4. CASE STUDIES

Loblolly pines, which provide habitat for ospreys and bald eagles, grow on many Bay installations.
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 and Channels Federal Navigation projects to restore wetlands in areas affected 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 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.

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

1996

Containment dikes being built from clean dredged material.

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.

1998

Dike construction on Poplar Island.
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.

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.

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

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.
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 example, 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.
“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).

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 (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.
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.
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.
**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.

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.

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.

<table>
<thead>
<tr>
<th>Installation</th>
<th>Water Quality Monitoring</th>
<th>Education and Outreach</th>
<th>SAV Restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aberdeen Proving Ground</td>
<td>1996–2004</td>
<td>✓</td>
<td>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.</td>
</tr>
<tr>
<td>Blossom Point Research Facility</td>
<td>1999–2004</td>
<td>None</td>
<td>SAV is abundant on this installation. A restoration project to control invasive species is planned for 2005.</td>
</tr>
<tr>
<td>Fort Eustis</td>
<td>1998–2000</td>
<td>None</td>
<td>SAV planting, including such species as widgeon grass and sago pondweed, was conducted.</td>
</tr>
<tr>
<td>Fort Monroe</td>
<td>1998–2003</td>
<td>✓</td>
<td>Eelgrass and widgeon grass seeds were planted.</td>
</tr>
<tr>
<td>Fort Belvoir</td>
<td>2004</td>
<td>None</td>
<td>Restoration planned for 2006.</td>
</tr>
<tr>
<td>Bolling Air Force Base</td>
<td>1999</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Naval Support Facility Dahlgren</td>
<td>1998–2003</td>
<td>✓</td>
<td>In 2000, redhead grass was planted.</td>
</tr>
<tr>
<td>Naval Support Facility Indian Head</td>
<td>1996–2003</td>
<td>✓</td>
<td>In May 2000, wild celery was planted.</td>
</tr>
<tr>
<td>Naval Support Facility Solomons Island</td>
<td>None</td>
<td>None</td>
<td>From 1999–2000, widgeon grass, eelgrass, and sago pondweed were planted.</td>
</tr>
<tr>
<td>Naval Weapons Station Yorktown</td>
<td>1999–2000</td>
<td>None</td>
<td>None: poor water quality</td>
</tr>
<tr>
<td>Naval Amphibious Base Little Creek</td>
<td>1997–2001</td>
<td>✓</td>
<td>In October of 2000, eelgrass and widgeon grass were planted.</td>
</tr>
</tbody>
</table>

**References for SAV Restoration:**


Freshwater SAV Partnership Homepage: [www.chesapeake.org/SAV/partnershiphome.html](http://www.chesapeake.org/SAV/partnershiphome.html)

Virginia Institute of Marine Science SAV Homepage: [www.vims.edu/bio/sav/](http://www.vims.edu/bio/sav/)
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 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 stormwater 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 stormwater 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.

- **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.
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 addition, 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.

**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.
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.

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.

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

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.

**FIGURE 29—MAP OF THE ELIZABETH RIVER.**
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.

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.
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.
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.

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.
“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.”

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.