 buildings and structures, and a work force of more than 2,500 personnel.

The mission of NRL is to conduct a broadly based, multidisciplinary program of scientific research and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems, and ocean, atmospheric, and space sciences and related technologies. To meet this goal, NRL provides:

- Primary in-house research for the physical, engineering, space, and environmental sciences;
- Broadly based exploratory and advanced development programs in response to identified and anticipated Navy needs;
- Broad multidisciplinary support to the Naval Warfare Centers; and
- Space and space systems technology development and support.

The mission of NRL-CBD is to operate and maintain a facility in support of NRL-DC where personnel from the various NRL-DC divisions conduct a wide range of technical research at NRL- CBD including condensed matter and radiation sciences, radar, tactical electronic warfare, chemistry, optical sciences, and work related to the Center for Advanced Space Sensing.

NRL-POM contains the largest high-speed tracking antenna in the United States and is suitable for low Earth orbit and deep space mission requirements. Real-time signal enhancement and analysis capability and specific operational analysis tools support a wide range of tasks. The Satellite Mission Analysis Facility at NRL-POM compares the on-orbit performance of complex systems against prelaunch and other baseline data. Most of the activities at NRL-POM are classified or sensitive in nature for security purposes; consequently, public access is restricted.

G. Stewardship and Compliance

This INRMP strives to ensure that natural resources management considers both compliance requirements and environmental stewardship objectives. Compliance requirements are those that are driven by state or federal regulations, such as the Clean Air Act (CAA), Clean Water Act (CWA), Coastal Zone Management Act (CZMA), the Sikes Act, Endangered Species Act (ESA), National Environment Policy Act (NEPA), and Migratory Bird Treaty Act (MBTA); DoDIs; Executive Orders (EOs); and Memoranda of Agreements or Understanding (MOAs or MOUs, respectively). Environmental stewardship projects are those that enhance the installation's natural resources, promote proactive conservation measures, and support investments that demonstrate Navy environmental leadership and proactive environmental stewardship.

This INRMP identifies both stewardship and compliance projects that help meet natural resources management goals. However, funding priority will be given to projects that are required to meet compliance criteria. Stewardship efforts that rely on volunteer labor and have the support of the military community or have available alternate funding sources are also likely to be implemented.

H. Review and Revision

This INRMP is a long-term planning document that requires periodic reviews of management goals and practices in order to provide the opportunity to incorporate new science and information as well as assess the performance of management actions. Navy policy states that the INRMP must be reviewed annually by the installation.

The annual review is to verify that:

- Current information on all conservation metrics is available;
- All "must fund" projects and activities have been budgeted for and implementation is on schedule (Projects schedules and funding are subject to change);
- All natural resources positions are filled or are in the process of being filled;
- Projects and activities for the upcoming year have been identified and included in the INRMP (an updated project list does not necessitate revising the INRMP);
- All required coordination has occurred; and

- All significant changes to the installation's mission requirements or its natural resources have been identified.

This evaluation is facilitated by the web-based Metrics Builder tool on the Natural Resources Data Call Station website. The Metrics Builder provides the means to evaluate performance in seven areas: INRMP implementation, partnerships/cooperation and effectiveness, team adequacy, INRMP impact on the installation mission, status of federally listed species and critical habitat, ecosystem integrity, fish and wildlife management, and public use.

Use of the Metrics Builder to conduct the INRMP annual reviews also generates Navy conservation program metrics to measure effects of the conservation program on the installation mission and the status of the Navy relationship with the USFWS and state fish and wildlife agencies.

The Metrics Builder is available on the Data Call Station website: https://clients.emainc.com/dcs/navfac/index.asp

Additionally, the INRMP must be reviewed, and if necessary revised, at intervals of not more than five years. Significant changes to the installation's mission requirements or natural resources would warrant an INRMP revision.

Periodic assessment is a necessary part of the natural resources planning process that evaluates program status, measures progress, and identifies new management issues, concerns, goals, and objectives. The natural resources planning framework, programs, issues, concerns, goals, and objectives presented in this INRMP are based on an assessment of previous programs.

I. Commitment of the U.S. Fish and Wildlife Service and State Wildlife Agencies

Under the Sikes Act, INRMPs are required to reflect mutual agreement with the USFWS and appropriate state agencies concerning the management of fish and wildlife. Such mutual agreement and cooperation will support the principles of ecosystem management by improving the management of ecosystems that cross federal, state, and private boundaries.

Per Sikes Act requirements, the USFWS, MDNR, and DDOE cooperate in the development and review of this INRMP as to operation and effect at least once every five years.

J. Management Strategy

Navy policy on natural resources management, as summarized from OPNAVINST 5090.1C, is to manage natural resources to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. Land use practices and decisions must be based on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem management approach.

Employing ecosystem management will help maintain and improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable

economies, human use, and the environment required for realistic military training operations (DoDI 4715.3 1996).

The basic principles and guidelines of ecosystem management are to:

- Preserve the function and integrity of natural ecosystems;
- Integrate human social and economic interests with environmental considerations;
- Involve all interested parties (stakeholders) in identifying management goals; and
- Adapt to changing conditions and requirements.

Ecosystem function is a result of interactions of its various components: geologic and soil features, climatic elements, plants, animals, and humans, and current and past disturbances (including past management practices). The function and integrity of an ecosystem are measured in terms of diversity, nutrient availability (productivity), and structural complexity. Assessing ecosystem health and sustainability requires objectively measuring a set of parameters that can be used to describe conditions. Adaptive management is an iterative cycle of planning, monitoring, evaluation, and adjustment that is best used to assess ecosystem function and the effectiveness of management practices.

2. CURRENT CONDITIONS AND USE

A. Installation Information

(1) General Description

NRL installations are located in close proximity to the Washington, D.C. metropolitan area (Table 2-1; Figure 2-1). The installations discussed in this INRMP are located in the District of Columbia and Maryland. NRL-DC is located in Washington, D.C. and NRL-CBD and NRL-POM are located in Calvert and Charles counties, Maryland respectively.

a. NRL-Washington, D.C.

NRL-DC occupies 131 acres along the east bank of the Potomac River (Figure 2-2). Bolling Air Force Base (AFB) is adjacent on the north, Blue Plains Wastewater Treatment Plant is south, and Interstate 295 is bordering the installation on the east. NRL-DC occupies its original site in the southwest sector of Washington, D.C. There are few distinguishing natural features about NRL-DC because it has been heavily developed and is characterized by landscape trees and mown areas.

b. NRL- Chesapeake Bay Detachment

NRL-CBD is located on the western shore of the Chesapeake Bay in a rural-suburban part of Calvert County, Maryland (Figure 2-3). It is a field station of NRL-DC and is approximately 40 miles southeast of Washington, D.C. The property encompasses 161 acres of developed and forested land. Maryland Route 261 transects the installation, north and south. The administrative areas are in the eastern portion of the installation, and most of the forested land is in the western portion. Dalrymaple Road borders the property on the west. Holiday Beach lies to the south of the installation and Randle Cliff Beach is immediately to the north of the property.

Table 2-1. Location and Size of NRL Installations

Installation	Location	Size (acres)
NRL- DC	Washington, D.C.	131
NRL- CBD	Calvert County, Maryland	161
NRL-POM	Charles County, Maryland	63

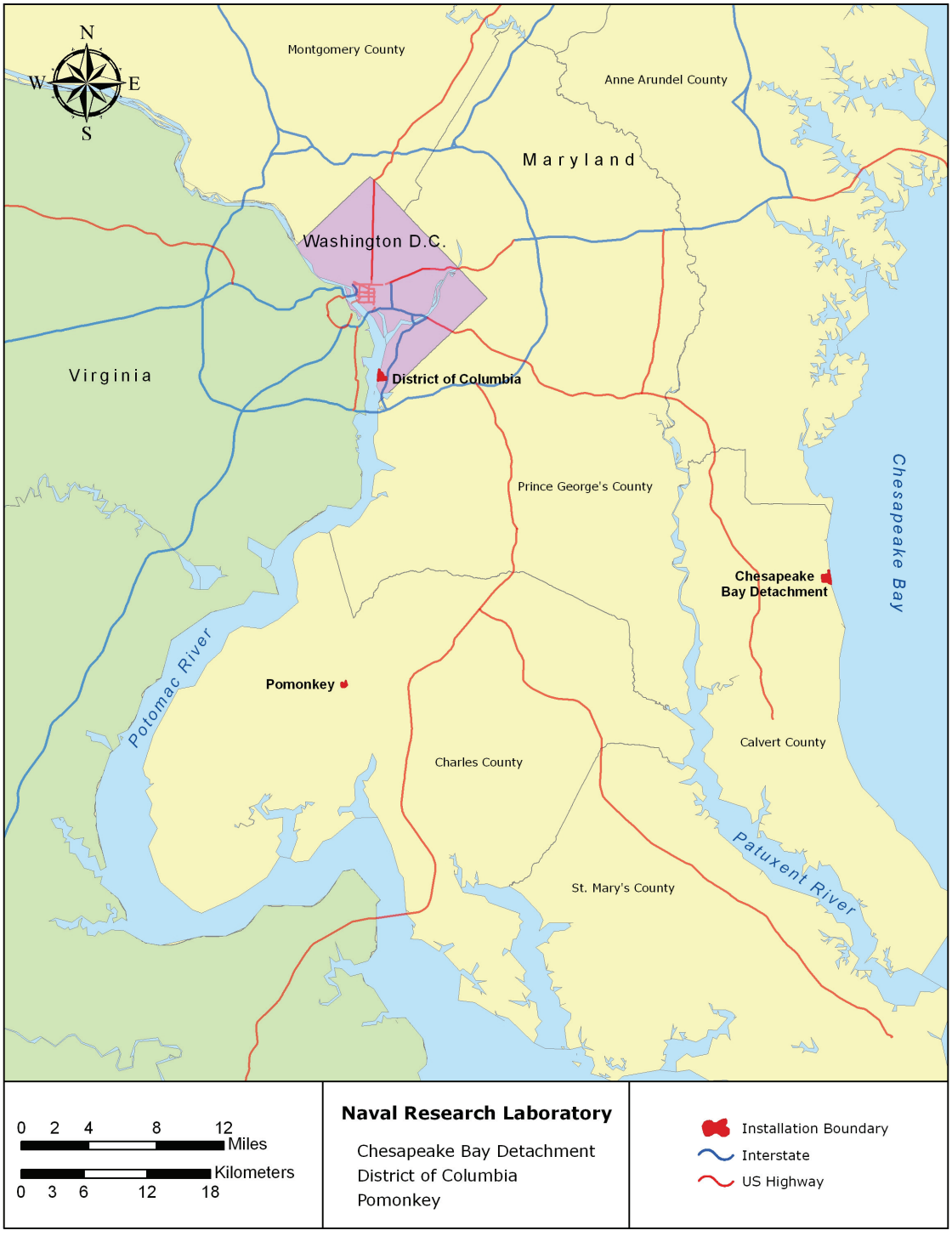

Figure 2-1. Location of NRL Installations

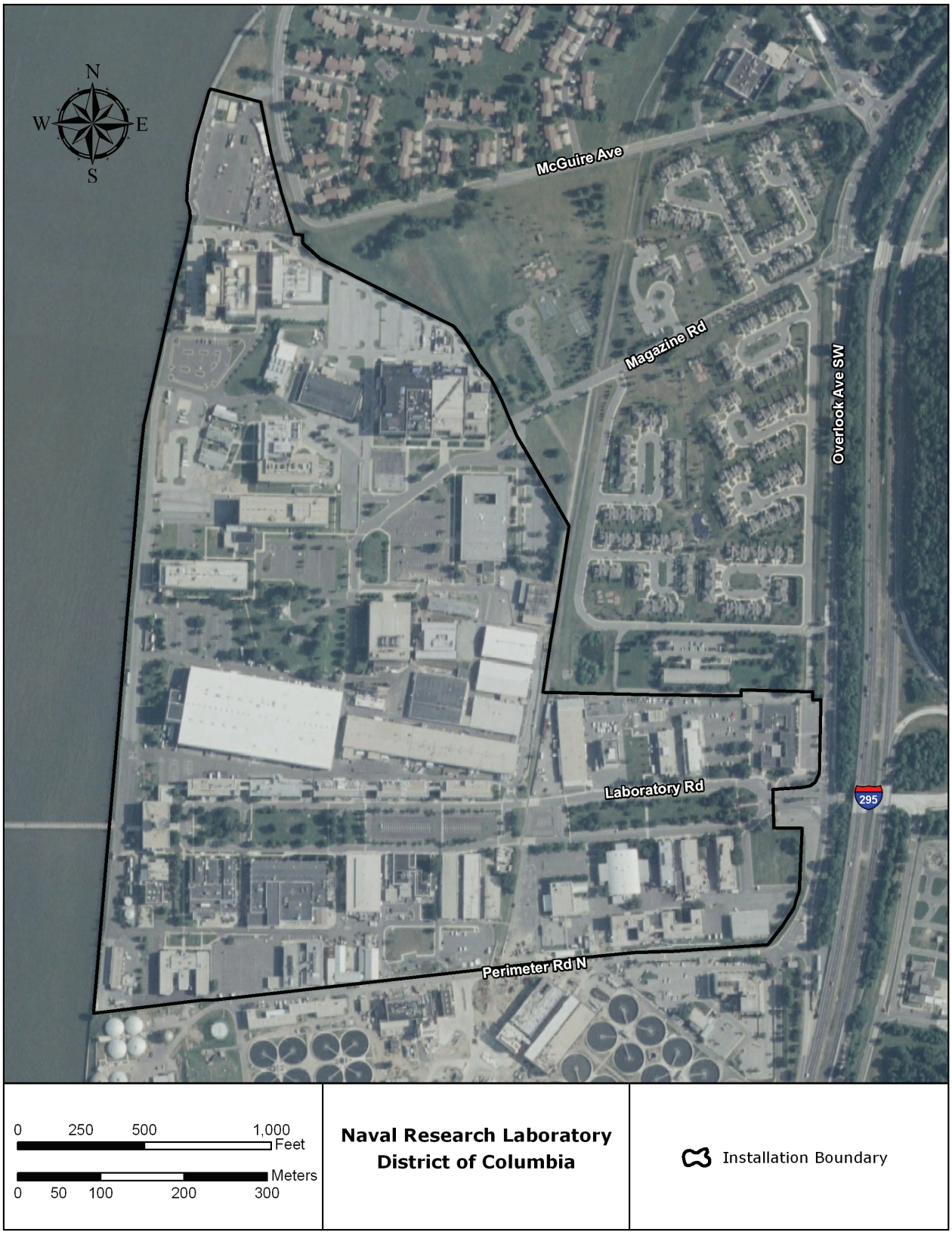

Figure 2-2. NRL-DC

Figure 2-3. NRL-CBD

c. NRL- Pomonkey

NRL-POM is 63 acres in size and located in a rural portion of Charles County, Maryland. It is also a field station of NRL-DC (Figure 2-4). NRL-POM is approximately 25 miles south of NRL-DC near LaPlata, Maryland. The central administrative area is surrounded by undeveloped area that serves as a buffer area to development and noise encroachment.

(2) Constraints

Current and future land uses at NRL-CBD and NRL-POM are limited by a number of constraining factors, while administrative functions at NRL- DC have limited constraints on the natural environment relative to natural resources management planning. Natural and cultural resources constraints to the military mission include wetlands, habitat for rare, threatened, and endangered species (RT&E), surface waters, soil erosion, historic structures, and sites on which significant cultural resources occur. The only constraint to NRL-DC is the potential for flooding as indicated by the 500 year flood levels (Figure 2-5). At NRL-CBD, these restrictions include wetlands, potentially four RT&E species, a historical graveyard, and soil erosion concerns along the banks of the Chesapeake Bay (Figure 2-6). For NRL-POM the only restrictions to the site are one unmapped wetland along the Bumpy Oak Road (Figure 2-7).

The INRMP development and implementation process for NRL installations must address various constraints to ensure compatibility with the research mission, safety, and various regulations. Additional constraints on opportunities could occur through adjacent land development and other types of encroachment in the areas surrounding the installations.

(3) Opportunities

Areas with little or no restrictions on the research mission provide the best opportunities for mission growth and change. At NRL-DC the potential for opportunities are limited by space more than environmental constraints, since this land is mostly urban and developed. Both NRL-CBD and NRL-POM have areas for expansion; however, much of this area is comprised of woodlands and hedgerows which provide wildlife habitat and act as an operational buffer from conflicting land uses and adjacent roadways. The forested areas and various other natural habitats would be compromised in productivity and resilience by a reduction in size. Proposed development should provide opportunities to improve the natural resources base, such as offsetting the loss of natural resources by reutilization of structures or paved areas. This INRMP recognizes the value of such trade-offs and recommends management actions for mitigation in which the natural environment and its various resources benefit in exchange for necessary development of buildings or installations. Additional constraints on the military mission at the NRL installations could occur through land development and other types of encroachment in the area surrounding NRL-CBD and NRL-POM.

Figure 2-4. NRL-POM

Figure 2-5. Constraints for NRL-DC

Figure 2-6. Constraints for NRL-CBD

Figure 2-7. Constraints for NRL-POM

(4) Operations and Activities

NRL installations include a 131-acre main laboratory (NRL-DC), 8 field sites, 111 buildings and structures, and a work force of more than 2,500 personnel. The overall management of the laboratory is under direction of a Naval Commanding Officer and a civilian senior Executive Director of Research. The internal structure of the laboratory consists of several staffs and five directorates. These include the Business Operations Directorate with 5 major divisions, and four research directorates, each headed by an Associate Director of Research, comprising 20 research divisions and detachments. Currently, personnel from the various NRL-DC divisions conduct a wide range of technical research at NRL-CBD including condensed matter and radiation sciences, radar tactical electronic warfare, chemistry, optical sciences, and work related to the Center for Space Technology. NRL-POM contains the largest high-speed tracking antenna in the United States and is suitable for low Earth orbit and deep space mission requirements. Most of the activities at NRL-POM are classified or sensitive in nature for security purposes; consequently, public access is restricted

(5) Historic Land Use and Installation History

NRL-DC was established on July 2, 1923, as the Naval Experimental and Research Laboratory. Over the past 85 years, the facility has grown from a modest beginning of five buildings and a few hand-picked scientists representing major research areas (radio and underwater sound) to its present status as the "Corporate Laboratory of the Navy."

In 1971, the DoD produced the "Plan for Department of Defense Facilities in the National Capital Region." This plan included a compilation of all the organizations and their installations in the Washington, D.C. area and a projection of DoD needs. In this plan NRL-DC was identified as a long-term site with the potential for significant increases in administrative and research installations.

In 1992, the Secretary of the Navy consolidated the existing Navy Research, Development, Test, and Evaluation Engineering Facilities with the Fleet Support Facilities to form a corporate community. This community consists of a single corporate research laboratory (NRL-DC) aligned with the Office of Naval Research (ONR) and four warfare-oriented centers aligned by mission with the Systems Commands. The four centers are the Naval Air Warfare Center, the Naval Command Control and Ocean Surveillance Center, the Naval Surface Warfare Center, and the Naval Undersea Warfare Center. As part of the consolidation, the Naval Oceanographic and Atmospheric Research Laboratory, with locations at Stennis Space Center, Mississippi, and Monterey, California, merged with NRL-DC to become what is today the Navy's corporate laboratory.

Prior to World War II, the planners and officers of NRL-DC desired to acquire a remote site in which to expand the number of radio propagation experiments that could be performed. Requirements of this new site were that it be adjacent to a body of water and have little exposure

to electrical interference from surrounding sources. In 1940, the Bureau of Ships approved the acquisition of land in close proximity to Washington, D.C. A 37.5-acre parcel of land, then called the Chesapeake Bay Annex, was purchased for NRL-DC research activities in 1941. Radar testing began at the new site in December 1941. By the end of 1942, testing of radar had been conducted on most models of early warning-type radar and on 38 models of British and U.S. surface-search radar.

NRL Pomonkey contains the largest high-speed tracking antenna in the United States and is suitable for low Earth orbit and deep space mission requirements. Real-time signal enhancement and analysis capability and specific operational analysis tools support a wide range of tasks. The Satellite Mission Analysis Facility at NRL Pomonkey compares the on-orbit performance of complex systems against prelaunch and other baseline data. Most of the activities at NRL Pomonkey are classified or sensitive in nature for security purposes; consequently, public access is restricted.

(6) Regional Land Use

NRL-DC, NRL-CBD and NRL-POM are located in the mid-Atlantic region of the United States, which includes Maryland, Virginia, Delaware, West Virginia, and Pennsylvania. When viewed as part of the region, these locations occupy a comparatively small area of land. Therefore, it is important to view the NRL instillations in the context of the larger geographical region. While the District of Columbia is considered an urban center with a large amount of developed land, there are multiple other land uses. The District of Columbia boasts more than 900 acres of city parks and more than 6,700 acres of national parkland. While it can be difficult for humans and wildlife to coexist within the borders of one city, the District of Columbia has an unexpectedly wide diversity of wildlife and habitats. The District of Columbia Office of Planning implements a Comprehensive Plan that includes a land use element (DC 1998). It identifies many elements of land use within the District of Columbia. The coexistence between humans and wildlife can improve and thrive with comprehensive strategic planning provided in the District of Columbia Wildlife Action Plan (DDOE 2006).

NRL-CBD is located in Calvert County which is Maryland's smallest county in land area with 213 square (sq) miles. According to the U.S. Census Bureau (USCB), the county has a total area of 345 sq miles, of which, 215 sq miles of it is land and 130 sq miles of it (37.65%) is water (USCB 2008). Calvert County is a peninsula, bounded by the Chesapeake Bay on the east and the Patuxent River on the west. Steep cliffs and woods predominate on the bay side while along the Patuxent, rolling fields slip gently down to the river. The county's many creeks provide refuge for wildlife as well as scenic areas for boating and fishing. Containing approximately 219 sq miles, the County is nine miles wide at its widest point, and 35 miles from the Anne Arundel line to Solomons. Once made up primarily of farms and tobacco fields, the county is slowly claiming its place as a fast-growing extra urban neighbor of Washington (Calvert County

Government 2008). NRL-CBD is boarded by the Chesapeake Bay on the eastern side with some residential streets to the north and urban forest land to the west and south.

NRL-POM located in rural Charles County is surrounded by forested and agricultural lands with a minimum of residential development. According to the USCB, the county has a total area of 643 sq miles, of which, 461 sq miles of it is land and 182 sq miles of it (28.33%) is water (USCB 2008). The land adjacent to NRL-POM is mainly undeveloped forest and abandoned farmlands with a small area still in agriculture use (grazing). The northeastern corner of the facility is boarded by Bumpy Oak Road and receives only light rural traffic.

B. General Physical Environment

(1) Climate and Weather

The coastal plain providence in which all three NRL installations are located is influenced by a modified continental climate, characterized by hot summers and cold winters and experiences a climatic shift of four seasons. Winds prevail from the northwest between the months of September and April and from the south between May and August. Annual precipitation, which is equally distributed throughout the year, averages approximately 39 inches. Light or heavy rain may occur in the spring, summer, and fall seasons, while rain, sleet, freezing rain, or snow may fall during the winter. No more than a few inches of snow will typically accumulate and such events usually last only a few days. The average winter temperature is 37º Fahrenheit (F) and the average winter daily minimum is 29ºF, although much lower temperatures are frequently recorded (Table 2-2). In the summer, the average temperature is 77ºF, with a daily maximum of 86ºF. A temperature of 106ºF, recorded in 1930, remains the highest recorded temperature for the D.C. area (Maryland State Climatologist Office 2008).

(2) Topography, Geology, and Soils

The NRL installations lie in the Atlantic Coastal Plain Province. The Piedmont and Coastal Plain provinces meet at the Fall Line that bisects Washington, D.C. The Fall Line is the result of the interface between crystalline rocks of the Piedmont Province and the unconsolidated Cretaceous and Tertiary sediments of the Coastal Plain Province. Great Falls, at the head of the Potomac River Fall Line, is an example of the dramatic changes in gradient that result along this interface.

The Atlantic Coastal Plain Province, which developed from marine sediments, is composed of gently seaward-dipping beds of unconsolidated sand and clay with smaller amounts of underlying gravel and marl deposits. Elevations in the Coastal Plain increase in the westward direction from sea level in the east to approximately 200 feet above mean sea level in the west (Terwilliger and Tate 1995)

Table 2-2. Weather Data Recorded for the Atlantic Coastal Plain Regions (1971-2000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Daily Max Temp (F)	43.7	46.8	55.8	66.2	75.6	83.8	88	86.4	80.3	69.5	58.8	48.6	67
Daily Min Temp (F)	28.4	30.1	37.5	45.9	55.8	64.6	69.2	67.4	61.1	50.1	41.4	32.9	48.7
Daily Mean Temp (F)	36.1	38.5	46.7	56.1	65.7	74.2	78.6	76.9	70.7	59.8	50.1	40.8	57.9
Monthly Mean Precipitation (in)	4.11	3.35	4.44	3.5	4.13	3.47	4.22	4.1	3.99	3.46	3.43	3.67	45.87
Monthly Mean Snowfall (in)	5.1	4.9	1.4	0.1	0	0	0	0	0	0	0.4	1.4	13.3
Monthly Snow Depth (in)	1	1	Trace	Trace	0	0	0	0	0	0	Trace	Trace	

[*] Data from the Royal Oak, Maryland (Talbot County); Coordinates: 38°43'N / 76°11'W (CustomWeather 2007)

NRL-DC and NRL-POM are relatively level with no dramatic changes in elevation. In contrast, NRL-CBD is generally characterized by sharp changes in elevation; and topographic features include several flat-topped ridges between dissected stream valleys. In some areas, the sides of these stream valleys are extremely steep, with slopes ranging up to 40 percent. The gradient of these slopes, combined with the instability of the soils, creates potential severe slope erosion problems. The eastern boundary of NRL-CBD consists of very tall cliffs that rise sharply from the Chesapeake Bay. These cliffs are beginning to undercut themselves and have a very high potential for erosion and landslides.

In general, many of the soil series found at NRL installations include soil complexes that either have been recently altered or have an urban component. Urbanization and related development has altered most of the soils at NRL-DC (Figure 2-8). Approximately 19 percent of the soils in Washington, D.C. have been undisturbed and are located mainly in parks (USDA NRCS 2006).

NRL-CBD includes soil complexes that are generally fine sandy loams (Figure 2-9). These soils are usually well drained, are acidic, and occur on steep slopes. As a result most of these soil types are subject to severe erosion, and the subsequent loss of topsoil and eventual formations of gullies. NRL-POM includes Beltsville silt loam and Bourne sandy loam soils (Figure 2-10). Table 2-3 and the following text provide a summary of soils at the NRL installations. In addition, the U.S. Department of Agriculture (USDA) custom soil resource reports for each installation have been placed in Appendix 11 for further information.

Figure 2-8. Soils at NRL-DC

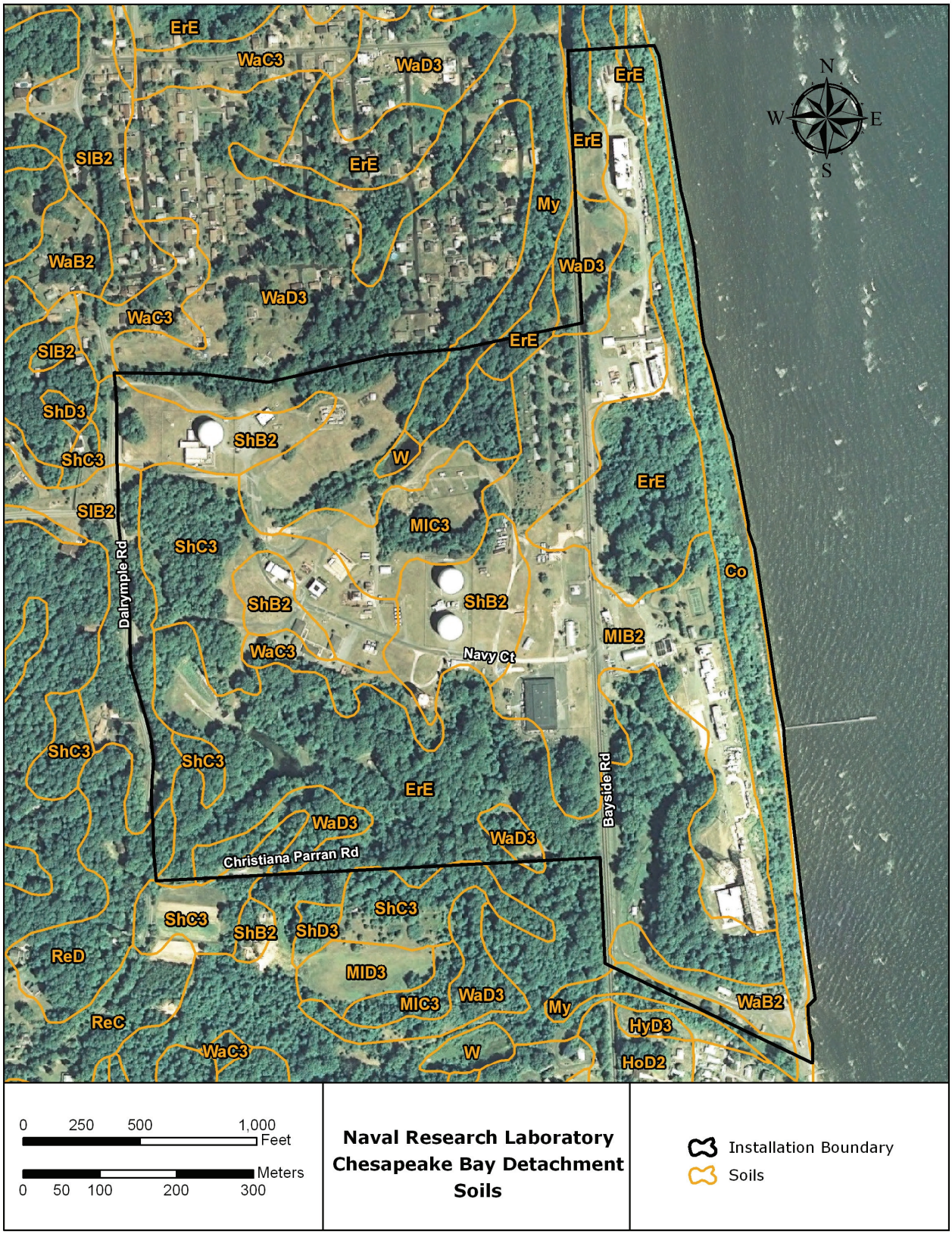

Figure 2-9. Soils at NRL-CBD

Figure 2-10. Soils at NRL-POM

Table 2-3. Soils Mapped at NRL Installations

	NRL-DC	NRL-CBD	NRL-POM
Beltsville (BaB, BaC)			▲
Coastal Beaches (CO)		▲	
Eroded Land (ErE)		▲	
Galestown (GeB)	▲		
Grosstown (GwD)			▲
Lenni (LQA)			▲
Marr (M1B2, MIC3)		▲	
Mixed Alluvial (My)		▲	
Rumford (ReD)		▲	
Sassafras (S1b2, ShB2, ShC3, ShD3, SIB2)		▲	
Udorthents (U1, U6, UmB)	▲		
Urban Land (Ub, Umbj)	▲	▲	
Westphalia (WaB2, WaC3, WaD3)		▲	
Woodstown (WpB)	▲		

- Beltsville—Soils in the Beltsville series are moderately well drained, are gently to moderately sloping, and have a fragipan in the subsoil. They formed in silty material deposited over very old sandy or gravelly deposits on uplands of the Coastal Plain.

- Coastal Beaches—This series occurs along most of the Chesapeake Bay. These beaches are smooth and hummocky and generally support little vegetation. These coastal areas are important for recreational activities but are not suitable for development.
- Eroded Land—This series can be found in steep areas that consist primarily of soil remnants. Most of the land has lost its surface soil and all, or most, of its subsoil is severely gullied. This soil is also found on slopes that range from 12 to 40 percent or more. The eroded land may result in grounds management problems by clogging ditches and drainageways. Also, eroded land is highly unstable which could lead to structural failure to buildings and roads. If eroded land is revegetated, it poses less of a threat and can be of greater value as a wildlife habitat or for bank stabilization.
- Galestown—Soils in the Galestown series are somewhat excessively drained and nearly level to gently sloping. These soils formed in old marine and alluvial deposits of sandy material, and some of them have been reworked by water. These soils are chiefly in areas bordering major rivers.
- Grosstown—The soils within this association contain more than 30 percent rock fragments in the lower subsoil and are characteristic of coastal plain of southern Maryland and possibly parts of Delaware and New Jersey. Taxonomic class classified as coarse-loamy, mixed, semiactive, and mesic Typic Hapludults.
- Lenni—This association is characterized by being poorly drained with a parent material of clayey fluviomarine sediments. It can be found in coastal plains of Delaware, Maryland, and New Jersey and often associated with low-lying uplands, flats, swales, broad interstream divides, and shallow depressions.
- Marr—This series is generally found on 2 to 6 percent moderately eroded slopes as well as 6 to 12 percent severely eroded slopes. This series is considered a deep and well-drained upland soil. This series is well suited for turf and forest management. If disturbed, erosion control measures should be taken immediately.
- Mixed Alluvial—This series consists of material washed from uplands and deposited on floodplains and along drainageways. This material ranges from sand and gravel to silt and clay. Areas containing this series may be poorly drained and, as a result, are highly susceptible to flooding. Because of flood hazards, these areas should, for the most part, be set aside for woodland and recreational uses.
- Sassafras—Soils in the Sassafras series are moderately sloping and well drained. They contain a gravelly sandy loam surface, a sandy loam subsurface, a sandy clay loam center, and a sandy loam lowest horizon.
- Rumford—Soils in this series have a course-loamy particle size control section which is well drained or somewhat excessively drained with very low to low surface runoff. This

series if often associated with coastal plains (75 to 150 feet elevation) of Virginia, southern Maryland, North Carolina, and possibly South Carolina.

- Udorthents—This soil consists of extremely heterogeneous fill material that has been placed on uplands, terraces, and floodplains. The source of fill varies, as does its thickness. Because these soils are so variable, an on-site investigation is necessary to determine the potential uses for these areas.
- Urban Land—The Urban Land category includes impervious surfaces covered with asphalt, concrete, or buildings.
- Westphalia—Soils in this series are deep and well drained and occur in uplands. These soils are low in silt and high in fine and very fine sands of relatively uniform grain size. Slope and erosion are limiting factors on this series.
- Woodstown—Woodstown soils are deep and moderately well drained located in upland areas. These soils formed in old sandy sediments containing moderate amounts of silt and clay.

(3) Hydrology and Aquatic Environment

a. Watersheds

The term "watershed" refers to the catchment area or drainage basin of a particular waterway. NRL-DC is located in the Middle Potomac-Anacostia-Occoquan watershed (hydrologic code 02070010). NRL-CBD is in the direct watershed of the Chesapeake Bay, while NRL-POM falls into the Potomac River watershed. The Middle Potomac-Anacostia-Occoquan watershed is part of the larger Potomac River Basin (subregion 0207 with 11 hydrologic subunits), which is the fourth largest watershed on the East Coast, encompassing portions of Pennsylvania, West Virginia, Virginia, Maryland, and Washington, D.C. The Potomac River empties into the Chesapeake Bay, linking the Potomac watershed and the 64,000-sq-mile Chesapeake Bay watershed. The Chesapeake Bay is the largest estuary in the United States and stretches 199 miles from north to south with more than 150 tributary rivers and streams. The entire drainage basin includes land from six states. The health of the Potomac River and ecological integrity of the Chesapeake Bay is dependent on the health of their tributaries.

The Potomac River is listed as an American Heritage River through the U.S. Environmental Protection Agency (EPA) and the 1997 Presidential EO 13061. The American Heritage Rivers Initiative is one of the most recent efforts to help U.S. rivers; the intent was to encourage communities to come together around their rivers and develop strategies to preserve them for future generations.

NRL installations contribute to watershed protection by following a Pollution Prevention (P2) Plan (NRL 2005). The P2 Plan for NRL installations addresses soil erosion control, spill

prevention, pesticide and fertilizer use, permitted stormwater discharges, coastal zone consistency determinations, and coordination with Chesapeake Bay Protection Act agreements.

b. Surface Water

Surface waters for NRL-DC and NRL-POM drain into the Potomac River. There are no surface water resources at these installations. There is no groundwater withdrawal for NRL-DC; potable water is obtained from the D.C. water supply. NRL-POM uses a groundwater well to provide potable water.

Surface water at NRL-CBD flows directly into the Chesapeake Bay. The 4,592-foot eastern boundary of NRL-CBD lies on a high cliff directly adjoining the Bay. There are three small streams on NRL-CBD that flow in a west-northwesterly direction into Fishing Creek, which empties into the Chesapeake Bay. There are two small freshwater ponds on the west side of the installation that have water year-round and are capable of supporting fish populations. Potable water at NRL-CBD is obtained from two on-site deep wells in the Aquia Greensands aquifer; the water quality is good.

C. General Biotic Environment

The District of Columbia is located between two ecoregions: (1) the mid-Atlantic Piedmont and (2) the mid-Atlantic Coastal Plain. The ecoregions divide the District in half diagonally along the fall line, with the Coastal Plain covering the southeastern half and the Piedmont covering the northwestern half. The District shares these ecoregions with the surrounding states of the mid-Atlantic region, including Maryland, Virginia, Pennsylvania, New Jersey and, in the case of the Coastal Plain, Delaware, making the District geographically similar to those states. This has many important implications for conservation planning. Issues important to habitats within the District are also important to the surrounding states (DDOE 2006).

The mid-Atlantic Piedmont extends into Virginia, Maryland, southeastern Pennsylvania, and northern New Jersey. It currently covers approximately 25,672 sq miles in total. The region is bordered by mid-Atlantic Coastal Plain to the east and the Appalachian Mountains to the west. Beginning at the fall line at 196 feet in elevation, the Piedmont extends west to the Blue Ridge and the Ridge and Valley regions of the Appalachian Mountains, reaching elevations of 980-2000 feet. The topography of the Piedmont is higher, rolling and more rugged than the Coastal Plain and its soils are composed of erosion resistant igneous and metamorphic rock, rather than the sands and clays of the Coastal Plain (DDOE 2006).

The mid-Atlantic Coastal Plain extends into Virginia, Maryland, Delaware, Pennsylvania and New Jersey. It currently covers approximately 21,706 sq miles in total. The region is bordered by the Atlantic Ocean to the east and the fall line to the west. From the west, rivers flow down from the Piedmont and mountains, including the Appalachian Mountains, where they slow down and release sediment onto the Coastal Plain. At this point, the low-lying plain reaches an elevation of

less than 260 feet and is characterized by bays and tidal rivers, such as the Chesapeake Bay and Potomac River. The soils are primarily derived from the sediments deposited from the mountains and are slow draining, leading to the development of many types of expansive wetlands (DDOE 2006).

(1) Rare, Threatened and Endangered Species and Species of Concern

A formal Rare, Threatened and Endangered Species survey for Puritan tiger beetle (*Cincindela puritana*) and Northeastern beach tiger beetle (*Cincindela dorsalis dorsalis*) was completed at NRL-CBD on July 2, 9, and 15, 2008 (Straughan Environmental Services, Inc., 2008a). A follow up survey for glade fern (*Diplazium pycnocarpon*) and red turtlehead (*Chelone oblique*) was completed at NRL-CBD on September 24, 2008 (Straughan Environmental Services, Inc., 2008b). On July 2, 2008 an adult Puritan beetle was found foraging on beach habitat located at the southeastern end of the CBD property and it is believed that this beach provides foraging habitat for a colony located south of the CBD property. Northeastern beach tiger beetle was not found during the initial survey and does not likely occur within the CBD property boundary. During the follow up survey for glade fern and red turtlehead, neither of the species was found within the CBD property but potential habitat was mapped. Annual or biennial surveys in potential habitat areas are recommended for both species (Straughan Environmental Services, Inc., 2008b).

Federally listed threatened and endangered species known to occur in Washington, D.C., Calvert and Charles counties, and Maryland are listed in Table 2-3.

Coordination letters were sent to the USFWS Chesapeake Bay Field Office, MDNR, and National Park Service Center for Urban Ecology to obtain current information on federal and state-listed plant and animal species (Appendix 10). Information was requested on the occurrence of rare, threatened, or endangered species on or in the vicinity of NRL-DC, NRL-POM, and NRL-CBD.

Although, these species are not federally listed as threatened or endangered, the U.S. Department of Interior, National Park Service Center for Urban Ecology provided two records from the District of Columbia Natural Heritage Program that pertains to NRL-DC. The yellow passionflower (*Passiflora lutea*, date of last observation 6 August 1997) and purple passionflower (*Passiflora incarnata*, date of last observation 1998) have been observed in the vicinity of NRL-DC.

The USFWS Chesapeake Bay Field Office identified protected species for two of the NRL installations. The bald eagle (*Haliaeetus leucocephalus*) nests within the vicinity of NRL-DC; one nest is 2 miles north of the installation and a second nest is 3.5 miles downstream of the installation on the Potomac River. Although, this species is not federally listed anymore it is still protected by two other major federal laws: the Bald and Golden Eagle Protection Act and the

Migratory Bird Treaty Act. In addition, bald eagles will continue to be protected under the Maryland Wildlife Diversity Conservation Plan (MDNR 2005). In addition to the nesting pairs, approximately 12 nonresident bald eagles are known to occur in the vicinity of NRL-DC during the winter season. These eagles forage from the Potomac River and roost in forested habitats.

Table 2-3. Federally Listed Species Potentially Occurring in The Vicinity of NRL Installations.

Common Name	*Scientific Name*	Federal Status	State Rank	Global / State Rank or Tier	County, State Listed	Nearest NRL Installation
Hay's spring amphipod	*Stygobromus hayi*	E	-	G1,G2	District of Columbia	NRL-DC
American burying beetle	*Nicrophorus americanus*	E	-	-	District of Columbia	NRL-DC
Eskimo curlew	*Numenius borealis*	E	-	GH	District of Columbia	NRL-DC
Dwarf wedge mussel	*Alasmidonta heterodon*	E	S1-	G1,G2	District of Columbia, Charles County, Maryland	NRL-DC, NRL-POM
Small whorled pogonia	*Isotria medeoloides*	T	-	G2	District of Columbia	NRL-DC
Eastern puma	*Puma concolor couguar*	E	-	G5	District of Columbia	NRL-DC
Gray wolf	*Canis lupus*	E	-	G4	District of Columbia	NRL-DC
Puritan tiger beetle	*Cicindela puritana*	T	S1	G1,G2	Calvert County, Maryland	NRL-CBD
Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	T	S1	G4	Calvert County, Maryland	NRL-CBD
Sensitive Joint-vetch	*Aeschynomene virginica*	E	S1	G2	Calvert County, Maryland, Charles County, Maryland	NRL-CBD, NRL-POM
Atlantic Sturgeon	*Acipenser oxyrinchus*	C	S1	G3	Calvert County, Maryland	NRL-CBD

E = Endangered; C = Species of Concern; T = Threatened; S1 = Highly State Rare (Maryland); G1 = Highly Globally Rare; G2 = Globally Rare, GH = Possibly Extinct. Source: USFWS 2008 and MDNR 2007

Except for occasional transient individuals, no federally proposed or listed endangered or threatened species are known to exist within the vicinity of NRL Pomonkey. The federally threatened Puritan tiger beetle (*Cicindela puritana*) is known to occur approximately 0.25 mile north and 0.25 mile south of NRL-CBD. The Puritan tiger beetle occurs along shorelines on the Chesapeake Bay and its tidal tributaries in locations with sandy beaches below high bluffs. The federally threatened northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) is known to occur approximately 1 mile south of NRL-CBD. This beetle is most vulnerable to disturbance during the larval stage, which lasts two years. The larvae live in vertical burrows in the beach intertidal zone.

The MDNR identified no records in the Wildlife and Heritage Service database for federal or state-listed rare, threatened, or endangered species within the boundaries of NRL-POM and NRL-CBD. The MDNR noted that such species could be present without being documented, because adequate surveys have not been conducted in the past. In addition, records for state-listed plant and animal species were reported for the two installations (Appendix 3).

(2) Wetlands

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (Environmental Laboratory 1987). Under the Cowardin system (Cowardin et al. 1979), wetlands are divided into five major systems: marine, estuarine, riverine, lacustrine, and palustrine. Of the three NRL installations, NRL-DC is an urban base in which no wetlands have been identified by the USFWS National Wetlands Inventory, an online data source for wetlands information (USFWS 2006). At NRL-POM, no wetland delineations have been made. However, the USFWS National Wetlands Inventory does recognize one wetland area just south of the front drive to the installation and along Bumpy Oak Road. This wetland is designated in two parts; a palustrine, forested, broad leaved, seasonal saturated wetland (PF01E) and palustrine scrub/shrub broad-leaved deciduous, semi-permanently flooded system (PSS1F; Figure 2-11). A delineation of wetlands at NRL-CBD was performed by the USACE in 2006 and is current at the time of the writing of this INRMP and stratifies the recommendations of the 2003 INRMP for NRL-CBD (NRL 2006). For map see Appendix 3 for a copy of the map from this report. In this report they found a total of 15 delineable wetlands including streams, Phragmites wetlands, stream ponds, floodplain wetlands, wet meadows, and streams manipulated for stormwater management.

Figure 2-11. Wetlands at NRL-POM

(3) Fauna

The availability of suitable habitat and diversity of habitats influence wildlife populations at NRL installations. Because of the urban surroundings at NRL-DC, the potential for attracting wildlife is relatively low. In addition, the District is a very small geographic area of only 69 miles^2. Nonetheless, the District of Columbia is home to over 500 species of birds, fish, mammals, reptiles and amphibians, many of which have adapted to urban environments and are frequently observed in the NRL-DC area. The various habitats are part of an ecological system that is larger than the boundaries of the District of Columbia, giving it an important regional context. The District of Columbia belongs to the mid-Atlantic region of the United States, which also includes Maryland, Virginia, Delaware, West Virginia and Pennsylvania. When viewed as part of the region, the District of Columbia occupies a comparatively small area of land. Therefore, it is important to view the District in the context of the larger geographical region to gain a full understanding of the needs of shared species and habitats (DDOE 2006). These species include eastern gray squirrel (*Sciurus carolinensis*), mourning dove (*Zenaida macroura*), European starling (*Sturnus vulgaris*), rock dove (*Columba livia*), American crow (*Corvus brachyrhynchos*), and house sparrow (*Passer domesticus*).

NRL-CBD and NRL-POM encompass natural areas that provide habitat for a wider variety of wildlife such as raccoon (*Procyon lotor*), osprey (*Pandion haliaetus*), cottontail rabbit (*Sylvilagus floridanus*), red fox (*Vulpes fulva*), opossum (*Didelphis virginiana*), and whitetail deer (*Odocoilieus virginianus*). Woodchucks (*Marmota monax*), turkey vultures (*Cathartes aura*), and black vultures (*Coragyps atratus*) have been in the past a nuisance species at NRL-POM. This installation provides suitable grassland habitat for woodchucks and roosting areas for vultures. Regionally, common reptiles and amphibians occur at NRL installations according to the availability of suitable habitat. The absence of wetlands and surface waters at NRL-DC reduces this likelihood. Appendix 3 lists fauna expected to occur on the NRL installations.

(4) Flora

The vegetation at NRL-DC is characteristic of urban environments with low floral diversity, reflecting the historic land uses and landscaping choices that have altered and replaced natural plant communities. The entire shoreline of the Potomac River at NRL-DC is bulkheaded and precludes natural vegetation. Although few natural areas remain at NRL-DC, many remain at NRL-CBD and NRL-POM. Descriptions of the regional plant communities and field observations on these two installations suggest that the present flora is similar to the types of vegetation that previously existed (Harker 1993). Appendix 3 lists flora expected to occur on the NRL installations.

a. Forests

Although the Coastal Plain has been greatly urbanized, natural vegetation persists in undeveloped areas. Pines such as Virginia pine (*Pinus virginiana*), shortleaf pine (*Pinus echinat*a), and loblolly pine (*Pinus taeda*) are abundant on the Coastal Plain; black oak (*Quercus velutina)* is a dominant canopy tree. Understory species include American holly (*Illex opaca*), flowering dogwood (*Cornus florida*), eastern red cedar (*Juniperus virginiana*), common persimmon (*Diospyros virginiana*), and sassafras (*Sassafras albidum*).

Southern floodplain forests are dominated by shagbark hickory (*Cary ovata*), green ash (*Fraxinus pennsylvanica*), black walnut (*Juglan nigra*), sweetgum (*Liquidambar styraciflua*), loblolly pine, swamp chestnut oak (*Quercus michauxii*), and willow oak (*Quercus phellos*). Common associate species include red maple (*Acer rubrum*), river birch (*Betula nigra*), white ash (*Fraxinus americana*), black gum (*Nyssa sylvatica*), and American elm (*Ulmus americana*).

Upland forests include Virginia and loblolly pines, sweetgum, hickories, tulip poplar (*Liriodendron tulipifera*), and southern red oak (*Quercus falcata*). Typical understory vegetation includes flowering dogwood, paw-paw (*Asimina triloba*), and highbush blueberry (*Vaccinium corymbosum*).

b. Open Areas

Open fields are maintained at NRL-CBD and NRL-POM to provide clearance for communications equipment. These habitats are associated with shrub communities that occur along the edges. Shrubs include sumac (*Rhus copallina*), cherry (*Prunus* spp.), and hawthorn (*Crataegus* spp.). These areas are maintained as open fields by periodic mowing. Vegetation in the landscaped areas includes closely mowed turf grass such as bermuda (*Cynodon dactylon*) and shade trees such as red maple.

c. Coastal Areas

The coastal areas of NRL-CBD consist of a bulkheaded shoreline. A narrow strip of vegetation occurs between the bulkhead and steep cliffs. Common woody vegetation includes black locust (*Robinia pseudoacacia*) and persimmon. The steep cliffs are covered in patches with Virginia creeper (*Parthenocissus quniquefolia*) and poison ivy (*Toxicodendron radicans*).

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3. ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

A. Supporting Sustainability of the Research Mission and the Natural Environment

(1) Research Mission and Sustainable Land Use

This INRMP provides management recommendations for sustainable land use that support the research mission by maintaining an environment in which personnel can work to provide the administrative functions for support of Navy activities. Mission requirements are met through the protection and enhancement of significant resources such as wetlands and habitat for migratory birds and other at-risk species. Sustainable management of these resources helps to ensure compliance with environmental laws and regulations and the continued availability of training lands and other installations.

(2) Defining Impact to the Research Mission

Implementation of this INRMP would enhance the environment that supports the research mission. There are no natural resources management activities in this INRMP required by regulation or recommended as stewardship actions that would negatively impact or constrain the research mission.

(3) Relationship to Other Plans

a. Stormwater Pollution Prevention Plan

The Stormwater Pollution Prevention Plan (SWPPP) identifies and maps potential pollutant sources that may contribute to the contamination of the stormwater discharges from permitted outfall drainage areas. Potential sources of pollutants include outdoor industrial activities and processing areas; material storage and handling areas; areas where hazardous material/hazardous waste/or petroleum, oil, and lubricant products are stored; construction and demolition sites; and land areas where chemicals are applied. The plan also describes stormwater management standards, stormwater management controls, and best management practices (BMPs) used at installations to maintain and protect water quality. SWPPPs are developed as a requirement of state and federal water pollution control regulations. Whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the potential for the discharge of pollutants to the waters of the state, the SWPPP must be amended. Currently a SWPPP is complete for NRL-CBD (DoN, 2004) and a plan is being drafted for NRL-DC. NRL-POM does not currently have a SWPPP. At all three of the installations BMPs are being used to ensure the local, state and Federal laws are being met Of the three NRL installations, only the NRL-CBD are subject to the EPA's National Pollutant Discharge Elimination System (NPDES) permit requirements and are included in the SWPPP. The remaining installation, NRL-POM, does not have NPDES permits and therefore does not require a SWPPP.

b. Installation Restoration Program

The DoN Installation Restoration Program (IRP) is responsible for identifying Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) releases, Resource Conservation and Recovery Act (RCRA), and releases under related provisions; considering risks and assessing impacts to human health and the environment, including impacts to endangered species, migratory birds, and biotic communities; and developing and selecting response actions when a release may result in an unacceptable risk to human health and the environment. When appropriate, the regional or installation's natural resources management staff will help the IRP Remedial Project Manager (RPM) identify potential impacts to natural resources caused by the release of these contaminants.

Installation natural resources staff will also participate, as appropriate, in the IRP decision-making process by communicating natural resource issues on the installation to the RPM, attending Restoration Advisory Board (RAB) meetings, reviewing and commenting on IRP documents (e.g., Remedial Investigation, Ecological Risk Assessment), and ensuring that response actions, to the maximum extent practicable, are undertaken in a manner that minimizes impacts to natural resources on the installation.

When appropriate, the installation natural resources staff will make recommendations to the IRP RPM regarding cleanup strategies and site restoration. During initial monitoring protocols, the natural resources manager has the opportunity to recommend site restoration practices that are outlined within the INRMP. Examples include landfill caps restored to grasslands, excavation areas restored to wetland/pond areas, and treated water located to enhance a pond area. No other information regarding the IRP is included in this INRMP, except for specific citation of or reference to the most up-to-date IRP program documents and their location.

B. Natural Resources Consultation Requirements

A number of federal laws, including the ESA, MBTA, Magnuson-Stevens Fishery Conservation and Management Act (MSFMCA) and CWA, require consultation with a designated federal regulatory agency such as USFWS, National Marine Fisheries Service (NMFS) or the U.S. Army Corps of Engineers (USACE) if a federal action has the potential to adversely impact a regulated resource.

(1) Endangered Species Act

Under the ESA, each federal agency must consult with the USFWS to ensure that its actions are not likely to threaten the continued existence of any threatened or endangered species or result in the destruction or adverse modification of habitat of such species. Section 7 of the ESA requires federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. Federal agencies are required to consult with the USFWS if an action may affect a listed species. Federally listed threatened

and endangered species known to occur in Calvert and Charles counties, Maryland and the District of Columbia are listed in Table 2-3.

(2) Clean Water Act

Under Section 404 of the CWA, discharge of dredge and fill material into waters of the United States, including wetlands, is prohibited unless a permit is issued by the USACE. Military construction (MILCON) and other activities with the potential to disturb wetlands must be reviewed individually with regard to wetland impacts, and federal permits are sought as needed.

(3) Migratory Bird Treaty Act

The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. An exemption to the MBTA that allows incidental take of migratory birds by the DoD during military readiness activities was finalized in February 2007 (Federal Register [FR] Vol. 72, No. 39). As directed by Section 315 of the 2003 National Defense Authorization Act, this rule authorizes such take, with limitations, that result from military readiness activities. If the DoD determines that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects.

(4) Magnuson-Stevens-Fishery Conservation and Management Act

The MSFCMA sets mandates for the NMFS, regional fishery management councils, and federal action agencies to identify and protect important marine and anadromous fish habitat. The councils, with assistance from NMFS, are required to delineate essential fish habitat (EFH) in fishery management plans or fishery management plan amendments for all managed species. Authority to implement the MSFCMA is given to the Secretary of Commerce through the NMFS. The MSFCMA requires that the EFH be identified and described for each federally managed species. NMFS has identified EFH in major estuaries, bays, and rivers along the northeastern coast of the United States. In the Potomac River, EFH has been designated for the following species:

- Windowpane flounder (*Scopthalmus aquosus*). EFH for juvenile and adult windowpane flounder includes bottom habitats with a substrate of mud or fine-grained sand (NOAA 1998).
- Bluefish (*Pomatomus saltatrix*). Bluefish is a schooling pelagic species and thus is not generally associated with bottom habitats. EFH for juvenile and adult bluefish includes the pelagic water column (NOAA 2007a).
- King mackerel (*Scomberomorus cavalla*). Spanish mackerel (*Scomberomorus maculates*), and cobia (*Rachycentron canadum*) are considered highly migratory species

by NMFS and EFH has been designated for all life stages of these species in the Potomac River (NOAA 2007b).

- Summer flounder *(Paralicthys dentatus)*. EFH for juvenile and adult summer flounder includes the demersal (i.e., bottom) waters of the Potomac River (NOAA 2007c).
- Red drum (*Sciaenops occelatus*). EFH for all life stages of red drum in the Potomac River includes tidal inlets and creeks, salt marshes, submerged aquatic vegetation, and unconsolidated bottom (i.e., soft sediments; NOAA 2007d).

Additionally, three skates have EFH designations in the Chesapeake Bay and associated inlets. Clearnose Skate *(Raja eglanteria*) has EFH designations for juvenile and adult in areas of the Chesapeake Bay and associated inlets with rocky or gravelly substrates and salinities greater than 22 parts per thousand (NOAA 2007e). EFH is also designated for the juvenile and adult stages of Little Skate (*Leucoraja erinacea*) and Winter Skate (*Leucoraja ocellata*), including sandy, gravelly, or mud substrates in the Chesapeake Bay and its tributaries (NOAA 2007e).

The MSFCMA requires federal agencies to consult with the NMFS on activities that may adversely affect EFH or when the NMFS independently learns of a federal activity that may adversely affect EFH. The MSFCMA defines an adverse effect as "any impact which reduces quality and/or quantity of EFH [and] may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR 600.810).

C. Planning for NEPA Compliance

NEPA of 1969, 42 USC §4232 et seq., requires all federal agencies take into consideration the potential environmental consequences of proposed actions in their decision-making process. The objectives of NEPA are to ensure that the government makes informed decisions and the public is included in the decision-making process and that all reasonable alternatives for an action are considered.

The Secretary of the Navy Instruction (SECNAVINST) 5090.6A and OPNAVINST 5090.1C establish Navy policy, procedures, and responsibilities for NEPA documentation for Navy actions. It is Navy policy to initiate the NEPA processes at the earliest possible time to be an effective decision-making tool in the course of identifying a proposed action and to develop and carefully consider a reasonable range of alternatives for achieving the purpose of the proposed action.

The Council on Environmental Quality (CEQ) defines an INRMP as a major federal action requiring NEPA analysis. As a result, the Navy Office of General Counsel has determined that Sikes Act requirements for INRMP implementation necessitate the preparation of NEPA documentation prior to INRMP approval. It is expected that annual updates and revisions would

be covered under the original NEPA documentation unless there has been a major change in installation mission or program scope.

NEPA is a procedural law that requires review and compliance with other laws. These include, but are not limited to, the: CAA, CWA, CZMA, National Historic Preservation Act (NHPA), Pollution Prevention Act (PPA), and ESA.

Per Section 102 of NEPA, all agencies of the federal government must address the following environmental planning requirements:

- Utilize a systematic, interdisciplinary approach to ensure the consideration of natural resources and the environment in planning and decision making;
- Prepare a detailed statement (i.e., an environmental impact statement) for major federal actions significantly affecting the quality of the environment;
- Study, develop, and describe appropriate alternatives to actions that use or impact natural resources or the environment;
- Recognize the worldwide and long-range character or environmental problems; and
- Initiate and utilize ecological information in the planning and development of resource-oriented projects.

D. Beneficial Partnerships and Collaborative Resource Planning

The development of partnerships with state and federal resources agencies as well as local conservation and academic institutions assists in developing and implementing sound management practices. The following is a list of groups and agencies that may form significant partnerships with NRL installations.

- The USFWS provides assistance in matters that concern the conservation, protection, and management of fish and wildlife species.
- The Chesapeake Bay Ecological Services Field Office provides assistance in the management of invasive species.
- The MDNR Wildlife and Heritage Service provide assistance in matters that concern the conservation, protection, and management of fish and wildlife species in Maryland.
- The MDNR Natural Heritage Program provides information and guidance related to rare, threatened, and endangered species information in Maryland.
- The DDOE provides help with air and water quality, fisheries and wildlife, watershed protection, stormwater management, and toxic substances for the Washington DC area.

E. Public Access and Outreach

(1) Public Access and Outdoor Recreation

There is very little open space available at NRL-DC. Because there is very little open space at NRL-DC (nearly all of the land is used for buildings, other facilities, and parking), opportunities for outdoor recreation are limited to the development of picnic areas for installation personnel. The restriction on public access and limited personnel involvement at NRL-POM precludes the development of outdoor recreation. The emphasis on outdoor recreation at NRL-CBD could be on a nature trail for outdoor recreation as well as nature study for site employees. These activities could be accomplished through coordination with installation employee volunteers. The existing perimeter and interior roads could be used for development of the nature trail.

(2) Public Outreach

Environmental education is an integral part of outdoor recreation and performs an important service for the military and surrounding community. News releases are one means to disseminate information about environmental stewardship and highlights of the accomplishments in natural resources management. For example, announcements in the newsletter at NRL-DC of birding opportunities at NRL-CBD would provide the staff opportunities for environmental education through greater awareness of bird communities and the DoD Partners in Flight (PIF) partnerships. Placement of interpretive signs along the proposed nature trail at NRL-CBD could provide valuable opportunities for environmental education through explanation of ecological features along the trail. The main goals of the environmental education program should be to enhance employee enjoyment and awareness and to increase employee's feelings of responsibility and respect for natural resources

F. Encroachment Partnering

The Defense Authorization Act (Title 10 USC 2684a) includes a provision that authorizes the execution of agreements with public and private partners to address the use or development of real property near installations to help limit encroachment and other constraints on research and testing operations.

Encroachment is defined in the OPNAVINST 11010.40 as "Any non-Navy or Navy action planned or executed in the vicinity of a naval activity or operational area which inhibits, curtails, or possesses the potential to impede the performance of the mission of the naval activity." OPNAVINST 11010.40 provides details for development of Encroachment Action Plans, which identify, quantify, and provide mitigation strategies for the potential encroachment threats to an installation. These plans delineate short, mid, and long-term strategies to address encroachment threats at that installation. Encroachment partnering with allowable entities will help accomplish

the Navy's goal of preservation and sustainment of conditions that are compatible with the mission and that achieve operational assurance.

G. State Comprehensive Wildlife Plans

State Wildlife Action Plans (SWAP in Maryland) and Wildlife Action Plans (WAP) in D.C. are 10-year strategic plans that are required for continued funding through the State Wildlife Grant Program administered by the USFWS. The Maryland SWAP and D.C. WAP were developed with extensive input from other state and federal agencies, nongovernmental organizations, and private citizens. A DoD representative served as the Conservation Team Leader on the External Steering Committee, which acted as an advisory board to ensure that a wide range of resource conservation interests were addressed in the development and implementation of the Maryland SWAP and D.C. WAP.

(1) District of Columbia

The District of Columbia's WAP was prepared in 2006 by the DDOE Fisheries and Wildlife Division (DDOE 2006). The plan incorporates information on these elements:

- Distribution and abundance of fish and wildlife species and descriptions of key habitats;
- Problems facing species or habitats and conservation actions; and
- Monitoring plans, the review cycle, and public participation.

The WAP focuses on species and habitats of greatest conservation need in D.C.; however, it is also an action plan for the conservation of the District's wildlife. One hundred-forty eight species of wildlife have been identified as species of greatest conservation need, or 19 percent of the total wildlife species found in the District (DDOE 2006). Thirteen habitat types have been identified as priority habitats for conservation (DDOE 2006).

The District WAP is available online at: http://ddoe.dc.gov/ddoe/cwp/view,a,1210,q,494364,ddoeNav,%7C31007%7C.asp

(2) Maryland

The Maryland Comprehensive Wildlife Conservation Strategy, or SWAP, was developed and is implemented by the MDNR Wildlife and Heritage Service (MDNR 2005). The SWAP focuses on species and habitats of greatest conservation need in Maryland; however, it is also an action plan for the conservation of all of the state's wildlife. The 502 "at risk" wildlife species and 35 "key wildlife habitats" such as Carolina bays, tidal marshes, grasslands, and old growth forests are assessed, and threats, conservation actions, and research needs are recommended in this report. The SWAP identifies significant habitat threats, such as habitat fragmentation and loss, and outlines 24 statewide conservation actions.

The SWAP identified a large number of conservation actions to address problems facing Maryland's at risk species and key wildlife habitats. The general categories of conservation actions were coordination; education and outreach; enforcement; habitat management; land protection; planning; regulations, policy, and law; and species management. Actions recommended in this INRMP are generally consistent with those put forth in the SWAP.

Habitat management, land protection, and planning conservation actions directly addressed in this INRMP include the following:

The Maryland SWAP is available online at: http://dnr.maryland.gov/wildlife/divplan_wdcp.asp

- Protect wetlands from drainage, ditching, filling, water withdrawal, and other damaging practices that alter hydrology.
- Incorporate wetland and forest conservation actions into land use and land planning efforts.
- Develop habitat management guidelines for use by natural resources personnel.

4. PROGRAM ELEMENTS

A. Rare, Threatened, and Endangered Species Management

(1) Program Description

Under the mandates of the ESA, federal agencies must protect and conserve the habitats under their control. Federal agencies must also conserve listed species and ensure that agency actions do not jeopardize the continued existence of those species.

A formal Rare, Threatened and Endangered Species survey for Puritan tiger beetle (*Cincindela puritana*) and Northeastern beach tiger beetle (*Cincindela dorsalis dorsalis*) was completed at NRL-CBD on July 2, 9, and 15, 2008 (Straughan Environmental Services, Inc., 2008a). A follow up survey for glade fern (*Diplazium pycnocarpon*) and red turtlehead (*Chelone oblique*) was completed at NRL-CBD on September 24, 2008 (Straughan Environmental Services, Inc., 2008b). On July 2, 2008 an adult Puritan beetle was found foraging on beach habitat located at the southeastern end of the CBD property and it is believed that this beach provides foraging habitat for a colony located south of the CBD property. Northeastern beach tiger beetle was not found during the initial survey and does not likely occur within the CBD property boundary. During the follow up survey for glade fern and red turtlehead, neither of the species was found within the CBD property but potential habitat was mapped. Annual or biennial surveys in potential habitat areas are recommended for both species (Straughan Environmental Services, Inc., 2008b).

NRL-DC and NRL-POM have not been surveyed for the presence of rare, threatened, and endangered species.

(2) Management Goals

The overall goal of this program element is to ensure compliance with the ESA, the Bald and Golden Eagle Protection Act, applicable state regulations, and to protect and enhance rare species populations and their habitats. Management criteria for the program include avoid impacts to rare, threatened, and endangered species and their habitat and maintaining existing population levels and habitat, and where feasible, increase populations and enhance habitat.

NRL natural resources professionals coordinate the planning, budget controls, and general administrative functions of the program. The USFWS, DDOE, and the MDNR Wildlife and Heritage Division provide guidance on rare species management issues and projects. The program ensures compliance with the following federal and state laws and the DoD and Navy policies:

- ESA of 1973 (16 USC 1531-1544, 87 Stat. 884) as amended;
- Bald and Golden Eagle Protection Act (16 USC 688-688 d, 54 Stat. 250) as amended;
- Maryland Endangered Species of Fish Conservation Act (4-2A-01 et seq.);

- Maryland Nongame and Endangered Species Conservation Act (10-2A-01 et seq.); and
- OPNAVINST 5090.1C Environmental and Natural Resources Program Manual.

B. Wetlands Management

(1) Program Description

Wetlands are protected and regulated protected by Section 404 of the CWA, EO 11990 (Wetland Protection), EO 11988 (Floodplain Protection), and applicable state regulations. The Navy considers wetland protection a top priority as reflected by their "No Net Loss" wetland policy. The wetland protection policy of NRL is in strict compliance with federal and state requirements and the Navy's wetland policy.

No wetlands have been identified by the USFWS National Wetlands Inventory (USFWS 2006) for NRL-DC, since most of the land has been converted through past urban development. At NRL-POM a survey of wetlands has not been performed, but the USFWS National Wetlands Inventory has identified at least one wetland within the facility. A delineation of wetlands at NRL-CBD was performed by the USACE in 2006 and stratifies the recommendations of the 2003 INRMP for NRL-CBD (NRL 2006). The wetland data contained in the NRL-CBD (geographic information system) GIS are available to a variety of users to ensure that wetland issues are integrated into the mission and land use planning processes. All proposed development activities are coordinated with the Natural Resources Manager early in the planning process to ensure that wetland issues are addressed. The Natural Resources Manager provides assistance in identifying potential alternatives to ensure compliance with regulations and to ensure that impacts to wetlands are avoided and minimized to the extent possible.

(2) Management Goals

The goals of wetlands management at NRL installations are to avoid or minimize impacts to wetlands to the greatest extent practicable, to mitigate any unavoidable impacts in accordance with state and federal regulations, and to enhance wetland habitats where feasible. The primary statutes that regulate activities in wetlands are EO 12088 - Federal Compliance with Pollution Control Standards, and the CWA, which require federal facilities to comply with all substantive and procedural requirements applicable to point and nonpoint sources of pollution.

The overall goal of the program is to ensure compliance with Section 404 of the CWA, EO 11990, EO 11988, and applicable state regulations, as well as to protect and enhance wetland communities at NRL installations. Management criteria for the program include:

- Protect and enhance the biodiversity, functions, values, and habitat availability of wetland communities;
- Maintain no net loss of installation wetlands;

- Implement ecosystem management practices to achieve program goals; and
- Comply with existing federal and state wetland regulations.

(3) Wetland Management

Under Section 404 of the CWA, discharge of dredge and fill material into waters of the United States, including wetlands, is prohibited unless a permit is issued by the USACE. Exemptions for discharges of dredged or fill material are provided for normal forestry activities such as timber harvesting and construction and maintenance of forest roads in accordance with BMPs if the activity is part of an established operation. However, activities that bring an area into farming, silviculture, or ranching use are not considered part of an established operation and do require permits.

In accordance with Section 401 of the CWA, federal agencies must also obtain a water quality certificate from the state for any action requiring a federal license or permit. The Maryland Department of the Environment (MDE) requires state permits for any impacts to state waters and wetlands, including isolated wetlands. A joint permit application process is used by the USACE and MDE for permitting purposes involving water and wetland resources.

As part of the permit evaluation process used to authorize a particular project proposing to impact state waters (including wetlands), applicants must (1) establish that avoidance of impacts to state waters, including wetlands is not practicable; (2) demonstrate that all practicable efforts to minimize unavoidable impacts to state waters, including wetlands, have been taken in project design and construction plan; and (3) provide a plan for compensation for all unavoidable impacts.

A number of Nationwide Permits (NWPs) may be used to streamline the permitting process for activities that would have minimal adverse effect on wetlands and other aquatic environments. The NWPs protect all jurisdictional waters, including small wetlands and other waterbodies, through their terms and conditions, such as acreage limits and linear foot limits. The NWPs also support the ‘‘no net loss goal’’ through mitigation requirements. Currently, activities such as the maintenance of existing structures, residential development, reshaping existing drainage ditches, stormwater management facilities, and recreational facilities that do not alter the existing landscape are permitted under NWPs. The maximum acreage limits of most of the NWPs is one-half acre including the loss of no more than 300 linear feet of stream bed, though several NWPs require a preconstruction notification to the District Engineer regardless of acreage impacted (72 FR 11092). The 300-linear foot limitation includes ephemeral, intermittent, and perennial streams (unless for intermittent and ephemeral stream beds this 300 linear foot limit is waived in writing by the district engineer). If project impacts are expected to exceed these criteria, an individual permit must be sought.

Compensatory mitigation requirements are determined by district engineers on a case-by-case basis, after considering relevant and available information, such as the ecological conditions of the project site, the type of activity, the impacts of the activity on the aquatic environment and other public interest factors. General conditions for NWPs require compensatory mitigation at a minimum one-for-one for all wetland losses that exceed one-tenth acre and require preconstruction notification. The mitigation ratio however, can be adjusted upward as necessary to provide for more appropriate mitigation for a specific activity. Mitigation ratios recommended by the MDE (MDE 2003) for various wetland types are generally as follows:

- 1:5:1 Emergent non tidal
- 1:5:1 Farmed non tidal
- 3:1 Scrub-shrub and forested non tidal wetlands
- 3:1 Emergent non-tidal wetlands of special state concern
- 4:5:1 Scrub-shrub and forested non-tidal wetlands of special state concern
- 4:5:1 Mitigation banking requirement if no other options are found

C. Fish and Wildlife Management

Fish and Wildlife Management at NRL installations addresses a wide variety of issues and is applicable to the entire installation. Game, non-game, wildlife habitat, fisheries, nuisance wildlife, and collection permit management all fall under the Fish and Wildlife Management Program.

In accordance with the Wildlife Management Plan and the overall natural resources management approach at NRL, fish and wildlife management focuses on protecting and enhancing biodiversity through ecosystem management. Biodiversity consists of all elements of the natural environment; ecosystem management is a tool that encourages management decisions to focus on natural resources at a community or ecosystem level rather than at a single species level. By maintaining or improving the quality, integrity, and connectivity of the ecosystem, individual species should prosper. While species-specific management actions are implemented under the Fish and Wildlife Management Program, they are done so within the broader context of ecosystem management. It should also be recognized that virtually every management program contributes to the management of fish and wildlife at the installation and that there is significant overlap with other programs. For example, rare species are a component of nongame management, but are also addressed separately under the Rare Species Management Program. The diverse ecological communities at and adjacent to NRL installations support an abundance of fish and wildlife resources. Federal and state lands in the vicinity of the installation are dedicated to the conservation of the region's natural resources and wildlife.

(1) Program Description

The availability of suitable habitat and diversity of habitats influences fish and wildlife populations at NRL installations. For NRL-DC, with the majority of the installation developed or comprised of mowed lawn, the potential for supporting a wide diversity of wildlife is relatively low and most species known or expected to occur are those that are adapted to urban environments (i.e., Canada geese). Nuisance wildlife control is a primary management activity that is required to reduce damage to facilities and habitats at both NRL-POM and NRL-CBD. NRL-POM is in a rural setting and has undeveloped land that is suitable as wildlife habitat, the sensitive nature of the military mission and lack of public access preclude management activities designed to increase wildlife populations on the installation. Reduction of deer population at NRL-CBD is a concern due to potential harm to limited natural resources.

Opportunities for fish and wildlife management at NRL-CBD include habitat development, fish stocking, and installation of bird nesting structures. The various habitat types that exist on NRL-CBD should be maintained to provide a diversity of food and cover resources for game and nongame animals.

(2) Management Goals

The overall goal of the program is to manage fish and wildlife resources to maintain and enhance ecosystem functions and values in a manner that is consistent with the research mission. The USFWS, DDOE, the MDNR are cooperating agencies and provide guidance on management issues and projects.

Management goals for the program include:

- Maintain healthy fish and wildlife populations that are capable of supporting nonconsumptive uses;
- Maintain and enhance biodiversity;
- Use ecosystem management practices to achieve program goals; and
- Ensure that wildlife populations do not conflict with the research mission.

(3) Urban Wildlife

Because of the high level of development at NRL installations, the conservation and enhancement of the remaining natural habitats is important to protecting the installations' wildlife resources. Conservation efforts that focus on maintaining a diversity of forested habitats that provide year-round food and cover (coniferous stands) as well as seasonal food and cover (deciduous stands) would provide the greatest benefits for wildlife. Providing supplemental habitat in urban areas is another management action that can enhance wildlife habitat at the installation.

Avian species are more likely to inhabit remnant forest patches surrounded by urban or developed land and thus abundance and diversity may be higher than that of mammals or herpetofauna. NRL installations are located within the Atlantic Flyway, which is a major migration route for migratory birds along the U.S. East Coast. Large numbers of birds are found in this corridor during the spring and fall migration periods.

(4) Nuisance Animal Management

Nuisance species are those that, because of their feeding or nesting habits, interfere with the research mission or well-being of domestic animals, other wildlife, or humans. Effective control measures must be based on economical, ecological, and sociological considerations to ensure that actions are justified, are environmentally safe, and are in the best interest of the public. Because of their feeding or nesting habits, nuisance animals interfere with the research mission, domestic animals, native wildlife species, and humans.

Three references that apply to managing nuisance animals are: (1) DoD Pest Management Program (DoD 2008; DIR 4150.07 [OPNAVINST 5090.1C]) and (2) Pest Management Program (OPNAVINST 6250.4B).

Potential requirements for nuisance animal control at NRL-DC involves resident Canada geese that are abundant in the Washington, D.C. area and pose potential aircraft strike hazard for helicopters arriving and departing the installation. Although Canada geese are not currently a nuisance species on NRL-DC, their presence in the local area requires an awareness of the potential for aircraft strike hazard. Resident and migratory Canada geese are legally protected under provisions of the Migratory Bird Treaty Act (MBTA). Coordination with the USDA Animal and Plant Health Inspection Service-Wildlife Services (APHIS-WS) and MDNR is required in any effort to handle or harm geese outside the legal hunting season. All NRL installations are responsible for producing a damage report that must be forwarded to MDNR, which issues the necessary permit for harassing geese.

Guidelines that describe methods of habitat modification, exclusion, and frightening nuisance geese and other waterfowl are available from the APHIS-WS at: http://www.aphis.usda.gov/ws/.

Nuisance animals at NRL-POM include woodchucks, turkey vultures, and black vultures. The burrowing activity of woodchucks has undermined some structures and created holes in mowed areas. Roosting by vultures on the antennas at NRL-POM has required periodic cleanup activities to remove defecation and debris. In accordance with the Memorandum of Understanding (MOU) between the DoD and APHIS-WS, assistance may be obtained for animal damage assessment and control of these species if problem arises again.

At NRL-CBD, overpopulation of deer, groundhogs, and roosting by osprey on the antennas has developed into nuisances situations. Nuisance animal control requirements to prevent overbrowsing of natural vegetation and ornamentals, assistance may be obtained from MDNR in developing alternative control methods. The deer population is currently estimated to be between 100 and 110 deer. The deer population has increased beyond the carrying capacity of this environment in the subsequent years since this study. The highest population estimated at NRL-CBD represented a density of approximately 1.5 acres per deer. The carrying capacity for this region is generally accepted as 20-40 acres per deer. Use of deer repellents to reduce deer numbers is at best only a short-term solution and has been unsuccessful in most applications throughout the United States. Cooperative efforts between the NRL and MDNR are currently being coordinated for deer control at NRL-CBD.

There is an active groundhog population at NRL-CBD that produces large holes in lawn areas and could potentially undermine the structural integrity of some buildings and the pier complex. Nuisance animals at this installation potentially pose safety hazards and could potentially damage personal property. They are not considered protected by federal or state laws; however, special permits may be required to trap, transport, or otherwise control these animals. The public works center contracts licensed pest controllers to perform nuisance wildlife control for groundhogs at NRL-CBD.

Osprey have a tendency to nest in trees with flat-topped canopies that are upwards of 50 feet tall and close to a large body of water that is well stocked with fish. Unfortunately, many of the antenna structures at NRL-CBD happen to fit the requirements for nesting osprey and they have become a nuisance species due to interference with Navy equipment. Although ospreys are now a common sight on Chesapeake Bay, two to three decades ago they faced possible extinction along much of the Atlantic coast due to DDT contamination. Ospreys are protected in guidelines outlined by the Migratory Bird Treaty Act (MBTA) and Biological Opinion (USFWS 2007) and must also be implemented to ensure continued protection of other raptors species. While the physical removal of these species is prohibited unless it impedes the research mission, the voluntary movement of this species by providing alternative nesting areas is potentially a solution.

(5) Integrated Pest Management

Solutions for pest management, whether focused on insects or nuisance animals, are best identified in an integrated pest management plan (IPMP). Integrated pest management (IPM) is an ecosystem-based strategy that focuses on long-term exclusion of pests and the damage they cause through techniques such as biological control, habitat manipulation, modification of cultural practices, and education of installation personnel. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment. The integrated aspect of IPM means that individual management decisions

are not isolated, but take into account all aspects of the existing and potential pest situation in relation to the overall installation operation. Instead of focusing on how to eradicate pests, IPM considers pest biology and all of the feasible preventive and curative options. IPM requires integrating the best available options in a complementary way to create an overall management plan that is efficient, effective, and sustainable. Cultural practices such as sanitation and habitat management are often the first line of defense in preventing pest problems.

The goal of an IPMP is to make decisions that produce economically and environmentally optimum results. These decisions are based on research whose goal is to fully comprehend the pest's biology, as well as management techniques and decisions that have been used on these nuisance species in the past. An IPMP was prepared in 2003 (NRL 2003a, NRL 2003b) for NRL-DC and NRL-CBD that outlines in-house and contractor responsibilities and includes pest management sheets for several pests frequently encountered. Each NRL installation maintains at least one Pest Management Program, including general pest control and grounds maintenance (NRL 2003a, NRL 2003b).

D. Forestry Management

(1) Program Description

The forested areas at NRL installations are relatively small with little or no potential for conventional commercial forest management (i.e., logging, timber sales). There is no forestland at NRL-DC though the installation does support a number of landscaped areas. A street tree inventory was conducted in 2004 to catalog and document the condition of street trees and provide maintenance recommendations. At NRL-POM, a forested buffer of approximately surrounds the facility and is maintained primarily as a noise and visual buffer, however again this area is too small for any forest management practices except as custodial maintenance as a buffer zone. Because there are only 32 forested acres at NRL-CBD, conventional forest management activities are not warranted. Although, there is a need for a management plan to maintain the forest ecosystem and removal of an accumulation of course woody debris which has accumulated over time; some of which could be considered dangerous due to fire and/or snagged-falling hazards.

(2) Management Goals

Although forest resources are not managed for timber production, they do provide a number of benefits to the installations including watershed protection, wildlife habitat, visual buffers, and recreational opportunities for installation personnel. The primary objectives of forest management at NRL installations are to maintain safe conditions for personnel, to maintain forests that contribute to the overall ecosystem functions, and improve the appearance of the installations through the preservation of existing natural and landscaped areas.

At both NRL-POM and NRL-CBD there is some potential for improving forests through custodial maintenance. The benefits of such maintenance could include improvements to safety, aesthetics, soil resources, watershed protection, wildlife habitat, and prevention of forest fires, disease outbreak and insect infestation. The most recent forest inventory at NRL-CBD was conducted in 1983 and does not reflect current conditions. No forest inventory has been conducted at NRL-POM.

(3) Urban Forestry

The objective of urban forestry is to optimize the social benefits of forested areas based on aesthetic, environmental, planning, and wildlife considerations, while reconciling these objectives to the needs of people, buildings, and other structures that typically coexist with urban forested land. Regularly scheduled management is needed to minimize safety hazards and sustain the urban forest on NRL installations.

There are no large, contiguous tracts of forest land at NRL-DC that would require typical forestry practices such as thinning, harvesting, and regeneration. The forested areas on this installation are small, isolated groups of trees ranging in size from a few trees to less than a quarter acre. Nonetheless, urban forestry practices are necessary to maintain these trees for their value in providing shade, outdoor recreation, parkland, and wildlife habitats. At NRL-POM and NRL-CBD larger tracks of forests are found and have been mostly set aside as buffer zone

Urban forestry practices often focus on establishing standard tree and shrub maintenance. Implicit in these standards is the goal of preventing unnecessary damage to trees and shrubs from construction or grounds maintenance activities. Implementing standard grounds maintenance practices that address protection of existing trees and shrubs can help achieve this goal.

Although commercial forestry is not an objective of forest management at NRL installations; urban forest management is necessary to maintain these resources for their value in providing shade, outdoor recreation, parkland, and wildlife habitats. Navy policies on urban forests, as stated in NAVFAC P-73, Real Estate Operations and the Natural Resources Management Procedural Manual, require consideration of both forest and landscape trees in all planning decisions.

Urban forestry planning involves selecting plants and trees that are suited to the particular site conditions or regional climate, planting trees or shrubs appropriate distances from buildings, and using proper pruning techniques. A prime concern in such landscape planning is the potential for tree and utility conflicts, involving both existing and proposed facilities.

E. Vegetative Management

(1) Program Description

Grounds maintenance is conducted on improved areas at NRL installations. The developed areas of NRL-DC have been maintained by landscaping and grounds maintenance for more than 80 years. Such maintenance involves mowing and trimming, application of soil amendments such as fertilizer and lime, reseeding grass areas, irrigation, control of insects and diseases, weed control, and tree planting. Landscape tree planting and tree maintenance are additional issues at NRL-DC and NRL-CBD. These activities are conducted primarily by the Research and Development Services Division through contracts to licensed landscape managers. There are minimal requirements for urban forestry and grounds maintenance at NRL-POM where grounds maintenance primarily involves mowing in grassland areas to maintain sufficient open area around communications facilities.

(2) Management Goals

A major focus of landscaping and land management at NRL-DC and NRL-CBD is implementation of the President's Executive Memorandum on Environmentally Beneficial Landscaping (EO 13148). In support of this directive, the Navy issued guidance affecting the use and selection of native plants on Navy lands. Under EO 13148, federal agencies are directed to implement the following items, where cost-effective and practicable:

- Use regionally native plants for landscaping.
- Design and use construction practices that minimize adverse effects on the natural habitat.
- Prevent pollution by reducing fertilizers and pesticides, using IPM techniques, recycling green waste, and minimizing runoff.
- Implement water-efficient practices such as the use of mulches, efficient irrigation systems, recycled or reclaimed water for irrigation, and selecting and siting of plants in a manner that conserves water and controls soil erosion.
- Create outdoor demonstrations incorporating native plants, as well as pollution prevention and water conservation techniques, to promote awareness of the environmental and economic benefits of implementing this directive.

F. Migratory Birds Management

(1) Program Description

Migratory birds are a large, diverse group of birds that utilize breeding grounds in the United States and Canada, and overwinter in southern North America, Central and South America, the West Indies, and the Caribbean.

(2) Management Goals

The goals of migratory bird management at NRL installations are to support the conservation of migratory birds through habitat conservation and enhancement and to avoid the incidental take of migratory birds through research support actions in accordance with the MBTA to the greatest extent practicable.

The MBTA, 16 USC 703-712 is the primary legislation in the United States enacted to conserve migratory birds. The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulation. As of August 2006, 972 species were included on the list of migratory birds (FR Vol. 71, No. 164). Non-native species such as house sparrows, European starlings, rock dove, and mute swans (*Cygnus olor*) are not protected by the MBTA.

An exemption to the MBTA allowing for the incidental take of migratory birds by the DoD during military readiness activities was finalized in February 2007 (FR Vol. 72, No. 39). As directed by Section 315 of the 2003 National Defense Authorization Act, this rule authorizes such take, with limitations, that result from military readiness activities. If the DoD determines that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects.

Additional protection for migratory birds on federal properties is provided by EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. This EO stresses incorporating bird conservation principles in agency management plans and requires federal agencies to enter into an MOU on migratory birds with the USFWS.

G. Invasive Species Management

(1) Program Description

Invasive species are typically alien plants or animals that have been intentionally or accidentally introduced by human activity into a region in which they did not evolve. Unlike many exotic species, invasive species escape cultivation and result in a variety of negative impacts. They become agricultural pests, infest lawns as weeds, displace native plant species, reduce wildlife habitat, and alter ecosystem processes. The economic costs of invasive species include loss of recreational land value, clogging of important waterways, and increased costs in maintaining open powerline rights-of-way. Additionally, because of their ability to alter natural ecosystems and diminish the abundance or survival of native species, invasive species are recognized as a leading threat to natural ecosystems and biodiversity, as well as a leading cause of species becoming threatened and endangered. It is estimated that 42 percent of the species protected by the ESA are at risk primarily because of nonnative, invasive species (Pimental et al. 2005)

Invasive and exotic species have not been reported as a problem at NRL-DC or NRL-POM, although no surveys have been done to verify the extent of invasive species at these installations. At NRL-CBD problems have been reported for common reed (*Phragmites australis*) and tree-of-heaven (*Ailanthus altissima*). Common reed occurs along the bottom of the cliffs in a wetland caused by water retention from the current erosion control wall and is also present in the open field ponds. Tree-of-heaven is scattered throughout the installation; it occurs as a single plant and in multistem colonies. In addition, there are a number of other invasive species, such as honey suckle (*Lonicera* spp.) and potentially privet (*Ligustrum* spp.), on the cliff sides and draws along the Chesapeake Bay. Although, these species may be invasive, they may be the only soil erosion control for these cliffs at this time.

(2) Management Goals

The overall goal of invasive species management is to protect ecosystems and native plant and animal species from invasive species through compliance with EO 13112. The EO requires that federal agencies coordinate complimentary, cost-effective activities concerning invasive species with existing organizations addressing invasive species. The Federal Interagency Committee for the Management of Noxious and Exotic Weeds, The Nature Conservancy, and the Maryland Natural Heritage Program may be available to provide guidance on invasive species management issues and projects.

Primary management objectives recommended in EO 13112 are to eradicate small infestations and contain expansive infestations. Early eradication of small infestations will save significant time and money and will be more successful than attempts to eradicate larger infestations. Expansive infestation should be contained by preventing the edges from advancing by using long-term control efforts, such as biological control, focused on the core of the infestation.

The following are the pertinent guidance (federal law and EO) relating to the management and/or maintenance of exotic invasive species management at NRL installations.

The Federal Noxious Weed Act of 1974 and the President's EO on Invasive Species (EO 13112) provide for the control of noxious plants on lands under the control or jurisdiction of the federal government. The law allows poisonous plants and noxious weeds to be controlled or destroyed in an approved manner when the plants interfere with the safe and efficient use of the land, endanger the health and welfare of personnel, or infest adjacent property.

EO 13112, Invasive Species, was issued in February 1999 to identify actions which may affect the status of invasive species. Subject to the availability of appropriations and to the extent practicable and permitted by law, each federal agency shall use relevant programs and authorities to: prevent the introduction of invasive species; detect and control such species in a cost-effective manner; monitor invasive species populations; provide for restoration of native habitats

that have been invaded; conduct research on invasive species to prevent introduction and for sound control; and promote public education on invasive species.

(3) Inventory

A thorough inventory of invasive species has not been conducted at NRL installations to date. To comply with EO 13112, a formal survey for invasive species should be conducted at these installations. Regularly monitoring for new populations of invasive and noxious weed species allows for early control of infestations, since management efforts are more effective when population sizes are small. NRL-CBD and NRL-DC installations are developed, urban bases with large edge-to-area ratios, rendering these areas highly vulnerable to invasion by exotic species. Although NRL-POM is isolated from most urban development, the potential for non-native invasive species is still a threat, and in many cases more so compared to an urban setting, since invasive species usually go unnoticed until population have grown quite large. An annual reconnaissance survey should be conducted to identify the presence of exotic or invasive species and to recommend control actions. Early control of these species would minimize maintenance costs and adverse effects on native species.

(4) Invasive Plant Control

Nonnative species are considered by some experts to be the second most important threat to biodiversity, after habitat destruction (Randall 1996; Pimm and Gilpin 1989). Invasive plants have characteristics that permit them to rapidly invade new areas and out-compete native plants for light, water, and nutrients. Some of these characteristics are: early maturation; profuse reproduction by seeds and/or vegetative structures; long seed life in the soil; seed dormancy which ensures periodic germination and prevents seedlings from sprouting during unfavorable conditions; adaptations for spread with crop seeds, by natural agents, and by humans; production of biological toxins that suppress the growth of other plants; prickles, spines, or thorns that can cause physical injury and repel animals; ability to parasitize other plants; seeds that are the same size and shape as crop seeds, which makes cleaning difficult; roots or rhizomes (tough horizontal shoots) with large food reserves; ability to survive and produce seeds under adverse environmental conditions; and high photosynthetic rates.

In accordance with EO 13112, NRL installations will control populations of invasive plants in a cost-effective and environmentally sound manner, although funding for such programs has historically been absent. When practicable, control efforts will be coordinated with other local or regional control programs. A variety of controls measures will be employed based on species-specific and site-specific requirements. In some cases, a combination of control measures may be appropriate. Various options for invasive plant control are discussed below.

a. Avoidance

Several avoidance measures are already in place at NRL installations and include prohibiting the use of invasive plants for landscaping or other purposes, implementing BMPs to minimize land disturbances that promote invasion, and re-vegetating disturbed areas with native species. Avoidance will remain the preferred measure of control.

b. Mechanical Controls

This method involves physical removal of invasive plants through means such as hand pulling of individual stems, digging, cutting, and mowing. This method can be very effective for certain species on a localized basis and is often the preferred method in order to avoid impacts to non target species and the use of herbicides. However, physical removal can be labor intensive on a larger scale, and repeated removal is typically required to ensure success. When implemented on a large scale, measures must be taken to avoid impacts to non target species and to minimize the potential for erosion. If used inappropriately, large-scale mechanical methods that disturb the ground can actually encourage invasive plant growth. Mechanical methods are often used in combination with selective use of a glyphosate-based herbicide.

c. Biological Controls

Biological controls typically involve the introduction of a species (biological control agent) that feeds on or impedes the growth of the target invasive plant. The science of biological controls has made significant advances in recent years, but effective and approved methods are currently limited. Where applicable, this method can be very cost effective and avoids potential impacts associated with chemical and mechanical controls. However, many biological control agents are nonnative species, which raises additional concerns. Biological control measures may be used at NRL installations when they are determined to be the most appropriate measure available. Use of biological controls will be limited to those agents that are USDA-approved and for which NEPA documentation already exists.

d. Chemical Controls

Herbicide application can be a very effective means of controlling invasive plants. However, herbicides have the potential to impact non-target plants as well as fish and wildlife resources. However, when appropriately used, non persistent herbicides can be the most appropriate control measure for many circumstances. Selective glyphosate-based herbicide application, in combination with mechanical methods and/or controlled burning, is an effective method for many common invasive plants. In accordance with DoD pest management guidelines herbicide use to control invasive plants will be limited to the extent possible. All herbicide use will be conducted in accordance with the Pest Management Plan and a DoD-certified applicator (or equivalent) will perform all applications. Only licensed herbicides will be utilized in accordance

with their approved uses. Herbicides used to control wetland or aquatic plants must be licensed for use in wetlands.

H. Land Management

(1) Program Description

The Land Management Program provides the foundation for the conservation of all other natural resources components, and serves as the basic land use and conservation management guide. Sound land and water management practices that conserve soil and water are paramount to the overall natural resources conservation program. Soil and water resources form the basis for supporting the remaining components of the system. Consequently, every effort is made to ensure this foundation is protected from man-induced and natural impacts. The program is applicable to the entire installation and has significant interaction with grounds maintenance/vegetative management, wetlands management, urban forest management, and fish and wildlife management, as well as other environmental compliance program elements.

(2) Management Goals

The goals of land management at NRL installations are to provide the basic requirements for natural resources and to ensure these resources will be sustained in perpetuity. Objectives of land management include:

- Conservation, development, management, and maintenance of all natural resources in accordance with proven scientific methods, procedures, and techniques;
- Protection of the real estate from depreciation by implementing appropriate land use practices;
- Reduction or elimination of any contribution of pollution through waste disposal or erosion and sedimentation;
- Improvement of the appearance of NRL installations through the preservation of the natural terrain and vegetation;
- Compliance with all applicable federal and state laws and regulations that mandate soil and water conservation;
- Improvement of the general health of the forest ecosystem while maintaining ecological balance;
- Protection of known rare, threatened, and endangered species and critical habitat; and
- Direct the natural development of the forest ecosystem to provide a variety of renewable resources and benefits.

(3) Erosion and Sediment Control

Minimizing the effects of erosion and sedimentation is a primary goal of the land management plan. Protection of the soil resources from erosive action maintains fertility, the integrity of the vegetative community it supports, and the quality of surface waters. The enforcement of the installation regulation prohibiting off-road vehicle parking has provided erosion and sediment control. A basic knowledge of soils and their potentials, limitations, and restrictions for certain uses is a prerequisite to effectively handle soil-and water-related problems. Thus, BMPs for watershed protection at NRL installations should include:

- Maintenance of site stormwater retention ponds which encourage deposition of suspended sediments and allow infiltration of storm runoff;
- Steering development to impervious soils and leaving porous soils free to infiltrate water;
- Preserving the floodplain and natural drainage systems;
- Use of grassed ditches rather than curbs and gutters; and
- Use of vegetative buffers along streams and along cliff side to prevent erosion.

The entire eastern border of NRL-CBD is coastal cliffs and represents a unique set of management concerns because of their high erodibility and instability. The cliffs are composed of bluish-gray, brittle clay intermixed with sand lenses. As this material becomes exposed to wind and water, it tends to peel off in vertical layers. Groundwater develops in perched water tables because of the impermeable clay layers. The saturated sand layers allow groundwater to seep out the cliff face, which results in increased cliff instability. The toe debris from sloughing cliff layers has become vegetated and has helped to stabilize the toe of the cliffs.

Several projects have been completed by the Calvert County Soil Conservation District for erosion control at NRL-CBD. The steep cliffs at NRL-CBD are subject to wind and wave erosion. The sandy soils are highly erodible from stormwater runoff. The erosion rate along the shoreline has been approximately 6 feet per year over the last 100 years. In the future evaluations of the cliff and shoreline may be necessary to help reduce the rate of erosion. Figure 4-1 shows a typical cross-section of the shoreline stabilization project at NRL-CBD.

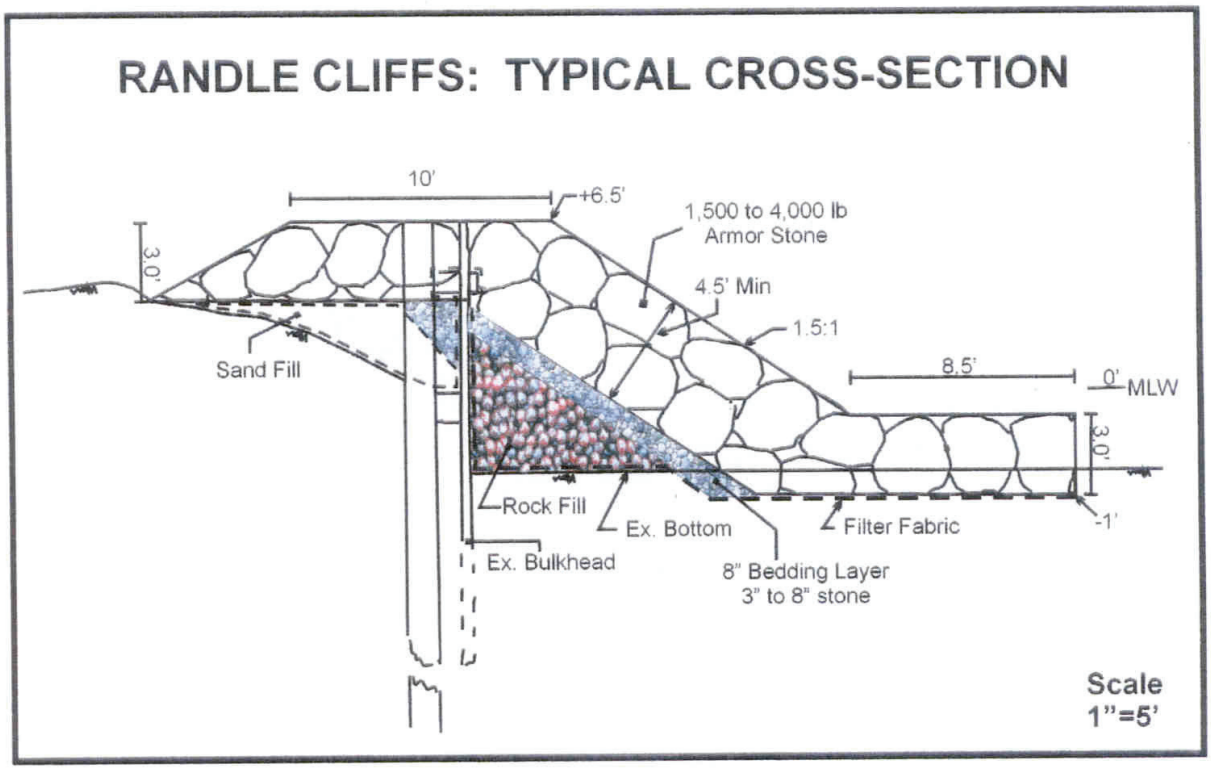

Figure 4-1. Bulkhead Renovation for Shoreline Stabilization

Two projects were proposed for management of stormwater runoff and bulkhead renovation for streambank stabilization and riparian buffer/wetland habitat protection, during the 2003 INRMP, at this time both of the projects have been finished. The completed and proposed projects include the following:

- 1992 – installation of stormwater control structure and piping behind Building 76
- 1994 – installation of rock jetty and stone reinforcement at the pier for shoreline erosion control
- 1996 – completion of Phases I and II of the Stormwater Management Retrofit Project
- 1998 – construction of embankment stabilization project, pond repair, and stormwater controls at the High Velocity Gun site
- 2000 – emergency inlet repair on the east side of Route 261
- 2001 – completion of Phase III of the Stormwater Management Retrofit Project
- 2003 – Completion of Phase IV of the Stormwater Management Retrofit Project
- Future Evaluations - Shoreline stabilization and cliff-line stabilization

I Agricultural Out Leasing

Not Applicable.

J. Use of Geographical Information Systems

Geographic data and information are an integral part of natural resources and environmental protection and planning at the NRL installations. All GIS information is collected and maintained in coordination with the Environmental Section at NRL.

NAVFAC created the GeoReadiness Repository to provide geospatial information relative to the Navy's Real Property Inventory to support functional areas including facilities management, environmental management, antiterrorism/force protection, base development/planning, regional planning, and range management. The GeoReadiness Repository, completed in 2004, provides a single source of authoritative strategic-level geospatial data for Class I (land) and Class II (facilities) properties (Carlen and Bason 2004). The GeoReadiness Repository enforces the Spatial Data Standards for Facilities, Infrastructure, and Environment. The GeoReadiness Repository provides a corporate resource for sharing existing data at the regional level and was not designed to replace current GIS management at NRL installations.

K. Outdoor Recreation

(1) Program Description

Outdoor recreation is defined by OPNAVINST 5090.1C as any program, activity, or opportunity dependent on the natural environment. Outdoor recreation at NRL installations include exercise activities such as walking, jogging, and bicycling; sport activities such as baseball/softball, tennis, and volleyball; and pavilion areas for picnics and gatherings. Developed or constructed facilities such as golf courses, tennis courts, riding stables, lodging facilities, boat-launching ramps, and marinas are generally not included in this definition of outdoor recreation and not discussed in this INRMP, other than depiction in Figures 2-5 through 2-7. Due to the urban nature and/or relatively small size of the installations, there are no consumptive uses (i.e., hunting or fishing) of the natural resources at NRL installations. Bird watching is the main non-consumptive natural resources based recreational activities at NRL installations. To help develop a more environmental or natural feel to the very urban setting of NRL-DC, an increase in nature or walking trails would promote more outdoor recreational opportunities.

(2) Management Goals

It is Navy policy to provide outdoor educational and recreational opportunities appropriate to the mission and the resources of Navy installations. The primary goals of outdoor recreation management at the NRL installations are to:

- Provide outdoor recreational opportunities for station personnel, and the military community to the maximum extent possible within the constraints of the research mission and capability of the natural resources; and
- Foster understanding and awareness of the environment through educational conservation programs.

L. Bird Aircraft Strike Hazard (BASH)

Not Applicable.

M. Wildland Fire Management

(1) Program Description

Wildfires are not a significant problem at NRL installations; however, fire management remains a concern given the nature of the mission activities. NRL-DC is completely developed and a Wildland Fire Management plan is not applicable. If fires were to break out at NRL-DC, the Naval District Washington (NDW) base fire department would respond. Both NRL-POM and NRL-CBD have forested areas that could be threatened by wildland fires, at both facilities local fire departments would respond. In case of fire:

- NRL-DC—Call 202-767-3333 and NDW base fire department responds.
- NRL-CBD—Call 410-257-4040 and CBD security responds and calls local fire department in Chesapeake Beach.
- NRL-POM—Call 911 and local LaPlata Volunteer Fire Department responds.

(2) Management Goals

The primary goals of wildfire management at NRL are to minimize the potential for wildfire and reduce its impacts to the greatest extent practicable. Additional objectives are to use prescribed fire, where feasible, as a cost effective management tool to enhance wildlife habitat and manage vegetation on operational lands. NRL-CBD has approximately 10 acres of forested land, but most of this area is surrounded by rural neighborhoods and roads, and burning would be difficult. Mechanical removal of course woody debris and forest thinning may be a more appropriate procedure.

(3) Management Practices

Evaluating, monitoring, and where necessary, reducing the potential fire hazard are important components of wildfire management. Specific fire protection procedures include vegetation maintenance in and around explosive storage and test areas.

Natural resources management activities that have potential to increase the risk of fire include prescribed burning and timber operations. Prescribed fire is an efficient land management tool used for both timber and wildlife benefits. It is often used in natural resources management to:

- Reduce hazardous fuel accumulation
- Prepare sites for seeding and planting
- Manage early successional habitat
- Improve wildlife habitat
- Control undesirable vegetation

However, where prescribed fire is not applicable due to damage to military structures and/or civilian structures and roads, mechanical measures may need to be used to maintain the forested areas to reduce the risk of wildfires, invasive species, insect infestation, or disease outbreaks. Prescribed burning, although rarely employed, is conducted in accordance with DNR Forest Service guidelines, which include fire protection procedures. DNR Forest Service fire resources may be available to help in a wildland fire event at Pomonkey. In addition, all prescribed burning is conducted in accordance with a base standard operating procedure (SOP) and a site-specific prescribed burn plan, which is developed by the Natural Resources Manager. The burn plan follows the guidelines of the state prescribed burn program and must include wildfire protection procedures. The plan must also provide for smoke management, state the objective of the treatment, and include a materials list and safety contact numbers. A map that indicates each burn unit and the location of all fire lines, firebreaks, roads, adjacent properties, and other important landscape features is also prepared.

N. Conservation Law Enforcement

Not Applicable.

O. Agricultural Out Leasing

Not Applicable.

P. Training of Natural Resources Personnel

A list of core competencies has been developed by the Commander Navy Region Mid-Atlantic (CNRMA) Training Program Coordinator to ensure natural resources personnel are adequately trained in resources management. 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 compliance Environmental Protection Specialists conducting inspections at NRL installations; and Phase IV training is required for general storefront compliance. A list of required and recommended courses and training opportunities is

included in Appendix 8. A course identification number (CIN) is given for Navy environmental courses. Other information given includes locations or course providers.

Q. Coastal/Marine Management

(1) Program Description

EO 12088, Federal Compliance with Pollution Control Standards, and the CWA require federal facilities to comply with all substantive and procedural requirements applicable to point and nonpoint sources of pollution. In accordance with these requirements, NRL installations must obtain all appropriate federal, state, 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.

(2) Coastal Zone Management Act and Chesapeake Bay Critical Area

The CZMA encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife supported by those habitats. Although federal lands and actions are exempt from state law jurisdiction, the CZMA requires activities on federal lands that are reasonably likely to affect use of lands or waters, or natural resources of the coastal zone beyond the boundaries of the federal property, to be consistent to the maximum extent practicable with the enforceable policies of the state's coastal zone management or watershed protection program. The Maryland CZMP is consistent with CZMA Section 307, which addresses requirements for state and federal government coordination and cooperation.

The Chesapeake Bay Critical Area Act regulates all lands under tidal influence of the Bay, its tributaries, adjacent wetlands, and a 1,000-foot inland buffer (MDE 2004). Although there are no Coastal Zone Management Program requirements in the District of Columbia (USACE 2007), the DDOE Watershed Protection Division works with several regional agencies and organizations, such as the Environmental Protection Agency, Chesapeake Bay Program, Interstate Commission on the Potomac River Basin, and the Metropolitan Washington Council of Governments to address shared environmental concerns (DDOE 2007).

(3) Stormwater Management and Pollution Prevention

An important component of any stormwater management program is non-point source pollution control. Some primary constituents of non-point source pollution include sediments, nutrients, and organic and toxic substances. At NRL installations, non-point source pollutants originate as sediments from disturbed areas, fertilizer runoff from lawns, minute amounts of automobile fluids, and other pollutants that wash from roadways during rainfall. The Navy considers abatement of nonpoint source pollution to be a top priority and NRL installations have developed

a nonpoint source management strategy in the SWPPP (NRL 2003). The purpose of this strategy is to cooperate closely with the EPA's Nonpoint Source Management Program and responsible state and local agencies. Nonpoint source pollution programs are administered by the following state agencies: Virginia Department of Conservation and Recreation Division of Soil and Water Conservation, MDE, and the District of Columbia Department of the Environment Watershed Protection Division. The NRL natural resources management program plans for containment of pollutants on the installation and dissipates their effects through bioremediation, thus benefiting soil and water conservation through the containment of environmental contaminants from stormwater.

R. Floodplains Management

(1) Program Description

The USACE regulates discharges of dredged or fill materials within 100-year floodplains. Few USACE Nationwide Permits are available for this purpose and almost all of these require notification to the District Engineer. Floodplains receive additional protection through EO 11988, Floodplain Management, which instructs federal agencies to restore and preserve floodplains and to reduce the risk of flood-related loss by not building there. If floodplain disturbance is unavoidable, appropriate permits and NEPA documentation must be obtained before any ground-disturbing activities are undertaken.

(2) Management Goals

The goal of managing floodplains at NRL installations is to ensure the avoidance, protection, and restoration of floodplains in accordance with the CWA, EO 11988, and the Chesapeake Bay Agreement to the greatest extent practicable.

(3) Management Practices

NRL-DC and NRL-CBD are the only NRL installations covered in this INRMP that are located within a 100-year floodplain. However, NRL-CBD lies mostly on a hill above the Chesapeake Bay and is therefore outside of the 100-year floodplain except for the shoreline at the bottom of the cliffs. At NRL-DC the 100-year floodplain only encompasses the property near the Potomac River. Land use changes proposed in the 100-year floodplain are reviewed through the NEPA documentation process.

S. Other Leases

Not Applicable.

5. IMPLEMENTATION

A. Prescriptions and Project Descriptions

During development of this INRMP, the working group members have defined goals, identified legal drivers, and collaborated to develop natural resources management objectives at NRL installations. A list of projects necessary to meet these goals and objectives were also developed. Detailed prescriptions including management actions, cost estimates, funding classification, and an implementation schedule are in Appendix 1 and a tabular list of projects is in Appendix 2.

The INRMP is considered implemented if the installation:

- Actively requests, receives, and uses funds for all Level 4 projects and activities;
- Ensures that sufficient numbers of professionally trained natural resources management staff are available to perform the tasks required by the INRMP;
- Coordinates annually with all cooperating offices; and
- Documents specific INRMP action accomplishments undertaken each year.

B. Achieving No Net Loss

The Sikes Act states that an INRMP shall provide for no net loss in the capability of military installation lands to support the military mission of the installation. Therefore, mission requirements and considerations have been integrated into this INRMP and the capability to support the mission is a natural resources priority.

C. Use of Cooperative Agreements

A Cooperative Agreement is used to acquire goods or services to accomplish a public purpose of support or stimulation authorized by federal statute. Use of cooperative agreements requires substantial involvement between the federal agency and recipient during performance of the activity. Sikes Act Cooperative agreements may be used to accomplish work identified in the INRMP and may be entered into with states, local governments, nongovernmental organizations, and individuals to provide for the maintenance and improvement of natural resources or to benefit natural resources research on DoD installations. Cooperative Agreements authorized by the Sikes Act are not subject to the provisions of the Federal Grant and Cooperative Agreement Act, but must comply with the procedural requirements of the DoD Grant and Cooperative Agreement Regulations. Funds approved for a particular fiscal year may be obligated to cover the costs of goods and services provided under a Cooperative Agreement during any 18-month period beginning in that fiscal year in accordance with the Sikes Act. Using cooperative agreements to accomplish projects is an efficient means to implement IMRMPs.

D Funding

The Office of Management and Budget (OMB) and the EPA require federal agencies to classify natural resources projects based in part on compliance requirements. DoDI 4715.3-Enclosure 4 provides detailed guidance on programming and budgeting natural resources projects. The priority classifications (Class 0 through Class III) are summarized below.

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

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

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

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

An additional Navy funding classification consists of four Environmental Readiness Levels (ERLs). Environmental Readiness Level 4 are "must fund" conservation requirements that are required to meet recurring natural and cultural resources conservation management requirements or current legal compliance needs, including Executive Orders. Specifically, Environmental Readiness Level 4:

- Supports all actions specifically required by law, regulation or EO (DoD Class I and II requirements);
- Supports all DoD Class 0 requirements as they relate to a specific statute such as hazardous waste disposal, permits, fees, monitoring, sampling and analysis, 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 inter-department and inter-agency efforts, and OSD mandated regional coordination efforts.

Environmental Readiness Level 3:

- Supports all capabilities provided by ERL4;
- Supports existing level of Navy executive agent responsibilities, participation in OSD sponsored inter-department and inter-agency efforts, and OSD mandated regional coordination efforts;
- Supports proactive involvement in the legislative and regulatory process to identity and mitigate requirements that will impose excessive costs or restrictions on operations and training; and
- Supports proactive initiatives critical to the protection of Navy operational readiness.

Environmental Readiness Level 2:

- Supports all capabilities provided under ERL3;
- Supports enhanced proactive initiatives critical to the protection of Navy operational readiness;
- Supports all Navy and DoD policy requirements; and
- Supports investments in pollution reduction, compliance enhancement, energy conservation and cost reduction.

Environmental Readiness Level 1:

- Supports all capabilities provided under ERL2;
- Supports proactive actions required to ensure compliance with pending/strong anticipated laws and regulations in a timely manner and/or to prevent adverse impact to Navy mission; and
- Supports investments that demonstrate Navy environmental leadership and proactive environmental stewardship.

An additional assessment level is assigned to projects to assist in recognizing appropriate funding sources in environmental program requirements exhibit. The following descriptions of Navy Assessment Levels are summarized from the Navy Environmental Requirements Guidebook (CNO 2003). Navy Level 1 requirements are those prescribed by state or federal laws, regulations, and EOs; Level 1 requirements include OMB/EPA Class 0, I, or II projects and ongoing efforts. Navy Level 2 requirements are derived from DoD or Navy policy; Level 3

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

A list of proposed projects necessary to implement this INRMP, implementation schedule, funding level, and proposed funding source is in Appendix 1. All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in this INRMP is intended to be nor must be construed to be a violation of the Anti-Deficiency Act (31 USC 1341 et seq.).

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Appendix 1

Project Prescriptions
Rare, Threatened, and Endangered Species Management

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Project Title

Rare, Threatened, and Endangered Species Surveys at NRL-CBD

Project Description

Conduct seasonal rare animal and plant species surveys for a period of one year for species identified as having a high probability of occurring. Update existing survey data and GIS layers for rare, threatened, and endangered species. This information is necessary to maintain a current status of the INRMP. Information will also enable NRL natural resources staff to develop management plans if necessary and conduct habitat enhancement projects.

Conduct threatened and endangered species surveys:

- Coordinate with USFWS and MDNR on survey methodology, informal consultation, and technical assistance as needed.

Impact to Mission

Noncompliance with ESA, Sikes Act, 32 CFR Part 190 (DoD Natural Resources Management Program) and, DoD Instruction 4715.3 (Environmental Conservation Program).

Regulatory Drivers: Federal agencies are required to ensure that their actions will not adversely impact endangered species. Updates to past surveys to substantiate the presence or absence of listed species are necessary to ensure compliance and population health. Monitoring or follow-up surveys of endangered species are also necessary to review military actions to determine effect on species populations so that actions can be modified to prevent taking or harming of these species. Specific regulatory drivers are: ESA, Sikes Act, OPNAVINST 5090.1 (series), and INRMP.

Implementation Schedule:

Priority: OMB/EPA Class I, ERL 4, Navy Level 1

Funding Sources: Internal / budget

Cost Estimate: $20,000

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INVASIVE SPECIES MANAGEMENT

Project Title

Invasive Species Survey and Management Plan for NRL-POM and NRL-CBD

Project Description

The invasive species survey, including GIS delineation and inventory, would address nuisance and invasive flora and fauna species at NRL installations. The site would be surveyed during the growing season and revisited after five years. All inventoried species would be delineated by Global Positioning System (GPS) and numbers recorded. In addition to locations and descriptions of invasive/nuisance species, guidance for control and/or eradication of the identified species would be provided a management plan.

- Coordinate with Calvert County Soil Conservation District to control common reed, tree-of-heaven, and other invasive species identified on the installation.

Impact to Mission

Invasive/nuisance species compete for habitat with native/endemic species and, in many cases, take over the habitat and change or alter the ecosystem. The result is a decrease in wildlife habitat and decreased habitat for rare, threatened, and endangered species. This is potentially true at the NRL-CBD where habitats for both the puritan tiger beetle (*Cicindela puritana*) and the northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) have being overrun by invasive species. Mapping and monitoring of invasive species are required for compliance with EO 13112. Baseline invasive species data are required to determine the extent and costs of invasive species control and to prioritize treatments.

Regulatory Drivers: Federal agencies are required to identify invasive species currently existing on federal lands, and to ensure that no new invasive species are introduced onto federal lands. In addition, federal agencies are to ensure that invasive species will not impact federally listed threatened or endangered species. Specific regulatory drivers are: Sikes Act, EO 11987 Exotic Organisms; EO 13112, Invasive Species; 32 CFR 190, Natural Resources Management Program; DoDI 4715.3 Environmental Conservation Program; OPNAVINST 5090.1C

Implementation Schedule:

Priority: OMB/EPA Class I, ERL 4, Navy Level 1

Funding Sources: Internal / budget

Cost Estimate: $20,000 per survey year

INVASIVE SPECIES MANAGEMENT

Project Title

Invasive Species Control – Phragmites at NRL-CBD

Project Description

Phragmites (*Phragmites australis*), also known as Common Reed, has been previously identified at NRL-CBD as a invasive species in wetland areas and along the Chesapeake shoreline and a potential danger to rare, threatened, and endangered species habitats (NRL 2007). Control target invasive species (identified through invasive species survey and management plan) and prevent the further spread and degradation of natural habitats on the stations. Invasive species are manageable if control efforts are undertaken early and management efforts maintained. Replace invasive species with native species in areas where they were providing landscaping, habitat, or other functions. Where applicable, this should include the planting of aquatic plant species to help stabilize aquatic soils and provide fish habitats.

Impact to Mission

Invasive/nuisance species compete for habitat with native/endemic species and, in many cases, take over the habitat and change or alter the ecosystem. The result is a decrease in wildlife habitat and decreased habitat for rare, threatened, and endangered species. Failure to implement this project would put NRL installations in noncompliance with EO 13112.

Regulatory Drivers: Federal agencies are required to identify invasive species currently existing on federal lands, and to ensure that no new invasive species are introduced onto federal lands. In addition, federal agencies are to ensure that invasive species will not impact federally listed threatened or endangered species. Specific regulatory drivers are: Sikes Act, EO 11987 Exotic Organisms; EO 13112, Invasive Species; 32 CFR 190, Natural Resources Management Program; DoDI 4715.3 Environmental Conservation Program; OPNAVINST 5090.1C

Implementation Schedule:

Priority: OMB/EPA Class II, ERL 4, Navy Level 1

Funding Sources: Internal / budget

Cost Estimate: $10,000 - $18,000 per project year

FOREST MANAGEMENT

Project Title

Forest Management Plan at NRL-POM and NRL-CBD

Project Description

Update the forest inventory and management plan. Include a hazard tree inventory and incorporate a native tree replacement program in the updated plan (see Appendix 3 for a list of native trees for NRL installations). Update forest GIS layer annually.

To develop a forest management plan:

- Inspect forested areas for insect and disease control requirements.

Impact to Mission

Failure to implement this project may result in an increased incidence of hazard trees that may become a safety issue. Absence of a forest management program to maintain health and productivity of forest stands in support of the mission ignores stewardship responsibilities; perception of Navy's natural resources program to federal, state, and NGOs is critical to the working relationship with our partners.

Regulatory Drivers: Sikes Act, 32 CFR Part 190 (DoD Natural Resources Management Program), DoD Instruction 4715.3 (Environmental Conservation Program), and 32 CFR Part 190 (DoD Natural Resources Management Program).

Implementation Schedule:

Priority: OMB/EPA Class III, ERL 2, Navy Level 5

Funding Sources: Internal / budget

Cost Estimate: $16,000 for one year

FISH AND WILDLIFE MANAGEMENT

Project Title

Deer Population Survey and Management Plan at NRL-CBD

Project Description

Conduct white-tailed deer population survey to determine population numbers, areas used, and impacts to the natural resources at NRL-CBD. Estimating deer abundance can be done through direct (spotlight counts or camera surveys) or indirect measurements (deer sightings per kilometer walked on foot or abundance of fecal pellet groups).

Due to the urban setting of the NRL-CBD and the security of some areas of the installation, abundance of fecal pellet groups would likely be the most efficient survey method, see Appendix 8 for more information. Following the deer population survey, incorporate results into a management plan that addresses damage to natural resources at the installation and methods of control. Alternative methods of control will be outlined, and one will be selected as the recommended alternative.

Implement deer herd control if needed:

- Coordinate with MDNR to reduce deer numbers.

Impact to Mission

Overpopulation of deer leads to destruction of forest habitat for other wildlife use as well as damage or destruction of landscape plantings. Additionally, deer disease and mortality could cause a health and safety issue for installation employees.

Regulatory Drivers: Sikes Act; 32 CFR Part 190, DoD (Natural Resources Management Program); OPNAVINST 5090.1C (Environmental and Natural Resources Program Manual).

Implementation Schedule:

Priority: OMB/EPA Class III, ERL 2, Navy Level 5

Funding Sources: Internal / budget

Cost Estimate: $15,000

FISH AND WILDLIFE MANAGEMENT

Project Title

Nuisance Animal Control - Groundhog removal from NRL-CBD

Project Description

Conduct a survey to determine best method for the removal of groundhogs and to implement this removal plan at NRL-CBD. Groundhogs are not considered protected by federal or state laws; however, special permits may be required to trap, transport, or otherwise control these animals. The public works center contracts licensed pest controllers to perform nuisance wildlife control at NRL-CBD. The Maryland DNR has a list of wildlife control cooperators on their website (www.dnr.state.md.us) or call Wildlife Services at 877-463-6497.

Impact to Mission

These species may cause safety hazards to people, property, and other wildlife. .

Regulatory Drivers: DoD Pest Management Program (DoD DIR 4150.7 [OPNAVINST 5090.1C]); and OPNAVINST 6250.4A.

Implementation Schedule:

Priority: OMB/EPA Class III, ERL 2, Navy Level 5

Funding Sources: Internal / budget

Cost Estimate:$5,000-$10,000

FISH AND WILDLIFE MANAGEMENT

Project Title

Pond Management Plan - Fish Stocking

Project Description

Stock the open field pond and forest pond with non-game native fish. Coordinate with MDNR and appropriate groups to obtain fish fingerlings for stocking and determine stocking rates.

Impact to Mission

Completing this project will enhance the natural functions of these two ponds and increase the number of native fish in the area.

Regulatory Drivers:	Sikes Act, 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), EO 11990 (Protection of Wetlands), and OPNAVINST 5090.1C
Implementation Schedule:	
Priority:	OMB/EPA Class 3, ERL 2, Navy Level 5
Funding Sources:	Internal / budget
Cost Estimate:	$15,000

FISH AND WILDLIFE MANAGEMENT

Project Title

Wildlife Habitat Development at NRL-CBD

Project Description

Wildlife have four basic needs for survival; food, water, shelter, and space and the more diverse the habitat, the greater the diversity of foods available on a seasonal basis. The abundance of water on NRL-CBD and in the vicinity makes this component not a limiting factor for wildlife. Shelter from adverse weather and predators, especially during nesting and rearing young, is necessary for healthy wildlife populations. Bush piles, thickets, and other vegetative cover should be maintained wherever possible on NRL-CBD as shelter for wildlife. Maintenance and development of shrubs along the edges of openings would enhance the benefits of the "edge effect" for wildlife. Shrub borders should be 20-25 feet wide and consist of native species from natural regeneration after discontinuing mowing in an area. Shrub borders would help to merge the transition from open fields to forested areas, thus maximizing the potential benefits of these two habitats for wildlife. This management could also be used to connect forested areas as travel corridors for wildlife. Wildlife requires a finite amount of space (territory or home range) to meet their life requirements and this area defined by the target organism. The size of NRL-CBD is adequate to meet the space requirements for most species of wildlife in that remain in the area; although if drastic changes are made to the natural areas of NRL-CBD (forest clearing, facilities development…) then reassessment of habitat should be considered.

To develop habitat to benefit nongame wildlife:

- Plant native shrub species such as *Vaccinium spp*., *Viburnum spp*., and *Asimina spp*. to develop shrub borders in the open fields.
- Coordinate with Calvert County Soil Conservation District to determine requirements for liming and fertilizer.
- Develop several brush piles in conjunction with the shrub borders as wildlife cover.
- Seek cooperative support from local conservation groups and installation volunteers to develop nongame habitat.

Impact to Mission

Failure to implement this project would put NRL in noncompliance with the Sikes Act. Providing sustainable multipurpose use of natural resources, including nonconsumptive uses is required by the Sikes Act and and OPNAVINST 5090.1C.

Regulatory Drivers Sikes Act, 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), OPNAVINST 5090.1C

Implementation Schedule:

Priority: OMB/EPA Class 3, ERL 2, Navy Level 5

Funding Sources: Internal / budget

Cost Estimate: $10,000

OUTDOOR RECREATION

Project Title

Interpretive Trail - Nature/walking trail at NRL-DC

Project Description

Construct an interpretive nature trail/walking trail through undeveloped areas at the NRL-DC. Design and install interpretive signs describing the flora and fauna found at the site.

In developing the nature trail:

- Locate 10 points along the trail and place interpretive signs (replaceable 12-inch x 8-inch laminated posters) with text on land management, natural history, and species descriptions.
- Seek cooperative support from installation volunteers to develop the nature trail.

Impact to Mission

Providing sustainable multipurpose use of natural resources, including nonconsumptive uses is required by the Sikes Act. As there are little natural resources available at NRL-DC, environmental education and awareness provide the primary sustainable multipurpose use of natural resources. Environmental education also performs an important service for the personnel at the Naval Research Laboratory by providing opportunities for installation personnel to experience and learn about natural resources, which will increase awareness and respect for the environment.

Regulatory Drivers: OPNAVINST 5090.1C; DoDI 4715.3, Environmental Conservation Program; 32 CFR 190, Natural Resources Management Program; Sikes Act.

Implementation Schedule:

Priority: OMB/EPA Class III, ERL 1, Navy Level 5

Funding Sources: Internal / budget

Cost Estimate: $30,000

LAND MANAGEMENT

Project Title

Pond Improvement/Restoration for NRL-CBD

Project Description

Improve water quality at the two ponds at NRL-CBD and provide the primary support for the aquatic communities. The open field pond is approximately 1.0 acre and the pond in the forested area is approximately 0.3 acre. Over the years, sedimentation in the open field pond and vegetation growth has reduced the aquatic habitat quality. In addition, the drainage riser is improperly installed and has not allowed for proper drainage to maintain pond water levels. This continual drainage has resulted in inadequate water depth for fish management. Areas of these ponds have shown signs of being invaded with phragmites, which precludes other wetland vegetation that would be more desirable as fringing vegetation. Tree growth on the earthen dams will eventually interfere with the integrity of the dam as root development penetrates the impermeable core. This is also true of trees that are growing in previously installed erosion control measures for the forested pond. These trees should be removed to maintain the integrity of the erosion control barriers.

In order to restore the ponds at NRL-CBD, the natural resource team should:

- Remove and properly install the water control structure in the open field pond, and remove some of the sediment during the water drawdown period to repair the water control structure.
- Remove trees from the dam/erosion control areas to avoid leaks in the dam from root development.

Impact to Mission

Failure to implement this project would put NRL in noncompliance with the Sikes Act. Providing sustainable multipurpose use of natural resources, including nonconsumptive uses is required by the Sikes Act.

Regulatory Drivers:	Sikes Act, 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), EO 12962, (Recreational Fisheries), OPNAVINST 5090.1C
Implementation Schedule:	
Priority:	OMB/EPA Class III, ERL 2, Navy Level 5
Funding Sources:	Internal / budget
Cost Estimate:	$15,000-$20,000

LAND MANAGEMENT

Project Title

Cliff Line Stabilization Plan (Phase 2) at NRL-CBD

Project Description

The eastern boundary of NRL-CBD consists of very tall cliffs that rise sharply from the Chesapeake Bay. The shorelines are a significant part of the character of Calvert County and provide natural heritage, scenic vistas, paleontological resources, and habitat for endangered species. These cliffs are beginning to undercut themselves and have a very high potential for erosion and landslides. In some areas, the sides of these stream valleys are extremely steep, with slopes ranging up to 40 percent. The gradient of these slopes, combined with the instability of the soils, creates potential severe slope erosion problems (see section 4H for more information). In the past a number of projects have been implemented to stabilize the shoreline with some success, but the cliff line is still vulnerable. Part of this is due to a lack of stable vegetation; much of which seems to be a mixture of invasive species. In addition these cliff lines are potential habitats for two endangered species; the puritan tiger beetle (*Cicindela puritana*) and the northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*). These endangered species are dependent on some natural erosion, which complicates how stabilization processes can be carried out. A plan of action is needed to help protect, restore, and stabilize the cliff line areas of NRL-CBD. In the development of a cliff line stabilization plan the following should be considered:

- Coordinate with the Calvert County Soil Conservation District on implementation of bulkhead renovation.
- Conduct informal consultation with USFWS for planning to avoid impacts to protected species.
- Coordinate with USFWS on avoidance and minimization of potential impacts to threatened species (Puritan tiger beetle and northeastern beach tiger beetle).
- Use BMPs specified in the Maryland Department of Environment Erosion and Sediment Control Manual and Navy standard operating procedures to avoid or minimize impacts to the environment.
- Coordinate with Calvert County Soil Conservation District for technical assistance in developing vegetative cover on the cliff face to reduce erosion and help stabilize the cliffs.

Impact to Mission

Failure to implement this project would demonstrate a lack of commitment to management and would fall short of stewardship responsibilities under the Sikes Act, OPNAVINST 5090.1C, and other regulatory drivers. In addition, continued erosion of the cliff line could damage building and jeopardize the research mission.

Regulatory Drivers:	ESA; Sikes Act; Coastal Zone Management Act; EO 13112 (Invasive Species); EO 11987 (Exotic Organisms); 32 CFR Part 190 (DoD Natural Resources Management Program); DoDI 4715.3 (Environmental Conservation Program); and OPNAVINST 5090.1C.
Implementation Schedule:	
Priority:	OMB/EPA Class 1, ERL 3, Navy Level 1
Funding Sources:	Internal / budget
Cost Estimate:	$250,000

LAND MANAGEMENT

Project Title

Shoreline Stabilization at NRL-CBD

Project Description

The shorelines are a significant part of the character of the Calvert County and Maryland. The cliffs provide natural heritage, scenic vistas, paleontological resources, and habitat for endangered species. Their preservation is vital to our future identity. However, due to potential danger to buildings and the research mission at NRL-CBD, attempts to control shoreline erosion have been implemented by the Navy and Calvert County Soil Conservation District. In the past, the erosion rate along the shoreline has been approximately 6 feet per year over the last 100 years. In the 1940s the Navy installed metal sheet piling along the shoreline and backfilled behind the piling to reduce erosion of the cliffs and to protect the buildings along the crest. The backfilled area has since developed into non-tidal wetland and riparian buffer habitat. By the 1960s the metal sheet piling had deteriorated to a point that the backfill was washing into the Chesapeake Bay. The Navy then installed a wooden bulkhead to replace the failing metal sheet piling. Several hundred feet of the sheet piling is still in place, approximately 6 feet offshore, and presents a significant safety hazard to Navy boat operations. Currently, 30 years after installation, the wooden bulkhead is failing and allowing the backfill to wash into the bay. In order to protect the research mission at NRL-CBD it is vital that new efforts to stabilize the shoreline be implemented.

To implement shoreline stabilization project the follow should be considered:

- Coordinate with the Calvert County Soil Conservation District on implementation of bulkhead renovation.
- Coordinate with USFWS on avoidance and minimization of potential impacts to threatened species (Puritan tiger beetle and northeastern beach tiger beetle).
- Use BMPs specified in the Maryland Department of Environment Erosion and Sediment Control Manual and Navy standard operating procedures to avoid or minimize impacts to the environment.

Impact to Mission

Failure to implement this project could result in loss of real estate property, infrastructure and could jeopardize the research mission.

Regulatory Drivers	Clean Water Act, Coastal Zone Management Act, EO 11990 (Protection of Wetlands), 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), OPNAVINST 5090.1, Chesapeake Bay Agreements
Implementation Schedule:	
***Priority*:**	OMB/EPA Class 1, ERL 3, Navy Level 1
Funding Sources:	Internal / budget
***Cost Estimate**:*	$1,000,000

WETLANDS MANAGEMENT

Project Title
Wetlands Delineation at NRL-POM

Project Description

Conduct baseline wetland delineation at NRL-POM and develop a wetlands GIS layer. An updated jurisdictional delineation would provide valuable wetland information to site planners. Assign wetland community types to each wetland area based on the Cowardin et al. (1979) system for wetland assessment purposes. Require that all mapped wetlands are incorporated into the installation GIS.

Impact to Mission

The lack of up-to-date wetlands delineation and GIS data layer can impede planning activities and may result in wetlands violations.

Regulatory Drivers: Clean Water Act, Coastal Zone Management Act, EO 11990 (Protection of Wetlands), 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), OPNAVINST 5090.1C

Implementation Schedule:

Priority: OMB/EPA Class II, ERL 3, Navy Level 2

Funding Sources: Internal / budget

Cost Estimate: $10,000

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Appendix 2

List of Projects

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Project Description	Implementation Schedule (FY)	Prime Legal Driver/ Initiative	Class, ERL, Navy Level	Cost Estimate ($)	Funding Source	Date Completed
Rare, Threatened, and Endangered Species Management						
Rare, Threatened, and Endangered Species Surveys at NRL-CBD	FY09	A, B, I, K	I, 4, 1	20,000	Internal / budget	
Invasive Species Management						
Invasive Species Survey and Management Plan for NRL-POM and NRL-CBD	FY09	B, G, H, I, J, K	I, 4, 1	20,000	Internal / budget	
Invasive Species Control – Phragmites at NRL-CBD	FY09, FY10, FY11, FY12, FY13	B, G, H, I, J, K	I, 4, 1	10,000 – 18,000/yr	Internal / budget	
Forest Management						
Forest Management Plan at NRL-POM and NRL-CBD	FY11	B, I, J, K	III, 2, 5	16,000	Internal / budget	
Fish and Wildlife Management						
Deer Population Survey and Management Plan at NRL-CBD	FY09	B, I, J	III, 2, 5	35,000	Internal / budget	
Nuisance Animal Control - Groundhog removal from NRL-CBD	FY11	M, N	III, 2, 5	5,000 – 10,000	Internal / budget	
Pond Management Plan - Fish Stocking	FY10	B, I, F, K, J, O	III, 3, 5	15,000	Internal / budget	
Wildlife Habitat Development at NRL-CBD	FY11	B, I, J, K	III, 3, 5	10,000	Internal / budget	
Outdoor Recreation						
Interpretive Trail - Nature/walking trail at NRL-DC	FY12	B, I, J, K	III, 1, 5	30,000	Internal / budget	
Picnic Tables Installation at NRL-DC	FY12	B, I, J, K	III, 1, 5	5,000	Internal / budget	
Land Management						
Pond Improvement/Restoration for NRL-CBD	FY10	B, I, J, K, O	III, 1, 5	15,000 – 20,000	Internal / budget	
Cliff Line Stabilization Study (Phase 2) at NRL-CBD	FY09	A, B, E, G, H, I, J, K	I, 3, 1	250,000	Internal / budget	
Shoreline Stabilization at NRL-CBD	FY12 and FY13 (If funding is identified and approved	C, E, F, I, J, K, P	I, 3, 1	3,000,000	Internal / budget	
Wetland Management						
Wetlands Delineation at NRL-POM	FY10	C, E, F, I, J, K	II, 3, 2	11,000	Internal / budget	

A – Endangered Species Act, as amended; B – Sikes Act, as amended; C – Clean Water Act, as amended; D – Migratory Bird Treaty Act, as amended;
E – Coastal Zone Management Act, as amended; F – EO 11990 (Protection of Wetlands); G – EO 13112 (Invasive Species); H – EO 11987 (Exotic Organisms); I – 32 CFR Part 190 (DoD Natural Resources Management Program); J – OPNAVINST 5090.1C (Environmental and Natural Resources Program Manual); K – DoD Instruction 4715.3 (Environmental Conservation Program). M – DoD Pest Management Program (DoD DIR 4150.7), N OPNAVINST 6250.4A.; O EO 12962, (Recreational Fisheries), P Chesapeake Bay Agreements

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Appendix 3

Surveys: Native Vegetation, Wetland Delineations and Threatened and Endangered Species Surveys for the NRL Installations

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Common Name	Scientific Name	NRL	CBD	Pomonkey
HERPETOFAUNA				
Frogs/Toads				
American Toad	*Bufo americanus*	•	•	•
Bullfrog	*Rana catesbeiana*	•	•	•
Eastern Spadefoot Toad	*Scaphiopus holbrooki*		•	•
Fowler's Toad	*Bufo woodhousei*	•	•	•
Green Tree Frog	*Hyla cinera*		•	•
Northern Cricket Frog	*Acris crepitans*	•	•	•
Pickerel Frog	*Rana palustris*	•	•	•
Pine Woods Tree Frog	*Hyla femoralis*		•	•
Southern Leopard Frog	*Rana sphenocephala*		•	•
Spring Peeper	*Hyla crucifer*	•	•	•
Upland Chorus Frog	*Pseudacris triseriata*	•	•	•
Wood Frog	*Rana sylvatica*	•		
Lizards/Salamanders				
Broadheaded Skink	*Eumeces laticeps*	•	•	•
Dusky Salamander	*Desmognathus fuscus*	•	•	•
Eastern Fence Lizard	*Sceloporus undulatus*	•	•	•
Five-Lined Skink	*Eumeces fasciatus*	•	•	•
Four-toed Salamander	*Hemidactylium scutatum*	•	•	•
Ground Skink	*Scincella lateralis*		•	•
Jefferson Salamander	*Ambystoma jeffersonianum*	•		
Marbled Salamander	*Ambystoma opacum*	•	•	•
Mud Salamander	*Pseudotriton montanus*	•	•	•
Red Salamander	*Pseudotriton ruber*	•	•	•
Red-Backed Salamander	*Plethodon cinereus*	•	•	•
Seal Salamander	*Desmognathus monticola*	•		
Six-Lined Racerunner	*Cnemidophorus sexlineatus*		•	•
Slimy Salamander	*Plethodon glutinosus*	•	•	•
Southeastern Five-Lined Skink	*Eumeces inexpectatus*		•	•
Spotted Salamander	*Ambystoma maculatum*	•	•	•
Spring Salamander	*Gyrinophilus porphyriticus*	•		
Two-Lined Salamander	*Eurycea bislineata*	•	•	•
Snakes				
Black Racer	*Coluber constrictor*	•	•	•
Black Rat Snake	*Elaphe obsoleta*	•	•	•
Brown Snake	*Storeria dekayi*	•	•	•
Copperhead	*Agkistrodon contortrix*	•	•	•
Corn Snake	*Elaphe guttata*	•	•	•
Eastern Garter Snake	*Thamnophis sirtalis*	•	•	•
Eastern Hognose Snake	*Heterodon platyrhinos*	•	•	•
Eastern Kingsnake	*Lampropeltis getulus*	•	•	•
Eastern Ribbon Snake	*Thamnophis sauritus*	•	•	•
Northern Water Snake	*Nerodia sipedon*	•	•	•
Redbelly Snake	*Storeria occipitomaculata*	•	•	•
Ringneck Snake	*Diadophis punctatus*	•	•	•
Rough Green Snake	*Opheodrys aestivus*	•	•	•
Scarlet Kingsnake	*Lampropeltis triangulum*	•	•	•
Scarlet Snake	*Cemopora coccinea*		•	•

Common Name	Scientific Name	NRL	CBD	Pomonkey
Snakes (continued)				
Smooth Earth Snake	*Virginia valeriae*	•	•	•
Smooth Green Snake	*Opheodrys vernalis*	•		
Worm Snake	*Carphophis amoenus*	•	•	•
Queen Snake	*Regina septemvittata*	•	•	
Turtles				
Snapping Turtle	*Chelydra serpentina*		•	•
Eastern Mud Turtle	*Kinosternon subrubrum*		•	•
Box Turtle	*Terrapene carolina*	•	•	•
Eastern Painted Turtle	*Chrysemys picta*		•	•
BIRDS				
Game Birds				
Bobwhite Quail	*Colinus virginianus*		•	•
Mourning Dove	*Zenaida macroura*	•	•	•
Ducks				
Black Duck	Anas rubripes		•	•
Blue Winged Teal	*Anas discors*		•	•
Green Winged Teal	*Anas crecca*		•	•
Mallard	*Anas platyrhynchos*	•	•	•
Pintail	*Anas acuta*		•	•
Song Birds				
Barn Swallow	*Hirundo rustica*	•	•	•
Bluebird	*Sialia sialis*	•	•	•
Brown Thrasher	*Toxostoma rufum*	•	•	•
Cardinal	*Cardinalis cardinalis*	•	•	•
Catbird	*Dumetella carolinensis*	•	•	•
Common Crow	*Corvus brachyrhynchos*	•	•	•
Dark-Eyed Junco	*Junco hyemalis*	•	•	•
Eastern Kingbird	*Tyrannus tyrannus*	•	•	•
Field Sparrow	*Spizella pusilla*	•	•	•
Fish Crow	*Corvus ossifragus*	•	•	•
Goldfinch	*Carduelis tristis*	•	•	•
Grackle	*Quiscalus quiscula*	•	•	•
Grasshopper Sparrow	*Ammodramus savannarum*	•	•	•
Indigo Bunting	*Passerina cyanea*	•	•	•
Meadowlark	*Sturnella magna*	•	•	•
Mockingbird	*Mimus polyglottos*	•	•	•
Purple Martin	*Progne subis*	•	•	•
Red-Winged Blackbird	*Agelaius phoeniceus*	•	•	•
Robin	*Turdus migratorius*	•	•	•
Savannah Sparrow	*Passerculus sandwichenis*	•	•	•
Song Sparrow	*Melospiza melodia*	•	•	•
Starling	*Sturnidae*	•	•	•
Towhee	*Pipilo ssp.*	•	•	•
Tree Sparrow	*Spizella arborea*	•	•	•
Vireo	*Vireo ssp.*	•	•	•
White-Throated Sparrow	*Zonotrichia albicollis*	•	•	•
Yellow Breasted Chat	*Icteria virens*	•	•	•
Yellow Throat	*Geothlypis trichas*	•	•	•

Common Name	Scientific Name	NRL	CBD	Pomonkey
Shorebirds				
Gull	*Laridae*	•	•	•
Plovers	*Charadriidae*	•	•	
Sanderling	*Calidris alba*	•	•	
Sandpiper	*Scolopacidae*	•	•	
Terns	*Laridae*	•	•	
Turnstone	*Arenaria ssp.*	•	•	
Willet	*Catoptrophorus semipalmatus*	•	•	
Yellowleg	*Tringa ssp.*	•	•	
Raptors				
Broad-Winged Hawk	*Buteo platypterus*	•	•	•
Eastern Screech Owl	*Otus asio*	•	•	•
Great Horned Owl	*Bubo virginianus*	•	•	•
Northern Harrier	*Circus cyaneus*	•	•	•
Red-Shouldered Hawk	*Buteo lineatus*	•	•	•
Red-Tailed Hawk	*Buteo jamaicensis*	•	•	•
MAMMALS				
Small Mammals				
Eastern Mole	*Scalopus aquaticus*	•	•	•
Eastern Cottontail	*Sylvilagus floridanus*	•	•	•
Gray Squirrel	*Sciurus carolinensis*	•	•	•
House Mouse	*Mus musculus*	•	•	•
Least Shrew	*Cryptotis parva*	•	•	•
Longtailed Weasel	*Mustela frenata*		•	•
Meadow Vole	*Microtus pennsylvanicus*	•	•	•
Muskrat	*Ondatra zibethicus*		•	•
Opossum	*Didelphis virginiana*	•	•	•
Raccoon	*Procyon lotor*	•	•	•
Short-Tailed Shrew	*Blarina brevicauda*	•	•	•
Striped Skunk	*Mephitis mephitis*	•	•	•
White-Footed Mouse	*Peromyscus leuopus*	•	•	•
Large Mammals				
Gray Fox	*Urocyon cinereoargenteus*		•	•
Red Fox	*Vulpes vulpes*		•	•
White Tailed Deer	*Odocoileus virginianus*		•	•
VEGETATION				
Trees				
American beech	*Fagus grandifolia*	•	•	•
American elm	*Ulmus americana*	•	•	•
American holly	*Ilex opaca*	•	•	•
black gum	*Nyssa sylvatica*		•	•
black oak	*Quercus velutina*		•	•
black walnut	*Juglans nigra*		•	•
butternut	*Juglans cinera*		•	•
common hackberry	*Celtis occidentalis*		•	•
eastern red cedar	*Juniperus virginiana*	•	•	•
eastern redbud	*Cercis canadensis*	•	•	•
flowering dogwood	*Cornus florida*	•	•	•
green ash	*Fraxinus pennsylvanica*		•	•

Common Name	Scientific Name	NRL	CBD	Pomonkey
Trees				
loblolly pine	*Pinus taeda*	•	•	•
northern red oak	*Quercus rubra*	•	•	•
overcup oak	*Quercus lyrata*	•	•	•
paw-paw	*Asimina triloba*		•	•
persimmon	*Diospyros virginian* a		•	•
pignut hickory	*Carya glabra*		•	•
red maple	*Acer rubrum*	•	•	•
red mulberry	*Morus rubra*	•	•	•
sassafras	*Sassafras albidum*		•	•
slippery elm	*Ulmus rubra*		•	•
sourwood	*Oxydendrum arboreum*		•	•
sweetgum	*Liquidambar styraciflua*	•	•	•
sycamore	*Plantanous occidentalis*	•	•	•
tree of heaven	*Ailanthus altissima*	•	•	•
tulip poplar	*Liriodendron tulipifera*	•	•	•
Virginia pine	*Pinus virginiana*	•	•	•
water oak	*Quercus nigra*	•	•	•
white ash	*Fraxinus american* a	•	•	•
white oak	*Quercus alba*	•	•	•
willow oak	*Quercus phellos*	•	•	•
Shrubs/Subtrees				
American beautyberry	*Callicarpa americana*	•	•	•
black haw	*Viburnum prunifolium*	•	•	•
black huckleberry	*Gaylussacia baccata*	•	•	•
black raspberry	*Rubus occidentalis*	•	•	•
buttonbush	*Cephalanthus occidentali* s	•	•	•
Chinese privit	*Ligustrum sinense*	•	•	•
dangleberry	*Gaylussacia frondosa*	•	•	•
deerberry	*Vaccinium stamineum*	•	•	•
European privet	*Ligustrum vulgare*	•	•	•
fetterbush	*Leucothoe racemos* a	•	•	•
highbush blueberry	*Vaccinium corymbosum*	•	•	•
mountain laurel	*Kalmia latifolia*		•	•
Pennsylvania blackberry	*Rubus pensilvanicus*	•	•	•
possum-haw	*Viburnum nudum*	•	•	•
sawtooth blackberry	*Rubus argutus*	•	•	•
scotch broom	*Cytisus scoparius*	•	•	•
spicebush	*Lindera benzoin*	•	•	•
strawberry bush	*Euonymus americanus*	•	•	•
swamp dogwood	*Cornus foemina*		•	•
swamp rose	*Rosa palustris*		•	•
wax myrtle	*Morella (Myrica) cerifera*		•	•
Vine/Liana				
cat greenbrier	*Smilax glauca*	•	•	•
common periwinkle	*Vinca minor*	•	•	•
crossvine	*Bignonia capreolata*	•	•	•
downy carrionflower	*Smilax pulverulenta*	•	•	•
English Ivy	*Hedera helix*	•	•	•

Common Name	Scientific Name	NRL	CBD	Pomonkey
Vine/Liana (continued)				
greenbrier	*Smilax rotundifolia*	•	•	•
honeyvine	*Cynanchum laeve*	•	•	•
Japanese honeysuckle	*Lonicera japonica*	•	•	•
muscadine grape	*Vitis rotundifolia*	•	•	•
poison ivy	*Toxicodendron radicans*	•	•	•
saw greenbrier	*Smilax bona-nox*	•	•	•
summer grape	*Vitis aestivalis*	•	•	•
trumpet creeper	*Campsis radicans*	•	•	•
virgin's bower	*Clematis virginiana*	•	•	•
Virginia creeper	*Parthenocissus quinquefolia*	•	•	•
wood vamp	*Decumaria barbara*	•	•	•
Forbs/Herbs				
a bluet	*Houstonia purpurea*	•	•	•
a glasswort	*Salicornia virginica*	•	•	•
beaked agrimony	*Agrimonia rostellata*	•	•	•
beechdrops	*Epifagus virginiana*	•	•	•
bellwort	*Uvularia perfoliata*	•	•	•
bellwort	*Uvularia sessilifolia*	•	•	•
black cohosh	*Cimicifuga racemosa*	•	•	•
black snakeroot	*Sanicula canadensis*	•	•	•
blisterwort	*Ranunculus recurvatus*	•	•	•
bloodroot	*Sanguinaria canadensis*	•	•	•
blue skullcap	*Scutellaia lateriflora*	•	•	•
blue vervain/swamp verbena	*Verbena hastata*	•	•	•
bog smartweed	*Polygonum setaceum*	•	•	•
bottonweed	*Diodia virginiana*	•	•	•
brown widelip orchid	*Liparis lillifolia*	•	•	•
brushy St. Johnswort	*Hypericum densiflorum*	•	•	•
butterfly pea	*Clitoria mariana*	•	•	•
Carolina elephant's foot	*Elephantopus carolinianus*	•	•	•
Chinese (serecia) lespedeza	*Lespedeza cumeata*	•	•	•
clearweed	*Pilea pumila*	•	•	•
cleavers	*Galium aparine*	•	•	•
common blue violet	*Viola sororia*	•	•	•
common cinquefoil	*Potentilla simplex*	•	•	•
common yellow oxalis	*Oxalis stricta*	•	•	•
cranefly orchid	*Tipularia discolor*	•	•	•
cream avens	*Geum virginianum*	•	•	•
creasted coralroot	*Hexalectris spicata*	•	•	•
cutleaf toothwart	*Cardamine concatenata*	•	•	•
devil's beggartick	*Bidens frondosa*	•	•	•
dog fennel	*Eupatorium capillifolium*	•	•	•
dotted smartweed	*Polygonum punctatum*	•	•	•
downy rattlesnake plantain	*Goodyera pubescens*	•	•	•
eastern rosemallow	*Hibiscus moscheutos*	•	•	•
elephant's foot	*Elephantopus tomentosus*	•	•	•
enchanter's nightshade	*Circaea lutetiana*	•	•	•
false nettle	*Boehmeria cylindrica*	•	•	•

Common Name	Scientific Name	NRL	CBD	Pomonkey
Forbs/Herbs (continued)				
feathery false lily of the valley	*Maianthemum racemosum*	•	•	•
fewflower ticktrefoil	*Desmodium pauciflorum*	•	•	•
field horsetail	*Equisetum arvense*	•	•	•
fireweed	*Erechtites hieracifolia*	•	•	•
Florida adder's mouth	*Malaxis spicata*	•	•	•
four-leaf yam	*Dioscorea quaternata*	•	•	•
fragrant bedstraw	*Galium triflorum*	•	•	•
golden ragwort	*Senecio aureus*	•	•	•
green adder's mouth orchid	*Malaxis unifolia*	•	•	•
hairy leafcup	*Smallanthus uvedalius*	•	•	•
hairy shadow witch orchid	*Ponthieva racemosa*	•	•	•
hairy skullcap	*Scutellaria elliptica*	•	•	•
hog peanut	*Amphicarpaea bracteata*	•	•	•
honewort	*Cryptotaenia canadensis*	•	•	•
Indian strawberry	*Duchesnea indica*	•	•	•
Jack-in-the-pulpit	*Arisaema tryphyllum*	•	•	•
jewelweed	*Impatiens capensis*	•	•	•
jumpseed	*Polygonum virginianum*	•	•	•
kidneyleaf grass-of-parnassus	*Parnasssia asarifolia*	•	•	•
lesser clearweed	*Pilea fontana*	•	•	•
licorice bedstraw	*Galium circaezans*	•	•	•
lizard's tail	*Saururus cernuss*		•	•
longstyle sweetroot	*Osmorhiza longistylis*	•	•	•
lopseed	*Phryma leptostachya*	•	•	•
lyreleaf sage	*Salvia lyrata*	•	•	•
Maryland meadow beauty	*Rhexia mariana*	•	•	•
meadow beauty	*Rhexia virginica*	•	•	•
naked-flowered tick trefoil	*Desmodium nudiflorum*	•	•	•
oneflower bedstraw	*Galium uniflorum*	•	•	•
pale Indian plaintain	*Arnoglossum atriplicifolium*	•	•	•
partridge berry	*Mitchella repens*	•	•	•
pennywort	*Hydrocotyle umbellata*	•	•	•
perplexed ticktrefoil	*Desmodium perplexum*	•	•	•
pinesap	*Monotropa hypopithys*	•	•	•
poor joe	*Diodia teres*	•	•	•
queendevil	*Hieracium gronovii*	•	•	•
red columbine	*Aquilegia canadensis*	•	•	•
rough avens	*Geum lacineatum*	•	•	•
roundlobe hepatica	*Hepatica nobilis* (*americana*)	•	•	•
scouring rush	*Equisetum hyemale*	•	•	•
sea rose-pink	*Sabatia stellari* s	•	•	•
skunk-cabbage	*Symplocarpus foetidus*		•	•
smooth Solomon's seal	*Polygonatum biflorum*	•	•	•
soft agrimony	*Agrimonia pubescens*	•	•	•
spatterdock	*Nuphar advena*	•	•	•
striped wintergreen	*Chimaphila maculata*	•	•	•
Virginia dayflower	*Commelina virginica*	•	•	•
Virginia heartleaf	*Hexastylis virginica*	•	•	•

Common Name	Scientific Name	NRL	CBD	Pomonkey
Ferns/Club-Mosses				
Christmas fern	*Polystichum acrosticoides*		•	•
cinnamon fern	*Osmunda cinnamomea*		•	•
netted chain fern	*Woodwardia areolata*	•	•	•
northern maidenhair	*Adiantum pedatum*		•	•
princess-pine	*Lycopodium obscurum*		•	•
royal fern	*Osmunda regalis*		•	•
sensitive fern	*Onoclea sensibilis*		•	•
southern lady fern	*Athyrium filix foemina*		•	•
Virginia chain fern	*Woodwardia virginica*	•	•	•
Graminoids				
big cordgrass	*Spartina cynosuroides*	•	•	•
black grass rush	*Juncus gerardii*	•	•	•
black needlerush	*Juncus roemerianus*	•	•	•
Bosc's panicgrass	*Dichanthelium boscii*	•	•	•
broomsedge	*Andropogon virginica*	•	•	•
bushy bluestrem	*Andropogon glomeratus*		•	•
common reed	*Phragmites australis*		•	•
common rush	*Juncus effusus*		•	•
Cypress panicgrass	*Dichanthelium dichotomum*		•	•
cypress swamp sedge	*Carex joorii*		•	•
eastern narrowleaf sedge	*Carex amphibola*		•	•
Eastern woodland sedge	*Carex blanda*		•	•
field paspalum	*Paspalum laeve*	•	•	•
fringed sedge	*Carex crinita*	•	•	•
greater bladder sedge	*Carex intumescens*		•	•
hairy wood rush	*Luzula acuminata*		•	•
Johnson grass	*Sorghum halepense*	•	•	•
leathery juncus	*Juncus coriaceus*		•	•
limestone meadow sedge	*Carex granularis*		•	•
long-leaf spikegrass	*Chasmanthium sessiliflorum*	•	•	•
narrow-leaved cattail	*Typha angustifolia*		•	•
variable panicgrass	*Dichanthelium commutatum*	•	•	•
warty panicgrass	*Panicum verrucosum*	•	•	•
whitegrass	*Leersia virginica*	•	•	•
woolgrass	*Scirpus cyperinus*		•	•

Data source: United States Naval Research Laboratory (NRL). 2006. Wetland delineation Naval Research Laboratory Chesapeake Bay Detachment. Naval Research Laboratory. June 2006

Figure A3-1. Results from Wetland Delineation for NRL-CBD

Figure A3-2. Results of Rare, Threatened, and Endangered Species Habitat Survey for NRL-CBD

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Appendix 4

Research Requirements

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FISH AND WILDLIFE MANAGEMENT

Project Title

Osprey Nesting Platform Observations

Project Description

Appropriate habitat for nesting and brooding has declined for many bird species world-wide. Nesting habitat can be created or enhanced for a number of species, including osprey. At NRL-CBD ospreys have increased in numbers, although available nesting sites are at a minimum which has attracted these birds to build nest on towers and building structures used to house antennas. This can be a potential problem for antenna equipment and jeopardize the research mission. A potential solution is the installation of osprey nesting platforms which could attract ospreys to nest away from antennas and towers. Ospreys prefer to nest in trees with flat-topped canopies that are upwards of 50 feet tall and close to a large body of water with ample fishing potential. The potential for established bird to move and utilize new nesting platforms is unknown. In addition, will developing more nesting platforms just encourage more birds to nest on and around existing antenna platforms, increasing the number of nesting birds and complicating the existing problem? To address these questions, an unused tower near an existing occupied nest was fitted with a nesting platform. Since osprey will not move their nest during the nesting season, current year nest site should not be disturbed until fall when birds have left for the winter (October 1 – March 1). At which time, the nest should be removed from the antenna complex. Adding a few handfuls of sticks form the old nest to the new platform may entice the returning bird to the new nesting site. If possible, construct uneven obstacles on the antenna complex in any open flat areas that birds are likely to build their nests. In the spring, weekly observation should be made to determine if nesting pairs utilize the new nesting site or try to return to the old nesting site. Although ospreys tend to be territorial, observation should be made to determine if adding new nesting sites is not just increasing the nesting population. If ospreys take to the new nesting sites, then building additional nesting platforms near affected antennas could solve the nuisance problem. This would be a more cost effective measure than building nesting sites as described in the 2003 INRMP for NRL facilities.

Impact to Mission

Failure to implement this project would demonstrate a lack of commitment to management and would fall short of stewardship responsibilities under the MBTA and other regulatory drivers.

Regulatory Drivers: Sikes Act, MBTA, 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), OPNAVINST 5090.1C

Implementation Schedule:

Priority:	OMB/EPA Class III, ERL 3, Navy Level 4
Funding Sources:	Internal / budget
Cost Estimate:	$ 2,000

Appendix 5

Migratory Bird Management

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MIGRATORY BIRD MANAGEMENT

Migratory birds are a large, diverse group of birds that utilize breeding grounds in the United States and Canada, and overwinter in southern North America, Central and South America, the West Indies, and the Caribbean. The MBTA, 16 USC §703-711 is the primary legislation in the United States established to conserve migratory birds. The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulation. An exemption to the rule that allows for the incidental take of migratory birds by DoD during military readiness activities was finalized in February 2007 (72 FR 8931). As directed by Section 315 of the 2003 National Defense Authorization Act, this rule authorizes such take, with limitations, that result from military readiness activities. If the DoD determines that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects.

Military readiness activities include 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. Military readiness does not include: the routine operation of installation operating support functions, such as: administrative offices; military exchanges; commissaries; water treatment facilities; storage facilities; schools; housing; motor pools; laundries; MWR activities; shops; mess halls; the operation of industrial activities; or, the construction or demolition of facilities listed above (72 FR 8931). During annual INRMP reviews, the Navy must report any migratory bird conservation measures that have been implemented and the effectiveness of the conservation measures in avoiding, minimizing, or mitigating take of migratory birds.

Additional protection for migratory birds on federal properties is provided by EO 13186 - Responsibilities of Federal Agencies to Protect Migratory Birds of 2001. This EO stresses incorporating bird conservation principles in agency management plans and requires federal agencies enter into a memorandum of understanding on migratory birds with the USFWS.

In accordance with the MBTA and EO 13186, NRL installations employ operational and conservation measures that avoid, minimize, or mitigate take of migratory birds.

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Appendix 6

Critical Habitat Issues

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Not Applicable.

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Appendix 7

Data Call Station Required Information

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Property Name and Total Acreage	NRL-Washington D.C.: 131.0 acres NRL-Chesapeake Bay Detachment: 161.0 acres NRL-Pomonkey: 63.0 acres
Total Acreage of Developed/Nondeveloped Areas	NRL-Washington D.C.: 131.0/1.0 acres NRL-Chesapeake Bay Detachment: 129.0/32.0 acres NRL-Pomonkey: 45.55/17.5 acres
Total Acreage of Agricultural Outleases	0
Total Forest Acres	NRL-Washington D.C.: <1.0 acres NRL-Chesapeake Bay Detachment: 32.0 acres NRL-Pomonkey: 17.45 acres
Total Recreation Acres	0
Number of Federal T&E Species	Not Surveyed –habitats have been identified at NRL-CBD
Number and Terms & Conditions for all Biological Opinions	0
Total Number of Candidate Conservation Agreements	0
Open Tasks in INRMP Implementation Table	
NEPA Documentation Review CATEXs (List by Project)	
NEPA Documentation Review EAs (List by Project)	
NEPA Documentation Review EISs (List by Project)	
NEPA Mitigation Effort	
BASH Program	N/A
Hunting Program	N/A
Fishing Program	N/A
Invasive Species Survey	No

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Appendix 8

Deer Population Survey Methodology

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Introduction

The recommended methodology for estimating deer density at NRL facilities is outlined below. This method involves counting the amount of fecal pellet groups deposited over a known period of time within a fixed area (Mayhew 2003; also see reference list). The length of time over which pellets were deposited (deposition period), the number of pellet groups deposited, and the number of pellet groups deposited per deer per day (deposition rate) are used to calculate a population density index (Mayhew 2003). The persistence of pellet groups gives this method an advantage over other methods of population density estimation (Eberhardt and Van Etten 1956). Precautions against introducing bias into the estimations include conducting surveys as early as possible after leaf fall (if snow accumulation is not an issue) or after the last frost, training surveyors, and using a second trained surveyor as quality assurance (Eberhardt and VanEtten 1956).

Assumptions of this methodology are summarized from Eberhardt and VanEtten 1956 and PDCNR:

1. Average deposition rate = 12 pellet groups per day per deer;
2. Counts made in winter/spring will include only pellet groups deposited since last leaf fall and that pellets deposited prior to leaf fall will be identifiable as such. Also, that pellets will persist from fall-spring;
3. All pellet groups are correctly identified and none are missed;
4. That 1/10 acre plot is an efficient sampling unit; and
5. A valid estimate of sampling error is obtained, although this is dependent on statistical theory and will not be investigated in detail for this methodology.

Materials

This methodology is straightforward and requires few, inexpensive pieces of field equipment. Required materials include: 10 stakes with a hook in the top (to which the rope will be attached), a length of rope cut to 11 feet and 9 inches, survey flags, and data forms. All but the data forms are available at local home supply stores or through Forestry Suppliers, Inc. (http://www.forestry-suppliers.com).

Sampling Methods

Ten plots, with a radius of 11’9” (1/100 acre), should be distributed throughout the forest and open areas at the site. In this survey methodology, fecal pellet groups are counted as a way to estimate population density; more information on this method can be found in the references listed below. Deer usually leave droppings where they are feeding (PDCNR No Date), and fecal pellet group counts are widely used to determine animal density in a given area (Campbell et al. 2004). A pellet group is defined as $\geq$ 5 pellets (CVNP 2007) and on average a deer will deposit

approximately 12 pellet groups per day (PDCNR No Date). During the survey, other deer sign including trails, tracks, and vegetation browse should be noted.

The survey can be conducted anytime between December and April, provided snow cover is not a problem, but should be finished before spring growth begins (Marques et al. 2001; Campbell et al. 2004). Ideally, two surveys should be done per year to provide two estimates of deer population density and a measure of quality control. For the first survey, in winter/spring (Jan 15), the survey plots should be permanently marked with a center stake. Attach the 11'9" rope to the center stake and place a survey flag at the outer edge of the plot circle where you start counting so as not to duplicate the count. The number of both new and old pellet groups should be counted within the 11'9" radius plot, and other deer sign should be recorded on field data sheets. If more than half of a pellet group on the edge of the plot is inside the plot, it is counted. However, only *new* pellet groups will be used in the calculations (old pellet groups will be used as other indicators of deer presence). After reading the plot, all pellet groupings should be removed from the plot, and the rope and survey flag should be removed for use at the next plot. Sixty days later (Mar 15), pellet groups occurring on the plot should be recounted using the same methodology, and the pellets left in place. Be sure to note the correct dates, as the time between counts (sampling interval) is very important to calculations. Sampling should take approximately 1 hour per plot to count pellet groupings, observe and note other deer sign and describe the vegetation / habitat type in which the plot is located.

Deer defecate in clusters, usually all in one spot, although uncommonly they may be spread out over a small area (PDCNR No Date). Deer pellets are oblong and usually have a tip at one end (CVNP 2007). Rabbit pellets may be confused, but are generally lighter in color and are round with no tip or point (CVNP 2007) and are rarely in clusters (PDCNR No Date). New pellet clusters are distinguished by a darker, shiny appearance and perhaps have recognizable bits of vegetation. Since the survey is taking place after leaf off, they should also be located on top of the fallen leaves. Old clusters are lighter in color, look dry and cracked and may be located under leaves.

Calculating Deer Density

Calculation of deer density is accomplished with the following four equations (from PDCNR):

1. $$\frac{\text{total \# of pellet groups}}{\text{total \# of plots}} \times \frac{\text{100 plots}}{\text{1 acre}} = \text{\# pellet groups per acre (A)}$$

2. $$\frac{\text{\# pellet groups per acre (A)}}{\text{12 (pellet groups per deer per day)}} = \text{\# deer per day per acre (B)}$$

3. # deer per day per acre (B) X 61 (# acres in study area) = # deer per day in study area (C)

4. $$\frac{\text{\# deer per day in study area (C)}}{\text{sampling interval}} = \text{population density in study area}$$

Notes on calculations:

Total # of pellet groups is the total of new pellet groups across all plots

Total # of plots should be 10 if the above methodology is followed

12 pellet groups per day per deer is the average outlined in PDCNR

Study area is approximately 161.0 acres

Sampling interval is number of days between sampling

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Appendix 9

Forest Management Guidelines

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Native Plants for Landscaping and Site Reclamation

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Forbs/Herbs									
Boneset	*Eupatorium* spp.	1'-4'	√	√	√		√	√	reclamation, wildflower meadow
Butterfly weed	*Asclepias tuberosa*	1'-3'	√					√	reclamation, wildflower meadow
Common milkweed	*Asclepias syriaca*	1'-2'		√	√		√	√	reclamation, wildflower meadow
Goat's rue	*Tephrosia virginiana*	1'-2'	√	√				√	reclamation
Goldenrod	*Solidago* spp.	2'-6'	√	√	√		√	√	reclamation, wildflower meadow
Late purple aster	*Symphyotrichum patens*	1'-4'	√	√			√	√	reclamation, wildflower meadow
New York aster	*Symphyotrichum novi-belgii*	1'-4'		√	√		√	√	reclamation, wildflower meadow
Round-head bushclover	*Lespedeza capitata*	2'-4'	√					√	reclamation
Sunflower	*Helianthus* spp.	1'-2'	√	√			√	√	reclamation, wildflower meadow
Swamp milkweed	*Asclepias incarnata*	1'-2'			√		√	√	reclamation, wildflower meadow
Threadleaf coreopsis	*Coreopsis verticillata*	2'	√				√	√	reclamation, wildflower meadow
Wand-like bushclover	*Lespedeza intermedia*	1'-3'	√	√			√	√	reclamation
Wild bergamot	*Monarda fistulosa*	<1'-3'	√					√	reclamation, wildflower meadow
Grasses									
Broomsedge	Andropogon virginicus	1'-3'	√	√			√	√	native warm-season grassland

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Bushy broomsedge	*Andropogon glomeratus*	1.5' -5'		√	√		√	√	native warm-season grassland
Switchgrass	*Panicum virgatum*	3'-5'	√	√	√		√	√	native warm-season grassland
Little bluestem	*Schizachyrium scoparium*	2'-3'	√	√			√	√	native warm-season grassland
Eastern gamma grass	*Tripsacum dactyloides*		√	√			√	√	native warm-season grassland
Side-oats grama	*Bouteloua curtipendula*			√			√		native warm-season grassland
Indian grass	*Sorghastrum nutans*	5'-6'	√	√			√	√	native warm-season grassland
Shrubs									
Blueberry, highbush	*Vaccinium corymbosum*	2'-12'		√	√	√	√		riparian buffer
Blueberry, lowbush	*Vaccinium pallidum*	1'-1.5'	√	√		√	√		reclamation, wildlife
Buttonbush	*Cephalanthus occidentalis*	3'-7'			√	√	√		riparian buffer
Chokeberry, red	*Aronia arbutifolia*	3'-10'	√	√	√		√	√	riparian buffer, reclamation
Dogwood, graystem	*Cornus racemosa*	10'-15'	√	√	√	√	√	√	riparian buffer, reclamation
Dogwood, silky	*Cornus amomum*	6'-10'		√	√		√		riparian buffer
Hazel alder	*Alnus serrulata*	6'-15'		√	√	√	√		riparian buffer
Hazelnut	*Corylus americana*	6'-10'		√	√		√	√	reclamation, wildlife
Inkberry	*Ilex glabrs*	2'-10'		√	√	√	√		riparian buffer, landscape
Mountain laurel	*Kalmia latifolia*	3'-10'	√	√		√	√		landscape
Serviceberry	*Amelanchier canadensis*	5'-15'		√					landscape, wildlife
Swamp azalea	*Rhododendron viscosum*	3'-8'		√	√	√	√		riparian buffer
Sweet pepperbush	*Clethra alnifolia*	3'-8'		√	√	√	√	√	riparian buffer, landscape
Viburnum, arrowwood	*Viburnum dentatum*	4'-8'		√	√		√	√	riparian buffer, landscape
Viburnum, blackhaw	*Viburnum prunifolium*	8'-15'	√	√	√	√	√		landscape, reclamation
Virginia sweetspire	*Itea virginica*	3'-5'		√	√	√	√	√	riparian buffer, landscape
Wax myrtle	*Morella (Myrica) cerifera*	2'-6'		√	√		√	√	riparian buffer
Winterberry	*Ilex verticilatta*	4'-12'		√	√		√	√	riparian buffer
Small Trees									
Dogwood	*Cornus florida*	20'-30'		√			√	√	landscape

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Hawthorn	*Crataegus* spp.	10'-20'		√			√	√	landscape
Sassafras	*Sassafras albidum*	20'-40'		√			√	√	landscape, reclamation
Serviceberry	*Amelanchier arboria*	15'-25'		√			√	√	landscape, wildlife
Sweetbay magnolia	*Magnolia virginiana*	15'-30'		√	√	√	√		riparian buffer, landscape
Medium to Large Trees									
America holly	*Ilex opaca*	40'-50'		√	√		√	√	landscape, wildlife
Ash, green	*Fraxinus americana*	50'-80'		√	√			√	riparian buffer, landscape
Ash, White	*Fraxinus pennsylvanica*	50'-60'		√	√			√	riparian buffer, landscape
Black locust	*Robinia pseudoacacia*	30'-50'	√	√			√	√	reclamation
Black willow	*Salix nigra*	30'-50'		√	√	√	√		riparian buffer
Blackgum	*Nyssa sylvatica*	50'-70'		√	√		√	√	riparian buffer, landscape, wildlife
Eastern red cedar	*Juniperus virginiana*	45'-65'	√	√	√		√	√	visual screen
Hackberry	*Celtis occidentalis*	40'-60'		√	√		√	√	riparian buffer, landscape
Oak, black	*Quercus velutina*	65'-80'	√	√	√		√	√	landscape, reforestation
Oak, cherrybark	*Quercus pagodaefolia*	70'-80'		√	√		√	√	landscape, reforestation,
Oak, chestnut	*Quercus prinus*	65'-80'	√				√	√	reforestation, reclamation
Oak, pin	*Quercus palustris*	60'-70'		√	√		√	√	riparian buffer, landscape
Oak, southern red	*Quercus falcata*	70'-80'	√	√			√	√	landscape, reforestation
Oak, white	*Quercus alba*	70'-80'		√			√	√	landscape, reforestation
Oak, willow	*Quercus phellos*	40'-60'	√	√	√		√	√	landscape, riparian buffer,
Persimmon	*Diospyros virginiana*	30'-40'	√	√			√	√	reclamation, wildlife
Pine, loblolly	*Pinus taeda*	80'-100'	√	√	√		√	√	landscape, reforestation
Pine, shortleaf	*Pinus echinata*	80'-100'	√	√			√	√	reforestation
Pine, Virginia	*Pinus virginiana*	30'-50'	√	√			√	√	reclamation
Red maple	*Acer rubrum*	50'-80'	√	√	√		√	√	riparian buffer, landscape
Red mulberry	*Morus rubra*	30'-40'		√			√	√	wildlife
River birch	*Betula nigra*	40'-70'		√	√	√	√		riparian buffer, landscape

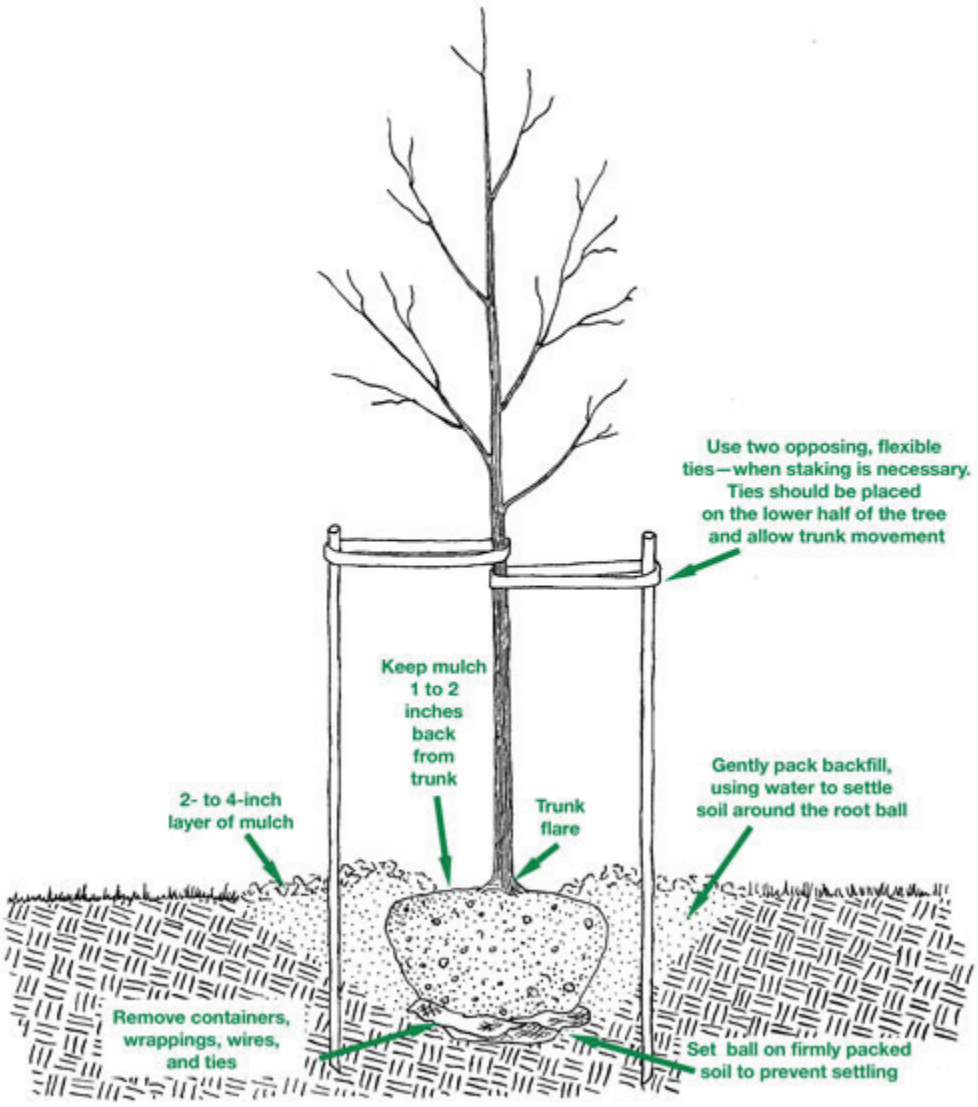
Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
Sycamore	*Platanus occidentalis*	75'-120'		√	√		√	√	riparian buffer, landscape
Yellow poplar	*Leriodendron tulipifera*	100'-150'		√			√	√	landscape, reforestation

New Tree Planting

The ideal time to plant trees and shrubs is during the dormant season, in the fall after leaf drop or early spring before bud-break. Weather conditions are cool and allow plants to establish roots in the new location before spring rains and summer heat stimulate new top growth. However, trees properly cared for in the nursery or garden center, and given the appropriate care during transport to prevent damage, can be planted throughout the growing season. In either situation, proper handling during planting is essential to ensure a healthy future for new trees and shrubs. *Before you begin planting your tree, be sure you have had all underground utilities located prior to digging.*

If the tree you are planting is balled and burlapped, or bare rooted, it is important to understand that the tree's root system has been reduced by 90-95% of its original size during transplanting. As a result of the trauma caused by the digging process, trees will commonly exhibit what is known as transplant shock. Transplant shock is indicated by slow growth and reduced vigor following transplanting. Proper site preparation before and during planting, coupled with good follow up care will reduce the amount of time the plant experiences transplant shock and will allow the tree to quickly establish in its new location. Carefully follow eight simple steps and you can significantly reduce the stress placed on the plant at the time of planting.

1. **Dig a shallow, broad planting hole.** Make the hole wide, as much as three times the diameter of the root ball, but only as deep as the root ball. It is important to make the hole wide because the tree roots on the newly establishing tree must push through surrounding soil to establish. On most planting sites in new developments, the existing soils have been compacted and are unsuitable for healthy root growth. Breaking up the soil in a large area around the tree provides the newly emerging roots room to expand into loose soil to hasten establishment.
2. **Identify the trunk flare.** The trunk flare is where the roots spread at the base of the tree. This point should be partially visible after the tree has been planted (see diagram). If the trunk flare is not partially visible, you may have to remove some soil from the top of the root ball. Find it so you can determine how deep the hole needs to be for proper planting.
3. **Place the tree at the proper height.** Before placing the tree in the hole, check to see that the hole has been dug to the proper depth, and no more. The majority of the roots on the newly planted tree will develop in the top 12" of soil. If the tree is planted too deep, new roots will have difficulty developing due to a lack of oxygen. It is better to plant the tree a little high, 1-2" above the base of the trunk flare, than to plant it at or below the original growing level. This will allow for some settling (see diagram). To avoid damage when setting the tree in the hole, always lift the tree by the root ball, and never by the trunk.
4. **Straighten the tree in the hole.** Before you begin backfilling have someone view the tree from several directions to confirm the tree is straight. Once you begin backfilling it is difficult to reposition.



5. **Fill the hole, gently but firmly.** Fill the hole about 1/3 full and gently but firmly pack the soil around the base of the root ball. Then, if the tree is balled and burlapped, cut and remove the string and wire from around the trunk and top 1/3 of the root ball (see diagram). Be careful not to damage the trunk or roots in the process. Fill the remainder of the hole, taking care to firmly pack soil to eliminate air pockets that may cause roots to dry out. To avoid this problem, add the soil a few inches at a time and settle with water. Continue this process until the hole is filled and the tree is firmly planted. It is not recommended to apply fertilizer at the time of planting.
6. **Stake the tree, if necessary.** If the tree is grown and dug properly at the nursery, staking for support is not necessary in most home landscape situations. Studies have shown that trees will establish more quickly and develop stronger trunk and root systems if they are not staked at the time of planting. However, protective staking

may be required on sites where lawn mower damage, vandalism or windy conditions are concerns. If staking is necessary for support, two stakes used in conjunction with a wide flexible tie material will hold the tree upright, provide flexibility, and minimize injury to the trunk (see diagram). Remove support staking and ties after the first year of growth. Leave protective staking in place as long as necessary.

7. **Mulch the base of the tree.** Mulch is simply organic matter applied to the area at the base of the tree. It acts as a blanket to hold moisture, protect against harsh soil temperatures, both hot and cold, and reduces competition from grass and weeds. Some good choices are leaf litter, pine straw, shredded bark, peat moss, or wood chips. A two to four inch layer is ideal. More than four inches may cause a problem with gas exchange. When placing mulch, care should be taken so that the actual trunk of the tree is not covered. This may cause decay of the living bark at the base of the tree. A mulch-free area, one to two inches wide at the base of the tree, is sufficient to avoid moist bark conditions and prevent decay.
8. **Follow-up care.** Keep the soil moist but not soaked; overwatering will cause leaves to turn yellow or fall off. Water trees at least once a week, barring rain, and more frequently during hot weather. When the soil is dry below the surface of the mulch, it is time to water. Continue until mid-fall, tapering off for lower temperatures that require less frequent watering. Other follow-up care may include minor pruning of branches damaged during the planting process. Prune sparingly immediately after planting, and wait to begin necessary corrective pruning until after a full season of growth in the new location.

(From International Society Arboriculture at *http://www.isa-arbor.com/consumer/planting.html*)

Pruning Trees

Pruning is the most common tree maintenance procedure. Although forest trees grow quite well with only nature's pruning, landscape trees require a higher level of care to maintain their safety and aesthetics. Pruning should be done with an understanding of how the tree responds to each cut. Improper pruning can cause damage that will last for the life of the tree, or worse, it will shorten the tree's life.

Reasons for Pruning

Since each cut has the potential to change the growth of the tree, no branch should be removed without a reason. Common reasons for pruning are to remove dead branches, to remove crowded or rubbing limbs, and to eliminate hazards. Trees may also be pruned to increase light and air penetration to the inside of the tree's crown or to the landscape below. In most cases, mature trees are pruned as a corrective or preventative measure.

When to Prune

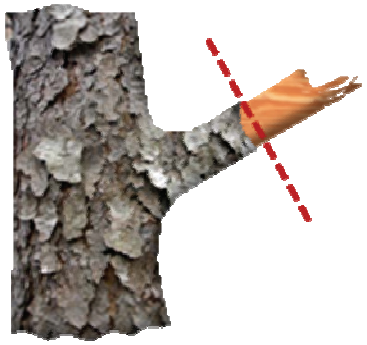
Most routine pruning to remove weak, diseased or dead limbs can be accomplished at any time during the year with little effect on the tree. As a rule, growth is maximized and wound closure is fastest if pruning takes place before the spring growth flush. Some trees, such as maples and birches, tend to "bleed" if pruned early in the spring. This may be unsightly, but is of little consequence to the tree.

A few tree diseases, such as oak wilt, can be spread when pruning wounds allow spores access into the tree. Susceptible trees should not be pruned during active transmission periods.

Heavy pruning just after the spring growth flush should be avoided. This is when trees have just expended a great deal of energy to produce foliage and early shoot growth. Removal of a large percentage of foliage at this time can stress the tree.

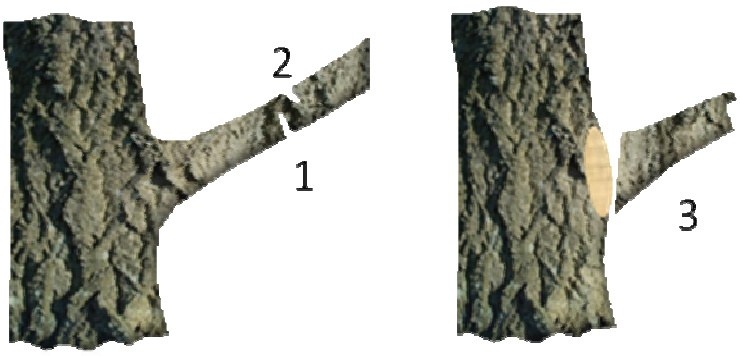
Making Proper Pruning Cuts to Mature Trees

Pruning cuts should be made just outside the branch collar. The branch collar contains trunk or parent branch tissue and should not be damaged or removed. If trunk collar has grown out on a dead limb to be removed, make the cut just beyond the collar. Do not cut the collar (see figure).



On a dead branch that has a collar of live wood, the final cut should be made just beyond the outer edge of the collar.

If a large limb is to be removed, its weight should first be reduced. This is done by making an undercut about 12-18 inches from the limb's point of attachment. A second cut is made from the top, directly above or a few inches further out on the limb. This removes the limb leaving the 12-18 inch stub. The stub is removed by cutting back to the branch collar. This technique reduces the possibility of tearing the bark



Use the 3-cut method to remove a large limb.

How Much Should be Pruned?

The amount of live tissue that should be removed depends on the tree size, species, and age, as well as the pruning objectives. Younger trees will tolerate the removal of a higher percentage of living tissue than mature trees. A common mistake is to remove too much inner foliage and small branches. It is important to maintain an even distribution of foliage along large limbs and in the lower portion of the crown. A widely accepted rule of thumb is never to remove more than one fourth of a tree's leaf bearing crown. In a mature tree, pruning even that much could have negative effects. Removing even a single, large-diameter limb can create a wound that the tree may not be able to close. The older and larger a tree becomes, the less energy it has in reserve to close wounds and defend against decay or insect attack. The pruning of large, mature trees is usually limited to the removal of dead or potentially hazardous limbs.

Wound Dressings

Wound dressings were once thought to accelerate wound closure, protect against insects and diseases, and reduce decay. However, research has shown that dressings do not reduce decay or speed closure, and rarely prevent insect or disease infestations. Most experts recommend that wound dressings not be used. If a dressing must be used for cosmetic purposes, then only a thin coating of a non-toxic material should be applied.

Newly Planted Trees

Pruning of newly planted trees should be limited to corrective pruning. Remove torn or broken branches. Save other pruning measures for the second or third year. The belief that trees should be pruned when planted to compensate for root loss is misguided. Trees need their leaves and

shoot tips to provide food and the substances, which stimulate new root production. Unpruned trees establish faster, with a stronger root system than trees pruned at the time of planting.

(From International Society Arboriculture at *http://www.isa-arbor.com/consumer/pruning.html*)

RECOGNIZING HAZARDOUS TREES

Hazardous Trees & Utility Lines. Trees that fall into utility lines have additional serious consequences. Not only can they injure people or property near the line, but hitting a line may cause power outages, surges, fires and other damage. Downed lines still conducting electricity are especially dangerous. A tree with a potential to fall into a utility line is a very serious situation.

Tree Hazard Checklist

Consider these questions . . .

1. Are there large dead branches in the tree?
2. Are there detached branches hanging in the tree?
3. Does the tree have cavities or rotten wood along the trunk or in major branches?
4. Are mushrooms present at the base of the tree?
5. Are there cracks or splits in the trunk or where branches are attached?
6. Have any branches fallen from the tree?
7. Have adjacent trees fallen over or died?
8. Has the trunk developed a strong lean?
9. Do many of the major branches arise from one point on the trunk?
10. Have the roots been broken off, injured or damaged by lowering the soil level, installing pavement, repairing sidewalks or digging trenches?
11. Has the site recently been changed by construction, raising the soil level or installing lawns?
12. Have the leaves prematurely developed an unusual color or size?
13. Have trees in adjacent wooded areas been removed?
14. Has the tree been topped or otherwise heavily pruned?

Managing Tree Hazards

One of these treatments may help make your tree safer. Reducing the risk associated with hazardous trees can take many forms.

1. **Prune the tree**. Remove the defective branches of the tree. Since in appropriate pruning may also weaken a tree,
2. **Provide routine care**. Mature trees need routine care in the form of water, fertilizer (in some cases), mulch and pruning as dictated by the season and their structure.

A number of treatments are best done by a Certified Arborist

1. **Cable and brace the tree.** Provide physical support for weak branches and stems to increase their strength and stability.
2. **Remove the tree.** Some hazardous trees are best removed. If possible, plant a new tree in an appropriate place as a replacement.

(International Society of Arboriculture at *http://www.isa-arbor.com/consumer/hazards.html*)

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Appendix 10

Regulatory Coordination

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Note: Appropriate letters will be inserted into this appendix by the NRL Natural Resource Specialist.

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Appendix 11

Soil Surveys

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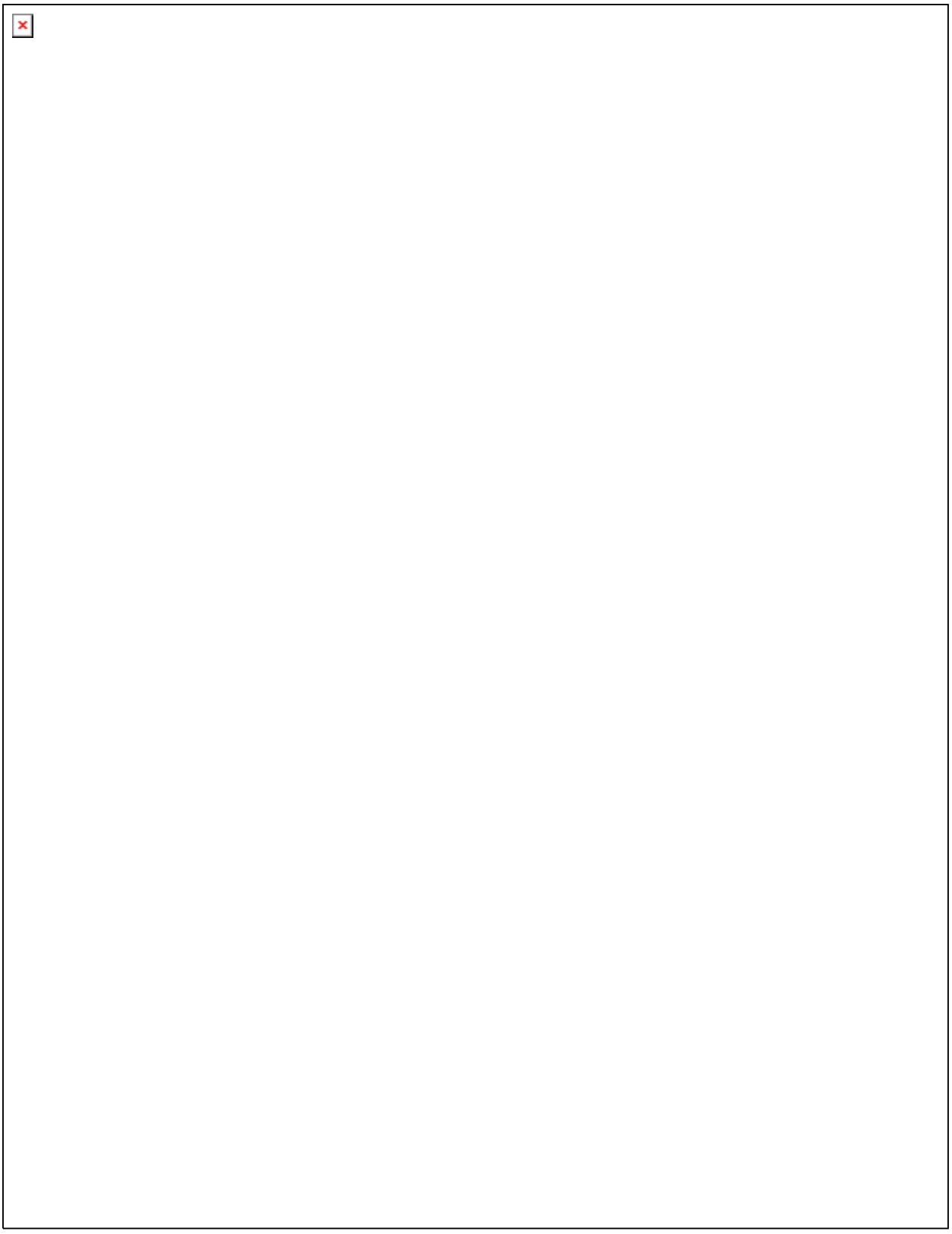


Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

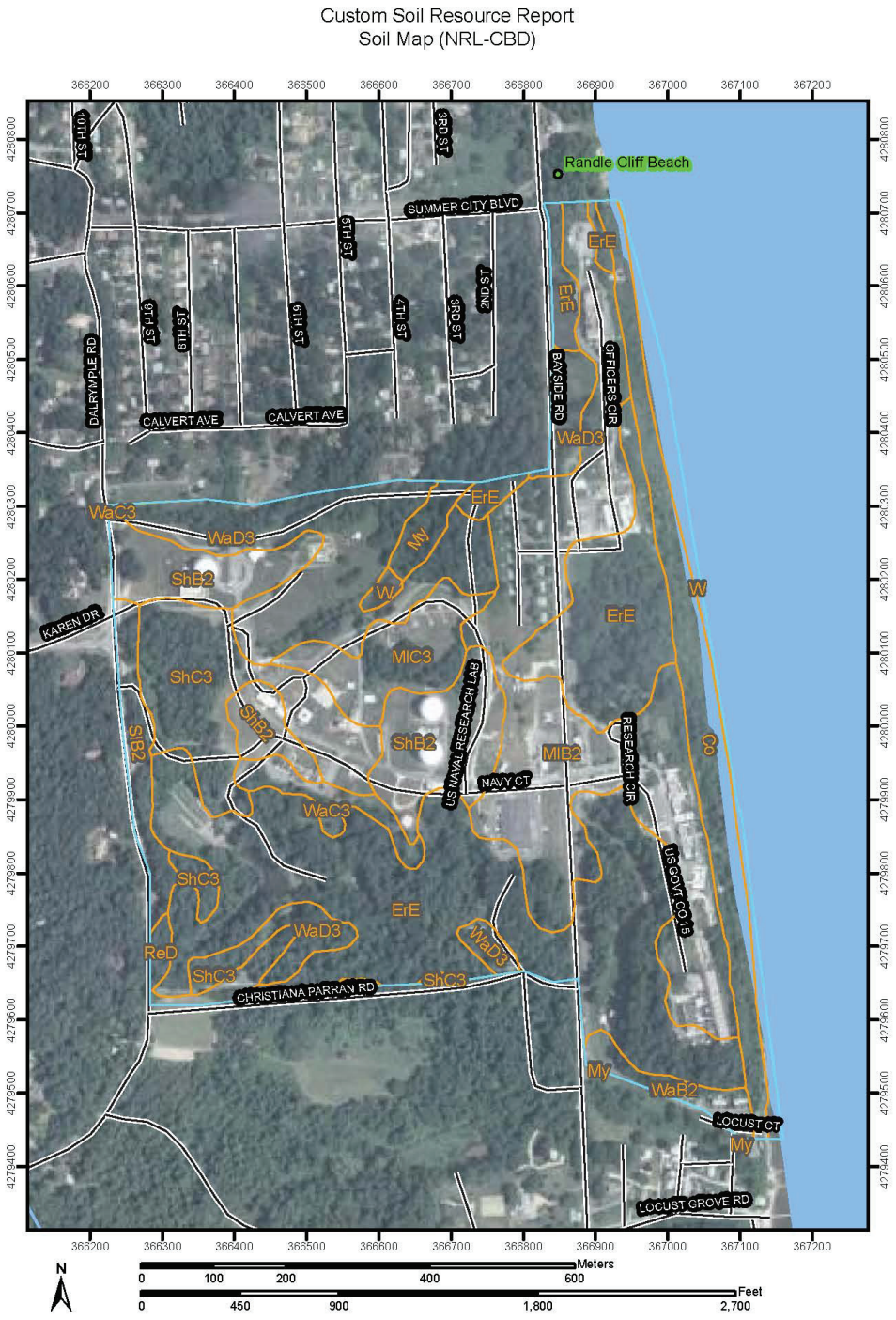
While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


Custom Soil Resource Report
Soil Map (NRL-CBD)
Randle Cliff Beach
SUMMER CITY BLVD
CALVERT AVE
CALVERT AVE
DALRYMPLE RD
KAREN DR
BAY SIDE RD
OFFICERS CIR
US NAVAL RESEARCH LAB
RESEARCH CIR
NAVY CT
US GOVT CO 15
CHRISTIANA PARRAN RD
LOCUST CT
LOCUST GROVE RD
WaD3
ErE
WaC3
ShB2
MIC3
ShC3
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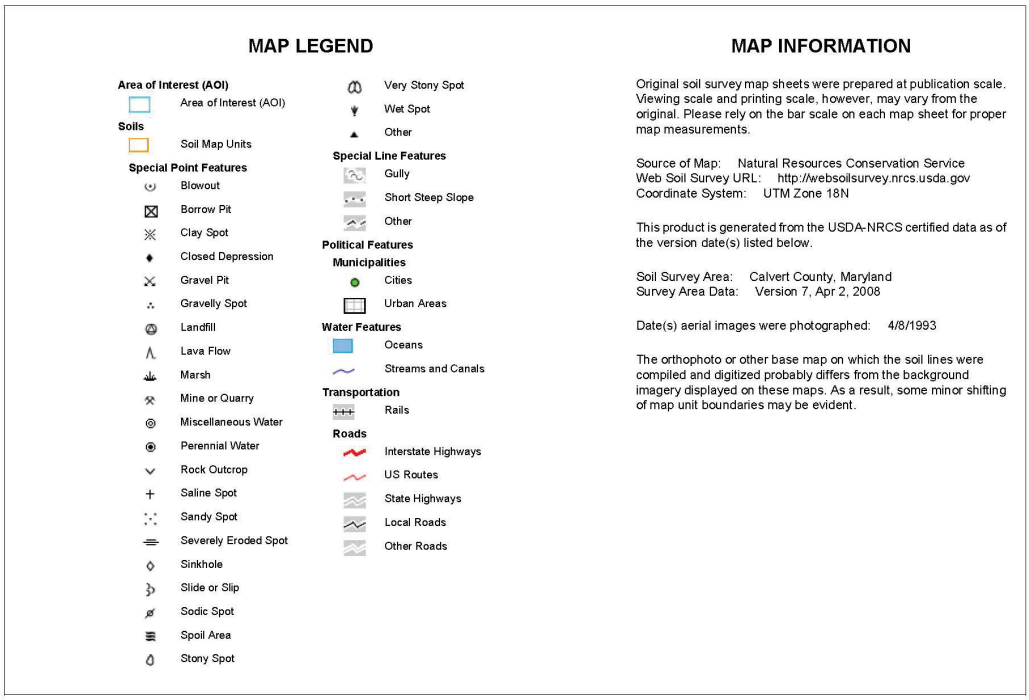
Custom Soil Resource Report
Legend (NRL-CBD)



Custom Soil Resource Report

Map Unit Legend (NRL-CBD)

Calvert County, Maryland (MD009)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Co	Coastal beaches	11.2	6.8%
ErE	Eroded land, steep	51.3	30.8%
MIB2	Marr fine sandy loam, 2 to 6 percent slopes, moderately eroded	32.8	19.8%
MIC3	Marr fine sandy loam, 6 to 12 percent slopes, severely eroded	6.2	3.8%
My	Mixed alluvial land	1.6	1.0%
ReD	Rumford-Evesboro gravelly loamy sands, 12 to 20 percent slopes	0.6	0.4%
ShB2	Sassafras fine sandy loam, 2 to 5 percent slopes, moderately eroded	14.7	8.8%
ShC3	Sassafras fine sandy loam, 5 to 10 percent slopes, severely eroded	14.1	8.5%
SlB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded	3.6	2.2%
W	Water	4.3	2.6%
WaB2	Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded	2.2	1.3%
WaC3	Westphalia fine sandy loam, 6 to 12 percent slope severely eroded	2.6	1.6%
WaD3	Westphalia fine sandy loam, 12 to 20 percent slopes severely eroded	21.0	12.6%
Totals for Area of Interest (AOI)		166.2	100.0%

Map Unit Descriptions (NRL-CBD)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability

of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and

relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Calvert County, Maryland Version date:4/2/2008 8:41:22 AM

Co—Coastal beaches

Map Unit Setting
Elevation: 0 to 10 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 210 days

Map Unit Composition
Coastal beaches: 100 percent

Description of Coastal Beaches

Setting
Landform: Beaches

Properties and qualities
Slope: 1 to 5 percent
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 to 72 inches
Frequency of flooding: Frequent
Maximum salinity: Very slightly saline to moderately saline (4.0 to 16.0 mmhos/cm)
Available water capacity: Very low (about 0.2 inches)

Interpretive groups
Land capability (nonirrigated): 8w

Typical profile
0 to 6 inches: Sand

ErE—Eroded land, steep

Map Unit Setting
Elevation: 30 to 330 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 160 to 250 days

Map Unit Composition
Eroded land: 100 percent

Description of Eroded Land

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 9 inches: Sandy loam

MIB2—Marr fine sandy loam, 2 to 6 percent slopes, moderately eroded

Map Unit Setting

Mean annual precipitation: 40 to 47 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 250 days

Map Unit Composition

Marr and similar soils: 100 percent

Description of Marr

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability (nonirrigated): 2e

Typical profile

0 to 12 inches: Fine sandy loam

MIC3—Marr fine sandy loam, 6 to 12 percent slopes, severely eroded

Map Unit Setting

Mean annual precipitation: 40 to 47 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 250 days

Map Unit Composition

Marr and similar soils: 100 percent

Description of Marr

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 12 inches: Fine sandy loam

My—Mixed alluvial land

Map Unit Composition
Mixed alluvial land: 100 percent

Description of Mixed Alluvial Land

Setting
Landform: Flood plains

Properties and qualities
Slope: 0 to 2 percent
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Available water capacity: Very low (about 0.9 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 6 inches: Gravelly silt loam

ReD—Rumford-Evesboro gravelly loamy sands, 12 to 20 percent slopes

Map Unit Setting
Elevation: 10 to 600 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 45 to 64 degrees F
Frost-free period: 170 to 250 days

Map Unit Composition
Evesboro and similar soils: 50 percent
Rumford and similar soils: 50 percent

Description of Rumford

Properties and qualities
Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.1 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 9 inches: Gravelly sandy loam

Description of Evesboro

Properties and qualities
Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 40 inches: Gravelly loamy sand

ShB2—Sassafras fine sandy loam, 2 to 5 percent slopes, moderately eroded

Map Unit Setting
Elevation: 30 to 330 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 160 to 250 days

Map Unit Composition
Sassafras and similar soils: 100 percent

Description of Sassafras

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.2 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 9 inches: Fine sandy loam

ShC3—Sassafras fine sandy loam, 5 to 10 percent slopes, severely eroded

Map Unit Setting

Elevation: 30 to 330 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 160 to 250 days

Map Unit Composition

Sassafras and similar soils: 100 percent

Description of Sassafras

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.2 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 9 inches: Fine sandy loam

SlB2—Sassafras loam, 2 to 5 percent slopes, moderately eroded

Map Unit Setting

Elevation: 30 to 330 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 160 to 250 days

Map Unit Composition

Sassafras and similar soils: 100 percent

Description of Sassafras

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.4 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 9 inches: Loam

W—Water

Map Unit Composition
Water: 100 percent

WaB2—Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded

Map Unit Setting
Mean annual precipitation: 40 to 47 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 250 days

Map Unit Composition
Westphalia and similar soils: 100 percent

Description of Westphalia

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.8 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 10 inches: Fine sandy loam

WaC3—Westphalia fine sandy loam, 6 to 12 percent slope severely eroded

Map Unit Setting
Mean annual precipitation: 40 to 47 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 250 days

Map Unit Composition
Westphalia and similar soils: 100 percent

Description of Westphalia

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.8 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 10 inches: Fine sandy loam

WaD3—Westphalia fine sandy loam, 12 to 20 percent slopes severely eroded

Map Unit Setting

Mean annual precipitation: 40 to 47 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 250 days

Map Unit Composition

Westphalia and similar soils: 100 percent

Description of Westphalia

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.8 inches)

Interpretive groups

Land capability (nonirrigated): 6e

Typical profile

0 to 10 inches: Fine sandy loam

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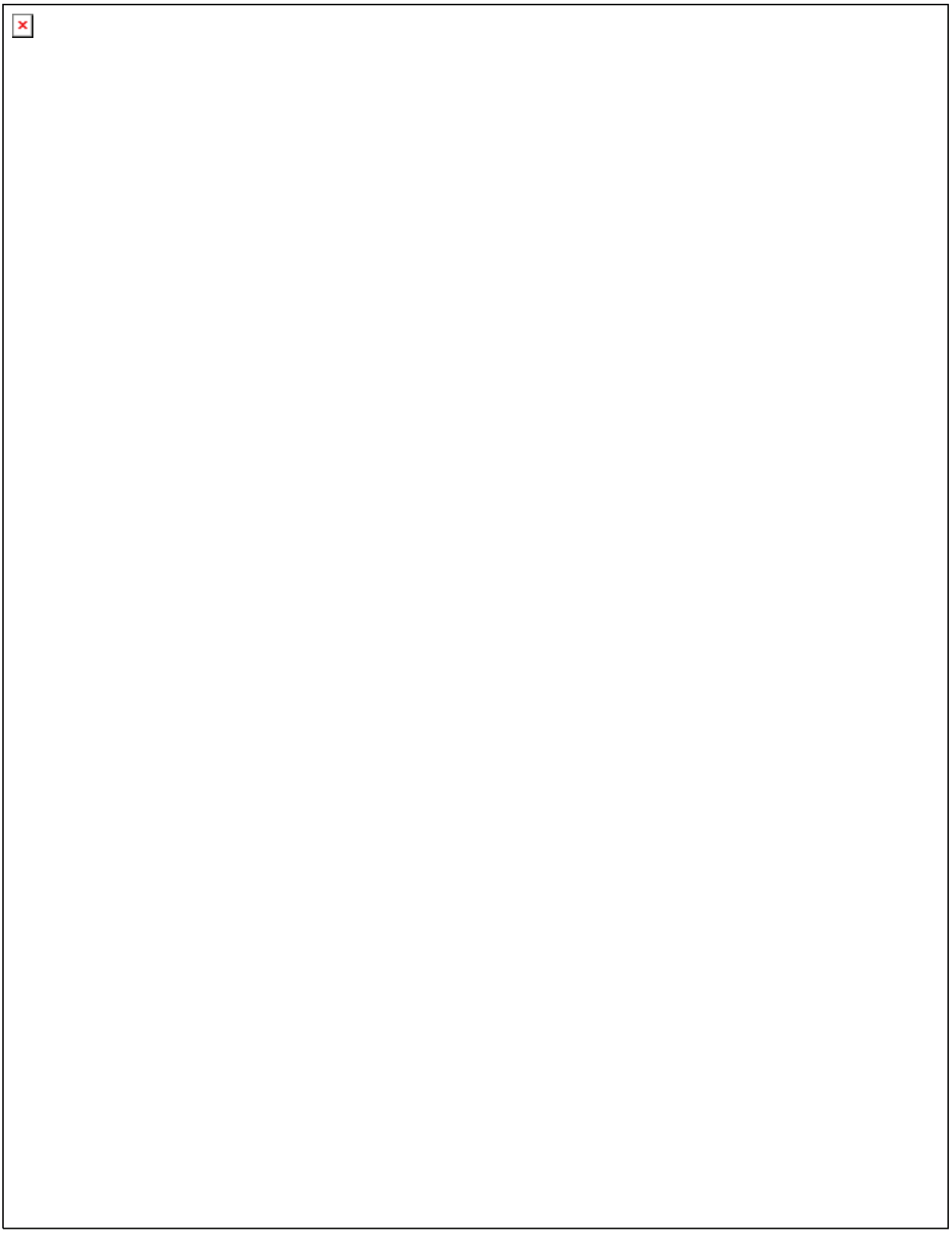

Preface

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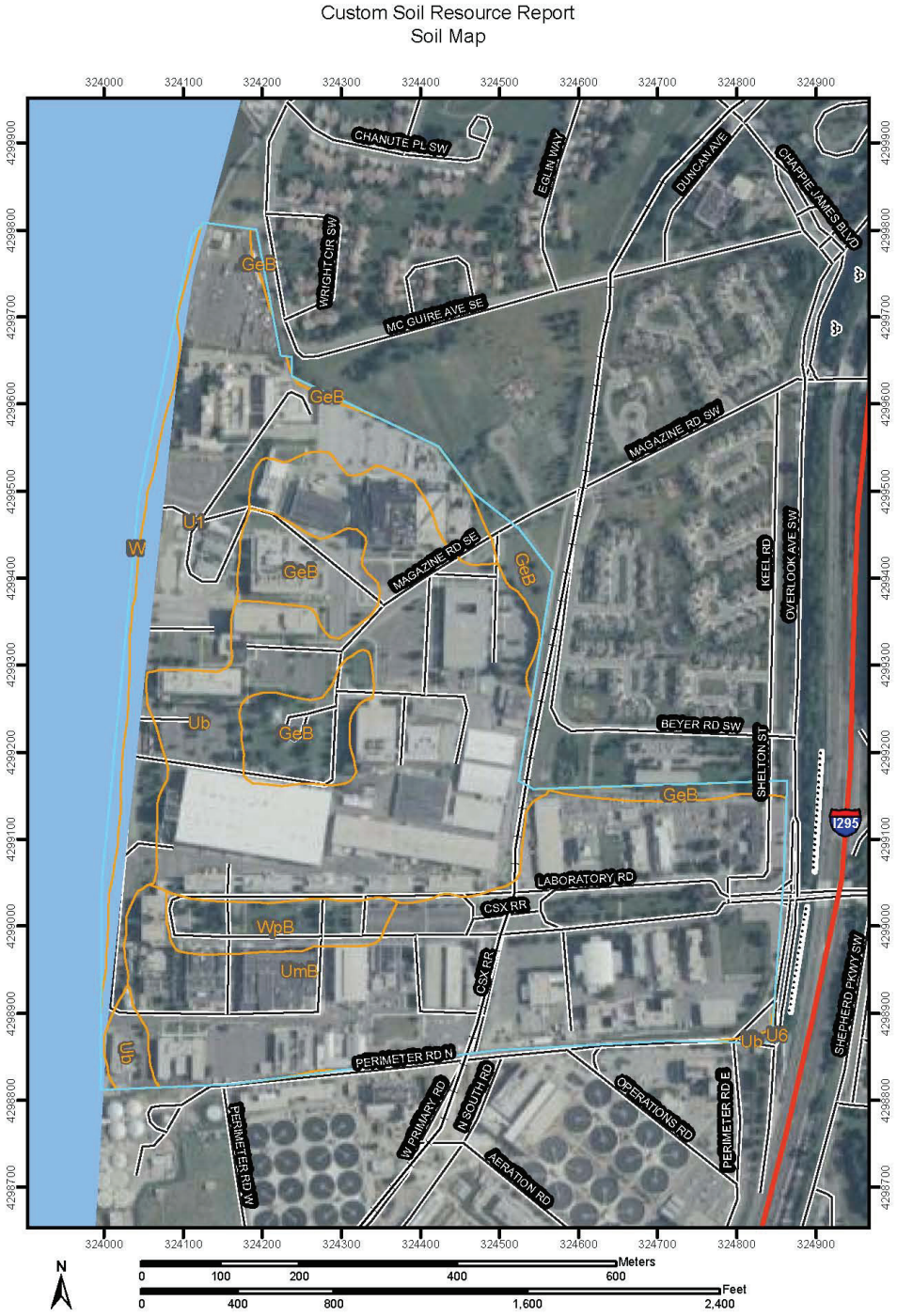
Custom Soil Resource Report
Soil Map
GHANUTE PL SW
EGLIN WAY
DUNCAN AVE
CHAPPIE JAMES BLVD
WRIGHT CIR SW
MC GUIRE AVE SE
MAGAZINE RD SW
MAGAZINE RD SE
KEEL RD
OVERLOOK AVE SW
BEYER RD SW
SHELTON ST
LABORATORY RD
CSX RR
PERIMETER RD N
PERIMETER RD W
W PRIMARY RD
N SOUTH RD
OPERATIONS RD
PERIMETER RD E
AERATION RD
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Meters
0
100
200
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600
Feet
0
400
800
1,600
2,400

Custom Soil Resource Report
Legend

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
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- Perennial Water
- Rock Outcrop
- Saline Spot
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- Sinkhole
- Slide or Slip
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- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
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Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: District of Columbia
Survey Area Data: Version 5, Sep 14, 2006

Date(s) aerial images were photographed: 4/5/1988

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Custom Soil Resource Report

Map Unit Legend

District of Columbia (DC001)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GeB	Galestown-Urban land complex, 0 to 8 percent slopes	12.3	8.9%
U1	Udorthents	26.7	19.3%
U6	Udorthents, smoothed	0.0	0.0%
Ub	Urban land	45.3	32.8%
UmB	Urban land-Galestown complex, 0 to 8 percent slopes	47.0	34.1%
W	Water	2.3	1.7%
WpB	Woodstown-Urban land complex, 0 to 8 percent slopes	4.4	3.2%
Totals for Area of Interest (AOI)		138.0	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially

where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Custom Soil Resource Report

District of Columbia Version date:9/14/2006 11:58:43 AM

GeB—Galestown-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

Elevation: 10 to 330 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 63 degrees F
Frost-free period: 160 to 250 days

Map Unit Composition

Urban land: 40 percent
Galestown and similar soils: 40 percent
Minor components: 20 percent

Description of Urban Land

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to

Interpretive groups

Land capability (nonirrigated): 8s

Description of Galestown

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability (nonirrigated): 3s

Typical profile

0 to 1 inches: Loamy sand
1 to 21 inches: Sand
21 to 40 inches: Sand
40 to 70 inches: Sand

Minor Components

Unnamed soils

Percent of map unit: 10 percent

Rumford

Percent of map unit: 5 percent

Sassafras

Percent of map unit: 5 percent

U1—Udorthents

Map Unit Composition
Udorthents and similar soils: 100 percent

Description of Udorthents

Properties and qualities
Slope: 0 to 10 percent
Depth to restrictive feature: 10 inches to
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups
Land capability (nonirrigated): 8s

U6—Udorthents, smoothed

Map Unit Composition
Udorthents and similar soils: 100 percent

Description of Udorthents

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: 10 inches to
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups
Land capability (nonirrigated): 8s

Ub—Urban land

Map Unit Setting
Frost-free period: 175 to 220 days

Map Unit Composition
Urban land: 100 percent

Description of Urban Land

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to

Interpretive groups
Land capability (nonirrigated): 8s

UmB—Urban land-Galestown complex, 0 to 8 percent slopes

Map Unit Setting

Elevation: 10 to 330 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 63 degrees F
Frost-free period: 160 to 250 days

Map Unit Composition

Urban land: 70 percent
Galestown and similar soils: 10 percent
Minor components: 20 percent

Description of Urban Land

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to

Interpretive groups

Land capability (nonirrigated): 8s

Description of Galestown

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability (nonirrigated): 3s

Typical profile

0 to 1 inches: Loamy sand
1 to 21 inches: Sand
21 to 40 inches: Sand
40 to 70 inches: Sand

Minor Components

Rumford

Percent of map unit: 5 percent

Sassafras

Percent of map unit: 5 percent

Woodstown

Percent of map unit: 5 percent

Unnamed soils

Percent of map unit: 5 percent

W—Water

Map Unit Composition
Water: 100 percent

Description of Water

Properties and qualities
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

WpB—Woodstown-Urban land complex, 0 to 8 percent slopes

Map Unit Setting
Elevation: 10 to 330 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 160 to 250 days

Map Unit Composition
Woodstown and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent

Description of Woodstown

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.3 inches)

Interpretive groups
Land capability (nonirrigated): 2w

Typical profile
0 to 7 inches: Sandy loam
7 to 11 inches: Sandy loam
11 to 29 inches: Sandy clay loam
29 to 45 inches: Sandy loam
45 to 80 inches: Loamy sand

Description of Urban Land

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to

Interpretive groups

Land capability (nonirrigated): 8s

Minor Components

Sassafras

Percent of map unit: 10 percent

Unnnamed soils

Percent of map unit: 5 percent

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Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

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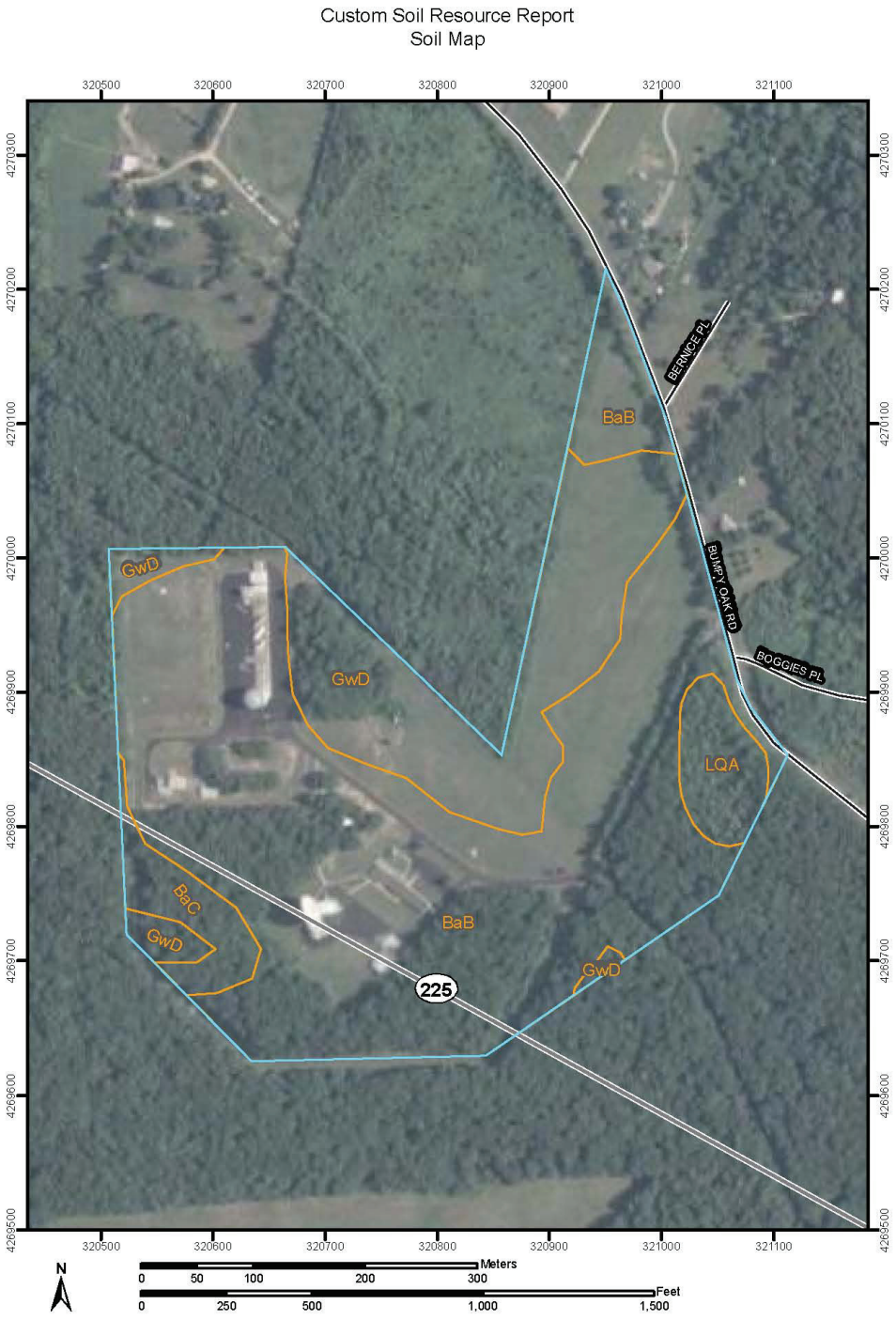
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Soil Map
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BUMPY OAK RD
BOGGIES PL
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Feet
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250
500
1,000
1,500

Custom Soil Resource Report
Legend

MAP LEGEND

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MAP INFORMATION

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Charles County, Maryland
Survey Area Data: Version 5, Apr 10, 2008

Date(s) aerial images were photographed: 3/17/1994

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Custom Soil Resource Report

Map Unit Legend

Charles County, Maryland (MD017)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BaB	Beltsville silt loam, 2 to 5 percent slopes	38.8	69.6%
BaC	Beltsville silt loam, 5 to 10 percent slopes	2.2	3.9%
GwD	Grosstown-Woodstown-Beltsville complex, 5 to 15 percent slopes	12.6	22.6%
LQA	Lenni and Quindocqua soils, 0 to 2 percent slopes	2.2	3.9%
Totals for Area of Interest (AOI)		55.7	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

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BaB—Beltsville silt loam, 2 to 5 percent slopes

Map Unit Setting

Elevation: 10 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 180 to 210 days

Map Unit Composition

Beltsville and similar soils: 70 percent
Minor components: 30 percent

Description of Beltsville

Setting

Landform: Broad interstream divides
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Silty eolian deposits over loamy fluviomarine deposits

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 20 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability (nonirrigated): 2e

Typical profile

0 to 3 inches: Silt loam
3 to 8 inches: Silt loam
8 to 20 inches: Silt loam
20 to 41 inches: Loam
41 to 65 inches: Sandy clay loam
65 to 71 inches: Very gravelly sandy clay loam
71 to 76 inches: Gravelly coarse sandy loam

Minor Components

Aquasco

Percent of map unit: 10 percent
Landform: Broad interstream divides
Landform position (three-dimensional): Interfluve

Reybold

Percent of map unit: 10 percent
Landform: Broad interstream divides

Landform position (three-dimensional): Interfluve

Lenni, undrained
Percent of map unit: 5 percent
Landform: Depressions

Grosstown
Percent of map unit: 5 percent
Landform: Broad interstream divides
Landform position (three-dimensional): Interfluve

BaC—Beltsville silt loam, 5 to 10 percent slopes

Map Unit Setting
Elevation: 10 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 180 to 210 days

Map Unit Composition
Beltsville and similar soils: 70 percent
Minor components: 30 percent

Description of Beltsville

Setting
Landform: Interfluves
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Silty eolian deposits over loamy fluviomarine deposits

Properties and qualities
Slope: 5 to 10 percent
Depth to restrictive feature: 20 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile
0 to 3 inches: Silt loam
3 to 8 inches: Silt loam
8 to 20 inches: Silt loam
20 to 41 inches: Loam
41 to 65 inches: Sandy clay loam
65 to 71 inches: Very gravelly sandy clay loam
71 to 76 inches: Gravelly coarse sandy loam

Minor Components

Grosstown
Percent of map unit: 15 percent
Landform: Broad interstream divides

Reybold
Percent of map unit: 5 percent
Landform: Broad interstream divides
Landform position (three-dimensional): Interfluve

Hoghole
Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (three-dimensional): Side slope

Aquasco
Percent of map unit: 5 percent
Landform: Broad interstream divides, swales
Landform position (three-dimensional): Interfluve

GwD—Grosstown-Woodstown-Beltsville complex, 5 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 180 to 210 days

Map Unit Composition
Grosstown and similar soils: 30 percent
Woodstown and similar soils: 30 percent
Beltsville and similar soils: 20 percent
Minor components: 20 percent

Description of Woodstown

Setting
Landform: Depressions, hillslopes, stream terraces, drainageways, drainhead complexes
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Loamy fluviomarine deposits

Properties and qualities
Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Moderate (about 8.9 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 8 inches: Sandy loam
8 to 28 inches: Loam
28 to 42 inches: Fine sandy loam
42 to 60 inches: Sandy loam
60 to 72 inches: Loamy sand

Description of Grosstown

Setting

Landform: Fluviomarine terraces, hillslopes, stream terraces, drainhead complexes
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Loamy and gravelly fluviomarine deposits

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.7 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 4 inches: Gravelly silt loam
4 to 20 inches: Silt loam
20 to 26 inches: Gravelly loam
26 to 71 inches: Extremely gravelly silt loam
71 to 80 inches: Extremely gravelly coarse sand

Description of Beltsville

Setting

Landform: Hillslopes, drainhead complexes
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Parent material: Silty eolian deposits over loamy fluviomarine deposits

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 20 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 3 inches: Silt loam
3 to 8 inches: Silt loam
8 to 20 inches: Silt loam
20 to 41 inches: Loam
41 to 65 inches: Sandy clay loam
65 to 71 inches: Very gravelly sandy clay loam
71 to 76 inches: Gravelly coarse sandy loam

Minor Components

Reybold
Percent of map unit: 10 percent
Landform: Hillslopes, drainhead complexes
Landform position (three-dimensional): Interfluve

Issue
Percent of map unit: 5 percent
Landform: Drainageways, drainhead complexes

Lenni, undrained
Percent of map unit: 5 percent
Landform: Depressions

LQA—Lenni and Quindocqua soils, 0 to 2 percent slopes

Map Unit Setting
Elevation: 10 to 360 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 180 to 210 days

Map Unit Composition
Lenni, undrained, and similar soils: 50 percent
Quindocqua, undrained, and similar soils: 30 percent
Minor components: 20 percent

Description of Lenni, Undrained

Setting
Landform: Depressions on broad interstream divides, fluviomarine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Clayey fluviomarine deposits

Properties and qualities
Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Land capability (nonirrigated): 4w

Typical profile

0 to 6 inches: Silt loam
6 to 9 inches: Silt loam
9 to 26 inches: Silty clay loam
26 to 49 inches: Clay
49 to 54 inches: Loamy sand

Description of Quindocqua, Undrained

Setting

Landform: Fluviomarine terraces, depressions on broad interstream divides
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water capacity: Very high (about 12.8 inches)

Interpretive groups

Land capability (nonirrigated): 4w

Typical profile

0 to 4 inches: Slightly decomposed plant material
4 to 11 inches: Loam
11 to 33 inches: Loam
33 to 59 inches: Very fine sandy loam
59 to 64 inches: Very fine sandy loam

Minor Components

Annemessex

Percent of map unit: 10 percent
Landform: Stream terraces, fluviomarine terraces, broad interstream divides
Landform position (three-dimensional): Tread

Beltsville

Percent of map unit: 5 percent
Landform: Broad interstream divides
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex

Liverpool

Percent of map unit: 5 percent
Landform: Broad interstream divides
Landform position (three-dimensional): Tread

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