

A Sustainable Chesapeake

BETTER MODELS FOR CONSERVATION

Edited by David G. Burke and Joel E. Dunn

THE CONSERVATION FUND



The case study you have downloaded is highlighted below. Other case studies from this Chapter of *A Sustainable Chesapeake: Better Models for Conservation* can be individually downloaded. The editors encourage readers to explore the entire Chapter to understand the context and sustainability principles involved with this and other featured case studies. The full publication contains 6 Chapters in total: Climate Change Solutions, Stream Restoration, Green Infrastructure, Incentive Driven Conservation, Watershed Protection and Stewardship.

CHAPTER 6 STEWARDSHIP

Introduction	220
Hull Springs Farm of Longwood University	221
Using Stewardship Plans to Create a Sustainable Conservation Model on Virginia's Northern Neck <i>By Bobbi Burton and Kathleen M. Register</i>	
Fox Haven Organic Farm	229
Restoring and Regenerating the Land for Food Production and Watershed Protection <i>By David G. Burke</i>	
USDA Conservation Programs	237
Improving Water Quality and Wildlife Habitat on Maryland's Eastern Shore <i>By Clay Robinson and David G. Burke</i>	
Using Engineered Wetlands to Enhance Water Quality	243
A Natural Treatment System at the Philip Morris USA Property Along Virginia's James River <i>By Joel E. Dunn and David G. Burke</i>	
Sustainable Infrastructure at Navy and Marine Corps Installations	253
An Effective Approach to Controlling Stormwater Entering the Bay <i>By David Cotnoir and David M. Boone</i>	
Controlling Exotic Invasive Plants in Parks and Natural Areas	263
A Site-Based and Weed-Based Approach in the Anacostia Watershed <i>By Jorge Bogantes Montero and Dr. Marc Imlay</i>	
Effective Techniques for Invasive Plant Control and Wildlife Habitat Restoration	271
Integrated Vegetation Management at Eastern Neck National Wildlife Refuge <i>By Rick Johnstone</i>	



Controlling Exotic Invasive Plants in Parks and Natural Areas

A Site-Based and Weed-Based Approach in the Anacostia Watershed

Volunteers with the Anacostia Watershed Society are driving a strategic attack on exotic invasive plant species that has already made dramatic improvements by removing half the invasive plants on more than 802 acres at 23 sites in the Anacostia River watershed.

CASE STUDY SUMMARY

Exotic invasive plant species are one of the biggest threats to biodiversity and ecosystem function in the Chesapeake Bay watershed. Removal of invasive plant populations in nature reserves and parklands improves habitat quality for native species, protects the natural heritage of the Chesapeake region, and creates a better environment for public recreation. The Anacostia Watershed Society has

developed an innovative method to eradicate and control exotic invasive species in public parks in the Anacostia River watershed.

The Anacostia Watershed Society is a local non-profit organization working on community-based environmental education, ecological restoration, and advocacy programs to protect and restore the Anacostia River watershed. Its mission is to make the river and its tributaries swimmable and

fishable, in keeping with the Clean Water Act, for the health and enjoyment of everyone in the community. In addition to managing the extensive invasive plant control program, the organization's restoration programs also involve reforestation of open lands, restoring wetlands, removing pollution, and stabilizing stream banks in the sub-watersheds.

The Anacostia River flows about 20 miles from its headwaters in Prince George's and Montgomery Counties in Maryland to the Potomac River in Washington, D.C. It is the most densely populated watershed in the region with 1.1 million people and predominantly urban and suburban land use. The wooded parks in the watershed have a particularly serious problem with more than 21 exotic invasive plants, such as kudzu (*Pueraria lobata*), multiflora rose (*Rosa multiflora*) and Japanese honeysuckle (*Lonicera japonica*). In an effort to improve community stewardship of the river and the environmental health of the Anacostia River watershed, The Anacostia Watershed Society has developed an Exotic Invasive Plant Species Control Program (IPSCP).

Multiflora rose, an exotic invasive species.



The IPSCP is a long-term project that engages local residents in a coordinated effort to remove invasive plant species from parks in the watershed. The program was designed in 2005 by Dr. Marc Imlay, a conservation biologist with extensive experience with invasive plant species. The IPSCP uses site-based and weed-based approaches that involve targeted herbicide application, hand removal, hand removal with tools, bagging, and re-vegetation. The site-based approach aims to eradicate all invasive plants from a particular park, whereas the weed-based approach focuses efforts on the most significant exotic invasive plants in a park. Since teaming up with Dr. Imlay, the Anacostia Watershed Society has removed approximately 47 acres of invasive plants and tackled 21 highly invasive species in seven parks throughout the watershed.

RESOURCE MANAGEMENT CHALLENGE

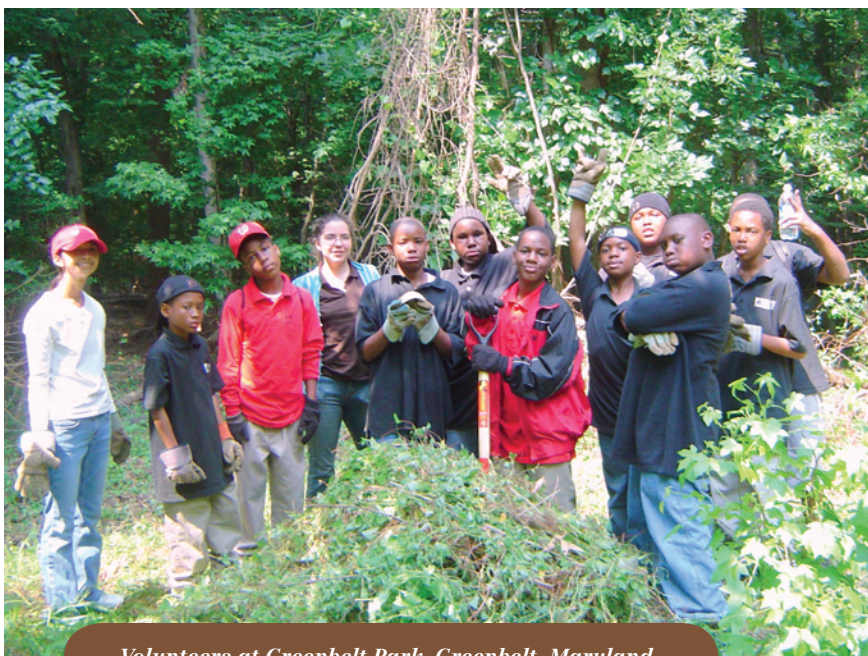
The ecological impacts of biological invasions caused by exotic invasive species are massive. Invasive species can eradicate native flora and fauna and destroy natural habitat, which leads to the degradation of ecosystem functions by disrupting ecological processes. Hundreds of species extinctions can be attributed to the spread of exotic invasive species throughout the world.

Uncontrolled exotic invasive species can also result in substantial costs to the economy by affecting agriculture and landscaping infrastructure. The globalization and increase in international trade and tourism provide unprecedented opportunities for species to be spread accidentally and deliberately.¹ Moreover, ornamental plant nurseries are still selling highly invasive plant species that lead to wide-spread intentional propagation of the destructive plants.



The Mid-Atlantic region of the United States has been subject to a serious biological infestation of more than 200 exotic invasive plant species.² Most of the plants are native to Asia and Europe and were brought to the region either purposefully, for use in horticulture or erosion control, or accidentally through trade or tourism. These plants now successfully reproduce in areas throughout the Chesapeake Bay watershed and often have no natural predators to keep their populations in check. Invasive plants often do well in fragmented habitats with lots of edge, which

allows for light penetration and propagule distribution either by wind or animals. The remaining forests in the Anacostia watershed, which cover approximately 25% of the landscape in a matrix of urban/suburban land use, are irregular, scattered, and often invaded by non-native highly invasive plant species. The fragmented urban forest patches remaining in the Anacostia river watershed have been considerably damaged by invasive plant species populations. The negative impact on the native biota is striking and in need of rapid attention.



Volunteers at Greenbelt Park, Greenbelt, Maryland.

CONSERVATION VISION

Exotic invasive plant species cover many parks and natural areas in the Anacostia River watershed that the conservation movement has been trying to protect from habitat destruction and other anthropogenic disturbances. In 2005, Dr. Marc Imlay proposed that Anacostia Watershed Society lead a stewardship program focused on controlling exotic invasive species in these parks and natural areas. Dr. Imlay has worked in Hawaii and North Carolina on invasive plant species and was pleased to share his experience. He proposed scientifically rigorous methods, which employed a combination of site-based and weed-based control approaches to tackle the invasive plant populations. The Anacostia Watershed Society assembled the program and engaged community members of all ages and backgrounds in its extensive volunteer network in the effort. Through their countless hours of hard work, these volunteers have dramatically reduced exotic invasive plant species populations in the watershed.

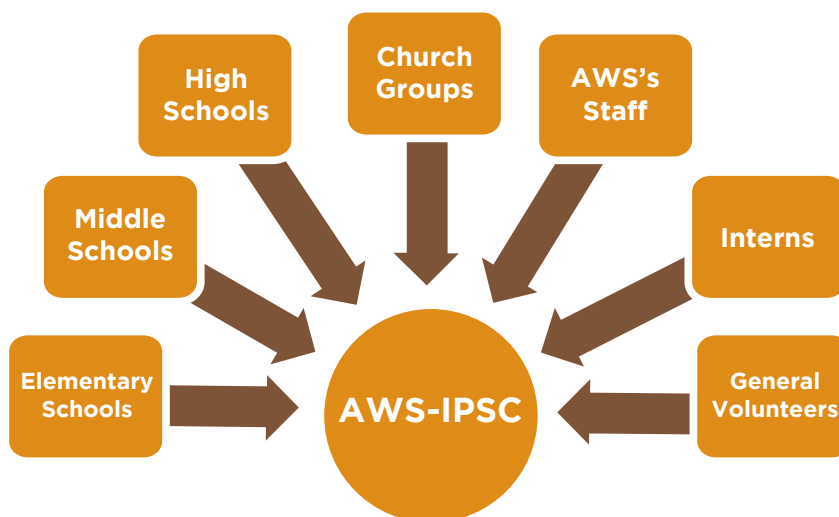
IMPLEMENTATION RESOURCES

The progress made to date on this innovative program has an equivalent cost of approximately \$433,000. Volunteer labor was valued at \$18/hour and AWS staff at \$22/hour. Of this total, approximately \$400,000 represents volunteer contributions and \$33,000 were AWS staff hours. The labor is equivalent to 3,000 work days performed from 2005 to 2008. The program has been financed by grants from eight organizations: the Bancroft Foundation; Morris

and Gwendolyn Cafritz Foundation; Horning Family Fund; Curtis and Edith Munson Foundation; National Fish and Wildlife Foundation; Maryland-National Capital Park and Planning Commission; U.S. Environmental Protection Agency; and the Morningstar Foundation.

The Anacostia Watershed Society has also received important advice for the program from the following experts: Dr. Sara Tangren (Department of Plant Sciences and Landscape Architecture, University of Maryland), Dr. Karen Prestegaard, (geologist, University of Maryland); Del Fanning (soils scientist, University of Maryland), Dr. Michele Dudash (entomologist, University of Maryland), and Mike Donovan (ornithologist). Joe Metzger, a botanist from the Maryland Native Plant Society, has also helped to identify plant species throughout the watershed.

The many hours of volunteer service are crucial to the program's success. As part of the Anacostia Watershed Society's environmental education program, students from elementary, middle, and high schools have been a major component of the volunteer workforce. This provides the students with both classroom and hands-on field experience, adding depth to their educational experience and strength-





Before and after the removal of kudzu from a sapling in a reforested area along the Northwest Branch of the Anacostia River Hyattsville, Maryland.

ening the invasive species control program. In addition, volunteers from church groups and concerned citizens have donated substantial amounts of their time.

CONSERVATION STRATEGY

The IPSCP controls invasive plants through a combination of site-based and weed-based strategies. The site-based strategy focuses on the removal of all exotics from a given site for the purpose of protecting keystone biotic resources (threatened species populations, fragile habitats, etc.) from the harmful impacts of exotic invasive species. The weed-based strategy directs limited resources to the worst invasive species, such as lesser celandine (*Ranunculus ficaria*) or English ivy (*Hedera helix*). With both methods, the Anacostia Watershed Society uses

an iterative or adaptive management process—a “learn by doing” approach that results in better ways to implement the program at different sites and with different focal species. An important component of the program has been the incorporation of an early detection/rapid response approach. Early detection/rapid response includes surveillance, identification, risk assessment, and quick response to new invasions of exotic plant species.³ The discovery of the rapidly expanding wavyleaf basketgrass (*Oplismenus hirtellus ssp. undulatifolius*) in 2005 at Little Paint Branch Park in Beltsville, Maryland, was an example of early detection/rapid response for the protection of natural protected areas. The plants were quickly controlled in the park, protecting native species and existing habitat.

Removal Methods and Research

Hand removal: Hand removal is the preferred method because it is harmless to the environment and draws public attention towards the problem of invasive exotic species. Hand removal is also simple for people of most ages to perform and can be effective for most invasive species. Nevertheless, this technique requires substantial volunteer effort and can be difficult when dealing with spiny species like wineberry (*Rubus phoenicolasius*) or multiflora rose (*Rosa multiflora*). Plants must be removed with the entire root system because some of the species may have the ability to sprout from underground stems and root fragments. It is critical to use this method before the fruits and seeds have matured and dispersed. Hand-removed biomass of species such as English ivy (*Hedera*



The removal of invasive exotic plants at Cherry Hill Park, College Park, Maryland.

helix) or multiflora rose (*Rosa multiflora*) is usually left in one on-site pile to decompose.

Hand removal with tools: This method has been used to pull out stout shrubs like bush honeysuckle (*Lonicera x spp.*), trailing plants like periwinkle (*Vinca minor*), or plants that have subterranean stems, such as lesser celandine (*Ranunculus ficaria*). The entire root system of the plant can be pulled out using a four-pronged spading fork when the soil is wet. The uprooted invasive species can then be piled up and left on site.

Bagging: For plant species that have the ability to sprout easily, the hand-pulled plants are bagged, removed from the site, and dumped. Contractor bags are preferred due to their toughness and resistance to tearing. The fruits of some species like porcelainberry (*Ampelopsis brevipedunculata*) are also bagged and properly disposed.

Targeted herbicide application: The Anacostia Watershed Society uses carefully targeted, federally approved, biodegradable herbicides, such as glyphosate, in natural areas. Glyphosate

is an agrochemical that usually bonds to soil particles, which prevents excessive leaching and uptake by non-target plants. Instead of spraying the foliage of invasive woody plants such as tree of heaven, Norway maple, and Chinese privet, which is normally impractical, a concentrated herbicide solution is injected into the tree either

by basal bark, hack and squirt, or cut stump. The use of herbicides as a component of exotic invasive species control has been essential in the improvement of these efforts through greater efficiency and, therefore, impact. Expanded use of herbicide is sometimes necessary when large numbers of volunteers are not available. The application of herbicides is only carried out by trained, adult personnel.

Biological Control: This method involves the use of living organisms, such as predators, parasitoids, and pathogens, to control invasive exotic species. The biological control agent is typically identified in the exotic species' native location as influential in reducing its unchecked growth. It is then thoroughly studied for any potential damage its introduction may pose. If it is found to be harmless, it is released in the problem areas. The Anacostia Watershed Society just started using weevils (a species of beetle) to control rapidly expanding populations of mile-a-minute (*Polygo-*



Volunteers remove weeds at Northwest Branch of the Anacostia River, College Park, MD.



Targeted Invasive Plant Species in the Anacostia River Watershed		
Species	Methods	Time of the Year
Beefsteak plant (<i>Perilla frutescens</i>)	HR/H	Summer
Bush honeysuckle (<i>Lonicera x spp.</i>)	HR/TR/H	Year-round
Chinese privet (<i>Ligustrum sinense</i>)	H/TR	Winter
Common periwinkle (<i>Vinca minor</i>)	TR/H	Winter/Year-round
English ivy (<i>Hedera helix</i>)	HR/TR/H	Winter/Year-round
Garlic mustard (<i>Alliaria petiolata</i>)	HD/H	Spring
Gill-over-the-ground (<i>Glechoma hederacea</i>)	HR/H	Winter
Japanese barberry (<i>Berberis thunbergii</i>)	TR	Year-round
Japanese honeysuckle (<i>Lonicera japonica</i>)	HR/H	Late Spring/Summer
Japanese knotweed (<i>Polygonum cuspidatum</i>)	H/TR	Year-round
Japanese stilt grass (<i>Microstegium vimineum</i>)	HR/H	Late Spring/Summer
Kudzu (<i>Pueraria lobata</i>)	H	Spring/Summer
Lesser celandine (<i>Ranunculus ficaria</i>)	TR/H	Late Winter
Mile-a-minute (<i>Polygonum perfoliatum</i>)	HR/H/Bio	Spring/Summer
Multiflora rose (<i>Rosa multiflora</i>)	TR/H	Year-round
Porcelain-berry (<i>Ampelopsis brevipedunculata</i>)	H	Spring/Summer
Purple deadnettle (<i>Lamium purpureum</i>)	HR	Spring/Summer
Purple loosestrife (<i>Lythrum salicaria</i>)	Bio	Spring/Summer
Tree-of-heaven (<i>Ailanthus altissima</i>)	HR/H	Year-round
Wavyleaf basketgrass (<i>Oplismenus hirtellus ssp. undulatifolius</i>)	HR/H	Spring/Summer
Wineberry (<i>Rubus phoenicolasius</i>)	TR	Year-round

HR: hand-removal; TR: hand-tool removal (with spading fork); H: herbicide application, Bio: biological control.

num perfoliatum) and will soon release shipments of another beetle species to control purple loosestrife (*Lythrum salicaria*) populations. The weevils (*Rhinoncomimus latipes*) were applied at a mile-a-minute patch in the Northwest Branch of the Anacostia River, contiguous to Magruder Park in the city of Hyattsville, Maryland.

Re-vegetation: Planting native trees, shrubs, and herbs is an integral method of erosion control after invasive plant removal. It is also one of the most commonly used habitat restoration methods in this program. The Anacostia Watershed Society works with nurseries to ensure that all the seedlings are native species of local provenance.

Target Invasive Species

Even though plant removal efforts

target any exotic invasive species, the Anacostia Watershed Society has focused on the most prevalent and highly invasive species in the watershed.

RESULTS

As of April 2009, the Anacostia Watershed Society removed at least 21 invasive plant species from a total area of approximately 47.2 acres. These figures are estimates because acreage was not recorded for all species removed. The invasive plant removal was performed at 23 sites, the majority of which were public recreational parks in Maryland. Removal efforts help control the dispersion of harmful species that would otherwise affect sensitive and remnant urban natural areas if left unmanaged. This is particularly true for the control of

species that are in their first stages of infestation either at a very local level or at the larger landscape level.

The use of site-based and weed-based approaches, combined with adaptive management, has been vital in addressing the abundant plant invasions throughout the watershed with limited resources. Additionally, the early detection/rapid response approach promptly controlled the outbreak of wavyleaf basket grass before it became widespread and out of control.

A site near the 38th Street Bridge, on the Northwest Branch of the Anacostia River near Hyattsville, has especially benefited from this program. As a consequence of levee construction in the 1950's, much of its natural channel morphology was



Volunteers plant native herbaceous plants in an experimental plot along the Northwest Branch of the Anacostia River in Hyattsville, Maryland.

Acreage of Invasive Plants Removed (2005-2009)

Species	Area of Plants Removed (Acres)
Beefsteak plant (<i>Perilla frutescens</i>)	0.145
Bush honeysuckle (<i>Lonicera x spp.</i>)	6.02
Chinese privet (<i>Ligustrum sinense</i>)	1
Common periwinkle (<i>Vinca minor</i>)	0.8475
English ivy (<i>Hedera helix</i>)	4.73
Garlic mustard (<i>Alliaria petiolata</i>)	3
Gill-over-the-ground (<i>Glechoma hederacea</i>)	0.1
Japanese barberry (<i>Berberis thunbergii</i>)	0.22
Japanese honeysuckle (<i>Lonicera japonica</i>)	6.11
Japanese knotweed (<i>Polygonum cuspidatum</i>)	0.09
Japanese stilt grass (<i>Microstegium vimineum</i>)	9
Kudzu (<i>Pueraria lobata</i>)	0.5
Lesser celandine (<i>Ranunculus ficaria</i>)	0.6
Mile-a-minute (<i>Polygonum perfoliatum</i>)	1.49
Multiflora rose (<i>Rosa multiflora</i>)	6.09
Porcelain-berry (<i>Ampelopsis brevipedunculata</i>)	0.2
Purple deadnettle (<i>Lamium purpureum</i>)	0.09
Tree-of-heaven (<i>Ailanthus altissima</i>)	3.5
Wavyleaf basketgrass (<i>Oplismenus hirtellus ssp. undulatifolius</i>)	3
Wineberry (<i>Rubus phoenicolasius</i>)	0.4638
Total: 47.20	

replaced with large, angular blocks of gray granite (rip-rap). The Anacostia Watershed Society conducted an experimental native re-vegetation project on the rip-rap slope at the river bank in order to demonstrate an alternative to the county's annual mowing-and-spraying of herbicide, and to also restore a native open-land ecosystem that is disappearing rapidly in Maryland.

In 2007, more than 9,080 individual plants of 27 locally native species were planted at the Hyattsville site. Preliminary results and observations show that the plot cultivated with native herbaceous species along the rip-rap slopes of the river support more plant species diversity (80 plant species) and wildlife than those that are subject to the mowing-and-spraying method (43 plant species found at the end of the survey). These native plantings provide the added benefit of improving the park landscape and providing a continuum of open-land habitat for wildlife along the riverbanks.



KEYS TO SUCCESS

- **Involve the public** and engage enthusiastic volunteers, such as school groups, church groups, and interns.
- **Link invasive plant species control with public environmental education** to increase awareness of the problem.
- **Use an adaptive management approach** and be flexible with the proposed control methods.
- **Use the early detection/rapid response approach** to avoid further serious invasive plant invasions that threaten to become costly.
- **Support your actions with scientific criteria**, even if the project is an on-the-ground stewardship effort.
- **Secure stable and long-term financial resources** because invasive plant species control is a long-term conservation project.

PHOTOS AND FIGURES

All photos and figures by the Anacostia Watershed Society except page 264, Burke Environmental Associates/The Conservation Fund

REFERENCES

- ¹International Union for Conservation of Nature. 2000. *IUCN Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species*. Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity, Nairobi, Kenya, 15-26 May, 2000. 21 pp. Available online at: <http://www.cites.org/eng/com/AC/16/Inf16-10.pdf>.
- ²Swearingen, J., K. Reshetiloff, B. Sattery and S. Zwicker. 2002. *Plant Invaders of Mid-Atlantic Natural Areas*. Report by the National Park Service, and U.S. Fish and Wildlife Service. Washington, D.C. 82 pp. Available online at: <http://www.nps.gov/plants/alien/pubs/midatlantic/>.

³National Invasive Species Council. 2003. *General Guidelines for the Establishment and Evaluation of Invasive Species Early Detection and Rapid Response Systems*. U.S. Department of Interior, Washington, D.C. 18 pp. Available online at: http://invasivespecies.nbii.gov/documents/inv_NISCEDRRGuidelineCommunication.pdf.



FOR MORE INFORMATION

Project Contact:

Anacostia Watershed Society
Phone: (301) 699-6204 | www.anacostiaws.org



ANACOSTIA
WATERSHED
SOCIETY