INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
NAVAL RECREATION CENTER SOLOMONS, MARYLAND

JANUARY 2010

FINAL

Naval Recreation Center Solomons
Integrated Natural Resources Management Plan

Prepared for:
Washington Division,
Naval Facilities Engineering Command
Washington, DC

Activity Point of Contact:
Mrs. Jackie Smith
Naval Air Station Patuxent River
Patuxent River, Maryland

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

Name of Contract: Update of Integrated Natural Resources Management Plan
Naval Recreation Center, Solomons
Contract #: N62470-02-D-9997
Document cleared for public release

Final
January 2010

Signature Page

The signatures below specify mutual consent for development and implementation of the Integrated Natural Resources Management Plan for the Naval Recreation Center Solomons.

M. Lewis By Direction — 5 MAR 2010

Installation Commanding Officer — **Date**

30 March 2010

U.S. Fish and Wildlife Service Regional Director — **Date**

Acting

9 February 2010

Maryland Department of Natural Resources — **Date**

Kyle E. Rambo — 19 JAN 2010

Installation Natural Resources Manager — **Date**

Susan Barnett — January 11, 2010

Naval Facilities Engineering Command Washington, Natural Resources Manager — **Date**

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 for Naval Recreation Center (NRC) Solomons, Solomons Island, Maryland, in accordance with DoD Instruction 4715.3 – Environmental Conservation Program; Navy Instruction OPNAVINST 5090.1 (series) – Environmental and Natural Resources Program Manual; 16 U.S. Code (USC) §670 a-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 military 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 head of the Maryland Department of Natural Resources (MDNR). 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 NRC Solomons. The effectiveness of this INRMP will be evaluated annually in cooperation with the appropriate field-level offices of the USFWS and state fish and wildlife agencies. 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 address relevant issues at NRC Solomons. Existing conditions, baseline survey data, current management practices, and recommended management actions have been described for each program element. Management program elements described in this INRMP include:

- Rare, Threatened, and Endangered Species Management
- Wetlands Management
- Fish and Wildlife Management
- Forest Management
- Vegetative Management

- Migratory Bird Management
- Invasive Species Management
- Geographic Information Systems Management
- Outdoor Recreation
- Wildland Fire Management
- Conservation Law Enforcement
- Training of Natural Resources Personnel
- Coastal / Marine Management
- Floodplains Management
- Cultural Resources Management

The management actions and projects identified for NRC Solomons are intended to help installation commanders manage natural resources effectively, ensure station lands remain available and in good condition, support the military mission, and 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.

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

TABLE OF CONTENTS (cont'd)

APPENDICIES

LIST OF FIGURES

LIST OF TABLES

Acronyms and Abbreviations

ACB	Alliance for the Chesapeake Bay
B&GEPA	Bald and Golden Eagle Protection Act
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
CWAP	Comprehensive Work Approval Process
CZMA	Coastal Zone Management Act
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoN	Department of the Navy
EAP	Encroachment Action Plan
EFH	essential fish habitat
EO	Executive Order
EPA	Environmental Protection Agency
EPR	Environmental Projects Request
ERL	Environmental Readiness Level
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FICMNEW	Federal Interagency Committee for the Management of Noxious and Exotic Weeds
FY	fiscal year
GIS	Geographic Information System
GPS	global positioning system
GCN	greatest conservation need
INRMP	Integrated Natural Resources Management Plan
IPM	integrated pest management
ISA	International Society of Arboriculture
LNG	liquefied natural gas
MBTA	Migratory Bird Treaty Act
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDSPGP	Maryland State Programmatic General Permit
MILCON	military construction
MMPA	Marine Mammal Protection Act
MOA	Memoranda of Agreement
MOU	Memoranda of Understanding

Acronyms and Abbreviations (cont'd)

MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MWR	Morale, Welfare and Recreation
NAVFAC	Naval Facilities Engineering Command
NDW	Naval District Washington
NEPA	National Environment Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMFWA	National Military Fish and Wildlife Association
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
NWI	National Wetlands Inventory
OMB	Office of Management and Budget
OPNAVINST	Chief of Naval Operations Operating Instruction
OSD	Office of the Secretary of Defense
PPA	Pollution Prevention Act
ppt	parts per thousand
RAB	Restoration Advisory Board
RV	recreational vehicle
RCRA	Resource Conservation and Recovery Act
RPM	Remedial Project Manager
RSC	Regulatory Services Coordination Office
RT&E	rare, threatened, and endangered
SAV	submerged aquatic vegetation
SCS	Soil Conservation Service
SDSFIE	Spatial Data Standards for Facilities, Infrastructure and Environment
SECNAVINST	Secretary of the Navy Instruction
SHPO	State Historic Preservation Office
SWAP	State Wildlife Action Plan
SWP3	Stormwater Pollution Prevention Plan
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance
VIMS	Virginia Institute of Marine Science

1. OVERVIEW

A. Purpose

In accordance with Department of Defense (DoD) Instruction 4715.3, Chief of Naval Operations Operating Instruction (OPNAVINST) 5090.1 (series), Naval Facilities Procedural Manual 73 (NAVFAC P-73), and 16 United States Code [USC] §670 a-f (Sikes Act), the Department of the Navy (DoN) is required to implement and maintain a balanced and integrated program for the management of natural resources. To facilitate the natural resources program, Naval Air Station (NAS) Patuxent River must prepare and implement an Integrated Natural Resources Management Plan (INRMP) for Naval Recreation Center (NRC) Solomons. The purpose of the INRMP is to ensure consistency with the use of NRC Solomons to support military preparedness, while providing for the conservation and rehabilitation of natural resources on military installations and the sustainable multipurpose use of the resources including hunting, fishing, trapping, and non-consumptive uses (Sikes Act). The INRMP must also ensure that natural resources management practices comply with all pertinent laws and regulations and are in accordance with Navy policy which, as summarized from OPNAVINST 5090.1 (series), is 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 NRC Solomons that are:

- Owned by the U.S. 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-DoD entities.

The INRMP primarily addresses natural resources management of the undeveloped, natural areas at NRC Solomons, but also applies to natural resource issues in developed areas such as support and administrative facilities and recreational areas.

C. Goals and Objectives

The INRMP is a long-term planning document that guides implementation of the natural resources program at NRC Solomons to help ensure support for the installation mission, while protecting and enhancing natural resources and providing a variety of outdoor recreational opportunities for DoD personnel, their dependents, and guests. Goals of the INRMP are to:

- Identify the responsible parties and stakeholders concerned with natural resources management;
- Describe the current and future military 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 installation and the surrounding area;
- Identify key natural resource management issues and concerns at the installation 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 military mission; and
- Identify scheduling priorities and funding opportunities for the implementation of natural resources projects and management actions.

D. Responsibilities

Responsibility for the development, revision, and implementation of INRMPs is shared by several command elements. Roles and responsibilities for Navy natural resources management are described in OPNAVINST 5090.1 (series) and in the Navy guidance for INRMP development and implementation (DoN 2006b). A summary of responsibilities for natural resources management at NAS Patuxent River follows.

Chief of Naval Operations (CNO) is the Echelon I command and serves as the principle leader to provide policy, guidance, and resources for the development, revision, and implementation of INRMPs. CNO also represents the Navy on issues and resolves high-level conflicts regarding development and implementation of INRMPs.

Commander, Navy Installations Command (CNIC) is the Echelon II command under CNO, responsible for Navy-wide shore installation management. CNIC has overall shore installation management responsibility and authority as the budget submitting office for installation support and is the Navy point of contact for installation policy and program execution oversight (CNIC 2007a). CNIC must ensure the programming of resources necessary to maintain and implement INRMPs; participate in the development and revision of INRMPs; and provide oversight for all natural resources program elements.

Natural resources management at NRC Solomons is overseen by NAS Patuxent River Conservation Branch of the Environmental Division within the Public Works Department. Responsibilities of the Commanding Officer, NAS Patuxent River are to ensure preparation, completion, and implementation of the INRMP and to systematically apply conservation practices set forth in the plan. It is his/her responsibility to act as steward of installation

natural resources and 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 military mission; and endorse INRMPs via Commanding Officer signature.

The NAS Patuxent River natural resources manager and natural resources specialists are primarily responsible for implementing this INRMP and coordinating with other personnel on the installation. 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. Natural resources program personnel are also responsible for ensuring this plan is reviewed in coordination with the U.S. Fish and Wildlife Service (USFWS) and the Maryland Department of Natural Resources (MDNR).

E. Authority

The Department of Defense (DoD) Instruction 4715.3, OPNAVINST 5090.1 (series), 32 Code of Federal Regulations Part 190 (32CFR190) (DoD Natural Resources Management Program), and 16 USC §670 a-f (Sikes Act) are the main authorities for the development and implementation of this INRMP.

F. 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); Executive Orders (EOs); DoD instructions; and Memoranda of Agreements or Understanding (MOAs or MOUs). 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.

G. 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 with the cooperation of the appropriate field-level offices of the USFWS and state fish and wildlife agencies. MDNR is the lead fish and wildlife agency in Maryland. Annual reviews enable project tracking and assessment, and help facilitate adaptive management. These reviews may be accomplished via correspondence or in a meeting between appropriate parties. 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;
- 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's 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.

H. Commitment of the U.S. Fish and Wildlife Service and Maryland Department of Natural Resources

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 and MDNR cooperate in the development and review of this INRMP as to operation and effect at least once every five years. In addition to the formal five-year review, Navy policy requires annual reviews be conducted in coordination with the Sikes Act partners.

I. Management Strategy

Navy policy on natural resources management, as summarized from OPNAVINST 5090.1 (series), 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 (DoD Instruction [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, 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

NRC Solomons encompasses approximately 296 acres on the eastern shore of the Patuxent River, in the southern portion of Calvert County, Maryland (Figure 2-1). NRC Solomons is located near the convergence of the Patuxent River and the Chesapeake Bay, approximately 60 miles southeast of Washington D.C. The Patuxent River forms the installation's southern and western borders, Maryland Route 2/4 forms the eastern border, and private property (a newly developed retirement community) lies along the northern border. The town of Solomons, Maryland lies to the south of the installation. NAS Patuxent River is across the Patuxent River, approximately 3 miles south of NRC Solomons.

(2) Military Mission

Two distinct military missions are supported at the NRC Solomons site. Approximately 85 percent of the installation serves as a DoD recreational facility; whereas the remaining 15 percent supports Naval warehouse facilities and an industrial tenant (Figure 2-2). NRC Solomons provides outdoor recreational opportunities such as camping, fishing, boating, and swimming. Facilities are available to active duty, retired, and reserve military personnel, as well as DoD civilians, and sponsored guests (DoN 2002). The industrial tenant provides mechanical manufacturing support for the fleet and rehabilitates equipment for NAS Patuxent River. The NAS Patuxent River Admiral's Quarters are also located in an historic district at NRC Solomons.

(3) Constraints

Current and future land uses at NRC Solomons have several constraining factors. Natural resources related constraints include wetlands, Chesapeake Bay Critical Area, habitat for protected species, and sites on which significant cultural resources occur. Other restrictions on mission and land use may be due to operational, environmental, and safety constraints. The Maryland Department of the Environment (MDE) identified four locations at NRC Solomons as having potential environmental concerns (MDE 2007), however all of these sites have undergone remediation (Smith 2009). Natural and cultural resources may restrict land use on approximately 210 acres at NRC Solomons (Figure 2-3). On-base constraints include wetlands (16 acres), Chesapeake Bay Critical Area (207 acres), and cultural resources (14 acres). Large areas of shellfish habitat also occur in the waters surrounding NRC Solomons. Any future land development should attempt to avoid impacts to these resources and if avoidance is not possible, all impacts will be mitigated as required. Recreational development is compatible with goals of the Critical Area Law and that water-dependent facilities are permissible in the Chesapeake Bay Critical Area.

Figure 2-1. NRC Solomons General Location Map

Figure 2-2. NRC Solomons Facilities

Figure 2-3. NRC Solomons Constraints Map

(4) Opportunities

Areas with little or no restrictions provide the best opportunities for mission growth and change. The total area of unconstrained land at NRC Solomons is 67 acres (Figure 2-4), which are well-suited for additional recreational and lodging facilities. Additional constraints on recreational opportunities at NRC Solomons could occur through adjacent land development and other types of encroachment in the area surrounding the installation.

(5) Operations and Activities

NRC Solomons, the largest outdoor recreation facility in the Navy (Tri-County Council for Southern Maryland 2003), provides outdoor recreational opportunities such as camping, fishing, boating, and swimming. Facilities at NRC Solomons are available to active duty, retired, and reserve military personnel, active DoD civilians, and sponsored guests. NRC Solomons is open year-round, and has as many as 50,000 visitors during the year (Rose 2007). Recreation facilities include picnic pavilions, a recreation center, marina, fishing pier, swimming pools, beach, miniature golf, driving range, basketball and tennis courts, softball field, sand volleyball, horseshoe pits, and walking trails (CNIC 2007b). Lodging facilities include campsites, recreational vehicle (RV) hookups, yurts, and cabins. NRC Solomons maintains a total of 15 group and 56 primitive camping sites, 6 electric only and 146 complete RV hookup sites, 15 apartments (1-4 bedroom), 16 inland classic and contemporary cottages (1-5 bedroom), 4 bungalows (3 bedroom), 10 log cabins (1 bedroom), and 4 cozy cottages (1 bedroom).

(6) Historic Land Use and Installation History

The Solomons Complex was established by the Navy in 1941, with the Naval Ordnance Laboratory being the first occupant. The Naval Mine Warfare Test Station was later established to provide research, development, and testing of Navy mine warfare and countermeasures. This location was chosen for its proximity to Washington D.C. and because of the sheltered, deep water surrounding the installation (MDE 2007).

The Naval Ordnance Laboratory Test Facility was established on the site in 1947. The Naval Ordnance Laboratory Test Facility conducted high and low altitude aircraft drops (primarily mines), torpedo shots in the river, and other explosive tests in mine warfare until 1950. From 1948 to 1950, additional buildings and open space were acquired to create the Naval Civil Engineering Laboratory, which conducted research and development of amphibious equipment. Torpedo work was phased out in 1958 and the torpedo shop was converted into assembly areas (MDE 2007). In 1969, work was begun on converting the northern portion of the installation to a recreational facility for Naval District Washington (NDW) personnel and in 1971 NRC Solomons was officially dedicated. In 1981, the remaining portions of the site were incorporated into the recreational facility (Public Works Center NDW 2002).

Figure 2-4. NRC Solomons Opportunities Map

(7) Regional Land Use

NRC Solomons is located on the southern tip of Calvert County at the confluence of the Patuxent River and the Chesapeake Bay. Until 1979, when the Governor Thomas Johnson Bridge was completed, the southern portion of Calvert County was relatively isolated. Shipbuilding, oystering, and fishing were the primary occupations in the Solomons Island area. Today, charter-boat fishing, recreational boating, and tourism are the major activities (Calvert Marine Museum 2007). Tobacco farming was the primary industry throughout the rest of the county (Calvert County 2007). The county is classified as rural, however new development and residential areas have been expanding in recent years. The Calvert Cliffs Nuclear Power Plant and Dominion Cove Point liquefied natural gas (LNG) facilities, are also located in southern Calvert County, approximately 4 miles northeast of NRC Solomons, and are major employers and economic engines for the region.

B. General Physical Environment

(1) Climate and Weather

NRC Solomons is influenced by a continental climate, modified by the influence of the Chesapeake Bay and the Patuxent River. It is characterized by hot summers and cold winters with four distinct seasons (Table 2-1) (United States Department of Agriculture [USDA] Soil Conservation Service [SCS] 1971). Annual precipitation, which is fairly equally distributed throughout the year, averaged approximately 43.2 inches from 1948-2005 (Southeast Regional Climate Center 2007). 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. Winds prevail from the northwest between the months of September and April and from the south between May and August. The average wind speed is fairly constant throughout the year, being slightly higher in the winter months, when the wind is from the northwest (CustomWeather 2007).

(2) Physiography, Geology, and Soils

NRC Solomons lies in the Atlantic Coastal Plain physiographic province, which is characterized by low elevations and little topographical relief. Elevations increase across the Coastal Plain in a westward direction from sea level in the east to approximately 200 feet above mean sea level in the west (Terwilliger and Tate 1995). Elevations at NRC Solomons range from sea level to about 30 feet above sea level (Figure 2-5). Steep bluffs, 20 to 30 feet in height, occur along much of the installation's shoreline.

Table 2-1. Historical Weather Data Recorded at Solomons Island

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave. Max. Temp. (°F)	44.2	46.3	53.9	65.2	74.6	82.2	86.7	86.1	79.5	68.4	58.3	47.2	66.1
Ave. Min. Temp. (°F)	29.2	30.5	37.0	46.7	56.8	65.5	70.6	70.1	64.0	53.2	72.9	33.3	50.0
Ave. Total Precip. (inches)	3.15	3.01	3.46	3.13	3.79	3.47	4.79	4.85	3.69	3.10	3.46	3.31	43.20
Ave. Total Snowfall (inches)	4.2	2.7	1.5	0	0	0	0	0	0	0	0.1	1.9	10.5
Ave. Wind Speed (mph)	13	14	14	13	10	9	9	8	9	10	11	13	
Ave. Wind Direction	NW	NW	NW	NW	SE	SW	SW	SW	NE	NW	NW	NW	

Source: Southeast Regional Climate Center 2007; CustomWeather 2007

The geology of the Atlantic Coastal Plain is composed of beds of unconsolidated sand and clay with smaller amounts of underlying gravel and marl deposits that gradually become deeper and thicker to the southeast. Sediment layers are underlain by hard bedrock, which is approximately 2,500 feet below sea level in southern Calvert County near NRC Solomons (Klohe and Kay 2007). Soils at NRC Solomons formed in unconsolidated marine sediments and are generally deep and well-drained to excessively-drained. The soil series include Coastal Beaches, Evesboro, Matapeake, Mixed Alluvial, Othello, Sassafras, Tidal Marsh, and Westphalia (Figure 2-6; Table 2-2). There are also areas classified as Gravel Pits and Man Made Land. Four of the soils series at the installation are classified as hydric by the USDA Natural Resources Conservation Service (NRCS) (2007). Hydric soils typically support hydrophytic vegetation and occur in wetland areas. The hydric soils at NRC Solomons comprise 22 percent of the installation and include the Coastal Beaches, Mixed alluvial land, Othello, and Tidal marsh series.

Figure 2-5. Elevation at NRC Solomons

Figure 2-6. NRC Solomons Soils

Table 2-2. Soils at NRC Solomons

Map Unit Symbol	Map Unit Name	Description	Acres
Hydric Soils			
Co	Coastal Beaches	This series occurs along most of the Chesapeake Bay and in places on the Patuxent River.	16.0
My	Mixed alluvial land	Mixed alluvial land consists of soil material washed from uplands and deposited on flood plains and along drainage ways.	1.4
OtA	Othello silt loam, 0-2% slopes	Othello soils are poorly drained and occur at low elevations. They formed in a thin mantle of silt over older sediments dominated by sands. Drainage and a seasonally high water table limit these soils.	28.4
OtB	Othello silt loam, 2-5% slopes	Othello soils are poorly drained and occur at low elevations. Significant amounts of this soil have been lost through erosion.	14.2
Tm	Tidal marsh	Tidal marsh consists of many small and few large areas that flood at unusually high tides	2.4
Non-hydric Soils			
EvB	Evesboro loamy sand, 0-6% slopes	The Evesboro series consists of very deep, excessively drained soils that formed in relict sand dunes. These soils are limited by erosion and excessive drainage.	10.8
Gp	Gravel and borrow pits	This classification includes areas from which gravel, sand, or soil materials have been removed for use in highway construction and for other purposes.	1.1
Ma	Made land	Areas that have been so disturbed or modified that the soils cannot be properly classified. Most of these areas are built up with fill material or have had the soil entirely removed by leveling.	9.4
MnA	Matapeake silt loam, 0-2% slopes	These soils consist of deep, well-drained soils that occur in uplands. Matapeake soils formed in a thin mantle of silty and fine sandy materials that lie over older sediments consisting mainly of coarser sands.	90.4
MnB2	Matapeake silt loam, 2-5% slopes, moderately eroded	Matapeake soils consist of deep, well-drained soils that occur in uplands. Appreciable soil loss has occurred in most places.	43.5
MnC2	Matapeake silt loam, 5-10% slopes, moderately eroded	These soils consist of deep, well-drained soils that occur in uplands. Soil has undergone uniform, but yet severe loss of surface soil.	1.1

Table 2-2. Soils at NRC Solomon (cont'd)

MnC3	Matapeake silt loam, 5-10% slopes, severely eroded	These soils consist of deep, well-drained soils that occur in uplands. The crumbly, silty surface layer has been almost entirely removed by erosion.	11.5
MuA	Mattapex silt loam, 0-2% slopes	The Mattapex series consists of deep, moderately well-drained soils that occur at low elevations. The soils formed in a thin mantle of silty and fine sandy materials over older sediments consisting mainly of coarser sands.	34.7
MuB2	Mattapex silt loam, 2-5% slopes, moderately eroded	A significant part of the surface layer of this soil has been lost through erosion.	5.4
MuD3	Mattapex silt loam, 5-15% slopes, severely eroded	The surface soil is gone in most places and some gullies occur.	0.5
SrE	Sassafras and Westphalia soils, steep	This unit consists of about 2/3 Sassafras and 1/3 Westphalia soils. Slopes range to 35 percent. Slope and erosion are limiting factors on this series.	6.6

Source: USDA, NRCS 2007; USDA, SCS 1971

(3) Hydrology

a. Watersheds

NRC Solomons is in the Solomons Harbor subwatershed of the Lower Patuxent River watershed (Figure 2-7). The Lower Patuxent River Basin is classified as mesohaline, with salinities between 5 and 18 parts per thousand (ppt) (MDNR 2007c). St. John's Creek, Mill Creek, and Hungerford Creek are the major tributaries to the Patuxent River in the Solomons Harbor subwatershed. The Patuxent River empties into the Chesapeake Bay, linking the Patuxent watershed and the 64,000-square mile Chesapeake Bay watershed. The health of the Patuxent River and the ecological integrity of the Chesapeake Bay are dependent on the health of river tributaries.

b. Surface Water

Surface water present at NRC Solomons includes the Patuxent River, Second Cove, and Third Cove. Second Cove serves as a recreational marina (Point Patience Marina) and Third Cove serves as a harbor for the installation's industrial complex. Runoff from the central portion of NRC Solomons enters a small stream that flows southward into an unnamed tidal creek, then into Second Cove, and eventually into the Patuxent River. An additional drainage swale in the central portion of the installation can also carry stormwater runoff after a significant rain event.

Figure 2-7. NRC Solomons Water Resources

c. Floodplains

Floodplains are defined as an area likely to be inundated by a flood with a particular degree of frequency. The Federal Emergency Management Agency (FEMA) flood insurance rate maps have been prepared for most of the region, including Calvert County. One hundred-year flood levels for the Patuxent River and its tributaries that could pose a potential flood-threat to NRC Solomons are established in the FEMA maps. A "100-year flood" or "100-year floodplain" describes an event or an area subject to a 1 percent probability of a certain size flood occurring in any given year. This concept does not mean such a flood will occur only once in one hundred years. Whether or not it occurs in a given year has no bearing on the fact that there is still a 1 percent chance of a similar occurrence in the following year. Since floodplains can be mapped, the boundary of the 100-year flood is commonly used to identify areas where the risk of flooding is significant. Frequency of inundation depends on the climate, the material that makes up the banks of the stream, and the channel slope (Department of Regional Development and Environment Executive Secretariat for Economic and Social Affairs Organization of American States 1991). Floodplain data are available from the NAS Patuxent River Environmental Division.

d. Groundwater

The major aquifers of Calvert County are the Piney Point-Nanjemoy, Aquia, and Magothy aquifers, though the Magothy aquifer is in the northern portion of the county and does not extend as far south as NRC Solomons (Curtin et al. 2003). The Piney Point-Nanjemoy aquifer is primarily used for small water users, such as self-supplied domestic users and small businesses. The Piney Point-Nanjemoy aquifer is 50 to 70 feet thick, and ranges from 213 to 260 feet below ground level (Klohe and Kay 2007). The Aquia aquifer is the primary source of public water supply within the county (U.S. Geological Survey [USGS] 2007) including NRC Solomons. The Aquia aquifer ranges from 125 to 200 feet thick and produces up to 3,000 foot squared of water per day (Drummond 2007). Groundwater monitoring wells installed throughout the county by the USGS and Maryland Geological Survey indicate that groundwater levels have been in decline over the past several decades because of increased usage. The level of the Aquia aquifer in the area of NRC Solomons has decreased from 25 feet below ground level to about 160 feet below ground level over the past 60 years (USGS 2007).

Water quality in the Aquia aquifer is generally good however; arsenic concentrations in some areas exceed the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level for public water supplies (Drummond 2007). Water-supply managers in Calvert and St. Mary's counties are therefore seeking to shift some ground-water usage from the Aquia aquifer to deeper aquifers. This shift of usage should also reduce water-level declines, and ameliorate problems in the Aquia aquifer.

C. General Biotic Environment

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

A survey for rare, threatened, and endangered (RT&E) species and species of concern was conducted at NRC Solomons in 2007 (Davis). This survey and coordination with the USFWS and the MDNR (Byrne 2007) indicate that no federal threatened or endangered species are known to occur on the installation. However, one state endangered bird species, Royal Tern (*Sterna maxima*); two state threatened plant species, White Spikerush (*Eleocharis albida*) and Showy Goldenrod (*Solidago speciosa*); and one state rare plant, Pumpkin Ash (*Fraxinus profunda*), were observed during the 2007 survey. An additional state rare species, the Peregrine Falcon (*Falco peregrinus*), has been documented as nesting in the vicinity of the site, under the Governor Thomas Johnson Bridge (Byrne 2000). The Peregrine Falcon was previously state and federally endangered but is now listed only as "In Need of Conservation" in Maryland (MDNR 2007d). In addition, the Peregrine Falcon, like most bird species found at Solomons, remains protected under the MBTA.

Bald Eagles (*Haliaeetus leucocephalus*) have also been documented foraging in the waters near NRC Solomons (DoN 2001) and Bald Eagle nest and roost-site surveys are conducted annually in the winter at NRC Solomons. However, suitable nesting habitat is lacking on the installation, so nesting is not expected. The Bald Eagle was removed from the federal list of threatened and endangered species in 2007, but is still listed as threatened by the state of Maryland (MDNR 2007d). The Bald Eagle also continues to be protected by the Bald and Golden Eagle Protection Act (B&GEPA) and the MBTA.

Although few have been documented at the installation, 13 animal and 60 plant species are listed on the MDNR Wildlife and Heritage Service list of current and historical RT&E species of Calvert County, Maryland (MDNR 2007b). Six plant species have been extirpated in Maryland, leaving 54 current RT&E plant species potentially occurring in the vicinity of NRC Solomons. A list of RT&E species known to occur in Calvert County is in Appendix 2.

(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). Wetlands at NRC Solomons were remotely delineated by the USFWS National Wetlands Inventory (NWI) based on aerial imagery flown in 1981 and 1982 (USFWS 2007). Wetland classifications were assigned using the Cowardin system (Cowardin et al. 1979). Approximately 16 acres of wetland were found to occur at NRC Solomons. One type of palustrine and four estuarine wetlands were identified at NRC Solomons (Table 2-3; Figure 2-8).

Table 2-3. Classification of Wetlands at NRC Solomons

Code	Cowardin Classification	Acres
PFO1	Palustrine forested broad-leaved deciduous	10.0
E2EM1	Estuarine intertidal emergent persistent	0.9
E1UB	Estuarine subtidal unconsolidated bottom	2.9
E2US2	Estuarine intertidal unconsolidated shore, sand	0.5
E2SS1	Estuarine intertidal scrub-shrub broad-leaved deciduous	1.7
Total		**16.0**

Palustrine wetlands are freshwater wetlands where salinity due to ocean-derived salts is below 0.5 percent. Included are wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. Palustrine wetlands also include wetlands lacking vegetation that are less than 20 acres in size and/or less than 6.6 feet deep in the deepest part of basin. Estuarine wetlands include deepwater tidal habitats and adjacent tidal wetlands that are usually semienclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land (Cowardin et al. 1979).

(3) Fauna

NRC Solomons encompasses a variety of natural and cultural habitat types that support populations of wildlife. Included are: open fields and lawns; forested areas; marshes; and beaches along the Patuxent River shoreline. Faunal surveys including Lepidoptera, herpetofauna, mammals, and birds were conducted at NRC Solomons in 2008 (Rambo 2008). In addition, a number of incidental observations of wildlife species were made during site visits for the 2001 INRMP, the current INRMP update, and other regional survey efforts (MDNR 2003, MDNR 2005a, U.S. Army Corps of Engineers [USACE] 1996). Faunal species that have been observed at NRC Solomons are listed in Appendix 2.

a. Mammals

Mammalian species that inhabit the terrestrial and wetland areas at NRC Solomons that are known to occur include medium-sized mammals such as Groundhog (*Marmota monax*), River Otter (*Lutra canadensis*), American Beaver (*Castor canadensis*), Raccoon (*Procyon lotor*), Eastern Cottontail (*Sylvilagus floridanus*), Eastern Gray Squirrel (*Sciurus carolinensis*), Striped Skunk (*Mephitis mephitis*) and Muskrat (*Ondatra zibethicus*) and Virginia Opossum (*Didelphis virginiana*). Whitetail Deer (*Odocoileus virginianus*) are the only large mammal species known to occur at the facility.

Figure 2-8. Wetlands at NRC Solomons

b. Reptiles and Amphibians

Although no surveys have been conducted on the installation, regionally-common reptiles and amphibians may be found. Common amphibians may include the Bullfrog (*Rana catesbeiana*), Green Treefrog (*Hyla cinerea*), Gray Treefrog (*Hyla chrysoscelis*), Fowler's Toad *(Bufo woodhousii fowleri*), American Toad (*Bufo americanus*), Spring Peeper (*Hyla crucifer*), Southern Leopard Frog (*Rana sphenocephala*), Green Frog (*Rana clamitans melanota*), Northern Cricket Frog (*Acris crepitans crepitans*), and Redback Salamander (*Plethodon cinereus*). Common reptiles may include Black Rat Snake (*Elaphe obsoleta obsoleta*), Eastern Garter Snake (*Thamnophis sirtalis sirtalis*), Northern Water Snake (*Nerodia sipedon sipedon*), Northern Black Racer (*Coluber constrictor constrictor*), Eastern Hognose Snake (*Heterodon platirhinos*), Eastern Worm Snake (*Carphophis amoenus amoenus*), Northern Brown Snake (*Storeria dekayi dekayi*), and Eastern Box Turtle (*Terrapene carolina carolina*). The Patuxent River supports a population of Diamondback Terrapin (*Malaclemys terrapin*), and there is a possibility that this species uses the beaches of NCR Solomons for nesting.

c. Birds

The avifaunal community at NRC Solomons is the most diverse faunal community on the installation. Birds that frequently utilize the installation's open areas and urban settings include Northern Mockingbird (*Mimus polyglottos*), American Robin (*Turdus migratorius*), Northern Cardinal (*Cardinalis cardinalis*), Brown-headed Cowbird (*Molothrus ater*), House Sparrow (*Passer domesticus*), House Finch (*Carpodacus mexicanus*), Rock Pigeon (*Columba livia*), and European Starling (*Sturnus vulgaris*). The limited marshland and shoreline also provide habitat for a number of shorebirds and wading birds including the Great-black-backed Gull (*Larus marinus*), Herring Gull (*Larus argentatus*), Laughing Gull (*Larus atracilla*), Ring-billed Gull (*Larus delawarensis*), Great Blue Heron (*Ardea herodias*), Snowy Egret (*Egretta thula*), and Green-backed Heron (*Butorides striatus*), as well as numerous Red-winged Blackbirds (*Agelaius phoeniceus*). The waters adjacent to NRC Solomons are known waterfowl concentration areas and a variety of waterfowl including grebes (*Podiceps* spp. and *Podilymbus podiceps*), loons (*Gavia* spp.), Buffleheads (*Bucephala albeola*), Common Goldeneyes (*Bucephala clangula*), Canvasbacks (*Aythya valisineria*), scaup (*Aythya* spp.), and mergansers (*Mergus* spp.) overwinter in the area. Ospreys (*Pandion haliaetus*) have also been observed nesting on channel markers just off the western shore of the installation and other structures.

d. Fish

Fish are another abundant wildlife guild that inhabit the tidal waters off the shore of NRC Solomons and the installation coves. Regional fish surveys (MDNR 2003, USGS 1997) and studies (USACE 1996) indicate a number of species of environmental and/or economical

importance are indigenous to the estuarine reaches of the Patuxent River and its tributaries. Estuarine species include the Striped Bass (*Morone saxatili*) (locally called rockfish), American Shad (*Alosa sapidissima*), Hickory Shad (*Alosa mediocris*), Alewife (*Alosa pseudoharengus*), and Blueback Herring (*Alosa aestivalis*), Atlantic Croaker (*Micropogonias undulatus*), Bay Anchovy (*Anchoa mitchilli*), Spot (*Leiostomus xanthurus*), Yellow Perch (*Perca flavescens*), White Perch (*Morone americana*), Atlantic Menhaden (*Brevoortia tyrannus*), and American Eel (*Anguilla rostrata*), as well as Softshell Clam (*Mya arenaria*), Eastern Oyster (*Crassostrea virginica*), and Blue Crab (*Callinectes sapidus*).

e. Essential Fish Habitat

Essential fish habitat (EFH) is defined under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (Public Law 94-265), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), as "those waters and substrate necessary to fish for spawning, breeding, and feeding or growth to maturity." The Sustainable Fisheries Act requires that EFH be identified for those species actively managed under federal fishery management plans. This includes species managed by the regional fishery management councils established under the MSFCMA, as well as those species managed by the National Oceanic and Atmospheric Administration (NOAA) Fisheries under federal fisheries management plans developed by the Secretary of Commerce.

EFH designations emphasize the importance of habitat protection to healthy fisheries and serve to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. EFH embodies both the water column (including its physical, chemical, and biological growth properties) and its underlying substrate (including sediment, hard bottom, and other submerged structures). Under the EFH definition, necessary habitat is that which is required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. EFH is designated for a species' complete life cycle, including spawning, feeding, and growth to maturity, and may be specific for each life stage (e.g., eggs, larvae).

NOAA Fisheries has identified EFH in major estuaries, bays, and rivers along the northeastern coast of the United States. In the Patuxent River, EFH has been designated and described for the following species:

- 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 ppt (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).

- Windowpane Flounder (*Scopthalmus aquosus*). EFH for juvenile and adult Windowpane Flounder includes bottom habitats with a substrate of mud or fine-grained sand, water temperatures below 25°C, and salinities between 5.5 and 36 ppt (NOAA 1998).
- Summer Flounder (*Paralicthys dentatus*). EFH for juvenile and adult Summer Flounder includes demersal (i.e., bottom) waters, including tidal guts. Juveniles may use estuarine habitats such as submerged aquatic vegetation (SAV) beds and open bay areas as nursery areas, and adults generally inhabit shallow estuarine waters during the warmer months (NOAA 2007c).
- Bluefish (*Pomatomus saltatrix*). Bluefish is a highly migratory, schooling pelagic species found along the Atlantic coast. EFH for juvenile and adult Bluefish includes the pelagic water column, and inland within the mixing and seawater zones of between 0.5 and 25 ppt, and greater than 25 ppt salinity, respectively. This species could be present in the vicinity of NRC Solomons primarily from April through October (NOAA 2007a).
- Coastal migratory pelagic species including King Mackerel (*Scomberomorus cavalla*), Spanish Mackerel (*Scomberomorus maculates*), and Cobia (*Rachycentron canadum*). EFH has been designated for all life stages of these species in the Patuxent River. EFH includes sandy shoals of capes and offshore bars, high-profile rocky bottom and barrier island ocean-side water, and all coastal inlets. EFH also includes estuaries and SAV for Cobia (NOAA 2007b).
- Red Drum (*Sciaenops occelatus*). EFH for the various life stages of Red Drum includes tidal inlets and creeks, salt marshes, SAV, and unconsolidated bottom (i.e., soft sediments; NOAA 2007d).

EFH that is either important to the long-term productivity of one or more managed species populations or deemed to be particularly vulnerable to degradation may be identified by fishery management councils and NOAA Fisheries as a Habitat Area of Particular Concern (HAPC). SAV beds of the Chesapeake Bay are considered HAPC for adult and juvenile Summer Flounder and all life stages of Red Drum.

(4) Flora

a. Ecological Communities

Although a comprehensive floral inventory has not been conducted at NRC Solomons, an urban forest survey conducted in 2003 (DoN 2003), the 2007 RT&E species survey (Davis), an invasive species survey conducted in 2007 (DoN 2009), and incidental observations made during field reconnaissance for this INRMP identified more than 70 plant species at NRC Solomons. Because of the high level of disturbance and development at NRC Solomons, a large number of invasive species have invaded these natural areas. Invasive species are non-native, or exotic plants and animals found outside their natural range, that out-compete native species in a specific habitat. The invasive species survey identified more than 30 invasive, non-native plant species that occur throughout the installation. Multiflora Rose (*Rosa*

multiflora), Common Reed (*Pragmites australis*), Japanese Honeysuckle (*Lonicera japonica*), and privet (*Ligustrum* spp.) are the most wide-spread and problematic invasive species on the installation. A list of native and non-native plant species known to occur at NRC Solomons is in Appendix 2.

Natural vegetative communities are very limited at NRC Solomons and improved lands with mowed lawns and ornamental trees and shrubs are the dominant vegetative cover (Figure 2-9). The largest natural area consists of a mixed shrub/woodland (13 acres) located in a wet depression in the central part of the installation. This site is a mid-successional stand that developed once maintenance was ceased on a site previously used for munitions storage.

Black Willow (*Salix nigra*), Black Cherry (*Prunus serotina*), Eastern Red Cedar (*Juniperus virginiana*), and Red Maple (*Acer rubrum*) are the dominant tree species. Common shrubs at the site are privet, Multiflora Rose, Winged Sumac (*Rhus copallina*), Groundsel Tree (*Baccharus halimifolia*), and Silky Dogwood (*Cornus amomum*). Japanese Honeysuckle blankets much of the vegetation on this site and a wetland swale that passes through is dominated by Common Reed. Numerous grasses, forbs, and herbaceous species occur along the nature trail and throughout the area as well. Several previously disturbed sites in the southern portion of the installation, which served as debris disposal areas or industrial waste sites are also classified as mixed shrub/woodlands and have similar species compositions.

A second natural area is a small pine stand (7 acres) in the southeast portion of the installation, east of Second Cove. Loblolly Pine (*Pinus taeda*) is the dominant canopy tree and there is little understory or herb layer in this stand. The beach area and small areas of emergent and forested wetlands are other ecological communities at NRC Solomons.

b. Submerged Aquatic Vegetation

SAV is a diverse assembly of marine and bay grasses found in shoal areas of the Chesapeake Bay, from its mouth to the headwaters of its tributaries (Virginia Institute of Marine Science [VIMS] 2005). SAV provides protection and nursery habitat for a broad range of aquatic organisms, contributes to the oxygenation of the water, and prevents erosion and sedimentation. During the growing season, SAV removes excess nutrients and reduces algal growth by retaining nitrogen and phosphorus. Large-scale declines in SAV populations have occurred since the 1960s in response to increasing amounts of non-point inputs of nutrients and sediments in the Bay system (Moore et al. 2004).

VIMS has mapped SAV in different regions of the Chesapeake Bay regularly since 1971 using aerial photo-interpretation and ground verification. The entire Bay was most recently mapped in 2005 (VIMS 2007) (Figure 2-10). SAV surveys of the Patuxent River in the vicinity of NRC Solomons have documented three species: Widgeon Grass (*Ruppia maritime*), Horned Pondweed (*Zannichellia palustris*), and Eelgrass (*Zostera marina*).

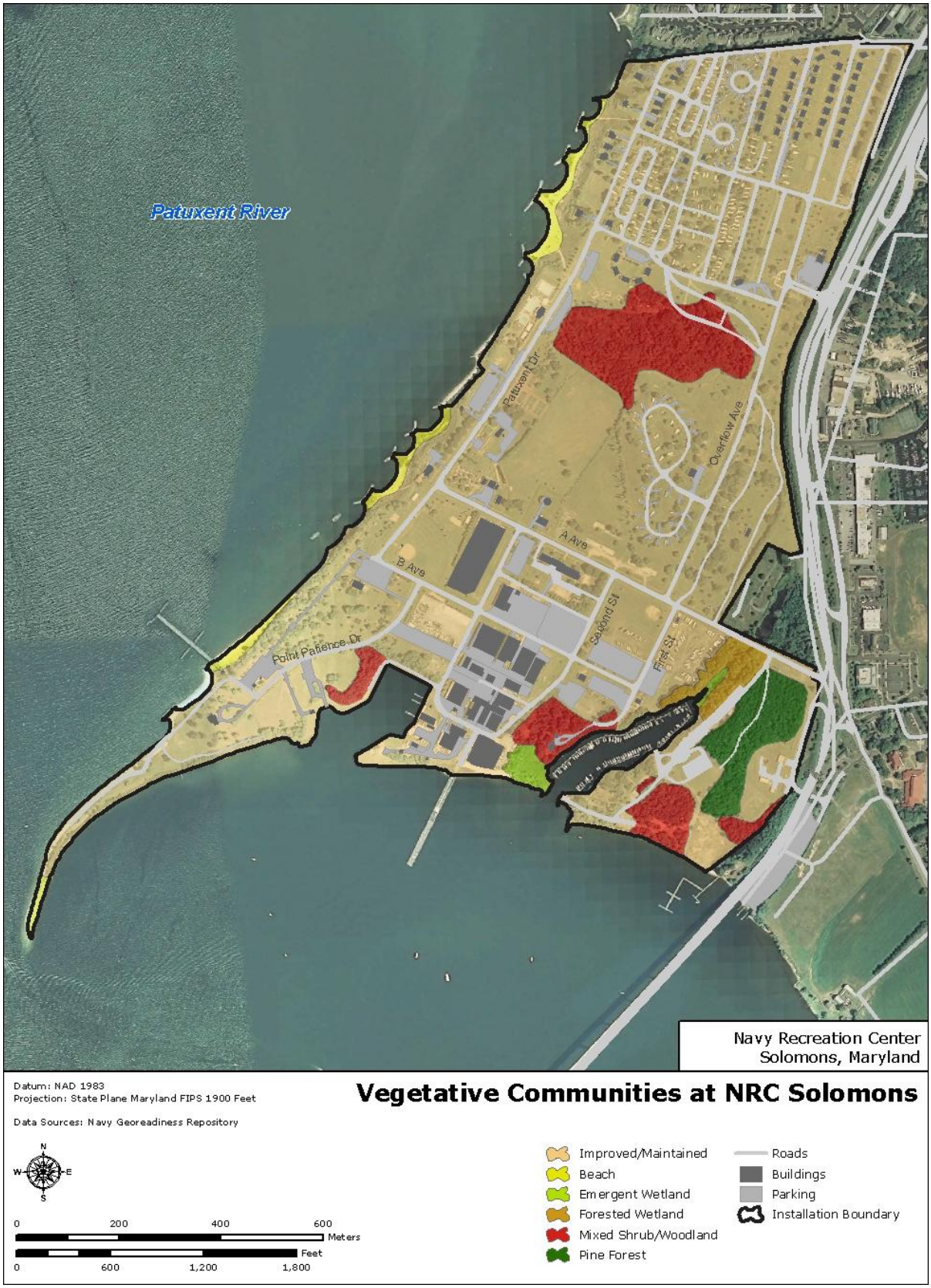


Figure 2-9. Vegetative Communities at NRC Solomons

Figure 2-10. Submerged Aquatic Vegetation in the Vicinity of NRC Solomons

Widgeon Grass was planted at NRC Solomons in April 2000 as part of a shoreline stabilization project initiated in the spring of 1999. However, the VIMS surveys have not documented any SAV beds at NRC Solomons indicating that this planting effort was unsuccessful. No SAV beds have been documented in the vicinity of NRC Solomons since 2002, when one SAV bed was documented to the north of the installation, and three SAV beds were documented to the east of Solomons Island (VIMS 2002). In 2005, Horned Pondweed and Eelgrass were present in the vicinity of NRC Solomons, but no beds were documented (VIMS 2005a).

3. ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

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

(1) Military Mission and Sustainable Land Use

The primary goal of natural resources management at NRC Solomons is to preserve and sustain conditions that are compatible with the installation's recreational mission. Mission requirements are met through the protection and enhancement of significant resources such as wetlands, rare species, and habitat for migratory birds and other at-risk species, land and watershed management, and invasive species control. Sustainable management of natural resources helps ensure compliance with environmental laws and regulations and the continued availability of the facility to meet DoD's recreational requirements.

(2) Defining Impact to the Military Mission

Natural resources management efforts at NRC Solomons are focused on reducing impacts to and/or enhancing the installation's recreational mission. Natural resources management efforts such as reducing shoreline erosion and restoring the facility's beaches have greatly enhanced recreational opportunities at NRC Solomons. Controlling nuisance wildlife and non-native plant species, creating an interpretive cultural and natural resources trail, and restoring wetlands are other management activities that have been undertaken to enhance the mission.

(3) Relationship to Other Plans

a. Encroachment Action Plan

Per OPNAVINST 11010.40 encroachment is "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." Individual Encroachment Action Plans (EAPs) have been developed or are being developed for each Navy installation (Danesi 2007). However, although NAS Patuxent River has cognizance of NRC Solomons, the NAS Patuxent River EAP does not address potential encroachment threats to NRC Solomons.

b. Stormwater Pollution Prevention Plan

The NRC Solomons Stormwater Pollution Prevention Plan (SWP3) identifies and maps potential pollutant sources that may contribute to the contamination of the stormwater discharges from permitted outfall drainage areas (DoN 2007). 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 NRC Solomons to maintain and protect water quality. The SWP3 was 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 SWP3 must be amended.

c. Environmental Restoration Program

The installation recognizes that adverse impacts to natural resources addressed in this INRMP may result from the release of hazardous substances, pollutants, and contaminants into the environment or from the actual restoration of contaminated sites. The DoN Environmental Restoration Program (ERP) is responsible for identifying Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) releases, Resource Conservation and Recovery Act (RCRA) releases, 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 ERP Remedial Project Manager (RPM) identify potential impacts to natural resources caused by the release of these contaminants. Regional or installation natural resources staff will also participate, as appropriate, in the ERP decision-making process by communicating natural resource issues on the installation to the RPM, attending Restoration Advisory Board (RAB) meetings, reviewing and commenting on ERP 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 regional or installation natural resources staff will make recommendations to the ERP RPM regarding cleanup strategies and site restoration. During initial monitoring protocols, the natural resources manager may suggest sampling and testing be accomplished so as to not impact sensitive or critical areas. Also during site restoration, the natural resources manager has the opportunity to recommend site restoration practices that are outlined within this INRMP. Examples include landfill caps restored to grasslands, excavation areas restored to wetland/pond areas, and treated water located to enhance a pond area.

Remedial investigations at NRC Solomons revealed a number of sites contaminated with hazardous and non-hazardous waste, including unexploded ordnance (UXO), resulting from

past land uses and waste disposal practices. The Navy completed remediation of all known ER sites at the end of 2008 (Smith 2009). However, there is always a possibility for future discoveries.

B. Natural Resources Consultation Requirements

A number of federal laws, including the ESA, CWA, CZMA, MBTA, Marine Mammal Protection Act (MMPA), and MSFCMA require consultation with a designated federal regulatory agency such as USFWS, National Marine Fisheries Service (NMFS), or the 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 County, Maryland are listed in Appendix 2. There are currently no federally listed threatened or endangered species known to occur at NRC Solomons, therefore no federal agency consultation regarding these resources is required.

(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. Section 401 of the CWA requires additional certification from the appropriate state regulatory agency. MDE oversees impacts to state waters and wetlands, including isolated wetlands in Maryland. 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. The NWI database indicates there are 16 acres of wetlands at NRC Solomons. Any future activity at the installation with potential to impact wetlands will be coordinated with the Baltimore USACE District.

(3) Coastal Zone Management Act

The federal 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. Maryland's coastal zone includes 16 counties and Baltimore City (MDNR 2002). Calvert County is located within Maryland’s coastal zone. 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 Program (CZMP). 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, an enforceable policy of the Maryland CZMP, is a joint effort by state and local governments to address the impacts of land development on habitat and aquatic resources in the Bay. In Maryland, the Chesapeake Bay Critical Area designation extends 1,000 feet inland from the mean high water mark or from the edge of tidal wetlands and is intended to significantly limit development on properties along significant tributaries to the Chesapeake Bay (MDE 2004). Approximately 207 acres of NRC Solomons are within the Chesapeake Bay Critical Area. Therefore the installation must submit a federal consistency determination to the Maryland Coastal Zone Program Office for concurrence prior to conducting activities that are likely to affect use of lands or waters, or natural resources of the State's coastal zone in this area. A consultation is conducted with the Maryland Critical Area Commission if an action likely to affect the State's coastal zone is conducted within the Critical Area.

(4) 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 DoD during military readiness activities was finalized in February 2007 (Federal Register 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 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.

A number of migratory birds are known to occur at the installation (Appendix 2). No current or planned activity at the installation has potential to result in a significant adverse effect on a population of a migratory bird species. Natural resources actions geared toward the management and enhancement of migratory bird habitat is discussed in Section 4.F of this INRMP.

(5) Marine Mammal Protection Act

The MMPA established a moratorium on the taking of marine mammals in waters or on lands under the jurisdiction of the United States (16 USC Section 1361). The MMPA defines take as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal" (16 USC Section 1312[13]). It also prohibits the importation of any marine mammal or marine mammal parts into the United States, unless it is for the purpose of scientific research or public display, as permitted by the Secretary of Commerce or Secretary of the Interior. The only marine mammal species likely to occur in the Patuxent River is the Common Bottlenose Dolphin (*Tursiops truncates*). Other marine mammal species rarely occur in the upper Chesapeake Bay and the likelihood of these species entering the Patuxent River is remote.

(6) 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 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. 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).

NOAA Fisheries has identified EFH in major estuaries, bays, and rivers along the northeastern coast of the United States. In the Patuxent River, EFH has been designated and described for 10 fish species. If land use changes, shoreline stabilization, or military operations with potential to impact these areas are planned, a consultation with NMFS would be required under the Magnuson-Stevens-Fishery Conservation and Management Act.

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 5090.1 (series) 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 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; MMPA; National Historic Preservation Act (NHPA); Research and Sanctuaries Act; 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 of environmental problems; and
- Initiate and utilize ecological information in the planning and development of resource-oriented projects.

Any action at NRC Solomons requiring NEPA documentation is coordinated by the NEPA Program Manager in the Environmental Division at NAS Patuxent River. The installation's environmental planning checklist ensures that planners and natural resource managers are actively involved with and aware of the various projects at NRC Solomons that require environmental review and coordination.

D. Beneficial Partnerships and Collaborative Resource Planning

The development of partnerships with state and federal resource 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 have formed or could form significant partnerships with NAS Patuxent River and NRC Solomons.

- The USFWS provides assistance in matters that concern the conservation, protection, and management of fish and wildlife species.
- The USFWS Chesapeake Bay Ecological Services Field Office provides support in the management of invasive species.
- The MDNR Wildlife and Heritage Service assists in matters that concern the conservation, protection, and management of fish and wildlife species.
- The MDNR Natural Heritage Program provides information and guidance related to RT&E species information.
- The Calvert County Soil Conservation District assists with soil conservation and erosion and shoreline stabilization issues.
- The DoD Chesapeake Bay Program provides assistance in meeting the mandates of the Agreement of Federal Facilities on Ecosystem Management in the Chesapeake Bay and other Chesapeake Bay Agreements.

E. Public Access and Outreach

(1) Public Access and Outdoor Recreation

Recreational facilities are only available to active duty, retired, reserve military personnel, active DoD civilians, and sponsored guests. There is no public access to NRC Solomons.

(2) Public Outreach

NAS Patuxent River natural resources staff provide environmental education programs and events for NRC Solomons visitors as requested, approximately two to three times per year. Historically, activities have also been conducted to include visitor participation in National Public Lands Day events.

F. Encroachment Partnering

Incompatible urban development could present NRC Solomons with a long-range threat to the military mission. As the town of Solomons, Maryland continues to grow toward the boundaries of NRC Solomons, land development could become incompatible with the installation's recreational mission and potentially result in pressure to modify land use at the installation.

An EAP was prepared for NAS Patuxent River in accordance with OPNAVINST 11010.40 (Encroachment Management Program). This EAP is a proactive strategy that addresses all types of encroachment pressures (e.g., adjacent private development, certain environmental restrictions, or growing competition for resources such as groundwater or waterfront) at the

installation and other operating areas, such as Bloodsworth Island Range and Webster Field, to preserve the ability to meet existing and future mission requirements and to provide effective testing and training capabilities. NRC Solomons, although under the cognizance of NAS Patuxent River, is not covered under this EAP.

G. State Comprehensive Wildlife Plans

The Maryland Comprehensive Wildlife Conservation Strategy, referred to as the State Wildlife Action Plan (SWAP), was developed and is implemented by the MDNR Wildlife and Heritage Service (MDNR 2005b). The SWAP is a 10-year strategic plan that is required for continued funding through the State Wildlife Grant Program administered by the USFWS. The SWAP was developed with extensive input from other state and federal agencies, non-governmental 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 SWAP.

A final draft of the SWAP has been produced for submission to the USFWS and is available online: http://dnr.maryland.gov/wildlife/divplan_wdcp.asp.

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 wildlife species of greatest conservation need (GCN) 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 consistent with those put forth in the state SWAP. Specific actions that directly support the Maryland SWAP addressed in this INRMP include:

- Mapping and protecting wetlands from drainage, ditching, filling, and other damaging practices that alter hydrology;
- Conducting baseline faunal surveys for migratory and breeding birds, small mammals, furbearers, and herpetofauna;
- Enhancing natural areas through the control of invasive plant species; and
- Continuing soil erosion prevention and shoreline stabilization efforts.

4. PROGRAM ELEMENTS

A. Rare, Threatened, and Endangered Species Management

(1) Program Description

The primary regulatory protection for RT&E species on military installations is the ESA. Under the mandates of the ESA, federal agencies must conserve listed species and ensure that agency actions do not jeopardize the continued existence of those species. Federal agencies must also protect and conserve the habitats under their control.

Although an RT&E species survey and coordination with the USFWS and the MDNR indicate that no federally listed species are known to occur on NRC Solomons, several state protected species have been documented. One state endangered bird species, Royal Tern; two state threatened plant species, White Spikerush and Showy Goldenrod; and one state rare plant, Pumpkin Ash, were observed during the 2007 survey. The Peregrine Falcon (state rare) and Bald Eagle (state threatened) have also been documented in the area. The Diamondback Terrapin is a Maryland state species of GCN that also has potential to occur.

(2) Management Goals

The overall goal of this program element is to ensure compliance with the ESA, the B&GEPA, applicable state regulations, and to protect and enhance rare species populations and their habitats. Specific management goals for the program include the following:

- Assess and monitor populations of RT&E species;
- Avoid impacts to RT&E species and their habitat; and
- Maintain existing population levels and habitat, and where feasible increase populations and enhance habitat.

NAS Patuxent River is responsible for rare species management at NRC Solomons. NAS Patuxent River natural resources professionals coordinate the planning, budget controls, and general administrative functions of the program. The USFWS and the MDNR Wildlife and Heritage Division may provide guidance on rare species management issues and projects. The program ensures compliance with the following federal and state laws and DoD and Navy policies: ESA of 1973 (16 USC 1531-1544, 87 Stat. 884) as amended, B&GEPA (16 USC 688-688d, 54 Stat. 250) as amended, Maryland Endangered Species of Fish Conservation Act (4-2A-01 et seq.) and Maryland Nongame and Endangered Species Conservation Act (10-2A-01 et seq.), and OPNAVINST 5090.1 (series) Environmental and Natural Resources Program Manual.

(3) Management Practices

The location of the identified RT&E species have been mapped using global position systems (GPS) technology and are maintained in the NAS Patuxent River geographic information system (GIS) database to provide critical information to improve land use decisions. Continued monitoring of the rare species, as well as continuing to conduct Bald Eagle nest and roost-site surveys each winter, will help ensure compliance with the federal and state laws and DoD and Navy policies. Additionally, projects that have potential to impact state or federally listed species may require additional evaluation and must be coordinated with MDNR and USFWS.

B. Wetlands Management

(1) Program Description

Wetlands management at NRC Solomons addresses tidal and non-tidal wetland areas and deepwater habitats on the installation. This program element is applicable to all jurisdictional wetlands and is designed to ensure compliance with federal and state wetland regulations. Basewide wetlands mapping at NRC Solomons was conducted using 1981-1982 aerial imagery as part of the NWI effort, which provides only very coarse, planning level data. Conducting an updated wetland survey and delineation (using GPS technology or traditional land survey methods) for inclusion in the NAS Patuxent River Natural Resources Office GIS would improve planning capabilities and wetlands protection at NRC Solomons.

(2) Management Goals

The goals of wetlands management is to ensure compliance with Section 404 and Section 401 of the CWA; Executive Order (EO) 11990 (Protection of Wetlands); EO 11988 (Floodplain Management), and applicable state regulations as well as the protection and enhancement of wetland communities at NRC Solomons. 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 Permitting

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. Activities that bring an area into farming or silviculture, however, 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. MDE requires state permits for any impacts to state waters and wetlands, including isolated wetlands.

To obtain the necessary permits, the proponent of an action must submit a joint federal/state application to the Regulatory Services Coordination Office (RSC) MDE, Water Management Administration. The RSC determines what type of permit is necessary and forwards the application to the appropriate governmental agencies. The review procedures and application package materials required vary depending on the size and type of project being proposed. Activities that are likely to cause more than minimal impact to wetlands require a USACE Standard Permit (Individual Permit) which is reviewed by the USACE, MDA, and local authorities, and is subject to public review.

A General Permit may be issued for activities that of activities that are similar in nature and would have only minimal individual or cumulative adverse environmental effects. General permits can be issued on a nationwide (nationwide permit) or regional (regional general permit) basis (EPA 2007). The Baltimore District Engineer has implemented a Maryland State Programmatic General Permit (MDSPGP). This regional permit is designed to continue to authorize certain activities previously covered by the nationwide permit program and institute an integrated state and federal regulatory process (USACE 2006). It is applicable to actions that will not individually and/or cumulatively result in direct or indirect impacts to more than 1.0 acre of waters of the United States, including jurisdictional wetlands and navigable waters.

As part of the MDSPGP 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.

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. Mitigation ratios recommended by the MDE (2008) for various wetland types are generally as shown in Table 4-1.

Table 4-1. Wetland Mitigation Ratios

Wetland Type Replacement	Ratio
Emergent	1:1
Emergent, using a bank	1.5:1
Scrub-shrub to emergent conversion	1:1
Scrub-shrub to emergent conversion, using a bank	1.5:1
Forested to emergent conversion	1:1
Forested to emergent conversion, using a bank	1.5:1
Forested to scrub-shrub conversion*	1:1
Scrub-shrub	2:1
Scrub-shrub, using a bank	3:1
Forested	2:1
Forested, using a bank	3:1
Emergent (of special state concern)	2:1
Emergent (of special state concern), using a bank	3:1
Scrub-shrub (of special state concern)	3:1
Scrub-shrub (of special state concern), bank	4.5:1
Forested (of special state concern)	3:1
Forested, (of special state concern), using a bank	4.5:1

*Some conversions of forested wetlands to scrub-shrub require mitigation
Source: MDE 2008

Compensatory mitigation may be accomplished through the following ways:

- Mitigation Banks: A permit applicant may obtain credits from a mitigation bank, which is a wetland, stream or other aquatic resource area that has been restored, established, enhanced, or preserved. This resource area is then set aside to compensate for future impacts to aquatic resources resulting from permitted activities. The value of a bank is determined by quantifying the aquatic resource functions restored, established, enhanced, and/or preserved in terms of credits.
- In-Lieu Fee Mitigation: A permit applicant may make a payment to an in-lieu fee program that will conduct wetland, stream or other aquatic resource restoration, creation, enhancement, or preservation activities. In-lieu fee programs are generally administered by government agencies or non-profit organizations that have established an agreement with the regulatory agencies to use in-lieu fee payments collected from permit applicants.
- Permittee-Responsible Mitigation: A permittee may be required to provide compensatory mitigation through an aquatic resource restoration, establishment, enhancement, and/or preservation activity. This compensatory mitigation may be provided at or adjacent to the impact site, or at another location, usually within the same watershed as the permitted impact. The permittee retains responsibility for the implementation and success of the mitigation project.

(4) Submerged Aquatic Vegetation

SAV is comprised of vascular plants that grow completely under water below the low-tide line in water depths up to nine feet (CBP 2007). Horned Pondweed (*Zannichellia palustris*) and Widgeon Grass (*Ruppia maritime*) are the two most common of the 11 species of SAV are commonly found in the Chesapeake Bay and its tidal tributaries (Table 4-2; VIMS 2005b). SAV is an important indicator of water quality, as well as a critical nursery habitat for many species (Center for Watershed Protection 2004). Historically high nutrient loads in the lower Patuxent River have resulted in a decrease in SAV abundance, although recent decreases in nutrient loads have not led to an increase in SAV (Center for Watershed Protection 2004).

In April 2000, Widgeon Grass was planted at NRC Solomons; however this planting appears unsuccessful as no SAV have been documented at NRC Solomons during the VIMS surveys. In 2003, MDNR began SAV (Eelgrass) restoration projects at five locations in the lower Patuxent River (MDNR 2007f). These restoration efforts continued through 2004 and 2005. Three of the restoration sites (Hungerford Creek, Myrtle Point, and Solomons Island) are in the vicinity of NRC Solomons. The Hungerford Creek restoration site is just north of NRC Solomons at the mouth of Hungerford Creek. A total of 2.25 acres were seeded at this site in 2004 and 2005. The Hungerford Creek restoration site is located on the western shore of the Patuxent River directly across from NRC Solomons. A total of three acres were seeded at this site in 2004 and 2005. The Solomons Island restoration site is located at the southern tip of Solomons Island. Over five acres were seeded at this site in 2004. The 2005 VIMS survey indicate that SAV species are present at all three restoration sites in the vicinity of NRC Solomons, although no beds were documented (VIMS 2005a).

Table 4-2. Common SAV of the Chesapeake Bay

Common Name	Scientific Name
Eelgrass	*Zostera marina*
Eurasian Watermilfoil	*Myriophyllum spicatum*
Sago Pondweed	*Potamogeton pectinatus*
Redhead Grass	*Potamogeton perfoliatus*
Horned Pondweed	*Zannichellia palustris*
Wild Celery	*Vallisneria americana*
Common Elodea	*Elodea canadensis*
Water Stargrass	*Heteranthera dubia*
Coontail	*Ceratophyllum demersum*
Southern Naiad	*Najas guadalupensis*
Widgeon Grass	*Ruppia maritima*

Source: VIMS 2005b

C. Fish and Wildlife Management

(1) Program Description

The availability and diversity of suitable habitats at NRC Solomons influence the fish and wildlife populations that can occur on the installation. With over 86 percent 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 and suburban environments. Although a comprehensive biological survey of the installation has not been conducted, a number of fish and wildlife species have been observed during surveys conducted in 2009 (Rambo), reconnaissance site visits (Geo-Marine, Inc. 2007), and other survey efforts (USACE 1996) (Appendix 2).

NAS Patuxent River natural resources personnel coordinate daily planning, budget controls, and general administrative functions of the program. The USFWS and MDNR are cooperating agencies and are available to provide guidance on management issues and projects.

(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 military mission and within habitat carrying capacity. Specific management goals for the program are to:

- Protect, conserve, and manage fish and wildlife populations that are capable of supporting non-consumptive and consumptive uses;
- Maintain and enhance biodiversity to the greatest extent practicable within the constraints of the military mission and given the urban setting; and
- Ensure that wildlife populations do not conflict with the military mission.

(3) Management Practices

In accordance with Navy policy, fish and wildlife management focuses on protecting and enhancing biodiversity through ecosystem management. Conserving habitat diversity is a primary tenet of ecosystem management and because of the high level of development at NRC Solomons, the conservation and enhancement of any remaining natural habitat is important to protecting the installation's wildlife resources. Management efforts currently underway to conserve and enhance habitat diversity include shoreline stabilization, ERP site restoration, and invasive species eradication.

Further efforts that focus on maintaining a diversity of habitat types that provide year-round food and cover (coniferous vegetation) as well as seasonal food and cover (mast producing deciduous vegetation) provide the greatest benefits for wildlife. Supplemental plantings of

native trees and shrubs in maintained open areas and around building and recreational areas, where consistent with current and planned land uses, would help enhance habitat diversity and meet wildlife management objectives. Providing additional artificial nesting habitat in urban areas is another management action that can enhance wildlife habitat at the installation.

(4) Nest Box Program

Providing nest boxes is an effective management practice for improving habitat for the installation's avian wildlife if properly maintained. Otherwise, they can actually increase populations of non-native/invasive species. Artificial nest boxes are useful for enhancing habitat conditions for a number of bird and wildlife species in areas where there are few natural cavity trees or where competition from aggressive non-native species such as House Sparrows and European Starlings is great. Placement of structures that benefit insectivorous birds in urban and housing areas also provides a benefit to people as these birds consume thousands of insects a day and provide enjoyment for human observers. Eastern Bluebirds (*Sialis sialis*), Tree Swallows (*Tachycineta bicolor*), Purple Martins (*Progne subis*), owls, Wood Ducks (*Aix sponsa*), mice, squirrels, and bats are species that commonly utilize artificial structures. NRC Solomons currently has several bluebird and Wood Duck nest boxes and nesting platforms for Ospreys. Mapping nest box locations using GPS technology and annual maintenance and monitoring would improve the effectiveness of this program.

(5) Nuisance Animal Management

The presence of wildlife in urban environments can pose difficulties as well as benefits. Nuisance situations occur when wildlife populations, including feral animals, exceed human expectations. It is Navy policy to employ an integrated pest management (IPM) approach to pest control. IPM is an environmentally sound approach to pest management that promotes non-chemical controls and stresses prevention to avoid unacceptable levels of pest damage. A variety of biological, cultural, and mechanical pest management strategies are used in IPM. The goal of IPM is to make decisions that produce economically and environmentally optimum results.

Wildlife at NRC Solomons that are considered nuisance species include Groundhogs, beavers, skunks, and jellyfish. Other potential nuisance species include feral cats, rats, and Whitetail Deer. These species may cause safety hazards to people, property, and other wildlife. Beaver, skunk, and deer are protected as game species under Maryland law. Because they are protected species, special permits are needed to trap, transport, or otherwise control these species. The Public Works Department contracts licensed pest controllers to perform nuisance wildlife control at NRC Solomons. Rabid fox and raccoons are also occasional concerns.

References that apply to managing nuisance animals at NRC Solomons are (1) the DoD Pest Management Program (DoD DIR 4150.7), (2) the Navy Pest Management Program (OPNAVINST 6250.4 (series)); and (3) OPNAVINST 5090.1 (series).

a. Groundhogs, Beavers, and Skunks

Nuisance animals at NRC Solomons that pose a potential safety hazard and could damage personal property include Groundhogs, beavers, and skunks. An active Groundhog population that digs tunnels at various outdoor recreational sites could undermine the structural integrity of buildings and the pier complex. Skunks, which also den in Groundhog burrows, can occur too close to buildings for the comfort of NRC Solomon's visitors. Beavers are another nuisance animal that have been observed on the installation. A small beaver population that inhabits Second Cove has been cutting large trees in close proximity to the boat storage area and the marina. Beaver damage could create substantial costs in replacement and repair of boats and marina facilities if one or more or trees fell into the boat storage or marina area.

b. Stinging Jellyfish

The Sea Nettle (*Chtysaora quinquecirrha*) is a stinging jellyfish that sometimes makes the Chesapeake Bay and its tributaries inhospitable to swimmers in the summer. These jellyfish are found most abundantly in the tributaries of the middle Chesapeake Bay where the salinity is between 10 and 20 ppt.

Efforts to control jellyfish in the Bay during the 1960s were largely unsuccessful. Nets and bubble screens were employed to keep them away from swimming areas. The jellyfish tended to clog the nets and to break into pieces that continued to sting. The benthic polyp stage also was targeted using chemicals. Chemical applications, however, resulted in the mortality of non-target species and were not continued. Additionally, researchers found a species of sea slug that consumed polyps, but culture methods proved unsuccessful and sea slug survival was low in the salinity levels favored by the sea nettle. The only method known to reduce jellyfish populations is an influx of fresh water, which decreases their reproductive potential. However, reducing the salinity is harmful to shellfish and submerged aquatic vegetation in the area (Maryland Sea Grant College 2004).

A more practical solution to Sea Nettle encounters in the swimming area involves informing and educating swimmers on the presence of jellyfish and ways to avoid contact. This should include coordinating with MDNR to prepare a brochure for Sea Nettle safety and treatment.

c. Feral Pets

Pets that have been abandoned or left behind by owners often become serious pests on military installations. Feral pets may carry diseases such as rabies, distemper, and feline

leukemia (in cats) and pose a serious health threat to humans and other family pets. It is therefore important to ensure that pets are properly vaccinated, tagged, and registered when brought onto NRC Solomons. In addition, feral animals and loose pets, particularly cats, are known to be very damaging to migratory bird populations and other native wildlife. To reduce impacts to native wildlife and in accordance with OPNAVINST 5090.1 (series), privately owned animals are not permitted to run at large on the installation. Pet owners should also be encouraged to neuter their pets to reduce the occurrence of unwanted animals.

The CNO Policy Letter of January 2002 on Preventing Feral Cat and Dog Populations on Navy Property states Navy policy on feral pets. In accordance with Navy policy, NRC Solomons must adopt proactive pet management procedures that prevent the establishment of free-roaming cat and dog populations on the installation and must ensure the humane capture and removal of feral cats and dogs. Every effort should be made to find homes for adoptable animals. Due to the potential of feral or free ranging cat populations to act as disease reservoirs, threatening human health, native wildlife populations and natural ecosystems, Navy commands shall not allow Trap Neuter Release or similar programs on their lands. Assistance from the local animal control warden should be sought for capture and placement or disposal of feral cats and dogs. Increasing public awareness on the problems associated with feral cats is a primary factor in controlling feral pet populations. Installation personnel and guests should understand that feeding feral cats and dogs is an unacceptable practice that may cause feral and other predator populations such as raccoons to increase. Prompt garbage removal and keeping dumpster and refuse receptacles covered with tight-fitting lids are other important practices.

d. Rabies

A potential problem at NRC Solomons is the occurrence of rabies in feral animals and wildlife. Rabies is a viral disease carried by mammals and often transmitted through the saliva of a symptomatic animal. Rabies affects the central nervous system and causes death without early detection and treatment. Today, rabies is most often transmitted to humans by wild animals. The optimal defense against rabies is through an education program for installation personnel.

(6) Fisheries Management

a. Habitat Management

The waters of the Patuxent River and its tributaries serve as important spawning or nursery sites for many finfish species such as Spot, Croaker, Striped Bass, flounder, menhaden, herring, and shad as well as Blue Crabs, oysters, and clams. Fish populations in the river, however, have decreased significantly from historic numbers because of overconsumption, pollution, and water quality degradation (USACE 1996). A number of projects have been

undertaken at NRC Solomons to improve water quality and fish habitat. Shoreline stabilization efforts along the western and southern shorelines, which are being completed in phases, have resulted in improved water clarity and the enhancement of fish habitat. Beach grass and SAV plantings at various locations along the shoreline have also helped reduce erosion and improve aquatic habitats.

The installation also participates in the state's Clean Marina Program and the Point Patience Marina is a certified Maryland Clean Marina (MDNR 2007a). The Clean Marina Initiative is a voluntary program that encourages marina operators and recreational boaters to protect coastal water quality by engaging in environmentally-sound operating and maintenance procedures. Certified marinas meet the rigorous pollution prevention standards established by the Maryland Clean Marina Committee and the MDNR. CNIC's goal for recreational marinas is to have all marinas that are located in states with a clean marina program to achieve certification by 2007.

b. Population Management

Fishing and crabbing are popular recreational activities at NRC Solomons. Visitors may rent boats to get onto the Patuxent River to fish, or may fish from the recreational pier. Regional fisheries management plans are supported at NRC Solomons through strict enforcement of all MDNR Fisheries Service regulations regarding minimum fish size, time of year restrictions, creel limits, and special considerations for all regulated species.

The dispersal and introduction of non-indigenous aquatic species is largely caused by the release or escape of bait fish and other organisms released by anglers. Although the state of Maryland does not currently have restrictions on non-native live bait, the Navy has implemented proactive measures to protect native fish populations and prevent the spread of aggressive non-native species by prohibiting use of all live bait other than night crawlers and bloodworms. Additional measures including prohibiting use of all live non-native bait and the release of live bait (on land or water) also help prevent the introduction and spread of invasive species. All unused bait must be put in a plastic bag or container and placed it in the trash for proper disposal. Use of non-native alternative live baits such as Nuclear Worms (*Namalycastis abiuma*), will continue to be prohibited at NRC Solomons.

c. Oyster Restoration

Although oyster production was once the primary industry in the area around Solomons Island, over-harvesting, degraded habitat, pollution, and diseases have caused a severe decline in oysters over the last century and very little harvest occurs in the Patuxent River today. Oysters are also an important part of the aquatic ecosystem as they filter pollutants and provide habitat for many other aquatic organisms.

As part of the 1999 shoreline stabilization project, an oyster reef was developed at the southern end of the installation in cooperation with MDNR. The Navy built the reef and purchased oyster spat for seeding. MDNR is currently monitoring the reef. Additional efforts like this would support regional efforts to restore water quality and fish habitat in the Patuxent River.

D. Forest Management

(1) Program Description

NRC Solomons is a highly developed installation that consists of developed and mowed areas with small, isolated stands of trees ranging in size from less than an acre to approximately 12 acres. There is little or no potential for commercial forest management on the installation. Forest resources do, however, provide a number of social, environmental, and economic benefits including aesthetic enhancement, water quality improvement, and wildlife habitat.

(2) Management Goals

The primary objectives of forest management are to:

- Conserve and enhance existing forested areas that contribute to overall ecosystem function, and
- Increase forested acreage through reforestation where practicable, within the constraints of the military mission.

(3) Management Practices

Although commercial forestry is not an objective of forest management at NRC Solomons; management of the forested areas is necessary to maintain this valuable resource. The primary issues concerning the forested areas are land development and invasive plant species. Recently developed land use plans for NRC Solomons focus on demolition and redevelopment of previously disturbed sites (i.e., abandoned housing areas) in order minimize habitat loss. Nineteen buildings were recently demolished in areas that will be redeveloped for additional recreational use (Ruoff 2007). Future land use changes should continue to restrict development to the existing disturbed footprint and any areas no longer required for mission purposes could be planted or allowed to naturally revert to forested land. As with other areas that developed on previously disturbed sites, efforts must be taken to control invasive species on any areas on which mowing or other maintenance is discontinued.

E. Vegetative Management

(1) Program Description

Vegetative management includes grounds maintenance in improved grounds, landscaped areas, and other non-forested areas at NRC Solomons. Two guidances relevant to vegetative management on federal facilities are EO 13514 (Federal Leadership in Environmental, Energy, and Economic Performance) and EO 13508 (Chesapeake Bay Protection and Restoration). EO 13514 promotes increased energy efficiency, reduced greenhouse emissions, and the protection and conservation of water resources, whereas EO 13508 requires federal agencies to implement land management practices to protect the Chesapeake Bay and its tributary waters. As specific DOD guidance is generated under these new EOs, those BMPs will be added to the INRMP and appropriate projects will be defined.

Vegetative management at NRC Solomons should emphasize the use of low maintenance, native species for landscaping. Vegetative management is closely linked with Pest Management, Fish and Wildlife Management, Urban Forest Management, Wetland (and Watershed) Management, and Invasive Species Management.

(2) Management Goals

The goals of vegetative management and grounds maintenance are to:

- Maintain safe conditions for personnel and visitors to NRC Solomons;
- Provide an attractive, well-maintained working environment for installation personnel through the proper management and enhancement of landscaped areas; and
- Enhance landscaped areas to better contribute to overall biodiversity and ecosystem function.

(3) Beneficial Landscaping

The primary method meeting vegetative management goals is through implementing beneficial landscaping practices that reduce the use of energy, water, and fertilizers as described in the 1994 President's Executive Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds (60 Federal Register 40837). The concept of beneficial landscaping emphasizes:

- Using regionally native plants;
- Using construction practices that minimize adverse effects on the natural habitat;
- Preventing pollution by reducing fertilizers and pesticides, using IPM techniques, recycling green waste, and minimizing runoff;
- Using water-efficient practices; and

- Creating 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.

The term beneficial landscaping describes practices that integrate native vegetation and wildlife habitat into the landscape and minimize the adverse effects that landscaping has on the natural environment. The use of regionally native plant species, which are generally better suited for local site conditions than non-native species, reduces the need for intensive maintenance and the use of fertilizers and pesticides. Native plant species are also less likely to become invasive pests than non-native species and serve as better sources of food and cover for native wildlife.

(4) Landscaping Design and Implementation

Creating a pleasant working environment for base personnel and recreational visitors is an important mission requirements for NRC Solomons, which can be accomplished though appropriate landscape design and implementation. The Naval District Washington Regional Landscape Management Plan (DoN 2003) addressed landscaping issues and concerns at eight installations including NRC Solomons. Specific observations of the Solomons site were:

- Much of the base consists of large expanses of lawn areas that require constant mowing and maintenance.
- Generally site landscape lacks continuity and definition.
- Use of inappropriate landscape species was noted in several areas.
- The front entrances and frontage lacks defined landscape and does not present a solid first impression of the facility to visitors.
- Entrance areas to the marina and other significant areas of the site lack definition.
- Parking areas lack defined landscape islands and shade trees.
- Plantings on site in open areas are generally random and seem, in some cases, to lack purpose.
- Tree planting along streets lacks structure and definition.
- Important building entrances generally lack landscape that would help define their purpose.
- Cottage areas lack landscape and shade trees.
- Mature landscape around the older facilities may require renovation.
- Woodlots are generally unkempt and infested with invasive species.
- Problems with follow up maintenance were evident, including removal of tree stakes and guy wires and removal of dead landscape materials.

To address these issues at NRC Solomons, new landscaping initiatives should be undertaken for different settings and site conditions, where practical, using the landscaping standards and practices and templates presented in the Regional Landscape Management Plan.

(5) Mowed Lawns

The lawns at NRC Solomons are mowed to present a neat and attractive appearance. Grassy areas generally are planted with cool season fescues. Important beneficial landscaping practices that could be implemented at NRC Solomons include reducing the area of mowed lawn by increasing the use of native trees, shrubs, and ground covers; proper use of mulch; maintaining lawn grass at a height of approximately three inches; and restricting mowing during dry periods. Lawns and landscaped areas should also be maintained to minimize invasive species infestation and ensure a neat, well-trimmed appearance. Because of the highly disturbed nature of the installation, areas that are removed from the mowing contract and allowed to naturalize must be monitored and treated for invasive species control.

(6) Urban Shade Trees and Forests

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 ornamental trees in all planning decisions. An urban forest survey was conducted in 2002 as an appendix to the NDW Regional Landscape Management Plan (DoN 2003). The survey effort focused on identifying hazard trees and assessing forest health and condition. The survey found that the urban forest at NRC Solomons is relatively diverse with more than 20 tree and shrub species occurring. Because of the high level of maintenance and mowing, natural tree regeneration is unlikely to occur; tree age ranges from sapling to about 75 years old; and overall, the trees are in good health. Individual trees were identified and mapped as hazardous or in need of routine pruning.

No specific diseases or pests were identified as the causes of tree mortality at NRC Solomons. Poor pruning and maintenance practices however, were cited as the primary issues causing injury and death of the urban forest at NRC Solomons. The lack of follow-up care such as leaving guy wires, stakes, tree guards, and planting tubes was also observed to be a major problem for urban forest health.

Implementing standard grounds maintenance practices that address protection of existing trees and shrubs would improve the appearance, longevity, and overall health of the urban forest trees at NRC Solomons. The International Society of Arboriculture (ISA) offers certification, training, and resources relating to standard practices for tree, shrub, and other woody plant maintenance, pruning, trimming, repairing, and removal of trees and shrubs. Tree pruning should only be performed by trained NRC Solomons personnel or qualified tree care professionals. Appropriate pruning guidelines are in Appendix 7.

Information and resources are available on the ISA website, located at: http://www.isa-arbor.com/.

a. Selection of Plant Materials

The size of plants used depends on budget, site conditions, planting season, available labor, and desired results. Small bareroot seedlings (whips) or cuttings (live stakes) are available in bulk quantities from the MDNR Forest Service. These seedlings are suitable for large-scale reforestation projects. Because they have relatively undeveloped root systems, bare-root seedlings are likely to dry out on poor, compacted, urban soils and are better suited for less disturbed sites. Container-grown stock is more expensive, but is less susceptible to drying and is better able to compete with surrounding vegetation. Sizes of containers vary from 6-inch tube-grown seedlings (tublings) to large pots or balled and burlapped (B&B) saplings. Two to three-gallon container-grown stock is widely available from private nurseries, survives transplanting better than bare-root, and is appropriate for use on a wide range of sites. Areas up to several acres in size can be planted economically with this size planting stock. Large balled and burlapped stock also has good survival rates after transplanting in poor or compacted urban soils, but is more costly per plant and is more labor intensive to transport and install than smaller stock. Balled and burlapped stock is most suitable for planting around buildings, along streets, and in high-visibility areas that are required to look good quickly. Planting a mixture of sizes of woody plants is an option that creates more diversity and a more naturalistic appearance.

The MDNR Forest Service tree nursery is available online at: http://www.dnr.state.md.us/forests/nursery/.

A list of plant species native to the NRC Solomons region and suitable for landscaping purposes is in Appendix 7. Plant characteristics and site requirements for each species are included in the list. The plant species listed are common commercial plants that may be purchased from the MDNR Forest Service tree nursery or local nurseries that specialize in native plants. Not all species offered by these nurseries are native, so care must be taken when placing orders.

b. Soil Amendments

Soil amendments such as lime, fertilizer, and organic matter are often used to improve nutrient availability, reduce soil acidity, and alter the physical characteristics of the soil. The addition of soil amendments is a considerable expense, however, and should not be routinely recommended for all planting sites. Selecting planting stock appropriate to a site's condition, when possible, is a more cost-effective alternative. One or more plant species can usually be found that can tolerate soil texture and nutrient availability of most soils. Soil amendments should not be added directly to planting holes for trees and shrubs. These amendments cause problems with soil moisture and root growth. If fertilizers are applied, it is important to use a slow-release product with low solubility so nutrients are not easily leached away.

c. Planting

The planning process should allow for planting during a suitable season. The type of planting stock used, in part, determines the appropriate time for planting. Bare-root seedlings should be planted in the spring before the emergence of new leaves as discussed in Section 3.7. Larger woody material is best planted in the late fall after leaves have dropped. At this time transpiration is minimal and root growth increases. Since roots are often damaged in the transplanting process, planting during the fall allows additional time for root development before the summer months when transpiration peaks. Groundcovers can be planted at any time, as long as there is adequate rainfall or available supplemental watering. Proper tree planting is another vital element of a healthy urban forest. Using correct planting methods can increase a tree's ability to become established quickly and improve its health and longevity. Planting technique differs somewhat with the type of material being planted, though the goal of each is to provide an environment that encourages root growth. Guidelines that apply to most types of planting stock are that the planting hole should be three to five times greater in diameter than the root ball of the material to be planted and only as deep as the root ball. It is important not to bury the roots too deep or they will not be able to get enough oxygen. Appropriate planting guidelines are in Appendix 7. To ensure the greatest chance of survival, urban tree and shrub planting should be performed by trained natural resources personnel or qualified tree care professionals.

d. Post-planting Care

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

Preventing damage from mowers and string trimmers is a significant problem for landscape managers. Wounds in a tree's bark (Figure 4-1) make it more susceptible to disease and pest infestations and reduce its chance of survival. Several alternatives exist for reducing tree damage. Mulch can be an effective method of protecting trees from mower damage, when used properly. Mulch protects trees by reducing weed growth around the plant's base, which reduces the need to mow near the plant. Mulch should be applied to a weed-free area around the root mat in a layer about 3 to 4 inches thick. Mulch

Figure 4-1. String Trimmer Damage to an Urban Tree

should not be applied too close to the tree trunk or too deeply as this creates an environment that promotes fungal growth and decay.

Placing trunk guards around the base of trees is another method of protecting them from mower damage. Flexible plastic trunk guards can be purchased from forest supply companies or homemade trunk guards can be made from hardware cloth. The plastic guards are more practical because they expand as the tree grows. Care must be taken to remove guards as trees grow as they can cause girdling and suckering when left in place too long (Figure 4-2).

Figure 4-2. Tree Guard and Stake Damage

Prohibiting the attachment of signs, fences, or other materials to trees will also help prevent avoidable damage to urban trees (Figures 4-3 and 4-4).

Figure 4-3. Improper Signage

Figure 4-4. Proper Signage

Periodic maintenance is an important part of keeping the urban forest in good health. Of critical importance is the removal of hazardous trees or branches, which if left unattended could cause damage to persons or property. Other high priority maintenance practices include the pruning or treatment of large-diameter dead or damaged limbs or limbs infected with disease or pests. As with planting, pruning should only be performed by qualified tree care professionals, as poor pruning may lead to structural damage and excessive wounding (Figure 4-5).

Figure 4-5. Poor Pruning Practices

F. Migratory Bird 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. 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 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.

A list of bird species not covered by the MBTA and summary of the Migratory Bird rule is available at: http://migratorybirds.fws.gov.

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 support functions, such as: administrative offices; military exchanges; commissaries; water treatment facilities; storage facilities; schools; housing; motor pools; laundries; Department of Morale, Welfare, and Recreation (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 to enter into a memorandum of understanding on migratory birds with the USFWS.

(2) Management Goals

The goals of migratory bird management at NRC Solomons are to support the conservation of migratory birds through habitat conservation and enhancement and to avoid the incidental

take of migratory birds through military readiness actions in accordance with the MBTA to the greatest extent practicable.

(3) Management Practices

The natural resources program has enhanced migratory bird nesting habitat by installing nesting boxes for Eastern Bluebirds and Wood Ducks and nesting platforms for Ospreys. Additional monitoring and maintenance of existing structures and the installation of additional nesting boxes would improve the program's effectiveness and value to migratory bird populations.

G. Invasive Species Management

(1) Program Description

Invasive species are any species that are not native to a given ecosystem, and whose introduction causes or is likely to cause economic or environmental harm and/or harm to human health (EO 13112 on Invasive Species, February 1999). 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 non-native, invasive species (Pimental et al. 2005).

EO 13112, Invasive Species was issued 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.

The Noxious Weed Act of 1974 provides 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. Of the seven listed noxious weeds in Maryland (Rice 2007), none have been found at NRC Solomons.

The control of invasive species is a primary natural resources management issue on military installations because of the potential impacts invasive species have on military training and readiness and the degradation they can cause to the natural environment. An invasive species control plan was developed for NAS Patuxent River, including NRC Solomons (DoN 2008).

The invasive species control plan recommends treatments that will enable the natural resources manager to control or eliminate the most problematic nuisance and invasive species at the installation. Approximately 15 of the species have been recommended for control (Figure 4-6).

(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 (FICMNEW), The Nature Conservancy, and the Maryland Natural Heritage Program may provide guidance on invasive species management issues and projects.

(3) Inventory

Over 30 exotic and invasive plant species (Appendix 2) were located on NRC Solomons during a 2007 field survey. Many of these species were planted as ornamental plantings, which have subsequently spread throughout the natural portions of the installation. Continued monitoring for new populations of invasive and noxious weed species would allow for early control of new infestations as well as assessment of control efforts.

(4) Invasive Plant Control

In accordance with EO 13112, NAS Patuxent River will control populations of invasive plants at NRC Solomons in a cost-effective and environmentally sound manner, although funding for such programs has historically been limited. 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 include: avoidance, manual removal, mechanical controls, biological controls, chemical controls, and controlled burning, all of which are discussed below.

a. Avoidance

Avoidance measures include prohibiting the use of invasive plants for landscaping or other purposes, implementing BMPs to minimize land disturbances that promote invasion, and revegetating disturbed areas with native species. Avoidance is the preferred measure of invasive species control at NRC Solomons. A list of appropriate native plant species and their landscape uses is in Appendix 7. A native plant list should be incorporated into grounds maintenance contracts to help ensure non-native species are avoided in newly planted areas.

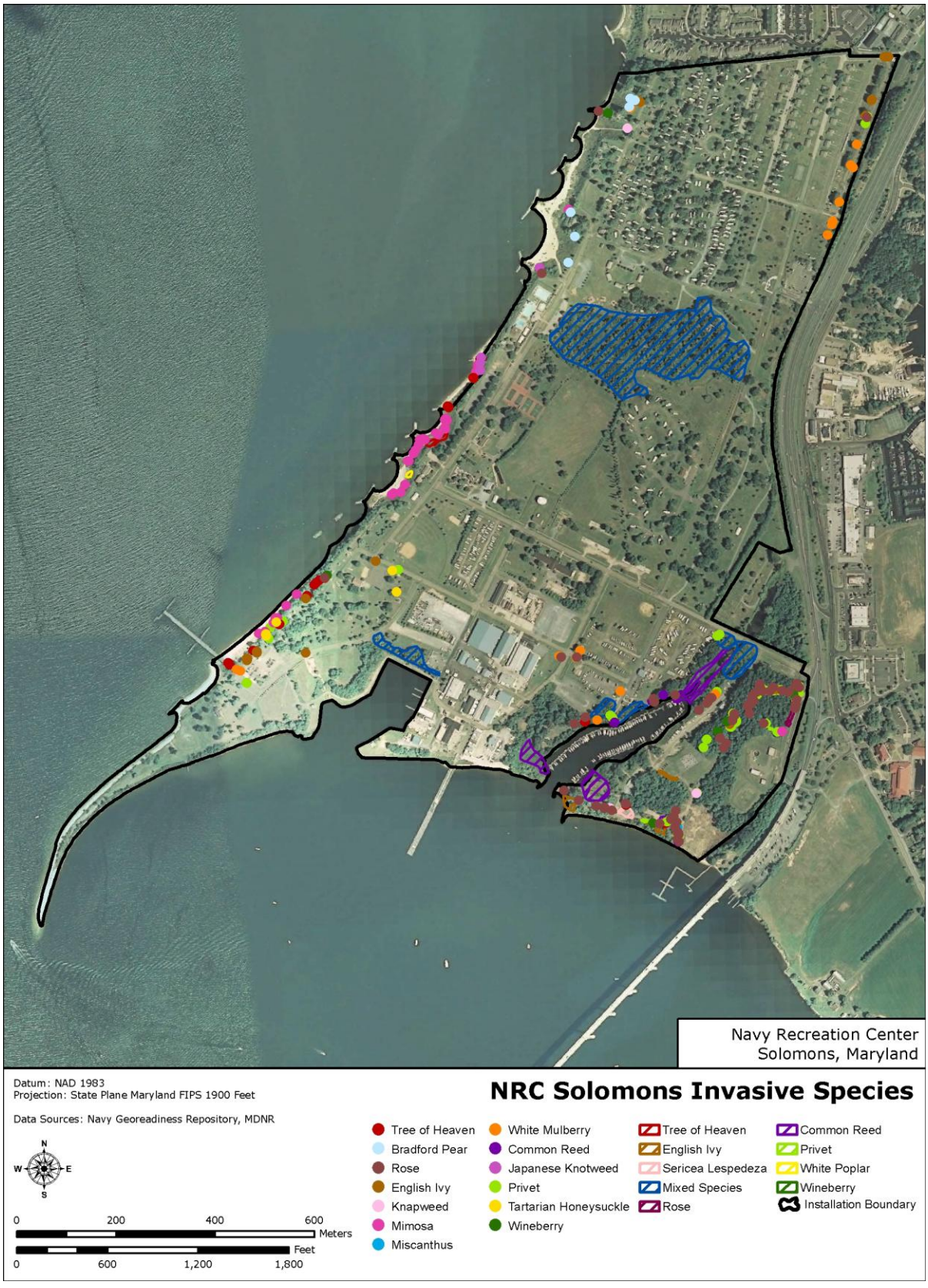


Figure 4-6 Invasive Species at NRC Solomons

b. Mechanical Controls

Mechanical controls include mowing, cutting, pulling, and prescribed burning to manage and eradicate invasive species. Small infestations may often be controlled by hand pulling, grubbing with a hoe, or by using a shrub-pulling device. However, such methods may cause soil disturbance, which can encourage reinvasion and intrusion by other pests. These methods are also generally not effective in eradicating large infestations unless combined with chemical controls. Controlled burning has not been attempted at NRC Solomons and is unlikely to present a viable option in the future due to the nature of the military mission, the urban setting, and the developed nature of the installation. Using a combination of mowing or cutting and a selective application of herbicide on targeted invasive plant species is often the most effective approach.

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 non-native species, which raises additional concerns. Biological control measures may be used at NRC Solomons 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. This method of invasive species control has not been attempted at NRC Solomons and is unlikely to present a viable option in the future.

d. Chemical Controls

Herbicide use is the most commonly used method of controlling invasive species. Because of environmental risks, herbicide treatments that rely on selective application methods, which minimize the release of the herbicide into the environment, are generally preferred over broadcast methods. These methods help avoid or minimize impacts to desirable, non-target species and are more consistent with the Navy's policy on IPM and reduction in pesticide use. Direct foliar sprays, basal bark applications, and cut surface (also called cut stump) treatments are the selective application methods that are generally recommended for control of invasive species at NRC Solomons. The USFWS has herbicide spraying capability and can support invasive species control efforts at NRC Solomons.

All herbicide use will be conducted in accordance with the NAS Patuxent River 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 at NRC Solomons and helps ensure compliance with federal and state regulations regarding water quality and watershed protection. The program is applicable to the entire installation and has significant interaction with Wetlands Management, Fish and Wildlife Management, Urban Forest Management, Vegetative Management, as well as other environmental compliance program elements.

The Maryland Natural Resources Conservation Service (NRCS), Calvert County Soil Conservation District, USACE, and EPA provide guidance on watershed protection issues and projects. Primary requirements driving this program include the CWA, DoD/Chesapeake Bay Program MOAs and initiatives, EO 12088 (Federal Compliance with Pollution Control Standards), and EO 13508 (Chesapeake Bay Protection and Restoration).

(2) Management Goals

Land management goals at NRC Solomons are to protect and enhance water quality on the installation, in the Patuxent River Basin, and the Chesapeake Bay Watershed using an ecosystem management approach to land management.

(3) Land Use Planning

Land management practices that limit sprawl through the re-development of previously disturbed sites are encouraged wherever practicable. Principles of sustainable development including minimizing impacts to natural areas, increasing density in previously developed areas, and utilizing energy-efficient design are promoted in the installation's Area Development Plan. Currently, 19 buildings have recently been demolished; two near Quarters A and 17 bungalows. Redevelopment of additional recreational facilities will be focused in these areas.

(4) Watershed Protection

NRC Solomons lies within the Lower Patuxent Watershed, which is a major contributor to the Chesapeake Bay Watershed. The Chesapeake Bay Watershed is recognized as one of the most important and productive estuaries in the world and is protected by federal, state, and local regulations. The Navy is a signatory to a number of agreements designed to restore the Chesapeake Bay. Included are the 1994 *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay*, the 1998 *Federal Agencies' Chesapeake Ecosystem*

Unified Plan (FACEUP), and the 2000 *Chesapeake 2000 Agreement* (C2K). These agreements identify goals and commitments aimed at the preservation and restoration of the Chesapeake Bay. Major goals of the Chesapeake Bay agreements are to reduce nutrients and toxins entering the Bay, protect stream corridors, enhance and protect wetlands, protect priority watersheds, identify and control invasive species on priority sites, and expand conservation landscaping on federal facilities. As specific DoD guidance is generated under EO 13508, those BMPs will be added to the INRMP and appropriate projects will be defined.

(5) Riparian Forest Buffer Restoration

A primary initiative of the Chesapeake Bay Program is the restoration of riparian forest buffers on at least 70 percent of all streams and shorelines in the Chesapeake Bay Watershed. In support of this goal, the Calvert County Soil Conservation District supported the Navy in planting approximately 700 trees along the bulkheaded shoreline at Pier 1 and various other locations at the installation between 1997 and 1999. A site assessment was also conducted in 1999 to identify other potential sites for riparian forest buffer restoration (DoN 2000). One additional site was identified. The site is a 650-foot stretch of shoreline east of Second Cove that currently serves as a waste disposal site for yard debris and other materials. Environmental remediation is currently planned for this site. When complete, riparian buffer establishment, including planting native trees and shrubs on the upland portion of the site and beach grasses on the adjacent sandbar, and continuing invasive species control is recommended.

The DoD Bay Coordinator coordinates riparian forest buffer initiative activities on DoD lands in the Chesapeake Bay Watershed: http://www.hqda.army.mil/acsimweb/env/cbi/index.html.

(6) Shoreline Stabilization

Historically, NRC Solomons has suffered from shoreline erosion and loss of property along much of the shoreline. Various protection measures such as bulkheading and armoring have been implemented in the past. In 1999, a shoreline stabilization project along the northern portion of the facility was completed to prevent shoreline erosion and protect the cottages and facilities. The project included recontouring a portion of the shoreline to create a 3:1 slope, constructing a series of stone breakwaters, fortifying the area behind the breakwaters with sand, and planting beach grasses to stabilize the newly developed beach. Future management of the stabilized area must include keeping portions of the site with steep slopes free of woody vegetation, which if blow-down occurs, can cause soil loss and destabilization. Foot paths and vehicular traffic must also be managed to prevent further soil erosion.

Beaches are important habitat for Diamondback Terrapins, which are known to nest on the beaches behind similar stone breakwaters elsewhere on the Patuxent River and, therefore,

may do so on the NCR Solomons beaches. Future shoreline erosion control projects will incorporate features suitable for enhancing wildlife habitat, as practicable, such as living shorelines and beaches. The installation will also consult with Diamondback Terrapin species experts when designing shoreline features.

Repairs to the Point Patients Marina, which were completed in 2005, stabilized shoreline at the marina while improving access and recreational opportunities. The project involved the repair of the 2,200-foot long by six feet wide recreational pier, replacement of 100 feet of wooden bulkhead with vinyl sheet piles, and the addition of a stone revetment 325 feet long by 20 feet wide. Ongoing management issues at the marina include invasive species and nuisance wildlife control. Periodic removal of woody species from the stone revetment is another management requirement.

I. Agricultural Outleasing

Not Applicable to NRC Solomons.

J. GIS Management

Geographic data and information are an integral part of natural resources and environmental protection and planning at NAS Patuxent River and NRC Solomons. 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 (SDSFIE). The GeoReadiness Repository provides a corporate resource for sharing existing data at the Regional level and was not designed to replace current NAS Patuxent River GIS management. All NRC Solomons GIS information is collected and maintained in coordination with the Natural Resources Office at NAS Patuxent River.

K. Outdoor Recreation

(1) Program Description

It is Navy policy to provide environmental awareness and recreational opportunities appropriate to the mission and the resources of the installation. Outdoor recreation is defined by OPNAVINST 5090.1 (series) as recreational programs, activities, or opportunities dependent on the natural environment. Developed or constructed facilities such as golf courses, tennis courts, riding stables, and lodging facilities are generally not included in this definition of outdoor recreation. Approximately 85 percent (252 acres) of the installation

serves as a DoD recreational facility. Fishing, bird watching, and nature observation are the primary natural resources-based recreational opportunities supported by NRC Solomons. Because of the developed nature of the installation, hunting is not permitted. Recreational facilities are only available to active duty, retired, reserve military personnel, active DoD civilians, and sponsored guests. NRC Solomons is not accessible to the general public.

Most of the recreational facilities at NRC Solomons are administered by MWR. Coordination and cooperation between MWR and natural resources staff, however, are necessary for protection and management of natural resources. Natural resources staff provide assistance on such issues as the prevention of non-point source pollution, nuisance wildlife control, tree care, and other aspects of urban forest management.

(2) Management Goals

The goal of outdoor recreation management at NRC Solomons is to enhance quality of life for the DoD community by providing recreational opportunities that are sustainable, consistent with the military mission and established carrying capacities, and in balance with the natural resources upon which they are based.

(3) Fishing

Saltwater fishing and crabbing are popular consumptive natural resources-based activities at NRC Solomons. MWR issues an average of 5,000 day passes and 700 seasonal passes each year (Rose 2007). Fishing activities require either an NAS Patuxent River or NRC Solomons fishing permit for persons over 12 years of age and a Maryland, Virginia, or Potomac River Fisheries Commission Recreational Fishing License for persons over 16 years of age. NRC Solomons does not manage offshore boat-fishing and does not require a base permit. Recreational crabbing only requires a base permit. Specific license and permit requirements are outlined in the NAS Patuxent River fishing instruction (NASPAXRIVINST 11015.7.M) (Appendix 5).

The NRC Solomons fishing program is administered in compliance with all state regulations regarding minimum fish size, time of year restrictions, creel limits, and special considerations for all regulated species. Popular sport fish such as rockfish, Bluefish, Spot, flounder, and Blue Crab are most frequently caught. Shellfishing is not authorized at NRC Solomons.

The installation provides fishing opportunities via the Point Patience Marina and Sunset Pier. All fishing piers and docks are handicapped accessible and are fully compliant with Americans with Disabilities Act requirements. Wheelchair accessibility is also provided for MWR rental boats by a portable wheelchair lift. MWR sells frozen bait such as chicken necks, crab aprons, peeler shrimp, spot, squid, and clam spouts; and live bait including

bloodworms and night crawlers. Bloodworms and night crawlers are the only live bait allowed for use at NRC Solomons.

(4) Environmental Awareness

Environmental awareness is another primary focus of NRC Solomons. A 1-mile interpretive nature trail provides installation visitors the opportunity to learn about natural and cultural resources while walking, jogging, or bike riding (Figure 4-7). The trail passes through forested upland and wetland habitats with boardwalks and a viewing platform. A gazebo was built in the center of the nature trail complex in 2005. A series of informative signs posted along the trail relate information on the natural and cultural history of the installation (Figure 4-8). The majority of the trail, however, is comprised of a tangle of invasive, non-native species, which does not provide for a pleasant outdoor learning experience. Long-term invasive species control is the major natural resources management issue along the nature trail.

Figure 4-7. Interpretive Trail Sign

L. BASH

Not Applicable to NRC Solomons.

M. Wildland Fire Management

Wildfires are not a significant problem at NRC Solomons; however, fire management remains a concern. The local fire department is responsible for all structural and wildfire control at the installation. 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 forested areas, ERP sites, and developed areas. The primary goals of wildfire management at NRC Solomons are to minimize the potential for wildfire and reduce its impacts to the greatest extent practicable.

N. Conservation Law Enforcement

NAS Patuxent River Police Department personnel stationed at NRC Solomons have arrest authority for conservation law enforcement. Law enforcement is solely the responsibility of the Navy; however, Navy law enforcement personnel cooperate with state and federal game wardens to enforce state and federal wildlife laws.

Figure 4-8. Outdoor Recreational Opportunities at NRC Solomons

O. Training of Natural Resources Personnel

A list of core competencies has been developed by the CNRMA Training Program Coordinator to ensure natural resources personnel are adequately trained in resources management. Not all levels of training are required for all natural resources personnel. Therefore three phases of core competencies have been identified. Phase I training indicates training requirements and opportunities appropriate for new media managers; phase II training is appropriate for existing media managers; and phase III training is required for compliance Environmental Protection Specialists.

A list of required and recommended courses and training opportunities follows. A course identification number (CIN) is given for Navy environmental courses. Other information given includes locations or potential course providers.

PHASE I - New Media Managers

A. Civil Engineering Corps Officer's School Courses
   1. Basic Environmental Law, CIN: A 4A-0058
   2. Environmental Protection, CIN: A-4A-0036
   3. Introduction to Cultural Resource Management Laws, CIN: A-4A-0070
   4. Natural Resources Compliance, CIN: A-4A-0087
   5. Ecological Risk Assessment, CIN: A-4A-0081
   6. Advanced Environmental Management, CIN: A-4A-0063
   7. Pesticide Applicator Training (Core) B-322 1070

B. Navy Occupational Safety and Health Courses
   1. Spill Management Team Training, CIN: A-493-0088/5637

C. Other Government Offerings
   1. Joint Permit Application (USACE)
   2. Range Master Certification (annual)
   3. CNO/NAVFAC Natural Resources Managers Meeting

D. Public Offerings
   National Military Fish Wildlife Association (NMFWA)
   1. NMFWA Conference (March, annual)
   2. Invasive Species Control
   3. Fish and Wildlife Law Enforcement (annual)

E. Other Public Offerings
   1. Wetlands Regulations (Wetland Training Institute, VIMS)
   2. 404 Permitting (USACE)
   3. NEPA
   4. Bird Aircraft Strike Hazard (BASH) Annual Conference (annual)
   5. GIS (Louisiana State University School of Forestry, continual)
   6. DoD Pesticide Applicator Certification (2 weeks in Jacksonville)
   7. NAVFAC sponsored courses

PHASE II – Existing Media Manager

A. Civil Engineering Corps Officer's School Courses
   1. Ecological Risk Assessment, CIN: A-4A-0081
   2. Natural Resources Compliance, CIN:A-4A-0087 (every 3 years)
   3. Health & Environmental Risk Communication, CIN: A-4A-0072
   4. Historic Preservation Law and Section 106 Compliance, CIN: A-4A-0073
   5. Pesticide re-Certification B 322 1074 (every two years)

B. Public Offerings/Courses
   1. Wetlands Regulations (Wetland Training Institute)
   2. Wetlands Delineation & Practicum (Wetland Training Institute)
   3. 404 Permitting (USACE)
   5. Joint Permit Application (USACE)
   6. BASH Conference
   7. CZMA/Chesapeake Bay Act/Coastal Consistency Determinations
   8. GIS (Louisiana State University School of Forestry, continual)
   8. Invasive Species (NMFWA) continual
   9. NMFWA Conference (March, annual)
   10. CNO/NAVFAC NR Managers Meeting (December, annual)
   11. Fish & Wildlife Law Enforcement Refresher (NMFWA continual)
   12. Coastal Ecology/Shoreline Stabilization (VIMS, continual)
   13. Forestry Wetlands Permitting
   14. Wetlands Construction/Mitigation
   15. Society of American Foresters Conference (continual)
   16. Southeast Deer Workshop (continual)
   17. VDGIF Workshops – various-wildlife, game management, habitat management
   18. Gap Analysis (USGS)
   19. NAVFAC sponsored courses
   20. CNO/NAVFAC Natural Resources Managers Meeting (December, annual)

PHASE III – Environmental Specialist
   1. In House Media Manager Training Checklist
   2. General Wetlands/Permit Awareness

P. Coastal/Marine Management

The CZMA provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Section 307 of the act stipulates that where a federal action results in reasonably foreseeable effects on any coastal use or resource (land, water use, or natural resource), the action must be consistent to the maximum extent practicable with the enforceable policies of the affected state's federally approved coastal zone management plan.

Information on Maryland's Coastal Program can be found at: http://www.dnr.state.md.us/bay/czm/.

Maryland has developed and implemented a federally approved Resources Management Program (established in 1978) that describes current coastal legislation and enforceable policies. The key components of this program depend on federal laws, such as Section 404 of the CWA, and state laws and authorities including the Chesapeake Bay Critical Area Program (established in 1984), the Tidal Wetlands Act of 1970, the Non-Tidal Wetlands Protection Act of 1989, and the state's authority under Section 401 of the CWA of 1977.

The extensive shoreline restoration project at NRC Solomons is the primary project at NRC Solomons that impacts coastal resources. This and other activities at NRC Solomons with potential to impact tidal or non-tidal wetlands or other coastal resources are fully coordinated with the Commission.

Q. Floodplains Management

The USACE regulates construction and discharges of dredged or fill materials within 100-year floodplains. Few NWPs 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.

R. Cultural Resources Management

Under Section 110 of the NHPA, federal agencies are required to identify all cultural resources within their landholdings that are eligible for inclusion in the National Register of Historic Places (NRHP). Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties and allow the Advisory Council on Historic Preservation and the State Historic Preservation Officer (SHPO) an opportunity to comment on proposed actions. Implementing regulations for Section 106 of the NHPA are contained in 36 CFR Part 800.

One historic district, which encompasses the NAS Patuxent River Admiral's Quarters (Quarters A Solomons) and its surrounding ground, have been designated by the SHPO as NRHP eligible (Figure 4-9). In addition, six archaeological sites have been identified at NRC Solomons. Four of the sites have been determined to be eligible to the NRHP and two of the sites have been determined to be ineligible. Any proposed activity with potential to impact the historic district or eligible archaeological sites will be coordinated through the SHPO. An updated Integrated Cultural Resources Management Plan is being developed for NAS Patuxent River, which incorporates site descriptions and cultural resources management for NRC Solomons (Smith 2009).

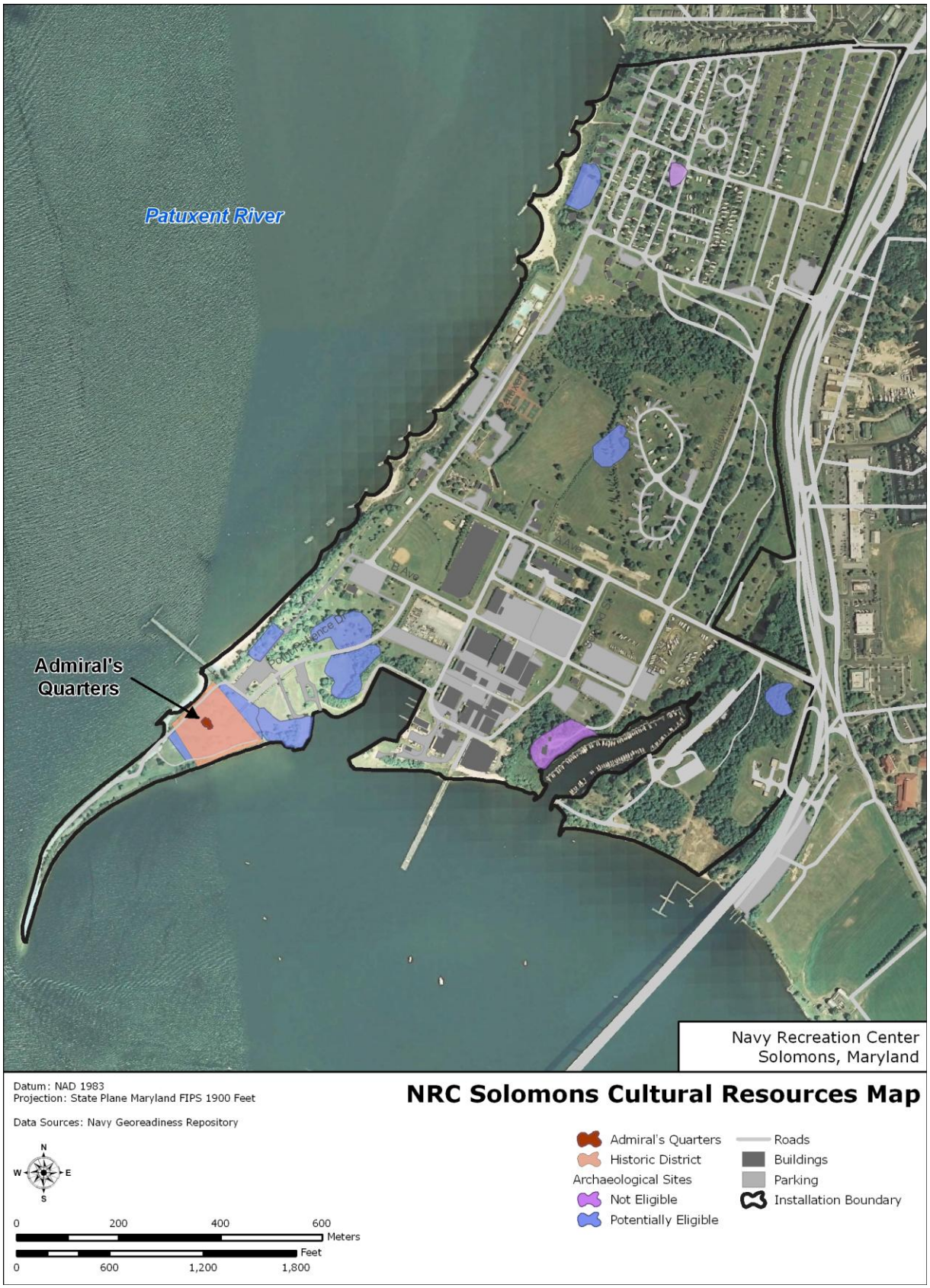


Figure 4-9. Cultural Resources

5. IMPLEMENTATION

A. Preparing Prescriptions

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

The INRMP is considered to be implemented if the installation:

- Actively requests, receives, and uses funds for all Level 4 projects and activities (see Section 5.D);
- 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 or stimulate an activity 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, non-governmental 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. In accordance with the Sikes Act, 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. Using cooperative agreements to accomplish projects is an efficient means to implement INRMPs and can be administered through the NAVFAC Washington office.

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 meet recurring natural and cultural resources conservation management or current legal compliance needs, including Executive Orders. Specifically, Environmental Readiness Level 4:

- Supports all actions specifically required by law, regulation or Executive Order (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 exhibits. 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 regulations; Level 4 requirements meet future requirements; and Level 5 requirements are leadership initiatives.

All conservation, compliance, and stewardship projects must be entered into the Environmental Projects Request (EPR)-web system and receive approval up the chain of

command. CNO N45 is the final authority for designating the appropriate Environmental Readiness Level. Proposed projects necessary to implement this INRMP, an implementation schedule, funding level, and proposed funding source are described 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.).

6. REFERENCES

Byrne, L. 2000. Personal communication between L. Byrne, MDNR, Wildlife and Heritage Division and R. Reinecke, Geo-Marine, Inc. on 6/14/2000.

Byrne, L. 2007. Personal communication between L. Byrne, MDNR, Wildlife and Heritage Division and J. Smith, NAS Patuxent River Natural Resources Specialist on 4/06/2007.

Calvert County. 2007. Welcome to Calvert County, History. http://www.co.cal .md.us/visitors/profile/history/.

Calvert Marine Museum. 2007. History of the Solomons Area. http://www .calvertmarinemuseum.com/history.htm.

Carlen, J. and C. Bason. 2004. Navy's GIS Solution for Decision Support and Service-wide Data-Sharing. Proceedings from ESRI User's Conference, http://gis2.esri.com /library/userconf/proc04/docs/pap1889.pdf.

Center for Watershed Protection. 2004. Lower Patuxent River in Calvert County, Maryland: Watershed Restoration Action Strategy. http://dnrweb.dnr.state.md.us/download/bays /lowpat_strategy.pdf.

Chesapeake Bay Program (CBP). 2007a. Bay Grasses. http://www.chesapeakebay.net /baygras.htm.

Chief of Naval Operations (CNO). 2003. Navy Environmental Requirements Guidebook, 2002 Update. http://155.252.252.6/wrs/guidebook/WRSGB_TOC.HTM.

Commander Navy Installations Command (CNIC). 2007a. Overview. http://www.cnic .navy.mil/HQ/AboutCNIC/GeneralInformation/History/index.htm.

Commander Navy Installations Command (CNIC). 2007b. NAS Pax River, Recreation. https://www.cnic.navy.mil/Patuxent/FamilyReadiness/Solomons/index.htm.

Chief of Naval Operations (CNO). 2003. Navy Environmental Requirements Guidebook, 2002 Update. http://155.252.252.6/wrs/guidebook/WRSGB_TOC.HTM.

Cowardin, L., V. Carter, F. Golet, E. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Prepared for U.S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington, D.C.

Curtin, S.E., D.C. Andreasen, and J.C. Wheeler. 2003. Potentiometric Surface of the Magothy Aquifer in Southern Maryland.. U.S. Geological Survey Open File Report 2005-1006. http://pubs.usgs.gov/of/2005/1006/.

CustomWeather. 2007. Almanac: Historical Climate Data for Solomons, Maryland. http://www.customweather.com.

Danesi. T. 2007. Encroachment Management Program for Natural Resources Workshop Feb. 2007. Program Manager, Encroachment Management Naval Facilities Engineering Command.

Davis, C. 2007. Rare Species Survey Solomon's Recreation Area, Calvert County, Maryland.

Department of Regional Development and Environment Executive Secretariat for Economic and Social Affairs Organization of American States. 1991. Primer on Natural Hazard Management in Integrated Regional Development Planning. Washington, D.C. http://www.oas.org/dsd/publications/Unit/oea66e/ch08.htm.

Department of the Navy (DoN). 2000. Chesapeake Bay Riparian Forest Buffer Site Assessments. Prepared for Atlantic Division Naval Facilities Engineering Command. Prepared by Geo-Marine, Inc., Newport News, Virginia.

Department of the Navy (DoN). 2001. Integrated Natural Resources Management Plan, Naval District Washington Installations. Prepared for Chesapeake Division, Naval Facilities Engineering Command. Prepared by Geo-Marine, Inc. Newport News, Virginia.

Department of the Navy (DoN). 2002. NAS Patuxent River Integrated Natural Resources Management Plan, Maryland.

Department of the Navy (DoN). 2003. Naval District Washington Regional Landscape Management Plan. Prepared for Chesapeake Division, Naval Facilities Engineering Command. Prepared by Geo-Marine, Inc. Newport News, Virginia and Land Planning & Design Associates, Inc., Charlottesville, Virginia.

Department of the Navy (DoN). 2006. Integrated Natural Resources Management Plan Guidance: How to Prepare, Implement, and Revise Integrated Natural Resources Management Plans (INRMPs). Washington Division, Naval Facilities Engineering Command, Washington D.C.

Department of the Navy (DoN). 2007. Storm Water Pollution Prevention Plan Solomons Annex, Naval Air Station Solomons, Maryland. Prepared for Naval Air Station Patuxent River, Maryland. Prepared by Enviro-Logical Solutions, Inc., Tampa, Florida.

Department of the Navy (DoN). 2009. Patuxent River Invasive Species Survey and Management Plan. Prepared for Naval Facilities Engineering Command Washington. Prepared by Geo-Marine, Inc., Hampton, Virginia.

Drummond, D.D. 2007. Water-Supply Potential of the Coastal Plain Aquifers in Calvert, Charles, and St. Mary's Counties, Maryland, With Emphasis On The Upper Patapsco And Lower Patapsco Aquifers. United States Department of the Interior, Geological Survey, Publication Number DNR-12-882007-236.

Environmental Laboratory. 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg.

Environmental Protection Agency (EPA). CWA Section 404-Permits to Discharge Dredged or Fill Material. http://www.epa.gov/owow/wetlands/regs/sec404.html.

Geo-Marine, Inc. 2007. Incidental Observations of Bird and Plant Species at NRC Solomons. Unpublished report. Prepared for Naval Facilities Engineering Command Washington. Prepared by Geo-Marine, Inc., Hampton, Virginia.

Klohe, C.A., and R.T. Kay. 2007. Hydrogeology of the Piney Point-Nanjemoy, Aquia, and Upper Patapsco Aquifers, Naval Air Station Patuxent River and Webster Outlying Field, St. Mary's County, Maryland, 2000–06: U.S. Geological Survey Scientific Investigations Report 2006–5266.

Maryland Department of Natural Resources (MDNR). 2002. Maryland's Coastal Program. http://www.dnr.state.md.us/bay/czm/coastal_zone.html.

Maryland Department of Natural Resources (MDNR). 2003. Lower Patuxent River Watershed Characterization. http://dnr.maryland.gov/watersheds/surf/proj/wras.html.

Maryland Department of Natural Resources (MDNR). 2005a. Chesapeake Bay & Tributaries Fishing Report. http://www.dnr.state.md.us/fisheries/fishingreport/fishingrptArchive /frarchives2005/1221chesapeake.asp.

Maryland Department of Natural Resources (MDNR). 2005b. Maryland Wildlife Diversity Conservation Plan. Wildlife and Heritage Service, Natural Heritage Program, Annapolis, Maryland. http://www.dnr.state.md.us/wildlife/wldivplan.asp.

Maryland Department of Natural Resources (MDNR). 2006. Patuxent River SAV Restoration. http://dnr.maryland.gov/bay/sav/restoration/pax_sum06.pdf.

Maryland Department of Natural Resources (MDNR). 2007a. Certified Clean Marinas. http://www.dnr.state.md.us/boating/cleanmarina/cleanmarinas.html.

Maryland Department of Natural Resources (MDNR). 2007b. Current and Historical Rare, Threatened, and Endangered Species of Calvert County, Maryland. http://www.dnr.state.md.us/wildlife/rte/rte07calvert.pdf.

Maryland Department of Natural Resources (MDNR). 2007c. Maryland Tributary Strategy Patuxent River Basin Summary Report for 1985 – 2005 Data. Maryland Department of Natural Resources Tidewater Ecosystem Assessment, Annapolis.

Maryland Department of Natural Resources (MDNR). 2007d. Rare, Threatened, and Endangered Animals of Maryland. Wildlife and Heritage Service, Natural Heritage Program, Annapolis, Maryland. http://dnrweb.dnr.state.md.us/download/ rteanimals.pdf .

Maryland Department of Natural Resources (MDNR). 2007e. Rare, Threatened, and Endangered Plants of Maryland. Wildlife and Heritage Service, Natural Heritage Program, Annapolis, Maryland. http://dnrweb.dnr.state.md.us/download/rteplants.pdf.

Maryland Department of Natural Resources (MDNR). 2007f. SAV Restoration. http://www .dnr.state.md.us/bay/sav/restoration/pax_map.asp.

Maryland Department of the Environment (MDE). 2003. Maryland State Wetland Conservation Plan. Baltimore, Maryland. http://www.mde.state.md.us/assets /document/wetlandswaterways/monitor.pdf.

Maryland Department of the Environment (MDE). 2004. A Guide to Maryland's Coastal Zone Program Federal Consistency Process. http://www.dnr.state.md.us/bay/czm/fed _consistency_guide.pdf.

Maryland Department of the Environment (MDE). 2007. Maryland Brownfields and Voluntary Cleanup Program Project Sites: ERRP Factsheet, Naval Recreation Center Solomons (MD-058), Solomons, Maryland. http://www.mde.state.md.us/assets /document/brownfields/Naval_Rec_Solomons.pdf.

Maryland Department of the Environment (MDE). 2008. Mitigation. http://www.mde.state.md.us/Programs/WaterPrograms/Wetlands_Waterways/ regulations/mitigation.asp.

Maryland Sea Grant College. 2004. Maryland Marine Notes. Volume 12, Number 5, July-August 1994. http://www.mdsg.umd.edu/MarineNotes/Jul-Aug94/side1/index.php.

Moore K.A., D.J. Wilcox, B. Anderson, T.A. Parham, and M.D. Naylor. 2004. Historical Analysis of Submerged Aquatic Vegetation (SAV) in the Potomac River and Analysis of Bay-wide SAV Data to Establish a New Acreage Goal. Unpublished report prepared for the Chesapeake Bay Program (CB983627-01).

National Oceanic and Atmospheric Administration (NOAA). 1998. Essential Fish Habitat Description: Windowpane Flounder (*Scophthalmus aquosus*). http://www.nero.noaa. gov/hcd/windowpane.pdf.

National Oceanic and Atmospheric Administration (NOAA). 2007a. Essential Fish Habitat Description: Bluefish (*Pomatomus saltatrix*). http://www.nero.noaa.gov/hcd /bluefish.htm.

National Oceanic and Atmospheric Administration (NOAA). 2007b. Essential Fish Habitat Description: Coastal Migratory Pelagics. http://www.nero.noaa.gov/hcd /mackcobia.htm.

National Oceanic and Atmospheric Administration (NOAA). 2007c. Essential Fish Habitat Description: Summer Flounder (*Paralichthys dentatus*). http://www.nero.noaa.gov /hcd/summerflounder.htm.

National Oceanic and Atmospheric Administration (NOAA). 2007d. Essential Fish Habitat Description: Red Drum (*Sciaenops ocellatus*). http://www.nero.noaa.gov/hcd /reddrum.htm.

National Oceanic and Atmospheric Administration (NOAA) 2007e. Essential Fish Habitat Designations for New England Skate Complex. http://www.nero.noaa.gov/hcd /skateefhmaps.htm.

NatureServe. 2008. NatureServe Explorer. http://www.natureserve.org/explorer/.

Public Works Center Naval District Washington (NDW). 2002. MWR Functional Plan for NDW Solomons Complex NRC.

Pimentel, D., R. Zuniga, and D. Morrison. 2005. Update on Environmental and Economic Costs Associated with Alien-Invasive Species in the United States. Ecological Economics 52 (2005):273-288.

Rice, P. 2007. INVADERS Online Database System. Division of Biological Sciences, University of Montana, Missoula, Montana. Available at http://invader.dbs.umt.edu.

Rambo, K. 2008. Unpublished Survey NRC Solomons.

Rose, C. 2007. Personal communication between C. Rose, NRC Solomons Recreation Director and M. Wallace, Geo-Marine, Inc. on 11/20/2007.

Ruoff, K. 2007. Personal communication between K. Ruoff, NAS Patuxent River Public Works Department and M. Wallace, Geo-Marine, Inc. on 11/20/07.

Shedlock, R.J., Bolton, D.W., Cleaves, E.T., Gerhart, J.M., and Nardi, M.R. 2007. A Science Plan for a Comprehensive Regional Assessment of the Atlantic Coastal Plain Aquifer System in Maryland: U.S. Geological Survey Open-File Report 2007–1205. http://md.water.usgs.gov/publications/ofr-2007-1205/FINAL%20OFR%202007-205 .508.pdf.

Smith, J. Personal communication between J. Smith, NAS Patuxent River Natural Resources Specialist and M. Wallace, Geo-Marine, Inc. on 12/21/09.

Southeast Regional Climate Center. 2007. Period of Record Monthly Climate Summary 1948-2005 (188405). http://radar.meas.ncsu.edu/cgi-bin/sercc/cliMAIN.pl?md8405 .

Terwilliger, K. and J. Tate. 1995. A Guide to Endangered and Threatened Species in Virginia. McDonald & Woodward Pub., Blacksburg, Virginia.

Tri-County Council for Southern Maryland. 2003. Analysis of the Economic Impact of the Pax River Complex, Indian Head Complex, and the Naval Recreation Center Solomons. Hughesville, Maryland.

U.S. Army Corps of Engineers (USACE). 1996. Patuxent River Water Resources Reconnaissance Study. USACE Baltimore District, Baltimore Maryland.

U.S. Army Corps of Engineers (USACE). 2006. Department of the Army Programmatic General Permit State of Maryland. http://www.nab.usace.army.mil/Regulatory/ Permit/MDSPGP-3.pdf.

U.S. Department of Agriculture Soil Conservation Service (USDA, SCS). 1971. Soil Survey of Calvert County, Maryland. Prepared by the USDA Soil Conservation Service, in cooperation with the Maryland Agricultural Experiment Station. http://www .sawgal.umd.edu/nrcsweb/calvconvert/manual/1.htm.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA, NRCS). 2007. Hydric Soils. http://soils.usda.gov/use/hydric/intro.html.

U.S. Fish and Wildlife Service (USFWS). 2007. National Wetlands Inventory (NWI). http://www.fws.gov/nwi/.

U.S. Geological Survey (USGS). 2007. Ground-Water Wells in Calvert County, Maryland. http://md.water.usgs.gov/groundwater/calvert/.

Virginia Institute of Marine Science (VIMS). 2002. 2002 SAV in the Chesapeake Bay and Coastal Bays: Solomons Island, Maryland (VIMS Map #071). http://www.vims .edu/bio/sav/sav02/quads/si071_page.html.

Virginia Institute of Marine Science (VIMS). 2005a. 2005 SAV in the Chesapeake Bay and Coastal Bays: Solomons Island, Maryland (VIMS Map #071). http://www.vims.edu/bio/sav/sav05/quads/si071_page.html.

Virginia Institute of Marine Science (VIMS). 2005b. Submerged Aquatic Vegetation in the Chesapeake Bay. VIMS SAV Mapping Lab. http://www.vims.edu/bio/sav /aboutsav.html.

Virginia Institute of Marine Science (VIMS). 2007. Bay Grasses (SAV) in Chesapeake Bay and Delmarva Peninsula Coastal Bays. http://www.vims.edu/bio/sav.

APPENDIX 1
LIST OF PROJECTS and PROJECT DISCRIPTIONS

Table 1. List of Projects.

Project #	Project Description	Implementation Schedule (FY)	Prime Legal Driver/ Initiative	OMB Class ERL Navy Level	Cost Estimate ($)	Funding Source	Date Completed
	RT&E Species						
	RT&E Species Monitoring	2012, 2017	A, G, H, I, K	II, 3, 1	28,000	O&MN	
	Wetlands Management						
	Baseline Wetlands Delineation	2012	A, B, D, E	II, 3, 2	14,000	O&MN	
	Fish and Wildlife Management						
	Baseline Faunal Surveys	2013	A, G, H, I	II, 3, 2	48,000	O&MN	
	Migratory Bird Management						
	Habitat Management for Cavity Nesters	2012, 2013	A, C, G, H, I	III, 1, 5	2,500	O&MN	
	Invasive Species Management						
	Invasive Species Control	annual	A, F, G, H, I	I, 4, 1	42,000	O&MN	
	Land Management						
	Erosion Control on Beach Access Road	2012	B, D, J	III, 1, 5	8,000	O&MN	
	Control Woody Vegetation on Stabilized Shoreline	annual	B, D, J	III, 1, 5	8,000	O&MN	
	Beach Access Stairs	2011	B, D, J	III, 1, 5	32,000	MWR NAF	
	Fence and Signage	2012	B, D, J	III, 1, 5	18,000	MWR NAF PW PMEB	

A – Sikes Act, as amended
B – Clean Water Act, as amended
C – Migratory Bird Treaty Act, as amended
D – Coastal Zone Management Act, as amended
E – EO 11990 (Protection of Wetlands)
F – EO 13112 (Invasive Species)
G – 32 CFR Part 190 (DoD Natural Resources Management Program)
H – OPNAVINST 5090.1 (Environmental and Natural Resources Program Manual
I – DoD Instruction 4715.3 (Environmental Conservation Program
J – Chesapeake Bay Agreements
K– Endangered Species Act, as amended

This page intentionally left blank

RARE, THREATENED, AND ENDANGERED SPECIES MANAGEMENT

Project Title

RT&E Species Monitoring

Project Description

Conduct periodic RT&E monitoring of populations or individuals of protected species determined present during the initial survey project at NRC Solomons. Seasonal plant and breeding bird surveys should be conducted every five years. Additional surveys should be conducted for RT&E species documented in Calvert County (Appendix 2).

Objective

Monitor the occurrence, population size, and relative health of RT&E species at NRC Solomons.

Background/Justification

An RT&E survey conducted in 2007 identified several state protected species including one state endangered bird species, Royal Tern (*Sterna maxima*); two state threatened plant species, White Spikerush (*Eleocharis albida*) and Showy Goldenrod (*Solidago speciosa*); and one state rare plant, Pumpkin Ash (*Fraxinus profunda*). Periodic monitoring is required to ensure compliance with the ESA, Maryland State conservation laws, and Navy policy on RT&E species.

Impact to Mission

Failure to implement this project would result in noncompliance with the Sikes Act and Navy policy on natural resources management, and potential noncompliance with the ESA and state laws.

Regulatory Drivers

Sikes Act, CZMA, ESA, 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), OPNAVINST 5090.1

Implementation Schedule:	2012, 2017
Priority:	OMB/EPA Class II, ERL 3 Navy Level 1
Funding Sources:	O&MN
Cost Estimate:	$28,000

WETLANDS MANAGEMENT

Project Title

Baseline Wetlands Delineation

Project Description

Conduct baseline wetland delineation at NRC Solomons and develop a wetlands GIS layer.

Objective

Assess the basewide occurrence of wetlands and provide a wetlands map for planning purposes.

Background/Justification

The existing NWI wetlands assessment was conducted with little or no ground truthing and appears to overstate the occurrence of wetlands in the interior portion of the installation. An updated planning-level or jurisdictional delineation would provide valuable wetland information to site planners.

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

CWA, CZMA, EO 11990 (Protection of Wetlands), 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), OPNAVINST 5090.1

Implementation Schedule:	2012
Priority:	OMB/EPA Class II, ERL 3, Navy Level 2
Funding Sources:	O&MN
Cost Estimate:	$10,000-$14,000

FISH AND WILDLIFE MANAGEMENT

Project Title

Baseline Faunal Surveys

Project Description

Conduct baseline faunal surveys at NRC Solomons to assess the occurrence of wildlife species utilizing the installation. Seasonal surveys should be conducted for small mammals, furbearers, herpetofauna, bats, and breeding and migratory bird species.

Objective

Assess the occurrence of wildlife populations utilizing the installation to better manage for all wildlife species.

Background/Justification

The Sikes Act, 32CFR190 (DoD Natural Resources Management Program), and Navy policy require current inventories on Navy-managed lands. Currently, no formal surveys have been conducted and only incidental observations of wildlife occurring at NRC Solomons have been made.

Impact to Mission

Baseline faunal surveys have not been conducted at NRC Solomons. Therefore failure to implement this project would result in noncompliance with the Sikes Act and Navy policy on natural resources management.

Regulatory Drivers

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

Implementation Schedule:	2013
Priority:	OMB/EPA Class II, ERL 3, Navy Level 2
Funding Sources:	O&MN
Cost Estimate:	$48,000

MIGRATORY BIRD MANAGEMENT

Project Title

Habitat Management for Cavity Nesters

Project Description

Repair/replace bluebird nest boxes. GPS all existing and new nest boxes.

Objective

Enhance nesting habitat for migratory birds.

Background/Justification

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 bluebirds, whose populations have been in decline, by the use of artificial nest boxes/platforms.

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 5090.1

Implementation Schedule:	GPS existing boxes 2012 Upgrade additional nesting boxes 2013
Priority:	OMB/EPA Class III, ERL 1, Navy Level 5
Funding Sources:	O&MN
Cost Estimate:	$2,500

INVASIVE SPECIES MANAGEMENT

Project Title

Invasive Species Management

Project Description

Develop priorities and implement management recommendations for controlling invasive species identified in a 2007 invasive plant inventory (DoN 2008). Conduct follow up monitoring to assess treatment effectiveness.

Objective

Control target invasive species and prevent the further spread and degradation of natural habitats at NRC Solomons.

Background/Justification

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

Impact to Mission

Absence of an active control program results in degradation of habitat that supports the mission and disregards Navy stewardship responsibilities.

Regulatory Drivers

Sikes Act, EO 11987 (Exotic Organisms), EO 13112 (Invasive Species), 32 CFR 190 (Natural Resources Management Program), DoDI 4715.3 (Environmental Conservation Program), OPNAVINST 5090.1

Implementation Schedule:	Annual
Priority:	OMB/EPA Class I, ERL 4, Navy Level 1
Funding Sources:	O&MN, Installation fish and wildlife permit sales
Cost Estimate:	$42,000

LAND MANAGEMENT

Project Title

Erosion Control on Beach Access Road

Project Description

Regrade road, install water bars, and revegetate road shoulder on the main beach access road.

Objective

Protect water quality by preventing further degradation of road condition and erosion.

Background/Justification

Gullying and loss of vegetation along this road are contributing to habitat degradation and reduction in water quality.

Impact to Mission

Failure to implement this project could result in loss of real property and infrastructure. Minor immediate repairs will prevent continued degradation and the need for major future repairs.

Regulatory Drivers

CWA, CZMA, Chesapeake Bay Agreements

Implementation Schedule:	2012
Priority:	OMB/EPA Class III, ERL 1, Navy Level 5
Funding Sources:	O&MN (maybe PW Project Management Engineering Branch)
Cost Estimate:	$8,000

LAND MANAGEMENT

Project Title

Control Woody Vegetation on Stabilized Shoreline

Project Description

Control woody vegetation along the restored shoreline through manual cutting and/or herbicide application. Avoid disturbance of native herbaceous vegetation on steep slopes.

Objective

Protect water quality and shoreline stability by controlling the growth of woody vegetation on the contoured slopes of the restored shoreline.

Background/Justification

A large portion of the NRC Solomons shoreline has been stabilized by the recontouring and establishing native grasses and other herbaceous vegetation. Growth of large woody vegetation can threaten shoreline stability on steep slopes by falling and removing large areas of soil with their root balls. Controlling woody species and promoting herbaceous vegetation will help maintain current shoreline conditions.

Impact to Mission

Failure to implement this project could result in loss of real property and infrastructure.

Regulatory Drivers

CWA, CZMA, Chesapeake Bay Agreements

Implementation Schedule:	Annual
Priority:	OMB/EPA Class III, ERL 1, Navy Level 5
Funding Sources:	O&MN
Cost Estimate:	$8,000

LAND MANAGEMENT

Project Title

Beach Access Stairs

Project Description

Install Stairs on Steep Slope for Beach Access behind Gazebo.

Objective

Protect water quality and shoreline stability by providing alternative beach access.

Background/Justification

Currently a foot path connects a paved path at the top of the slope with the beach area west of the gazebo. Loss of vegetation and disturbance are contributing to soil loss on this slope. Constructing stairs to provide beach access would eliminate foot traffic and help protect shoreline stability in this area.

Impact to Mission

Failure to implement this project could result in increased erosion and reduced water quality.

Regulatory Drivers

CWA, CZMA, Chesapeake Bay Agreements

Implementation Schedule:	2011
Priority:	OMB/EPA Class III, ERL 1, Navy Level 5
Funding Sources:	MWR Nonappropriated Funds (NAF)
Cost Estimate:	$32,000

LAND MANAGEMENT

Project Title

Fence and Signage

Project Description

Install a split rail fence (or other appropriate fence material) and signage to control foot traffic on the steep slopes along 300 feet of the stabilized portions of shoreline.

Objective

Protect water quality and shoreline stability by providing alternative beach access.

Background/Justification

Frequent foot traffic crossing the grassy slopes to the beach area are contributing to the formation of foot paths and loss of vegetation along portions of the stabilized shoreline at NRC Solomons. Redirecting foot traffic to stairs or existing roads would help maintain vegetated conditions and prevent erosion on these slopes.

Impact to Mission

Failure to implement this project could result in increased erosion and reduced water quality.

Regulatory Drivers

CWA, CZMA, Chesapeake Bay Agreements

Implementation Schedule:	2012
Priority:	OMB/EPA Class III, ERL 1, Navy Level 5
Funding Sources:	MWR NAF or PW Project Management Engineering Branch
Cost Estimate:	$18,000

This page intentionally left blank

APPENDIX 2
SPECIES LISTS

Rare, Threatened, and Endangered Species of Calvert County, Maryland.

		STATUS[1]		
SPECIES	**SCIENTIFIC NAME**	**FEDERAL**	**STATE**	**RANK**
Animals				
Bald eagle	*Haliaeetus leucocephalus*	-	T	G4S2S3B
Peregrine falcon	*Falco peregrinus*	-	I	G4T3S2
Shortnose sturgeon	*Acipenser brevirostrum*	E	E	G3S1
NE beach tiger beetle	*Cicindela dorsalis dorsalis*	T	E	G4T2S1
Puritan tiger beetle	*Cicindela puritana*	T	E	G1G2S1
Sedge wren	*Cistothorus platensis*	-	E	G5S1B
Spotfin killifish	*Fundulus luciae*	-		G4S2?
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*	-	E	G5S1S2
Carolina satyr	*Hermeuptychia sosybius*	-		G5S1S3
Cypress sphinx moth	*Isoparce cupressi*	-		G4SU
Black rail	*Laterallus jamaicensis*	-	I	G4S2S3B
Red-legged purse-web spider	*Sphodros rufipes*	-		G4S1S2
Least tern	*Sterna antillarum*	-	T	G4S2B
Plants				
Sensitive joint-vetch	*Aeschynomene virginica*	T	E	G2S1
Blunt-leaved gerardia	*Agalinis obtusifolia*	-	E	G4G5QS1
Thread-leaved gerardia	*Agalinis setacea*	-	E	G5?S1
Koehne's ammannia	*Ammannia latifolia*	-		G5S2
Single-headed pussytoes	*Antennaria solitaria*	-	T	G5S2
Curtiss' three-awn	*Aristida curtissii*	-		G5T5SU
Woolly three-awn	*Aristida lanosa*	-	E	G5S1
Mosquito fern	*Azolla caroliniana*	-		G5SU
Small-fruited beggar-ticks	*Bidens mitis*	-	E	G4?S1
Shoreline sedge	*Carex hyalinolepis*	-		G4G5S2S3
Lake-bank sedge	*Carex lacustris*	-	T	G5S2
Necklace sedge	*Carex projecta*	-	-	G5S2

Rare, Threatened, and Endangered Species of Calvert County, Maryland (cont'd).

		STATUS[1]		
SPECIES	**SCIENTIFIC NAME**	**FEDERAL**	**STATE**	**RANK**
Plants (cont')				
Spurred butterfly-pea	*Centrosema virginianum*	-	-	G5S2
Red turtlehead	*Chelone oblique*	-	T	G4S1
Standley's goosefoot	*Chenopodium standleyanum*	-	E	G5S1
Linear-leaved tick-trefoil	*Desmodium lineatum*	-	E	G5S1
Cream-flowered tick-trefoil	*Desmodium ocholeucum*	-	E	G2?S1
Few-flowered tick-trefoil	*Desmodium pauciflorum*	-	E	G5S1
Rigid tick-trefoil	*Desmodium rigidum*	-	E	G?QS1
Glade fern	*Diplazium pycnocarpon*	-	T	G5S2
Beaked spikerush	*Eleocharis rostellata*	-		G5S2?
Tobaccoweed	*Elephantopus tomentosus*	-	E	G5S1?
Rough-leaved aster	*Eurybia radula = Aster radula*	-	E	G5S1
Hairy fimbristylis	*Fimbristylis puberula*	-	-	G5SU
Smooth fuirena	*Fuirena pumila*	-		G4S2S3
Broad-leaved beardgrass	*Gymnopogon brevifolius*	-	E	G5S1
Star duckweed	*Lemna trisulca*	-	E	G5S1
Long-awned diplachne	*Letochloa fascicularis*	-	-	G5SU
American frog's-bit	*Limnobium spongia*	-	E	G4S1
Climbing fern	*Lygodium palmatum*	-	T	G4S2
Anglepod	*Matelea carolinensis*	-	E	G4S1
Narrow melicgrass	*Melica mutica*	-	T	G5S1
Creeping cucumber	*Melothria pendula*	-	E	G5?S1
Sweet pinesap	*Monotropsis odorata*	-	E	G3S1
Southern bayberry = Evergreen bayberry	*Morella caroliniensis = Myrica heterophylla*	-	E	G5S1
Large-seeded forget-me-not	*Myosotis macrosperma*	-	-	G5S2S3
Kidneyleaf grass-of-parnassus	*Parnassia asarifolia*	-	E	G4S1
Pale green orchid	*Platanthera flava*	-	-	G4S2

Rare, Threatened, and Endangered Species of Calvert County, Maryland (cont'd).

		STATUS[1]		
SPECIES	**SCIENTIFIC NAME**	**FEDERAL**	**STATE**	**RANK**
Plants (cont')				
Camphor pluchea	*Pluchea camphorata*	-	E	G5S1
Dense-flowered knotweed	*Polygonum densiflorum*	-	E	G5S1?
Bristly smartweed	*Polygonum setaceum*	-	-	G5SU
Leafy pondweed	*Potamogeton foliosus*	-	E	G5S1
Clasping-leaved pondweed	*Potamogeton perfoliatus*	-	-	G5S2
Spiral pondweed	*Potamogeton spirillus*	-	-	G5S1
Shumard's oak	*Quercus shumardii*	-	T	G5S2
Twining snoutbean	*Rhynchosia tomentosa*	-	T	G5S2
Englemann's arrowhead	*Sagittaria engelmanniana*	-	T	G5?S2
Long-beaked arrowhead	*Sagittaria longirostra*	-	-	GNRQ
Common skullcap	*Scutellaria galericulata*	-	-	G5S1
Sea-purslane	*Sesuvium maritimum*	-	E	G5S1
Showy goldenrod	*Solidago speciosa*	-	T	G5S2
Rough rushgrass	*Sporobolus clandestinus*	-	T	G5S2
Silvery aster	*Symphyotrichum concolor = Aster concolor*	-	E	G4?S1
Southern wildrice	*Zizaniopsis miliacea*	-	E	G5S1

Source: MDNR 2007b

[1]Federal Status
E = Endangered
T = Threatened
State Status
E = Endangered
T = Threatened
I = In Need of Conservation

Global Rank
G1 = Highly globally rare
G2 = Globally rare
G3 = Either very rare and local throughout its range or distributed locally in a restricted range
G4 = Apparently secure globally although it may be quite rare in parts of its range
G5 = Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery
G? = The species has not yet been ranked.

State Rank
S1 = Highly State rare
S2 = State rare
S3 = Rare to uncommon
SU = Possibly rare in state, but of uncertain status
S? The species has not yet been ranked
-B = This animal species is migratory and the rank refers only to the breeding status of the species
-N This animal species is migratory and the rank refers only to the non-breeding status of the species

Wildlife Known to Occur at NRC Solomons.

COMMON NAME	SCIENTIFIC NAME	ORIGIN[1]
Mammals		
American Beaver	*Castor canadensis*	N
Virginia Opossum	*Didelphis virginiana*	N
River Otter	*Lutra canadensis*	N
Groundhog = Woodchuck	*Marmota monax*	N
Striped Skunk	*Mephitis mephitis*	N
Raccoon	*Procyon lotor*	N
Eastern Gray Squirrel	*Sciurus carolinensis*	N
Eastern Cottontail	*Sylvilagus floridanus*	N
Herpetofauna		
Eastern Painted Turtle	*Chrysemys picta picta*	N
Bullfrog	*Rana catesbeiana*	N
Green Frog	*Rana clamitans melanota*	N
Invertebrates (butterflies)		
Red-banded Hairstreak	*Calycopis cecrops*	N
Spring Azure	*Celastrina i. iadon*	N
Eastern Tailed Blue	*Everes c. comyntas*	N
Pearl Crescent	*Phyciodes t. tharos*	N
Fish		
Blueback Herring	*Alosa aestivalis*	N
Hickory Shad	*Alosa mediocris*	N
Alewife	*Alosa pseudoharengus*	N
American Shad	*Alosa sapidissima*	N
Bay Anchovy	*Anchoa mitchilli*	N
American Eel	*Anguilla rostrata*	N
Atlantic Menhaden	*Brevoortia tyrannus*	N
Blue Crab	*Callinectes sapidus*	N
Eastern Oyster	*Crassostrea virginica*	N
Spot	*Leiostomus xanthurus*	N
Little Skate	*Leucoraja erinacea*	N
Winter Skate	*Leucoraja ocellata*	N
Atlantic Croaker	*Micropogonias undulatus*	N
White Perch	*Morone americana*	N
Striped Bass	*Morone saxatili*	N
Softshell Clam	*Mya arenaria*	N
Summer Flounder	*Paralicthys dentatus*	N
Yellow Perch	*Perca flavescens*	N
Bluefish	*Pomatomus saltatrix*	N
Cobia	*Rachycentron canadum*	N
Clearnose Skate	*Raja eglanteria*	N
Red Drum	*Sciaenops occelatus*	N
King Mackerel	*Scomberomorus cavalla*	N
Spanish Mackerel	*Scomberomorus maculates*	N
Windowpane Flounder	*Scopthalmus aquosus*	N

[1]I = Introduced

N = Native

Sources: DoN 2001, MDNR 2003, MDNR 2005a, NatureServe 2008, Rambo 2008

Birds Known To Occur at Naval Recreation Center Solomons.

Common Name	Scientific Name	Occurrence	Habitat	Origin	Global Rank	State Rank	Federal Status	State Status
Cooper's Hawk	*Accipiter cooperii*	Uncommon resident	Forest	N	-	-	-	-
Spotted Sandpiper	*Actitis macularia*	Uncommon summer	Shore	N	G5	S3S4B	-	-
Red-winged Blackbird	*Agelaius phoeniceus*	Common resident	Marsh	N	-	-	-	-
Mallard	*Anas platyrhyncos*	Common resident	Pond	N	-	-		
Ruby Throated Hummingbird	*Archilochus colubris*	Common summer resident	Forest	N	-	-	-	-
Great Egret	*Ardea alba*	Summer resident	Marsh	N	-	-	-	-
Great Blue Heron	*Ardea herodias*	Common resident	Marsh	N	-	-	-	-
Cedar Waxwing	*Bombycilla cedrorum*	Uncommon resident	Open woodland	N	-	-	-	-
Green Heron	*Butorides striatus*	Common summer resident	Marsh	N	-	-	-	-
Canada Goose	*Branta canadensis*	Common resident	Pond, open field	N	-	-	-	-
Northern Cardinal	*Cardinalis cardinalis*	Common resident	Throughout	N	-	-	-	-
American Goldfinch	*Carduelis tristis*	Common resident	Old field	N	-	-	-	-
House Finch	*Carpodacus mexicanus*	Common resident	Throughout	N	-	-	-	-
Turkey Vulture	*Cathartes aura*	Common resident	Throughout	N	-	-	-	-
Chimney Swift	*Chaetura pelagica*	Summer resident	Rural and urban areas	N	-	-	-	-
Black Vulture	*Coragyps atratus*	Uncommon resident	Throughout	N	-	-	-	-
American Crow	*Corvus brachyrhynchos*	Common resident	Throughout	N	-	-	-	-
Fish Crow	*Corvus ossifragus*	Common resident	Marsh	N	-	-	-	-
Blue Jay	*Cyanocitta cristata*	Abundant resident	Throughout	N	-	-	-	-
Mute Swan	*Cygnus olor*	Uncommon non-native resident	Pond	I	-	-	-	-
Bay-breasted Warbler	*Dendroica castanea*	Migrant	Forest	N	-	-	-	-
Black-throated Blue Warbler	*Dendroica caerulescens*	Migrant	Forest	N	G5	S3S4B	-	-
Yellow Warbler	*Dendroica petechia*	Common summer resident	Woods, thickets	N	-	-	-	-
Pine Warbler	*Dendroica pinus*	Common summer resident	Pine forest	N	-	-	-	-
Blackpoll Warbler	*Dendroica striata*	Migrant	Forest	N	-	-	-	-
Gray Catbird	*Dumetella carolinensis*	Common resident	Forest, thickets	N	-	-	-	-
Willow Flycatcher	*Empidonax traillii*	Summer resident	Marsh, shrub thickets	N	-	-	-	-

Birds Known To Occur at NRC Solomons (cont'd).

Common Name	Scientific Name	Occurrence	Habitat	Origin	Global Rank	State Rank	Federal Status	State Status
Peregrine Falcon	*Falco peregrinus*	Rare resident	Cliffs, tall buildings	N	G4T4	S2	-	I
Common Loon	*Gavia immer*	Uncommon migrant	Inland lakes and rivers	N	G5	S4N	-	-
Common Yellowthroat	*Geothlypsis trichas*	Common resident	Forest, thickets	N	-	-	-	-
Bald Eagle	*Haliaeetus leucocephalus*	Resident	Areas close to water	N	G4	S2S3B	-	T
Barn Swallow	*Hirundo rustica*	Abundant summer resident	Barn, bridge, building	N	-	-	-	-
Baltimore Oriole	Icterus galbula	Uncommon summer resident	Open woodland	N	-	-	-	-
Orchard Oriole	*Icterus spurius*	Common summer resident	Open woodland	N	-	-	-	-
Dark-Eyed Junco	*Junco hyemalis*	Abundant winter resident	Throughout	N	G5	S2B	-	-
Herring Gull	*Larus argentatus*	Abundant resident	Wetland, throughout	N			-	-
Laughing Gull	*Larus atracilla*	Common resident	Seacoasts, bays, estuaries	N	G5	S1B	-	-
Ring-Billed Gull	*Larus delawarensis*	Abundant summer resident	Wetland	N	-	-	-	-
Great-Black-Backed Gull	*Larus marinus*	Common resident	Shoreline, beach	N	-	-	-	-
Bonaparte's Gull	*Larus philadelphia*	Winter resident	Shore	N	-	-	-	-
Red bellied Woodpecker	*Melanerpes carolinus*	Common resident	Forest	N	-	-	-	-
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Uncommon resident	Forest	N	-	-	-	-
Song Sparrow	*Melospiza melodia*	Abundant resident	Open field	N	-	-	-	-
Northern Mockingbird	*Mimus polyglottos*	Common resident	Throughout	N	-	-	-	-
Black-and-white Warbler	*Mniotilta varia*	Common summer resident	Forest	N	-	-	-	-
Brown-headed Cowbird	*Molothrus ater*	Abundant resident	Throughout	N	-	-	-	-
Great Crested Flycatcher	*Myiarchus crinitus*	Common summer resident	Forest	N	-	-	-	-
Osprey	*Pandion haliaetus*	Common resident	Shoreline, beach	N	-	-	-	-
Eastern Tufted Titmouse	*Parus bicolor*	Abundant resident	Forest, open areas	N	-	-	-	-
Carolina Chickadee	*Parus carolinensis*	Abundant resident	Forest, open areas	N	-	-	-	-
House Sparrow	*Passer domesticus*	Abundant non-native resident	Throughout	I	-	-	-	-
Indigo Bunting	*Passerina cyanea*	Uncommon summer resident	Open field	N	-	-	-	-
Double-crested Cormorant	*Phalacrocorax auritus*	Common resident	Wetland, open water	N	-	-	-	-
Downy Woodpecker	*Picoides pubescens*	Common resident	Forest	N	-	-	-	-

Birds Known To Occur at NRC Solomons (cont'd).

Common Name	Scientific Name	Occurrence	Habitat	Origin	Global Rank	State Rank	Federal Status	State Status
Eastern Towhee	*Pipolo erythrophthalmus*	Common resident	Forest edges	N	-	-	-	-
Scarlet Tanager	*Piranga olivacea*	Summer resident	Forest	N	-	-	-	-
Blue-gray Gnatcatcher	*Polioptila caerulea*	Common summer resident	Deciduous forests	N	-	-	-	-
Common Grackle	*Quiscalus quiscula*	Abundant resident	Throughout	N	-	-	-	-
Eastern Phoebe	*Sayornis phoebe*	Uncommon summer resident	Open woodland	N	-	-	-	-
Northern Waterthrush	*Seiurus noveboracensis*	Migrant	Streams	N	G5	S2S3B	-	-
American Redstart	*Septophaga ruticilla*	Uncommon summer resident	Deciduous forests	N	-	-	-	-
Eastern Bluebird	*Sialia sialis*	Common resident	Open field, woods edge	N	-	-	-	-
Chipping Sparrow	*Spizella passerina*	Common resident	Open woodland	N	-	-	-	-
Forster's Tern	*Sterna forsteri*	Summer resident	Shore	N	-	-	-	-
Royal Tern	*Sterna maxima*	Summer resident	Shore	N	G5	S1B	-	E
Eastern Meadowlark	*Sturnella magna*	Uncommon resident	Old field	N	-	-	-	-
European Starling	*Sturnus vulgaris*	Abundant non-native resident	Throughout	I	-	-	-	-
Carolina Wren	*Thryothorus ludovicianus*	Common resident	Forest	N	-	-	-	-
Brown Thrasher	*Toxostoma rufum*	Common resident	Forest	N	-	-	-	-
House Wren	*Troglodytes aedon*	Common Summer resident	Forest, open areas	N	-	-	-	-
American Robin	*Turdus migratorius*	Abundant resident	Throughout	N	-	-	-	-
Eastern Kingbird	*Tyrannus tyrannus*	Common summer resident	Open area	N	-	-	-	-
Nashville Warbler	*Vermivora ruficapilla*	Migrant	Forest	N	G5	S1S2B	-	I
Warbling Vireo	*Vireo gilvus*	Uncommon summer resident	Open woodland	N	-	-	-	-
White-eyed Vireo	*Vireo griseus*	Common summer resident	Forest	N	-	-	-	-
Red-eyed Vireo	*Vireo olivaceus*	Common summer resident	Forest	N	-	-	-	-
Mourning Dove	*Zenaida macroura*	Common resident	Throughout	N	-	-	-	-
White throated Sparrow	*Zonotrichia albicollis*	Abundant migrant	Throughout	N	-	-	-	-

[1]I = Introduced
N = Native
[2]S1 – Extremely Rare
S2 – Very Rare
S3 – Rare to Uncommon
S4 – Apparently Secure in Maryland
S5 – Demonstrably Secure in Maryland
S_B – Breeding Status
S_N – Non-breeding Status
G5 – Demonstrably Secure Globally
I – In need of conservation
E – Endangered
T - Threatened
Sources: DoN 2001, Geo-Marine, Inc. 2007, MDNR 2007d, Rambo 2008

This page intentionally left blank

Vegetation Known to Occur at NRC Solomons.

Common Name	Scientific Name	Origin[1]
Graminoids		
Broomsedge	*Andropogon virginicus*	N
Bermuda Grass	*Cynodon dactylon*	I
Japanese Stiltgrass	*Microsigeum viminium*	I
Silver Grass	*Miscanthus* sp.	I
Switchgrass	*Panicum virgatum*	N
Dallisgrass	*Paspalum dilatatum*	I
Common Reed	*Phragmites australis*	N/I
Salt Marsh Cordgrass	*Spartina alterniflora*	N
Herbs/Forbs		
Wild Garlic	*Allium vineale*	I
Spotted Knapweed	*Centaurea stoebe*	I
Mexican Tea	*Chenopodium ambrosioides*	I
Tall Thistel	*Cirsium altissimum*	I
Deptford Pink	*Dianthus armeria*	I
White Spikerush	*Eleocharis albida*	N
Japanese Clover	*Kummerowia striata*	I
Sericea Lespedeza	*Lespedeza cuniata*	I
American Pokeweed	*Phytolacca americana*	N
Japanese Knotweed	*Polygonum cuspidatum*	I
Curley Dock	*Rumex crispus*	I
Crown Vetch	*Securigera varia*	I
Showy Goldenrod	*Solidago speciosa*	N
Periwinkle	*Vinca minor*	I
Shrubs		
Groundsel Tree	*Baccharis halimifolia*	N
Swamp Dogwood	*Cornus amomum*	N
Privet, Japanese	*Ligustrum japonicum*	I
Privet, Chinese	*Ligustrum sinese*	I
Honeysuckle, Tartarian	*Lonicera tatarica*	I
Nandina	*Nandina domestica*	I
Winged Sumac	*Rhus copallina*	N
Rose, Dog	*Rosa canina*	I
Rose, Multiflora	*Rosa multiflora*	I
Wineberry	*Rubus phoenicolasius*	I
Trees		
Red Maple	*Acer rubrum*	N
Silver Maple	*Acer saccharinum*	N
Tree Of Heaven	*Ailanthus altissima*	I
Mimosa	*Albizia julibrissin*	I

Vegetation Known to Occur at NRC Solomons (cont'd).

Common Name	Scientific Name	Origin[1]
Paper Mulberry	*Broussonetia papyrifera*	I
Hackberry	*Celtis occidentalis*	N
Eastern Redbud	*Cercis canadensis*	N
Pumpkin Ash	*Fraxinus profunda*	N
Flowering Dogwood	*Cornus florida*	N
Ash	*Fraxinus* spp.	N
American Holly	*Ilex opaca*	N
Eastern Red Cedar	*Juniperus virginiana*	N
Tulip Poplar	*Liriodendron tulipifera*	N
Sweetgum	*Liquidambar styraciflua*	N
White Mulberry	*Morus alba*	I
Black Gum	*Nyssa sylvatica*	N
American Sycamore	*Platanus occidentalis*	N
Pine, Eastern White	*Pinus strobus*	N
Pine, Loblolly	*Pinus taeda*	N
Pine, Virginia	*Pinus virginiana*	N
White Poplar	*Populus alba*	I
Black Cherry	*Prunus serotina*	N
Bradford Pear	*Pyrus calleryana*	I
White Oak	*Quercus alba*	N
Bur Oak	*Quercus macrocarpa*	N
Willow Oak	*Quercus phellos*	N
Common sumac	*Rhus glabra*	
Black Locust	*Robinia pseudoacacia*	N
Black Willow	*Salix nigra*	N
Sassafras	*Sassafras albidum*	N
Bald Cypress	*Taxodium distichum*	N
Eastern Hemlock	*Tsuga canadensis*	N
Slippery Elm	*Ulmus rubra*	N
Vines		
Trumpet Creeper	*Campsis radicans*	N
English Ivy	*Hedera helix*	I
Honeysuckle, Japanese	*Lonicera japonica*	I
Virginia Creeper	*Parthenocissus quinquefolia*	N
Mile-a-minute	*Polygonum perfoliatum*	I
Kudzu	*Pueraria lobata*	I
Catbrier	*Smilax rotundifolia*	N
Poison Ivy	*Toxicodendron radicans*	N
Grape	*Vitis* spp.	N

[1]I = Introduced

N = Native

Sources: DoN 2001, DoN 2003, DoN 2007, Geo-Marine, Inc. 2007

APPENDIX 3
RESEARCH REQUIREMENTS

Installation Natural Resources Manager will provide information as necessary.

This page intentionally left blank

APPENDIX 4
MIGRATORY BIRD MANAGEMENT

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 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, NAS Patuxent River employs operational and conservation measures that avoid, minimize, or mitigate take of migratory birds at NRC Solomons. The natural resources program has enhanced migratory bird nesting habitat by the installation of nesting boxes for Eastern Bluebirds and Wood Ducks and nesting platforms for Ospreys. Additional monitoring and maintenance of existing structures and the installation of additional nesting boxes would improve the programs effectiveness and value to migratory bird populations.

This page intentionally left blank

APPENDIX 5
FISHING INSTRUCTION

DEPARTMENT OF THE NAVY
NAVAL AIR STATION
22268 CEDAR POINT ROAD
PATUXENT RIVER, MARYLAND 20670-1154

NASPAXRIVINST 110157.M
MAR 2 2007

NAS PATUXENT RIVER INSTRUCTION 11015.7M

From: Commanding Officer

Subj: FISHING, SHELLFISHING, AND CRABBING REGULATIONS

Ref: (a) NAVFAC P-73, Volume 2
(b) Guides to Freshwater and Saltwater Sportfishing in Maryland (Annual)

Encl: (1) Map of Station Fishing, Crabbing, and Shellfishing Areas, Naval Air Station (NAS) Map of Station Fishing, Crabbing, and Shellfishing Areas, Webster Field Annex (WFA) Map of Station Fishing and Crabbing Areas, Solomon's Recreation Center (SRC) Trophy Largemouth Bass Program

1. Purpose. To publish regulations and procedures governing fishing, shellfishing, and crabbing on the NAS Patuxent River, Maryland, NAS Webster Field Annex (WFA), ST. Inigoes, Maryland, and (SRC), Solomon's, Maryland, and to implement applicable provisions of references (a) and (b).

2. Cancellation. NASPAXRIVINST 11015.7L. This instruction has been revised and should be read in its entirety.

3. Policy. The Commanding Officer (CO) in accordance with all Federal and State of Maryland laws and regulations will control fishing, shellfishing, and crabbing on NAS, WFA, and SRC.

4. Regulations and Procedures.

a. Definitions. The following definitions shall apply to fishing, shellfishing, and crabbing in NAS, WFA, and SRC waters:

(1) NAS. For the purposes of authorization under this instruction, NAS includes only the NAS Patuxent River property located near Lexington Park, Maryland.

(2) WFA. For the purposes of authorization under this instruction, WFA includes the NAS Patuxent River property at St. Inigoes, Maryland, known as Webster Field Annex.

of authorization under this instruction, SRC includes the Naval Recreation Center at Solomon's, Maryland.

(4) Non-tidal Waters. Non-tidal waters on NAS include freshwater streams and the five ponds identified in enclosure (1). Non-tidal waters on WFA include Finger Pond and fishing Ponds. Non-tidal waters at SRC do not exist. Non-tidal waters are also referred to as freshwater.

(5) Tidal waters. Tidal waters on NAS include the Chesapeake Bay, Patuxent River, Goose Creek, Harper Creek, Pearson Creek, and Pine Hill Run (upstream to the hunter check station, Building 2497). Tidal waters on WFA include those portions of the St. Mary's River and St. Inigoes Creek shoreline, Chapel cove, Priest's Inlet, Langley Inlet, and Fort Point Cove as indicated in enclosure (2). Tidal fishing opportunities at SRC are available from the fishing pier only. Tidal waters are also referred to as saltwater.

(6) Fishing. Fishing refers to the harvest or attempted harvest of finfish species.

(7) Shellfishing. Shellfishing refers to the harvest or attempted harvest of clams, oysters, and mussels.

(8) Crabbing. Crabbing refers to the harvest or attempted harvest of the species known as blue crab.

b. Authorized personnel. Authorization to enter NAS, WFA, or SRC for business purposes does not necessarily authorize access for recreational purposes. Authorization for fishing, shellfishing, and crabbing on NAS, WFA, and SRC is as follows. Proper credentials must be presented to the permit-issuing clerk.

(1) NAS. The following personnel are authorized to fish, shellfish, or crab on NAS:

(a) Active duty military personnel with DD Form 2 (Active)

(b) Dependents of active duty military with DD Form 1173

(c) Retired military personnel with DD Form 2 (Retired)

(d) Dependents of retired military personnel with DD Form 1173

(e) Reservists with appropriate identification card with DD Form 2 (Reserve)

(f) Active federal civil service employees assigned on board NAS or WFA with NAS ID badge or USCSC Optional Form 55 Dependents of civilian personnel described in (f) above. Sponsors must accompany dependents to permit-issuing clerk.

(g) Retired civil service personnel with valid Officer's Club or Civilian Recreation Association (CRA) ID badge. NAS fishing permit fees are separate from Officer's Club and CRA membership fees.

(h) Long term contractors, with NAS picture ID badge, may fish or crab only in tidal waters of the station. Due to the limited nature of the resource, contractors may not fish in non-tidal waters or harvest shellfish.

(i) Dependents of contractors described in (i) may fish or crab only in tidal waters of the station.

(j) Maryland Department of Natural Resources (DNR) Police with DNR uniform or DNR badge and U.S. Fish and Wildlife Service special agents with badge and credentials.

(2) WFA. All personnel listed in paragraph 4.b(1) that have a valid NAS Patuxent River badge and a valid NAS fishing permit are authorized to fish, shellfish, and crab aboard WFA. Long term contractors with NAS Patuxent River picture ID badge and a valid NAS fishing permit are authorized to fish in salt-water only.

(3) SRC. Persons authorized to fish and crab aboard Solomon's Rec. Center include:

(a) Active duty military personnel with DD Form 2 (Active)

(b) Dependents of active duty military with DD Form 1173

(c) Retired military personnel with DD Form 2 (Active)

(d) Dependents of retired military personnel with DD Form 1173

(e) Reservists with appropriate identification card with DD Form 2 (Reserve)

(f) Active DoD federal civilian emloyees

(g) Persons with a valid SCR *Leisure Pass*

(h) Dependents of civilian personnel described above. Sponsors must accompany dependents to permit-issuing clerk.

(4) Guests. Active duty military, retired military, civil service employees of NAS or WFA, or civil service employees that retired from either NAS or WFA may sponsor a guest(s). Persons authorized to fish at SRC may sponsor a guest(s). A sponsor must accompany their guest(s) at all times and shall assume responsibility for their actions. Guests may not shellfish.

(5) Exceptions to the above will be handled on a case-by-case-basis. Requests shall be submitted in writing to the Commanding Officer via the Natural Resources Manager.

c. Licenses and permits. All fishing activities require **both** a state license **and** either an NAS fishing permit or an SRC permit. NAS fishing permits are valid at NAS, WFA, and SRC. An SRC fishing permit is only valid at the Solomon's Recreation Center. Recreational crabbing requires only a base permit for the base where crabbing. Specific license and permit requirements are detailed in the chart which follows. During working hours, fishing permits may be obtained from the Morale, Welfare, and Recreation Department, Building 458, Supervisory Recreation Specialist's Office, Room 12 of the Drill Hall. After working hours, permits may be obtained from the Command Duty Office in Building 409. Fishing permits may also be purchased at the SRC Registration Desk and the information shack

at the fishing pier. All persons, including guests, 12 years old and older must obtain a Station fishing permit to fish in tidal water (including crabbing) or freshwater at NAS, WFA, and SRC. Permits must be in possession while fishing. Persons, including guests, between the age of 12 and 15 (inclusive) will be issued a permit free of charge. Under a reciprocal agreement between Maryland, Virginia, and the Potomac River Fisheries Commission, the following licenses are acceptable for fishing in Maryland tidal waters (saltwater): Maryland State Recreational License, Virginia State Recreational Tidal Fishing License, or Potomac River Fisheries Commission Recreational Fishing License. Licenses and base permits are valid for a calendar year. License and base permit requirements are as follows:

Table 1. Maryland State license and Station fishing permit requirements

	Tidal Water		**Freshwater**		**Crabbing**		**Shellfishing**	
Age	**State License**	**Station Permit**	**State License**	**Station Permit**	**State License**	**Station Permit**	**State License**	**Station Permit**
<12	Not Required	Not required	Not required	Not required	Not Required	Not Required	Not Required	Not Required
12-15	Not required	Fishing permit issued free of charge	Not required	Fishing permit issued free of charge	Not Required	Fishing permit issued free of charge	Not Required	Fishing permit issued free of charge
16-65	Chesapeake Bay Sport Fishing License	Fishing permit required	Freshwater Sport Fishing License	Fishing Permit Required	Not Required	Fishing Permit Required	Not Required	Fishing Permit Required
>65	Consolidated Senior Resident Sport Fishing License	Fishing permit required	Consolidated Senior Resident Sport Fishing License	Fishing permit required	Not Required	Fishing Permit Required	Not Required	Fishing Permit Required

(1) Guests. Guests must obtain all required licenses and permits. Guests are required to purchase a guest permit, valid only for the date(s) specified. Guests may

purchase either a daily guest permit or a weekly guest permit valid for seven consecutive days. Daily guest permits are valid for 24 hours from the time of purchase. Guests between the ages of 12 and 15 (inclusive) must also obtain a fishing permit, which will be issued free of charge. Multiple fishing days may be specified on a single daily guest permit; however, the guest will pay the daily fee for each date specified. A guest may not purchase more than five (5) seven-day guest permits or fifteen (15) daily permits in a single fishing season. When issuing guest permits for multiple fishing days, MWR will charge only a single permit-handling surcharge ($1.00).

(2) Scouts. Members of official scout units (including leaders) when registered through the NAS Scouting Liaison Officer, may fish or crab without station permits during the duration of their official stay (not to exceed one week). This privilege extends only to Gardiner Pond (#1) and all tidal waters. All state licensing requirements still apply.

(3) Permit Prices. Permit prices are as follow:

(a) Fishing/Crabbing. Fishing and crabbing permits are issued free of charge to persons between 12 and 15 years of age (inclusive). All authorized personnel purchasing a permit for NAS or WFA will be charged a fee of $10.00, and authorized personnel purchasing a permit for SRC will be charged a fee of $5.00, per calendar year.

(b) Shellfishing. NAS shellfishing permits are issued free of charge to persons between 12 and 15 years of age (inclusive). All other authorized personnel will be charged a fee of $20.00. Shellfishing is not authorized at the SRC.

(c) Guest permits. NAS and SRC guest fishing permits are free to persons between the ages of 12 and 15 (inclusive) years of age. Daily (24 hour) NAS guest fishing permits are issued at the rate of $5.00 per day. Weekly guest fishing permits (valid for seven consecutive days) are issued at the rate of $15.00 per week. Daily (24 hour) SRC guest permits are issued at the rate of $3.00 per day. Weekly guest fishing permits (valid for seven consecutive days) are issued at the rate of $9.00 per week.

d. Fishing, Shellfishing, and Crabbing Areas. Freshwater fishing is authorized in the following areas:

(1) Freshwater fishing on NAS is authorized in all freshwater streams and the five (5) ponds shown in enclosure (1). Richneck Pond (pond 6) is closed to all fishing.

NOTICE: Due to low levels of PCB's and pesticides on NAS, consumption limits are in effect for all NAS ponds. To remain within the acceptable risk range, an average person (70 kg or 154 lbs.) should limit consumption of fish from all NAS ponds to not more than two eight-ounce portions per month, not more than 19 meals (8 oz. each) per year, and not more than 133 meals per lifetime. If you are consuming the maximum recommended meals per year, you should do so for no more than 7 years.

(a) Freshwater fishing on WFA is authorized in Finger Pond and Fishing Pond located on the map in enclosure (2).

(2) Saltwater fishing, shellfishing, and crabbing are authorized in the following areas:

(a) Only those portions of the NAS shoreline indicated on enclosure (1) as well as Harper, Pearson, and Goose Creeks, and Pine Hill Run (upstream to the hunter check station, Building 2497) are authorized areas. Boat fishing beyond 75 yards of the shore is subject only to State sportfishing regulations. Boat ramps at Harper's Creek and West Basin are authorized for use.

(b) The State of Maryland defines the Patuxent River as a line drawn from Drum Point in Calvert County to Hog Point in St. Mary's County. The Patuxent River is a tributary to the Chesapeake Bay and all associated State sportfishing regulations will be enforced.

(c) Residents of Quarters A, Quarters B, and Gold Coast housing units may fish, shellfish, and crab in front of their quarters with purchase of state licenses and base permit. These areas are off limits to all other recreational fishing, shellfishing, and crabbing.

(d) Special area restrictions for recreational fishing, crabbing, and shellfishing on NAS and WFA are as follows:

1. Fishing and crabbing will not be permitted along the eastern section of the West Basin sea wall when surface effect ship launching or active docking operations are in progress. This area will be open to fishing or crabbing when ships are moored or absent.

2. All waters of Harper and Pearson Creeks north of the Harper's Creek Bridge are closed to shellfishing.

3. The large pier at WFA may be used for fishing and crabbing during periods when the airfield is inactive. Persons wishing to fish or crab from the pier should contact flight planning at (301) 342-3836 for airfield status. The boat ramp and pier at the WFA Coast Guard (CG) Facility is for official use only. Under no circumstances may vehicles be parked near the boat ramp or Coast Guard facility.

4. The fishing pier at SRC is the only place fishing is allowed on the facility.

e. Camping. Camping, occupying RV's, or erecting temporary shelters while fishing is permitted in many areas, but may require additional permits and fees. Contact the MWR permit issuing clerk for details.

f. Regulations. All fishing, shellfishing, and crabbing at NAS, WFA, or SRC will be conducted per the State of Maryland regulations. There will be no open season on any fish, shellfish, crustacean, reptile, or amphibian, except as specified in reference (b). Many of the following regulations are derived directly from state laws or regulations, and are subject to change. Station regulations may be more restrictive, but not more permissive, than state regulations. In cases of apparent regulatory conflict or contradiction, the state law or regulation shall take precedence.

(1) Freshwater Fishing.

(a) An angler is limited to not more than three fishing rods at any one time.

(b) Creel and size limits:

1. A person may possess two (2) largemouth bass per day between 9 and 11 inches total length from 16 June to 28 February only.

2. A person may **not** possess largemouth bass between 11 and 15 inches total length at any time.

3. A person may possess one (1) largemouth bass per day over 15 inches total length from 16 June to 28 February only.

4. **Largemouth bass of any size may not be possessed from 01 March to 15 June.** Fish may be caught, but they must be released.

5. Station ponds are managed on a trophy bass fishery as detailed in enclosure (3).

6. A person may not possess a catfish under ten (10) inches total length. There is a daily limit of five (5) catfish per person.

7. A person may **not** possess more than 15 bluegill per day; 30 possession, in aggregate. There is no minimum size limit for bluegill.

8. A person may **not** possess more than 15 crappie (black or white) per day; 30 possession, in aggregate. There is no minimum size limit for crappie.

(c) Gasoline engines may **not** be operated on the ponds. Electric trolling motors are permitted.

(d) Digging for bait in the vicinity of the ponds is prohibited to prevent erosion and siltation.

(e) In order to prevent the harmful introduction of exotic fish species, the use of live baitfish is restricted. Fishermen may use only native species caught from the body of water they are fishing. No other live fish may be released to any station waters without written permission from the NRB.

(f) No trotlines, fish traps, or chemicals may be placed in the ponds except under the direction of the Station

Environmental Department Conservation Division. Bush-bobs, bank-bobs, and jug rigs are not permitted.

(g) Vehicles may **not** be driven onto or across pond dams.

(h) Bullfrogs may be taken by hand from any station waters with gigs, rods, dip nets, etc. Shooting is prohibited. Frogs may not be taken from 01 May to 31 July. There is no limit on the number of bullfrogs that may be taken.

(i) It is lawful to shoot carp with a bow and arrow.

(j) Snapping turtles may be taken for personal consumption subject to the following methods. A person may not catch snapping turtles by the use of hook and line, trotline, bow and arrow, spear, gig or gig iron, or any other device capable of piercing any part of a turtle. Turtles may be taken with turtle traps, turtle nets, or by hand.

(2) Saltwater Fishing and Crabbing.

(a) Wanton Waste: Fish, such as skates and stingrays (including the locally common Cownose Ray), may not be deliberately killed and left in the field. Skates and rays that are incidentally caught must be released by cutting the line or removing the hook. Fishermen are encouraged to utilize as much of their catch as possible.

(b) An angler may use up to, but not more than three (3) fishing rods, except on the Goose Creek and SRC fishing pier where only two (2) rods are permitted.

(c) Defacing (or any other abuse of any government property) and littering, including the discarding of monofilament line, are expressly forbidden.

(d) Fish, crabs, and shellfish harvested on NAS, WFA, or SRC may not be sold.

(e) Crabbing season follows State of Maryland regulations (usually open from 01 April through 15 December). A recreational crabber, without a license, may possess two (2) dozen hard crabs per person and one dozen peeler and soft crabs per person.

(f) A recreational crabber, with a license, may possess one (1) dozen hard crabs per person and one dozen peeler and soft crabs per person.

(g) A recreational crabber, with a license, may possess one (1) bushel of hard crabs and two (2) dozen peeler or soft crabs.

(h) Crab minimum size requirements, from shell tip to tip, are as follows:

1. Male hard crabs five (5) inches, 01 April - 14 July

2. Male hard crabs five (5) and one quarter (1/4) inches, 15 July - 15 December

3. Mature female crabs no minimum size limit

4. Soft crabs - three and one half (3 ½) inches, 01 April - 15 December

5. Peeler crabs - three and one quarter inches (3 ¼), 01 April - 14 July

6. Peeler crabs - three and one half (3 ½) inches, 15 July - 15 December.

(i) recreational crabbers may not use crab traps or baskets on Wednesdays. Only dip nets, hand lines, and pots at private piers are permitted on Wednesdays.

(j) An individual may use a maximum of five (5) collapsible crab traps.

(k) One trotline, measuring a total length of 600 feet, may be used per boat to catch crabs. However, an individual may not set or fish a trotline within 100 feet of another person's trotline.

(l) No crab pots may be used on Station except for residents of coastal housing areas, who may set up to two (2) crab pots, attached by rope or line to a pier, dock, or shoreline without a crab pot license.

(m) Monofilament cast nets may be used to catch baitfish.

(n) It is unlawful to possess an egg bearing female (sponge) crab.

(o) An individual may catch crabs with a crab seine not exceeding 50 feet in total length, which must be hauled up in the water and not on shore.

(p) Baitfish collection: The collection of baitfish from all Station waters shall be subject to the following limits:

1. A seine up to 50 feet in total length and five (5) feet wide may be used to obtain bait minnows.

2. Baitfish is defined as non-game fish that are used whole or in part as bait for other game fish. Non-game fish are those without established seasons, size or creel limits. The only baitfish that may be harvested on Station include minnow, spot, alewives, menhaden, and herring.

3. Minnows including killifish (otherwise know as bullminnows), mummichogs, sheepshead, shiners, anchovies, and silversides may be caught with nets or minnow traps. A combined total of 25 minnows may be caught per licensed/permitted fisherman per day. The possession limit - the total of which may be kept on hand at any one time shall be 25 minnows.

4. Spot may be caught by net, trap, or hook and line. A total of 50 spot may be caught per licensed/permitted fisherman per day. The possession limit (the total of which may be kept on hand at any one time) shall also be 50 spot.

5. Alewives, menhaden, or herring may be caught by net or trap. A combined total of 10 gallons (or 100 pounds whichever is less) may be caught per licensed/permitted fisherman per day. The possession limit (the total of which may be kept on hand at any one time) shall also be 10 gallons or 100 pounds.

6. No fish, crab, or shellfish may be caught and sold for commercial purposes from waters of the Naval Air Station or Solomon's Recreation Center.

Reference (b) contains creel and size limits for saltwater fish.

(3) Shellfishing.

(a) The annual shellfishing season opens on 15 December and closes 28 February. Water and/or oyster quality tests may be conducted by the Station Environmental Department Conservation Division prior to 15 December each year. The season opening date may be delayed if these tests indicate the need. There is no shellfishing authorized at SRC.

(b) Shellfish harvested on NAS/WFA may **not** be sold.

(c) The limit of oysters or clams is one (1) bushel each per family per day. A bushel container is not capable of holding more that 6,237 cubic inches.

(d) Oysters may be taken only by hand with tongs, nippers, rakes, or by diving **without** tanks. Dredging is prohibited.

(e) Per State law, oysters may be harvested only from sunrise to 1500 hours on Monday through Friday and from sunrise to noon on Saturday. Shellfish may not be harvested on Sunday.

(f) All oysters taken must be at least three (3) inches in length from hinge to mouth. A person may possess a marketable size oyster that has undersize oysters or spat less than one inch in length from hinge to bill attached to them that cannot be separated without destroying the small oyster.

(g) All waters of Harper's and Pearson Creeks, north of the Cedar Point Road bridge, are closed to shellfishing.

g. Violations. Violations of applicable Federal and State of Maryland statues (Annotated Code of Maryland - Natural Resources) may result in criminal prosecution before States Magistrate for NAS, WFA, and SRC fishing privileges. The following is a list of common violations and administrative actions that may be taken against personnel who violate applicable State statues and/or provisions of this instruction. Additionally, the sponsor assumes all responsibility for their guest(s) and will receive the suspension for any violations. Permit suspensions may be in addition to criminal prosecution

and/or prosecution through the Uniform Code of Military Justice. Penalties for the first offense are listed. A repeated violation within 12 months of the first violation will result in a one-year suspension of privileges. Reinstatement of fishing, shellfishing, and crabbing privileges is at the discretion of the Commanding Officer.

MAXIMUM SUSPENSION	VIOLATION
1 year	Fishing with trotlines, fish traps, or chemicals in ponds, Vehicles operated on dam
1-year	Wanton waste
90 Days/permit purchase	Fishing without a permit, if a guest, sponsor receives suspension
90 Days	Fishing with live baitfish
90 Days	Violation of any State statute
90 Days	Defacing or destroying government property and littering
60 Days	Operation of gasoline powered motor in pond
60 Days	Violation of station limit, but not State limit
60 Days	Fishing, shellfishing, or crabbing in an unauthorized area
30 Days	Digging in the vicinity of the ponds

5. Action. The Environmental Department Conservation Division, is assigned the responsibility of controlling fishing, shellfishing, and crabbing on NAS, WFA, and SRC. The Station Police will enforce all applicable Federal, State, and Station regulations. Angler's must show their permits and government identification and/or identify their sponsor upon request of any police officer, Auxiliary Security Force, or Master-at-Arms.

6. Review Authority. The Conservation Division Director shall review this instruction annually and make changes as necessary.

GLEN IVES

Distribution:
Electronic only via Navy Directives
website https://mynavair.navair.navy.mil

b. Ultimately increase the numbers and size of bass.

c. Increase the average size of bluegill and red-eared sunfish available to anglers.

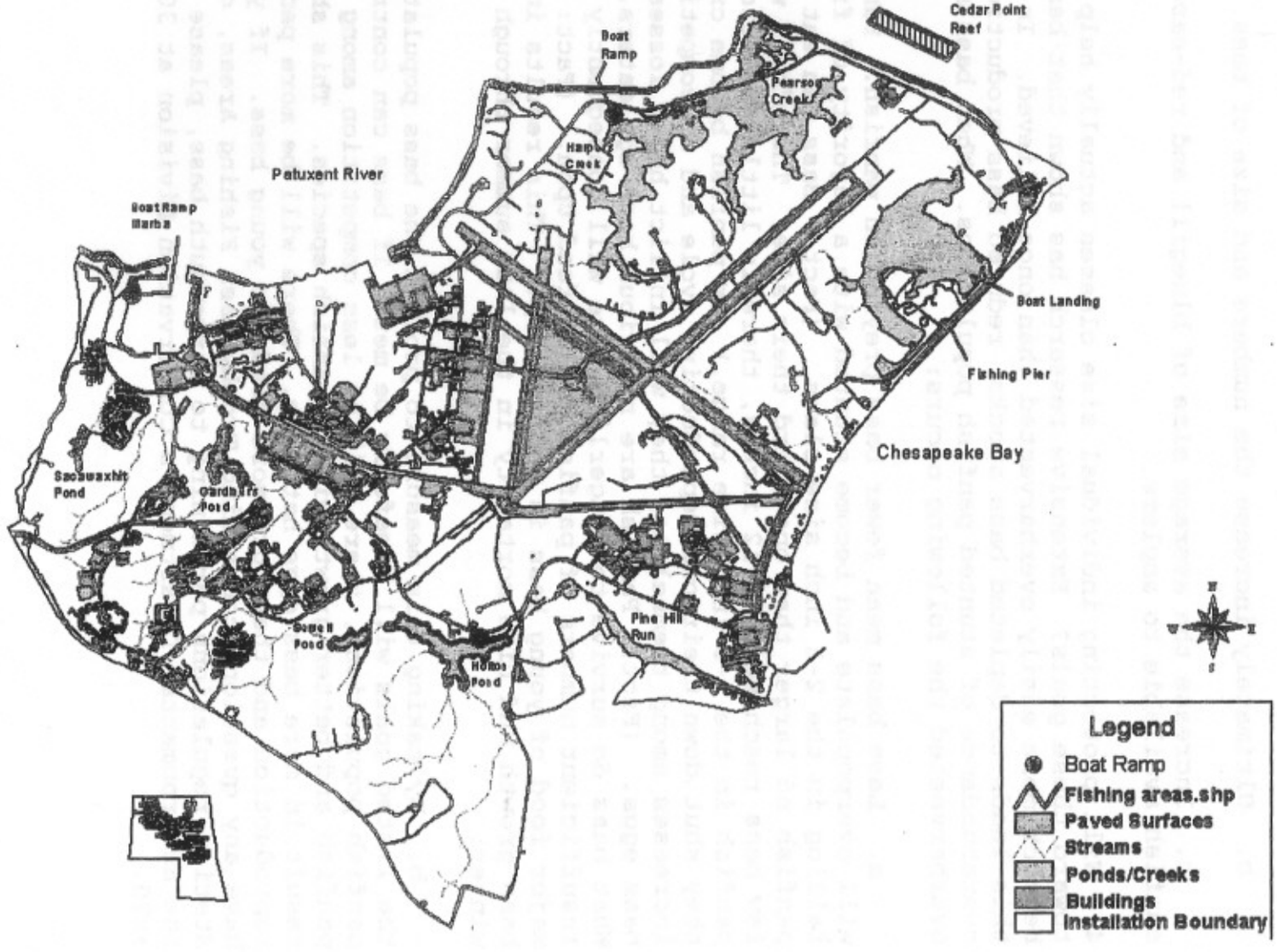
4. Will protecting individual size classes actually help work toward these goals? Extensive research has shown that bass can be much more easily overharvested than once believed. In turn, this leads to depleted bass stocks, reduced bass production, and overabundance of stunted panfish populations. When bass are overharvested the following occurs:

a. Less bass mean fewer bass preying on panfish. Panfish will overpopulate and become stunted with a majority of fish falling in the 2-5 inch size class. (Fact: Bass can eat panfish no larger than one-third their size. Therefore, with few bass reaching over 12 inches, there is little predation upon panfish in the 3-5 inch size range.) As panfish become crowded, they shut down their own reproductive cycle and as competition increases among themselves, they will inflict heavy losses on bass eggs. (Fact: Panfish are notorious bass egg eaters.) What bass do survive to fingerling size will consequently have insufficient numbers of panfish fry to feed upon. (Fact: The major food of young bass is panfish fry.) This results in poor bass growth and high mortality in the late summer through winter.

b. By taking this measure to protect the bass population, the listed goals will hopefully be met. If bass can control panfish populations, there will be less competition among panfish and better growth within panfish species. This should result in more bass eggs hatching. There will be more panfish reproduction and therefore more food for young bass. If you have any questions concerning Trophy Bass Fishing Areas, or the Station regulations pertaining to largemouth bass, please call the Environmental Department's Conservation Division at 301-342-3670.

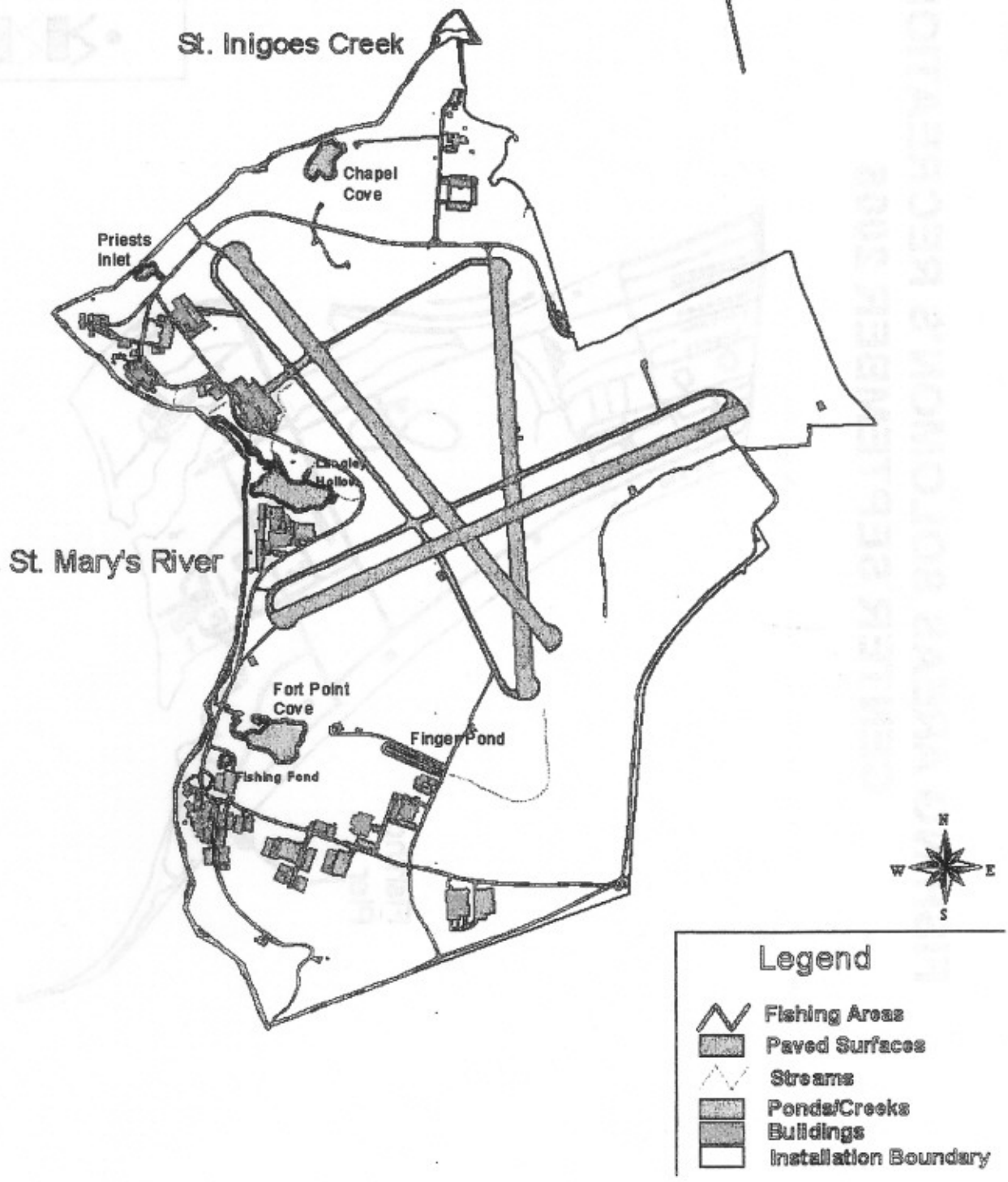
NASPAXRIVINST 11015.7M
MAR 2 2007

FISHING AREAS NAS PATUXENT RIVER
MAIN SITE SEPTEMBER 2006



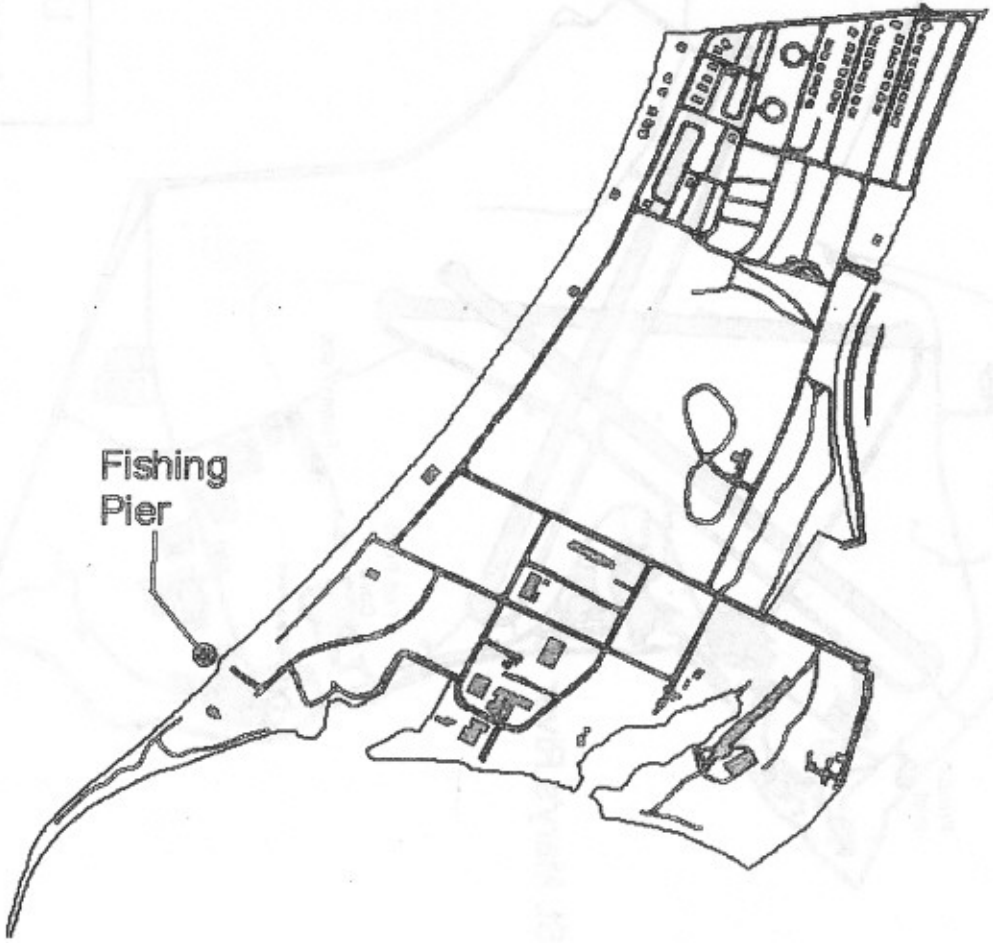
NASPAXRIVINST 11015.7M
MAR 2 2007

FISHING AREAS AT NAS PATUXENT RIVER
WEBSTER FIELD SEPTEMBER 2006



NASPAXRIVINST 11015.7M
MAR 2 2007

FISHING AREAS SOLOMON'S RECREATION CENTER SEPTEMBER 2006



Legend

- Fishing Pier
- Fishing Areas
- Paved Surfaces
- Streams
- Ponds
- Buildings
- Installation Boundary

APPENDIX 6
DATA CALL STATION REQUIRED INFORMATION

Data Call Information

Property Name and Total Acreage	Naval Recreation Center Solomons (296 acres)
Total Acreage of Developed vs. Non-developed Areas	75 developed/221 undeveloped
Total Acreage of Agricultural Outleases	N/A
Total Forest Acres	12
Total Recreation Acres	235
Number of Federal T&E Species	0
Number and Terms & Conditions for all Biological Opinions	0
Total Number of Candidate Conservation Agreements	0
Open Tasks in INRMP Implementation Table	9
NEPA Documentation Review CATEXs (List by Project)	0
NEPA Documentation Review EAs (List by Project)	0
NEPA Documentation Review EISs (List by Project)	0
NEPA Mitigation Effort	0
BASH Program	N/A
Hunting Program	No
Fishing Program	Yes
Invasive Species Survey	Yes (DoN 2007)

This page intentionally left blank

APPENDIX 7
URBAN FOREST MANAGEMENT GUIDELINES

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
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
Bushy broomsedge	*Andropogon glomeratus*	1.5' -5'		√	√		√	√	native warm-season grassland
Switchgrass	*Panicum virgatum*	3'-5'	√	√	√		√	√	native warm-season grassland

Common Name	Scientific Name	Height	Low Moisture	Moderate Moisture	High Moisture	Full Shade	Partial Sun	Full Sun	Suggested Uses
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
Hawthorn	*Crataegus* spp.	10'-20'		√			√	√	landscape
Sassafras	*Sassafras albidum*	20'-40'		√			√	√	landscape, reclamation

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

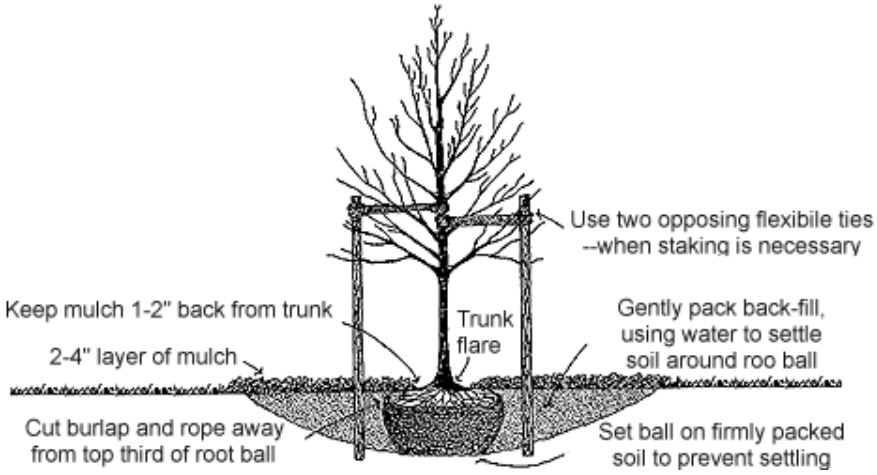
This page intentionally left blank

New Tree Planting

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

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

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



5. **Fill the hole, gently but firmly.** Fill the hole about 1/3 full and gently but firmly pack the soil around the base of the root ball. Then, if the tree is balled and burlapped, cut and remove the string and wire from around the trunk and top 1/3 of the root ball (see diagram). Be careful not to damage the trunk or roots in the process. Fill the remainder of the hole, taking care to firmly pack soil to eliminate air pockets that may cause roots to dry out. To avoid this problem, add the soil a few inches at a time and settle with water. Continue this process until the hole is filled and the tree is firmly planted. It is not recommended to apply fertilizer at the time of planting.
6. **Stake the tree, if necessary.** If the tree is grown and dug properly at the nursery, staking for support is not necessary in most home landscape situations. Studies have shown that trees will establish more quickly and develop stronger trunk and root systems if they are not staked at the time of planting. However, protective staking may be required on sites where lawn mower damage, vandalism or windy conditions are concerns. If staking is necessary for support, two stakes used in conjunction with a wide flexible tie material will hold the tree upright, provide flexibility, and minimize injury to the trunk (see diagram). Remove support staking and ties after the first year of growth. Leave protective staking in place as long as necessary.
7. **Mulch the base of the tree.** Mulch is simply organic matter applied to the area at the base of the tree. It acts as a blanket to hold moisture, protect against harsh soil temperatures, both hot and cold, and reduces competition from grass and weeds. Some good choices are leaf litter, pine straw, shredded bark, peat moss, or wood chips. A two to four inch layer is ideal. More that four inches may cause a problem with gas exchange. When placing mulch, care should be taken so that the actual trunk of the tree is not covered. This may cause decay of the living bark at the base of the tree. A mulch-free area, one to two inches wide at the base of the tree, is sufficient to avoid moist bark conditions and prevent decay.

8. **Follow-up care.** Keep the soil moist but not soaked; overwatering will cause leaves to turn yellow or fall off. Water trees at least once a week, barring rain, and more frequently during hot weather. When the soil is dry below the surface of the mulch, it is time to water. Continue until mid-fall, tapering off for lower temperatures that require less frequent watering. Other follow-up care may include minor pruning of branches damaged during the planting process. Prune sparingly immediately after planting, and wait to begin necessary corrective pruning until after a full season of growth in the new location.

(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

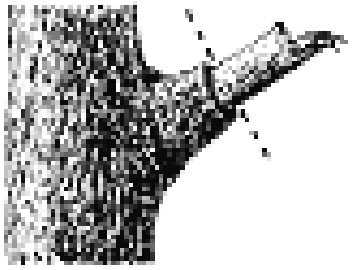
Most routine pruning to remove weak, diseased or dead limbs can be accomplished at any time during the year with little effect on the tree. As a rule, growth is maximized and wound closure is fastest if pruning takes place before the spring growth flush. Some trees, such as maples and birches, tend to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

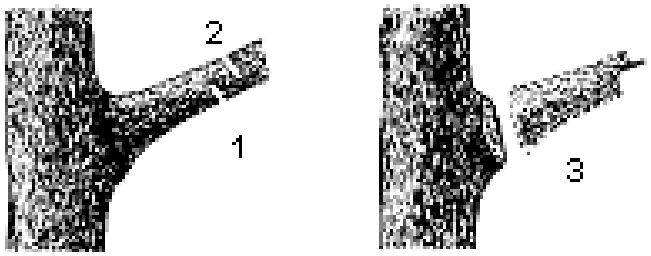
Making Proper Pruning Cuts to Mature Trees

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*)