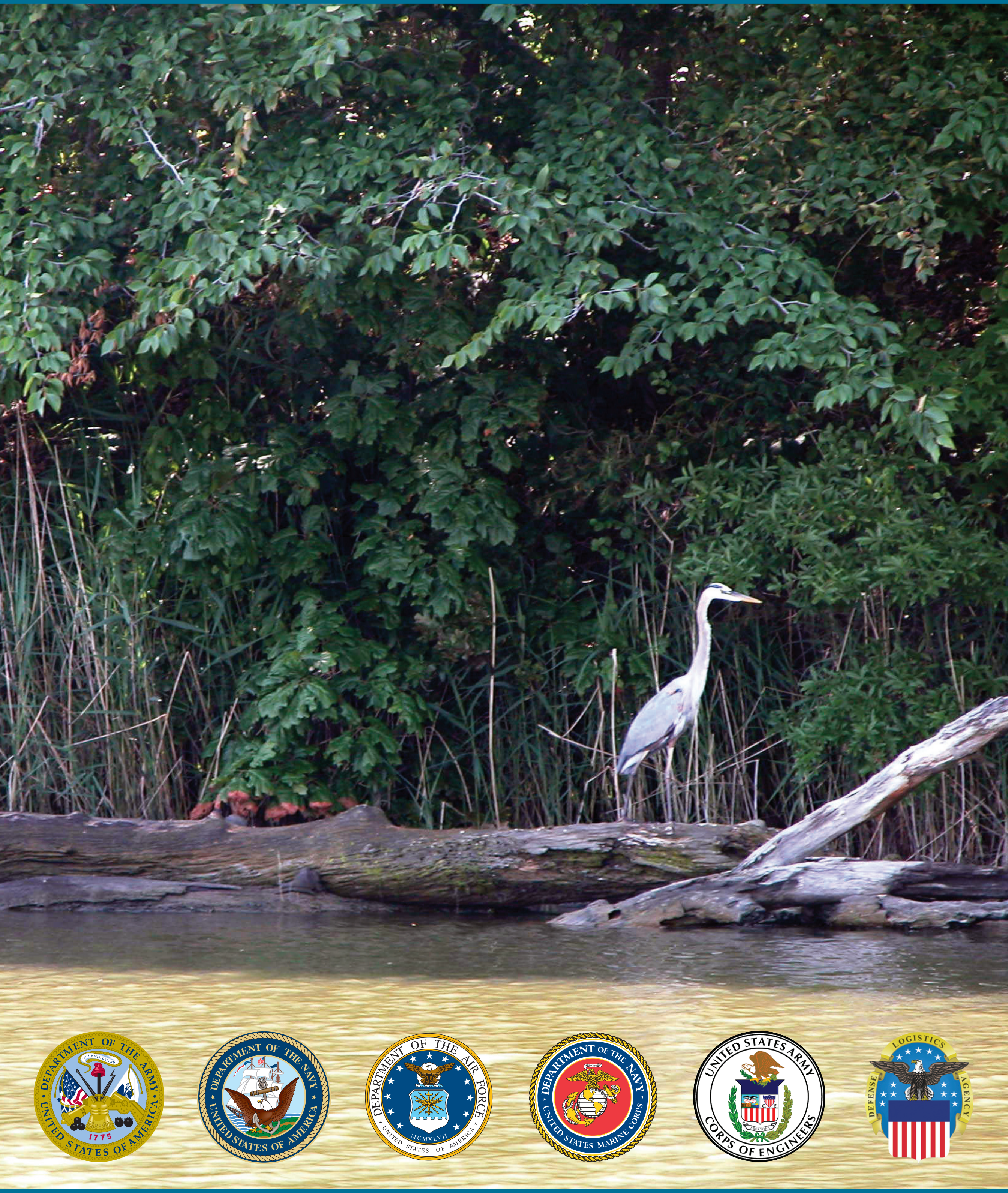
Defending Our National Treasure:

A Department of Defense Chesapeake Bay Restoration Partnership 1998–2004



Defending Our National Treasure:

A Department of Defense Chesapeake Bay Restoration Partnership 1998–2004

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Acknowledgements:
This book would not have been possible without the concerted efforts of a myriad of dedicated and motivated people who work everyday to improve the quality of the environment throughout the Chesapeake Bay and its watershed, particularly the environmental staff of the Department of Defense Chesapeake Bay installations. The activities that take place at the various Department of Defense installations are generally not visible to the public. This book is intended to highlight some of the accomplishments by Department of Defense personnel and provide context to the activities that are occurring within one of the the largest landholders in the watershed.

Science communication input on design and layout was provided by Tracey Saxby, Jane Thomas, Jane Hawkey, and Emily Benson.

This book was supported by the Chesapeake Watershed Cooperative Ecosystem Studies Unit (CESU), which is comprised of nine university/research institutions and six Federal agencies, (www. cesu.al.umces.edu).

IAN Press ▪ Cambridge, Maryland USA ▪ 2007

Requests for copies of this book or recopies of the materials within should be made to:
Commander, Navy Region Mid-Atlantic
Chesapeake Bay Program, 1510 Gilbert Street, Norfolk, VA 23511-2737
Phone: 757-887-4707 or 757-887-4933

For bibliographic purposes this book may be sited as:
Lane, H., J.L. Woerner, W.C. Dennison, C. Neill, C. Wilson, M. Elliott, M. Shively, J. Graine, and R. Jeavons. 2007. *Defending Our National Treasure: Department of Defense Chesapeake Bay Restoration Partnership 1998-2004*. Integration and Application Network, University of Maryland Center for Environmental Science, Cambridge: MD.

First published 2007
ISBN 978-1-60461-231-8

Printed by Economy Printing, Easton, Maryland
Set in Minion Pro 10pt
Cover printed on 100 lb paper

Cover photo: Great blue heron along the Tred Avon River in Maryland, Jane Hawkey. *Chapter cover photo credits:* Chapters 1–5: Department of Defense, Appendices: Heather Lane

FOREWORD

The Department of Defense is one of the largest Federal landholders in the Chesapeake Bay watershed with over 420,000 acres spread among 68 installations. The lands, waters and air of the Chesapeake Bay are essential for the Department of Defense to achieve its military training and readiness mission. Department of Defense installations strive to integrate military mission with environmental stewardship to ensure environmental improvement of the Bay. This report, ***Defending Our National Treasure: A Department of Defense Chesapeake Bay Restoration Partnership 1998–2004***, provides a showcase of the recent efforts of Department of Defense civilians, soldiers, and their families that contribute to Bay restoration.

As reflected in the recent Department of Defense Directive "Environment, Safety and Occupational Health," the Department of Defense leadership is requiring that environmental considerations be part of every significant aspect of military operations—from design to disposal. The Department of Defense is transitioning beyond compliance with environmental requirements to maintain defense readiness today while assuring the sustainability of natural resources needed for future military training and testing. The Department now views compliance as a "floor," not a "ceiling" in achieving its environmental goals. Our efforts have moved beyond cleanup to conservation, protection, and sustainment of the Bay's natural resources under our trusteeship. Department of Defense installations are engaged to protect and restore living resources, vital habitat, and water and air quality in and around our installations.

Protecting our resources is incorporated into Department of Defense's sustainable building design principles. Military construction projects are encouraged to use low impact development (LID) technologies for new storm water construction projects. For instance, Navy installations located in Washington D.C. have used ten different LID technologies in parking lots, roadways, and open spaces that filter pollutants and control storm water runoff. The Pentagon recently constructed a four-acre green roof, one of the largest on the East coast, on its Remote Delivery Facility. This facility not only reduces runoff but also saves on energy costs.

Much of the Department of Defense's environmental success in the Chesapeake Bay is due to partnerships. By partnering with our neighboring communities and federal, state, and local agencies, we can share expertise and ensure that our progress toward achieving *Chesapeake 2000* restoration and protection goals is more efficient and effective. For example, the Army, to meet vital habitat restoration goals, created a premier submerged aquatic vegetation (SAV) program near Aberdeen, Maryland in cooperation with the University of Maryland. This ongoing program involves research, restoration, and sharing of scientific data on submerged aquatic vegetation with the State of Maryland and the Virginia Institute of Marine Science. Other installations, such as Langley Air Force Base in Hampton, Virginia and the U.S. Naval Academy in Annapolis, Maryland have also participated in SAV restoration and research efforts.

Some of our greatest progress is through relationships developed by the local installations with their communities by providing public access and educational opportunities to help area residents learn about the Bay ecosystem and their everyday impacts on it. Sometimes this outreach extends beyond the environmental arena to lend a helping hand to the community to preserve vital aspects of our nation's cultural heritage. In September 2003, Fort Lee near Hopewell, Virginia, within twenty-four-hours notice, located a building on-site that would provide 15,000 square feet of space, utilities, and security for 600,000 archeological artifacts from the Jamestown National Park Service's Visitor Center that were endangered by Hurricane

Isabel. The building was re-keyed to provide security, military police were assigned to patrol the area, National Park Service staff were given passes to get in and out of the post, and access to a forklift was provided—all at no charge by Fort Lee.

The Department of Defense will continue to balance and integrate defense activities with the Chesapeake Bay's restoration and protection. We will employ new technologies and practices that improve our environmental programs and commitments to the Bay. The Department of Defense will help demonstrate the difference we can make by encouraging greater environmental awareness in the Chesapeake Bay watershed. The challenge we face and shall meet is to achieve a secure, sustainable future that contributes not only to the success of our armed forces and our nation, but also the success of restoring and protecting our environmental treasures, such as the Chesapeake Bay.

Department of Defense

Alex A. Beehler

Assistant Deputy Under
Secretary of Defense
(Environment, Safety &
Occupational Health)

PREFACE

Defending Our National Treasure: A Department of Defense Chesapeake Bay Restoration Partnership 1998–2004 provides an overview of major issues impacting the Chesapeake Bay, history of the Department of Defense's involvement in Bay restoration efforts, current Department of Defense Chesapeake Bay restoration initiatives, specific case studies, and viewpoints of various key individuals dedicated to restoration. These topics are presented in a richly illustrated style including maps, photographs, conceptual diagrams, and figures to uniquely communicate information and make it accessible to a broad audience. Each section provides the essence of each topic rather than the complete and comprehensive treatment. For example, there are numerous documents describing Chesapeake Bay and Department of Defense initiatives (www.denix.osd.mil). ***Defending Our National Treasure*** provides the context and background for the issues impacting the Chesapeake Bay and describes the restoration activities conducted on the Department of Defense installations within the Bay watershed.

As one of the largest landholders in the Chesapeake Bay watershed, the Department of Defense's efforts have an important role in the restoration and improvement of the Chesapeake Bay. Department of Defense activities exemplify the positive effects of interagency cooperation and demonstrate the commitments the Department of Defense has made with the U.S. Environmental Protection Agency and other Chesapeake Bay Program partners. Department of Defense initiatives and accomplishments with regard to the Federal Agencies' Chesapeake Ecosystem Unified Plan (FACEUP), the *Chesapeake 2000*, and the *Chesapeake Bay Restoration Act* (CBRA) of 2000 are included in this report. The amount of land the Department of Defense manages both directly on the shores of the Chesapeake Bay and within its watershed is substantial. All branches of the Department of Defense (Army, Army Corps of Engineers, Air Force, Navy, and Marine Corps) take their land stewardship seriously. Department of Defense installations within the Bay watershed proactively establish restoration initiatives

Photos: Department of Defense

Department of Defense restoration efforts in the Chesapeake Bay demonstrate how interagency cooperation and partnerships with organizations like the Chesapeake Bay Program can bring about improvements in Bay health.

Photos: Department of Defense

Department of Defense installations in the Chesapeake Bay watershed provide green space for wildlife in the face of increased urbanization. Environmental programs conducted by all branches of the military support vital habitat for living resources.

and are working to improve living resources, vital habitat, water quality, sound land use, and community engagement. Some examples of these intiatives include building living shorelines, using low impact development techniques, and creating partnerships with other agencies and organizations. Common challenges to military landholders in the Chesapeake region include invasion of exotic species, encroachment, and air pollution. Department of Defense installations span the gamut of the most historically degraded (Elizabeth River) to Aberdeen Proving Ground where an amazing resurgence of submerged aquatic grasses has occurred and the greatest number of bald eagle nests in the Chesapeake Bay are located. Thus, the Department of Defense's approach to restoration and protection provides widely-applicable examples for others facing similar challenges. One of the intentions of this book is to demonstrate the variety and complexity of Department of Defense restoration activities in and around the Chesapeake Bay.

The Chesapeake Bay is truly a national treasure: its bountiful resources have been described by writers since the time when Captain John Smith first arrived on its shores 400 years ago to the present. The Chesapeake Bay (Great Shellfish Bay) has immense resources and extensive shoreline providing a unique connection that people in the region have with the Bay. As a significant land holder in the Bay watershed, the Department of Defense is part of that unique connection. The national treasure of the Bay is severely threatened by the 17 million people living in this watershed and their associated activities. Department of Defense installations increasingly provide a haven of green space in an expanding urban and suburban population. Thus, what happens on installations not only affects the personnel who live and work on these installations but affects all the people in the region. It is clear that after hundreds of years of occupation and development of the watershed we need active intervention. The Department of Defense has responded to this challenge by developing environmental programs across the branches, across issues, and across the watershed.

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VIEW POINT

"Much of the Department of Defense's success in the Chesapeake Bay region has been the result of long standing partnerships with neighboring communities and federal, state, and local agencies. The Department of Defense continues to expand these partnerships in order to share expertise and ensure that our progress toward achieving restoration and protection goals in the Chesapeake Bay is effective and efficient."

Department of Defense

Donald R. Schregardus

Deputy Assistant Secretary of the Navy (Environment)

Mr. Schregardus is principal policy advisor on environmental programs, including conservation of natural and cultural resources, compliance with environmental laws and regulations, cleanup of contaminated sites, and programs for pollution prevention. He also represents the Department of the Navy on the Department of Defense Environmental, Safety and Occupational Health Board, and coordinates for the Department of Defense Clean Air Act and Clean Water Act issues of importance to the services.

Degrees

Mr. Schregardus received a Bachelor of Science in Physics in 1972 and a Master of Environmental Sciences in 1974 from Miami University, Oxford, Ohio.

Previous positions

Mr. Schregardus began his career with Argonne National Laboratory before joining the Environmental Protection Agency in 1974. He became the Region 5 water quality modeling expert and subsequently the Chief of the Compliance Section for the Water Division in Region 5. In 1989, he was appointed Deputy Director of Water Programs for the Ohio Environmental Protection Agency. In 1991, Governor Voinovich appointed Mr. Schregardus Director of the Ohio Environmental Protection Agency. When he stepped down as Director in 1999 he had served four years longer than any previous Director. Mr. Schregardus joined ms consultants, inc. as an Environmental Principal in 1999 prior to his appointment as the Deputy Assistant Secretary of the Navy (Environment) in November 2001.

1. THE CHESAPEAKE BAY

Wetlands at Fort Eustis, Virginia.

As a unique and vibrant ecosystem, the Chesapeake Bay offers residents and visitors the opportunity to explore nature through recreational activities such as fishing, swimming, and boating. In addition to these recreational activities, the Bay also provides habitat for numerous commerical fisheries. While we enjoy our interactions with the Bay, we must be aware that our activities affect its health. If we wish to continue to use the Bay as a source of recreation and industry, we need to understand how natural processes and human influences impact the Bay.

As a Chesapeake Bay partner, the Department of Defense recognizes the importance of promoting an understanding of Bay issues and offers the following information to provide context for its restoration and management programs. This overview focuses on the broad issues that influence Bay health, including its unique features, current issues facing the Bay, and current issues in restoration.

UNIQUE FEATURES OF THE CHESAPEAKE BAY

Several unique features of the Chesapeake Bay make it one of the most remarkable and productive ecosystems in the world. The Bay provides habitat for over 3,200 species and is among the most productive systems per unit area on the earth. Some of the features that contribute to the Bay's uniqueness include the size of its watershed, water flow in the Bay, its vulnerability to human degradation, and the population growth in the watershed.

Size of the Bay and its watershed

The Chesapeake Bay is the largest estuary in the United States. The Bay itself is the size of Connecticut, and its watershed is the size of Missouri. Like all estuaries, the size of the Chesapeake Bay is defined by salinity. An estuary encompasses the area in which the salt gradient goes from full freshwater to full ocean water. The upper tributaries of the Chesapeake

Department of Defense

Sunset over Fort Eustis, Virginia in the Chesapeake Bay watershed.

FACTS ABOUT THE CHESAPEAKE BAY

The Chesapeake Bay watershed

Area	64,000 sq. mi	165,000 sq. km
Length	360 mi	580 km
Width	180 mi	290 km
Avg. elevation	1,000 feet	300 m
Max elevation	4,700 feet	1400 m

The Chesapeake Bay

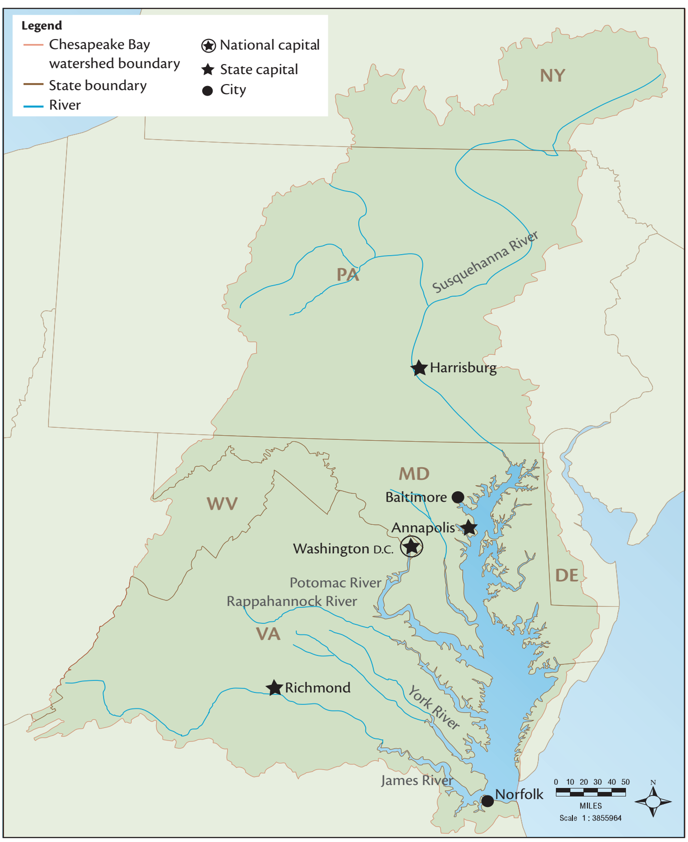
Area	5,200 sq. mi	13,000 sq. km
Length	200 mi	315 km
Width	3–35 mi	5–56 km
Avg. depth	30 feet	8.5 m
Max. depth	150+ feet	46+ m

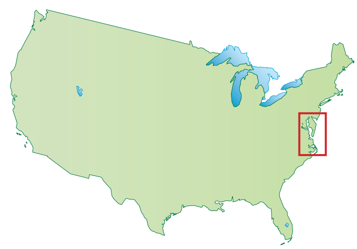
Bay length, width, and average depth from National Estuarine Atlas (NOAA, 1985); maximum depth from NOAA chart 1990 and B. Bolcourt (pers comm).

Bay are a tidal fresh region that is influenced by the ocean. Closer to the ocean, at the mouth of the Bay, salinity increases. However, full ocean salinity is not found until one enters the Atlantic Ocean proper. This far-reaching gradient means that the Chesapeake Bay covers a large area; it is this immense size that helps to make the Bay vulnerable to human activities.

Correspondingly, the Chesapeake Bay has a large watershed that incorporates the watersheds of many large tributaries including the Susquehanna, Potomac, Rappahannock, York, Patuxent, and James Rivers and several small tributaries including the Sassafras, Elk, Severn, and Choptank Rivers. These tributaries carry nutrients, sediment, and freshwater into the Bay (Figure 1).

FIGURE 1—THE CHESAPEAKE BAY IS A LARGE ESTUARY WITH A LARGE WATERSHED.





The Chesapeake Bay has a large watershed, equal in size to the state of Missouri. Many tributaries feed the Bay: some of the largest include the Susquehanna, Potomac, Rappahannock, York, Patuxent, and James Rivers.

Because the Bay is so large, it falls under the jurisdiction of six states, the District of Columbia, 3,000 local governments, and 23 federal agencies. The Bay's size and the multi-jurisdictional authority over it complicate management policies and make restoration challenging. However, numerous agencies, institutions, and non-profit organizations continuously find ways to work together to improve Bay health.

Water flow in the Chesapeake Bay

One of the natural processes key to understanding environmental conditions in the Bay is water flow in an estuary. The Chesapeake Bay has a classic two-layer flow in which lighter, less dense freshwater from rivers moves along the surface toward the ocean and heavier, more dense saltwater flows along the bottom (Figure 2). The isolated saltwater at the bottom of the Bay is often called the salt wedge. The salt wedge affects fish dynamics because many species have specially adapted larvae that thrive in higher salt concentrations. The two-layer flow persists until strong storms mix the bottom and surface waters. However, the trough in the central mainstem of the Bay is rarely mixed and frequently experiences anoxic or hypoxic conditions.

In estuaries, water clarity is influenced by the mixing of water. When water from the tributaries reaches the Bay, it dumps the sediment and other suspended particles it was carrying. These particles decrease water clarity in the upper Bay. The river water also brings nutrients to the Bay, encouraging algal blooms (phytoplankton) and turning the water green in some areas. Oceanic waters around the mouth of the Bay are more classically blue because they do not contain suspended particles or phytoplankton (Figure 2). Thus, the color of the Bay water changes as one moves toward the ocean.

KEY TERMS AND PHRASES

Estuary: A semi-enclosed body of water that has a free connection with the open ocean and has freshwater from rivers or streams mixing with saltwater. Estuarine waters are decreasingly salty in the upstream direction and increasingly salty downstream. The ocean tides are projected upstream to the freshwater tributaries that feed the estuary.

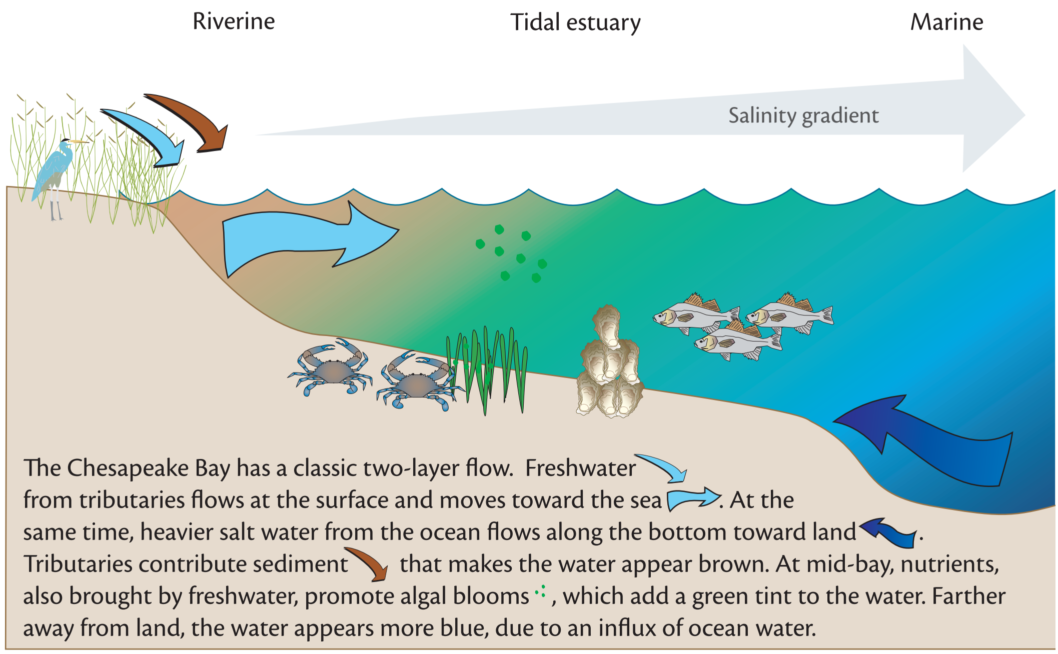
Salt wedge: A sharp boundary between the water masses, with freshwater floating on top and a wedge of saltwater on the bottom. Some mixing does occur at the boundary between the two water masses, but it is generally slight.

Anoxic: The condition where no oxygen is present in water. Frequently, anoxia is brought on by the decomposition of large algal blooms which rapidly consumes oxygen.

Hypoxic: A condition where very low levels of oxygen are present in water.

Sources: www.chesapeakebay.net/glossary.htm
www.oceanservice.noaa.gov/education/

FIGURE 2—FRESHWATER AND SEDIMENT INFLUENCE MIXING AND WATER CLARITY.



The Chesapeake Bay has a classic two-layer flow. Freshwater from tributaries flows at the surface and moves toward the sea. At the same time, heavier salt water from the ocean flows along the bottom toward land. Tributaries contribute sediment that makes the water appear brown. At mid-bay, nutrients, also brought by freshwater, promote algal blooms, which add a green tint to the water. Farther away from land, the water appears more blue, due to an influx of ocean water.

Vulnerability to human degradation

Many of the features that make the Chesapeake Bay special also make it vulnerable to human degradation. For example, the Bay's extensive shoreline provides valuable habitat. However, that same lengthy shoreline is a large source of land-derived sediments and nutrients that impact water quality and living resources.

Another special feature of the Bay is its productivity, due in part, to its ability to store nutrients. These nutrients allow energy to be transferred through phytoplankton to forage fish, large fish, and shellfish (Figure 3). In fact, the quantity of nutrients stored in the Bay is such that it can support a staggering amount of wildlife. Reports from the first explorers and settlers describe how the waters were teeming with oysters and the sky was black with waterfowl. The Bay's name reflects its productivity: *Chesapeake* is a Native American word meaning shellfish. However, because the Bay is so retentive, all the things that are transferred, injected, or deposited in the Bay are not easily removed.

Adding to the Bay's vulnerability is the fact that it falls under the jurisdiction of six states, the District of Columbia, 3,000 local governments, and 23 federal agencies. All of these entities play a role in how the Bay is managed. In addition, there is a large land-to-water ratio in the watershed, resulting in heavy nutrient and sediment loads.

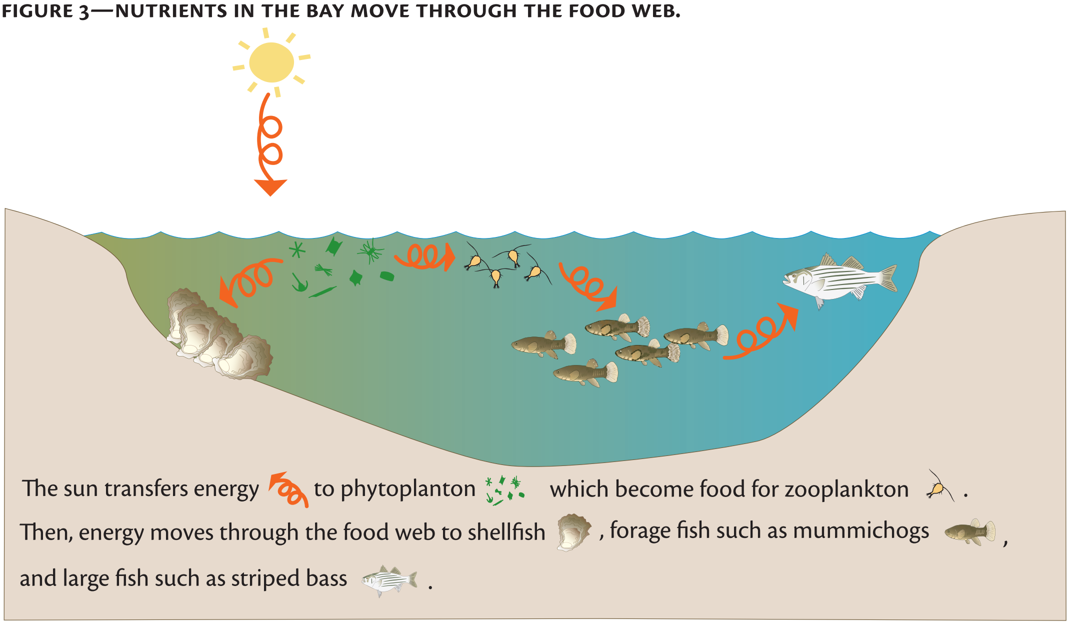
USDA Natural Resources Conservation Service

The Chesapeake Bay supports thousands of waterfowl.

Department of Defense

Fifty major tributaries and thousands of creeks, streams, and rivers make the Chesapeake Bay very accessible. Channels such as these at Fort Eustis, Virginia provide accessibility.

FIGURE 3—NUTRIENTS IN THE BAY MOVE THROUGH THE FOOD WEB.




Lynn Betts, USDA Natural Resources Conservation Service

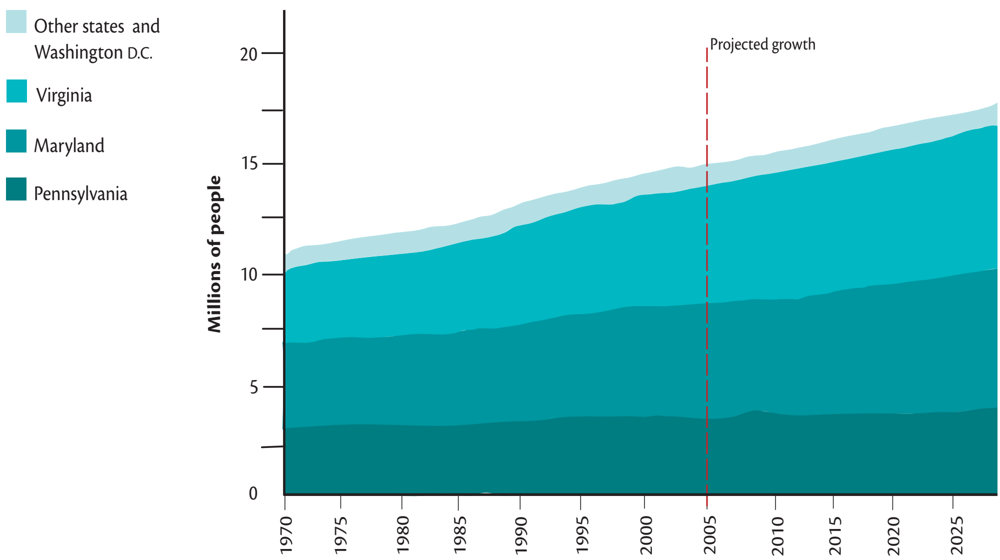
With rapid land use changes, farm land quickly becomes residential areas.

Population growth in the watershed

The Chesapeake Bay watershed covers a large amount of land, and within the watershed the population is growing at a rapid rate (Figure 4). This growth can be attributed to several factors including the historic settlement of major cities, expansion of urban centers, increased coastal development, and immigration.

Historically, settlers built cities along the fall line, (the point at which waterfalls made it impossible for explorers to take their boats further up a waterway). Thus, urban centers such as Baltimore and Richmond were established at their current locations. In addition, sea ports such as Annapolis, Oxford, and St. Michaels were settled as trading centers. These urban centers are continuing to expand today in combination with coastal development. In addition, immigrants are drawn to the region by its attractive coastlines and close proximity to important political centers such as Washington D.C.

FIGURE 4—REAL AND PROJECTED POPULATION GROWTH IN THE BAY WATERSHED FROM 1970–2030.



The Chesapeake Bay Program Scientific and Technical Advisory Council

VIEW POINT

"As one of the watershed's major landowners, it is great to see that the Department of Defense understands how important the management of its facilities are in the restoration efforts of the Chesapeake Bay."

University of Maryland Center of Environmental Science

Donald F. Boesch

President, University of Maryland Center for Environmental Science

Dr. Boesch is a Biological Oceanographer who has conducted research in coastal and continental shelf environments along the Atlantic Coast, Gulf of Mexico, eastern Australia, and the East China Sea.

His present research is focused on the use of science in Ecosystem Management, and he is active in extending his knowledge in environmental and resource management at regional, national, and international levels.

Degrees
B.S., Tulane University; PhD, College of William and Mary

Previous positions
Executive Director of the Louisiana Universities Marine Consortium; Professor of Marine Science at Louisiana State University; Faculty Member at the Virginia Institute of Marine Science

Selected publication
Boesch, D.F. and J. Greer (eds.). 2003. Chesapeake Futures: Choices for the 21st Century. Chesapeake Research Consortium, Inc., Edgewater, Maryland.

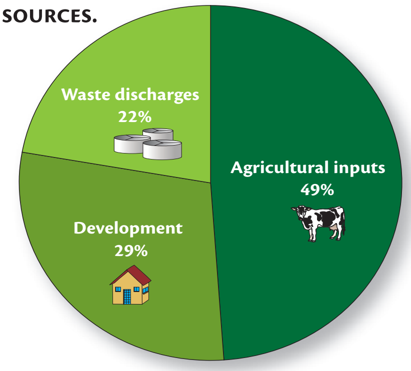
CURRENT CHESAPEAKE BAY ISSUES

Currently, the health of the Chesapeake Bay is influenced by a variety of issues which stem from both natural and human activities. The following is a summary of the issues that have the greatest impact on the Bay.

Increased nutrients

The issue of greatest concern in the Chesapeake Bay region is nutrient loading. Nutrients such as phosphorus and nitrogen enter the Bay through runoff. Nitrogen and phosphorus come from a variety of sources and have value as fertilizers (Figure 5). However, when they are displaced into the Bay, they become pollutants that can trigger large algal blooms.

FIGURE 6—PHOSPHORUS IS DERIVED FROM MANY SOURCES.



The Chesapeake Bay Program Scientific and Technical Advisory Council

The main source of phosphorus in the Bay watershed is agricultural inputs such as animal manure. Other sources of phosphorus include development and waste discharges from treatment plants.

Phosphorus

Phosphorus, a nutrient of interest to many researchers, is typically bound to soil and sediment particles and associated with wastewaters. In this region, the primary source of phosphorus is runoff from animal manure (Figure 6). The best management procedures used to curb phosphorus loading include manure control and wastewater treatment upgrades. Phosphorus inputs are also increased by development, which increases impervious surfaces. Impervious surfaces increase the runoff that carries phosphorus to the Bay.

FIGURE 5—THERE ARE NUMEROUS SOURCES OF NUTRIENT INPUTS IN THE CHESAPEAKE BAY WATERSHED.

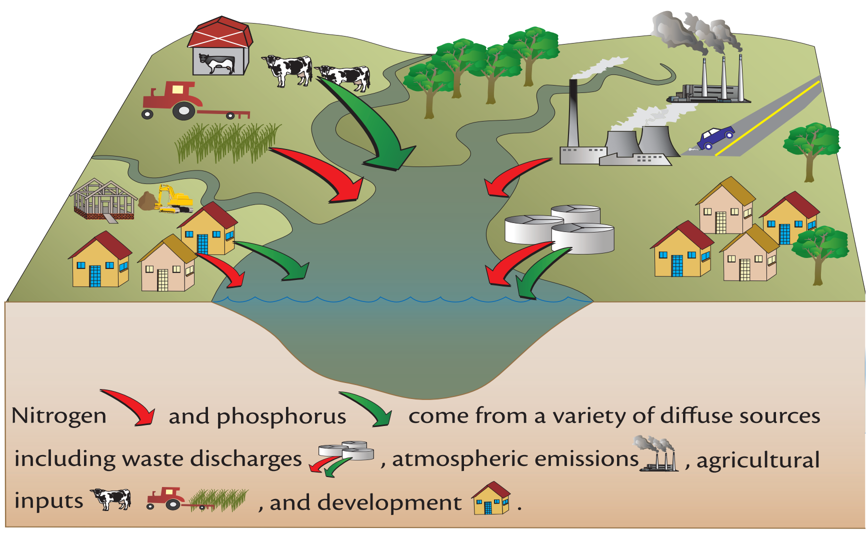
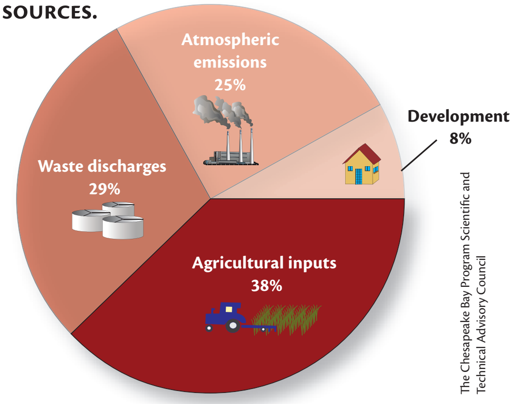


FIGURE 7—NITROGEN IS DERIVED FROM MANY SOURCES.



The Chesapeake Bay Program Scientific and Technical Advisory Council

Like phosphorus, agricultural inputs are the primary source of nitrogen in the Bay. Atmospheric and waste discharges also contribute to nitrogen in the Bay, and development makes up a small portion of nitrogen inputs as well.

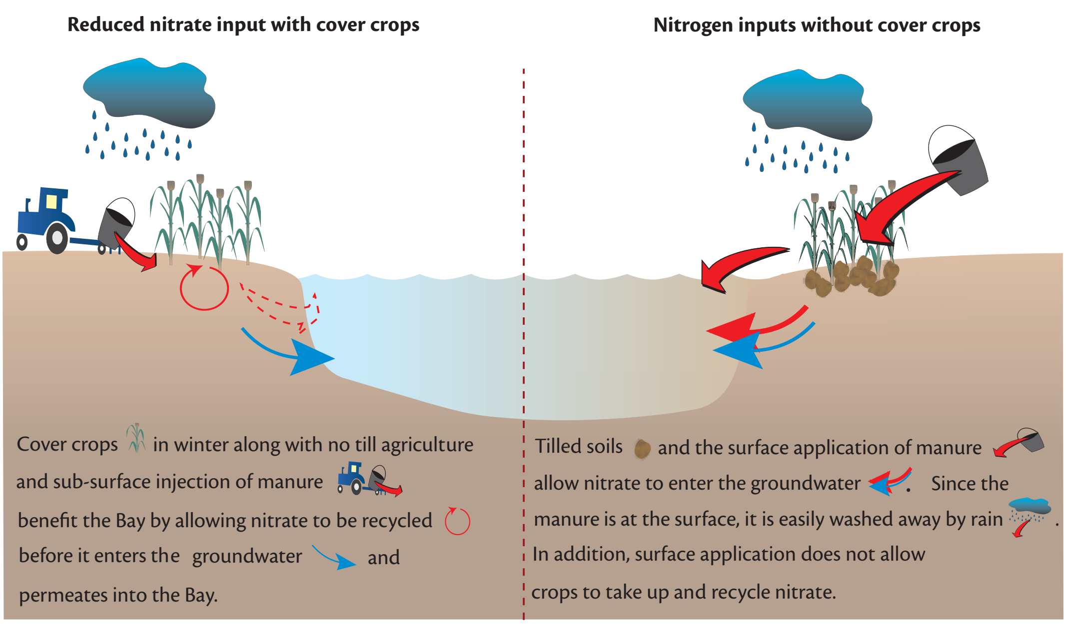
Department of Defense

Cover crops at the Naval Support Facility Patuxent River, Maryland. Cover crops can reduce nitrate inputs to the Bay.

Nitrogen

The other nutrient of primary concern is nitrogen. Nitrogen in the Chesapeake Bay is derived almost equally from atmospheric emissions, agricultural inputs, and waste discharge (Figure 7). Yet, the central issue concerning nitrogen in the Bay is nitrate enrichment due to agricultural inputs. Nitrate, a form of nitrogen, moves quickly through groundwater into the Bay. Once nitrate enters the groundwater system, it is almost impossible to remove. However, extensive research suggests that cover crops (crops planted in winter following the harvest of the cereal grain rotation) can absorb nitrate before it reaches the groundwater system (Figure 8). Timing in cover crop implementation is essential because early planting is shown to be more effective than later planting. Currently, cover crop incentive programs are based on early planting timetables.

FIGURE 8—WINTER COVER CROPS REDUCE NITRATES IN GROUNDWATER AND STREAMS.



Low levels of oxygen in bottom waters

Nutrients also play an integral role in another Bay issue: low levels of oxygen in the bottom waters. Runoff from urban centers, sewage systems, agriculture, and atmospheric inputs has injected nutrients into the Chesapeake Bay. Each spring, increased temperatures and an influx of nutrients trigger algal blooms (phytoplankton). The phytoplankton grow faster than consumers can eat them. The blooms then exhaust the nutrient resources in the area and the bloom collapses. After the collapse, the phytoplankton settle to the bottom waters and become a substrate for bacteria. These bacteria begin to decompose the phytoplankton, a process that consumes oxygen. Because the two-layer flow (previously discussed on page 4) limits the interaction between bottom and surface waters, re-oxygenation by the atmosphere cannot take place. Thus, the bacteria remove the oxygen in the water until it steadily decreases to a vanishingly small concentration. The bottom waters' inability to re-oxygenate causes anoxic (no oxygen) and hypoxic (low oxygen) waters to accumulate in the deeper waters of the Bay, particularly the drowned Susquehanna River channel—the deep part of the Bay that was once the river's stream bed (Figure 9).

OXYGEN TOLERANCE OF DIFFERENT ORGANISMS IN THE CHESAPEAKE BAY

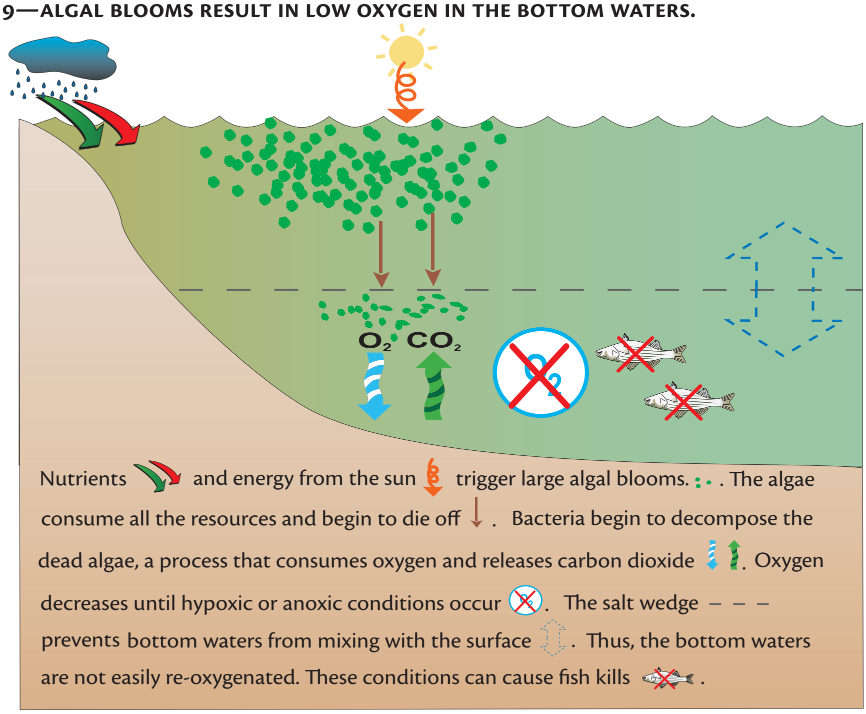
Organism	*Dissolved oxygen (mg/L)*
Striped bass	2.80
Eastern oyster	<1.5
Blue crab	<1.0

Source: www.epa.gov/waterscience/criteria/dissolved/index.html

These areas are commonly called dead zones because fish are unable to live there. Also, some tributaries of the Bay have low oxygen regions due to isolated land sources of nutrients that trigger blooms or sloshing of anoxic or hypoxic waters from the mainstem.

Historically, the issue of preventing low levels of oxygen in deep waters became so important that it inspired the creation of the Chesapeake Bay Program in 1983. Currently, an on-going monitoring project—ecological forecasting—uses freshwater flow information and nutrient loads to predict the size of the annual hypoxic zone.

FIGURE 9—ALGAL BLOOMS RESULT IN LOW OXYGEN IN THE BOTTOM WATERS.



Harmful algal blooms

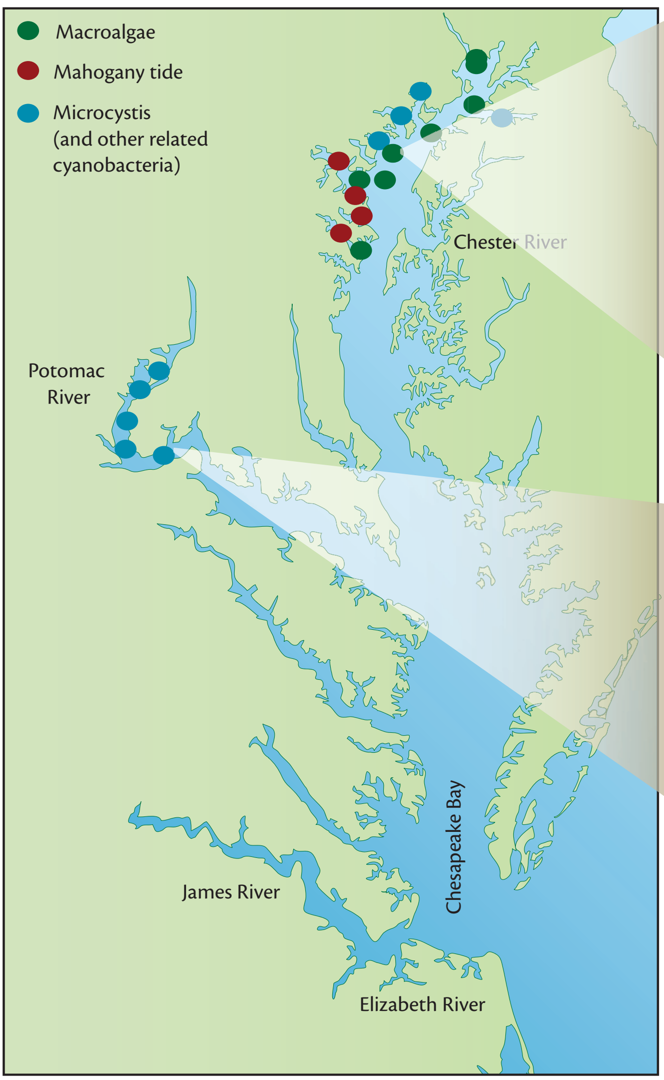
A Bay-wide issue of increasing prevalence is harmful algal blooms such as mahogany tides, *Pfiesteria* blooms, and cyanobacterial (blue-green algae) blooms (Figure 10).

Mahogany tides regularly occur in tributaries and near-shore areas of the Bay. Water becomes discolored due to the prevalence of a variety of micro-organisms. Currently, causes of mahogany tides are being investigated; while it is known that nutrient over-enrichment can contribute to blooms, the actual triggers of blooms require further study.

Researchers who study the Bay are also concerned about the potential for *Pfiesteria* blooms. In 1997, *Pfiesteria* was the cause of fish kills in the Pocomoke River. This event led to great concern about the cause of the bloom and the implications the toxic algae could have to human health. Shortly after the bloom, an on-going monitoring system was established; however, such blooms have not recurred.

Each summer, cyanobacterial (blue-green algae) blooms occur in the freshwater of the Bay, including the Potomac, Sassafras, and Elk Rivers. These blooms create surface slicks and frequently close beaches because they can cause abdominal stress in humans.

FIGURE 10—HARMFUL ALGAL BLOOMS OCCURRED IN VARIOUS LOCATIONS DURING THE SUMMER OF 2004.



Macroalgae in the Middle River, Maryland blocks light and consumes oxygen. Blooms such as these are often brought on by increased nutrient loads.

Foam caused by a cyanobacterial bloom in the Potomac River.

Adapted from *Harmful Algal Blooms in Maryland's Chesapeake and Coastal Bays 2004* Photos: Peter Tango

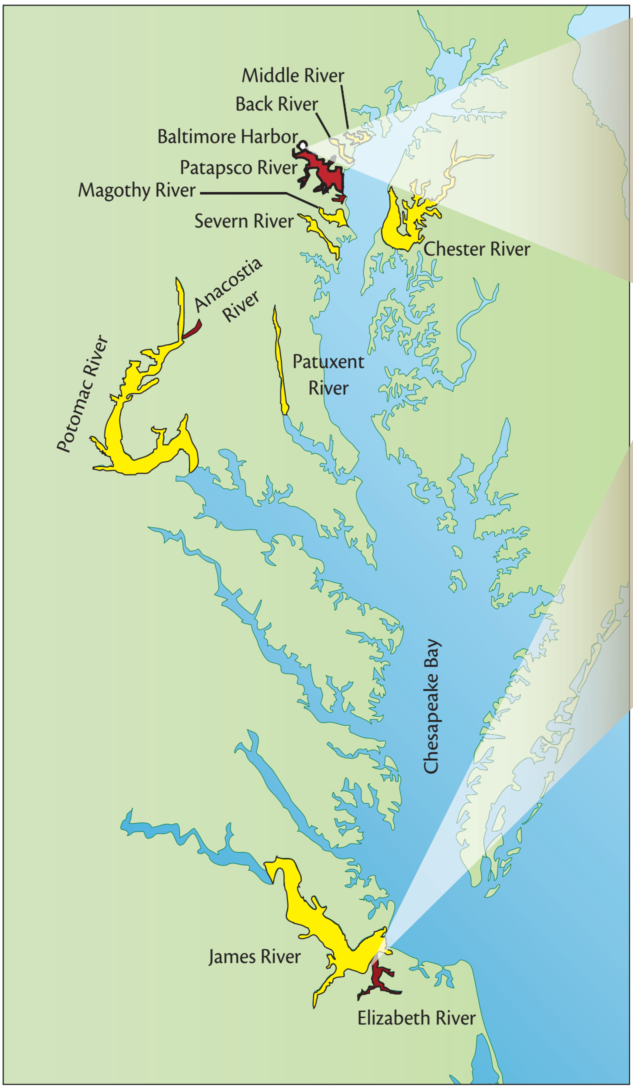
Toxins in the Bay

Like most parts of the world, the Chesapeake Bay is affected by toxins. Hot spots of heavy metals are adjacent to industrial areas such as Baltimore Harbor, the Elizabeth River region near the Norfolk ship yards, and the Anacostia River, a branch of the Potomac River near Washington D.C. (Figure 11). Historically, these regions are areas of concentration for toxins. However, in recent years improvements in toxic pollution have been made.

Recently, methylmercury has received much national attention. In this region, methylmercury enters the Bay through power plant emissions and accumulates in fish and shellfish, particularly in higher predators. The toxin can then be transferred to humans when these fish are consumed.

Another emerging toxin of concern is the brominated fire retardants that have been found in various organisms and sediments in the Bay. These toxins are fairly ubiquitous and can be found in common materials such as carpeting and clothing. Currently, research is being conducted to document the pathways of this substance.

FIGURE 11—SOME AREAS IN THE CHESAPEAKE BAY HAVE A PROBABILITY OF ADVERSE EFFECTS FROM TOXINS.



Heavy boat traffic and industry in and along Baltimore Harbor contribute to the high concentration of toxins found in the area.

A tug boat prepares to lead a commercial barge to a shipyard on the Elizabeth River. The numerous shipyards in Norfolk, Virginia release toxins into the water.

Region of Concern area with probable adverse effects

Area of Emphasis area with potential for adverse effects

Map adapted from The Chesapeake Bay Program   Photos: National Oceanic and Atmospheric Administration

Urban encroachment

Throughout the watershed, urban encroachment has reduced and fragmented vital habitat resulting in a decrease in biodiversity across the Bay region. Urban encroachment is of concern to the Department of Defense for two primary reasons: 1) it threatens the vital species that live on the green spaces protected by installations; and 2) it hinders military training.

When created, Department of Defense installations were far removed from public and residential areas. However, as urbanization expands cities and towns, communities encroach on installations where live weapons firing and ground maneuvering training is conducted. Thus, the training operations that once occurred in isolation now create noise and dust that disturb residents in new communities. These residents are also concerned about live weapons fire during these training operations.

Some community members have suggested that live training could be replaced with simulations. However, simulations cannot accurately portray the extreme rigors and demands of operations that military personnel must overcome. Live weapons and ground maneuvering training enhances the armed forces' ability to perform missions. Although the Department of Defense takes measures to ensure that their training operations do not endanger any citizens, it has become more and more challenging to balance the concerns of ever-growing communities with the Department of Defense's duty to prepare and train highly effective military personnel.

In order to better manage their land for military purposes and address the challenges of urban encroachment, the Department of Defense will continue to work with conservation groups and government agencies to procure conservation easements and design methods for maintaining the health and safety of its neighbors.

Increased sediment in the Bay

Increased sediment in the Chesapeake Bay influences water quality and clarity. In turn, water clarity affects submerged aquatic vegetation (SAV), which provides energy

Department of Defense

A Virginia Beach neighborhood (in the distance) encroaching on Fort Story, Virginia.

Department of Defense

Stabilization of Fishing Point landfill using offshore breakwaters and beach grass plantings at Naval Support Facility Patuxent River, Maryland. Breakwaters and vegetation slow erosion and reduce sediment inputs to the Chesapeake Bay.

and habitat for many organisms in the Bay. Sediments in the Chesapeake Bay come from two main sources—erosion and dredging.

Sediment from erosion

Aside from increased nutrients, increased sediment from erosion is the biggest issue facing the Bay today. Like nutrients, sediments are a valuable resource, but they become a pollutant when displaced. Bay-wide, sediments are increasing due to shoreline erosion, erosion in the coastal plain, and human influence on river flow via dams.

Shoreline erosion accounts for half of all the sediments in the Bay. This type of erosion usually occurs in pulses associated with storm surge or runoff events and is also attributed to sea level rise. Various measures are being taken to reduce shoreline erosion such as the construction of breakwaters, bulkheads, and groins. The Department of Defense has implemented several living shoreline projects to decrease erosion and stabilize banks.

Inland, the highly erodable Piedmont (fertile, clay) soils within the watershed are brought to the Bay by runoff. The erodability of these

Eyes on the Bay courtesy of MODIS Aqua Rapid Response Project at NASA GSFC

Satellite image of sediments flowing into the Chesapeake Bay.

soils is intensified by farming in the region, resulting in larger sediment loads. Erosion is also magnified by the human influence on river flow caused by dams. This problem is felt most keenly on the Susquehanna River where several sediment-trapping dams have been built.

When the dams reach their sediment capacity, they over-top, and fine-grained sediments suspended in the water travel down the river into the Bay. These fine-grained sediments are light and can be transported long distances. At present, all but one of the dams on the Susquehanna River have reached their sediment capacity. The exception is the Conowingo Dam located near the mouth of the river, and it is currently running at 90% capacity. The sediment escaping from these dams will soon find its way into the Bay.

Sediment from dredging

To counteract the large volume of sediment entering the Bay and keep its waterways navigable, portions of the Chesapeake Bay are dredged each year. Gradually, fine-grained sediments fill the approaches to harbors in the Bay and make navigation difficult for ocean-going cargo ships and naval vessels. Most of these ships require 50 feet of water, which is a problem in a bay that is naturally shallow and constantly receiving sediment. Thus, to maintain the required depth for ocean-going ships, a costly and labor-intensive dredging program occurs annually. After dredging, the dredge material (the fine-grained sediment that needed to be removed) must be placed in another part of the Bay. (See Poplar Island Case Study, p. 114.)

Currently, an extensive discussion is taking place about the possible uses of dredge materials. As seen at Poplar Island, non-contaminated dredge material can be used to rebuild wetlands in areas where they have disappeared. At this time, researchers are investigating the possibility of conducting a similar project to help Blackwater National Wildlife Refuge combat the effects of sea level rise.

Dredging is also controversial because the Chesapeake Bay is an estuary and as such will naturally fill with sediment over time. In fact, the Bay started filling about 7,000–9,000 years after it was formed. However, this filling has been accentuated by sediment inputs from land use practices and erosion.

Department of Defense

A pond, bound by an earthen dam, used for dewatering dredged materials at Fort Eustis, Virginia.

Department of Defense

This parade ground is actually a green roof, which sits atop the Pentagon's Remote Delivery Facility. Green roofs are vegetated roofs that reduce impervious surfaces and decrease runoff.

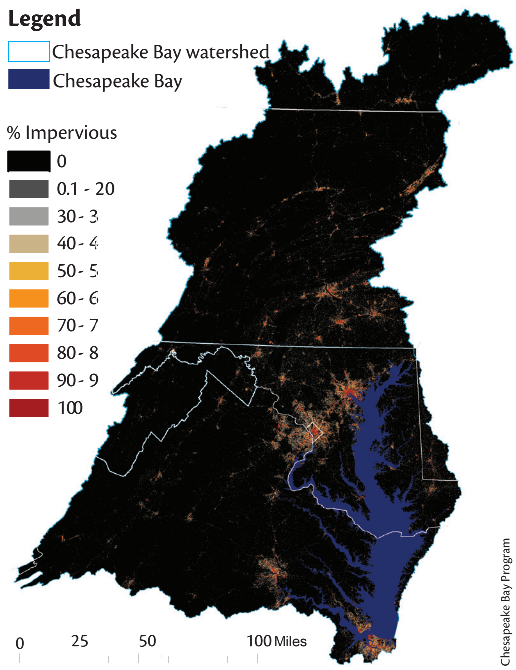
Increased impervious surfaces

Within the Chesapeake Bay watershed, development is rapidly increasing impervious surfaces at a rate four times greater than the rate of population growth (Figure 12). These surfaces, commonly in the form of rooftops and streets, alter runoff patterns. Impervious surfaces interest the Department of Defense because their installations are transected by transportation corridors—roads that connect expanding towns.

Normally, rain is slowly absorbed by the ground and gradually released into groundwater where vegetation filters the water before it percolates into rivers and streams. However, when rain falls on impervious surfaces, it runs directly into rivers and streams in a high-energy, flash flow. This increased energy flow erodes stream banks more quickly and releases more sediment into the Bay.

As housing developments and roadways grow, there is a movement to employ mechanisms that reduce the impact of runoff from impervious spaces such as storm water retention, rain water gardens, and green roofs.

FIGURE 12—IMPERVIOUS SURFACE COVER IN 2000.

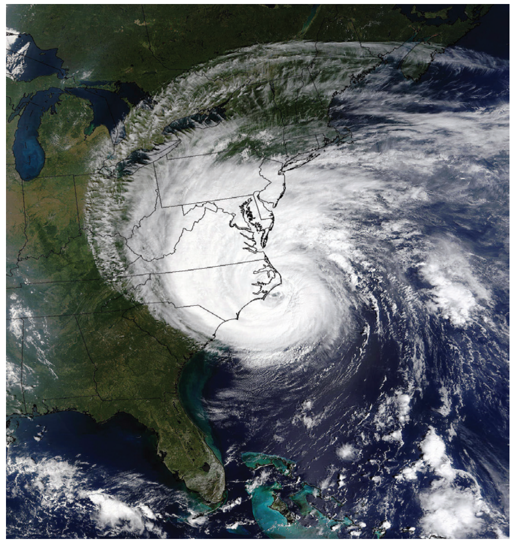


Chesapeake Bay Program

Increased impervious surfaces such as roofs and roadways prevent rainfall from slowly permeating the soil. Instead, rainfall pours into rivers and streams in a high-energy flow that causes erosion and stream bank destabilization.

Effects of storm surge

Like all coastal residents, the Department of Defense is concerned about coastal flooding. Tropical Storm Isabel demonstrated an increased vulnerability to such flooding. In September 2003, Hurricane Isabel was down-graded to a tropical storm before it came up the western side of the Chesapeake Bay, bringing with it a 6–12 foot storm surge. Isabel was strikingly similar to an un-named 1933 hurricane which also caused significant widespread flooding within the Chesapeake Bay watershed. However, the flooding that resulted from Tropical Storm Isabel had a greater impact than the 1933 hurricane. For example, Isabel affected short-term water quality, influenced fisheries recruitment, and eroded shorelines and wetlands. Isabel's storm surge reached far-inland, flooding areas usually unaffected by such strong storms. Though it was a tropical storm when it reached the Chesapeake Bay area, Isabel caused flooding equivalent to that of the hurricane of 1933.



MODIS Rapid Response Team, NASA Goddard Space Flight Center

Hurricane Isabel making landfall in the Carolinas. Later Isabel was down-graded to a tropical storm, which caused severe flooding in much of the Bay watershed.

It is believed that the effects of Isabel's storm surge were accentuated by sea level rise. Tide gauges show that sea level rise in the Chesapeake Bay has increased by one foot over the last 100 years, and sea level in the Bay is continuing to rise at nearly double the global average. Hurricane Isabel showed that low-lying areas in the Chesapeake Bay region can and will be negatively affected by sea level rise and are more susceptible to strong tropical storms and hurricanes.

Department of Defense

Isabel's storm surge inundated the entrance portal to the 1st Fighter Wing at Langley Air Force Base, Virginia, home of the 27th, 71st, and 94th Fighter Squadrons.

U.S. Naval Academy Alumni Association and Foundation

Flooding at the Naval Academy in Maryland two days after Tropical Storm Isabel made landfall in the area.

Increased occurrence of invasive *Phragmites* strain

Though *Phragmites* is native to the Bay area, an invasive strain of the plant is threatening to overtake the native population. The non-native strain has spread rapidly from the north-eastern U.S. and now dominates wetlands all across the country. The success of the non-native *Phragmites* may be attributed to habitat disturbance, shoreline development, pollution, and eutrophication (nutrient loading) of waterways. The invasive strain threatens Bay health by decreasing biodiversity and driving native plant species out of the marsh community. This threat interests the Department of Defense because their installations contain large marsh communities. Several techniques are used to manage non-native *Phragmites* including mowing, burning, spraying, and tidal gates (Figure 13). However, all of these methods impact other plants and animals in the marsh.

National Oceanic and Atmospheric Administration

Invasive *Phragmites* strain dominates wetland habitats.

OTHER INVASIVE PLANT SPECIES

Many invasive plants threaten native species in the Bay watershed. Below are a few of the most troublesome.

Water chestnut: native to Europe, Asia, and Africa.

Habitat: Shallow, nutrient-rich lakes and rivers

Impact:

- Creates a canopy that blocks light;
- Clogs waterways; and
- Spikes on seeds can tear through leather.

Purple loosestrife: native to Europe and Asia.

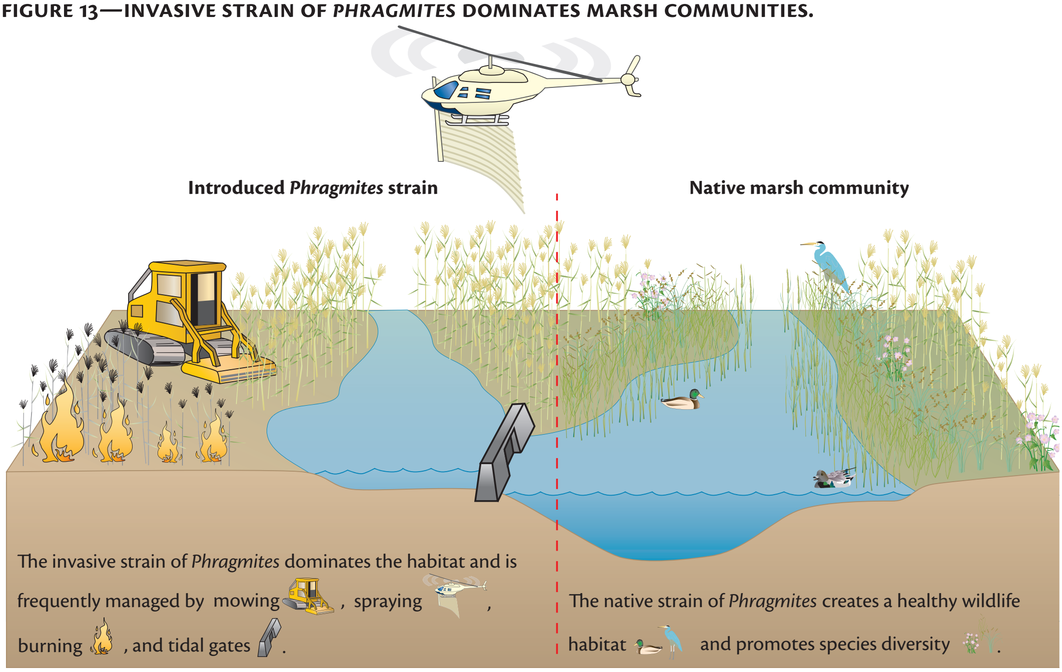
Habitat: Freshwater meadows, tidal and non-tidal marshes, river banks, stream banks

Impact:

- Creates thick monocultures (one dominant species);
- Drives out native species; and
- Chokes waterways with dense roots.

Adapted from www.chesapeakebay.net/newsinvasivesstressor011706.htm

FIGURE 13—INVASIVE STRAIN OF *PHRAGMITES* DOMINATES MARSH COMMUNITIES.



Over-browsing by deer

Across the entire watershed, growing deer populations have been consuming large amounts of vegetation, resulting in over-browsing. Development has caused forest fragmentation which simultaneously restricts hunting around residential areas and concentrates deer in smaller areas. Deer populations are steadily increasing throughout the watershed, leading to the appearance of a noticeable browse line (very little vegetation five feet up from the ground) in many forested areas. Natural succession of grasslands to forest habitat and reforestation of timber harvest areas are also being affected, as the growing deer population feeds extensively on tree seedlings. Many Department of Defense installations use managed hunting programs to control deer population density and limit the effects of over-browsing.

DEER-RESISTANT PLANTS

Over-browsing by deer is so prevalent that it impacts residential gardens and parks. This problem has prompted numerous plant experts to write about deer-resistant plants that may prevent deer from feeding in these areas. The following are some examples of deer-resistant plants:

Common name	*Scientific name*
Big bluestem	*Andropogon gerardii*
Nodding onion	*Allium cernuum*
Spotted geranium	*Geranium maculatum*
Sundail lupine	*Lupinus perennis*

However, when deer populations are very high, food resources are so scarce that the deer may opt to eat the plants that once deterred them.

U.S. Fish and Wildlife Service BayScapes Conservation Landscaping Program www.nps.gov/plants/pubs/chesapeake/toc.htm

Department of Defense

Over-browsing by dense deer populations influences forest growth in that saplings are consumed before they can develop into trees. In partnership with state game agencies, many Department of Defense installations allow hunting to control deer numbers.

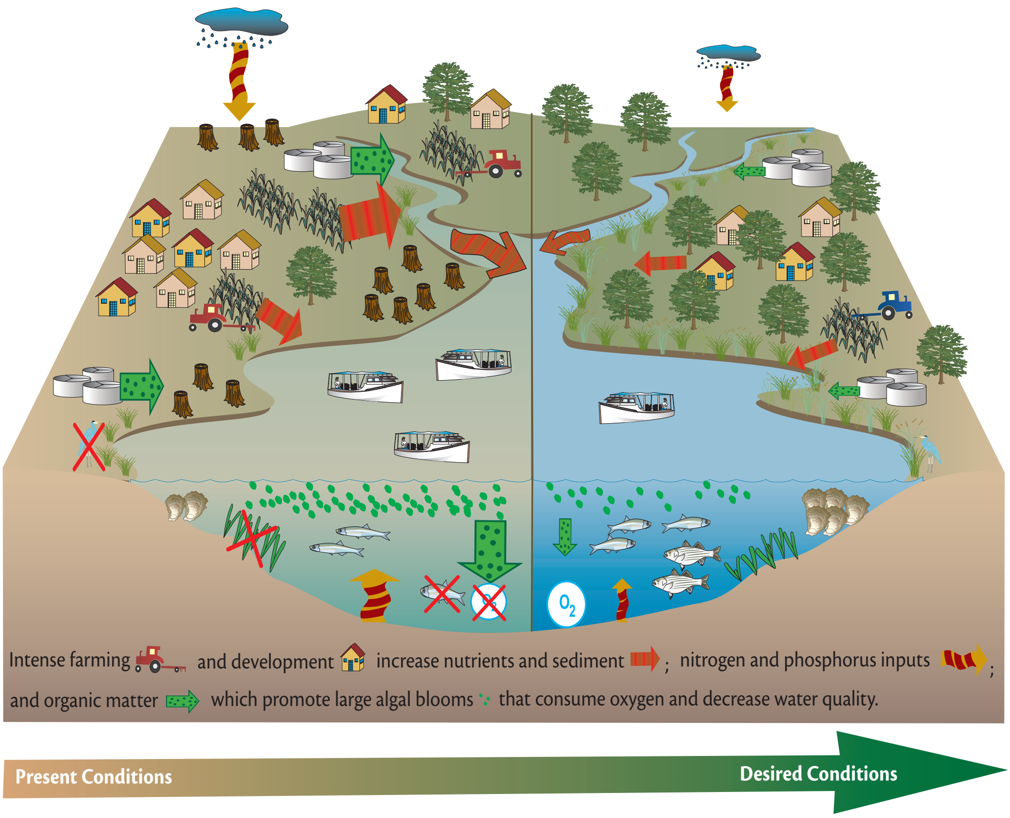
RESTORATION EFFORTS IN THE BAY

The goal of restoration efforts in the Chesapeake Bay is to restore functionality (biofiltration and productivity)—they are not attempts to return the Bay to its historic conditions. Such efforts would be impossible because the Bay is a dynamic ecosystem subject to natural processes that alter its characteristics. However, by concentrating on improved functionality, restoration efforts can rehabilitate some of the human degradation the Bay has experienced since the 1950s (Figure 14). Since restoration is not intended to recreate the previous conditions of the Bay, perhaps it is more accurately described as rehabilitation.

The first large-scale and formalized restoration efforts in the Bay began with the formation of the Chesapeake Bay Program in 1983. The Program is a federally-mandated partnership between governments, agencies, and non-government organizations focused on reducing nutrient over-enrichment. Over time, the Program has promoted community education, fisheries management, habitat issues, and sound land use practices. Since 1983, numerous organizations have been created to improve Bay health.

Currently, as in the past, reduced nutrient loads are the primary objective of restoration efforts because they result in improved water quality, functionality, and ecosystem health. In addition, many experts believe that if water quality issues are addressed, then ancillary ecosystem functions will recover. This section will explore current key issues in restoration, concerns about restoration efforts, challenges to restoration efforts, and the importance of restoration to the Department of Defense.

FIGURE 14—RESTORATION GOALS FOR THE CHESAPEAKE BAY FOCUS ON NUTRIENT REDUCTION.



Many researchers, government agencies, and volunteers are dedicated to rehabilitating the health of the Bay by reducing inputs and improving water quality. Their objective is to create sound restoration plans that promote best management practices. The Department of Defense is committed to working towards a cleaner, healthier Bay and has established a series of restoration projects on its installations within the watershed.

Current key issues in restoration

Though nutrient reduction is the primary objective of restoration efforts, several other key issues impact the Chesapeake Bay including the decline and resurgence of aquatic grasses, the health of the native oyster population, and stream bank restoration.

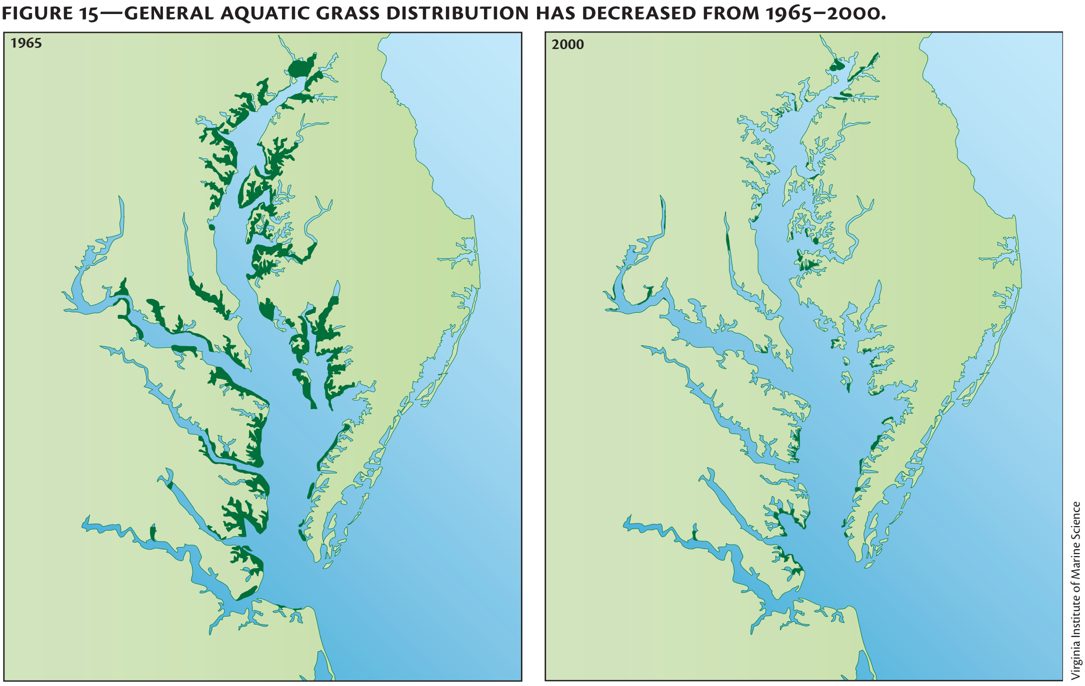
The decline and resurgence of aquatic grasses

Aquatic grasses support a tremendous amount of biodiversity and are one of the reasons for the Bay's historic biofiltration capability and high productivity. They are also indicators of ecosystem health and are often referred to as the "canaries in the coal mine" when it comes to the state of the Chesapeake Bay. However, for the last 30 years, aquatic grasses have been disappearing from the Bay (Figure 15). This decline, which has been attributed to poor water quality, first began in the early 1970s. The decline was accelerated in 1972 by Hurricane Agnes when the storm brought a large influx of water into the Bay. In 2003, Tropical Storm Isabel further reduced aquatic grasses. In addition to sensitivity to salinity, these plants are also very sensitive to light reduction and decreased water quality due to increased nutrients.

Aquatic grasses provide habitat for numerous species.

Recently, restoration efforts focused on planting whole plants and seeds have assisted in the resurgence of aquatic grasses in the low salinity communities of the upper tributaries such as the Potomac River and Susquehanna Flats. However, high salinity communities are experiencing a loss of aquatic grass. In part, restoration efforts are dwarfed by the year-to-year fluctuations of water quality and clarity, which can quickly damage a young aquatic grass population. At present, researchers are seeking ways to improve their methods and restore these vital organisms to the Bay.

FIGURE 15—GENERAL AQUATIC GRASS DISTRIBUTION HAS DECREASED FROM 1965–2000.



In general, aquatic grasses have been declining for the last several decades due to poor water quality. Aquatic grass communities support many species and provide biofiltration for the Chesapeake Bay.

The health of the native oyster population

Because oysters have a tremendous influence on the ecology and economy of the Chesapeake Bay region, the health of the native oyster (*Crassostrea virginica*) population is key to restoration. During the last century, oysters have been intensely harvested and these harvests supported numerous fishing and canning operations. More recently, a disastrous decline of oysters has occurred due to two diseases: MSX (Multi-nucleated Sphere with unknown affinity X, known as shell fungus disease) and Dermo (a parasite). These diseases likely came from a past introduction of non-native oyster species. Complicating the oyster harvesting problem is the fact that fishermen employ inefficient harvesting methods such as skip jacks and hand tongers. Some in the industry are pushing for the use of power dredging but, at this point, there are very few oysters to catch by these means.

In order to restore the oyster fisheries, and the resultant biofiltration capacity, in the Bay, researchers have developed oyster hatcheries where spawning oysters are taken to a laboratory, and the larvae they release is allowed to settle on oyster shells. These shells are then used to repopulate the decimated oyster reefs in the Bay. An effort is also underway to clean old oyster reefs by removing diseased oysters. The purpose of this is to give hatchery oysters an uninfected start in life and better odds of living long enough to be harvested. Early hatchery studies show that the trial oyster reefs are successful at rehabilitating oyster populations.

THE DEBATE OVER ASIAN OYSTERS

Renewed efforts to introduce a non-native species of oyster into the Chesapeake Bay have begun. Many believe that the Asian oyster (*Crassostrea ariakensis*) could benefit the Bay by achieving the following:

- Establishing a disease-free population;
- Rekindling the commercial harvest; and
- Restoring biofiltration in the Bay.

Others are opposed to the introduction of Asian oysters because of the following potential drawbacks:

- Out-competing native populations and further reducing their numbers;
- Contracting the same diseases that kill native oysters; and
- Changing the Bay ecosystem in unexpected ways.

Further research will be conducted before a decision about this issue is made.

Currently, the Asian oyster is being intensely researched with an environmental impact statement soon to be released by the Maryland Department of Natural Resources.

Allison Dungan, IAN Image Library (www.ian.umces.edu/imagelibrary/)

Oysters act as biofilters that maintain healthy water quality in the Chesapeake Bay. As the population declines so too does water quality.

Don Merrit, University of Maryland Center of Environmental Science

Watermen retreive oysters from an oyster dredge on the Choptank River in Maryland.

Stream bank stabilization

Restoration efforts have focused on stabilizing stream banks. The goal of this effort is to improve water quality and bank stabilization by regrading banks and planting vegetation. These efforts have been the initative of Department of Defense installations as well as local groups. Thus, stream bank stabilization is an essential part of improving water quality in the Bay. Stabilization is achieved by regrading banks and replanting vegetation.

Margaret Palmer, University of Maryland Center for Environmental Science

Erosion, accentuated by an increase in impervious surfaces and the high-energy flow of runoff, has made this stream bank on the mainstem of the Paint Branch in Montgomery County, Maryland unstable.

Margaret Palmer, University of Maryland Center for Environmental Science

A stream bank restoration project has stabilized the banks of the Paint Branch and reduced erosion. Stable stream banks result in less sediment being carried to the Chesapeake Bay by its tributaries.

Though findings suggest that these efforts have had some success, the effectiveness of bank restoration cannot be calculated because of a lack of monitoring.

Concerns about Bay restoration efforts

In 2003, several books and newspaper articles raised concerns about the progress of restoration efforts in the Bay. These writers wonder why the Chesapeake Bay, as the most well-studied, well-funded, intensely-managed, and recognizable ecosystem on Earth, was not improving. These criticisms caused agencies, researchers, and non-government organizations to rethink their approach to restoration.

Researchers maintain that restoration efforts are valuable. Without restoration, they argue, increased population and nutrient loads would have already wiped out the remaining functionality of the Bay. The writers who criticized these efforts recognize the value of restoration programs as well—praising the Chesapeake Bay Program for its public awareness campaigns and calling it a model system for engaging agencies and non-profit organizations.

Challenges to restoration

Restoration must overcome many challenges which can impede the rehabilitation of Bay health. These challenges include population pressure, rapid land use changes, and financial limitations.

Population pressure increases on a daily basis as more people move to the Chesapeake Bay watershed, resulting in increased impervious surfaces, runoff, and nutrient inputs. In order to prevent Bay health from further degradation, restoration efforts must grow in conjunction with the population.

Rapid land use changes present a challenge to restoration by increasing impervious surfaces and influencing climate. Land use changes are happening faster than restoration efforts can counteract them. Conservation easements, where the landowners of an area that is already providing some conservation function enter a legal agreement to limit the use of that land, are one way to offset rapid land use change.

Another challenge to restoration is financing; restoration can be extremely costly. Estimates by the General Accountability Office suggest that restoration in the Chesapeake Bay would cost in the order of tens of billions of dollars. In a period of national financial strain, finding the funds needed for restoration can be difficult. However, investing in restoration will never be cheaper than it is today. As environmental degradation increases, so too will the cost of restoration. There are no cheap solutions to improving Bay health, but by investing in restoration now and prioritizing monies for optimal effect, funds can be used to achieve maximum benefit.

Despite the challenges, restoration of the Bay is crucial. First and foremost, a healthier Bay results in healthier communities with improved water quality, more commercial fisheries, and increased opportunities for recreational activities. The Chesapeake Bay can benefit from researchers who can identify and solve problems, committed residents who are sincerely concerned about the state of the Bay, and a resiliency that allows small changes in environmental conditions to trigger a rapid response from the system. Thus, improved Bay health is a worthy and achievable goal.

Department of Defense

Navy enlisted and civilian volunteers plant 9,000 plants at a former Superfund site, returning the area to wetlands at Norfolk Naval Shipyard, Virginia. Though restoration can be challenging, efforts such as this are helping to improve Bay health.

Department of Defense

Navy personnel participate in Clean the Bay Day, an annual litter removal event that also educates participants about the importance of Bay restoration.

Importance of restoration to the Department of Defense

Restoring the Chesapeake Bay is important to the Department of Defense for many reasons. First, a healthy environment supports its mission. Additionally, soldiers, personnel, and their families live within the Bay watershed. Thus, improving Bay health helps to improve the quality of life for Department of Defense personnel, as well as civilians living in the community.

The Department of Defense is a leader in Bay restoration. As development encroaches upon Department of Defense installations, these lands become increasingly important oases from development. Thus, many installations serve as biodiversity reservoirs where organisms can thrive in relatively undisturbed ecosystems. Managing these biodiversity reservoirs with care allows the Department of Defense to protect lands within the watershed on the same order of scale as the National Park system.

The following chapters will describe the Department of Defense's long history as a Chesapeake Bay advocate, some of the many initiatives the Department of Defense has executed, case studies that illustrate how the Department of Defense promotes and restores the health of the Bay, and future initiatives the Department of Defense will take to continue supporting the Bay.

FEDERAL LAND HOLDINGS IN THE WATERSHED

The Department of Defense is a significant landholder in the Chesapeake Bay watershed and is steward of many Bay habitats.

Forest Service (Department of Agriculture)	**3,757 sq. mi**
Department of Defense	**657 sq. mi**
Army	341
Navy/Marine Corps	198
Army Corps of Engineers	94
Air Force	21
Defense Logistics Agencies	3
National Park Service (Department of the Interior)	**489 sq. mi**

Because the Department of Defense oversees a large amount of land in the Chesapeake Bay watershed, it is uniquely positioned to protect and preserve vital habitat and threatened species (Figure 16).

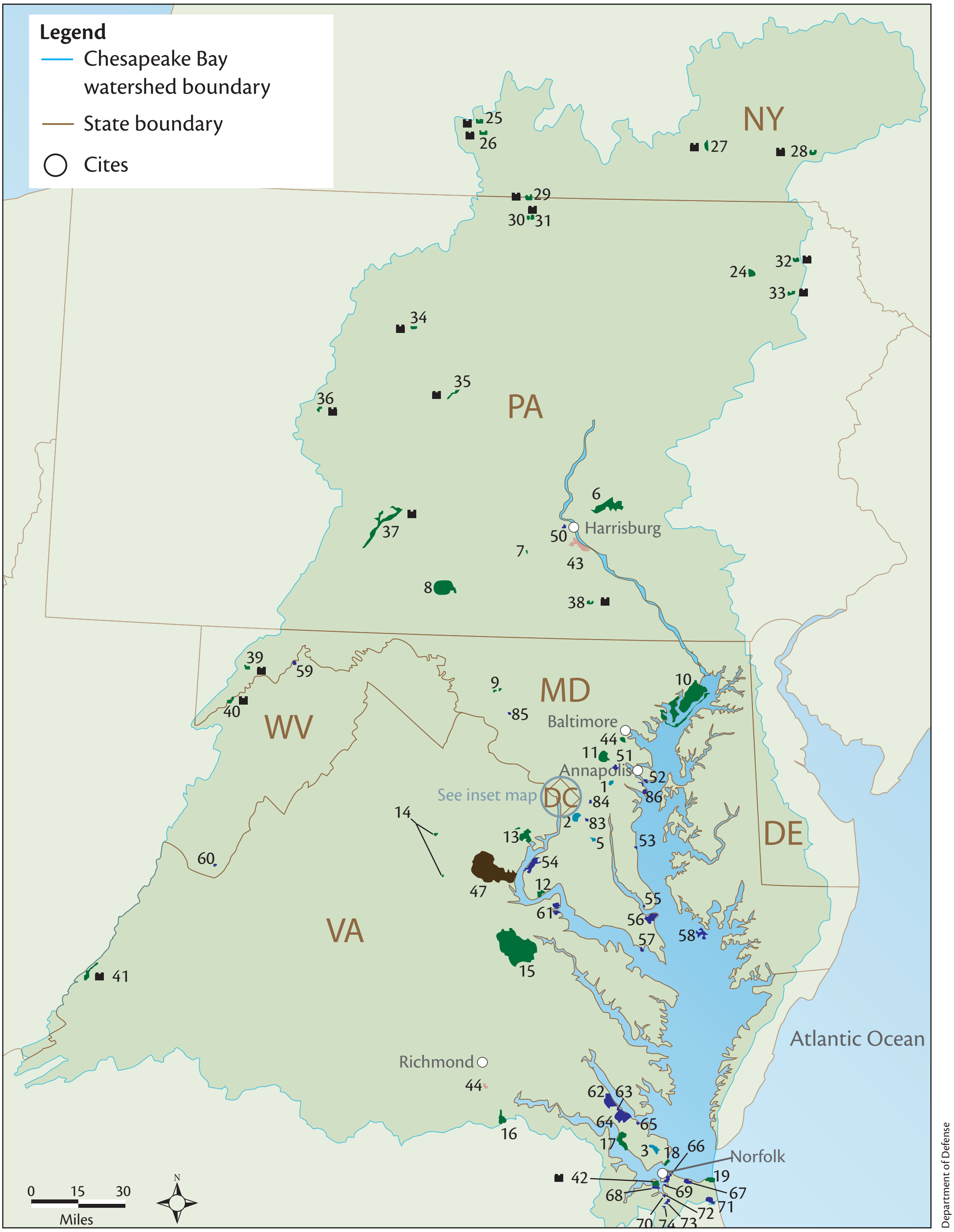
In additon, the Department of Defense supports a variety of restoration programs that help improve and maintain Bay health.

Sources: Department of Defense, National Park Service, and the Environmental Protection Agency

Department of Defense

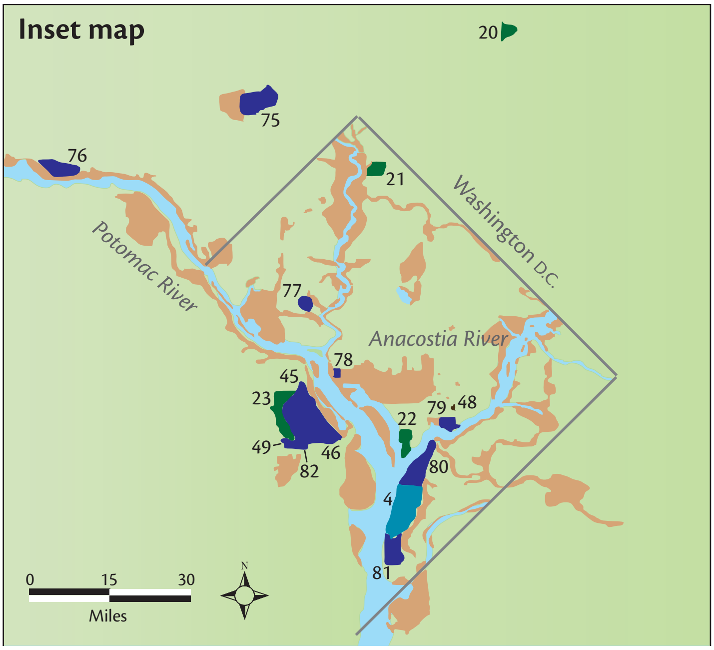
A great blue heron in the wetlands at Fort Eustis, Virginia. Department of Defense installations provide relatively undisturbed ecosystems for organisms in the Chesapeake Bay watershed.

FIGURE 16—DEPARTMENT OF DEFENSE INSTALLATIONS WITHIN THE CHEASAPEAKE BAY WATERSHED INCLUDING ARMY CORPS OF ENGINEERS SITES.



Air Force
1. Davidsonville Communications Station
2. Andrews Air Force Base
3. Langley Air Force Base
4. Bolling Air Force Base
5. Brandywine Global Communications Receiving Station

Army
6. Fort Indiantown Gap
7. Carlisle Barracks
8. Letterkenny Army Depot
9. Fort Detrick
10. Aberdeen Proving Ground
11. Fort Meade
12. Blossom Point Research Facility
13. Fort Belvoir



Department of Defense

Installations Key

- Air Force
- Army
- Army Corps of Engineers
- Defense Logistics Agency
- Marine Corps
- Navy
- Other Federal Property (D.C. inset map only)

14. Warrenton Training Center
15. Fort A.P. Hill
16. Fort Lee
17. Fort Eustis
18. Fort Monroe
19. Fort Story
20. Adelphi Laboratory Center
21. Walter Reed Army Medical Center
22. Fort McNair
23. Fort Myer
24. Scranton Army Ammunition Plant

Army Corps of Engineers

25. Almond Lake
26. Arkport Dam
27. Whitney Point Lake
28. East Sidney Lake
29. Cowanesque Lake
30. Tioga Lake
31. Hammond Lake
32. Stillwater Lake
33. Aylesworth Lake
34. Alvin R. Bush Dam
35. Foster J. Sayers Dam
36. Curwensville Lake
37. Raystown Lake
38. Indian Rock Dam
39. Savage River Dam
40. Jennings Randolph Lake
41. Lake Moomaw
42. Craney Island Dredge Spoils Disposal Area

Defense Logistics Agency

43. Defense Distribution Depot Susquehanna
44. Defense Supply Center, Richmond

Department of Defense

45. Arlington National Cemetery
46. Pentagon

Marine Corps

47. Marine Corps Base Quantico
48. Marine Barracks, Washington
49. Henderson Hall

Navy

50. Naval Support Activity Mechanicsburg
51. U.S. Naval Academy Dairy Farm
52. Naval Support Facility Annapolis
53. Naval Support Facility Chesapeake Beach
54. Naval Support Facility Indian Head
55. Naval Support Facility Solomons Island
56. Naval Support Facility Patuxent River
57. OLF Webster Field
58. Naval Support Facility Patuxent River, Bloodsworth Island
59. Allegheny Ballistics Laboratory
60. Navy Information Operations Command, Sugar Grove
61. Naval Support Facility Dahlgren
62. Armed Forces Experimental Training Activity Camp Peary
63. Naval Weapons Station Yorktown, Cheatham Annex
64. Naval Weapons Station Yorktown
65. Naval Weapons Station Yorktown Fuels
66. Naval Station Norfolk
67. Naval Amphibious Base Little Creek
68. Defense Fuel Supply Point Craney Island
69. Naval Station Norfolk, Lafayette River Annex
70. Naval Medical Center Portsmouth
71. Naval Air Station Oceana
72. Naval Station Norfolk, St. Helena Annex
73. Norfolk Naval Shipyard
74. Naval Station Norfolk, St. Juliens Creek Annex
75. National Naval Medical Center Bethesda
76. Naval Support Facility Carderock
77. U.S. Naval Support Facility Observatory
78. Naval Support Facility Potomac Annex
79. Washington Navy Yard
80. Naval Support Facility Anacostia
81. Naval Support Facility Naval Research Laboratory
82. Naval Support Facility Arlington
83. Naval Support Facility Andrews
84. Naval Support Facility Suitland
85. Naval Support Facility Thurmont
86. U.S. Naval Academy

VIEW POINT

"The Department of Defense recognizes that the goals of the Chesapeake Bay Program can only be realized by the leveraging of resources created through partnerships with other federal agencies, state and local governments, non-profit organizations and members of the communities which surround our installations. Partnerships promote the exchange of information, sharing of knowledge, and pooling of resources. The rapport developed between individuals in the process leads to creative new ideas and the basis for continued cooperation."

Rear Admiral Frederic R. Ruehe
Commander, Navy Region Mid-Atlantic

Prior to assuming duties as Commander, Navy Region Mid-Atlantic, Rear Admiral Ruehe served as Commander, U.S. Naval Forces Japan; Commander, Amphibious Force Seventh Fleet/Amphibious Group One in Japan; Commander, Navy Region Southwest; Executive Assistant to the Chief of Staff Supreme Allied Commander, Atlantic, Norfolk, VA; Commanding Officer *Belleau Wood* LHA3, Sasebo, Japan; Commanding Officer Helicopter Anti-Submarine Squadron Light Four Zero, Mayport, FL; Air Officer *USS Tarawa* LHA1; Commanding Officer Helicopter Anti-Submarine Squadron Light Three Three, San Diego, CA; Staff Analyst Total Force Programming/Manpower, Washington, D.C.; Squadron Operations Officer and Detachment Officer-in-Charge Helicopter Anti-Submarine Squadron Light Three Five; Officer-in-Charge Commander Anti-Submarine Warfare Wing Pacific Fleet, Philippines; Instructor Pilot Helicopter Anti-Submarine Squadron Light Three One; Helicopter Anti-submarine Squadron Light Three Three; Damage Control Assistant *USS Henry B. Wilson* DDG7.

Degrees

Rear Admiral Ruehe is a 1973 graduate of the University of Illinois. He also holds a Master of Science degree from the University of Southern California. His personal awards include the Defense Superior Service Medal, the Legion of Merit (four awards), the Meritorious Service Medal (five awards), and the Navy Commendation Medal.

Current duties

Rear Admiral Ruehe assumed command of Navy Region, Mid-Atlantic in November 2005. Comprised of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia, as the Commander of the Mid-Atlantic Region, he is responsible for the safety, security, and efficient operation of over ten naval shore installations that provide direct logistical and administrative support to over 100 home ported ships and over 40 aircraft squadrons of the U.S. Atlantic Fleet. Rear Admiral Ruehe also serves as the Department of Defense Regional Environmental Coordinator for the Mid-Atlantic Region. In this capacity, he supports the Defense Department mission through the coordination, communication, and facilitation of environmental issues and activities across all branches of the Armed Forces.

2. THE DEPARTMENT OF DEFENSE AND THE CHESAPEAKE BAY: A BRIEF HISTORY

Cape Henry lighthouse at Fort Story, Virginia.

The Department of Defense has 68 installations in the watershed and 18 Army Corps of Engineers reservoirs, comprising approximately 657 square miles of land. The Department of Defense is one of the largest landholders in the Chesapeake Bay watershed; however, its holdings comprise less than 1% of the total watershed. Department of Defense installations range in size from fewer than 20 acres to over 75,000 acres, including the world's largest naval station. Much of this land remains undeveloped and is a haven for a wide variety of plants and animals. The Department of Defense's mission consists of maritime operations and ship berthing, air operations, repair and maintenance of facilities, supply, communications, and training. Each installation possesses a unique natural and cultural heritage and can contribute to the restoration of the Bay in different ways.

THE DEPARTMENT OF DEFENSE'S COMMITMENT TO THE BAY

The Department of Defense has a long history in the Chesapeake Bay. The Bay has been important to the military as a source of food, transportation, training grounds, and strategic fighting areas. In recent years, the military has been an instrumental part of the Bay's restoration and protection. This effort ties into the overall Department of Defense environmental program, which seeks to maintain military readiness while enhancing quality of life and encouraging environmental stewardship and community partnerships.

Beginning of Department of Defense research in the Chesapeake Bay

In the late 1950s and early 1960s, scientific evidence showed degeneration in submerged aquatic vegetation (SAV), shell and finfish harvest, and water quality. This evidence caused many experts to wonder what had initiated these declines. It was thought that over-harvesting, nutrients from waste water treatment plants, toxic discharge from industry, or possible sedimentation runoff from farms and new developments could have contributed to the problem. Researchers wanted to understand why one of the largest and most productive

Department of Defense

The first federally funded lighthouse in the U.S. was built at Cape Henry.

1792

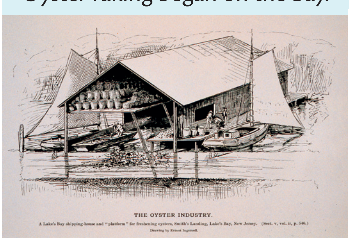
Department of Defense

In 1776, the Continental Army occupied this garrison which they renamed Washingtonburg in honor of General George Washington. In 1807 the garrison became the first Army installation and was named Carlisle Barracks.

1807

1813

Oyster raking began on the Bay.



National Oceanic and Atmospheric Administration

1933

An interstate meeting on the Chesapeake Bay was held and it was decided that the Bay must be treated as a single resource.

National Oceanic and Atmospheric Administration

estuaries in the world was dying. In the 1960s, the answers to these questions and many others were a mystery.

In 1965, Congress appointed the Army Corps of Engineers through the *Rivers and Harbors Act* to conduct a widespread study of the Bay. The purpose of this study was to determine the reason for the decline in water quality and living resources in the Bay. In 1976, Congress asked the newly-formed Environmental Protection Agency (EPA) to conduct a separate study of the Bay. Reports by both agencies, published in the 1970s and 1980s respectively, indicated that an overabundance of nutrients, toxins, and sediment was severely degrading the Bay's water quality. The results of these studies initiated the historic *Chesapeake Bay Agreement of 1983*, which was signed by the Governors of Pennsylvania, Maryland, and Virginia, the Mayor of the District of Columbia, the Administrator of the EPA (representing federal agencies), and the Chairperson of the Chesapeake Bay Commission (a tri-state legislative body).

The signatories of the 1983 *Chesapeake Bay Agreement* established the fundamental structure of the Chesapeake Bay Program, and are referred to as the Chesapeake Executive Council. The Executive Council meets annually and rotates the chair each year. The 1983 agreement established four general goals in the areas of improving water quality and living resources, increasing public involvement, encouraging environmentally sound growth, and facilitating cooperation between the signatory jurisdictions.

The Executive Council also established an Implementation Committee and the EPA Chesapeake Bay Program Office in Annapolis, Maryland. The Implementation Committee oversees the restoration effort by coordinating technical research and management plans through a system of committees and subcommittees staffed by personnel from each of the signatory jurisdictions and the EPA. The Implementation Committee holds meetings every other month that are open to the public

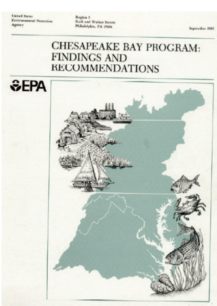
Rivers and Harbors Act appointed the U.S. Army Corp of Engineers to study water quality in the Chesapeake Bay.

Jane Thomas, IAN Image Library (www.ian.umces.edu/imagelibrary/)

1965

1976

1983



The Chesapeake Bay Program

Congress called on the Environmental Protection Agency to study the Chesapeake Bay.

Department of Defense

The first Chesapeake Bay agreement was signed.

at the Chesapeake Bay Program Office. The Department of Defense participates on the Implementation Committee.

In 1984, the EPA and the Chesapeake Bay Program established the Federal Agencies Committee as part of the *Joint Resolution on Pollution Abatement in the Chesapeake Bay.* The Federal Agencies Committee is composed of federal agencies that either own land or have missions that affect the water quality and living resources of the Chesapeake Bay. The Committee is responsible for providing input on federal policies on the Chesapeake Bay Program. Membership on the Federal Agencies Committee is the primary means by which the services directly participate in the Chesapeake Bay Program.

The Department of Defense was the first federal agency to become formally involved in the Chesapeake Bay restoration effort with the signing of the *EPA/Department of Defense Chesapeake Bay Initiative–a Joint Resolution on Pollution Abatement in the Chesapeake Bay* in September 1984. The Army Corps of Engineers formalized its partnership with the Chesapeake Bay Program in November 1984 with the *Memorandum of Understanding with the EPA*. Through these agreements, the Department of Defense and the Army Corps of Engineers became members of the Bay Program's Implementation Committee and the Federal Agencies Committee.

Additional Bay Agreements

The structure of the Chesapeake Bay Program has been further refined through a series of subsequent agreements. The *1987 Chesapeake Bay Agreement* established 29 goals under six categories: living resources; water quality; population growth and development; public information, education and participation; public access; and governance. It also set a goal of accomplishing a 40% reduction in the amount of phosphorus and nitrogen entering the Bay by the year 2000 so that improved water quality could directly improve its living resources. Finally, it established the health of the Bay's living resources as the ultimate indicator of the Program's success.

The EPA and the Department of Defense signed the *Chesapeake Bay Initiative–a Joint Resolution on Pollution Abatement.*

The Chesapeake Bay Program created the Federal Agencies Committee to help control pollution.

1984

1987

A new Chesapeake Bay agreement established the structure of the Chesapeake Bay Program. Representatives from the Commonwealth of Virginia, the State of Maryland, the Commonwealth of Pennsylvania, the U.S. Government, the District of Columbia, and the Chesapeake Bay Commission signed the agreement.

The Chesapeake Bay Program

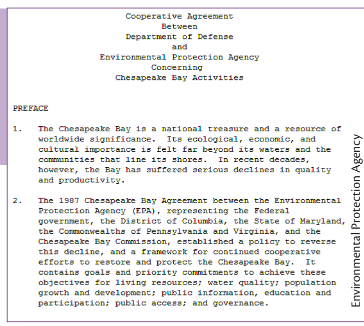
Just as the 1983 agreement resulted in the *1984 Department of Defense/EPA Agreement*, the new *1987 Chesapeake Bay Agreement* generated the *Cooperative Agreement Between the Department of Defense and EPA Concerning Chesapeake Bay Activities*. This initiative signed on April 20, 1990, incorporated the goals of the *1987 Cheseapeake Bay Agreement* and increased communication and cooperation between the Department of Defense and the Chesapeake Bay Program's partners.

The *1992 Chesapeake Bay Agreement Amendments* reaffirmed the Program's commitment to attaining its nutrient reduction goals and established the Chesapeake Tributary Strategies Program to more effectively reach those goals. Studies performed under the Program had determined the need to reduce nutrients at their source—upstream of the Bay. The 1992 amendments established state-wide (Maryland, Pennsylvania, and Virginia) reduction goals for the Bay's ten largest tributaries and specific numeric reduction goals for each of the signatory jurisdictions and sub-watersheds in the Chesapeake Bay watershed. Each jurisdiction agreed to establish Tributary Strategy Teams to work with all levels of government, interest groups, and citizens to develop nutrient reduction plans for each major tributary.

On September 14, 1993, the Department of Defense and EPA refined the *1990 Department of Defense/EPA Agreement* with the signing of the *Department of Defense/EPA Action Items for the Chesapeake Bay Program*. The program initiatives outlined in this agreement incorporated the latest initiatives from the 1992 amendments and furthered the Department of Defense's efforts to restore and protect living resources, improve water quality, improve public communications and access, enhance Bay Program planning efforts, maintain compliance, and promote pollution prevention measures.

On July 14, 1994 representatives from 29 federal agencies signed the *Agreement of Federal Agencies on Ecosystem Management*

The *Cooperative Agreement Between Department of Defense and EPA concerning the Chesapeake Bay Activities* was created.


Cooperative Agreement
Between
Department of Defense
and
Environmental Protection Agency
Concerning
Chesapeake Bay Activities

PREFACE

1. The Chesapeake Bay is a national treasure and a resource of worldwide significance. Its ecological, economic, and cultural importance is felt far beyond its waters and the communities that line its shores. In recent decades, however, the Bay has suffered serious declines in quality and productivity.

2. The 1987 Chesapeake Bay Agreement between the Environmental Protection Agency (EPA), representing the Federal government, the District of Columbia, the State of Maryland, the Commonwealths of Pennsylvania and Virginia, and the Chesapeake Bay Commission, established a policy to reverse this decline, and a framework for continued cooperative efforts to restore and protect the Chesapeake Bay. It contains goals and priority commitments to achieve these objectives for living resources; water quality; population growth and development; public information, education and participation; public access; and governance.

Environmental Protection Agency

1990

1992

A new Chesapeake Bay agreement containing the Tributary Strategies Program was written.

Chesapeake Bay Program
A Watershed Partnership

Chesapeake Bay Program

in the Chesapeake Bay. This agreement was the first to be signed by a collective body of federal agencies, and it formalized the federal agencies' commitment to participation in the Chesapeake Bay Program. It created two new workgroups within the existing Federal Agencies Committee. The first workgroup was a Federal Research Agenda Workgroup created to oversee the coordination of research agendas among the various subcommittees and workgroups within the program in order to avoid duplication of data generation by federal agencies. The second workgroup was a Data/Geographic Information System Workgroup created to standardize and consolidate federal agency and the Chesapeake Bay Program databases and maximize data sharing.

The *1998 Federal Agencies' Chesapeake Ecosystem Unified Plan* (FACEUP) further enhanced the role of federal agencies in meeting the Chesapeake Bay Program's restoration goals. Using the *1994 Federal Agencies Agreement* and the *Clean Water Action Plan* under President Clinton's *1998 Clean Water Initiative*, it directed twelve federal agencies to achieve 50 specific goals in support of the Chesapeake Bay Program and established a lead federal agency for each goal. It took from the *Clean Water Action Plan* a watershed approach to restoration efforts and an emphasis on meaningful citizen involvement in these efforts. It also established seven categories for Bay restoration efforts:

- Partners for the Chesapeake;
- Protectors of Priority Watersheds;
- Stewards of the Bay's Living Resources and Habitats;
- Leaders in Nutrient and Toxics Prevention and Reduction on Federal Lands and Facilities;
- Guardians of Human Health;
- Providers of Research, Assessment, and New Technologies; and
- Supporters of Smart Growth.

The 1998 agreement was adopted in a signing ceremony at Fort McNair that included an address by EPA Director Carol Browner on the importance and uniqueness of the agreement.


Department of Defense

1993 — The *Department of Defense/EPA Action Items for the Chesapeake Bay Program* were signed.

1994 — Twenty-nine agencies signed the *Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay*.

1998 — The Department of Defense signed the *Federal Agencies' Chesapeake Ecosystem Unified Plan (FACEUP)* at Fort McNair.

1998 — The *Clean Water Initiative* started as part of the *Clean Water Action Plan*.

CLEAN WATER ACTION PLAN

Environmental Protection Agency

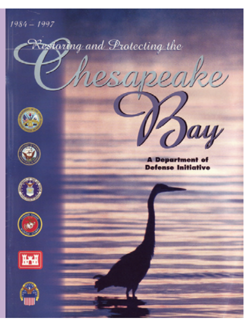
Chesapeake 2000: A Watershed Partnership, was signed June 23, 2000, by the Director of the EPA (representing the federal agencies), the governors of Maryland, Virginia, and Pennsylvania, and the Mayor of the District of Columbia. It was the product of three parallel projects that began in 1998. The first project was an internal Bay Program review of its first 15 years. The second project was a public participation process coordinated by the Alliance for the Chesapeake Bay that resulted in the *Listening to the People* document. The third project was a scientific review of the Bay, known as *Chesapeake Futures*, conducted by the Bay Program's Scientific and Technical Advisory Committee. It reaffirmed the commitment of the signatories to restore and protect the Bay established by the *1987 Chesapeake Bay Agreement*, and it established 90 specific goals to guide the efforts of the next decade in the areas of living resource protection and restoration; vital habitat protection and restoration; water quality protection and restoration; sound land use; and stewardship and community engagement.

The *Chesapeake 2000* models its goals after the Chesapeake Bay itself. Its goals are presented as a seamless garment with each individual goal reinforcing the overall goals of restoring the Chesapeake Bay ecosystem just as each component of the ecosystem forms an integral and inseparable part of the whole ecosystem. In particular, it responds to the pressure of population increase in the watershed and proposes more extensive partnerships between signatory agencies, local governments, community groups, and the public in order to meet the agreement's goals.

The *Chesapeake Bay Restoration Act*, signed in 2000, amended Section 117 of the *Federal Water Pollution Control Act*. It reauthorized the EPA's Chesapeake Bay Program and gave the Program's goals and procedures the force of law. It also established the Chesapeake Bay agreement as being anything formally signed by the Chesapeake Executive Council.

On December 3, 2001, the Executive Council of the Chesapeake Bay Program signed

Restoring and Protecting the Chesapeake Bay: A Department of Defense Initiative 1984–1997, a book describing the agency's contributions to Bay restoration, was published.



Department of Defense

The Chesapeake Bay Program *Directive No. 01-1 Managing Storm Water on State, Federal and District Owned Lands and Facilities* was signed.

2001

2000

Chesapeake 2000 containing 90 specific goals to guide restoration efforts was signed.

The *Chesapeake Bay Restoration Act* was enacted as part of the *Federal Water Pollution Control Act.*


Department of Defense

Vegetative buffers such as the one at the Naval Medical Center in Portsmouth, Virginia are just one of the management practices that helps meet the Storm Water Directive.

Directive No. 01-1: Managing Storm Water on State, Federal and District Owned Lands and Facilities. While the annual Executive Council has generated numerous directives, the Storm Water Directive is of particular importance because it addresses what has proven to be the Chesapeake Bay Program's most elusive goal: reduction of nutrient loading through control of storm water runoff. The directive establishes 20 specific storm water management commitments and completion dates. These commitments include creating an inventory of target public lands, showing how to enhance management of storm water through demonstration projects, and analyzing the economics and effectiveness of those projects. The targeted public land parcels and facilities designated for enhanced storm water management must be identified in 2002. By the end of 2006, numerous innovative storm water management demonstration projects must be in the implementation stage, and by the end of 2008 another 15 must be underway on non-targeted public land parcels. The Storm Water Directive also established mechanisms to partner with local watershed organizations.

Although the Chesapeake Bay Program has only been in existence since 1983, its participants have accumulated an extraordinary amount of knowledge about the Chesapeake Bay as a complex system. Through this knowledge, the participants have refined the Program's goals as reflected in the succession of agreements between 1983 and 2000.


Department of Defense

Department of Defense personnel sample golf course soils prior to application of fertilizer.


Department of Defense

As the Department of Defense continues to support the Storm Water Directive, additional storm water management practices will be implemented on non-targeted public land parcels. This storm water runoff prevention system where wash rack water is captured in an oil/water separater is one method that could be used to reach the goals of the directive.

DEPARTMENT OF DEFENSE PARTNERSHIPS FOR THE BAY

The alliance between the Department of Defense and the Chesapeake Bay Program is a story of partnerships at all levels: among the military services; the EPA Chesapeake Bay Program; other federal, state, and local agencies; non-profit environmental organizations; and neighboring communities. The Department of Defense is an active participant in the Chesapeake Bay Program, a regional partnership that has led the restoration and protection efforts for the Chesapeake Bay since 1983. Bay Program partners include the states of Maryland, Pennsylvania; and Virginia; the District of Columbia; the Chesapeake Bay Commission; the federal government; universities; and participating citizen advisory groups. As the Chesapeake Bay Program has evolved these partnerships have also evolved.

Commander Navy Region Mid-Atlantic serves as the Navy Regional Environmental Coordinator and the Department of Defense Executive Lead Agent for the Chesapeake Bay Program. The Regional Environmental Coordinator organizes the implementation of program goals and initiatives throughout all military services. Each military service also has a Chesapeake Bay Program Coordinator. The service coordinators provide natural resources guidance and facilitate research and restoration projects at the military installations located within the Chesapeake Bay watershed.

CONCERNS ABOUT THE BAY'S FUTURE

The Department of Defense intends to use the next few years to complete its commitments under the 1998 agreement and address its new commitments under *Chesapeake 2000*. The main items left to be completed under the 1998 agreement are developing nutrient management plans for Bay installations, expanding Businesses for the Bay participation so that more installations are mentors, and increasing the number of practical on-the-ground projects at its 68 installations. The Department of Defense will also continue with its education and public outreach efforts by sponsoring and participating in workshops, continually updating its Chesapeake Bay Program website, providing support to the installations for their community outreach events, and keeping the public aware of its success stories.

The Department of Defense shares with the Chesapeake Bay Program—and all of its signatory agencies, state and local governments, community groups, and citizens throughout the watershed—the vision of a cleaner, more biologically diverse Chesapeake Bay. Significant progress toward this vision has been made in the form of pollution reduction, nutrient and sediment load reduction, wetlands protection, oyster reef and SAV bed creation, and more effective natural resources management implementation. The Department of Defense is proud to have been part of that effort. The Department of Defense's continued efforts will change and evolve in response as the scientific community identifies new challenges.

The Department of Defense also shares with all the participants in the Chesapeake Bay Program, and the many non-profit organizations engaged in conservation projects within the watershed, concern for the future of the Bay given the steady increase in population in the watershed. The gravity of that threat is reflected in the persistence of storm water as a cause of degradation to the Bay and its tributaries. Therefore, it is essential that all the partners to the Chesapeake Bay Program use experience gained to work more effectively in the future. The Department of Defense is committed to serving as a leader in that effort by working to continue to meet the Chesapeake Bay Program goals. We plan to do this by sharing our expertise and by joining in partnership with all the men, women, and children doing their part for the Bay by practicing conservation in their daily lives.

Department of Defense

Environmental Protection Agency and Department of Defense Pollution Prevention signing cermony. Partnerships such as this support future restoration efforts in the Chesapeake Bay.

VIEW POINT

"The Army's Chesapeake Bay Program is founded on the principles of sustainability. Sustainability is also the foundation for the Army Strategy for the Environment. The Army recognizes that a successful Chesapeake Bay Program can only be achieved through the success of all stakeholders in the Bay region. Using the concept of sustainability as our vision, we take a systems approach to strengthen our mission capabilities, enhance environmental quality, and build effective community partnerships. We are committed to the sustainability of the Chesapeake Bay ecosystem now and in the future."

Department of Defense

Addison D. Davis, IV

Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health)

Mr. Davis provides executive leadership for all Army environment, safety and occupational health programs including Army National Guard and Reserve activities. His responsibilities span a global organization that includes over a $1 billion annual environmental program and oversight for the safety and occupational health of over 1.2 million soldiers and Army civilian employees worldwide. Mr. Davis works with key personnel in the Army, the Department of Defense, and other federal and state agencies in developing and advocating Army policies for environment, safety and occupational health programs in accordance with Presidential Executive orders, public laws, state and local standards, Department of Defense directives, and the Army mission.

Degrees

- B.S., United States Military Academy at West Point
- M.P.A., Harvard University.

Previous positions

Acting Deputy Director for Demand Reduction at the White House Office of National Drug Control Policy following a distinguished 26-year career in the United States Army. From 2000 to 2003, he served as the Garrison Commander for Fort Bragg. He was a Hoover Fellow at Stanford University.

3. DEPARTMENT OF DEFENSE INITIATIVES

Walkway to the beach at Fort Story, Virginia.

CHESAPEAKE BAY RESTORATION SUPPORTS THE DEPARTMENT'S MISSION AND TRAINING

The creeks and coves of the Chesapeake Bay echo with military history. Many decisive battles were fought in the Bay and its watershed that established the liberties and freedoms we enjoy today. The operational units on the Bay installations are involved in maritime operations and ship berthing, air operations, repair and maintenance of facilities, supply, communications, and training. Much of the 420,000 acres of land held by Bay installations remains undeveloped and provides habitat for wildlife and a realistic training environment for military personnel. To meet mission requirements, Bay installations must provide the war-fighter with ground, amphibious, and air combat training, thereby preparing our armed forces for the diverse array of environments they will face during combat and humanitarian operations.

Department of Defense restoration efforts focus on Bay commitments while sustaining military mission readiness, enhancing quality of life for military families, increasing partnership opportunities, and promoting environmental stewardship.

Installations provide a safe environment for amphibious and open water training exercises and simultaneously comply with all federal, state, and local regulations to restore healthy waters. This in turn protects the health of our military members and their families.

By working to restore and improve habitat such as wetlands, dunes, beaches, and upland areas, the Department of Defense improves the ability of those areas to support realistic training scenarios while protecting and conserving vital habitat and

Department of Defense

A sailor covers his shipmates while they board Yard Patrol Craft 681 (YP 681) during an exercise in the Chesapeake Bay.

Department of Defense

Chesapeake Bay beaches at Fort Story, Virginia are used for amphibious cargo landing exercises.

Department of Defense

The Air Force flies training missions over the Chesapeake Bay.

ensuring the future availability of that habitat. Installations are working to lessen the threat of encroachment by partnering with local officials and organizations to reduce the rate of harmful sprawl development. This can help balance the goals of training military personnel, complying with federal and state environmental laws and regulations , and improving the quality of life for military members, their dependents, and members of adjacent communities.

Through outreach and education efforts, surrounding communities recognize the value of having the Department of Defense as a neighbor. The good will generated through these efforts helps foster support from the community for the Defense mission.


Department of Defense

Army training officer leads students through tactical maneuvers at Aberdeen Proving Ground, Maryland.


Department of Defense

Army personnel practice short-term combat bridging techniques on the Potomac River at Fort Belvoir, Virginia.


Department of Defense

Marine Corps personnel utilize a CH-53 helicopter to perform forest fire suppression training at Quantico.


Department of Defense

The USS George Washington sails out of the Chesapeake Bay for a Composite Training Unit Exercise in the Atlantic Ocean.

LIVING RESOURCES

Historic oyster beds in the Bay were so large that they caused early explorers to run aground. National Oceanic and Atmospheric Administration

Living resources, the organisms that contribute to the health of vital habitat and a balanced ecosystem, are the main health indicators in the Chesapeake Bay. Thus, the conditions of the resources such as finfish, shellfish, and the habitats in which they live serve as markers that guide restoration efforts in the Bay. As a partner with the Chesapeake Bay Program (CBP) on the *Chesapeake 2000*, the Department of Defense contributes to improving the health of living resources by executing initiatives focused on oyster restoration, exotic species management, fish passage for migratory and resident fish, multi–species management, and blue crabs.

CHESAPEAKE 2000

In order to respond to the problems facing the Bay in a multi–faceted manner, The Chesapeake Bay Program and its partners developed the *Chesapeake 2000*. This agreement focused on the following five objectives:

Living Resource Protection and Restoration
To restore, enhance, and protect living resources, their habitats and ecological relationships

Vital Habitat Protection and Restoration
To preserve, protect, and restore those habitats that are vital to the survival of living resources

Water Quality Protection and Restoration
To achieve and maintain the water quality necessary to support living resources and human health

Sound Land Use
To develop practices that protect and restore watershed resources and water quality

Stewardship and Community Engagement
To promote individual stewardship and assist individuals, organizations, local governments, and schools to commit to improving Bay health

United States Geological Survey

A black-crowned night heron in the marsh. *Chesapeake 2000* is focused on protecting living resources such as this bird and the habitat in which it lives.

OYSTER RESTORATION

Oysters improve the health of the Chesapeake Bay by filtering the water, enhancing water quality, and providing habitat for other species on their reefs. Many restoration efforts have focused on rehabilitating the oyster population in the Bay.

In the past, oysters have been a major part of the economy in the region. Unfortunately, oyster populations have dwindled in recent years due to disease, degraded water quality, loss of habitat, and overharvesting. Current populations of the Eastern oyster, *Crassostrea virginica*, account for less than 1% of historic levels. Because of the role they play in the Bay's health, the Chesapeake Bay Program and its partners, including the Department of Defense, are committed to the restoration and creation of oyster reefs.

Oyster restoration partners have developed an Oyster Management Plan to provide guidance and coordination for a Bay–wide approach to oyster restoration and fishery management. Restoration will be a long–term effort and will require the dedication of all partners.

> *Oysters play a major role in improving water quality and the overall health of the Chesapeake Bay.*

The main goal for oyster restoration in the Bay is a tenfold increase in native oysters by 2010. Plans have been set forth for how to achieve this, from increasing sanctuaries, to encouraging more aquaculture, to putting more funding into disease research and disease–resistant management strategies. The Department of Defense has focused its restoration efforts on creating oyster reefs.

Joanna Woerner, IAN Image Library (www.ian.umces.edu/imagelibrary/)

Oyster shell such as these are placed on the floor of the Chesapeake Bay to serve as substrate for hatchery oysters.

Department of Defense oyster projects

The Department of Defense has been directly involved with oyster restoration since the early 1990s. The following are some of the important projects conducted from 1998–2004.

Fort Monroe–In 2004, Fort Monroe purchased two upwellers for the purpose of raising oyster spat into adults. Four thousand oyster spat were purchased and are currently being raised in the upwellers. The objectives of this project were two-fold: 1) Determine the efficiency and labor needed to raise oysters in an upweller system, and 2) Monitor the oysters' effect on various water quality parameters. Adult oysters will be given to the Chesapeake Bay Foundation to be released into Bay waters in Virginia.

Department of Defense

Staff member at Fort Monroe, Virginia places oyster spat in a floating container where the oysters will grow before they are planted on a reef.

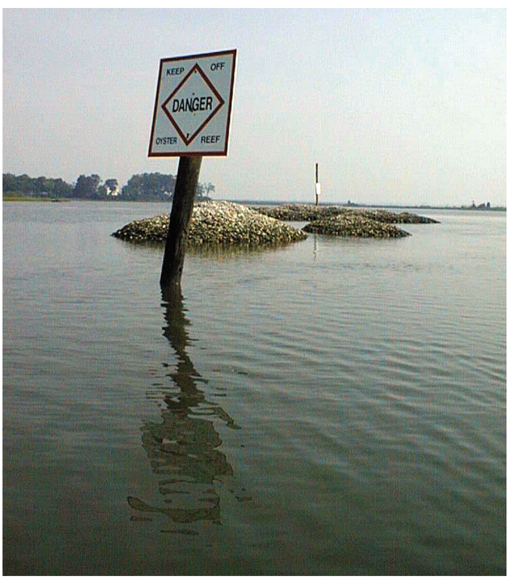
Langley Air Force Base–In 2001, Langley Air Force Base, the Virginia Marine Resource Commission, and the City of Hampton partnered together to install an oyster reef using unused porcelain as a substrate in conjunction with the old oyster shells which normally constitute a reef. This unused porcelain was not suitable for retail sale; however, it did provide desirable calcium–rich points of attachment for oyster spat. Numerous military and civilian volunteers participated in the installation process. The end result was a three–dimensional oyster reef emulating those historically found near the Back River.

Department of Defense

Artificial oyster reef being constructed near Langley Air Force Base, Virginia.

Department of Defense

A Chesapeake Bay Foundation volunteer surveys the donor oyster reef at Lafayette River Annex in Norfolk, Virginia.



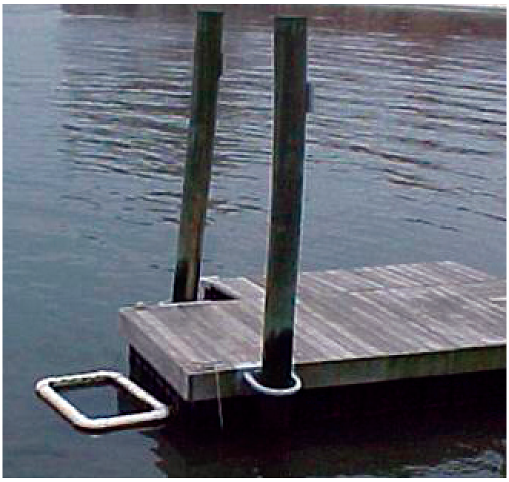
Department of Defense

Naval Weapons Station, Yorktown helped to construct artificial oyster reefs at the mouth of Felgates Creek, Yorktown, Virginia.

Naval Weapons Station Yorktown–In 1999, the Naval Weapons Station partnered with the Virginia Marine Resource Commission and the Virginia Institute of Marine Science (VIMS) to build and seed an artificial oyster reef at the mouth of Felgates Creek. The resulting reef was approximately 350 feet long and 35 feet wide. This reef was stocked with oysters grown by local volunteers. In May 2003, in conjunction with VIMS, the Weapons Station sponsored four field trips for local students to the oyster reef. The students canoed to the reef and netted and identified a number of fish and crustacea. They also populated the reef with approximately 60,000 young oysters they had grown over the course of the school year.

Webster Field–Six oyster reefs were constructed ranging from 50–150 feet long by 35 feet wide. Oysters were added to the reefs each year.

Department of Defense oyster projects (continued)



Department of Defense

Oyster float at Fort Monroe, Virginia. Floats such as this one helped raise oysters for the Chesapeake Bay Foundation's oyster release program.

Fort Monroe–From 2000–2002, in cooperation with the City of Hampton, Fort Monroe grew oysters in floats. Approximately 1,500 oyster spat from the Chesapeake Bay were grown in Taylor floats and Sepa cages until they reached approximately 2 inches in size. Upon reaching maturity, they were given back to the Chesapeake Bay Foundation to be released on oyster reefs in the local waters.

Army Corps of Engineers–In 1998, the Army Corps of Engineers placed shells in a location in the Chester River and seeded them with four million spat. This is in addition to other oyster reefs that had been constructed in the Choptank River, Patuxent River, and Kedges Straight prior to 1998. In 2000 and 2001 the Norfolk District constructed three, three–dimensional sanctuary reefs and one 100–acre two–dimensional reef adjoining harvest area in the lower Rappahannock River. Shells for this and additional projects were obtained by dredging oyster shells from locations that have become unsuitable for oyster production in recent decades due to tidal conditions and salinity. In 2002, the Norfolk District constructed eight one–acre, three–dimensional sanctuary reefs and an adjoining two–dimensional sanctuary area covering 150 acres in Tangier Sound. In 2003 and 2004, efforts were focused in the Chester and Choptank Rivers; 145 acres of oyster reef were created in the Choptank River and 73 acres in the Chester River.

Naval Medical Center Portsmouth–Over several years, personnel from this installation created oyster floats with seed oysters from the Chesapeake Bay Foundation's Oyster Gardening Program. The floats were made to protect the seed oysters from predators such as birds and crabs. Periodically, personnel clean the oysters and check their health.

Department of Defense

Every two months volunteers at Naval Medical Center Portsmouth, Virginia bring oysters up from floats to clean parasites from them.

VIEW POINT

"The Department of Defense manages lands in the Chesapeake Bay watershed and shorelines that provide valuable habitat and offer outstanding opportunities for environmental restoration—all the while supporting military missions. We commend your Bay efforts—needed now more than ever."

Environmental Protection Agency

Rebecca Hanmer
Director, Environmental Protection Agency Chesapeake Bay Program Office

The Bay Program, created in 1983, is a cooperative restoration effort among Maryland, Virginia, Pennsylvania, and the District of Columbia, the Chesapeake Bay Commission, and the federal government. Under the leadership of the Chesapeake Executive Council, composed of the EPA Administrator, the governors of Maryland, Virginia, and Pennsylvania, the mayor of the District of Columbia, and the chair of the Chesapeake Bay Commission, Rebecca is responsible for implementing the Executive Council's goals and objectives for the restoration of the Bay. The Council has adopted three major agreements over the years: the 1983 and 1987 agreements and *Chesapeake 2000,* which sets out a detailed agenda for the Bay Program that includes quantifiable goals and target dates for reaching them.

Degrees
Rebecca Hanmer attended the College of William and Mary, New York University, and the American University in Washington, D.C. and holds Bachelor's and Master's degrees in political science.

Previous positions
Prior to accepting her current position, Rebecca was director of Region III's Water Protection Division. She is a charter member of the EPA, joining when the agency was created in 1970. Since 1975 she has held a number of executive positions in the EPA including Acting Assistant Administrator for Water, Deputy Assistant Administrator for Water, Regional Administrator for Region IV in Atlanta, Acting Regional Administrator for Region VIII in Denver, Director of the Offices of Water Enforcement and Permits and Federal Activities, and Deputy Regional Administrator for Region I in Boston. From 1990 to 1997 Rebecca worked for the Organization for Economic Co-operation and Development in Paris where she managed OECD's technology and environment program and headed the Pollution Prevention and Control Division.

EXOTIC SPECIES

Exotic species (also known as invasive species) are those species capable of moving to new habitats where they can grow and thrive. These species can be introduced accidentally through activities such as ballast water exchange or deliberately through the release of non–native animals into the wild by pet owners. Some examples of common exotic species in the Bay watershed include the common reed *Phragmites*, zebra mussels, purple loosestrife, kudzu, honeysuckle, and multiflora rose.

Exotic species can cause the extinction of individual native species and changes in ecosystems.

Exotic species become a nuisance (or invasive) when they negatively effect the native ecosystem and native species by encroaching on habitat and food sources. Exotic species also become a nuisance when they impact training.

U.S. Fish and Wildlife Service

Kudzu taking over the ground cover in a forest.

Controlling exotic species is important because of their potential to become a nuisance. Many species are controlled through use of chemical or harvesting methods. Chemical methods include the use of herbicides through spraying. Harvesting methods include controlled burning, dredging, and seasonal mowing. Often, a combination of chemical and harvesting methods is required.

In the Chesapeake Bay region, work is being done to identify and rank invasive species that are causing significant negative impacts to the Bay's aquatic resources. Management plans are being devised for those species, as well as for dealing with the problem of invasive species introduction via ballast water. The goal is to restore the integrity of the Bay's ecosystem.

Dr. John Meade, Rutgers University

Multiflora rose is a small shrub with red berries that out competes native species in the Chesapeake Bay watershed.

Department of Defense exotic species projects

The Department of Defense conducted numerous exotic species projects within the Chesapeake Bay watershed between 1998 and 2004. Many of these efforts continue today. Because each installation is affected differently by exotic species, personnel at the installations use different control methods to address the specific needs of their location. The table below illustrates the variety of actions taken to counteract the impact of these potentially harmful species.

Department of Defense

Department of Defense Chesapeake Bay Quality Management Board members discuss invasive plant species control methods.

Installation	*Species of concern*	*Management practice*
Aberdeen Proving Ground, MD	Water chestnut	Hand removal by soldiers
Fort A.P. Hill, VA	Autumn olive	Non–chemical reclamation
Fort Detrick, MD	*Phragmites*, Japanese stilt grass, devil's tearthumb, tree of heaven, multiflora rose, and English ivy	Cutting and removing seeds from site
Fort Eustis, VA	*Phragmites* and kudzu	Herbicide application
Fort Indiantown Gap, PA	Various invasive species	Herbicide application
Fort Meade, MD	*Phragmites*, Japanese stilt grass, devil's tearthumb, tree of heaven, multiflora rose, and English ivy	Hand removal by volunteers
Fort Monroe, VA	*Phragmites*	Mechanical removal Aerial spraying of herbicides
Fort Story, VA	Kudzu	Herbicide application
Langley Air Force Base, VA	*Phragmites*	Aerial spraying of herbicides
Naval Support Facility Patuxent River, MD	Kudzu	Herbicide application
Naval Support Facility, Indian Head, MD	Various invasive species	Backpack spraying of herbicides

Department of Defense

Aerial spraying of herbicide on *Phragmites* at Langley Air Force Base, Virginia.

FISH PASSAGE AND MIGRATORY AND RESIDENT FISH

More than 1,000 miles of spawning habitat for migratory fish are blocked due to dams, culverts, and other obstructions on Chesapeake Bay tributaries. By removing or bypassing the blockages to build fish passages, this habitat can be reopened to fish such as shad, striped bass, herring, and perch. These anadromous fish (ocean fish that breed in freshwater) populations have been decreasing in certain areas of the Bay due to these obstructions.

The obvious answer to this problem is to remove the blockage and allow for the passage of fish to their spawning grounds. However, removing dams and other obstructions can sometimes be expensive and not a viable option. In locations such as this, a fish passage is installed instead; this allows fish to bypass the blockage in its movement up or downstream. Examples of fish passages include fish lifts, elevators, and ladders.

One of the goals of *Chesapeake 2000* was to reopen 1,570 miles of spawning habitat to these migratory fish. This goal was reached and was further exceeded by an additional 238 miles of fish passage.

Passages allow fish to travel up dammed rivers and enable them to reach breeding grounds located upstream.


National Oceanic and Atmospheric Administration

Fish steps such as the ones shown here can allow fish to pass through obstructed streams.


Department of Defense

Blocked culverts such as this one at Naval Support Facility Indian Head, Virginia prevent fish from reaching breeding areas.

Department of Defense fish passage projects

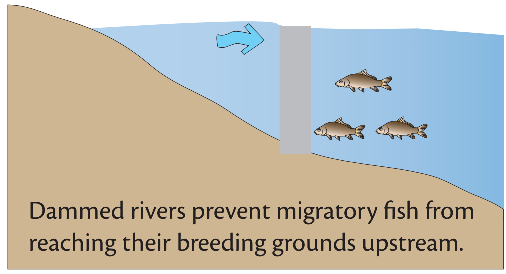
The Department of Defense's fish passage projects contributed to the completion of the *Chesapeake 2000* fish passage goal. The following projects are indicative of the Department of Defense's efforts to improve fish passages for both migratory and resident species (Figure 17).

Fort Belvoir–After coordinating with the Virginia Department of Transportation, the installation restored a stream through a box culvert. The natural channel design improved anadromous fish passage on Accotink Creek and Long Branch.

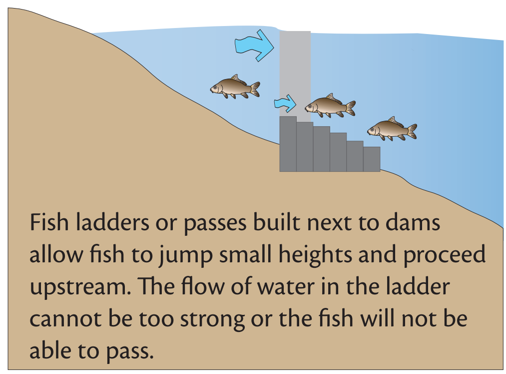
Army Corps of Engineers–The U.S. Army Corp of Engineers opened up ten miles of the Potomac River by replacing an inoperative fish passage originally built as part of the Little Falls Dam in 1959. The new fishway was completed in 2000, using an innovative design that uses three W-shaped labyrinth weirs customized to the specific hydrological conditions of that location. The fishway reduces water velocity to levels that allow fish to move upstream over the passage despite a wide range of river flow.

FIGURE 17–FISH PASSAGES ALLOW FISH TO MOVE UPSTREAM.

Rivers without fish passes



Rivers with fish passes



Department of Defense

An example of a fish ladder; this was constructed at Fort Meade, Maryland.

Department of Defense fish passage project: multi-agency partnerships in action

In addition to the many restoration projects it executes on its own, the Department of Defense works with partners on restoration projects. In 2004, the Army Corps of Engineers worked with the City of Fredericksburg and Friends of the Rappahannock to remove the Embrey Dam. The removal was necessary so that fish could migrate to spawning grounds nearly 100 miles upriver (Figure 18).

Department of Defense

The Embrey Dam was an obstacle to fish trying to swim upstream to feeding and breeding areas until it was dismantled.

The Embrey Dam, located on the Rappahannock River at Fredericksburg, was originally built in 1910 to generate electricity by diverting water into an adjacent canal. After the electricity was no longer needed, the dam fell into disrepair, and its removal was called for by the City. To coordinate the largest dam removal in the nation since 1999, many agencies and groups worked closely together. Partners for this project included the Army Corps; members of the Army's 554th

FIGURE 18—REMOVAL OF EMBREY DAM OPENED MILES OF FISH HABITAT ON THE RAPPAHANNOCK RIVER.

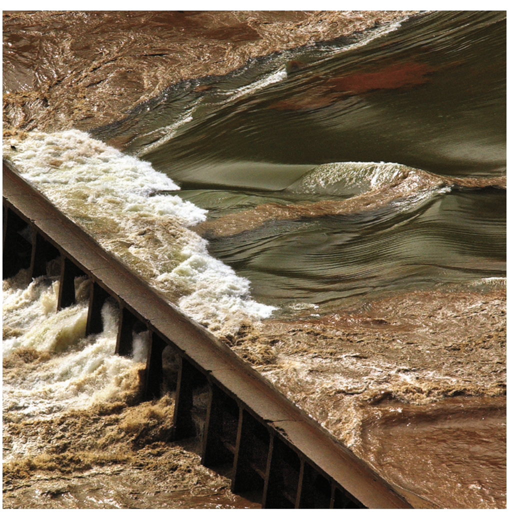
Adapted from Virginia Department of Game and Inland Fisheries, www.dgif.state.va.us/fishing/

Department of Defense

Left: The RED HORSE (Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer) Air Force Reserve Unit from Nellis Air Force Base, Nevada prepares the Embrey dam for demolition. ***Right:*** The explosion that created the breach in the dam.

Department of Defense

Removal of debris after the initial demolition.



Department of Defense

The removal of the Embrey Dam restored 1,300 river miles of fish passage to the Rappahannock River watershed.

Dive Unit, 7th Transportation Group out of Fort Eustis, Virginia; the RED HORSE (Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer) Air Force Reserve Unit from Nellis Air Force Base, Nevada; the Virginia Department of Game and Inland Fisheries, Stafford County; the City of Fredericksburg; the U.S. Fish and Wildlife Service; Coastal America; and the Chesapeake Bay Program.

The Corps was given the task of creating a notch in the dam that would allow the river to flow across the structure. This notch was formed by blasting a 100–foot hole in the dam. The 544th Engineer Dive Team from Fort Eustis and demolition experts from the Air Force Reserves used the demolition of the dam as a real–world joint training exercise. This exercise was part of the Department of Defense Innovative Readiness Training Program. After the breach, the rest of the dam was removed under the supervision of the Army Corps.

By removing the dam, the Rappahannock River became the longest free–flowing river in the Chesapeake Bay watershed. This project opened many miles of waterways to fish including 71 miles on the Rappahannock River, 35 miles on the Rapidan River, and as much as 900 miles on smaller tributaries. Overall, the removal of the Embrey Dam restored 1,300 river miles of fish passage to the Chesapeake Bay watershed.

MULTI–SPECIES MANAGEMENT

The Department of Defense is one of the largest federal landholders in the Bay watershed, controlling nearly 400,000 acres of land, much of it undeveloped. Ecosystem management is the guiding principal of natural resources management at Department of Defense installations.

Complex relationships exist among the living resources in the Chesapeake Bay watershed.

The military partners with the U.S. Fish and Wildlife Service and state Fish and Wildlife Departments to conserve, protect, and manage the natural resources on its installations. These partnerships help improve the management of ecosystems that cross federal, state, and private boundaries.

Management decisions at the installation level are evaluated based on their overall impact. In this manner, decisions are avoided which adversely affect other program areas. Some examples of this approach include locating timber management operations to enhance habitat diversity; maintaining riparian buffers and providing travel corridors for wildlife; utilizing grounds maintenance techniques and schedules that maximize the utility of maintained areas to wildlife; conducting whitetail deer management programs to ensure preservation of understory vegetation and enhancing habitat for ground nesting birds; and using prescribed burns to support the military mission by reducing fuel loads, maintaining early successional and grassland habitat, and improving the quality of managed timber.

By making management decisions on an ecosystem basis, the military helps maintain the diversity of species and habitat that is important in maintaining a healthy Bay.

The Department of Defense develops Integrated Natural Resource Management Plans for ecosystem–based management of living resources and vital habitats.

Department of Defense

BLUE CRABS

The blue crab (*Callinectus sapidus*) is perhaps the most recognizable symbol of the Chesapeake Bay. Scientists have studied the blue crab for years to attempt to learn more about their behavior and life cycle. The blue crab harvest has been the most valuable commercial fishery in the Bay for many years, and the crabs are prized by recreational fishermen as well. However, there is concern over the future of this resource.

Department of Defense installations have control over many areas where the blue crab lives, and where young crabs develop after they return to the Bay and assume their first true crab stage. Since, once mature, they are destined to be the dominant bottom–dwelling predator in the Bay, it is ironic that larval and juvenile crabs are an important source of food for many fish species.

It is theorized that the loss of submerged aquatic vegetation (SAV) habitat throughout the Bay has led directly to the decline in blue crab numbers. Department of Defense installations throughout the Bay watershed are working to reverse this trend by studying near–shore water quality with an eye towards identifying suitable locations for SAV planting. In suitable areas, many installations have created or enhanced SAV beds. These grass beds provide shelter and nursery areas for the blue crab and also help improve the overall water quality of the Bay by absorbing nutrients such as nitrogen and phosphorus.

Department of Defense installations have also undertaken numerous projects to reduce erosion and sedimentation into the Bay. These projects will benefit the crab population by improving the level of dissolved oxygen in the water during summer.

Blue crabs are both predator and prey in the food web of the Chesapeake Bay.

© Michael Jastremski, istockphoto.com

Blue crab populations have been declining perhaps because of the loss of submerged aquatic grass habitats. Their decline has researchers, residents, and fisherman concerned about the future of one of the Bay's most recognizable symbols.

Department of Defense

A Navy Environmental Specialist explains the life cycle of the blue crab to local school children. He uses a collection of shells to show how the crab grows.

VITAL HABITAT

Goose Island Cove at Fort Eustis, Virginia.

Department of Defense

The creatures in the Chesapeake Bay watershed require stable, healthy habitats in which to live. These habitats are vital to the survival of numerous organisms and support biodiversity in the Bay region. The three important habitats in and along the Bay include the following:

- *Submerged aquatic vegetation*
- *Wetlands*
- *Riparian forest buffers*

This section provides an overview of the restoration projects the Department of Defense conducts to preserve and restore habitats that are vital to the survival of living resources including submerged aquatic vegetation restoration, watershed planning, wetlands restoration, and riparian forest buffer restoration.

Protecting vital habitat helps to ensure the future of endangered species such as this sand plain gerardia (*Agalinis acuta*) plant at Andrews Air Force Base, Maryland.

KEY TERMS AND PHRASES

Habitat–The physical location or type of environment in which an organism or biological population lives or occurs.

Ecosystem–The dynamic and interrelating complex of plant and animal communities and their associated non–living environment.

Stakeholder–The individuals and groups that have a vested interest in or are impacted by an environmental issue.

SAV–Abbreviation for submerged aquatic vegetation, beds of underwater grasses.

Riparian forest buffer–The forests that are located along the margins of upland and aquatic habitats which protect water quality and temperature, and some or all of a nearby floodplain.

Source: biology–online.org

SUBMERGED AQUATIC VEGETATION

Bay grasses, also called submerged aquatic vegetation (SAV), are critical to the Chesapeake Bay ecosystem. They produce oxygen, provide habitat for fish and shellfish, and reduce wave action and shoreline erosion.

Historically 200,000 acres of SAV may have lined the shores of the Bay, but in 1984 acreage was down to a low of 38,000 acres. Increasing quantities of nutrients and sediments contribute to these declines. Because aquatic grasses are a good measure of Bay health, they are an important tool in the restoration process. As water quality improves in certain areas, the amount of bay grasses in those areas should increase as well.

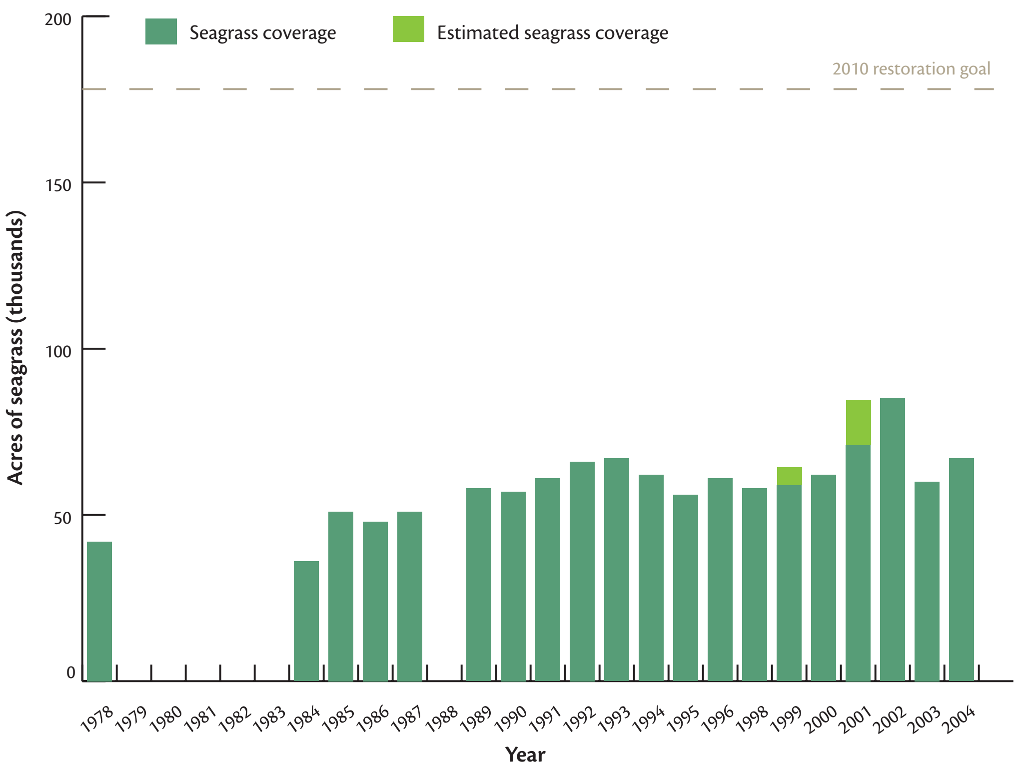
Chesapeake Bay partners have agreed to a restoration goal of 185,000 acres by the year 2010. Total acreage in 2004 in the Chesapeake Bay was estimated at over 72,000 acres, which is 39% of the overall goal (Figure 19).

Underwater bay grasses provide crucial habitat for many aquatic organisms.

Department of Defense

Bay grasses provide vital habitat to numerous organisms including shellfish and fish larvae.

FIGURE 19— SEAGRASS COVERAGE FROM 1978 TO 2004 (2010 RESTORATION GOAL IS 185,00 ACRES)



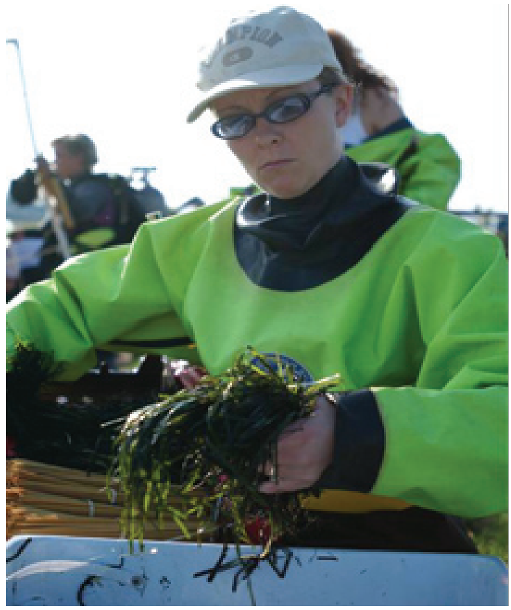
Chesapeake Bay Program

No baywide surveys 1979–1983 and in 1988.

Department of Defense submerged aquatic vegetation projects

The Department of Defense conducts a wide range of submerged aquatic vegetation (SAV) projects focused on restoring vital habitat.

Langley Air Force Base–Langley AFB, along with the National Aquarium in Baltimore, Virginia Marine Resources Commission, Virginia Department of Conservation and Recreation, and the Chesapeake Bay Foundation conducted an SAV planting consisting of 150,000 sprigs. More than 15,000 square feet of SAV were planted just offshore of the installation. Langley's shoreline receives the direct impact of a three–mile fetch of wind driven waves from the northeast, resulting in steady decline of these plants. This project won the 2002 Partnership Award from Coastal America. The award recognizes exceptional teamwork between government agencies, military installations, non-profit organizations, and the private sector to protect and restore coastal resources.



Department of Defense

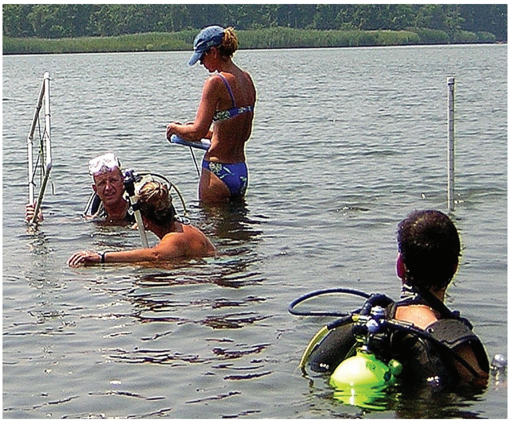
A seagrass planting at Langley Air Force Base, Virginia was done with several partners including the National Aquarium in Baltimore and the Virginia Marine Resources Commission.

Fort Eustis–In partnership with the Alliance for the Chesapeake Bay, Fort Eustis created new SAV beds in 1998 and 1999. After determining the best planting locations based on water sampling data obtained over a year, Fort Eustis planted 1,600 sprigs of mixed widgeon (*Ruppia maritime*) and sago pond weed (*Potamogeton pectinatus*). Plantings were done using volunteer divers. Fort Eustis had only a 30% survival rate, but the surviving SAV patches have expanded every year.

Naval Support Facility Indian Head–SAV sampling has been conducted at Indian Head since 1997. The sampling consists of six sites in the Potomac River, Mattawoman Creek, and Chicamuxen Creek where SAV beds are present.

Department of Defense

Air Force personnel and staff members from the National Aquarium in Baltimore plant eelgrass on the Back River in Virginia.


Department of Defense

Divers from the Army Testing Center and snorkelers from Maryland Department of Natural Resources' Chesapeake Bay Research Reserve and the Army Environmental Center count the number of *Americana* shoots in a natural bed.

Fort Monroe–Fort Monroe planted 2,000 sprigs of eel grasses, donated by the Alliance for the Chesapeake Bay, in two plots in Mills Creek. Both water quality and SAV growth monitoring were done during this project. Virginia Institute of Marine Science examined the sites and concluded the grasses had not survived. It was later determined that the water temperature in Mill Creek was too warm for eel grass, and it could not compete with brown algae growth.

Naval Support Facility Dahlgren–Naval Support Facility Dahlgren conducts nearshore SAV water quality monitoring. Data collected includes water temperature, pH, salinity, dissolved oxygen, type of vegetation at the site, photo active radiation (measures the reflection of light through the water column), and secchi disc readings. Water samples are sent to the Virginia Institute of Marine Science for lab analysis to determine levels of nitrate, phosphate, total suspended solids, and chlorophyll *a* at each site. Laboratory results are provided to the Chesapeake Bay Program Office.

Aberdeen Proving Ground–In partnership with the EPA, the U.S. Fish and Wildlife Service, and the Department of Agriculture, Aberdeen Proving Ground has set up an SAV program, which includes monitoring SAV habitat parameters, water quality, distribution, and abundance in all of its waters. This program increased the EPA's midchannel monitoring sites to 40 and has provided some of the most detailed GIS data on seagrasses of any SAV program to date. Aberdeen Proving Ground has also developed its own propagule source for use in restoration efforts. These restoration efforts took place in 2004 in Redman Cove (~100 plants, <1 acre), and in 1999 at J–Field (~3500 plants, <1 acre).

Naval Support Facility Patuxent River–SAV surveys are conducted by installation Natural Resources Staff annually in tidal creeks and inlets. Planting has not been necessary, and beds appear to be strong.

Naval Academy–Partnering with the Alliance for the Chesapeake Bay, an SAV test planting was conducted in the spring of 1999 with *R. maritima, P. perfoliatus*, and *S. pectinata*. The *P. perfoliatus* and *S. pectinata* were hand planted, while the *R. maritima* was grown on coconut-fiber mats and anchored to the sediment. At the end of the growing season only healthy, dense beds of *R. maritima* were present; however, these beds did not persist into the following spring.

Langley Air Force Base–After careful monitoring for water quality parameters, restoration sites were chosen. In 1998, staff and volunteers planted 2,600 shoots of *Z. marina* at one site. The *Z. marina* was collected by hand from a nearby donor bed, sorted and replanted in test plots. At the end of the monitoring period, 67% of the plants had survived and were growing. The following spring, the plots had expanded dramatically, and a monitoring and restoration program was initiated. In October of 1999 and 2000, plantings of 5,000 shoots were completed. Monitoring shows that these plots had similar success to the 1998 planting. There was also another round of planting completed in 2003.

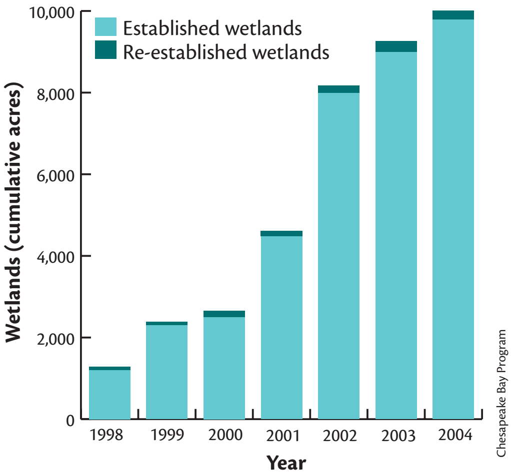
Naval Support Facility Indian Head–In 2000 partnering with the Alliance for the Chesapeake Bay, two test plots were planted with 1,200 *V. americana* shoots in Mattawoman Creek in the Potomac River. Despite heavy grazing, approximately 30% of the transplanted material survived until colonization of the area by the invasive SAV, *H. verticillata*. An additional 4,000 shoots of *V. Americana* were planted in late spring of 2000 at two separate sites. One of these sites was protected with orange construction fencing while the other site was left unprotected. Grazing was evident at the unprotected site and survival was much lower (20%) than at the protected site (55%). Post restoration monitoring also noted the presence of *H. verticillata* at one of the sites.

WETLANDS

Restoring wetlands is important because they serve several vital functions. For example, wetlands provide habitat for numerous species and act as a nursery for many types of fish larvae. In addition, wetlands protect and improve water quality by absorbing nutrients and preventing erosion. Wetlands also provide flood protection because they are able to absorb flood waters. The Chesapeake Bay Program established a goal of restoring 25,000 acres of wetlands by 2010.

Wetlands improve water quality, serve as vital habitat, and provide flood protection.

FIGURE 20—WETLAND RE–ESTABLISHMENT AND ESTABLISHMENT FROM 1998 TO 2004 (2010 RESTORATION GOAL IS 25,054 ACRES)



Established wetlands refer to the creation of wetlands that did not previously exist. Re–established wetlands are the previously existing wetlands restored to their historic function.

According to the Bay Program, between 1998 and 2004, just over 10,000 acres of wetlands were re-established or established in Maryland, Virginia, Pennsylvania, and Washington D.C. (Figure 20). These numbers are debatable, as the final acreages are hard to quantify due to wetland loss from land subsidence, sea level rise, and erosion; but progress is certainly being made.

Department of Defense

A wetland area on a Department of Defense installation: Millstead Creek and marsh, Fort Eustis, Virginia.

Department of Defense wetlands projects

Wetlands provide many important functions for the Chesapeake Bay and the organisms that live there. Due to this, the Department of Defense conducts numerous wetland restoration projects.

Fort Meade–In 1999, Fort Meade dredged 8–acre Burba Lake to remove sediment and nutrients that had been building up. In 2000, Fort Meade planted 9,000 herbaceous plants and 200 trees and shrubs in plots along Lake Burba's shoreline. Species planted include: buttonbush, sweet pepperbush, hibiscus, duck potato, lizard tail, and swamp milkweed. Temporary fencing was also installed around the new plantings to discourage Canada geese from entering the area.

Fort Indiantown Gap–Fort Indiantown Gap partnered with the Chesapeake Bay Foundation, The Nature Conservancy, and the U.S. Environmental Protection Agency to restore and enhance a 5–acre wetlands area through a program of regrading and planting native hydrophytic plant species. The project also included restoring seven miles of riparian forest buffer, and allowing 25 upland acres to revert to warm–season meadow grasses through mowing restrictions. The installation has already seen new native growth since implementing the mowing restrictions.


Department of Defense

Fencing for the control of geese was installed around Burba Lake at Fort Meade, Maryland.

Aberdeen Proving Ground–Aberdeen's Special Area Management Plan (SAMP) is an unofficial agreement between the command, Army Corps Baltimore District and Maryland's Department of the Environment to simplify the Clean Water Act Section 404 permit system. Representative wetland areas were identified and delineated, and an assessment of wetland functions was completed. This process will be used to evaluate impacted wetlands and improve functions in potential wetland mitigation areas. One function studied is the removal of invasive vegetative species and the replacement with native species, thus improving habitat type. A wetland mitigation bank will be included in future development of the SAMP.


Department of Defense

Great egret flying over the restored tidal wetlands at Naval Station Norfolk, Virginia.

Department of Defense wetlands projects (continued)

Fort Belvoir–In 1998, Fort Belvoir completed installation–wide mapping of wetlands. They operate under a *No Net Loss* policy for wetlands and emphasize avoidance of wetlands in project siting.

Naval Support Facility Dahlgren–In 1998, wetlands were constructed in the Kitts Marsh area. For this project, a mowed drainage swale was converted into a 1–acre freshwater and brackish wetland. The lower brackish marsh was supported by the tidal influence of the adjacent Potomac River, while storm water charged the upper freshwater wetland. In 1999, a wetland was constructed for the sewage treatment plant. This wetland is a submerged wetland constructed to enhance effluent quality in terms of biological oxygen demand (BOD), total suspended solids (TSS), and total nitrogen. The constructed wetland received secondary clarifier effluent which flows through the wetland cell and discharges to an ultraviolet light disinfection structure. The constructed wetland reduces the BOD and TSS to below 10 mg/L, and wetland plants reduce nitrogen levels to 5 mg/L when the biological nutrient removal system is in service using no additional chemical treatment. A 2004 wetland restoration and construction project was associated with Dahlgren's Installation Restoration Program (IRP). The project included removing environmental contaminants from an upland and adjacent brackish marsh complex. Additional wetland acreage was established during the course of this project to provide a wetlands bank for mitigative requirements created by other wetland impacts being addressed by the IRP program. This project involved restoration/creation of 6.9 acres of wetlands.

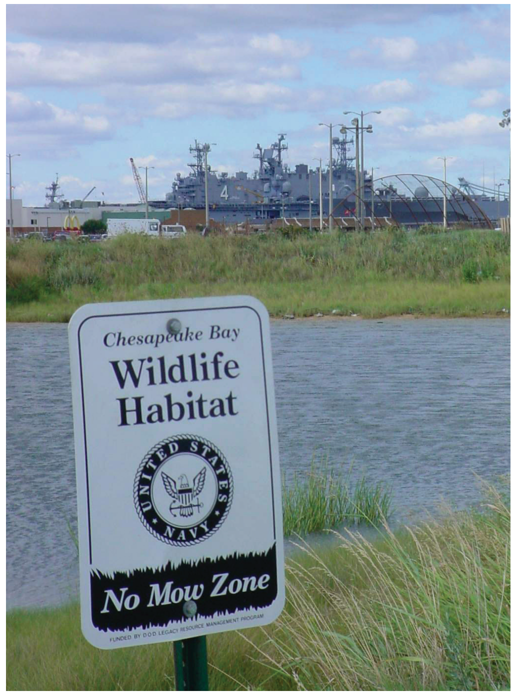
Webster Field– In 2003, the OLF Webster field partnered with the National Aquarium in Baltimore, the Naval Facilities Engineering Command Washington, the St. Mary's County Soil Conservation District, and the Southern Maryland Resource Conservation and Development Board to restore 1.5 acres of tidal wetland habitat and 3,500 feet of new shoreline at Priest Point at the Patuxent River's Webster Field Annex. Together, these groups planted more than 30,500 units of marsh grasses.

Department of Defense

Volunteers plant wetland plants at Webster Field adjacent to the Potomac River in Maryland.

Department of Defense

Dredged material was placed in Kingman Lake by the Army Corps of Engineers to create a marsh and riparian forest buffer.



Department of Defense

Restored tidal wetlands at Naval Station Norfolk, Virginia.

Army Corps of Engineers–Kingman Lake, located on the western edge of the Anacostia River in Washington D.C. was dredged in the 1920s and 1930s to create a public recreation area. The 411–acre lake was never completed and silted in over a course of decades rendering it of no recreational or habitat value. In 1999, the Baltimore District began a 41–acre wetlands restoration within Kingman Lake. The Corps placed dredged material and planted 700,000 native wetland plants and reforested 6.2 acres with native hardwoods to provide a 100–foot wide riparian buffer between the lake and the adjacent Langston Golf Course. The last stage of the project consists of building up a 20–acre mud flat along the mainstem of the river between East Capital Street and the Benning Road Bridge, and planting 400,000 native wetland plants. This area will have elevated walkways over the wetlands for observing nature and a dock for launching canoes and rowing shells.

Naval Support Facility Indian Head–In 2001, the Naval Support Facility created a seasonal shallow water area by installing a water control structure. Along with helping to filter out sediment and pollutants, this area serves to enhance wildlife habitat, especially for attracting woodpeckers and wood ducks.

Naval Support Facility Patuxent River–The Support Facility has restored 2.1 acres of non–tidal wetlands and created a nature trail around the wetlands for public enjoyment. The project also includes a boardwalk, gazebo, and commercial–sized binoculars. Interpretative panels were erected to provide educational information about wetlands.

RIPARIAN FORESTS

Riparian forest buffers are areas of forest along the streams and banks of the Chesapeake Bay. These forests provide a filtering mechanism to improve water quality, as well as providing habitat for animals in the Bay.

The Chesapeake Bay Program goal for riparian forest buffers is the construction of at least 10,000 miles of riparian stream buffer by 2010. The initial goal of 2,010 miles was achieved in 2002 (Figure 21).

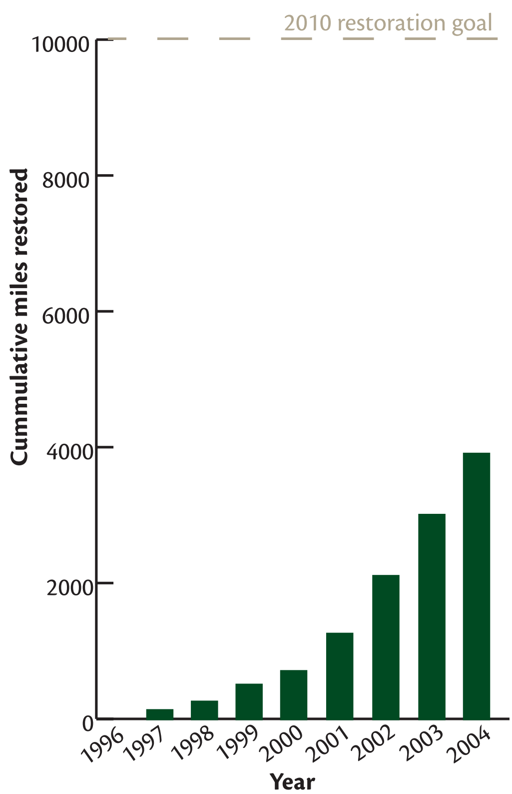
The Department of Defense has some of the greenest space remaining in the face of increasing urban encroachment, and its restoration efforts continue to provide habitat. Since 1997, the Department of Defense has restored riparian forest buffer (RFB) habitat throughout the Bay watershed. For example, Naval Weapons Station Yorktown has restored 2.5 linear miles at a former weapons storage compound and landfill site; Naval Support Facility Indian Head has contributed 2.5 linear miles; Fort Detrick, Fort Meade, Fort Indiantown Gap, and Fort A.P. Hill have combined to restore over 6 linear miles of riparian buffer along the Bay tributaries in Maryland, Virginia, and Pennsylvania. Many other installations have contributed to Department of Defense restoring over 25 linear miles. The Department of Defense was instrumental in helping the Bay Program meet its overall goal of restoring 2,010 miles of linear RFB by the year 2010, (a full eight years early as this goal was met in 2002).

Department of Defense

Navy personnel complete a riparian forest buffer planting at a former Superfund site.

> *Riparian forest buffers improve water quality while providing habitat for wildlife.*

FIGURE 21—RIPARIAN FOREST BUFFER RESTORATION 1996–2004 (2010 RESTORATION GOAL 10,000 MILES)



Chesapeake Bay Program

In order to restore water quality, the Chesapeake Bay Program set a goal of 10,000 miles of restored riparian forest buffer by 2010. As a partner, the Department of Defense strives to restore riparian forests.

Department of Defense riparian forest projects

In support of the vital habitat goals in *Chesapeake 2000*, the Department of Defense strives to restore riparian forest buffers on its Bay installations.

Naval Weapons Station Yorktown–In January 1998, the environmental division at Naval Weapons Station Yorktown and the Virginia Institute of Marine Science co–sponsored a planting project to establish 1,300 linear feet of riparian buffer along Felgates Creek. Approximately 250 native trees and shrubs were planted (species include: loblolly pine, dogwood, ash, wax myrtle, viburnum, raspberry and blackberry, blueberry, hawthorn, redbud, and several species of oak).

Fort Monroe–Since 2001, approximately 300 trees have been donated by the Virginia Department of Forestry and U.S. Fish and Wildlife Service. About 500 man–hours were used to plant the trees to help restore a mile–long riparian buffer in the Dog Beach area along the Chesapeake Bay.

Department of Defense

Fort Monroe, Virginia installation personnel plant trees to restore a riparian forest area.

Department of Defense

Riparian forest buffer at Navy Information Operations Command Sugar Grove, West Virginia.

Navy Information Operations Command, Sugar Grove–At Sugar Grove, invasive plants were removed from along the South Fork River. Native species of trees and shrubs were planted in their place.

Aberdeen Proving Ground–Abeerden has replanted 18 acres of forest to offset construction projects which have impacted habitat areas.

Fort Detrick–At a Department of Defense Riparian Forest Buffer Workshop, representatives from each of the military services, other federal agencies, members of Fort Detrick's motor pool, soldiers from the U.S. Army Medical Research Institute of Infectious Diseases, the Maryland Department of Natural Resources, and the Maryland Conservation Corps planted more than 400 trees and shrubs.

Fort Detrick's riparian forest buffer efforts tie into the city of Frederick's Greenways program. The long–range goal of this program is to establish a greenway, or linear forested park, from the Catoctin Mountains to the Monocacy River, which would provide a flyway and travel corridor for wildlife (Carroll Creek riparian forest). Since 1998, 14.5 acres of riparian forest buffer have been planted.

Department of Defense riparian forest projects (continued)

Langley Air Force Base–In 2001, approximately 1,000 cubic yards of concrete rubble were removed from a 2–acre parcel adjacent to the northwest branch of the Back River. This area was replanted with trees and shrubs native to the Tidewater area, resulting in a riparian buffer. The transplanted trees and shrubs are thriving and much of the concrete rubble was used for shoreline stabilization projects in other areas on the installation.

Fort Eustis–To form a green belt, former warehouse sites were converted to open groves of trees and native species were planted among the existing mature tree canopy. This action increased the tree canopy density along the entire length (1.7 miles) of Washington Boulevard.

Fort A.P. Hill–To celebrate Earth Day 1998, Fort A.P. Hill environmental staff planted a total of 120 tree seedlings along Wrights Run and Reynolds Run, tributaries to the Mattaponi River, and Mill Creek, a tributary to the Rappahannock River, with the help of volunteers. For Earth Day 1999 and 2000 the same team of installation personnel and students expanded the buffers by planting more trees, starting an Earth Day tradition of expanding riparian forest buffer.

Langley Air Force Base–At Langley AFB, a reforestation project was begun in 1999. For this project, 22 volunteers from the first Civil Engineering Squadron, Equipment Maintenance Squadron, and 94th Squadron planted 500 seedlings. They connected an existing forest and grassland to create the first portion of a 10–acre riparian buffer along the Back River. In May 1999, 800 more seedling trees and shrubs were planted as part of a wildlife enhancement program. In an effort to keep deer and other wildlife off the airfield, habitat areas have been planted with food source materials to contain foraging in appropriate areas, (indigobush, red osier dogwood, sweetgum, overcup oak, lespedeza, and other native food material).

Carlisle Barracks–At Carlisle Barracks, about 250 trees were planted along the Letort Spring Run to create a natural barrier to prevent pesticides and nutrients from entering the water. Since the trees were planted, the understory has become thicker, providing a better buffer zone.

Camp Peary–Approximately 60% of the mature forested area on base was destroyed by Tropical Storm Isabel. To reforest the area, Camp Peary harvested timber for recycling from over 500 acres of the storm–damaged area, and reforested or replanted over 20 acres of oak seedlings in 2004.

Department of Defense

New Gosport upland riparian buffer planting in Portsmouth, Virginia.

Department of Defense

Department of Defense

Before: Riparian forest buffer along Blows Mill Run at Naval Weapons Station Yorktown, Virginia *before* restoration. **After**: The same forest buffer along Blows Mill Run *after* restoration was completed.

Naval Weapons Station Yorktown–In 1998, Naval Weapons Station Yorktown purchased more than 20 species of native pine and hardwood seedlings. In the spring, 50 volunteers planted more than 5,000 trees and shrubs, covering 100 feet on each side of a tributary of Blows Mill Run for a distance of 1.2 miles. The upland portion of the planting site was planted with loblolly pines and warm–season grasses. In all, approximately 125,000 trees and shrubs, or about 625 trees and shrubs per acre, were planted on the site.

Fort Meade–To celebrate Earth Day 2000, a group of 300 volunteers from AmeriCorps, the EPA, and a local middle school planted 3,000 seedling trees along the Midway Branch Creek, a tributary to the Little Patuxent River. The same day, another 100 seedlings and 36 tall trees were planted around the installation's Environmental Science Center close to Franklin Branch, another tributary to the Little Patuxent River.

WATERSHED PLANNING

Watershed planning is a way of protecting natural resources, while also enhancing the community. The aim of watershed planning is to evaluate and support the health of entire ecosystems rather than focusing on one particular species. This big picture approach helps establish relationships between installations, community groups, schools, local and state governments, and any other group that is interested in helping to protect the watershed. Watershed planning has the potential to impact large areas (Figure 22). However, watershed planning can also be applied to the local streams and creeks that transect communities. Whether on a large or small scale, this kind of planning is important because it addresses habitat questions within the purview of the watershed, instead of along political boundaries. Thus, watershed planning encourages many organizations to work together.

Watershed planning provides a way for all stakeholders to build a vision for their watershed's future.

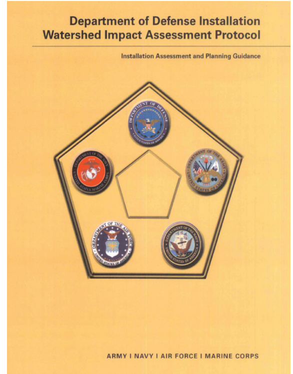
Installation Watershed Impact Assessment Protocol

To assist Army installations with evaluating the condition of water resources on or near their installations the Department of the Army developed a watershed assessment tool. This tool, entitled the Department of Defense Installation Watershed Impact Assessment Protocol, is currently available to all Department of Defense Services. The Protocol is located on the Clean Water

Department of Defense

Navy and Air Force personnel discuss local watershed planning with other members of the Elizabeth River Project.

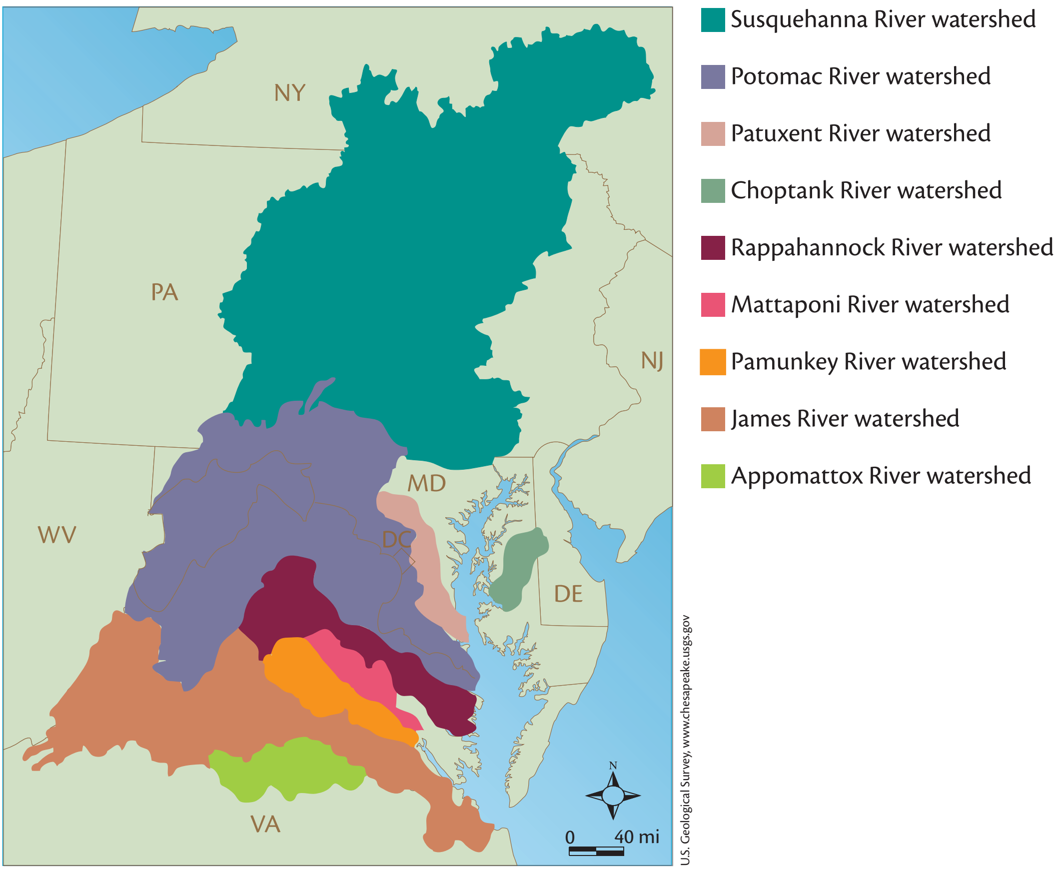
Act Service Steering Committee website on the Defense Environmental Network Information Exchange (*www.denix.osd.mil/denix/Department of Defense/Working/CWASSC/Subjects/Watershed/Department of Defense_watershed.pdf*). The Protocol better equips installation environmental, operations, planning, and engineering personnel in working together to respond to environmental issues, evaluate activities that impact a watershed, develop pollution prevention restoration plans, and correct or reduce watershed impairments.



Department of Defense

Department of Defense Watershed Impact Assessment Protocol is a valuable resource for personnel working to address environmental issues and improve Bay health.

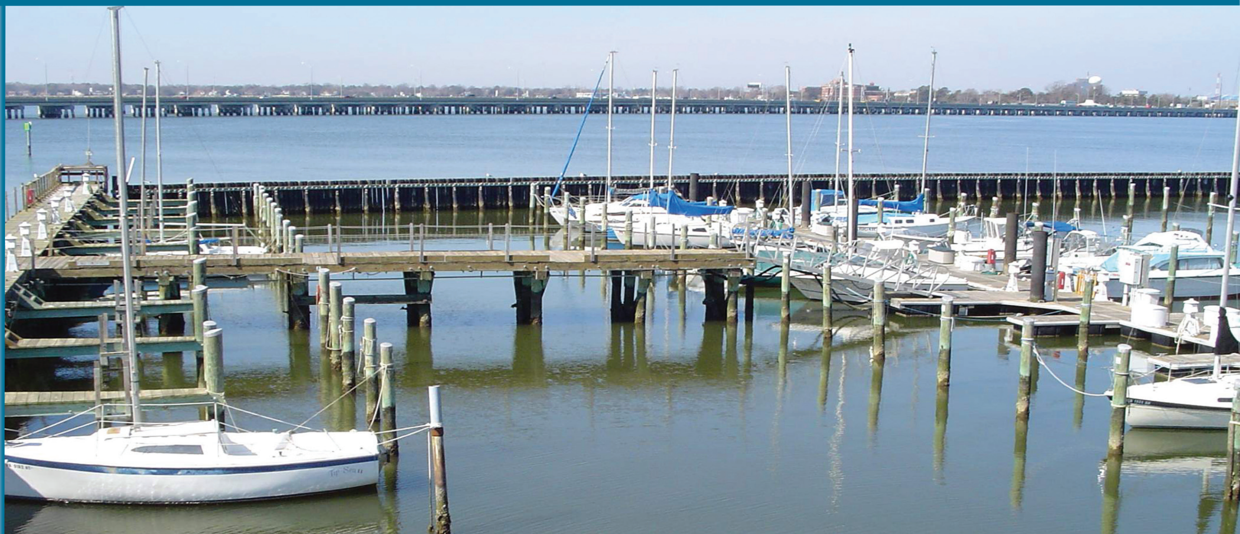
FIGURE 22—THE CHESAPEAKE BAY WATERSHED IS A COLLECTION OF SMALLER WATERSHEDS.



U.S. Geological Survey, www.chesapeake.usgs.gov

This map shows some of the smaller watersheds that are part of the Chesapeake Bay's watershed. Watershed planning allows for comprehensive restoration plans that protect specific species, entire ecosystems, and the ecological communities within that watershed. Thus, watershed planning has the potential to impact large areas.

WATER QUALITY



Fort Monroe, in Hampton, Virginia participates in the Virginia Clean Marina Program. Department of Defense

Water quality is the main focus of Chesapeake Bay restoration. A decline in water quality is quickly noted by the reduction in underwater grasses, lesser diversity of species, disappearance of some species altogether, and presence of disease.

To promote good water quality and support the goals of *Chesapeake 2000*, the Department of Defense conducts numerous restoration projects focused on reducing nutrient and sediment inputs and chemical contaminants, monitoring priority urban water, preventing air pollution, and controlling boat discharges.

TYPES OF EROSION MANAGEMENT

Below are descriptions of a few of the most common methods employed by the Department of Defense.

Breakwaters: free standing structures that reduce wave action by refraction and diffraction before it reaches the land.

Virginia Institute of Marine Science

Breakwaters built to protect the shorelien at Cape Henry at Fort Story, Virginia.

Groins: structures positioned perpendicular to shore that trap sediments and prevent erosion. Shoreline will increase between groins as water movement carries sediment along the shore.

Bulkheads: retaining walls built along coastlines or banks that prevent water movement from eroding soil or sand.

National Oceanic and Atmospheric Administration

Bulkhead on the lower Patuxent River—built to protect houses in the distance.

Revetments: walls that protect the shoreline from incoming waves. They serve a similar function to bulkheads. Revetments can either be pervious or impervious. Pervious revetments allow water to seep into the protected shoreline without causing erosion.

Sources: www.vims.edu/physical/research/shoreline/ and the *Cambridge Academic Dictionary*

NUTRIENTS AND SEDIMENTS

Nutrients are, historically, the focus of restoration efforts in the Chesapeake Bay area. Nitrogen and phosphorus occur naturally in the environment, but an overabundance of these nutrients is entering the water now due to lack of forests and wetlands to act as buffers.

Sources of nutrients include point and non-point sources. A point source is one which can be attributed to a specific physical location, as with a pipe output from a treatment plant. A non–point source is one which is a diffuse source. These pollutants can come from any number of places including parade grounds, golf courses, farm fields, and parking lots.

In the *1987 Bay Agreement*, the goal was set to reduce nutrients to the Bay by 40% by the year 2000. After this overall goal was set, specific nutrient goals were created for each tributary basin. States then developed *Tributary Strategies* which outlined how each basin would reach their nutrient reduction goal. Several Bay installations are involved in these tributary strategy teams.

Reducing excess nutrients and sediments improves the water quality of the Chesapeake Bay.

In 2003, the goal was set that nitrogen loads will be reduced from the 2000 levels of 285 million pounds to no more than 175 million pounds per year. The phosphorus goal now states that loads will be reduced from the 2000 levels of 19.1 million pounds entering the Bay to no more than 12.8 million pounds per year.

Sediments, including clay, silt, and sand, enter the Bay through shoreline erosion, and during periods of rain and melting snow. Excessive amounts of sediment can cause harmful conditions in the Bay, including smothering bottom dwelling creatures, clouding the water and blocking light–therefore inhibiting the growth of SAV, and filling in dredged areas which will prevent the movement of boats, making travel hazardous.

The sediment goal includes a reduction from 2000 levels of 5.04 million tons entering the Bay to no more than 4.15 million tons per year.

Department of Defense

The Department of Defense uses Nutrient Management Plans to help organize and plan nutrient reduction projects.

LIVING SHORELINES

Bay installations participate in numerous living shoreline programs to improve water quality. Living shorelines use natural materials such as marsh plants and strategically placed organic material in conjunction with construction techniques such as low profile breakwaters to restore the function of shoreline ecosystems. Living shorelines reduce the sediments and runoff entering the Bay.

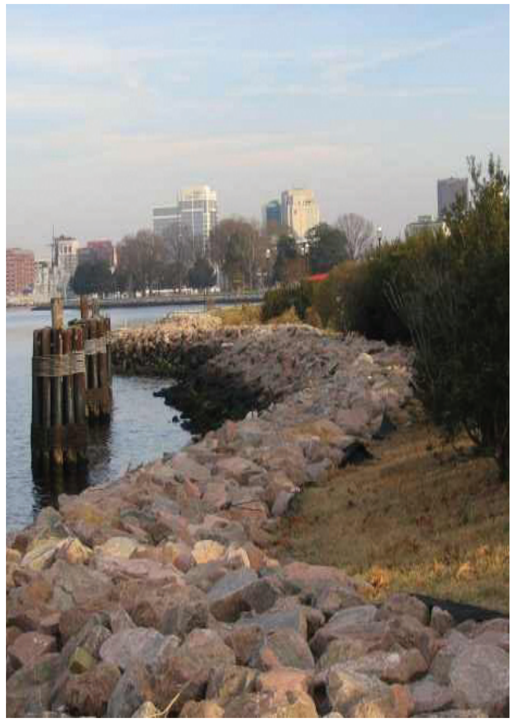
Department of Defense nutrients and sediments projects

In order to reduce nutrients and sediments in the Bay, the Department of Defense conducts numerous restoration projects including shoreline stabilization, storm water outfall construction, and vegetation revitalization.

Blossom Point Research Facility–A shoreline erosion minimization project was begun at the Blossom Point Research Facility. The goal of the project is to reduce the rate of shoreline loss from 2 feet annually to less than 0.5 feet annually. The Multi–Agency Cooperative Research Project partnership includes the following partners: the Alliance for the Chesapeake Bay, U.S. Fish and Wildlife Service, University of Maryland Center for Environmental Science, U.S. Geological Survey, Army Adelphi Laboratory Center Garrison, Army Corps Engineering Research and Development Center, and Army Corps of Engineers, Baltimore District. Since 1999, members of the research consortium have collected and analyzed data on parameters in the area such as SAV, sediment, faunal composition, presence of epiphytes (plants that grow on other plants), and water quality parameters.


Department of Defense

Sediment retention pond constructed at Letterkenny Army Depot, Pennsylvania.


Department of Defense

Stone revetment at Naval Medical Center Portsmouth, Virginia.

Naval Medical Center Portsmouth–The Naval Medical Center constructed a 450–linear foot stone revetment using 1,500 tons of riprap. This project was enhanced by the planting of 250 wax myrtles, 22 loblolly pines, 10 live oaks, 3 black pines, 3 river birches, 16 London plane trees, and 17 pin oaks. This project was constructed in accordance with a Shoreline Management Plan, put together to address the issues of eroding shoreline.

Fort Monroe–In March 1999, volunteers and staff planted 10,000 American beachgrass (*Ammophila breviligulata*) plants at the northern end of Dog Beach. These plants were put in to anchor blowing sand in this erosion–prone area in order to help stabilize the dunes.

Letterkenny Army Depot–At Letterkenny Army Depot, a sediment retention pond was constructed at the Open Burning/Open Detonation grounds. Barren soil adjacent to the pond was hydro–seeded and drainages within the detonation grounds were lined with riprap to decrease erosion and sedimentation.

Department of Defense

This new bridge at the Naval Support Facility Patuxent River, Maryland was designed to help stabilize the inlet.

Fort Monroe–Three deteriorated storm water outfall pipes along the counter scarp wall of the historical moat were repaired. Once the pipes were repaired, three flapper gate valves were installed. This project also allowed for the removal of debris from the slope embankment including existing tree stumps, old fencing, concrete, and non–native vegetation. Once completed, the embankment between the counter scarp wall and the existing chain link fence, approximately 20 feet, was regraded and native bayscaping plants were used for stabilization.

Fort Monroe–In 2004, a groin rehabilitation project was conducted at Dog Beach on the Chesapeake Bay side. A maintenance and repair project was executed to reshape three existing concrete groins. This included the removal of rebar and other undesirable metals. The existing concrete rubble was used as the core material for shaping the groins. The new groins received 6,397 tons of new armor stone and 933 tons of chinking stone. The stone and concrete help protect the natural areas on Fort Monroe from major storms and stabilize the adjacent Chesapeake Bay beach areas.

Naval Support Facility Patuxent River–A new bridge was installed to replace the pedestrian bridge spanning the inlet to Harper and Pearson Creeks from the Patuxent River. The purpose of the project was to stabilize the inlet. The previous structure relied on multiple in–stream supports, while the new structure is a single span bridge with footers in either bank and no in–stream pilings.

Blossom Point Research Facility–At Blossom Point, vegetative and stone habitat structures were installed once a stream was evaluated for trout habitat potential. Following the construction of these structures, a significant increase in pools and riffles was observed.

Fort Story–Fort Story worked with the Norfolk District of the Army Corps and the 11th Transportation Battalion to control the rate of erosion (Fort Story loses eight feet of dune per year.) by placing a series of sand–filled 200–foot long polypropylene bags, known as geotubes, along the shoreline. The geotubes were covered with sand and planted with American beachgrass to stabilize the dune.

Department of Defense nutrients and sediments projects (continued)

Langley Air Force Base–In the spring of 2003, the Langley Air Force Base Back River Restoration Team and the Department of Defense received the 2002 Coastal America Partnership award for their restoration and management efforts related to an erosion control project using fringe marsh and stone. The significant achievements of this project include the restoration of approximately 150,000 square feet of historic SAV beds; construction of a shoreline stabilization demonstration project; furnishing of research and documentation of native eelgrass planting techniques specific to Langley's shorelines; construction of a conservation oyster reef and the seeding of 200,000 oyster spat; maintenance of critical real time data collection at the site that coordinates with other data collected around the Bay watershed by the National Oceanic and Atmospheric Administration (NOAA), the Virginia Institute of Marine Science (VIMS), and the National Aquarium; and the provision of a living classroom to local students on board one of the Baywatcher tours that allow children the opportunity to broadcast seed oysters on the conservation reef. Partners in this project include Langley Air Force Base, Department of Defense, Virginia Marine Resources Commission, Alliance for the Chesapeake Bay, National Aquarium in Baltimore, City of Hampton–Public Works Department, the Chesapeake Bay Foundation, and the Virginia Department of Conservation and Recreation.

Fort Belvoir–Between 1998 and 2000, Fort Belvoir corrected 23 restoration sites identified by the Watershed Management Plan to stabilize streambanks and reduce wetland impacts from excessive runoff velocities.

Fort Meade–Fort Meade stabilized the shoreline of an 8–acre lake with vegetation plots and improved storm water runoff by installing storm water management ponds.

Fort Monroe–A shoreline erosion control project was conducted along the Phoebus Channel in 2003 to prevent a building from being undermined by wave action. The beach along the western edge of the building's footer had eroded away approximately two feet. The project consisted of filling in voids created by erosion and installing filter fabric overlaid with riprap. Due to existing currents in the area, the adjacent shoreline to the north of the building was also protected with filter fabric and riprap to prevent possible future beach erosion.

Department of Defense

A living shoreline at Langley Air Force Base, Virginia.

Department of Defense

A stone revetment at the Naval Support Facility Patuxent River, Maryland replaced an existing deteriorating bulkhead. The yellow line floating in the water is a turbidity curtain that prevents sediments from moving downstream and decreasing water clarity.

Naval Support Facility Patuxent River–At the West Basin Marina, Naval Support Facility Patuxent River placed 2,500 linear feet of stone revetment along an existing deteriorating bulkhead and created a new jetty to stop shoreline erosion and prevent additional sediment from going in to the Patuxent River.

Fort Indiantown Gap–Maintenance was carried out on all trails along a corridor to repair large washouts following Hurricane Ivan. In addition, Syntac was spread on all trail surfaces to reduce erosion and the development of fine particles from vehicular traffic.

Naval Weapons Station Yorktown–To improve water quality, a shoreline stabilization structure based on gabion baskets was constructed at Felgates Crossing. Natural Resources staff delineated the extent of the shoreline erosion due to wave action and worked with Naval Facilities Engineering Command Atlantic personnel to design a permanent solution. The final project involved regrading and stabilizing the deteriorating wing walls with the installation of approximately 175 feet of rock–filled gabion baskets. Over 500 tons of stone were placed inside the baskets.

Department of Defense

A shoreline stabilization structure at Felgates Crossing is made of gabion baskets, which are 'baskets' made of wire mesh and filled with piled stones.

Department of Defense nutrients and sediments projects (continued)

Blossom Point Research Facility–Between 1999 and 2003, three storm water outfalls (from parking lots and buildings), totaling over 1,000 linear feet, were stabilized using Class I and Class II riprap. These projects significantly stabilized these areas with considerable reduction in sediment from the non-point sources observed.

Aberdeen Proving Ground–Two miles of shoreline have been restored from severe erosion. These areas have included riprap, groins, jetties, offshore breakwaters and vegetation plantings.

Naval Support Facility Patuxent River–The Naval Support Facility Patuxent River created 65,700 square feet of tidal marsh/dune system along ~1,000 linear feet of shoreline at West Basin/Gate 4. To do this, they deposited ~5,470 cubic yards of sloped, clean, select sand fill averaging 90 feet wide, and stabilized it with *Spartina alterniflora* and *Spartina patens*. In addition, they deposited approximately 20,000 cubic yards of sloped, clean, select sand fill, averaging 90 feet wide, as beach nourishment and stabilized it with a 20-foot by 115-foot stone groin. Three breakwaters (130-foot, 200-foot and 120-foot) averaging 30 feet wide were also installed along with 1,300 linear feet of stone revetment (including a stone jetty) averaging 35 feet wide.

Department of Defense

Department of Defense

Top: Volunteers at the Naval Support Facility Patuxent River, Maryland plant grasses on the beach. ***Bottom:*** The tufts of the newly planted grass, in addition to breakwaters, help protect the shoreline along the West Basin of the Naval Support Facility Patuxent River, Maryland.

Department of Defense

At the Naval Support Facility Indian Head, Maryland areas of erosion along this stream were reinforced with jute matting and grass seeding.

Naval Support Facility Indian Head–A stream was restored by creating a slight meandering contour and reinforcing areas of potential erosion with large stone. The stream banks were secured with jute matting and grass seeding. In addition, a riparian forest buffer was planted in partnership with the Maryland Department of Natural Resources following the completion of the project.

Washington Navy Yard–In 1999, the installation received an award for rehabilitating the Yard's storm sewer system to eliminate the potential for contaminant migration from soils to the Anacostia River through the storm sewer lines. Storm sewers were flushed, relined or replaced, inlets were renovated or replaced, and 11 Low Impact Development (LID) storm water features (bioretention cells, permeable paver cells, tree boxes and rain barrels) were constructed to remove contaminants from the runoff to improve Anacostia River water quality. They also deposited ~20,000 cubic yards of clean, select sand fill, averaging 90 feet wide, as beach nourishment and stabilized this with a 20–foot by 115–foot stone groin. Other parts of this project included the installation of three breakwaters (one 130–foot, one 200–foot, and one 120–foot) averaging 30 feet wide, two 30–foot by 150–foot breakwater spurs, and 1,300 linear feet of stone revetment (averaging 35 feet wide).

Camp Peary–Camp Peary began a shoreline erosion control project in 2004. The project involved installing stone revetment that encompasses approximately 4,000 linear feet of shoreline. The project expands along the entire length of the 9.9 mile shoreline of both the York River and Queens Creek.

Naval Amphibious Base Little Creek–In 2002 and 2003, several beach stabilization projects were undertaken at Naval Amphibious Base Little Creek, Virginia. Through the efforts of environmental staff, military personnel, and volunteer labor, sprigs of dune grass were planted on the primary sand dunes to repair and infill damaged or bare areas.

Department of Defense

Grasses were planted on the dunes at Naval Amphibious Base Little Creek, Virginia in order to stabilize the beach.

Department of Defense nutrients and sediments projects (continued)

Naval Support Facility Patuxent River–The Naval Support Facility created tidal marsh and conducted shoreline restoration at both the Fuel Pier and Mattapany. Naval Support Facility Patuxent River installed four breakwaters (two 150 feet in length, one 180 feet in length, and one 140 feet in length). The installation also graded and planted 1,200

Department of Defense

Department of Defense

This project at Naval Support Facility Patuxent River, Maryland consisted of a system of four headland breakwaters with beach sands obtained from the adjacent sandy upland banks to create a series of stable pocket beaches. The project spans 2,200 feet of shoreline. ***Top:*** Quarters 'A' soon after construction. ***Bottom:*** Quarters 'A' one year later.

Department of Defense

Department of Defense

At the fuel pier at Naval Support Facility Patuxent River, Maryland, 410 linear feet of stone revetment were installed to protect the shoreline.

linear feet of shoreline, using 9,000 cubic yards of clean select sand fill and *Spartina alterniflora* and *Spartina patens*.

To control erosion at the Fuel Pier, 5 headland breakwaters were installed along with beach sand obtained from the adjacent 60 foot banks to create a series of stable pocket beaches. Dune vegetation was planted to help stabilize the tombolos (sand attachment at breakwaters) and backshore region. The project weathered Tropical Storm Isabel with no impact to the upland banks.

Webster Field–The Naval Air Station created a marsh along 4,315 feet of eroding shoreline (Priest's Point and Chapel Cove). To do this, they deposited ~2,450 cubic yards of clean, select sand fill along 2,630 linear feet of shoreline. They stabilized the beach sand with 30,500 units of *Spartina alterniflora* and *Spartina patens* in areas averaging 40 feet wide. Eleven stone sills averaging 14 feet wide and totaling 2,150 linear feet were installed. Two breakwaters (averaging 26 feet wide) were constructed along 270 linear feet of shoreline, and three breakwater spurs (averaging 19 feet wide) were constructed, totaling 240 linear feet. Other elements of the project included the placement of 1,560 linear feet of stone revetment in 5 areas and the construction of 6 oyster rock reefs (ranging from 50–140 feet long by 35 feet wide). The project covered about 2.4 acres of shallow water habitat.

Rich Takacs, NOAA Restoration Center

Stone revetment and breakwaters installed at Webster Field, Maryland protect restored wetlands.

Department of Defense

Breakwaters constructed at Fort Eustis, Virginia help protect the shoreline from wave action and subsequent erosion.

Department of Defence nutrients and sediments projects (continued)

Naval Weapons Station Yorktown, Cheatham Annex–In coordination with the Virginia Department of Conservation and Recreation, the Virginia Marine Resource Commission, the local wetlands board, and the Virginia Department of Historic Resources, the Navy undertook a project to stabilize approximately 200 feet of wave–eroded shoreline along the York River. The repair work consisted of reducing the slope of the bank at the shoreline, placing filter cloth along the bottom of the slope, and placing 1000 tons of large stone (riprap) on top of the filter cloth to create a seawall. It is estimated that the project has reduced pollution into the York River by approximately 259 pounds of phosphorus and 189 pounds of nitrogen in the soil per year. The project has also prevented further loss of Navy property as the bank had been eroding at the rate of 1.1 feet per year.

Webster Field–At the area around the USS Tulip Memorial, the Naval Air Station created approximately 2,680 square feet of tidal marsh fringe by constructing approximately 135 feet of stone sill with wetlands substrate (50 cubic yards of clean sand) and wetlands plants of *Spartina alterniflora* and *Spartina patens*.

Department of Defense

A wave–eroded shoreline at the Naval Weapons Station Yorktown, Cheatham Annex, Virginia.

Department of Defense

This stone riprap erosion control structure was installed to prevent further loss of Navy property and minimize the amount of pollutants reaching the York River.

VIEW POINT

"At the end of every day, month or year we must ask ourselves: 'Did we capture the pounds of pollution we need to trigger a response? Did we restore, protect, or improve an acre of habitat?' Unless we do that, we are not making progress."

Ann Pesiri Swanson

Executive Director, Chesapeake Bay Commission

Ann Pesiri Swanson is known regionally, nationally and internationally as a conservation leader. Ann serves as Executive Director of the Chesapeake Bay Commission, a tri-state legislative advisory authority composed of legislators, cabinet secretaries and citizens from Maryland, Virginia, and Pennsylvania. The Commission is a signatory to the Chesapeake Bay Agreements and coordinates Bay restoration activities among the state legislatures and the U.S. Congress. Ann has been a leader in the region for the past twenty years. There is hardly a piece of conservation legislation in the tri-state region that does not have Ann's mark.

Ann was recognized as the University of Vermont Outstanding Alumni of the Year in 1989, received Chesapeake Executive Council Salute to Excellence Award in 1992 and again in 1999, the Chesapeake Bay Foundations' 2001 Conservationist of the Year and, most recently, the Sierra Club's Award for Outstanding Achievement in 2004. Ann has chaired the Board of the University of Vermont's School of Natural Resources Advisory Council for the past six years.

In 2003 Ann created the Bay Funders' Network organizing more than 100 philanthropic organizations in the Bay basin. She has illustrated several published books on natural history and is an avid gardener, birder, naturalist, and kayaker.

Degrees

Undergraduate degree in Wildlife Biology, University of Vermont; Graduate degree in Environmental Science, Yale University

CHEMICAL CONTAMINANTS

Toxic chemical contamination can enter the Bay through a variety of means. Some of these are traditional point sources, but other routes such as non-point source groundwater discharge and airborne deposition are also involved. Spills and the accidental release of products that contain toxic compounds can also cause these chemicals to end up in the Bay. The Defense Department is reducing the input of chemical contaminants into the Bay ecosystem through aggressive pollution prevention efforts. At Defense installations, processes that use hazardous and toxic products are examined to determine if alternatives exist that are non-toxic or less hazardous. Hazardous materials are centrally stored and issued, which has reduced the amount of excess material inventoried at work areas. Pesticide usage has been reduced by adoption of Integrated Pest Management (IPM) practices such as biological, mechanical and cultural pest control. Awareness has been raised among installation residents by providing educational materials that explain IPM techniques to control household and lawn and garden pests. The potential for storm water runoff to transport chemical contaminants has also been addressed through site evaluations of existing storm water best management practices (BMPs); some steps in the evaluation include increased frequency of BMP inspections; and spill containment structures, products, and training at transportation facilities and docking areas.

Naval Station Norfolk–The Spruce Barge at Naval Station Norfolk is responsible for assisting submarines in performing minor interior maintenance and for resurfacing the topside of the submarine. Originally, non-skid coating was removed from the topsides through physical grinding methods, which created large volumes of fugitive dust containing heavy metals. After piloting a High Pressure Water Jet Blasting system for non-skid surface removal in 2003, the project's success reduced fugitive dust emissions 90%, reduced labor by 50%, and resulted in a cost savings to the Navy of $285,000.

Chemical contaminants accumulate in animal tissue to levels that can be harmful.

Department of Defense

Secondary spill containment structures such as the concrete wall around this diesel tank at Naval Weapons Station Yorktown, Virginia are designed to capture any spills from the tank and allow for easy cleanup.

Department of Defense

A sailor at Naval Station Norfolk, Virginia using a High Pressure Water Jet Blasting System to remove faulty non-skid deck surface. Previously, this was done by grinding. The new method reduces heavy metal-containing dust emmisions by 90%.

PRIORITY URBAN WATERS

In 1993 the Chesapeake Bay Program designated the Elizabeth River, the Baltimore Harbor, and the Anacostia River as toxic regions of concern in the Bay watershed. The Navy has a significant presence in two of the three targeted priority urban watersheds (the Elizabeth River in Hampton Roads and the Anacostia River in Washington D.C.).

Under the Urban Waters Initiative, EPA and the military Services have increased coordination and cooperation with respect to restoring degraded urban rivers through remedial water quality and environmental restoration activities. For example, for the Anacostia River Initiative the Navy has been instrumental in demonstrating federal leadership in the development of studies and strategies as part of their participation on the Anacostia Toxins Watershed Alliance. In much the same way, the Army Corps of Engineers and the Navy support the 14-point restoration plan on the Elizabeth River by participating in restoration of living resources and vital habitat workgroups.

By actively engaging the Elizabeth River Project, the Anacostia Watershed Restoration Committee and other such entities, the Navy has successfully integrated their restoration priorities with those of the surrounding community and local watershed planning organizations, creating a watershed-focused approach, fostering diverse stakeholder buy-in, and ensuring long-term success of selected projects. Funding, materials and in-kind services have been provided from a variety of sources including Navy Environmental Restoration funding, National Oceanic and Atmospheric Administration, Alliance for the Chesapeake Bay, Elizabeth River Project, and Department of Justice. The ongoing partnerships have yielded numerous restoration projects (riparian and wetland plantings at Norfolk Naval Shipyard on Paradise Creek and the southern branch of the Elizabeth river) and innovative storm water management projects (Low impact development projects at Washington Navy Yard on the Anacostia River).

The most severe toxins contamination problems in the Chesapeake Bay are located near urban centers.

National Oceanic and Atmospheric Administration

The Department of Defense participates in local watershed planning and supports restoration projects in Priority Urban Waters such as the Elizabeth River (shown above).

AIR POLLUTION

Airborne nitrogen compounds and chemical contaminants contribute to the Chesapeake Bay's decline. Stationary sources such as incinerators, boiler plants, and heating units produce much of this pollution. Department of Defense facilities have taken many opportunities to reduce emissions from their stationary sources. Both new construction and existing facilities are taking advantage of the latest technology to eliminate or reduce harmful output. Many existing boiler plants have upgraded to state-of-the-art emission control technology, such as continuous monitoring systems that measure the opacity of the flue gasses to determine particulate matter output. In addition, a large number of central boiler plants have been decommissioned and replaced with energy efficient building–specific heating systems such as ground source heat pumps. There has also been a major initiative to convert coal- and oil-fired boilers and heating plants to clean burning natural gas units. For the emission sources that continue to burn oil, the use of low sulfur fuel oil is required and, at some locations, facility operations may be limited to a certain number of hours or to a maximum amount of fuel consumed to reduce total emissions.

> *Airborne pollutants can be deposited on the land and transported to the Bay, where they can negatively affect finfish, shellfish, and other living resources.*

Department of Defense

Airborne chemical contaminants from incinerators, boiler plants, and heating units can settle in the Chesapeake Bay. Converting old coal-fired boiler plants to modern natural gas units can significantly reduce air pollution.

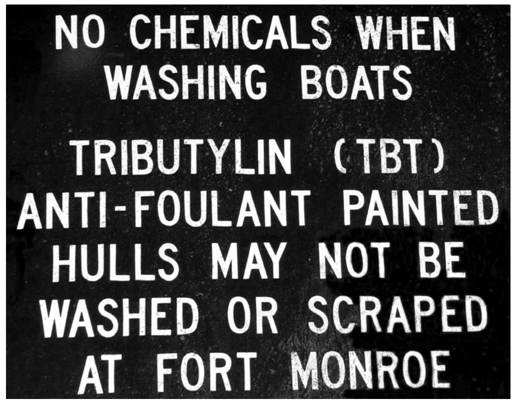
BOAT DISCHARGE

At marinas, unchecked storm water runoff from boatyards, drips from fuel docks, discharges from marine heads, and fish waste contribute to the loss of habitat, reduced water quality, and result in fewer living resources. The maintenance, operation, and storage of recreational vessels have the potential to pollute adjacent waters and to impair air quality. Contaminants include dust from hull maintenance operations, solvents from engine repair shops, petroleum from careless fueling practices, sewage discharges from boats, and heavy metals from antifouling paints. These pollutants may be deposited directly into waterways or they may be carried in by storm water runoff.

The Clean Marina Program is a voluntary program initiated by the states of Maryland and Virginia to control non–point sources of pollution by providing technical assistance and promoting educational efforts to marina operators and recreational boaters.

The Department of Defense is committed to restoring and protecting water quality throughout the Chesapeake Bay watershed and realizes that careful stewardship of rivers and waterways is essential to meeting this goal. To demonstrate this commitment, two Department of Defense installations are currently certified under their respective state's Clean Marina Program for superior pollution prevention and recycling practices: Old Point Comfort Marina in Fort Monroe, Virginia, and Point Patience Marina, Navy Recreation Center, on Solomons Island, Maryland.

Establishing no–discharge zones help to improve water quality in small coves and bays with poor circulation.



A sign at Fort Monroe, Virginia which participates in the Virginia Clean Marina Program.

Point Patience Marina at Solomons Island, Maryland.

Department of Defense Clean Marina Program

To support the Clean Marina Program, Department of Defense installations work to reduce boat discharge at clean marinas such as Solomons Island and Fort Monroe.

Naval Support Facility Solomons Island– Point Patience Marina is located on the southern end of the Navy Recreation Center at Solomons Island, Maryland. Nestled where the Patuxent River meets the Chesapeake Bay, the Point Patience Marina is in a calm inlet that houses 124 vessels in wet berthing ranging in size from 20–45 feet. The Marina also accommodates over 200 dry storage vessels and houses a 615 foot fishing pier.

Point Patience Marina was the first military marina certified by the State of Maryland as a Clean Marina in 1998. This is a voluntary program that provides education in pollution prevention guidance and on–site technical practices to boaters. Point Patience Marina met 100% of the criteria laid out by the State of Maryland within the following areas: marina design, storm water management, vessel maintenance, petroleum control, sewage handling, waste containment, and marina management.

To continue the clean marina initiative, Point Patience Marina offers customers a boat washing station that operates on a detergent–free and 100% recycled water system, a fish cleaning station, and complimentary boat inspections by the local Coast Guard Auxiliary Branch.

The Marina provides an information board with up–to–date tips for better boating and boat ownership to include cleaning vessels without the use of detergents and utilizing common household products such as vinegar, lemon juice, and baking soda that are not only safe for the environment but for boating families as well.

Point Patience Marina personnel partner with the Patuxent River Naval Air Station Hazardous Materials Team and ensure proper training for all marina and maintenance staff in the area of spill containment with annual training and hands–on practice with spill response equipment.


Department of Defense

Old Point Comfort Marinia at Fort Monroe, Virginia.

Fort Monroe–Old Point Comfort Marina was the first military marina to become an official Virginia Clean Marina. The Virginia Clean Marina Program is a joint effort between a network of Virginia agencies such as the Departments of Environmental Quality, Conservation and Recreation, Health, and Game and Inland Fisheries; the Marine Resources Commission, the Chesapeake Bay Local Assistance Department, and the Virginia Sea Grant Program at the Virginia Institute of Marine Science. This voluntary program provides pollution prevention guidance and on–site technical assistance to marinas, local governments, and recreational boaters to minimize negative impacts on water quality and coastal resources. Marinas that commit to becoming a Virginia Clean Marina put into place best management practices that go above and beyond regulatory requirements. Old Point Comfort Marina uses the Virginia Clean Marina Guidebook as a planning tool for improvements at the marina. Boaters are educated on pollution, environmental awareness, and safety issues through a bulletin board, which includes a poster reminding smokers not to throw cigarette filters into the water. Smokers are provided with individual filter trash bags. Fish waste is collected at the fish cleaning station in trash receptacles rather than being discarded into the water. When enough carcasses are collected, they are ground, mixed with menhaden oil, and sold as chum in the marina store. Old Point Comfort Marina's staff regularly exercises their emergency plans and participates in installation spill response training. The importance of such training is made clear by the marina manager, Theresa Grogan, "I am a firm believer in leading by example. By being designated a Virginia Clean Marina, we are being presented with a great opportunity to set the standard for protecting the Bay from sources of non–point source pollution through implementation of best management practices."


Department of Defense

Natural Resources personnel perform periodic cleaning of seed oysters being grown in floating upwellers in Old Point Comfort Marina at Fort Monroe, Virginia.

SOUND LAND USE

A walkway made of pervious pavers at the Naval Medical Center, Portsmouth, Virginia. Department of Defense

The Department of Defense installations have frequently been referred to as 'islands of biodiversity'. Increased development has created these islands in and around installations. As population growth and expansion continue, additional pressures will be experienced by native biological communities. In some instances, military installations are the last refuge for threatened or endangered species.

Conservation helps maintain natural landscapes required for the training and testing necessary to maintain military readiness. Managing for biodiversity ensures that lands and waters are maintained in a 'healthy condition,' and it provides greater flexibility in land use for current and future military operations. Biodiversity conservation is a central component of ecosystem management which has been embraced as the Department of Defense's natural resources management strategy.

Biodiversity conservation can assist in compliance efforts and help avoid conflicts. Managing for biodiversity assists in mitigation procedures for environmental impact assessment processes under the National Environmental Policy Act as well as consultation processes under the Endangered Species Act.

Citizens demand that federal land owners demonstrate responsible stewardship of public lands. The practice of biodiversity conservation fosters good will within the communities surrounding Bay installations which, in turn, engenders public support for the military mission. By helping to maintain aesthetically pleasing surroundings and expanding opportunities for outdoor recreation, managing for biodiversity can improve the quality of life of the nation's military personnel and their families.

The Bay installations will continue to assess their lands by updating their Integrated Natural Resources Management Plans and by adopting new technologies such as GIS to monitor their condition and inventory their living resources. Department of Defense installations in the Bay watershed will continue to seek opportunities to avoid creating new impervious surface by ensuring that all development and redevelopment is carried out in a manner consistent with the Chesapeake Bay Program's goals.

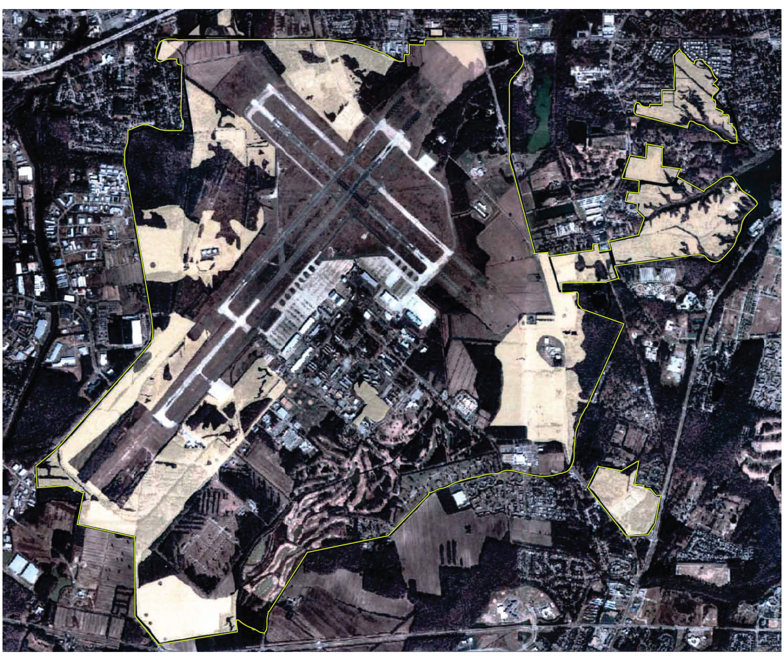
LAND CONSERVATION

The effect of urbanization of adjacent lands represents a readiness issue as well as an environmental issue because encroachment threatens to reduce the ability of the military to provide realistic training opportunities for its service members.

Land conservation protects habitat, supports wildlife, and ensures biodiversity.

Real Property Master Plans and sustainable design and development principles allow installations to protect their natural resources and meet changing mission needs. Identification of natural resources and sensitive areas, as well as identification of potential threats and stressors to those areas, allows planners to establish controls over further development on the installation. The Master Plan addresses issues such as integrating growth with natural and cultural resource protection goals, directing future growth to mesh with existing infrastructure, and identifying efficiencies that can combine and consolidate areas in which compatible activities can take place. Sustainable design and development principles help implement the Master Plan by performing two functions. First, they serve to ensure the compatibility of the scale of new structures with the installation's existing structures and natural setting in order to maintain and enhance a sense of place. Second, they provide detailed guidelines on how to minimize the impact of new development by incorporating low impact strategies (minimizing impervious surfaces, retaining and treating more storm water on-site, innovative landscaping) at the design stage. Several Bay installations have developed detailed Real Property Master Plans that incorporate sustainable design and development principles, and several more are planning to develop them.

All of the Bay installations are looking for opportunities to employ conservation landscaping, low impact development techniques, and other sustainable design principles in association with both new construction and retrofitting of existing facilities.



Department of Defense

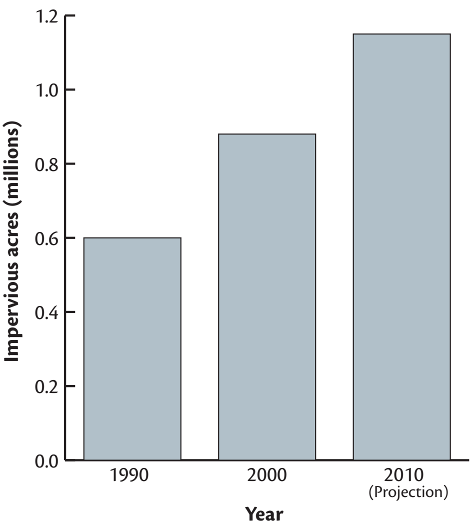
As urban sprawl increases, Department of Defense installations serve as islands of biodiversity that conserve land and protect ecosystems. Above, expanding development encroaches on Naval Air Station Oceana, Virginia (outlined in yellow).

DEVELOPMENT, REDEVELOPMENT, AND REVITALIZATION

As forests and open areas are converted into areas of intense development, the route pollution will take to get from the land to the water will be more rapid. Development pressure, particularly increased runoff due to impervious surfaces, will continue to increase as long as people continue to move into the area (Figure 23). An estimated 17.6 million people will live in the watershed by 2020.

Low impact development is an innovative form of storm water control using small–scale landscape features.

FIGURE 23—IMPERVIOUS ACRES IN THE CHESAPEAKE WATERSHED INCREASES RUNOFF.



Chesapeake Bay Program

Impervious acres increase runoff and result in increased nutrients and sediments in the Bay. However, low impact development (LID) allows rain to penetrate the ground and prevent high flow runoff.

Department of Defense

Washington Navy Yard Low Impact Development Demonstration Project on the Anacostia River. This project included the modification of the storm drain inlet.

To help protect the Bay from the impacts of increased development, the Department of Defense has adopted low impact development techniques. Low impact development is an innovative approach to storm water management that uses design techniques to treat runoff close to its source. Low impact development addresses storm water runoff through small–scale landscape features. It can be applied to new and existing development of all types—in parking lots, on rooftops, along sidewalks, and in roadway medians. The Department of Defense has made low impact development an important aspect of all development constructed on installations within the Chesapeake Bay watershed.

Department of Defense

Washington Navy Yard Low Impact Development Demonstration Project on the Anacostia River. Projects such as this parking lot retrofit reduce the negative impacts of impervious acres.

Department of Defense development, redevelopment, and revitalization projects

In order to improve the health of the Bay, the Department of Defense conducts extensive development and revitalization projects at various Bay installations. The following are some examples of those development and revitalization projects.

National Naval Medical Center Bethesda– The National Naval Medical Center Bethesda has placed an emphasis on incorporating storm water best management practices into the design and construction of two large parking lot projects. These projects consisted of constructing a wet pond detention basin at one parking lot and a sand filter detention basin at another parking lot. These best management practices treat a total of 20% of the runoff from finished lots for pollutants/ sediments and allow water to recharge the local ground water aquifer.


Department of Defense

National Naval Medical Center Bethesda, Maryland installed this low impact sand filter detention basin.

Fort Monroe–At Fort Monroe, several low impact development technologies such as bioretention and porous pavers have been used to manage storm water. Low impact development and pollution prevention are the preferred methods for managing storm water at Fort Monroe. Since the installation is situated directly on the Chesapeake Bay, effective storm water management is a big concern. To date, three bioretention basins have been installed. These basins biologically filter storm water and slow direct runoff into the Bay. The basins typically capture runoff from buildings and their adjacent impervious parking lots. This holding capacity is the key function of the basins; it allows enough time for the water to percolate down through the ground or be taken up by plants.

Fort A.P. Hill–Fort A.P. Hill has adapted low impact development concepts to a project to control storm water flow currently conveyed by an open drainage swale and culvert system. The retrofit is intended to increase storm water infiltration by approximately 15–20% before leaving the project area.


Department of Defense

A wet pond detention basin at a parking lot at the National Naval Medical Center Bethesda, Maryland.

Department of Defense development, redevelopment, and revitalization projects (continued)

Naval Medical Center Portsmouth–In 2000, the Naval Medical Center (NMC) was recognized by the Elizabeth River Project River Stars Program for Sustained Distinguished Performance for installing storm drain inserts in parking areas to collect sand and sediment. They received another award in 2002 for installing pervious pavement and planting 250 wax myrtles. NMC Portsmouth has also replaced an impervious road at Hospital Point with one constructed of pervious pavers. There are about 37,750 square feet of pervious pavers placed on the compound—these are comprised of limited use roadway, parking, and sidewalk areas. They have reduced their impervious surface area by 10%.

Department of Defense

Pervious pavers installed at Naval Medical Center Portsmouth, Virginia help to reduce the area of impervious surface on the compound.

Fort Monroe–As a requirement of Fort Monroe's state storm water permit, the total amount of impermeable footprint on the post must be reduced. In total, the installation decreased amounts of impervious surfacing by 150,610 square feet in 2003 and 2004. This greatly reduces the amount of storm water exiting Fort Monroe into the Chesapeake Bay via storm drains.

Camp Peary–New housing areas have been designed using a cluster development theme, emphasizing efficient use of storm water retention ponds, while protecting existing forested areas. A specific example of a low impact design involved use of a rain garden design for Willowood.

Department of Defense

Fort Monroe, Virginia has greatly reduced their impermeable footprint by installing permeable pavers in parking lots.

Department of Defense

This permeable paver sidewalk at Fort Meade, Maryland helps reduce the amount of storm water that flows into the Bay.

Washington Navy Yard–In 1999, eleven low impact development storm water features (such as bioretention cells, permeable paver cells, tree boxes and rain barrels) were constructed to remove contaminants from the runoff and improve Anacostia River water quality.

Naval Support Facility Observatory–The Naval Observatory created a small pond and wetland area to hold runoff which is now redirected from the main storm line. This was put into place to reduce the volume of runoff being delivered to a landscaped park downstream (Dumbarton Oaks).

Department of Defense

The Washington Navy Yard has installed many low impact development features, including this bioretention cell.

Department of Defense

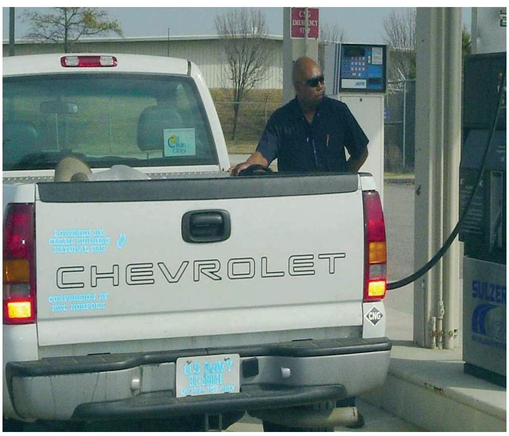
This pond area was constructed at the Naval Support Facility Observatory, Washington D.C. to help reduce the volume of runoff delivered downstream.

TRANSPORTATION

By implementation of the Department of Defense Transportation Incentive Program, the military is in compliance with Executive Order 13150 of April 21, 2000. This Executive Order directed Federal agencies to establish a transportation fringe benefit program in order to reduce Federal employees' contribution to traffic congestion and air pollution. The Department of Defense strongly encourages and financially subsidizes commuting by mass transportation to reduce traffic congestion and improve air quality. This policy pays dividends when it comes to minimizing adverse effects on the Bay and its tributaries.

Nation-wide carbon pollution from transportation impacts air quality.

Other initiatives the military has undertaken to reduce the number of vehicles on the road include instituting flexible work schedules that allow employees to work more hours per day and therefore fewer days per week, altering the hours of work to stagger traffic and reduce congestion, setting up carpool programs for the work force, using vans and buses to move workers from site to site while at work, and providing bicycles for use in areas of concentrated development.



Department of Defense

The Department of Defense supports the use of clean and alternative fueled vehicles such as this one. The vehicle is marked with a "Powered by Clean Burning Natural Gas" emblem.

Department of Defense

Special parking reserved for carpoolers encourages Fort Monroe, Virginia personnel to carpool.

Department of Defense

When feasible, fuel efficient government 'mules' are used at Fort Monroe, Virginia instead of larger cars or trucks.

Department of Defense

Navy personnel utilize mass transit to reduce congestion in the Norfolk/Virginia Beach area.

PUBLIC ACCESS

The Chesapeake Bay watershed is home to millions of people. Providing public access is vital to promoting a sense of stewardship and an appreciation of the natural, recreational, historical, and cultural resources associated with the Bay. At the same time, public access must be provided in an environmentally sensitive way that protects those resources. In spite of the constraints imposed by security and operational requirements, the Department of Defense continues to provide public access through military installations to the Bay and its tributaries. Interpretive displays, nature trails, driving tour brochures, education centers, watchable wildlife areas, fishing piers, observation decks, and beach access points are all ways that the military educates the public about the vast living resource at their back door. These efforts to inform and engage the public also reinforce other aspects of Chesapeake Bay preservation. By educating the public and creating a sense of ownership, public access energizes volunteer involvement in resource restoration, and conservation intiatives.

Military educators inform the public with the help of interpretive displays and watchable wildlife areas.

Department of Defense

This educational sign is provided for citizens' use along a path at Fort Meade, Maryland. The installation aims to inform people about wildlife on the base.

Department of Defense

This walkway to Dog Beach at Fort Monroe, Virginia, made out of recycled plastic, provides access to citizens while protecting the fragile sand dunes.

STEWARDSHIP AND COMMUNITY ENGAGEMENT

Navy personnel from Naval Amphibious Base Little Creek, Virginia participate in tree plantings with local school children as part of continuing education and outreach. Department of Defense

Department of Defense Bay installations organize events that provide members of the installation community opportunities to participate in restoration activities with the public. These events often include an educational component, with staff members and other experts holding a workshop in conjunction with the activity. Examples of such activities include annual Earth Day, Arbor Day and Clean the Bay Day events, National Public Lands Day projects, invasive species removal, riparian buffer zone plantings, installation litter pickups, submerged aquatic vegetation planting, oyster restoration, and many others.

Bay installations also use a variety of communication forums to share news about their restoration activities and specialized expertise with other agencies and the public. Installation newspapers and newsletters, other Department of Defense publications such as *Currents* magazine, as well as local news media educate the internal and external communities about the Department of Defense's commitment to Bay stewardship. One primary method to showcase installations' activities and share information both within the services and to the public is the Joint Services Chesapeake Bay Program website (www.hqda.army.mil/acsimweb/env/cbi/) and its newsletter, *The Joint Military Services Chesapeake Review*.

In addition, many installations and military services include information about Bay restoration activities on their individual, regional, or district websites.

Finally, installation staff at some Department of Defense agencies and Bay installations participate in Partners in Education. They lend their expertise and often provide installation access to local schools to help meet the *Chesapeake 2000* goal of providing a meaningful Bay or stream outdoor experience for every school student in the watershed before graduation from high school.

The Joint Military Services

Chesapeake Review

Vol. 8 No. 6

November – December 2004

IC HIGHLIGHTS

The Implementation Committee (IC) of the Environmental Protection Agency's (EPA) Chesapeake Bay Program (CBP) met recently several times to discuss CBP funding and implementation.

Invasive Species Monitoring Plan

As part of fulfilling a commitment contained in the *Chesapeake 2000 Agreement* (C2K), the Invasive Species Workgroup of the Living Resource Subcommittee (LRSc) has identified six species believed to present the largest threat to the restoration of the Bay's ecosystem:

- Mute swan *(Cygnus olor)*
- Nutria *(Myocastor coypus)*
- Phragmites *(Phragmites australis)*
- Purple loosestrife *(Lythrum salicaria)*
- Water chestnut *(Trapa natans)*
- Zebra mussels *(Dreissena polymorpha)*.

Now that the species are identified, another C2K commitment requires the implementation of management plans for those species.

Matt Fleming of the Maryland Department of Natural Resources, the chair of the LRSc, proposed that the newly formed Mid-Atlantic Regional Panel (MARP) of the Aquatic Nuisance Species Task Force be tasked to assign invasive species management responsibilities. The MARP partnership includes representatives from the states of Delaware, Maryland, New Jersey, New York, North Carolina, Pennsylvania and Virginia; the District of Columbia; federal and state agencies; and nonprofit, industry and tribal interests. The LRSc recommended forwarding current drafts of the six prioritized invasive species management plans, along with comments received to date, to the MARP for review. The IC voted to accept the LRSc's proposal. The MARP will hold its first meeting early in 2005.

(Continued on page 3)

This 174,240-square-foot parade ground in Arlington, Va., is also the roof for the Pentagon's Remote Delivery Facility.

Pentagon Renovation and Construction Program

DEPARTMENT OF DEFENSE

Pentagon's Green Roof Holds Surprises

By Shana Bullock

Walking along the neatly planted rows of willow oaks *(Quercus phellos)*, crepe myrtles *(Lagerstroemia indica)* and liriope *(Liriope muscari)* in Arlington, Va., it is hard to imagine that below this parklike setting, people are busy at work. This landscaped parade ground is on top of the Pentagon's Remote Delivery Facility (RDF), which has one of the largest green roofs in the east.

A green roof is a vegetated roof system that is used as an environmentally sensitive and aesthetically pleasing alternative to conventional roofing and that offers many benefits (see box at bottom of page). Green roofs can be grouped into two broad categories: extensive systems, which contain 6 inches or less of growing medium, and intensive systems, which contain more than 6 inches of growing medium.

Extensive systems are lighter in weight and can be used on slopes measuring up to 40 degrees. Extensive systems use specially engineered soil that can support specific species of plants tolerant of extreme conditions. The graphic on page 2 illustrates a sample extensive green roof system.

Intensive roofs often use ordinary topsoil and can be planted with a large variety of plants, including trees. The Pentagon's green roof incorporates both intensive and extensive systems to cover about 4 acres of the 6-acre RDF roof.

(Continued on page 2)

By Installing a Green Roof, You Can ...

- **Reduce and slow stormwater runoff** by absorbing and retaining rainwater, resulting in the reduction of pollutants entering the Chesapeake Bay.
- **Reduce the urban heat island effect** that raises temperatures by up to 10 degrees above those of surrounding rural areas by providing a vegetative cover over roof materials.
- **Save on cooling costs** by reducing heat absorption and subsequent transfer to a building's internal environment.
- **Provide a pleasing alternative to conventional roofing materials,** especially for buildings with multiple stories where people view parts of the building's roof.
- **Offer opportunities for recreational space** by incorporating walking paths, picnic tables and interpretive signs.

www.hqda.army.mil/acsimweb/env/cbi/

The *Joint Military Services Chesapeake Review* newsletter illustrates how the Department of Defense works to be a good steward of the Bay.

EDUCATION AND OUTREACH

The Department of Defense has thousands of employees living in the Chesapeake Bay watershed. How they conduct their work and their personal lives has the potential to significantly impact the Bay. The Department of Defense has many programs and policies in place to protect and improve the Bay that relate to the working environment. Things like pollution prevention initiatives, nutrient and sediment reduction projects, exotic species control, and wetland creation and restoration are helping to improve habitat quality and protect the Bay from further degradation.

Education and outreach programs are also a vital component to provide public awareness about the importance of protecting the Bay. Large-scale projects funded by the Department of Defense are important, but it is just as important to educate citizen and community groups and cultivate personal involvement in local restoration projects. Building a sense of stewardship among the residents of the Bay watershed is important to increasing public involvement in the protection of the Bay.

Installations' environmental education programs are accessible to school and community groups through hands-on projects.

Department of Defense

Personnel at Naval Station Norfolk, Virginia participate in the annual Clean the Bay Day Event. Valuable data collected during these events provides information that is used to prevent future pollution.

Department of Defense

Navy Natural Resources personnel at Naval Air Station Oceana, Virginia plant trees with local elementary school students.

Defense Department initiatives to educate military and civilian employees, dependents, and the general public about the importance of the continued health of the Bay include Earth Day and Arbor Day celebrations at many installations, outreach efforts by environmental professionals at local schools, and volunteer opportunities for schools and community groups to participate in restoration activities such as site plantings and school tours of sensitive ecosystems. In addition, Department of Defense installations sponsor annual Clean the Bay Day events, provide employees and base housing residents with brochures and information about how to reduce storm water pollution and Bay-friendly landscaping, install educational trails and signs to highlight the history and biology of the Bay ecosystem, and operate environmental education centers that include interpretive displays and present educational programs to the local community. Many Department of Defense projects, such as low impact development technologies, shoreline restoration sites, and storm water best management practices are shown on tours and offered up to members of the federal workforce, private companies, and public groups as examples to inspire similar projects on non-Department of Defense facilities.

Department of Defense

Volunteers remove an abandoned shopping cart from a stream during a cleanup at Fort Meade, Maryland.

Department of Defense

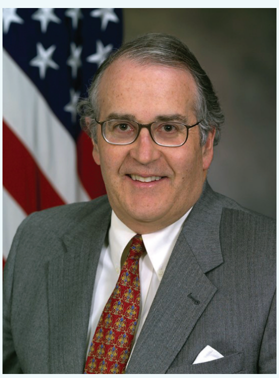
A Fort Monroe, Virginia display at an Earth Day event. Displays such as this allow Department of Defense personnel to educate the public about environmental issues.

Department of Defense

Navy volunteers participate in Clean the Bay Day at Lafayette River Annex in Norfolk, Virgina.

VIEW POINT

"A healthy Chesapeake Bay is essential for the Department of Defense to achieve its military training and readiness mission. To assure the sustainability of natural resources needed for future military testing and training, the Department is transitioning beyond compliance with environmental requirements. Department of Defense leadership view compliance as a 'floor,' not a 'ceiling' in achieving environmental goals. This, along with creative and innovative partnerships, has expanded our efforts in the conservation, protection, and sustainment of the Bay's natural resources under our trusteeship."



Department of Defense

Alex A. Beehler

Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health)

Mr. Beehler is principal assistant and advisor to the Deputy Under Secretary of Defense for all environmental, safety, and environmental health policies and programs in the Department of Defense. Priorities include the implementation of the Department of Defense's environmental readiness initiative in response to challenges of encroachment, the Defense Environmental Restoration Program, unexploded ordinance management, explosive safety, and pollution prevention.

Degrees

Mr. Beehler received a Bachelor's degree from Princeton University (1975) in public and international affairs and a law degree from University of Virginia (1978). Mr. Beehler is a member of the District of Columbia, State of Maryland, and Commonwealth of Virginia bar associations.

Previous positions

Previously, Mr. Beehler served as Director of Environmental and Regulatory Affairs for Koch Industries and concurrently served at the Charles G. Koch Foundation as Vice President for Environmental Projects. Mr. Beehler maintains a strong background in federal environmental policy having served in the Department of Justice as a senior trial attorney for environmental enforcement and at the Environmental Protection Agency as a special assistant for legal and enforcement counsel.

Department of Defense education and outreach projects

In order to increase public awareness through meaningful, hands-on experiences, the Department of Defense conducts numerous education and outreach projects.

Aberdeen Proving Ground–In order to provide a meaningful Bay experience, APG invited students from Edgewood Elementary School to their installation. These students participated in planting and restoring Bayscape at APG as part of National Public Lands Day.

Fort Meade–Fort Meade has implemented volunteer stream cleanup events, 2-3 times per year. They also organized monthly volunteer invasive species control events and volunteer tree plantings occur annually. All volunteer programs are carried out year round and during annual Earth Day events.

Camp Peary–Camp Peary has established a public nature trail equipped with trail markers and educational information including identification of an eagle nesting area, geese crossings and nesting areas, cultural and historical sites, and bluebird habitat areas.

Fort Detrick–Boy Scouts are provided opportunities (storm drain stenciling, and wetland plantings) for Eagle Scout projects.

Naval Support Facility Patuxent River–The shoreline stabilization project at Solomons is regularly used for training and certification by National Oceanic and Atmospheric Administration divers needing experience in oyster reef monitoring. The project as a whole is showcased as an example of how to use living shoreline design, SAV, and oysters in the development of shoreline stabilization projects.

Fort Monroe–With the Virginia Institute of Marine Science and the Chesapeake Bay National Estuarine Research Reserve, Fort Monroe facilitated ecology field trips. Local high school students investigated estuarine shallow water, salt marshes, and beaches along Mill Creek and the Chesapeake Bay.

Fort Monroe–In 2004, the Directorate of Public Works and Logistics Environmental Office helped preschool children make bird feeders from recycled 2 liter bottles and non-toxic paint. The children were taught about Chesapeake Bay wildlife and the importantance of recycling and reusing.

Washington Navy Yard–Interpretive panels were placed at one of the LID bioretention cells that was constructed in a parking lot at the Navy Yard. The panel shows a diagram of the bioretention cell design and explains the benefit of good water quality to the Anacostia River.

Department of Defense

A Girl Scout collecting eastern white oak acorns at Defense Supply Center Richmond for use by the Virginia Department of Forestry to grow oak seedlings for reestablishment in the Bay watershed.

Department of Defense

Navy personnel complete Natural and Cultural Resources Driving Tour displays at Naval Support Facility Patuxent River, Maryland.

Naval Support Facility Patuxent River–Twenty cultural and natural resources interpretive signs were produced and placed at various locations around the installation. In addition, 10,000 driving tour booklets were produced to elaborate on the historical and natural information presented on the signs.

The Support Facility has restored 2.1 acres of non-tidal wetlands and created a nature trail around the wetlands for public enjoyment. The project also includes a wetland deck, boardwalk, gazebo, and commercial-sized binoculars. Interpretative panels were erected to provide educational information about the flora, fauna, and ecosystem of wetlands.

The installation hosts dozens of environmental education programs each year. In addition, school groups are invited to participate in beach clean-ups, beach grass and tree plantings, and other events. The installation invites Eagle Scout and college student volunteer projects.

In addition to staffing an environmental education center at the main installation, Environmental Department personnel host Earth and Arbor Day events, assist with Envirothon training and testing (competition for high school students that tests knowledge of environmental science and natural resource management), and support career fairs.

Washington Navy Yard–Naval District Washington is a driving force behind Bridges to Friendship, a partnership between Naval District Washington and local non-profit groups to train underprivileged youth in various trades. The Bridges to Friendship youth helped to build a rain garden at the Navy Yard, and Naval District Washington is currently pursuing a contract to maintain all low impact development features in the Region. This effort will again be staffed by Bridges to Friendship trainees.

Fort Monroe–Fort Monroe purchased and installed educational signs around the installation at specific points like the marina, piers, and boat ramps to educate readers about Bay wildlife.

Department of Defense

Wetlands viewing station overlooking Mill Creek salt marsh, Fort Monroe, Virginia.

GOVERNMENT BY EXAMPLE

Through stewardship and community engagement, the Department of Defense promotes individual stewardship and works with community-based organizations, businesses, local governments, and schools to undertake initiatives to achieve the goals and commitments of *Chesapeake 2000*. Over the past several years, the Department of Defense has participated as a member of Businesses for the Bay, a voluntary team of forward-looking businesses, industries, government facilities, and other organizations within the Chesapeake Bay watershed. In 2003, U.S. Army Garrison, Fort A.P. Hill and Commander, Navy Region, Mid-Atlantic both received *Outstanding Achievement for a Government Facility* awards for demonstrating outstanding progress in achieving pollution prevention goals within the Chesapeake Bay watershed and in 2004, Defense Supply Center Richmond received a *Government Excellence* award.

In conjunction with the Stewardship and Community Engagement *Chesapeake 2000* commitment, Executive Order 13148, "Greening the Government through Leadership in Environmental Management," requires the Department of Defense to integrate environmental accountability across all missions, activities, and functions into day-to-day decision making, long-term planning, and processes. Specifically, Executive Order 13148 requires the Department of Defense to report its progress towards environmental management system integration goals, ozone-depleting substance reduction, and toxic release inventory (TRI) reduction to the Environmental Protection Agency.

Department of Defense

Midshipmen from the U.S. Naval Academy, Maryland participate in Clean the Bay Day. Participation in events such as this is one example of how the Department of Defense leads by example.

As a good steward of the Bay, the Department of Defense collaborates with community-based organizations to improve Bay health.

In implementing Executive Order 13148, the Department of Defense is required to put in place documented environmental management system at all appropriate facilities. The Defense Supply Center Richmond (DSCR) took a community approach to its environmental management system, recognizing the importance of having a good relationship with the surrounding communities. DSCR partnered initially with the local community and the Virginia Department of Environmental Quality to form the Virginia Regional Environmental Management System (V-REMS). V-REMS coordinates environmental assessments and management programs conducted by the partners. With this partnership in place, DSCR is able to ensure environmental compliance which has resulted in measurable benefits. By replacing ten gasoline-powered vehicles with electrical vehicles, DSCR has been able to reduce their air emissions. Additionally, DSCR has implemented a closed-loop car wash, reducing water consumption by up to 80%. Through the sharing of information with its community partnerships, DCSR was able to achieve these environmental successes while

Department of Defense

This No Mow Zone at the Defense Supply Center Richmond, Virginia provides habitat for wildlife.

remaining focused on the environment and the installation's mission.

Section 505 of Executive Order 13148, requires the Department of Defense to reduce and manage the use of ozone-depleting substances that includes a plan to phase out acquisition of Class I ozone-depleting substances by December 31, 2010. The Department of Defense has developed various programs and initiatives to eliminate these substances. The Army, for example, is recognized as a world leader in ozone-depleting substances elimination in the area of helicopter engine nacelle fire suppression and natural refrigerant development. The Army Program Executive Office, Aviation, in conjunction with Program Management Apache, Program Management Utility Helicopter, and Program Management Cargo Helicopter, continues efforts to qualify a halon replacement using hydrofluorocarbon HFC-125 for aircraft nacelles.

The Department of Defense continues to work towards reducing releases of toxic release inventory chemicals. Excutive Order 13148 requires the Department of Defense to reduce its reported toxic release inventory releases and off-site transfers of toxic chemicals for treatment and disposal by 10% annually, or by 40% overall. A large portion of toxic release inventory reported releases occur as a by-product of mission critical Department of Defense manufacturing and utilities processes.

The Department of Defense cannot reduce these coincidentally manufactured chemicals, such as nitrate compounds from wastewater treatment and hydrochloric acid from coal-fired heating plants, without expensive, long-term infrastructure projects. While further reductions of toxic release inventory releases, especially during wartime, remain a challenge, the Department of Defense is working to make reductions when economically and technologically feasible. For example, the Navy is scheduled to replace the coal plant at Naval Amphibious Base Little Creek in 2006, which will reduce the Navy's toxic release inventory releases by 300,000 pounds.

The Department of Defense is committed to the goals outlined in Executive Order 13148 and the commitments of *Chesapeake 2000*. The Department of Defense strives to lead by example, by implementing environmentally-sound practices to improve the health of the Bay, while maintaining the agency's overall mission to preserve and protect our country.


Department of Defense

At Aberdeen Proving Ground, Maryland elementary school children place stepping stones in the garden area of a Bayscape project.

Department of Defense government by example projects

By supporting projects such as Bayscapes, the Department of Defense participates in Government By Example. The following projects highlight how the Department of Defense leads by example.

Fort Meade–In May 1998, Fort Meade's environmental staff, assisted by 130 volunteers, planted 2,800 plants in a BayScapes demonstration area located by the installation's Burger King to maximize its visibility. The plants were a mix of native grasses, herbaceous plants, shrubs, and trees selected for their resistance to diseases and pests and low maintenance needs. An interpretive sign was prominently placed in the demonstration area to inform drivers waiting in line of the BayScapes concept. In addition, the land was contoured to create shallow depressions along a drainage way in the garden which channels water into a series of pools so that it will both provide water for plants and be retained rather than contributing to storm water flow.

Department of Defense

Volunteers work with Fort Meade, Maryland personnel to create a Bayscape.

Fort Lee–To celebrate National Public Lands Day 2000, 25 volunteers worked on a 4.5 acre BayScapes demonstration area located at the main entrance to the installation. It was planted with a native meadow mix of vegetation and interspersed with patches of cedars and shrubs as well as pine trees and hardwoods to demonstrate the beginning stages of succession from field to forest. Prominently placed signs explain BayScapes and succession growth to visitors.

Department of Defense

The unveiling of a newly constructed Bayscapes at Fort Lee, Virginia.

Adelphi Laboratory Center, Blossom Point, and Fort Belvoir– In 1998 facility-wide mowing reduction plans were put into place. This resulted in the removal of 85 acres from intensive mowing and leaf removal at Blossom Point, 70 acres at Fort Belvoir, and 27 acres at Adelphi. Extra acreage returned to the natural environment improves the health of area trees, adds grassland habitat for a large variety of wildlife, and generates food for raptors. Under the plans, all turf areas are reviewed annually and designated for intensive mowing, infrequent mowing, or removed from the mowing schedule based on environmental impacts, aesthetic value, costs, and equipment needs.

Aberdeen Proving Ground–The Director of Industrial Operations is using a storm water banking system which gives the installation credit for the removal of all impervious surfaces. These credits apply to Maryland Department of the Environment's Storm Water Management program and are deducted from the bank as construction requires the installation of new impervious surfaces.

Washington Navy Yard–The Navy Yard has given low impact development training and tours of the Navy Yard's innovative low impact development storm water features to other Navy and Department of Defense commands, federal government employees, and private companies and public groups such as colleges and local garden clubs. The Navy Yard has formed a Partnership for Sustainable Facilities with the EPA, the Army, General Services Administration, and a non-profit low impact development consultant to develop targeted training for Department of Defense and other federal planners and designers, and Public Works employees.

Aberdeen Proving Ground–In 2000, APG completed the last of its nearly 500 bald eagle perching platforms on top of power line poles. These were erected in areas around the installation to reduce the threat of electrocution from perching on the bare posts. APG has also established an 800-meter exclusion zone around each nest during nesting season and increased food supplies through their SAV program. The eagle population has steadily increased, and in 2004 there were 27 active nests and 32 chicks.

Department of Defense

Jute logs are used to control erosion in a storm water swale at Navy Information Operations Command, Sugar Grove.

Navy Information Operations Command, Sugar Grove–Sugar Grove has taken a proactive approach in using as many bio-based products (coir mats, logs, and wattles) as possible. At the site of a new housing area near an existing wetland, Sugar Grove removed a failing slope, regraded the slope, and stabilized the area with jute mesh matting and coir log products until revegetation could occur.

Fort Belvoir–Fort Belvoir hosted a 3-day low impact development workshop that resulted in designs for the several new facilities including a hospital and chapel. This design emphasized low impact development and innovative storm water management in installation plans. The installation's environmental office provides technical guidance on low impact development and storm water management to all tenants. The installation's environmental office actively promotes low impact development, innovative storm water management techniques and the SPiRiT (Sustainable Project Rating Tool) program. This program, based on the Leadership in Energy and Environmental Design program, provides a set of standards and a rating system for evaluating sustainable facilities and allows for early integration of environmentally responsible practices into the design process at Army installations.

Department of Defense government by example projects (continued)

Aberdeen Proving Ground–To celebrate National Public Lands Day 2000, soldiers and volunteers planted a BayScapes demonstration area. Seventy-five volunteers planted over 800 native flowers, grasses, shrubs, and trees as the first phase of a one-acre BayScapes demonstration site located at the main entrance to the post.

Fort Monroe–Severe salt water flooding during Tropical Storm Isabel destroyed many of the ornamental plantings on Fort Monroe. In lieu of replacing the plants with non-native species, the decision was made to replant with native vegetation. The U.S. Fish and Wildlife Service provided recommendations for the replacement of trees and shrubs on post. The use of native tree and shrub varieties, often referred to as Bayscaping, has several benefits. Native plants require less additional watering or fertilizing, have a higher salt tolerance, and are not as susceptible to local pests. Use of Bayscaping reduces the amount of excess fertilizers and pesticides entering the Chesapeake Bay.

Department of Defense

Native Bayscaping landscaping, using native plants, was installed at Fort Monroe, Virginia.

Pentagon–In 2001, the Pentagon completed construction on the Remote Delivery Facility. The Remote Delivery Facility has one of the largest green roofs on the East Coast, comprising 4 acres of the 6-acre roof. The green roof is being used as a parade ground. Incorporating a green roof into the original Remote Delivery Facility building design enabled the Pentagon to minimize costs because no retrofitting was necessary.

Department of Defense

To construct this green roof at the Pentagon's Remote Delivery Facility, 12-18 inches of topsoil was placed on the roof to allow planting of grass and shrubs.


Department of Defense

The Department of Defense and U.S. Fish and Wildlife Service personnel construct heron nesting platforms at Bloodsworth Island, Maryland. These platforms provide places for herons to nest and raise their young.

Camp Peary–Installation facility standards have been revised to promote green technologies in construction projects, including use of plastic recycled timber decking materials at recreational sites, use of carpets containing recycled materials, mulching the landscape beds, installation of pervious pavers, use of cluster housing developments, and installation of energy saving devices like automatic light sensors.

Storm water retention ponds are designed to enhance the Chesapeake Bay restoration goals and demonstrate innovative storm water management practices.

Installation personnel have reduced their mowing frequencies in identified areas to enhance the wildlife habitats.

Naval Support Facility Anacostia–One bioswale has been installed to improve the water quality of runoff from a new parking area. This bioswale will capture the rainwater before it is able to reach the Anacostia River.

Fort Monroe–Fort Monroe has a Landscape Planting Plan that integrates appropriate plant species to be used in landscaping designs on Fort Monroe. The Plan uses Bayscaping and native plants, plus takes into consideration recommended plants of the Mid-Atlantic Region Historic Landscape Management Plan, since Fort Monroe is on the National Historical Register. This plan is also integrated with the Real Property Master Plan Installation Design Guide, Natural Resources Management Plan, and Urban Forestry Plan.

Naval Support Facility Patuxent River–Wildlife habitat restoration was completed by building new nesting platforms for blue herons on Bloodsworth Island. Salt infiltration combined with sea level rise and shoreline erosion had deprived the blue heron population of trees to use as nesting platforms. Facility personnel and volunteers added 49 new nesting platforms to 27 that were previously built. The 27 platforms have had a 90-95% usage rate.

PARTNERSHIPS

The Department of Defense recognizes that the goals of the Chesapeake Bay Program can only be realized by the leveraging of resources created through partnerships with other federal agencies, state and local governments, non-profit organizations, and members of the communities which surround installations. Partnerships promote the exchange of information, sharing of knowledge, and pooling of resources. The rapport developed between individuals in the process leads to creative new ideas and the basis for continued cooperation. Efforts made by the Department of Defense in support of the Bay Program goals have included partnerships that have made the effort more effective and enduring. Without exception, the greater the degree of partnering, the greater the impact of the projects.

Individual installations have worked with local cities and counties, colleges and universities, as well as state and federal agencies to implement storm water management plans, eradicate invasive species, restore fish passages and other vital habitat, conduct stream assessments, conduct water quality monitoring, and restore submerged aquatic vegetation.

Partnerships between local governments and community watershed groups provide opportunities for improved communication and participation in dealing with local environmental matters.

Chesapeake 2000 committed the Bay watershed partners to "complete a public process to develop and begin implementation of revised Tributary Strategies to achieve and maintain the assigned loading goals." By staying actively engaged with this process, the Department of Defense can plan required sewage treatment plant upgrades, storm water best management practices, nutrient and sediment management plans, and predict future areas of regulatory


Department of Defense

Naval Support Facility Patuxent River and Southern Maryland Coastal and Aquatic Resource Team receive a 2004 Coastal America Partnership Award.

focus that may require out year funding for design and construction. Installations that have participated in the tributary strategy process include: Naval Support Facility Patuxent River; Naval Station, Norfolk; Fort A.P. Hill; Aberdeen Proving Ground, and Washington Navy Yard.

Department of Defense personnel in the Chesapeake Bay Program frequently share their expertise by speaking at workshops sponsored by other government agencies and non-profit organizations and by sharing their knowledge at local schools.

The Department of Defense is a signatory to the Partners in Flight Program in which federal agencies address the problems facing neotropical migratory birds through communication, cooperation, and conservation efforts. Installations have conducted base-wide surveys assessing the distribution and seasonal abundance of bird species on site. In addition, installation staff monitor breeding neotropical migratory and resident birds through the Monitoring Avian Productivity and Survivorship Program, which is a partnership between the United States and Canada. In addition, installations work with the local Audubon Societies to perform annual bird counts.

The Department of Defense is a partner in the Chesapeake Watershed Cooperative Ecosystem Studies Unit through a cooperative agreement with the host university (University of Maryland Center for Environmental Science), and other federal agencies (Department of Interior, and Department of Agriculture) as well as academic institutions and other partners. This agreement allows military

Department of Defense

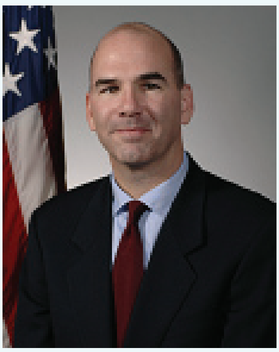
The Department of Defense is a signatory partner of the Partners in Flight program.

installations in the six states and the District of Columbia to use partner institutions to provide technical assistance, research support, and education and outreach support.

The Department of Defense has partnered with numerous non-government organizations including the Chesapeake Bay Foundation to conduct oyster reef surveys adjacent to Department of Defense facilities; Alliance for the Chesapeake Bay and Chesapeake Research Consortium to conduct submerged aquatic vegetation transplant and utilization studies; Casey Tree Endowment for urban tree survey and inventory work in the Washington D.C. area; Potomac Conservancy in support of the Growing Native program where native tree seeds are collected from federal lands for donation to state nurseries for future riparian projects; Anne Arundel Community College for invasive species control work in Virginia and Maryland; and the Virginia Institute of Marine Science for riparian and wetland restoration projects in the southern half of the watershed.

VIEW POINT

"The Air Force is working to develop integration and unity of effort so that we can provide the necessary tools and resources for improving Chesapeake Bay to the base commanders and managers."



Department of Defense

Michael F. McGhee

Acting Deputy Assistant Secretary of the Air Force (Environment, Safety and Occupational Health)

Mr. McGhee is currently acting with all duties, responsiblities, and authorities of the Deputy Assistant Secretary of the Air Force for Environment, Safety and Occupational Health (ESOH), providing senior policy and program oversight for Air Force ESOH programs worldwide. Mr. McGhee is a member of the Defense Leadership and Management Program and is a licensed professional engineer in the state of Texas.

Degrees and fellowships

- Bachelor of Science in Mechanical Engineering, West Virginia University, 1985
- Master of Arts in Management, Webster University, 1988
- Master of Business Administration, Webster University, 1998
- Master of Science in National Resource Strategy, Industrial College of the Armed Forces, 2005
- Congressional Fellowship in 1999
- Excellence in Government Fellowship in 2002

Previous positions

Prior to assuming duties as Acting Deputy Assistant Secretary of the Air Force for Environment, Safety and Occupational Health, Mr. McGhee served as the Chief of the Project Management Branch, HQ USAFE Civil Engineer Directorate, Engineering Division, Aviano 2000 Project Management Office, Aviano Air Base, Italy; Chief, Environmental Quality Branch and Deputy Chief, Environmental Division, DCS Installations and Logistics, Pentagon, Washington D.C. Civil Engineer Legislative Affairs; Congressional Fellow, Legislative Assistant, Office of the Honorable Diana DeGette, U.S. House of Representatives, Washington D.C.; Deputy Director, Environmental Management Directorate, San Antonio Air Logistics Center, Kelly AFB, Texas; Chief, Environmental Flight, 15th Civil Engineer Squadron, Hickam AFB, Hawaii; PACAF Restoration Team Chief, PACAF Control Group Chief, Air Force Center for Environmental Excellence, Brooks AFB, Texas; and Chief, Environmental Compliance Programs, Environmental Management Directorate, San Antonio Air Logistics Center, Kelly AFB, Texas.

4. CASE STUDIES

Loblolly pines, which provide habitat for ospreys and bald eagles, grow on many Bay installations.

POPLAR ISLAND

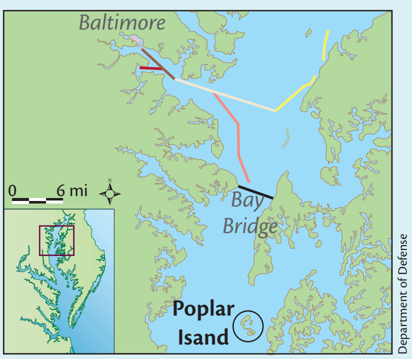
Aerial view of Poplar Island.

Department of Defense

The Army Corps of Engineers teamed with the Maryland Port Administration and other federal and state agencies to restore Poplar Island, which is located in the Chesapeake Bay 34 miles southeast of Baltimore. This project was a means to explore the potential use of material dredged from the Baltimore Harbor

Poplar Island is a national model for habitat restoration and benefical use of dredged material.

BALTIMORE HARBOR AND NAVIGATION CHANNELS



- Brewerton Channel
- Curtis Bay Channel
- Craighill Entrance
- East Channel
- Fort McHenry Channel
- Swan Point Channel
- Tolchester Channel
- West Channel

These channels are maintained through periodic dredging, with the material removed being placed in specified dredged material placement sites.

and Channels Federal Navigation projects to restore wetlands in areas effected by erosion.

The Army Corp of Engineers maintains the federal navigation channels that serve the Port of Baltimore. Port authorities estimated that over the next 20 years, maintenance dredging and improvements to shipping channels would generate more dredged material than they currently had room to place. A disruption in the dredging would affect both the local and national economy because the Port allows a significant amount of cargo to move through Baltimore and handling that cargo supports a large number of jobs.

In 1996, a study was conducted to determine the feasibility of using dredged material to create wildlife habitat. The results were positive, and the Corps selected Poplar Island as its project site. Since Poplar Island was rapidly eroding, it was determined that island restoration would be an ideal solution to the dredged material management issue.

Offshore islands, such as Poplar Island offer unique habitat; because their isolation results in a lack of human disturbance and predators. These islands areas are desirable nesting sites for waterbirds and some endangered species. Poplar Island contains such important habitat that it was identified by the U.S. Fish and Wildlife Service, Maryland Department of Natural Resources, and other resource management agencies as a valuable nesting and nursery area for many species including eagles, ospreys, herons, and egrets.

HISTORIC CONFIGURATION

Over time, the configuration of Poplar Island has changed. In 1847 the island was more than 1,000 acres in size. By the time a task force was convened in 1990 to discuss dredged material placement options, Poplar Island had about 10 acres total landmass.

In the early 1900s, maps show that the eroding shoreline had split the island into three

FIGURE 24—POPLAR ISLAND IN 1914 AND 1969.

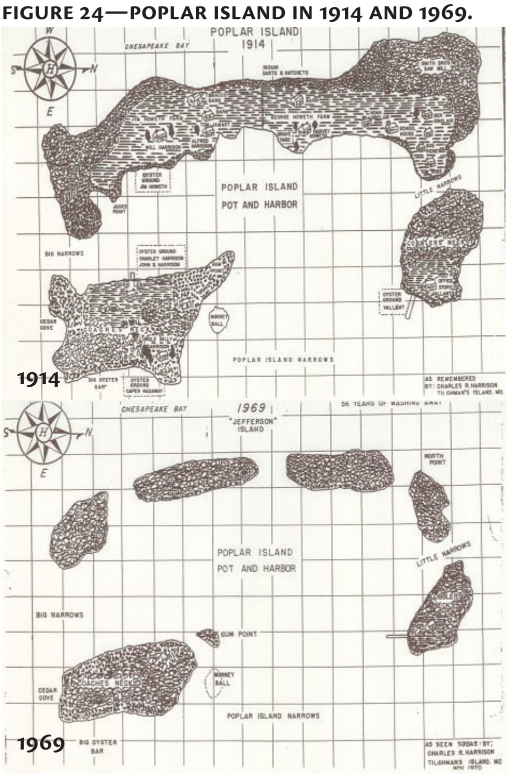
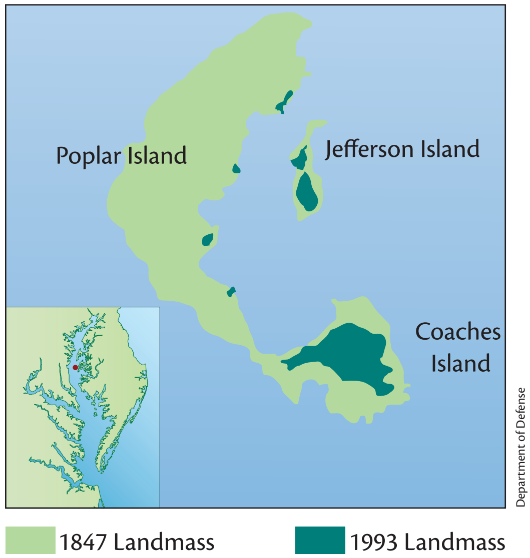


FIGURE 25—THE LANDMASS OF POPLAR ISLAND HAS CHANGED FROM 1847 TO 1993.



separate landmasses (Figure 24). At this point in time, 70–100 people lived on the group of islands known as Poplar Island. The main island supported the town of Valliant that included a general store, post office, school, church, and sawmill. The town was abandoned in the 1920s when erosion became so severe that homes were uninhabitable. By 1931, Poplar Island had been reduced to only 134 acres. The group of islands was purchased by politicians for both business and pleasure. After a 1946 fire destroyed their clubhouse, the island became completely deserted. In the 1960s, maps document that the landmasses had split into smaller islands, with the main island barely 10 acres wide (Figure 24).

By 1990, the total area of the islands was less than 10 acres. Erosion had split the northern portion into four smaller islands: North Point Island, Middle Poplar Island, South Central Poplar Island, and South Poplar Island (Figure 25). These islands are collectively referred to as Poplar Island. Poplar Island also refers to two other parcels of land: Coaches Island (which was part of Poplar Island in 1847), and Jefferson Island (which was never part of Poplar Island). It was proposed that clean dredged materials from navigation channel maintenance should be moved to the new island to create wetland habitat and reverse the effects of erosion.

RESTORATION TIMELINE

The goal for the Poplar Island project was to restore the island to its 1847 size within a 35,000 foot perimeter. To mimic the island's historic configuration, the area added to the island would contain both wetland and upland habitats. The final product will consist of 570 acres of upland habitat at an elevation up to 20 feet and 570 acres of wetlands habitat that will be further divided into approximately 456 acres of low marsh and 114 acres of high marsh.

To achieve this goal, approximately 40 million cubic yards of dredge material from Baltimore Harbor and the navigation channels leading to the harbor would be used to restore 1,140 acres of remote island habitat.

Containment dikes being built from clean dredged material.

Department of Defense

1996

In September 1996, the project was approved by the Assistant Secretary of the Army (Civil Works) and then authorized in October 1996.

1998

Approximately two years later, in February, Phase I construction began. During Phase I dikes were constructed to enclose a 640-acre area and a breakwater between the dike and another island to protect Poplar Harbor. This project would go on to build and raise approximately 8 miles of dikes to contain the dredged material and protect the island from severe wave activity.

Department of Defense

Dike construction on Poplar Island.

Over a year later, in September 2003, Phase I dike raising occurred. This involved the incremental raising of the dikes in the upland areas from the initial elevation of 10 feet mean lower low water to just over 20 feet mean lower low water. As cells of the project are completely filled and shaped, permanent vegetative planting occurred.

Department of Defense

Planting marsh grass on Poplar Island.

Phase II construction was built to enclose the remaining 500 acres. This was completed February 2002.

2001 | 2002 | 2003 | 2010 - 2020

The first dredged material placement occurred in April 2001. Over the life of the project, the dredged material will be placed behind 35,000 feet of containment dikes surrounding the four remnants of the main landmass known as Poplar Island.

Department of Defense

Dredge infill pipe spreading sediment onto Poplar Island.

Future inflows will occur annually over the life of the project during the fall and winter months to build wetlands for wildlife. An estimated final project completion date is 2020.

Department of Defense

Diamondback terrapin hatchlings on Poplar Island.

FUTURE OUTLOOK

Overall, major economic and environmental benefits will be seen due to the completion of this project. The newly-built high-quality wetland and upland habitat will support commercially and recreationally valuable finfish and shellfish; birds; and threatened or endangered species. Indeed, wildlife are already being attracted to the island. In addition to bald eagles, ospreys, brown pelicans, and several species of heron and terns are already using the island. For exmaple, hundreds of diamondback terrapins hatched in August 2002.

FUTURE ACTIONS

The rebuilding of the island will occur over the course of 24 years and will result in 1,140 acres of nesting and nursery area for eagles and ospreys. Dredged material placements are slated to occur annually until the year 2012. The project is expected to be completed in 2020, although the goals are expected to be attained by 2016.

Striped bass seen near the shore of Poplar Island.

Osprey in nest on Poplar Island.

Snowy Owl on Poplar Island.

Great blue herons on the shore of Poplar Island.

VIEW POINT

"One of the Corps primary mission areas is ecosystem restoration and protection. In 1984, the Corps became one of the first partners in the Chesapeake Bay Program to help restore and protect the Bay's vital resources. Today the Corps is partnering with many communities, organizations, and agencies to meet Chesapeake 2000 *goals. We are all working towards a shared vision of the Chesapeake Bay 'with abundant, diverse populations of living resources, fed by healthy streams and rivers, sustaining strong local and regional economics, and our unique quality of life,'"* (Chesapeake 2000).

Department of Defense

John Paul Woodley, Jr.

Assistant Secretary of the Army (Civil Works)

Mr. Woodley is responsible for the supervision of the Army's Civil Works program, including programs for conservation and development of the nation's water and wetland resources, flood control, navigation, and shore protection.

Degrees

Mr. Woodley attended Washington and Lee University in Lexington, Virginia, on an Army R.O.T.C. scholarship. He received a Bachelor of Arts Degree from Washington and Lee in 1974, and was elected to Phi Beta Kappa. Mr. Woodley also attended the Law School at Washington and Lee, where he received his juris doctor degree cum laude in 1977.

Previous positions

Mr. Woodley served as Principal Deputy Assistant Secretary of the Army (Civil Works) from December 9, 2004 until this appointment. Prior to this, he served as the Assistant Secretary of the Army (Civil Works) from August 22, 2003, until December 8, 2004. He served as the Assistant Deputy Undersecretary of Defense (Environment).

Prior to his appointment as the Assistant Deputy Undersecretary of Defense (Environment), Mr. Woodley served as Secretary of Natural Resources in the Cabinet of Virginia Governor Jim Gilmore from January 1998 until October 2001. While in this position, Mr. Woodley was heavily involved in the development, signing, and execution of *Chesapeake 2000*. Mr. Woodley served as Deputy Attorney General of Virginia for Government Operations beginning in 1994.

SUBMERGED AQUATIC VEGETATION

Seagrass bed in Round Bay on the Severn River, Annapolis, Maryland.

Jane Thomas, IAN Image Library (www.ian.umces.edu/imagelibrary/)

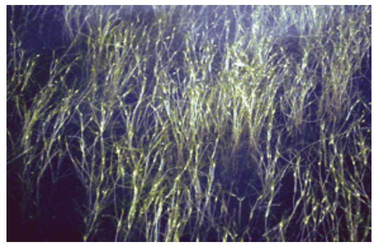
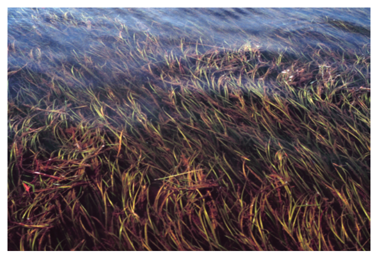
Submerged aquatic vegetation (SAV), commonly called underwater grasses, grow in the shallow waters along the shoreline of the Chesapeake Bay and its tributaries. SAV historically covered close to 200,000 acres of the Chesapeake Bay. Aerial surveys conducted in 1984 documented only 38,000 acres, a great decline from historic coverage. In 1994, the SAV coverage in the Chesapeake Bay had increased to 72,943 acres, but this is still a long way from the goal of 185,000 acres set forth in *Chesapeake 2000*. This decline has been linked to both natural and anthropogenic causes.

SAV serves many valuable functions within estuarine ecosystems such as providing habitat, sheltering juvenile finfish and shellfish; providing food for resident and migratory waterfowl; enhancing water quality by reducing sediment resuspension, trapping suspending sediments, removing toxins and nutrients (nitrogen and phosphorus) from the water column, and oxygenating the surrounding water column. Because submerged aquatic vegetation is vital to the health of the Chesapeake Bay, the Department of Defense and the Chesapeake Bay Program have made SAV monitoring, protection, and restoration a major goal.

Just as the Chesapeake Bay changes in salinity in parts per thousand (ppt) from the Susquehanna River to the Atlantic Ocean, so does the distribution of SAV (Figure 26). Tidal fresh (<0.5 ppt) and oligohaline (0.5–5 ppt) salinity regimes can be dominated by different species such as wild celery (*Vallisneria americana)*, American waterweed (*Elodea canadensis)*, water stargrass (*Heteranthera dubia)*, redhead grass (*Potamogeton perfoliatus)*, sago pondweed (*Stuckenia pectinata)*, coontail (*Ceratophyllum demersum)*, Eurasian watermilfoil (*Myriophyllum spicatum)*, and hydrilla (*Hydrilla verticillata)* among others. Mesohaline (5–18 ppt) salinity regimes give way to species such as horned pondweed (*Zannichellia palustris*) and widgeon grass (*Ruppia maritima*). In the polyhaline (>18 ppt) salinity regime eelgrass (*Zostera marina*) dominates.

Light is life—SAV requires light for photosynthesis. Most sunlight reaching the earth's surface is deflected before it reaches these plants.

FIGURE 26—VARIOUS TYPES OF SUBMERGED AQUATIC VEGETATION LIVE IN THE CHESAPEAKE BAY.

Salinity regime	*Submerged aquatic vegetation*	
Tidal Fresh (<0.5–5 ppt)	Wild celery (*Vallisneria americana*)—often confused with eelgrass, has a light green stripe in the center of its leaves.	 Maryland Department of Natural Resources
Mesohaline (5–18 ppt)	Widgeon grass (*Ruppia maritima*)—one of the more valuable waterfowl food sources.	 U.S. Fish and Wildlife
Polyhaline (>18 ppt)	Eelgrass (*Zostera marina*)—one of the more valuable waterfowl food sources.	 National Oceanic and Atmospheric Administration

Source: Chesapeake Bay Program at www.chesapeakebay.net/baygras.htm

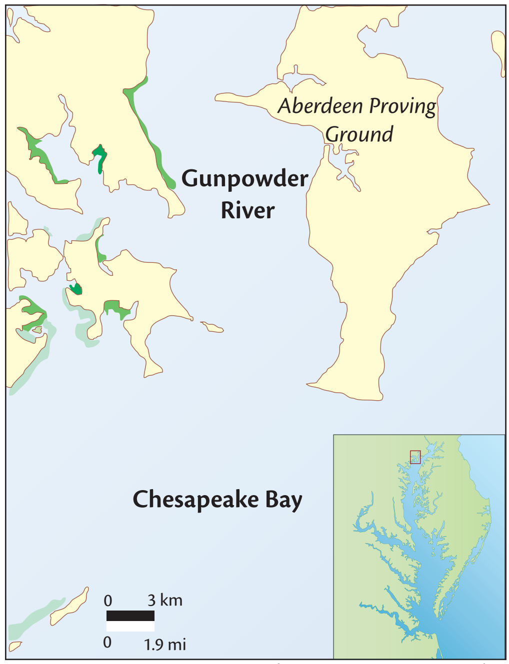
Of these species, especially in the low salinity systems, several are not native to the Chesapeake Bay. For example, water chestnut (*Trapa natans*), curly pondweed (*Potamogeton crispus*), *M. spicatum*, and *H. verticillata* have all gained a foothold in the Bay. Non-native species can out-compete native species for space and resources and cause native populations to decline. These species may not provide the same quality of resources as the native species do.

SAV DISTRIBUTION AND GROWTH

Independent of salinity regime, there are several factors that influence SAV health and growth. The most important factor is light. Like terrestrial plants, SAV requires light for photosynthesis. However, the natural properties of water deflects some of the sunlight before it reaches SAV. In addition, high levels of suspended sediment particles refract another portion of the sunlight. Light can also be absorbed by algae, both at the water surface and growing on the SAV leaf. The growth of these algae is fueled by excess nutrients (nitrogen and phosphorus) in the water column. Without enough light, SAV will not survive or have a chance to reproduce and expand. Another important factor is physical habitat. Sediment composition, water depth, and wave exposure can all affect the distribution of SAV. These factors can rapidly change due to dredging, sea level rise, and armoring of shorelines. Grazers, such as the non-native mute swan, can also destroy large beds of SAV, while invasive SAV species can displace the native species.

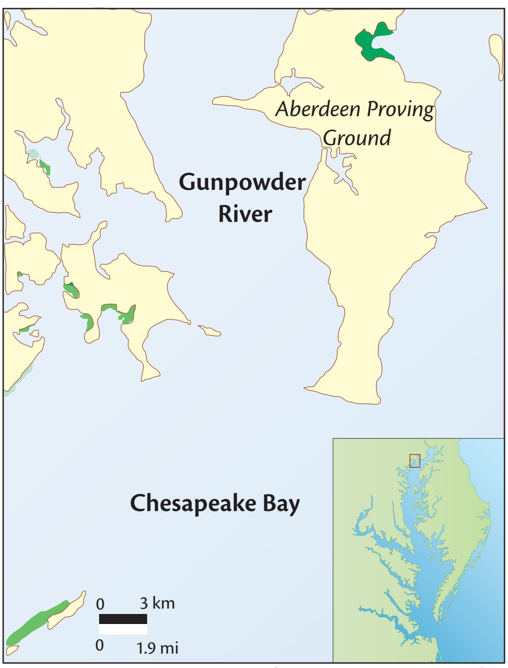
While the abundance of SAV in a given area will fluctuate with the changing climatic conditions (Figures 27A-C), there is a concern that populations will never reach the historic levels. The dramatic decline of SAV seen in the late 1960s and 1970s is attributed to an increase in nutrients and sediments from the development boom in the watershed. Other large scale events such as hurricanes and tropical storms can severely damage SAV in the Bay. Storms like Tropical Storm Agnes (1972) can carry large sediment loads into the Bay. This sediment can bury SAV and create waves and currents that can abrade the roots, seeds, tubers and entire SAV plants. Small scale events, such as droughts can also cause fluctuations in SAV coverage. While a drought may decrease the runoff carried into the Bay causing increases in water clarity and SAV coverage in the Lower Bay, the increases in water temperature and salinity causes decreases in SAV coverage in the Upper Bay. SAV seeds are able to remain dormant and viable during the smaller scale events, but large scale events may carry the seed source out of suitable areas.

FIGURE 27A—SAV COVER IN 2002.



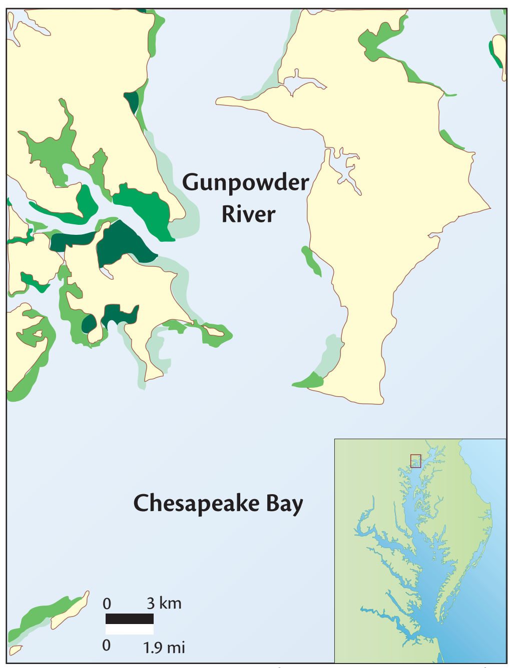
SAV Density — Total SAV coverage: 154.40 ha
- 0–10%
- 10–40%
- 40–70%
- 70–100%

FIGURE 27B—SAV COVER IN 2003.



SAV Density — Total SAV coverage: 112.96 ha
- 0–10%
- 10–40%
- 40–70%
- 70–100%

FIGURE 27C—SAV COVER IN 2004.



SAV Density — Total SAV coverage: 981.84 ha
- 0–10%
- 10–40%
- 40–70%
- 70–100%

DEPARTMENT OF DEFENSE SAV RESTORATION EFFORTS

The Department of Defense conducts numerous submerged aquatic vegetation (SAV) restoration projects. The following two projects illustrate the types of restoration the Department of Defense supports. Refer to Chapter 3 for other examples of SAV work conducted by the Department of Defense.

Army Environmental Center/Aberdeen Proving Ground SAV Program–In 1996 the U.S. Army Environmental Center (AEC), Aberdeen Proving Ground's (APG) Directorate of Safety, Health and the Environment, the U.S. Army Research Laboratory, with cooperation from the University of Maryland, created the AEC/APG SAV Program. This program has gone through many evolutions and today is one of the premier SAV programs throughout the Bay region. Since its inception, the partnership has grown to include local, state and federal agencies. The purpose of this collaboration was to research and restore SAV in the Bay ecosystem and to share scientific knowledge and coordinate Chesapeake Bay restoration activities, both on and off Army installations.

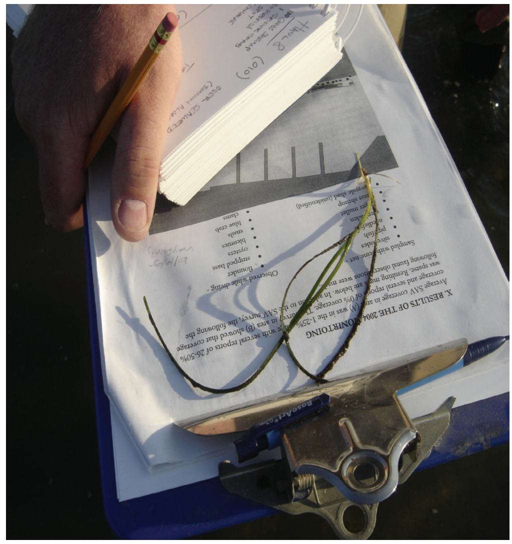
Army Environmental Center/Aberdeen Proving Ground monitors water quality at 29 sites in the Gunpowder River, Dundee Creek, Bush River, and Swan Creek throughout the SAV growing season of April through October. This data, while housed at APG, is shared with Maryland Department of Natural Resources for use in the SAV restoration target model. The model for the Gunpowder and Bush Rivers is one of the most accurate in the Chesapeake Bay. In addition to water quality monitoring, researchers at APG monitor the location and expansion of existing SAV beds and investigate the establishment of new beds. This groundtruthing data is shared with the Virginia Institute of Marine Science (VIMS) to help validate their aerial surveys. In addition to validating aerial surveys, groundtruthing can differentiate species whereas aerial photographs cannot.

The third prong of the program is restoration of SAV. Several techniques have been used at APG to try to restore SAV, including hand planting of whole plants or fragments, using floats to propagate plants *in situ*, and using planting grids in unexploded ordnance areas. There has been limited success with these methods on a small scale. Workers from AEC/APG have also assisted with restoration efforts adjacent to APG that have been performed by other groups. With anthropogenic pressure increasing and time running out to meet restoration goals, there is a need to restore SAV on a large scale. While this is being attempted in the Lower Bay with *Z. marina*, there has been little research into the freshwater species. AEC/APG in cooperation with the Freshwater SAV Partnership is attempting to secure funding for research and restoration using seeds from freshwater species of SAV.

Department of Defense

Army personnel check submerged aquatic vegetation in grow-out tanks at Aberdeen Proving Ground, Maryland.

Freshwater SAV Partnership–Born out of the need for scientific information pertaining to freshwater SAV in order to meet the Chesapeake Bay agreement, the Freshwater SAV Partnership was developed. Located in the Upper Bay and strong in the belief that upstream SAV enhancements will reduce downstream nutrient, contaminant, and suspended sediment loads. The AEC/APG asked the Chesapeake Research Consortium (CRC) to establish a partnership of institutions. At its inception in 2002, the Freshwater SAV Partnership outlined its mission to expand current knowledge and research on basic biology, physiology, and ecology of freshwater SAV. The Partnership is also committed to investigating new approaches to restoring these taxa.


Department of Defense

Department of Defense personnel monitor submerged aquatic vegetation to learn more about its basic biology.

To achieve its mission, the Partnership identified specific goals including compiling existing information on freshwater/oligohaline SAV and conducting research to determine environmental growth requirements for Freshwater SAV and develop new approaches for their propagation and restoration. In addition, the Partnership will also distribute all propagation and restoration results and methodologies to federal, state, and local resource managers, researchers, and educational groups.

Department of Defense

Submerged aquatic vegetation grids such as the one above are used to secure newly-planted SAV to the substrate.

With financial support from AEC, the CRC is overseeing activities of the Freshwater SAV Partnership. The Partnership is currently comprised of twenty member institutions including federal and state agencies, academic institutions, and non-governmental organizations. The Partnership provides a centralized location for the distribution of new and innovative freshwater SAV research and restoration methodologies. With the paucity of information on freshwater SAV, the Partnership is able to identify specific research goals within the Chesapeake Bay and leverage funds to study restoration needs.

FIGURE 28—BAY INSTALLATIONS CONDUCT MANY SUBMERGED AQUATIC GRASS RESTORATION PROJECTS.

	Water quality monitoring	*Education and outreach*	*SAV restoration*
Aberdeen Proving Ground	1996–2004	✓	From 1996–1999 sago pondweed, wild celery, and redhead grass have been thriving. In 2004, water stargrass and common waterweed were added through restoration efforts.
Blossom Point Research Facility	1999–2004	None	SAV is abundant on this installation. A restoration project to control invasive species is planned for 2005.
Fort Eustis	1998–2000	None	SAV planting, including such species as widgeon grass and sago pondweed, was conducted.
Fort Monroe	1998– 2003	✓	Eelgrass and widgeon grass seeds were planted.
Fort Belvoir	2004	None	Restoration planned for 2006.
Langley Air Force Base	1998– 2003	✓	A test pilot eelgrass planting project was completed from 1988–1999. In 2001 and 2002, a full scale planting was completed.
Bolling Air Force Base	1999	None	None
Naval Support Facility Patuxent River	2000– 2002	✓	None: Plenty of seagrass (horned pondweed and widgeon grass).
Naval Support Facility Dahlgren	1998– 2003	✓	In 2000, redhead grass was planted.
Naval Support Facility Indian Head	1996– 2003	✓	In May 2000, wild celery was planted.
Naval Support Facility Solomons Island	None	None	From 1999–2000, widgeon grass, eelgrass, and sago pondweed were planted.
Naval Academy	1997– 2003	✓	From 1998–1999, redhead grass, widgeon grass, and sago pondweed were planted.
Naval Weapons Station Yorktown	1999– 2000	None	None: poor water quality
Naval Amphibious Base Little Creek	1997– 2001	✓	In October of 2000, eelgrass and widgeon grass were planted.

REFERENCES FOR SAV RESTORATION:

Bortz, J., Engelhardt, K., Koch, E., Murphy, R., Sellner, K., Thur, R., Yee, K. 2005. SAV Restoration Handbook: A Guide for Restoring SAV on DoD Installations.

Freshwater SAV Partnership Homepage: www.chesapeake.org/SAV/partnershiphome.html

Virginia Institute of Marine Science SAV Homepage: www.vims.edu/bio/sav/

LOW IMPACT DEVELOPMENT

Washington Navy Yard Low Impact Development Demonstration Project on the Anacostia River. Department of Defense

Low impact development (LID) is an innovative approach to storm water management that maintains or restores the natural hydrologic functions of a site to achieve natural resource protection objectives and meet regulatory requirements. Low impact development employs a variety of natural and built features that reduce the rate of runoff, filter out pollutants, and facilitate the infiltration of water into the ground. By reducing water pollution and increasing groundwater recharge, LID helps to improve the quality of receiving surface waters and stabilize the flow rates of nearby streams.

Low impact development incorporates a set of overall site design strategies as well as highly localized, small-scale, decentralized source control techniques know as Integrated

Department of Defense

A bioretention low impact develoment project at Washington Navy Yard on the Anacostia River.

Low impact development is an innovative approach to storm water management.

Management Practices (IMPs). Rather than collecting runoff in piped or channelized networks and controlling the flow downstream in a large storm water management facility, LID takes a decentralized approach that disperses flows and manages runoff closer to where it originates. Because LID embraces a variety of useful techniques for controlling runoff, designs can be customized according to local regulatory and resource protection requirements as well as site constraints. New projects, redevelopment projects, and capital improvement projects can all be viewed as candidates for LID implementation.

Storm water management controls should be located as close as possible to the sources of potential impacts. For example, the management of water quality from pavement runoff should use devices installed at the edge of the pavement. These types of controls are generally small-scale and can be designed to address specific management issues. The objective is to consider the potential of every part of the landscape, building(s), and infrastructure to contribute to storm water management goals. When selecting LID devices, preference is given to those that use natural systems, processes, and materials. The following list defines examples of LID devices that have been used at Department of Defense installations:

- *Bioretention*: Vegetated depressions that collect runoff and facilitate its infiltration into the ground.
- *Dry wells*: Gravel- or stone-filled pits that are located to catch water from roof downspouts or paved areas.
- *Filter strips*: Bands of dense vegetation planted immediately downstream of a runoff source designed to filter runoff before entering a receiving structure or water body.
- *Grassed swales*: Shallow channels that are lined with grass and used to convey and store runoff.
- *Infiltration trenches*: Trenches filled with porous media such as bioretention material, sand, or aggregate that collect runoff and infiltrate it into the ground.
- *Inlet pollution removal devices*: Small storm water treatment systems that are installed below grade at the edge of paved areas and trap or filter pollutants in runoff before it enters the storm drain.
- *Permeable pavement*: Asphalt or concrete rendered porous by the aggregate structure.
- *Permeable pavers*: Manufactured paving stones containing spaces where water can penetrate into the porous media placed underneath.

Department of Defense

Girls scouts help to build a filter strip at Fort Monroe, Virginia.

- *Rain barrels and cisterns*: Containers of various sizes that store the runoff delivered through building downspouts. Rain barrels are generally small structures, located above ground. Cisterns are large, are often buried underground, and may be connected to the building's plumbing or irrigation system.
- *Soil amendments*: Minerals and organic material added to soil to increase its capacity for absorbing moisture and sustaining vegetation.
- *Tree box filters*: Curbside containers placed below grade, covered with a grate, filled with filter media and planted with a tree.
- *Vegetated buffers*: Natural or man-made vegetated areas adjacent to a water body, providing erosion control, filtering capability, and habitat.
- *Vegetated roofs*: Impermeable roof membranes overlaid with a lightweight planting mix with a high infiltration rate and vegetated with plants tolerant of heat, drought, and periodic inundation.

Department of Defense

Dry well at Washington Navy Yard.

Department of Defense

Tree box filter at Washington Navy Yard.

Several successful low impact development pilot projects have been constructed by the Department of Defense during the last several years. The effectiveness of these projects in managing runoff, reducing construction and maintenance costs, and increasing community involvement has created significant interest in low impact development. The challenge is to adapt these approaches and techniques to the unique requirements of Department of Defense facilities on a wider scale. The Army has developed a tool called the Sustainable Project Rating Tool (SPiRiT). This tool provides a set of standards for sustainable building design on installations. The principles of low impact development are a major component of SPiRiT. In 2001, the Assistant Chief of Staff for Installation Management directed the use of SPiRiT for all new design. In additon, the Navy has published a document entitled *Unified Facilities Criteria Design: Low Impact Development Manual*. This document is applicable to all Department of Defense departments, defense agencies, and Department of Defense field activities.

DEMONSTRATION PROJECT AT NAVAL DISTRICT WASHINGTON, WASHINGTON NAVY YARD

The Department of Defense constantly strives to incorporate innovative storm water runoff management methods into its construction projects. Low impact development is an example of these efforts. At the Washington Navy Yard more than ten different kinds of these techniques are used in parking areas, roadways, and around buildings and open spaces.

Low impact development in parking lots

Washington Navy Yard used many bioretention techniques in their project. For example, parking areas were retrofitted to direct runoff into bioretention cells, where runoff and pollution will be absorbed into the ground instead of running directly off the parking lot and into storm drains. In addition, parking lots were retrofitted with permeable pavers, which will reduce storm water runoff, as the water trickles through the gravel before reaching the ground. The impervious area is reduced while land use is maximized.


Department of Defense

Construction of bioretention strip at Washington Navy Yard.


Department of Defense

Completed bioretention strip at Washington Navy Yard.


Department of Defense

Installation of pervious pavers at Washington Navy Yard.

Department of Defense

Completed pervious pavers at Washington Navy Yard.

Low impact development and soil amendment

The Washington Navy Yard also used soil amendment (the process of adding materials to soils that increase permeability and filtration), which has similar results as permeable pavers. The addition of organic material such as mulch, topsoil, and compost enhances the water retaining capacity of the soil. This reduces the rate of storm water runoff and pollutants reaching the nearby waterbody.

Department of Defense

A cell using soil amendment techniques at Washington Navy Yard.

Other low impact development techniques employed

Altogether, the project at Washington Navy Yard consisted of the following techniques:

- Retrofitting two parking areas to direct runoff into two bioretention cells and creating two permeable paver strips;
- Creating a rain garden to collect and filter roof runoff laden with copper from the historical downspouts;
- Retrofitting two pedestrian areas with permeable paver cells;
- Installing two rain barrels to catch roof runoff and slowly release it to planted areas;
- Installing one tree box; and
- Creating many sand filters to collect roof water and reduce peak discharge.

The finished product is a success. There was no loss of parking spaces in any of the parking lots, and very little maintenance is required, aside from normal grounds maintenance. This pilot project serves as an example of storm water runoff control.

Department of Defense

An overview of some of the low impact development techniques employed at Washington Navy Yard.

ELIZABETH RIVER RESTORATION

Photos: Department of Defense

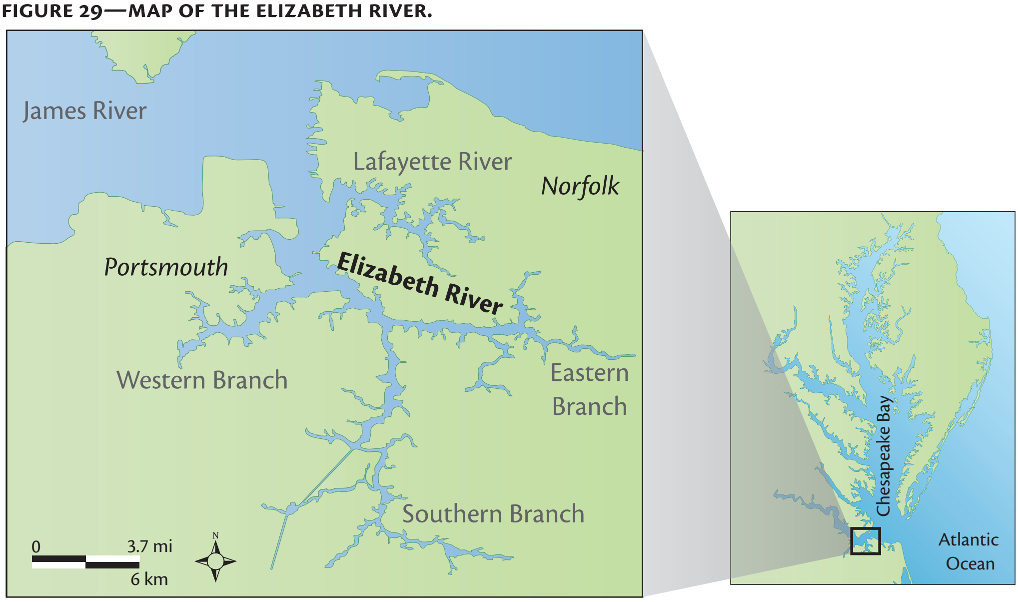
The Department of Defense has helped restore the Elizabeth River through projects on one of its tributaries, Paradise Creek. ***Left:*** Navy ships at Norfolk Naval Shipyard along the Elizabeth River. ***Middle:*** An aerial view of Paradise Creek. ***Right:*** After the stabilized soil was removed from the banks of Paradise Creek, volunteers planted vegetation and rebuilt wetlands.

The Elizabeth River watershed encompasses the urban cities of Norfolk, Portsmouth, Chesapeake, and the western part of Virginia Beach, Virginia (Figure 29). The 200 square mile watershed is highly industrialized and 90% developed. In addition, the river is host to the world's largest naval base and is one of the world's busiest ports.

The Elizabeth River faces a variety of environmental challenges. Along with Baltimore Harbor and the Anacostia River, the Elizabeth River is a Chesapeake Bay Program designated area of concern due to high levels of pollution in its waters and sediments. The river has experienced the loss of 50% of its wetlands since 1944, its sediment contains 18 times more polycyclic aromatic hydrocarbons than the Baltimore Harbor, and it is contaminated with storm water runoff laden with heavy metals and hydrocarbons.

As a *Chesapeake 2000* partner, the Department of Defense has contributed to the restoration of the Elizabeth River with its cleanup efforts in Paradise Creek, an important tributary to the river, and at a Norfolk Naval Shipyard site on the river.

FIGURE 29—MAP OF THE ELIZABETH RIVER.



National Oceanic and Atmospheric Administration

RESTORATION ON PARADISE CREEK

Restoring of the wetlands at the New Gosport landfill site located on the Paradise Creek sub-watershed in Portsmouth, Virginia was a priority of the Navy's Installation Restoration Program. Paradise Creek is a tributary of the Elizabeth River, one of three targeted watersheds under the Chesapeake Bay Program (Figure 30). The Navy recognized the unique partnership opportunities afforded by the location of the creek and potential for innovative restoration at the site. One such opportunity included working with a progressive local watershed planning component actively engaged in restoration work through the Elizabeth River Project.

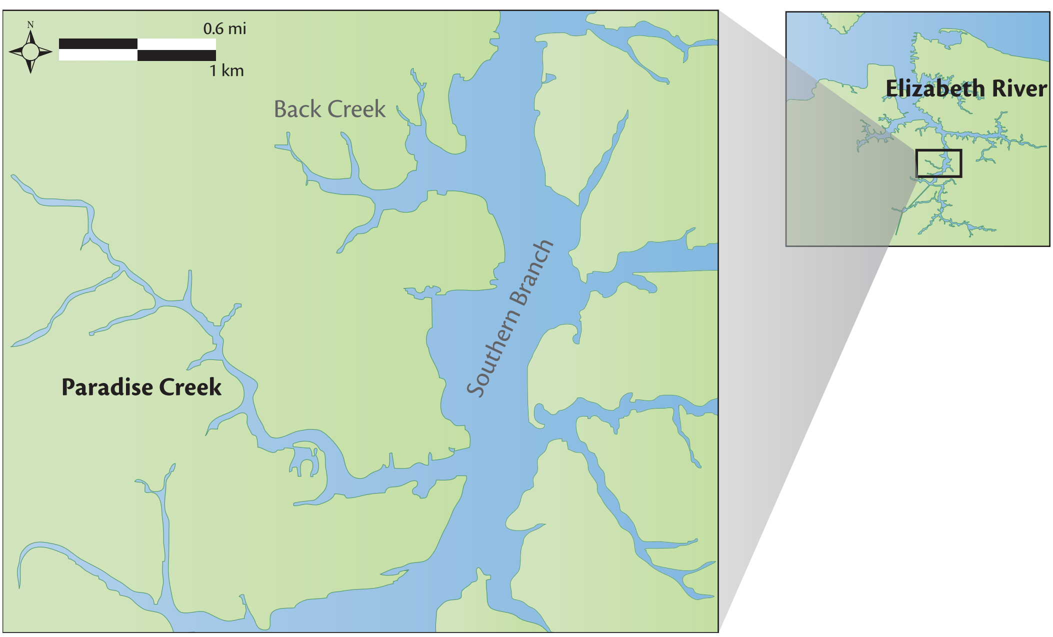
Restored vegetation buffer along Paradise Creek.

Department of Defense

The New Gosport landfill on Paradise Creek contained over 55,000 tons of abrasive blast material (ABM), contaminated soils, and lead-tainted paint chips from ship blasting operations conducted from 1969–1970. The original plan was to completely excavate all of the ABM and dispose of the material as hazardous waste, but the projected costs of this method far exceeded the total funding allocated for the project. To prevent complete scrapping of the project and to avoid continued cleanup delays, the Navy Environmental Restoration Team/Paradise Creek petitioned all stakeholders to explore creative and innovative alternatives for the site.

As a result, the Navy formed a partnership team with the Virginia Department of Environmental Quality, the Environmental Protection Agency–Region III, the Elizabeth River Project, the College of William and Mary (Virginia Institute of Marine Science), and remedial action contractors (OHM/IT). By involving this diverse group of stakeholders

FIGURE 30—MAP OF PARADISE CREEK OFF THE SOUTHERN BRANCH OF THE ELIZABETH RIVER.



National Oceanic and Atmospheric Administration


Department of Defense

Stabilizing agents were added to the soil to neutralize any contaminants that may be present.


Department of Defense

The stabilized soils were then removed in preparation for the creation of wetlands.

early in the planning process, options were considered that met state and federal regulatory requirements; provided support for local watershed planning restoration initiatives; incorporated the best available science; and considered community input and continued environmental stewardship for the site.

The team determined that *in situ* stabilization of the lead-contaminated material would meet the approved cleanup goals under the Comprehensive Environmental Response Compensation and Liability Act and reduce the overall cost of disposal by rendering the material non-hazardous. This innovative approach reduced the estimated project cost from approximately $90 per ton (~$5 million total) to approximately $42 per ton (~$2.5 million total) and the resulting non-hazardous material was reused as a cap for a regional landfill. Working closely with the Virginia Institute of Marine Science, the team conceived, developed, and implemented a detailed restoration plan that included a 1.9 acre engineered tidal wetland and completed riparian forest buffer plantings in an additional 1.1 acres of upland habitat adjacent to the site. These efforts help to control storm water runoff and provide much needed wildlife habitat in the highly urbanized watershed.

In conjunction with the Elizabeth River Project, work is ongoing at the site to explore additional riparian enhancements, define public access requirements, and investigate alternative methods for control of invasive plant species from adjacent properties.

One of the most significant achievements of this project was the successful, cost-effective integration of regional restoration goals into an established regulatory program. The Navy Environmental Restoration Team/Paradise Creek went beyond regulatory compliance and incorporated design changes that support the local watershed planning goals of the Elizabeth River Project as well as *Chesapeake 2000* initiatives. By partnering with a diverse group of federal agencies, state and local governments, local watershed planning organizations, and community members, this team effectively integrated regional and local restoration goals into a model project for application at other sites throughout the entire Chesapeake Bay and its tributaries. The Navy received the 2004 Coastal America Spirit Award for this project.


Department of Defense

The newly-graded and planted bank of Paradise Creek. This part of the bank was later restored and is now the New Gosport wetlands.

NAVY/ATLANTIC WOOD INDUSTRIES JOINT APPROACH RESPONSE ACTION

Another Elizabeth River restoration project, the Navy/Atlantic Wood Industries Joint Approach Response Action project at Norfolk Naval Shipyard South Gate Annex and Atlantic Wood Industries (AWI) was conducted in Portsmouth, Virginia. This project involved cross boundary contamination that included removal of approximately 44,000 tons of waste calcium hydroxide and fly ash from an Installation Restoration site at Norfolk Naval Shipyard and Atlantic Wood Industries. Since the project involved two facilities listed on the Comprehensive Environmental Response Compensation and Liability Act's National Priorities List, efficient and effective coordination with the Environmental Protection Agency–Region III, Navy, Department of Justice, Atlantic Wood Industries, and the Virginia Department of Environmental Quality was critical to the long-term success of the restoration project.

The unique legal agreements and partnerships required to expedite restoration of this site were the driving force behind development and implementation of the Joint Approach Response Action concept. The Navy, Department of Justice, and Atlantic Wood Industries conceived and negotiated a unique restoration agreement (the first of its kind) to jointly address the cross boundary contamination at the site. In addition, the Department of Justice provided funding to Atlantic Wood Industries through an escort account rather than through the traditional cost recovery suit process. Due to this innovative agreement and unique restoration partnership, the entire project was planned, negotiated, and executed within 24 months; no work had been completed at the site in the previous fifteen years. Once the removal action was completed, the Navy/AWI Joint Approach Response Action teamed together with the Virginia Institute of Marine Science and Elizabeth River Project to take the extra step to incorporate a 1.3 acre engineered tidal wetland and a 1.6 acre riparian forest buffer component into the final site plan. This effort not only satisfied state and federal regulatory requirements, but it also integrated Chesapeake Bay Program initiatives into the final remedy for site restoration. The Navy received the 2004 Coastal America Spirit Award for this project.


Department of Defense

Arieal view of the Joint Approach Response Action project in Portsmouth, Virginia.


Department of Defense

Prior to removal action, the settling lagoon at Norfolk Naval Shipyard, South Gate, contained calcium hydroxide sludge that was generated as a byproduct of acetylene gas production and heavy metals from paint chips in grit blast from small boat repair.

VIEW POINT

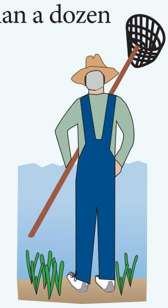
"Earth was put together with such finesse. Everything we needed was here. All the beautiful resources of the world were here. To allow somebody for selfish reasons to destroy those assets is unconscionable."

Bernie Fowler

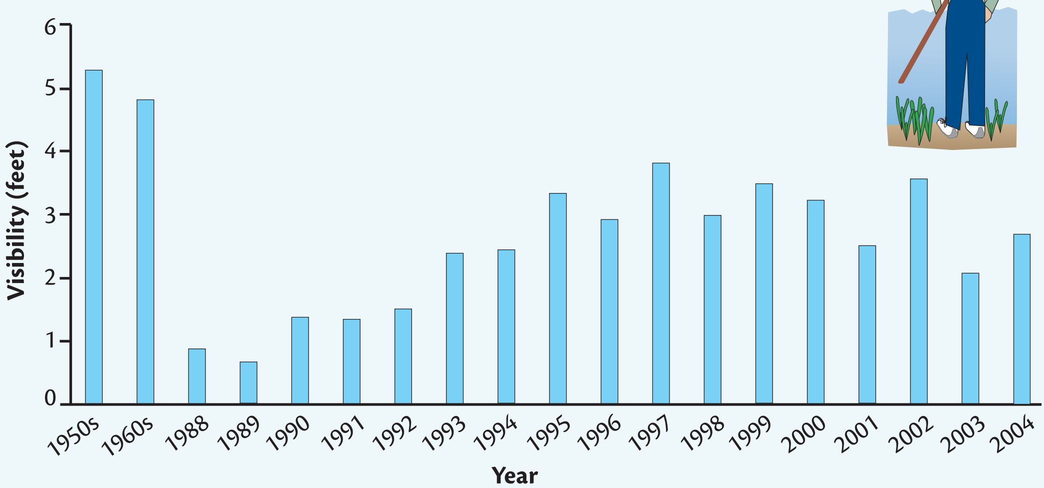
Mr. Fowler has been a State Senator, World War II soldier, owner of Bernie's Boats, Chesapeake Bay waterman, and citizen activist.

Bay restoration accomplishments

Bernie Fowler remembers the days of his youth, when he could wade up to his shoulders in his beloved Patuxent River and still see the river's bottom, teeming with crabs and fish swimming among the grasses and oyster shells. While that is not the picture of the Bay today, Bernie has raised public awareness of declining water quality due to nutrient and sediment pollution. Through annual wade-ins at Broomes Island, Bernie has found a way to explain water clarity to people without the use of charts and graphs. He measures the depth of water clarity in the Patuxent when he can see his white sneakers through the water. The water line on Bernie's denim overalls is measured and recorded in the "Bernie Fowler Sneaker Index". Since Bernie's first wade-in in June 1988, annual wade-ins have begun on more than a dozen other tributaries throughout Maryland.



Sneaker Index: visibility in the Chesapeake Bay



Senator C. Bernard Fowler, 1992-1993 Chair of the Chesapeake Bay Commission; Karl Mountford, U.S. EPA Chesapeake Bay Program.

5. FUTURE CHALLENGES AND INITIATIVES

Sunrise over the Chesapeake Bay.

The Department of Defense has been an active participant in the restoration and cleanup efforts of the Chesapeake Bay long before formal Chesapeake Bay Program directives were signed. Some efforts at Bay installations were initiated as a result of Congressional legislation. Environmental legislation proliferated in the late 1960s and increased Department of Defense roles and responsibilities in preserving and protecting the environment. In the decade prior to signing its first Chesapeake Bay agreement in 1984, the Department of Defense spent more than $180 million for projects in the Chesapeake Bay watershed.

Currently, a Chesapeake Bay Program Coordinator provides guidance, oversees research, and assists with restoration efforts at each installation. To demonstrate the Department of Defense's continuing commitment to the restoration of the Chesapeake Bay, this chapter highlights initiatives and discusses the challenges associated with storm water management, population increase, encroachment, and riparian forest buffers in the Chesapeake Bay region.

In June 2000, the Chesapeake Bay Program partners adopted *Chesapeake 2000*, a strategic plan and a vision of the future of the Chesapeake Bay; a vision that includes abundant, diverse populations of living resources fed by healthy streams and rivers, sustaining strong local and regional economies, and a unique quality of life.

Chesapeake 2000 refocused the challenges and goals of the Chesapeake Bay Program to improve water quality, restore vital habitat, such as marshes, forests, and underwater grasses and implement sensible harvest levels aimed to keep the Bay's intricate ecosystem in balance. Likewise, *Chesapeake 2000* recognizes that conditions in the water are inextricably linked to conditions on the land. The agreement asserted that a broad public stewardship must encompass sound land use practices to protect the health of local waterways and the Bay. To meet these newly-focused goals and initiatives, the Department of Defense has continued to lead in efforts to improve each of the commitment areas and has undertaken several initiatives to help military installations in the Chesapeake Bay work towards agency-wide environmental goals.

STORM WATER MANAGEMENT

Storm water that flows across impervious surfaces such as roads, paved parking lots, and rooftops can carry potentially harmful contaminants to local streams that lead to the Chesapeake Bay (Figure 31). Urban runoff continues to degrade water quality and is one of the most significant factors contributing to the decline of the Bay's health. Recognizing the environmental importance of improving the quality and reducing the quantity of storm water runoff, Department of Defense installations actively manage storm water to protect the Bay. At Langley Air Force Base, a program has been implemented to monitor storm

Department of Defense

Navy Natural Resources personnel plant American beach grass in an effort to stabilize eroding beachfront at Hamster Beach at the Naval Air Station in Norfolk, Virginia.

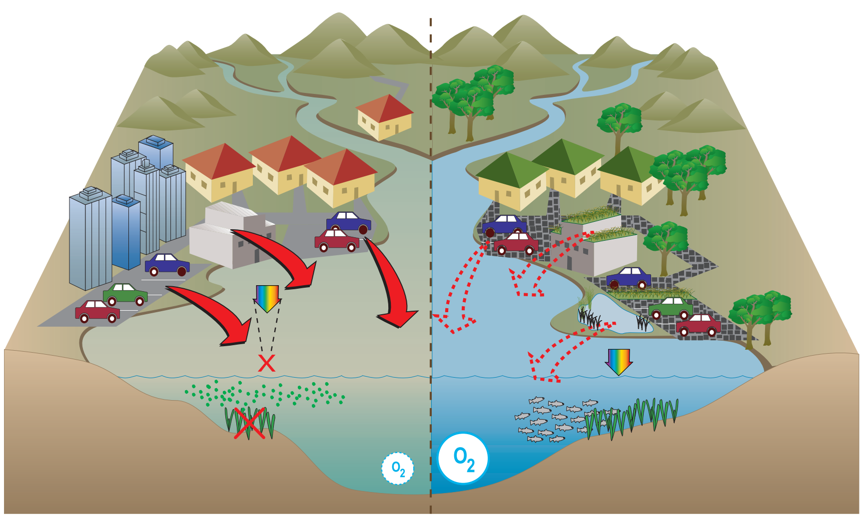
water runoff and establish best management practices to control and limit the discharges associated with installation industrial activities. These best management practices include educating installation personnel on how to avoid harmful discharges and preventing pollution from entering the Bay by constructing systems to control storm water runoff.

As part of an overall effort to help protect and restore water quality, the Navy has encouraged its facilities to implement storm water management strategies such as low impact development. The Navy is working with the Low Impact Development Center to draft a comprehensive design plan for implementing low impact development practices at all military installations. Low impact development is a comprehensive land planning and engineering design approach focused on maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds. The plan will provide information on how low impact development can address regulatory requirements and establish resource protection goals for installations. The plan will include examples of practices and procedures to determine which best management practices will be most effective at specific installations.

At the Washington Navy Yard and Naval Medical Center Portsmouth, several low impact development projects such as replacing conventional parking lot asphalt cover with permeable paving stone have successfully demonstrated effective storm water management. These techniques utilized by the Navy have improved the quality and reduced the quantity

FIGURE 31—LOW IMPACT DEVELOPMENT ON BAY INSTALLATIONS IS EFFECTIVE AT MANAGING STORM WATER RUNOFF.

Poor storm water management **Effective storm water management**



Urban development, urban sprawl, roads and parking lots, and buildings without green roofs all increase impervious surfaces on the landscape. Impervious surfaces cause stormwater runoff and nutrients to enter waterways in large, pulsed amounts. This influx of nutrients can result in an increased incidence of algal blooms, decreased light availability, low dissolved oxygen levels, and loss of submerged aquatic vegetation.

The use of pervious pavers on roads and parking lots, rain gardens, stormwater retention ponds, and green roofs minimize impervious surfaces on the landscape. Minimizing impervious surfaces allows stormwater runoff and nutrients to enter waterways in small, diffuse amounts. This allows natural levels of light availability, dissolved oxygen, submerged aquatic vegetation, and other aquatic organisms to proliferate.

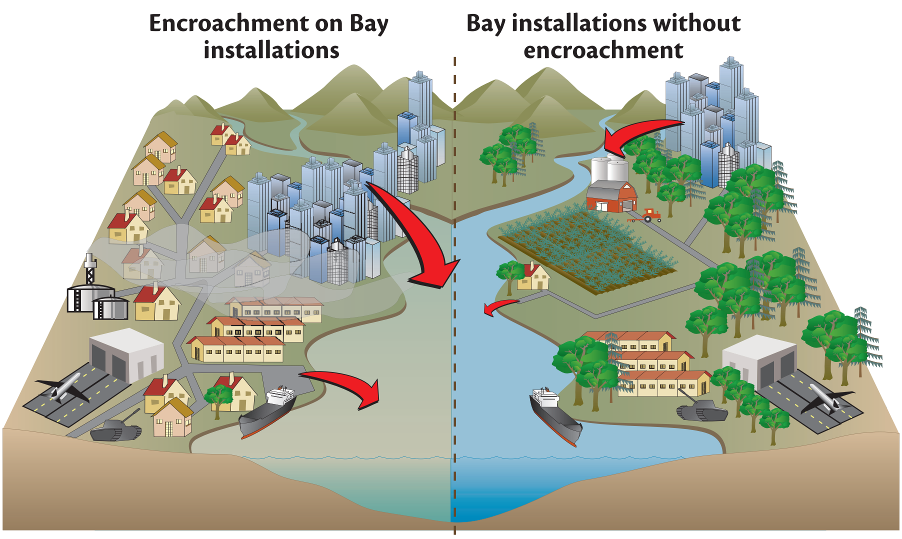
of storm water runoff; thus, preventing nutrient- and sediment-laden storm surges from entering the Bay. The Navy Yard Low Impact Development project now serves as a model to train personnel on effective use of these practices for managing storm water runoff. At both Fort Meade and Aberdeen Proving Ground in Maryland, installations that are projected to grow significantly in the next several years, the Army has integrated low impact development and BayScape practices to control storm water and create wildlife habitat. Extensive use of pollution prevention techniques such as substituting green products for hazardous ones, moving operations under cover and onto impervious surfaces for easy cleanup, and using less water and chemical-intensive cleaning methods are being used to help prevent storm water from polluting the Bay.

In addition, the Department of Defense Clean Water Act Services Steering Committee encourages military installations to work with the Environmental Protection Agency and the states to identify potential water quality trading opportunities. Water quality trading would allow one source to meet its regulatory obligations by using pollutant reductions created by another source that has lower pollution control costs. This approach could lead to more efficient and cost-effective implementation of the *Clean Water Act* requirements, especially water quality trading initiatives that reduce compliance costs and provide greater regulatory flexibility in achieving National Pollutant Discharge Elimination System and water quality standard permit requirements, load reduction allocations associated with total maximum daily loads, non-point source reductions, and storm water runoff controls.

ENCROACHMENT

Encroachment is the cumulative impact of pressure placed on military installations, ranges, and surrounding communities resulting from increasing development (Figure 32). As urban growth continues to affect the Chesapeake Bay region, U.S. military forces are pressured to meet the demands of national military readiness with ever decreasing space to train troops. Open spaces including land, airspace, sea, and frequency spectrum are vital to Department of

FIGURE 32—BAY INSTALLATIONS FACE CHALLENGES FROM ENCROACHMENT.



As urban development increases, housing developments may encroach upon Bay installations . This may include the construction of transportation corridors that cut through Bay installations . Increased development surrounding installations leads to elevated nutrient inputs and increased pollution .

If smart growth is employed during housing developments, they do not encroach upon Bay installations . In addition, patches of forest , farmland , and urban centers are separated from installations. Smart growth also leads to smaller nutrient inputs than conventional urban development.

Defense mission readiness. In order to prepare military forces, adequate training spaces are needed to simulate realistic combat conditions, including live-fire training and weapons testing. Encroachment can restrict units and personnel from conducting activities and increase the cost of training and testing.

The Naval Support Facility Patuxent River in Maryland has taken the initiative to raise awareness about environmental and encroachment issues in the operational community. Recently, the St. Mary's Board of County Commissioners purchased two parcels of land within the Air Installation Compatibility Use Zone. One parcel of land purchased includes Lexington Manor, an area that housed residents near Naval Support Facility Patuxent River. Located under the flight path of the Navy aircraft landing at Patuxent River, this created a potentially dangerous situation. The purchase of this land will ensure the housing complex is demolished and the remaining families are relocated to safer housing. Ultimately, the land will be brought into compliance with the Air Installation Compatibility Use Zone regulations, creating a safer environment at Naval Support Facility Patuxent River. In addition, 50 acres of the land purchased will remain as open space and eventually be accessible to the public for natural resource awareness. The Army is working with non-governmental organizations through a cooperative agreement to cost-share the purchase of land titles or conservation easements from willing sellers (at fair market value) to minimize incompatible land use adjacent to their installations. This project, known as the Private Lands Initiative, strives to reduce training restrictions, meets *Endangered Species Act* responsibilities by preventing future species listings, and prevents restrictions on available maneuver space.

POPULATION GROWTH

Environmental problems in the Chesapeake Bay are magnified due to the increasing population in the area. Currently, 15 million people live in the Bay's watershed and the population is anticipated to grow to 18 million people by the year 2020. Population growth and demographic changes on and near the Chesapeake Bay have the potential to challenge the Department of Defense's current activities and the future capabilities of military installations. As the population surrounding Naval Support Facility Patuxent River has increased, so has the sensitivity to supersonic flight, low-level aircraft, and repetitive noise. As a result, Naval Support Facility Patuxent River has created a new video entitled *Aircrew Awareness in the Patuxent River Complex* to address the areas of rapidly expanding population. The video contains vital information for aircrews flying in the Chesapeake Test Range. It familiarizes aircrews with the Patuxent River Complex and how their actions

Adrian Jones, IAN Image Library (www.ian.umces.edu/imagelibrary/)

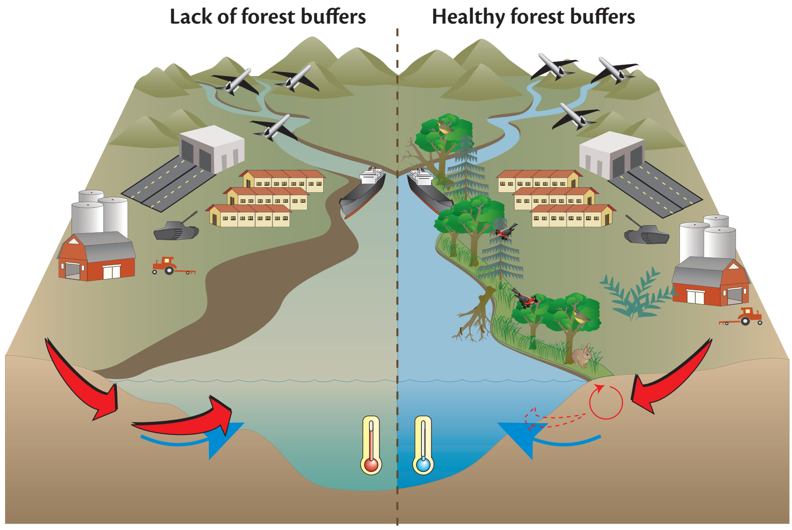
Intense population growth on and near the Chesapeake Bay can challenge Bay installations' activities and future capabilities.

contribute to the supportive relationship between Naval Support Facility Patuxent River and the community. The video also encourages aviators to be vigilant in conducting missions so that they have minimal impact on residents. Aviators can minimize their impact by avoiding flight paths near schools, churches, and houses when possible. As part of the training program, a fact sheet was developed for all aviators to keep with their flight books. In addition to the fact sheets these flight books include video highlights, a map of the test range, and a list of commonly used radio frequencies. This video will ensure Naval Support Facility Patuxent River accomplishes its military mission with minimal impact on the surrounding communities. With an increase in urbanization in the Chesapeake Bay region, limitations on the Department of Defense's training capabilities have become a serious challenge. Competition for airspace, land, and electro-magnetic spectrum are well-recognized factors that are influenced by long-term population trends. Urban sprawl also impacts military readiness and sustainability by transforming ranges and training lands into islands of biodiversity, which can increase the regulation and application of environmental constraints to these once-remote sites. By working proactively with state and federal regulators and surrounding communities, military facilities can both help preserve the Chesapeake Bay ecosystem and ensure their long-term ability to support mission requirements.

RIPARIAN FOREST BUFFERS

Riparian forest buffers provide habitat for wildlife and stabilize areas to prevent erosion. Buffers offer numerous benefits to wildlife—providing food, shelter, habitat, and

FIGURE 33—RIPARIAN FOREST BUFFER RESTORATION ON BAY INSTALLATIONS HELPS TO RECYCLE NUTRIENTS AND IMPROVE WATER QUALITY.



Streamside areas that lack riparian forest buffers are prone to erosion . When riparian forest buffers are not present, stream water temperature rises , which can be detrimental to aquatic organisms. In the absence of riparian forest buffers, sub-surface nutrients are not taken up or reduced prior to entering the stream with groundwater .

Riparian forest buffers stabilize stream banks by reducing erosion, keeping stream water temperature cool as a result of shading, and provide important habitat for organisms, both on the land and in the stream itself . Riparian forest buffers also help reduce nutrient inputs into streams. Some sub-surface nutrients are taken up by the roots of the riparian vegetation , reducing the nutrients that enter the stream with groundwater to a small amount .

nesting areas. The vegetative root systems in these areas stabilize soils and moderate stream flow, reducing the potential for sediment erosion. Specifically, forest buffers moderate air and water temperatures and improve water quality by trapping and filtering sediments and nutrients before they enter the Bay (Figure 33). The Department of Defense supports off-site efforts to reduce encroachment on its military installations by promoting buffers along waterways, encouraging conservation easements, and maintaining and restoring wetlands and shorelines. These efforts help sustain the military training environment, protect watersheds, improve water quality, and enhance conservation of natural resources.

In conjunction with the Prince William Conservation Alliance in Virginia, Marine Corps Base Quantico is working to acquire Merrimac Farm. This acquisition will preserve the natural value of the land and prevent future development of this site. Preservation of this farm, which borders the Base, will protect the installation from issues associated with encroachment and save 100 acres of valuable non-tidal wetlands and a major groundwater recharge site from development. In the future, the partners hope this land can be used as a public environmental education center. This project is compatible with Department of Defense conservation efforts and would create a buffer zone around Marine Corps Base Quantico.

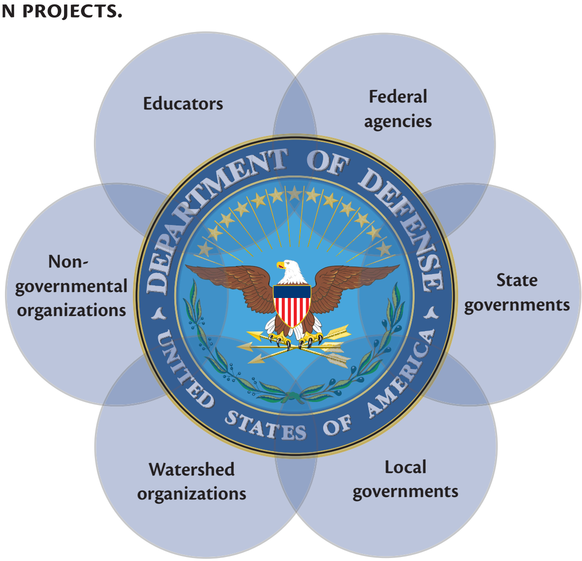
Army Compatible Use Buffers is an innovative new program involving diverse partnerships to sustain long-term mission requirements by protecting private land adjacent to Army installations. As encroachment accelerates, these areas become critical to the training and readiness necessary to fight and win the nation's wars. By utilizing partnerships with conservation organizations, this program helps the Army fulfill its responsibility as a federal agency to comply with all environmental regulations, while at the same time limiting the effects of encroachment, and maximizing the ability of the installations' lands to support the military mission.

PARTNERSHIPS

Much of the Department of Defense's success in restoration in the Chesapeake Bay region has been the result of long standing partnerships with neighboring communities and federal, state, and local agencies (Figure 34). The Department of Defense continues to expand these partnerships in order to share expertise and ensure that the progress toward achieving restoration and protection goals in the Chesapeake Bay is effective and efficient.

One example of an effective partnership is *Businesses for the Bay*. This organization is a voluntary team of forward-thinking businesses, industries, government facilities, and other organizations within the Chesapeake Bay watershed. The Department of Defense

FIGURE 34—THE DEPARTMENT OF DEFENSE PARTNERS WITH MANY OTHER ORGANIZATIONS TO COMPLETE EFFECTIVE RESTORATION PROJECTS.



Department of Defense

The Department of Defense and U.S. Fish and Wildlife personnel installed Heron Nesting Platforms at Bloodsworth Island, Maryland.

continues to work with partnering businesses to implement pollution prevention through improving daily operations and reducing contaminants and other debris from entering the Chesapeake Bay. In 2004, Defense Supply Center Richmond was a recipient of an Outstanding Achievement for a Government Facility award. Defense Supply Center Richmond is a storage and office complex that manages various types of hazardous materials, ozone-depleting substances reserve, and petroleum-based products for the Department of Defense. Defense Supply Center Richmond has centered its development on an ISO 14001 compliant Environmental Management System and pollution prevention initiatives that focus on material substitution, process modification, and recycling. These efforts led to the creation of an Environmental Management System partnership with community stakeholders including other Department of Defense military installations, two cities, two counties, two regional planning districts, a deep-water port, and Virginia's environmental regulatory agency. The partnership has strengthened communication between different groups and has provided pollution prevention assistance to other members. Defense Supply Center Richmond was recognized for its leadership and partnership efforts with other government and local entities.

In addition, the Department of Defense is working with the Smithsonian Institution to use a rapid and inexpensive testing method in Chesapeake Bay water quality studies. The method will assist in determining the health of the Bay's tributaries which can become polluted from point and non-point sources. Traditional methods that rely on fish and bottom-dwelling organisms are expensive and time consuming. This new method will rely on the presence and distribution of aquatic plants instead of fish to determine the health of streams.

Through another partnership, the Department of Defense was able to protect valuable nesting areas. At Bloodsworth Island, an uninhabited 5,000 acre marsh located in the middle of the Chesapeake Bay, hundreds of blue herons make the island their home each spring and summer. Over the years, encroaching salt water and other conditions have reduced habitat, including the loblolly pines, a favorite tree for nesting. As an active bombing range, naval warfare exercises have always been restricted to outside the blue herons' main colony. In

1983, the Navy along with the U.S. Fish and Wildlife Service, Maryland Department of Natural Resources, and other environmental organizations built 26 nesting platforms on the island. In 2002, 49 new platforms with 4 nesting sites each were built and 26 existing platforms were rebuilt and repaired. This was a collaborative effort with participants from Naval Support Facility Patuxent River, Washington Navy Yard, and U.S. Fish and Wildlife Service who were successful in building new nests for the blue herons.

One important component of the Department of Defense's multi-faceted Chesapeake Bay Program involves researching and restoring submerged aquatic vegetation, a group of true, flowering plants adapted to living and reproducing underwater. Known locally as bay grass, submerged aquatic vegetation(SAV) intercepts and filters nutrients before they reach and impact fragile estuary ecosystems. The publication entitled, *SAV Restoration Handbook: A Guide for Restoring SAV on DoD Installations*, was the collaborative effort of years of Department of Defense involvement with submerged aquatic vegetation and of the valuable partnerships with the greater scientific community. The combined efforts ensure that natural resource management is integrated with military readiness activities and the Department of Defense is committed to its restoration and enhancement of the unique assets of the Bay. These partnerships, along with the willingness of the U.S. Congress to support the Chesapeake Bay programs and initiatives, contribute to the continued restoration and protection of the Chesapeake Bay.

CONCLUSIONS

The Department of Defense continues to demonstrate its commitment to the restoration and protection of the Chesapeake Bay. This commitment fits well within the framework of the military's focus on sustainability. Without a strong focus on preserving the quality of the environment and the availability of resources, the Department of Defense's mission to defend the nation's values and way of life becomes more difficult over time. The accomplishments highlighted in this report represent only a fraction of the Department of Defense's efforts in the Bay. These efforts will continue to grow as partnerships expand and broaden between federal, state, and local agencies, organizations, and businesses and efforts emerge to collectively restore and protect Bay habitats while encouraging greater environmental awareness about the issues impacting the Chesapeake Bay.

Department of Defense

Deputy Assistant Secretary of the Navy (Environment) Donald R. Schregardus hacks into a crop of invasive vegetation along the shoreline of the St. Mary's River during a Webster Field restoration event.

Donald R Schregardus

Donald R. Schregardus
Deputy Assistant Secretary of the Navy (Environment)

VIEW POINT

"Businesses that implement environmental policies and practices that go 'above and beyond compliance' are the environmental leaders that set a new standard for other businesses to study and adopt. Businesses for the Bay *members know that improved environmental performance adds value to their company, shareholders, employees and the community—saving money while saving the Bay."*

Alliance for the Chesapeake Bay

Mary Lynn Wilhere

Businesses for the Bay,
Coordinator
Alliance for the Chesapeake Bay

Businesses for the Bay (B4B) is a voluntary pollution prevention program of the Chesapeake Bay Program with more than 700 member facilities and partners. Ms. Wilhere manages this program for the Alliance for the Chesapeake Bay.

Ms. Wilhere works with businesses, trade groups and associations, non-government organizations, and government agencies to find solutions to environmental challenges. Ms. Wilhere provides technical assistance and recommendations for cost savings, pollution prevention, adoption of innovative technology, and assistance to reduce a facility's toxic and nutrient loads to the Chesapeake Bay watershed.

Degrees

- BSBA, Georgetown University
- MPPM, Environmental Management and Policy, University of Pittsburgh
- Graduate School of Public and International Affairs Graduate work in Environmental Science Studies, Johns Hopkins University

Previous positions

Eighteen years in the environmental field—ten years with non-profit organizations and eight years with a for-profit environmental and economic consulting firm.

APPENDICES

Wetlands and forest are characteristic of the Chesapeake Bay watershed.

APPENDIX A: INSTALLATIONS WITHIN THE CHESAPEAKE BAY WATERSHED

Air Force
Andrews Air Force Base
Bolling Air Force Base
Brandywine Global Communications Receiving Station
Davidsonville Communications Station
Langley Air Force Base

Army
Aberdeen Proving Ground
Adelphi Laboratory Center
Blossom Point Research Facility
Carlisle Barracks
Fort A.P. Hill
Fort Belvoir
Fort Detrick
Fort Eustis
Fort Indiantown Gap
Fort Lee
Fort McNair
Fort Meade
Fort Monroe
Fort Myer
Fort Story
Letterkenny Army Depot
Scranton Army Ammunition Plant
Walter Reed Army Medical Center
Warrenton Training Center

Army Corps of Engineers
Almond Lake
Alvin R. Bush Dam
Arkport Dam
Aylesworth Lake
Cowanesque Lake
Craney Island Dredge Spoils Disposal Area
Curwensville Lake
East Sidney Lake
Foster J. Sayers Dam
Hammond Lake
Indian Rock Dam
Jennings Randolph Lake
Lake Moomaw
Raystown Lake
Savage River Dam
Stillwater Lake
Tioga Lake
Whitney Point Lake

Defense Logistics Agency
Defense Distribution Depot Susquehanna
Defense Supply Center, Richmond

Department of Defense
Arlington National Cemetery
Pentagon

Marine Corps
Henderson Hall
Marine Barracks, Washington
Marine Corps Base Quantico

Navy
Allegheny Ballistics Laboratory
Armed Forces Experimental Training Activity Camp Peary
Defense Fuel Supply Point Craney Island
National Naval Medical Center Bethesda
Naval Air Station Oceana
Naval Amphibious Base Little Creek
Naval Medical Center Portsmouth
Naval Station Norfolk
Naval Station Norfolk, Lafayette River Annex
Naval Station Norfolk, St. Helena Annex
Naval Station Norfolk, St. Juliens Creek Annex
Naval Support Activity Mechanicsburg
Naval Support Facility Anacostia
Naval Support Facility Andrews
Naval Support Facility Annapolis
Naval Support Facility Arlington
Naval Support Facility Carderock
Naval Support Facility Chesapeake Beach
Naval Support Facility Dahlgren
Naval Support Facility Indian Head
Naval Support Facility Naval Research Laboratory
Naval Support Facility Patuxent River
Naval Support Facility Patuxent River, Bloodsworth Island
Naval Support Facility Potomac Annex
Naval Support Facility Solomons Island
Naval Support Facility Suitland
Naval Support Facility Thurmont
Naval Weapons Station Yorktown
Naval Weapons Station Yorktown, Cheatham Annex
Naval Weapons Station Yorktown Fuels
OLF Webster Field
Navy Information Operations Command, Sugar Grove
Norfolk Naval Shipyard
U.S. Naval Academy
U.S. Naval Academy Dairy Farm
U.S. Naval Support Facility Observatory
Washington Navy Yard

APPENDIX B: CHESAPEAKE BAY PROGRAM INSTALLATION POINTS OF CONTACT

Installation	Address	Phone number
Army		
Aberdeen Proving Ground	CDR, USAGAPG ATTN: IMNE-APG-SHE-R Building E-5772 Aberdeen Proving Ground, MD 21010	410-436-4843
Adelphi Laboratory Center	Adelphi Laboratory Center ATTN: IMNE-ALC-PWE 2800 Powder Mill Road Adelphi, MD 20783	301-394-1061
Army Chesapeake Bay Coordinator	Executive Program Manager DAIM-EDS 600 Army Pentagon Washington, D.C. 20310-0600	703-601-1584
Army Environmental Command	Army Environmental Command ATTN: SFIM-AEC-TSR 5179 Hoadley Road, Building E4430 Aberdeen Proving Ground, MD 21010-5401	410-436-6981
Blossom Point Research Facility	Adelphi Laboratory Center ATTN: IMNE-ALC-PWE 2800 Powder Mill Road Adelphi, MD 20783	301-394-1061
Carlisle Barracks	Carlisle Barracks ATTN: DPW-EED Building 330 Engineer Ave. Carlisle, PA 17013-5020	717-245-3612
Fort A.P. Hill	DPW Environmental Division 19952 North Range Road Fort A.P. Hill, VA 22427-3123	804-633-8745
Fort Belvoir	Environmental and Natural Resources Division Directorate of Public Works 9430 Jackson Loop, Suite 107 Fort Belvoir, VA 22060-5116	703-806-0049
Fort Detrick	Natural and Cultural Resources Manager 810 Schreider St. Frederick, MD 21702-5000	301-619-2033
Fort Eustis	U.S. Army Garrison Fort Eustis ATTN: IMNE-EUS-PW-E 1407 Washington Blvd. Fort Eustis, VA 23604	757-878-2375 ext 23
Fort Indiantown Gap	Forestry Section Bldg. 11-19 Fort Indiantown Gap Annville, PA 17003-5002	717-861-2882
Fort Lee	U.S. Army Garrison Fort Lee ATTN: IMNE-LEE-PWE 1816 Shop Road Fort Lee, VA 23801	804-734-5080

APPENDIX B: CONTINUED

Installation	Address	Phone number
Fort Meade	U.S. Army Garrison Fort Meade ATTN: IMNE-MEA-PWE 239 Ross Road Fort Meade, MD 20755-5115	301-677-9185
Fort McNair	DPW Environmental Division 106 Stewart Road, Bldg. 313 Fort Myer, VA 22211-1199	804-633-8745
Fort Monroe	U.S. Army Garrison Fort Monroe ATTN: IMNE-MNR-PWE 318 Cornog Lane Fort Monroe, VA 23651-1110	757-788-5364
Fort Myer	DPW Environmental Division 106 Stewart Road, Bldg. 313 Fort Myer, VA 22211-1199	804-633-8745
Fort Story	U.S. Army Garrison Fort Eustis ATTN: IMNE-EUS-PW-E 1407 Washington Blvd. Fort Eustis, VA 23604	757-878-2375 ext 23
Installation Management Command - Northeast Region	IMCOM-NE ATTN: IMNE-PWD-E 5 North Gate Road Fort Monroe, VA 23651-1048	757-788-5340
Letterkenny Army Depot	Letterkenny Army Depot ATTN: AMSAM-LE-EE-S (Bldg. 14) Chambersburg, PA 17201-4150	717-267-8832
Scranton Army Ammunition Plant	Scranton Army Ammunition Plant 156 Cedar Avenue Scranton, PA 18505-1138	570-340-1163
Walter Reed Army Medical Center	Walter Reed Army Medical Center Garrison Environmental Office Building 11, Room 2-58 6900 Georgia Avenue NW Washington, D.C. 20307	202-782-7822
Army Corps of Engineers		
Baltimore District	U.S. Army Corps of Engineers, Baltimore District CENAB-PL P.O. Box 1715 Baltimore, MD 21203-1715	410-962-6715
Norfolk District	U.S. Army Corps of Engineers, Norfolk District CENAO-PM-PP 803 Front Street Norfolk, VA 23510-1096	757-201-7764
Air Force		
Air Force Chesapeake Bay Coordinator	Langley Air Force Base Natural Resources Planner 1st CES/CEVQ 37 Sweeney Blvd., Room 253 Langley AFB, VA 23665-2107	757-764-1090

Installation	Address	Phone number
Andrews Air Force Base	Environmental Planning 316 CES/CEV 3466 North Carolina Avenue Andrews AFB, MD 20762-4803	301-981-1426
Bolling Air Force Base	Environmental Flight Chief 11th Civil Engineer Squadron 370 Brookley Avenue Bolling AFB, D.C. 200232	202-767-8600
Langley Air Force Base	Natural Resources Planner 1st CES/CEVQ 37 Sweeney Blvd., Room 253 Langley AFB, VA 23665-2107	757-764-1090
Defense Logistics Agency		
Defense Distribution Depot Susquehanna	Environmental Specialist DES-DDC-EE Defense Distribution Center 2001 Mission Drive Warehouse 1 Bay 2 New Cumberland, PA 17070-5000	
Defense Logistics Agency Chesapeake Bay Coordinator	Defense Logistics Agency 8725 John J. Kingman Road Suite 2639, ATTN: DES-E Fort Belvoir, VA 22060-6253	703-767-6253
Defense Supply Center Richmond	Defense Supply Center Richmond 8000 Jefferson Davis Highway Richmond, VA 23297	804-279-6429
Marine Corps		
Henderson Hall	Head, NREA Branch (B. 046) 3250 Catlin Avenue Marine Corps Base Quantico, VA 22134-5001	703-784-4030
Marine Barracks, Washington	Safety and Environmental Office Marine Barracks, Washington 1555 South Gate Road Arlington, VA 22214	703-614-1900
Marine Corps Base Quantico	Safety and Environmental Office Marine Barracks, Washington 1555 South Gate Road Arlington, VA 22214	703-614-1900
Marine Corps Base Quantico	Head, NREA Branch (B. 046) 3250 Catlin Avenue Marine Corps Base Quantico, VA 22134-5001	703-784-4030
Marine Corps National Capital Region Chesapeake Bay Coordinator	Deputy Natural Resources and Environmental Affairs Branch (G-5) 3250 Catlin Avenue Marine Corps Base Quantico, VA 22134-5001	703-432-0535

APPENDIX B: CONTINUED

Installation	Address	Phone number
Navy		
Armed Forces Experimental Training Activity Camp Peary	Environmental Manager AFETA Camp Peary 1100 Executive Drive Williamsburg, VA 23188	757-229-2121, ext. 4263
Defense Fuel Supply Point Craney Island	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
DoD/Navy Chesapeake Bay Program Coordinator	Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office (N451) 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4707
National Naval Medical Center	Environmental Programs Division National Naval Medical Center 8901 Wisconsin Avenue, Building 14 Bethesda, MD 20889	301-295-5217
Naval Air Station Oceana	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Naval Amphibious Base Little Creek	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Naval Medical Center Portsmouth	Environmental and Natural Resources Manager Facilities Management Department Naval Medical Center Portsmouth 620 John Paul Jones Circle Portsmouth, VA 23708	757-953-6992
Naval Station Norfolk	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Naval Station Norfolk Lafayette River Annex	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933

Installation	Address	Phone number
Naval Station Norfolk St. Helena Annex	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Naval Station Norfolk St. Juliens Creek Annex	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Naval Support Activity Mechanicsburg	Naval Support Activity 5450 Carlisle Pike, Bldg. 305 Mechanicsburg, PA 17055	717-605-2179
Naval Support Facility Anacostia	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Naval Support Facility Andrews	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Naval Support Facility Annapolis	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Naval Support Facility Arlington	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Naval Support Facility Carderock	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Naval Support Facility Chesapeake Beach	Naval Research Laboratory Code 3540 – Safety Branch 4555 Overlook Avenue SW Washington, D.C. 20375	202-767-2232
Naval Support Facility Dahlgren	Bldg. 189 Naval District Washington, Dahlgren 17322 Dahlgren Road Dahlgren, VA 22448	540-653-4186
Naval Support Facility Indian Head	Naval Support Activity, South Potomac – Indian Head Natural Resources Office 101 Strauss Avenue, Bldg. 289 Indian Head, MD 20640-5035	301-744-2273
Naval Support Facility Naval Research Laboratory	Naval Research Laboratory Code 3540 – Safety Branch 4555 Overlook Avenue SW Washington, D.C. 20375	202-767-2232

APPENDIX B: CONTINUED

Installation	Address	Phone number
Naval Support Facility Observatory	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Naval Support Facility Patuxent River	Conservation Division 22541 Johnson Road, Building 1410 Naval Air Station Patuxent River, MD 20670-1700	301-757-0007
Naval Support Facility Patuxent River Bloodsworth Island	Conservation Division 22541 Johnson Road, Building 1410 Naval Air Station Patuxent River, MD 20670-1700	301-757-0007
Naval Support Facility Potomac Annex	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-980-3415
Naval Support Facility Solomons Island	Conservation Division 22541 Johnson Road, Building 1410 Naval Air Station Patuxent River, MD 20670-1700	301-757-0007
Naval Support Facility Suitland	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Naval Support Facility Thurmont	Environmental Division (Code N45) 1014 N Street SE, B. 200 Washington Navy Yard, D.C. 20374-5001	202-433-7181
Naval Weapons Station Yorktown	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Naval Weapons Station Yorktown Cheatham Annex	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Naval Weapons Station Yorktown Fuels	Chesapeake Bay Program Manager (N451) Commander, Navy Region Mid-Atlantic Regional Environmental Coordination Office 1510 Gilbert Street Norfolk, VA 23511-2737	757-887-4933
Navy Information Operations Command, Sugar Grove	Environmental & Natural Resources Programs Manager NAVOICOM SUGAR GROVE WV 63 Hedrick Drive, Code N45 Sugar Grove, WV 26815	304-249-6341
Norfolk Naval Shipyard	Norfolk Naval Shipyard (Code 106) Building M-22, 3rd Floor Portsmouth, VA 23709	

Installation	Address	Phone number
Outlying Landing Field Webster Field	Conservation Division 22541 Johnson Road, Building 1410 Naval Air Station Patuxent River, MD 20670-1700	301-757-0007
U.S. Naval Academy	Public Works, Environmental Division 181 Wainwright Road Annapolis, MD 21402	410-293-1025
U.S. Naval Academy Dairy Farm	Public Works, Environmental Division 181 Wainwright Road Annapolis, MD 21402	410-293-1025
Washington Navy Yard	Environmental Division (Code N2) 1014 N Street SE, Suite 320 Washington Navy Yard, D.C. 20374-5001	202-433-6710 or 301-227-4850
Department of Defense		
Arlington National Cemetery	Environmental Coordinator Arlington National Cemetery Facility Maintenance Complex Building 123 Arlington, VA 22211-5003	703-607-8204
Pentagon	Defense Facilities Directorate Safety and Environment Manager 1155 Defense Pentagon Washington, D.C. 20301-1155	703-693-3683

RESOURCES

Bortz, J., Engelhardt, K., Koch, E., Murphy, R., Sellner, K., Thur, R., Yee, K. 2005. SAV Restoration Handbook: A Guide for Restoring SAV on DoD Installations.

K.G. Sellner (ed.) 2005. Hurricane Isabel in Perspective. Chesapeake Research Consortium, CRC Publication 05-160, Edgewater, Maryland.

White, C.P. 1998. Chesapeake Bay: A field guide. Tidewater Publishing: Centreville, Maryland

Unified Facilities Criteria (UFC) Design: Low Impact Development Manual (UFC 3-21-10) of 25 October 2004.

United States. Department of Defense. 1997. Recovering and Protecting the Chesapeake Bay: A DoD Initiative.

WEB SOURCES

Description	Web address
U.S. Department of Defense	
Air Force	www.af.mil
Army	www.army.mil
Army Corps of Engineers	www.usace.army.mil
Defense Logistics Agency	www.dla.mil
Marine Corps	www.usmc.mil
Navy	www.navy.mil
Department of Defense	www.defenselink.mil
DoD Progress Report Online	www.ian.umces.edu/dod
Joint Military Services Chesapeake Bay Program	www.hqda.army.mil/acsimweb/env/cbi
Defense Environmental Network and Information eXchange	www.denix.osd.mil
Chesapeake Bay	
Businesses for the Bay	www.chesapeakebay.net/b4bay.htm
Chesapeake Bay Foundation	www.cbf.org/site
Chesapeake Bay Journal	www.bayjournal.com
Chesapeake Bay National Estuarine Research Reserve (Virginia)	www.vims.edu/cbnerr
Chesapeake Bay National Estuarine Research Reserve (Maryland)	www.dnr.state.mu.us/bay/cbnerr
Chesapeake Bay Program	www.chesapeakebay.net
Chesapeake Bay Trust	www.chesapeakebaytrust.org
Chesapeake Research Consortium	www.chesapeake.org
Freshwater SAV Partnership	www.chesapeake.org/SAV/partnershiphome.html
Federal agencies	
Federal Highway Administration	www.fhwa.dot.gov
General Services Administration	www.gsa.gov
National Aeronautics and Space Administration	www.nasa.gov
National Oceanic and Atmospheric Administration Chesapeake Bay Office	www.noaa.chesapeakebay.net
National Park Service	www.nps.gov
U.S. Environmental Protection Agency Chesapeake Bay Office	www.epa.gov/region03/chesapeake

Description	Web address
U.S. Fish and Wildlife Service Chesapeake Bay Office	www.fws.gov/chesapeakebay
U.S. Forest Service	www.fs.fed.us
U.S. Geological Survey	www.usgs.gov
USDA Cooperative State, Research, Education, and Extension Service	www.csrees.usda.gov
USDA Farm Service Agency	www.fsa.usda.gov
USDA Natural Resources Conservation Service	www.nrcs.usda.gov
State agencies	
D.C. Department of the Environment	www.ddoe.dc.gov
Delaware Department of Natural Resources and Environmental Control	www.dnrec.delaware.gov
Maryland Department of the Environment	www.mde.state.md.us
Maryland Department of Natural Resources	www.dnr.state.md.us
New York Department of Environmental Conservation	www.dec.ny.gov
New York State Office of Parks, Recreation, and Historic Preservation	www.nysparks.state.ny.us
Pennsylvania Department of Conservation and Natural Resources	www.dcnr.state.pa.us
Pennsylvania Department of Environmental Protection	www.depweb.state.pa.us
Virginia Department of Conservation and Recreation	www.dcr.virginia.gov
Virginia Department of Environmental Quality	www.deq.state.va.us
Virginia Department of Forestry	www.dof.virginia.gov
Virginia Department of Game and Inland Fisheries	www.dgif.state.va.us
West Virginia Conservation Agency	www.wvca.us
West Virginia Department of Environmental Protection	www.wvdep.org
Natural resources	
Center for Watershed Protection	www.cwp.org
Low Impact Development Center	www.lowimpactdevelopment.org
International Storm water Best Management Practices (BMP) Database	www.bmpdatabase.org
Tributary strategies	
D.C. Tributary Strategies	www.ddoe.dc.gov/ddoe/cwp/view,a,1209,q,492320.asp
Maryland Tributary Strategies	www.dnr.state.md.us/tribstrat
Pennsylvania Tributary Strategies	www.depweb.state.pa.us/chesapeake/cwp
Virginia Tributary Strategies	www.naturalresources.virginia.gov/Initiatives/WaterQuality
West Virginia Tributary Strategies	www.wvdep.org/ITem.cfm?ssid=11&1id=851
Research institutions	
University of Maryland Center for Environmental Science	www.umces.edu
Virginia Institute of Marine Science	www.vims.edu/bio/sav

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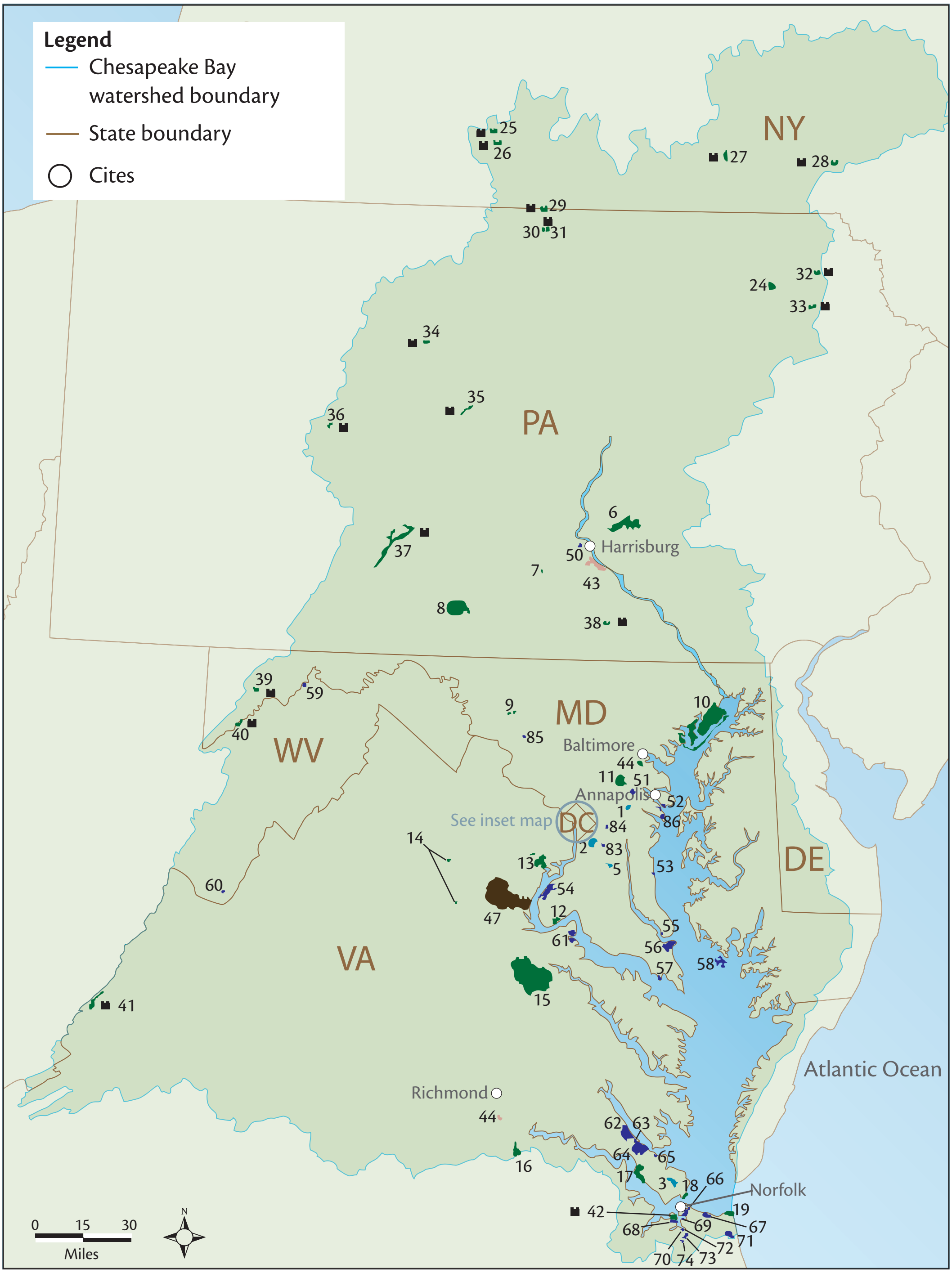
DEPARTMENT OF DEFENSE INSTALLATIONS WITHIN THE CHEASAPEAKE BAY WATERSHED INCLUDING ARMY CORPS OF ENGINEERS SITES.



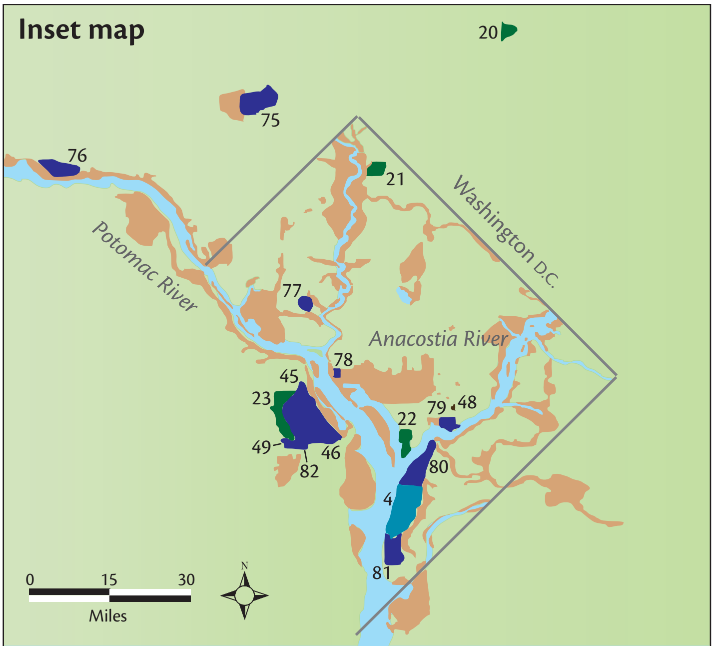
Department of Defense

Air Force

1. Davidsonville Communications Station
2. Andrews Air Force Base
3. Langley Air Force Base
4. Bolling Air Force Base
5. Brandywine Global Communications Receiving Station

Army

6. Fort Indiantown Gap
7. Carlisle Barracks
8. Letterkenny Army Depot
9. Fort Detrick
10. Aberdeen Proving Ground
11. Fort Meade
12. Blossom Point Research Facility
13. Fort Belvoir



Department of Defense

Installations Key

- Air Force
- Army
- Army Corps of Engineers
- Defense Logistics Agency
- Marine Corps
- Navy
- Other Federal Property (D.C. inset map only)

14. Warrenton Training Center
15. Fort A.P. Hill
16. Fort Lee
17. Fort Eustis
18. Fort Monroe
19. Fort Story
20. Adelphi Laboratory Center
21. Walter Reed Army Medical Center
22. Fort McNair
23. Fort Myer
24. Scranton Army Ammunition Plant

Army Corps of Engineers

25. Almond Lake
26. Arkport Dam
27. Whitney Point Lake
28. East Sidney Lake
29. Cowanesque Lake
30. Tioga Lake
31. Hammond Lake
32. Stillwater Lake
33. Aylesworth Lake
34. Alvin R. Bush Dam
35. Foster J. Sayers Dam
36. Curwensville Lake
37. Raystown Lake
38. Indian Rock Dam
39. Savage River Dam
40. Jennings Randolph Lake
41. Lake Moomaw
42. Craney Island Dredge Spoils Disposal Area

Defense Logistics Agency

43. Defense Distribution Depot Susquehanna
44. Defense Supply Center, Richmond

Department of Defense

45. Arlington National Cemetery
46. Pentagon

Marine Corps

47. Marine Corps Base Quantico
48. Marine Barracks, Washington
49. Henderson Hall

Navy

50. Naval Support Activity Mechanicsburg
51. U.S. Naval Academy Dairy Farm
52. Naval Support Facility Annapolis
53. Naval Support Facility Chesapeake Beach
54. Naval Support Facility Indian Head
55. Naval Support Facility Solomons Island
56. Naval Support Facility Patuxent River
57. OLF Webster Field
58. Naval Support Facility Patuxent River, Bloodsworth Island
59. Allegheny Ballistics Laboratory
60. Navy Information Operations Command, Sugar Grove
61. Naval Support Facility Dahlgren
62. Armed Forces Experimental Training Activity Camp Peary
63. Naval Weapons Station Yorktown, Cheatham Annex
64. Naval Weapons Station Yorktown
65. Naval Weapons Station Yorktown Fuels
66. Naval Station Norfolk
67. Naval Amphibious Base Little Creek
68. Defense Fuel Supply Point Craney Island
69. Naval Station Norfolk, Lafayette River Annex
70. Naval Medical Center Portsmouth
71. Naval Air Station Oceana
72. Naval Station Norfolk, St. Helena Annex
73. Norfolk Naval Shipyard
74. Naval Station Norfolk, St. Juliens Creek Annex
75. National Naval Medical Center Bethesda
76. Naval Support Facility Carderock
77. U.S. Naval Observatory
78. Naval Support Facility Potomac Annex
79. Washington Navy Yard
80. Naval Support Facility Anacostia
81. Naval Support Facility Naval Research Laboratory
82. Naval Support Facility Arlington
83. Naval Support Facility Andrews
84. Naval Support Facility Suitland
85. Naval Support Facility Thurmont
86. U.S. Naval Academy

Defending Our National Treasure: A Department of Defense Chesapeake Bay Restoration Partnership 1998–2004 includes the following sections:

- Overview of major issues impacting the Chesapeake Bay;
- History of the Department of Defense's involvement in Bay restoration efforts;
- Department of Defense restoration initiatives;
- Specific case studies of restoration efforts; and
- View Points of various key individuals in Chesapeake Bay restoration.

These topics are presented in a richly illustrated style including maps, photographs, conceptual diagrams, and figures to uniquely communicate information and make this information accessible to a broad audience. In addition, the Department of Defense's approach to restoration and protection provides widely-applicable examples for other organizations facing similar challenges.

As one of the largest federal landholders in the Chesapeake Bay watershed, the Department of Defense's efforts have an important role in the restoration and protection of the Chesapeake Bay. While these efforts continue, this report captures and summarizes the diversity and scope of the Department of Defense initiatives in the Chesapeake Bay watershed.

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA