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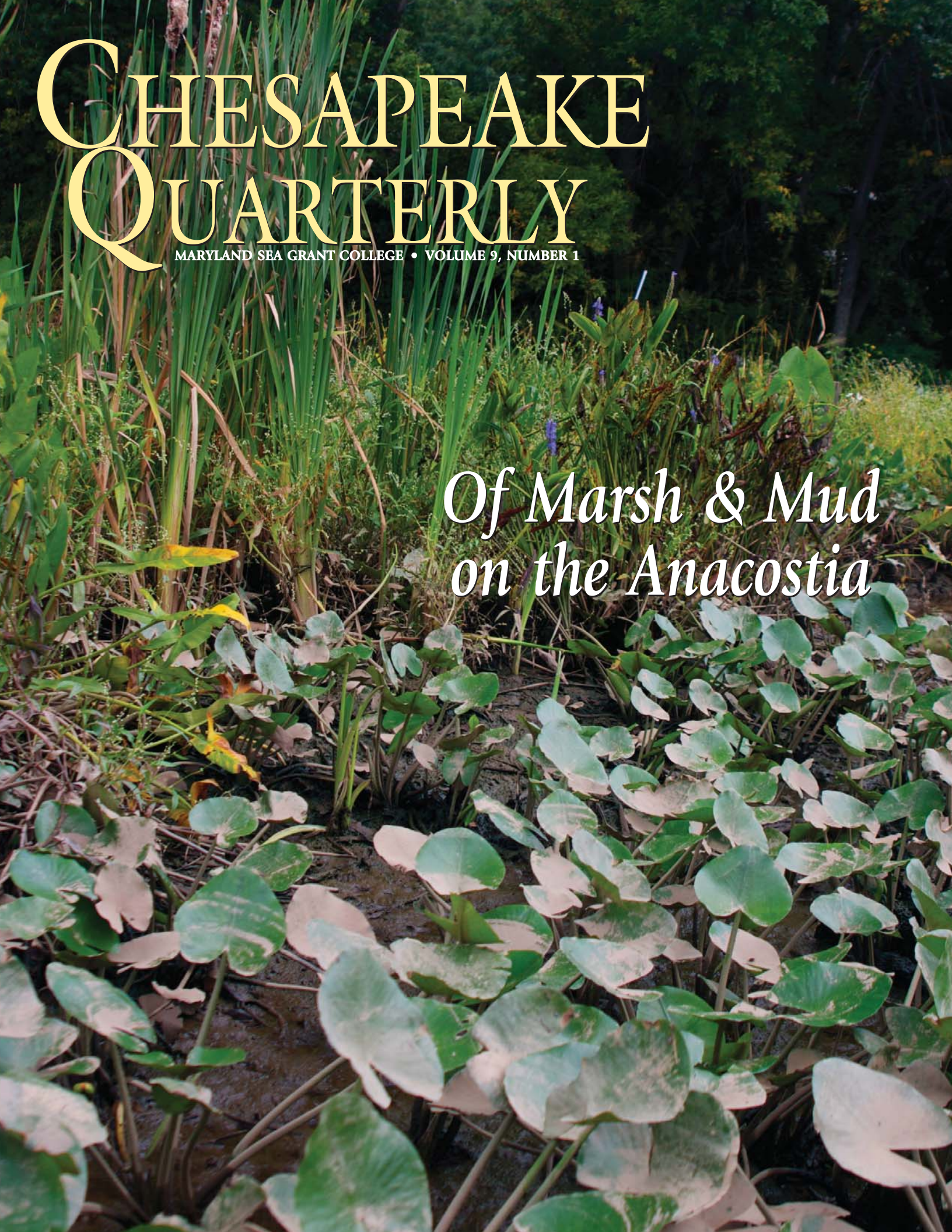

Of Marsh & Mud on the Anacostia

contents

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Chesapeake Quarterly explores scientific, environmental, and cultural issues relevant to the Chesapeake Bay and its watershed.

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Cover photo: *Marsh and mudflat intermingle at Kingman Marsh on the Anacostia River. Heart-shaped spadderdock (foreground) thrives, one of the few species not palatable to hungry resident geese.* ***Opposite page:*** *Restored marshes near Kingman and Heritage Islands sit in the shadow of RFK stadium in Northeast D.C. The marshes help return ecological functions to the urban Anacostia once provided by historic freshwater wetlands.* PHOTOGRAPHS BY ERICA GOLDMAN.

An Urban

Last year, a child tipped the scales of history. Since that birth, the world's population has shifted. More people now live in urban areas than in rural ones.

This waypoint is largely symbolic. We've been an urban species for quite some time. In China, over 600 million people live in cities. Shanghai alone is home to nearly 16 million. In New York City, the largest and most densely populated city in the United States, more than 8 million people live packed in a mere 305 square miles.

On the way to becoming the urban species that we are today, we've transformed our natural landscapes — sometimes beyond recognition. A patch of grass. A stand of trees. A degraded urban creek or river. In some places, these are the only reminders of the wilderness that came before.

In Washington, D.C., within sight of the U.S. Capitol, the Anacostia River has fallen victim to bygone agriculture and more recent urbanization. Much of the river has silted in. Left to accumulate the District's trash and sewage, it became a conduit for cholera, typhoid, and malaria. Its pristine marshes disappeared, replaced by expansive, polluted mudflats. Its story is a complex saga of changing land use and environmental decay, with strong subtexts of race and politics.

The wilderness that the Anacostia once embodied is long gone. Dense

Equilibrium?

stands of wild rice, full of birds. Waters thick with fish. This ecological state of the river is relegated to historical accounts. But a growing push toward restoration aims to put some of that wildness back in the form of rebuilt marshes and parklands. And with less trash. These efforts hope to turn the clock back toward a greener, cleaner time.

Could a restored Anacostia River ever resemble the historic one? Or have the insults of urbanization changed the rules of the game too much? Sewage and stormwater. Invasive plant species. City-dwelling geese with an insatiable hunger for fresh vegetation. Are these realities of the urban realm compatible with a healthy natural system?

Probably. Given the opportunity, ecological systems tend to impress us with their resilience. We can provide a little nudge. Remove a few obstacles. Even the harshest, most degraded lands and water often prove able to support diverse plants and animals.

But what we expect from an engineered restoration effort might not be what we get. We can plant seeds, only to find that hardier invasive species muscle them out. We can tend young shoots, only to find them devoured by uninvited guests, non-native species that thrive in urban areas.

For the Anacostia River a restored ecosystem may reflect a new equilibrium, a new balance between the urban and the wild that can coexist in a city like Washington, D.C. We can have a vision for what we want that future to look like. We can set the course in motion — tend its progress, shape, steer. But what will happen when the time comes to let go?

— Erica Goldman

Shaking mud from her hands, *U.S. Geological Survey botanist Cairn Krafft makes her way toward experimental plots designed to examine the grazing impact of Canada geese on marsh vegetation.*

Marsh in the City
Bringing Historic Wetlands Back to the Nation's Capital

Story & photographs by Erica Goldman

Wearing army green hip waders, Cairn Krafft clomps across the manicured fairway grass of the Langston Golf Course. She moves through the first-cut rough, then the uncut rough, then steps off the course completely — where she sinks deep into the mud. She lunges forward, shifting her body weight to her left quadricep so she can extract her right leg. Thuuwwuucck. The mud closes noisily around the hole left by her foot. She lunges forward again, sinking in past her knee. Momentum is the key to not getting stuck.

American lotus plants *droop in Anacostia mud at low tide. Volunteers worked hard to transplant the lotus to Kingman Marsh, burying each tuber by hand a foot beneath the mud. The lotus, with its signature yellow flowers, once flourished in the Anacostia's historic marshes.*

With the practiced walk of someone who's moved through mudflats many times before, she surges steadily forward through the thick, gray ooze of Kingman Marsh, an expanse of freshwater tidal wetland in the center of Washington, D.C. She's not looking for golf balls.

It's an unlikely place for a freshwater marsh. And to the golfers playing a hole at the adjacent course, Krafft, with her windblown, curly hair and oversized waders, must seem an unlikely sight. Metro's orange line roars across a bridge nearby. Just beyond lie some of Northeast D.C.'s most troubled urban neighborhoods. But since 2000, efforts to restore historic marshland to the Anacostia River have transformed these waters that run beneath the overpass on Benning Road.

Krafft shifts forward through the mud, which sucks at her waders with each step. Through dark sunglasses over her prescription lenses, she sees the nearshore vegetation thin out, giving way to a span of exposed mud. Thin patches of green plants punctuate the barren expanse — low-standing spadderdock and arrow arum, with their wide, heart-shaped leaves. She makes her way carefully toward a fenced area, part of an experimental study she leads along with biologist Mikaila Milton of the National Park Service and other scientists from the U.S. Geological Survey.

Inside the fence, lush marsh vegetation grows some eight feet in the air. Krafft, a USGS botanist at the Patuxent Wildlife Research Center in Laurel, Maryland, picks out native cattails, wild rice, and burr marigolds.

Nearly all the Anacostia River once looked like this. Historical accounts describe extensive marshes, dense with wild rice, cattails, and reeds, lining a deep-water channel. The marshes were home to muskrat, beaver, and turtles. They were rich in bird life, with abundant kingfishers, herons, and Sora rails. Their waters teemed with shad, pike, perch, bass, and herring. Fishermen plucked giant sturgeon from the depths. (See Making Mud of the Ancient Anacostia, p. 8.)

Crouching down, Krafft heaves at a heavy log propped against the fencing. She levers it upwards with the weight of her body and casts it to one side, her bare hands now covered in mud. The eight-inch opening at the base must remain clear for fish, turtles, and other small animals to enter the area. Only Canada geese should be excluded. A fallen log or

any other obstacle would introduce a confounding factor to the study.

Just outside the fenced plot, two PVC pipes mark the dimensions of an identical unfenced parcel. Here no plants grow, save a single gnawed-off shoot. Dimpled by puddles trapped by a receding tide, the unfenced area is barren — a flat expanse of mud.

Feeding Frenzy

The goal was to bring back some of the ecological power of Anacostia's historic wetlands. Create habitat for wildlife. Filter water. Give urban D.C. a glimpse of what a freshwater marsh can offer. That's why the U.S. Army Corps of Engineers, the D.C. government, and the National Park Service set out to restore 33 acres of wetlands in Kingman Lake, an area once dominated by prolific marshes. Building on earlier restoration work at Kenilworth Marsh upstream, the Army Corps in 2000 worked to elevate the planned marsh to a height suitable for the right plant species. They filled the mudflats with 179,400 cubic yards of dredged material removed from the Anacostia's Federal Navigation Channel. Then they planted. And planted. Almost 700,000 plants representing 7 different species. In total, this effort cost more than $6 million.

Nearly none of these plants now remain. The resident Canada goose population has eaten almost everything that's not fenced in. Krafft is not surprised. She's been watching the geese feast on plants in Kingman Marsh for almost ten years. As the workers began planting in 2000, geese followed on their heels. Soon the birds had devoured nearly 50 percent of the new marsh or between 300,000 and 400,000 young plants. The geese, over 600 at last count, would have consumed every last shoot had a contractor working for the Army Corps not rapidly erected fencing to protect new vegetation.

The Canada geese in question are a non-native subspecies imported from the Midwest. The hunting community intentionally introduced the geese to the area on two separate occasions, first in the early 1900s and again in the 1960s. The first introduction was to serve as a "live decoy," to lure the high-flyers closer to the ground, according to Steve McKindley-Ward from the Anacostia Watershed Society.

Hunters brought the introduced subspecies of Canada geese near extinction in subsequent years, both in the Chesapeake region and around the coun-

Lush grass on the Langston Golf Course *lures Canada geese to Kingman Marsh, which borders greens and fairways (top). Leaving their telltale footprints in mud (above), the geese have consumed nearly all of the marsh plants not protected in fenced plots (left).*

try. In the 1960s, perhaps to right past wrongs, hunters reintroduced this subspecies to the area from a small remaining flock in Minnesota. Due to genetic differences from native Canada geese (so-called "Carolina high-flyers"), the imported geese don't have a strong urge to migrate. No longer hunted extensively, the imported geese stayed and reproduced, becoming a burgeoning resident population. Each year, this resident subspecies remains in the D.C. area during the plant growing season, feeding on marsh vegetation, when the migratory birds have already flown north to breed.

By 2001 the National Park Service was confident that the replanted Kingman Marsh had firmly established itself — and it removed the fencing around the new plantings. The action turned out to be premature. The geese came back in large numbers and feasted on the young shoots, effectively eliminating much of the new planting from the year before.

Fences quickly went back up, built by various groups, and plants began to grow again inside these enclosed areas. Now the National Park Service cannot take down the fences, not until they come up with a plan for controlling the resident Canada goose population. If the fences come down too soon, the geese may graze years of restoration work right back to mudflat.

Hard Evidence

Krafft maneuvers across an open expanse of mudflat. It's slow going. Lunge. Stabilize. Extract back foot. Lunge again. In spots the mud is knee-deep.

She's striking out toward another set of fenced plots across the marsh. There she'll repeat her surveillance of the fence perimeter. This surveillance is part of the monitoring protocol for a large-scale goose herbivory (grazing) study at Kingman Marsh. Krafft is the lead biologist for the study, whose goal is to quantify the impacts of grazing by Canada geese on the vegetation in Kingman Marsh. Working with her on the surveillance is Peter Hill, who works with the Watershed Protection Division of the District Department of the Environment (DDOE). Krafft and Hill are checking each plot to make sure that the eight-inch gap at the bottom is free of trash or woody debris.

Few doubt that the geese are responsible for denuding Kingman Marsh of vegetation. But without hard numbers, collected in a rigorous way, the evidence remains anecdotal. It will take the weight of scientific data collected in this study to push through the public process needed to develop a Goose Management Plan.

The goose plan would be part of an Environmental Impact Statement (EIS) that the National Park Service (NPS) has been working on since 2007, explains Stephen Syphax, who heads the NPS local Resource Management Division. The study is part of the assessment looking at a whole suite of possible impacts on marsh vegetation — including invasive species and other grazers like turtles and fish. The paired site design, with fences designed to exclude geese specifically, are necessary to prove that geese are the culprits, explains Syphax.

Several measures for controlling geese have already been tried over the past four years, under the direction of a multi-agency Resident Goose Management Committee, a body composed of the D.C. government, U.S. Army Corps of Engineers, National Park Service, Anacostia Watershed Society, and USGS's Patuxent Wildlife Research Center. All along the tidal river corridor, from Bladensburg to Poplar Point, workers have coated eggs of resident geese with corn oil, a technique that destroys an egg by preventing gas exchange through the shell.

While this method has drastically reduced the number of geese being added to the Anacostia flock through reproduction, it can't reduce the existing population enough to relieve overgrazing pressure on Kingman Marsh. Urban geese, it turns out, live longer than their migratory

Continued on p. 11

Side-by-side fenced and unfenced plots *(the two PVC poles at left mark the unfenced plot), help scientists quantify the grazing impact of Canada geese on Kingman Marsh.*

Making Mud of the

Extensive mudflats in the Anacostia River were pretty rare hundreds of years ago. Some tidal flats probably fringed the dense stands of vegetation, providing important habitat for certain shore birds and invertebrates. But based on historical maps and archival accounts, they were few and far between.

The Anacostia River was quite deep, some 40 feet in the channel, according to historian John Wennersten's book, *Anacostia: The Death and Life of an American River*. It was navigable for ocean-going vessels all the way up to the port of Bladensburg in Maryland. Highway for communication and commerce, the river drove economic growth in the region beginning in the late 17th century — at a time when tobacco was king.

Tobacco, a fast-growing cash crop, thrived in the temperate climate and rich soil of the Chesapeake. Maryland was a big tobacco producer, and Prince George's County had more tobacco farms than any other county in the state. Farmers grew tobacco all along the shores of the Anacostia, and the port at Bladensburg shuttled it out to the Chesapeake Bay and the Atlantic Ocean beyond.

But with tobacco came the mass felling of the region's forests to clear land for farms and plantations. One plantation, the famed Montpelier in Prince George's County, claimed some 9,000 acres, likely once forestland, for fields, tobacco barns, stables, slave quarters, and one of the county's grandest mansions.

Cleared forests, construction debris, and weakened topsoil from continuous planting near the headwaters caused massive downstream silting of the Anacostia River. By 1762, just 20 years after the port at Bladensburg was first established, the docks were so heavily silted that the town held a lottery for "removing the shoals." By 1850 the port of Bladensburg was shut down. It had silted in completely, rendering it useless for any sort of shipping.

Meanwhile industry along the Anacostia continued to expand. The Navy Yard, along with housing and businesses, sprung up to support a growing population. Soon the Anacostia also became a dumping ground for sanitary sewage,

an outcome dictated by complex racial politics in the District at the time.

By the end of the Civil War in 1865, outbreaks of cholera, smallpox, typhoid, and malaria had claimed thousands of lives, mostly African American. From an ecological standpoint, the combined impacts of siltation and development had basically turned much of the Anacostia to mud.

Though mudflats were becoming pervasive throughout the river system, the Kingman Marsh area remained relatively intact until the early 20th century. During this period, the U.S. Army Corps of Engineers began a large-scale dredging effort to reopen the historic shipping channel, in the process destroying most of the scant marshland that remained.

In 1916, the Corps deposited dredge spoils from the lower Anacostia on 160 acres of existing marshland to form Kingman Island (see A New Beginning for Kingman Island, p. 10). Between 1920 and the late 1940s, the Corps dredged the marshes surrounding Kingman Island to remove still more silt from the river and to control recurrent outbreaks of malaria. This dredging created Kingman Lake, which was intended as an outlet for recreational boating. But the lake began silting in immediately, filling with decades of deposited sediment from erosion in the water-

Anacostia River Chronology

1634 Maryland Colony founded

1742 Bladensburg chartered as a shipping port for tobacco

1800 Agriculture shifts from tobacco to grain

1850 Potomac River becomes D.C.'s principal water supply

Port of Bladensburg silted in and useless

1861-1865 Civil War; epidemics of smallpox, typhoid, and malaria; government investigates sanitary sewerage

1871-1873 The Anacostia is viewed by local government as a sewage conduit

1890-1898 Col. Peter C. Haines plans to reclaim Anacostia mudflats

1902 Army Corps of Engineers dredges parts of the Anacostia

1916 Kingman Island created

1918 Washington Suburban Sanitary Commission organized to investigate typhoid epidemic and ensure pure water for Montgomery and Prince George's counties, MD

1930s Evolution of land use in the watershed from agriculture to urbanization

1932 Bacterial contamination closes a large portion of the Anacostia

Ancient Anacostia

Hunters pole through wild rice *in this 19th century image (opposite page), searching for Sora rails, birds once abundant in Anacostia's marshes. The U.S. Army Corps of Engineers planned to remake the Anacostia River, as shown in a map from 1913 (above). The old channel (dotted lines) would disappear into a new lake, and in places the Corps would even fill the natural channel with dredged spoil. There would be a new, higher shoreline, and new islands, including Kingman Island (shown above as two islands on either side of Benning Road; the two eventually became one large island). A lock and dam system (never built) would control the lake level. In the end the river was neither natural nor controlled, and mud prevailed.* ENGRAVING ON P. 8 BY E. COUES AND D.W. PRENTISS, 1883; MAPS ABOVE, 1913, AND BELOW, 1891, BY THE U.S. ARMY CORPS OF ENGINEERS; CHRONOLOGY ADAPTED FROM ANACOSTIA: DEATH AND LIFE OF AN AMERICAN RIVER BY JOHN WENNERSTEN.

shed. Vast intertidal mudflats formed in the Kingman area, soon dominating the landscape at low tide.

By the late 1980s, the Anacostia River as a whole had lost 98 percent of its tidal wetlands and 75 percent of its freshwater wetlands, according to reports from the Anacostia Watershed Restoration Committee, part of the Washington Council of Governments. Sewage and toxic contamination were widespread, and the D.C. Council prohibited water contact sports like swimming, fishing, and boating.

Not until conditions had deteriorated to this point did efforts begin to rescue this "ruined river." The establishment of the Anacostia Watershed Society in 1987 and the leadership of its director, Robert Boone, former stream coordinator for the Interstate Commission on the Potomac River Basin, mounted the charge for restoration.

Dick Hammerschlag, who spent nearly his whole career working on the Anacostia as a biologist for the U.S. Geological Survey, remembers participating in planning charrettes in the 1980s with the Washington Council of Governments. A "germ of interest," he says, was stirring. The goal: remove mudflats and restore some of the ecological function of the Anacostia's historic wetlands.

— *E.G.*

Read more about Wennersten's book at: www.mdsg.umd.edu/cq/v08n1/side6/

1938 Wastewater treatment plant at Blue Plains opens

1948 Water Pollution Control Act of 1948 provides the first federal funds for state water control programs

1965 President Lyndon B. Johnson calls the Potomac "a national disgrace"

1971 D.C. Council prohibits water contact sports in the Potomac, Rock Creek, and the Anacostia

1972 Anacostia experiences major fish kills; Federal Clean Water Act passes

1980 50 percent of the Anacostia watershed is urbanized; population reaches 569,000

1987 98 percent of the tidal wetlands and 75 percent of the basin's freshwater wetlands lost or destroyed by this date

1988-1995 260 spills of hazardous substances totaling nearly 60,000 gallons in the Anacostia

2003 Anacostia Watershed Initiative of 2003, federal law

2005 Trash-Free Potomac Treaty

2008 Kingman Island opens to public

2010 D.C. Bag Bill law goes into effect

A New Beginning for Kingman Island

Erica Goldman

D.C. Office of Planning

Bridge to the future, *a wooden walkway leads visitors to a small network of trails on Kingman Island (above). The area reopened for education and recreation in 2008. When restoration is complete, Kingman Island will host an environmental education center, a playground, and a picnic area. A memorial tree grove will honor the D.C. schoolchildren who fell victim to the September 11th attack (see proposed master plan at right).*

Construction on Benning Road has brought traffic down to one lane, making chaos of the congested morning commute. But a quick left turn onto Oklahoma Avenue followed by another left into the RFK Stadium parking lot brings a sudden quiet. A lone car at the far end of the parking lot is the only sign of human activity this gray morning.

Light rain slicks the asphalt of the empty parking lot and the Orange Line metro train roars overhead. But behind parking lot 6, black wrought iron gates stand open, welcoming visitors out of gritty Northeast D.C. and into an unspoiled wilderness area.

The car belongs to Matt English. He's just finished opening the access gate to Kingman Island and Heritage Island, which together cover 45 acres in the Anacostia River. A wooden pedestrian bridge leads visitors to a lookout over Kingman Lake, a platform large enough for school groups to assemble for educational programs or to dangle fishing rods into the Anacostia River below.

The bridge and platform overlook the patches of restored marsh of Heritage Island and Kingman Lake that have managed to thrive in spite of hungry geese (see Marsh in the City, p. 5). Stands of wild rice in full flower, planted by the Anacostia Watershed Society, sway in the wind-swept rain. Wild rice was habitat for the famed Sora rails, birds once common in this region and now all but extinct.

English crosses a second bridge over Kingman Lake, pulling up the hood of his jacket as the rain begins to fall harder. He tucks his logbook into his jacket to keep it dry as he heads down the main entrance trail to Kingman Island. Every morning, ever since the island opened to the public in May 2008, English has opened the gates and checked the condition of the trails, making sure that they're clear of debris and free of trash. English is the Kingman Island Coordinator for Living Classrooms, a non-profit that provides environmental programming for school groups and the public. He's in charge of helping the public discover Kingman Island and use it for recreation and exploration.

Kingman Island has a storied background. When it was created in 1916 from sediment dredged from the Anacostia River by the Army Corps of Engineers, its whole 95 acres initially fell under the jurisdiction of the National Park Service. For the first few decades, Kingman Island remained untouched wilderness. In 1939, the National Park Service opened the Langston Golf Course in the northern half of the island. The course was built as a segregated golf facility, named for John Mercer Langston, the dean and founder of Howard University's Law Department and the first black congressman elected from Virginia. It is still a favorite course for African American golfers.

The fate of the southern half of Kingman Island became the subject of decades of wrangling. The 1940s saw plans to build a private airstrip. During World War II people grew "Victory Gardens" there. In the 1970s, there was a proposal for a children's recreation center. In the 1980s, an Indian philanthropist who was also an Italian countess sought to build an amusement park on the island. In 1996, the National Park Service transferred the ownership of the southern half of the island to the District of Columbia, who negotiated a 99-year lease with private developers to construct a $150 million theme park on the island.

Concern over the "environmentally appropriate" nature of such a project and its impact on local real estate values sparked intense community opposition from the neighborhoods of Kingman Park and River Terrace. Under considerable pressure from the D.C. Council member from Ward 6, the District's financial control board ultimately rejected the proposal in 1999.

Amidst the controversy, the island was closed to the public — at least officially. Unofficially, it became a dumping ground for leaves by the city and for bricks, pipes, and tree stumps by others. Homeless people camped out there. Rumors circulated that arson destroyed the old pedestrian access bridge.

The Anacostia Waterfront Revitalization Plan proved the push needed to redirect Kingman Island toward environmental restoration and public access. This effort began 10 years ago when the District executed a Memorandum of Understanding for the Anacostia Waterfront with over 20 District, federal and state agencies. Since then, Kingman Island and Heritage Island have become District-funded restoration projects, led by the D.C. Office of the Deputy Mayor for Planning and Economic Development. Beginning in 2000, groups like the nonprofit Earth Conservation Corps (see Taking Out the Trash, p. 14) have removed trash from the island and built a bridge for visitor access. In parallel, the National Park Service and the Army Corps of Engineers have worked to rebuild the wetlands surrounding the island.

Since the islands reopened in 2008, Living Classrooms has been hosting environmental education programs for school children and leading public tours. The District's restoration plans will eventually include a new Environmental Education Center, designed to achieve the highest level of green building certification,

Erica Goldman

Through the gate each morning *at 9:00 am, Matt English opens up Kingman Island and walks the trails to check for debris. English works for Living Classrooms, a Baltimore-Washington nonprofit educational group that focuses on hands-on learning.*

and a memorial tree grove dedicated to D.C.'s schoolchildren who were victims of the September 11 terrorist attack.

The tree canopy provides some shelter from the rain as Matt English turns down a narrower trail leading toward the southern end of Kingman Island. This trail passes under busy East Capitol Street, a covered area sporting some graffiti, that has proved difficult to keep free of trash.

English works to engage the community in volunteer trash cleanups. The D.C. neighborhoods of Rosedale and Kingman Park in particular have shown a lot of interest. Walking the trails each day, he's met people who used to come out to the island in their youth but who haven't been out in years. Slowly he's getting the word out that Kingman Island has once again become a resource for all to enjoy.

At the end of the trail, English takes a pencil out of his pocket and notes some downed branches in his logbook. It's not a high priority area because it's at the far end of the island and few visitors make it to this point. Still it will go on the list of problems to be attended to.

He heads back to the junction of the north and southbound trails. The rain is still coming down so he decides to hold off on walking the northern portion until later in the afternoon. He'll be back on Kingman Island around 4:30 pm to close up the gates for the night and will scope out the northbound trail then. He'll walk all the trails to make sure no one gets left behind.

Cinching his hood against the rain, he makes his way back over the bridge and through the gates, heading for his car parked in the still-empty stadium parking lot.

— E.G.

Visit www.mdsg.umd.edu/cq to see a video about the late 1990s campaign that helped save Kingman Island from development

Marsh in the City, *continued*

counterparts — surviving up to 15 years. This is thanks to a lack of hunting or natural predators and easy access to ample food. And even if 95 percent of all eggs in a local population could be found and destroyed each year, the population would only see a 25 percent reduction over 10 years, according to calculations by the Canada Goose Committee of the Atlantic Flyway Council.

The most effective control option may be culling the geese. Culling, of course, is usually the technical term for killing, and any plan that includes killing geese is likely to upset some citizens and advocacy groups, says Syphax. The Humane Society, for example, faults the construction of wetlands next to a golf course as intentionally serving up a "salad bar" for the geese. Since Canada geese eat grass as a primary staple of their diet, they gravitate toward large expanses, such as playing fields, cemeteries, and golf courses, particularly if near a water source.

The draft EIS, anticipated in the summer of 2010, will present a game plan of alternatives for managing Canada geese and other threats. Based on public feedback that may prove contentious, the final record of decision will shape a course for Kingman Marsh. Without a control plan, however, the restoration effort in this section of Kingman Marsh could be doomed.

Marsh and Mudflat

In 1993, soon after wetland restoration projects began in the Anacostia River, Peter May started making first-hand observations in another marsh. Just upstream from Kingman Marsh was a wetland called Kenilworth Marsh, and it was the first Anacostia mudflat targeted for restoration.

In 1992 the National Park Service collaborated with the Baltimore District Army Corps of Engineers to hydraulically pump sediment out of the tidal Anacostia River and deposit it in the new marsh area, raising surface elevations to levels favorable for marsh vegetation. This massive effort in the spring of 1993 put 290,000 plants in the ground at Kenilworth, foreshadowing what would later be tried at Kingman Marsh.

May had just gone to work for the Watershed Protection Division of the D.C government, and his job included collecting data on birds, fish, and invertebrate life at Kenilworth Marsh in response to the new plantings. He was tasked with evaluating the success of the restoration effort by comparing it with another well-established reference marsh — Dueling Creek.

One observation really piqued his interest. The plantings seemed to be flourishing at Kenilworth. But one small section of the restored marsh reverted back to mudflat. Why? What were the drivers that favored the mudflat state in this spot? These were questions that would change his professional course. They would also lead him to develop an idea that geese and mudflats may both have a place in an urban marsh ecosystem.

May's curiosity about mudflats led him to apply to a master's program at the University of Maryland to study with ecological engineer Patrick Kangas. There he could test his ideas in an academic setting. While still working with the D.C. government, May began his graduate work in 1996. For nearly a decade, he worked to develop an idea that marshes, mudflats, or a mix of the two reflect different "alternate states" of the marsh ecosystem. In two different marshes, he explored how factors like goose grazing can play a pivotal role in "flipping the switch" between these different states.

When planning efforts began for restoration work at Kingman Marsh, the Anacostia again shaped May's course. He realized he would have a singular chance to study an ecological system as it underwent transformation. At Kingman, he could conduct formal before-and-after comparisons of the hoped-for transition from mudflat to marsh. He could monitor which plants would thrive in the restored marsh and what unexpected

challenges might arise that might be unique to this urban environment. Excited by this new opportunity, May decided to expand his master's work into a Ph.D. dissertation.

From his master's work May saw that geese had not destroyed marsh restoration work at Kenilworth in the same way they later did at Kingman Marsh. And he thought he knew why. The geese were present at Kenilworth, but a combination of factors made the ecosystem transformation play out differently. At Kenilworth, dense stands of trees prevent the kind of easy access to grass and water that geese later found at Kingman, where the marsh sits next to a golf course. The sediment at the base of Kenilworth marsh had been elevated higher prior to planting — and that variable proved highly significant. The high elevation allowed more vegetation to establish and flourish, even in the face of some grazing pressure. Why did one area revert to mudflat? It was located at a lower elevation.

Hindsight is always 20-20. Before the success at Kenilworth and the struggles at Kingman, no one anticipated how sensitive the marsh plants would be to modest variations in elevation. Nor did anyone truly appreciate how much the location near a golf course would attract Canada geese. Only later would the U.S. Geological Survey's monitoring efforts, along with May's field research, with its carefully designed experimental modules surveyed over periods of years, provide some of the proof necessary to explain why the restoration at Kenilworth went so much more smoothly than the one at Kingman Marsh.

From the outset, the vision for Kenilworth and Kingman was much the same. Restore the ecological function of the marshes of the Anacostia's past. Repair a piece of this ruined river so people could understand the significance of what had come before — lush emergent marsh vegetation, willow, wild rice, native cattails. Mudflats were not part of this original vision, nor were hungry geese or invasive plant species.

Intellectual curiosity led Peter May *to consider how restoration ecology can help natural systems heal themselves. Here he pages through* Ecological Engineering*, a book by his Ph.D. advisor, Patrick Kangas. From his Baltimore-based office in the environmental design firm Biohabitats, May works to incorporate ideas by Kangas and others, including famous ecologist Howard T. Odum.*

But the reality of the stressors in this urban ecosystem has led May to develop an alternate vision for Kingman Marsh. May thinks that mudflats have their place there too. They provide a key ecological niche, says May, especially for certain shorebirds who rely on an open field of view to scan for predators. Marshes almost always have some mudflat habitat at the fringe, he explains. He suggests that given the set of challenges, a more realistic ideal for Kingman Marsh might be an "equilibrium state," a mix of mudflat and emergent marsh vegetation.

What might this equilibrium look like? Without a solid plan for managing Canada geese, it would be hard to justify the expense or effort of further plantings of the desired plant species in the low to mid-elevation levels of Kingman Marsh. After the initial plantings were devoured and fencing went up for a second time, many of the new plants that grew did not come from those planted the year before. This new growth came from seeds already present in the seed bank, or seeds that had been borne by wind and water, so-called volunteer species.

Volunteer species would be an inevitable part of a restored Kingman Marsh. To May, this fact speaks to the need to shift people's "palate" toward a new "design acceptance" for different plant species. This philosophy helps guide his current work as an environmental scientist for Biohabitats, an ecological engineering and environmental planning design firm in Baltimore. In areas subject to intense grazing pressure or other disturbances, according to May, a restoration effort should be designed to include species present in the seed bank, perhaps even invasive species. A key aspect of ecological engineering is to let the natural system work for you, May suggests, not to fight it.

"I'm totally for restoration work in the Anacostia, but it is very expensive," says May. "We need to be looking at ways to achieve restoration goals by getting more for less."

May believes that "getting more for less" will require understanding the "natural way" of the system. This disturbed, urban environment, to some extent, needs to self-organize and take care of itself, he says. That is, in the continued presence of variables like geese and invasive species.

"Hopefully we are not so arrogant to think that we will build the system and it will stay this way," May says. "At some time you have to let it go."

The Holy Grail

Cairn Krafft steps around the sign that marks the end of the trail on Kingman Island. Picking her way carefully down a

Dwarfed by dense plants, *Cairn Krafft plunges into Fringe A, a restored marsh near Kingman Island on the banks of the Anacostia River. Here plastic barricades sheltered plants from hungry geese during restoration work, and now some 60 plant species flourish, 98 percent of them native to the region.*

steep incline, she bushwhacks through overgrown vegetation. A thick, thorny stem of a blackberry bush, as wide as her forearm, blocks her path. She steps down on it hard, swinging her leg high to avoid getting jabbed by the thorns.

She's heading down towards "Fringe A," a restoration area near the southern tip of Kingman Island, located along the bank of the Anacostia main stem.

Stepping off the edge of the sea wall, Krafft has more bushwhacking to do. As she lowers herself into the marsh, cattails and willows, some eight-feet-tall, swallow her whole. The marsh assails her with smells of rotten eggs and mint. Coarse blades of rice cutgrass tangle in her curly hair and sting her arms with dozens of tiny slices. She wishes she'd worn long sleeves. Mud splashes up her hip waders but she doesn't sink too deeply here. The dense vegetation binds the mud, anchoring the ooze.

Krafft makes her way with difficulty through the dense vegetation. From where she stands she can't even see the edge of Fringe A, some 60 meters distant. Deep inside the marsh, the buzz of insects almost drowns out the rumble of Metro's orange line.

Here the Army Corps drew from lessons learned in Kingman Marsh, where May's research and USGS monitoring efforts demonstrated that marsh elevation was a critical issue. When the Corps undertook the Fringe project in 2003, they attempted to build the elevations higher than the lowest areas of Kingman Marsh. To protect the plantings from the high-energy flow of the main stem Anacostia, they also drove interlocking plastic barriers (so-called sheet piling) into the riverbank, which had an ancillary benefit of protecting against grazing geese.

When the barricade is removed, the team hopes that Fringe A will remain safe from hungry geese. The marsh plants grow so dense and high that a goose shouldn't be able to land in the thick of it. More than 60 species of marsh plants now thrive in Fringe A. Diverse species grow at high densities. And, at the end of five years of monitoring, 98 percent of the marsh is native plants. To Krafft, current conditions at Fringe A represent a "holy grail" for tidal freshwater marsh restoration on the Anacostia.

But for nearby Kingman Marsh, the fate of this massive wetland restoration effort remains uncertain, hinging on the outcome of the ongoing Environmental Impact Statement. The fences that shelter the vegetation won't stay up forever. They're difficult and expensive to maintain, says Krafft. Keeping the fences intact takes tremendous volunteer time and labor. More centrally, she says, permanent fencing is not compatible with the vision of a restored marsh.

So without a plan for controlling the number of Canada geese at Kingman Marsh, the plants at low to mid-elevations may be lost once the fences come down. And when the geese devour all the palatable marsh plants, they'll move on — leaving an expanse of mudflat in their wake.

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For More Information

Kingman Island
www.kingmanisland.org/

Anacostia Waterfront Initiative
http://dcbiz.dc.gov/dmped/

Anacostia Watershed Society
www.anacostiaws.org/

Biohabitats
www.biohabitats.com/

National Capital Parks-East
www.nps.gov/nace/

Living Classrooms National Capital Region
livingclassroomsdc.org/

Taking Out the Trash

By Erica Goldman

Tuesday afternoon. The lunch break has ended and the members of the Earth Conservation Corps' (ECC) River Team gather near the entrance of the Matthew Henson Center, a warehouse-like building tucked in the shadow of Nationals Stadium in Southeast D.C. Wearing uniform ECC T-shirts with baggy black pants, the team is heading out to clean trash and leaves out of catch basins around Fort Dupont Park. It rained heavily over the weekend, leaves blowing off trees by the thousands. There's likely to be a lot of debris.

Every Tuesday and Thursday since October 2008, Corps members have worked to install and maintain screens in the catch basins of the Fort Dupont subwatershed of the Anacostia. It is part of an effort to make just one combined sewer overflow (CSO) into the river totally trash free.

Charles Glass, a professor of environmental engineering at Howard University in the District, is the architect of this project, designed to test three different screen designs for their ability to keep large pollutants like trash out of the river. So far, with the help of volunteers from the Earth Conservation Corps, a nonprofit organization that focuses on youth development and environmental service, he's outfitted 35 out of 50 catch basins in the subwatershed.

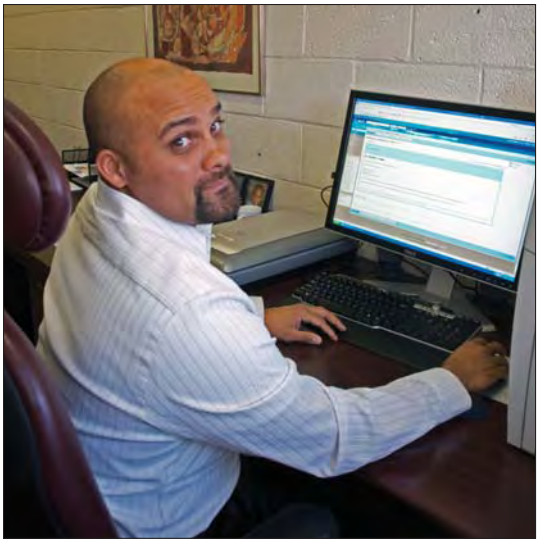
Glass's work goes straight to the heart of the Anacostia River's most basic problem: Lack of stewardship. Through his work with Corps members, all of whom have a history with the juvenile justice system in the District, he's tackling head on the challenge of engaging a community troubled by poverty, drugs, and violence to become caretakers of their local surroundings.

The Anacostia watershed is a mess, he says, "because people are not empowered to change their environment." In this community, he says, "you are talking about having food. You are talking about trying to have a better education system." For public officials and for residents, the environment doesn't rank high on the list of priorities.

Conservation volunteers, like Desmond Williams *(top right), help Earth Conservation Corps leaders Kelly Hart and Kevin Jeffrey (above) remove leaf litter and debris from storm drains (above left). They'll weigh the trash that they collect, collecting data to determine how well screens in the drain work to keep trash out of the Fort Dupont subwatershed of the Anacostia River.* PHOTOGRAPHS ABOVE AND ON OPPOSITE PAGE BY ERICA GOLDMAN.

Back at Howard University, a historically black university, Glass teaches civil engineering and environmental microbiology. He's lived and breathed engineering for as long as he can remember. At Montgomery Blair High School in Silver Spring, Maryland he was tracked early because of his high math scores. One summer in high school, he attended a minority summer access program at the University of Delaware where he was exposed to all of the different disciplines in engineering. He continued his studies as an undergraduate at Johns Hopkins University and received his Ph.D. from the University of Colorado. His research program focuses on advances in wastewater treatment, design of bioretention cells, and Low Impact Development (LID).

His work with the Earth Conservation Corps on the Anacostia River takes a much more fundamental approach.



Leading the charge, *Howard University professor Charles Glass tests how well different screen designs work to keep trash and leaf litter out of storm drains in the Fort Dupont area.*

Cleaning a catch basin is one of the most basic things that you can do. "This isn't science," he says.

But the Anacostia River has some pretty basic problems. "Why do I see floating feces in the Anacostia River? I would like not to see floating feces in the Anacostia," Glass says. "Why do I have to see trash? Trash is one of the most basic pollutants. We don't even teach 'trash' in engineering… That is so 1880s."

And while cleaning a catch basin might be fairly simple work, managing a crew and helping to instill a strong work ethic in people can be quite challenging, he says. This is where the Earth Conservation Corps plays a pivotal role. This is where Glass is committed to contributing his time and energy.

Since 1989, the Earth Conservation Corps has worked to provide career skills and environmental training to unemployed youth from troubled and disadvantaged backgrounds. Corps members complete a 9-month program of environmental service, cleaning the Anacostia River, rebuilding shoreline, and taking documentary video footage of their work. They receive a living stipend and, upon completion of the program, a fellowship to support educational expenses.

Glass's project is funded by a grant to the Earth Conservation Corps from the District Department of the Environment. Every Tuesday and Thursday, he tries to get out in the field with the Corps' River Team, although he's had to take a break while recovering from leg surgery. The team cleans the storm drains, raking leaves and debris into large trash bags. Then they weigh what they've collected, gathering data on how much trash they're keeping out of the Anacostia River because of the screens that have been installed, evaluating which screen design works best.

Relative to the scale of problems facing water quality in D.C. and throughout the Chesapeake watershed, catch basins are a cheap and easy fix, says Glass. It only costs $8,000 to retrofit a catch basin, he says. For $15,000 the basin can be outfitted with a Granulated Activated Carbon (GAC) filter. This will keep a "huge load" out of the river.

In practice, it's not so easy. At the core, the problem is one of political will, according to Glass. A culture exists within the D.C. Water and Sewer Authority and the Washington Suburban Sanitary Commission that is resistant to change. For an economically disadvantaged community, environmental stewardship can be a tough sell.

Achieving a trash-free river, says Glass, will require a shift away from business-as-usual — within the City Council, the Water and Sewer Authority, and the community. Ultimately, it will come down to how much we choose to care.

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To find out more about the Earth Conservation Corps, visit www.ecc1.org/

Trash Summit

Read an online feature about the annual Trash Summit, an initiative aimed at cleaning up the Potomac River and its watershed: www.mdsg.umd.edu/cq/trashsummit

A Moment in Time for Clean Water

In May 2009, shortly after President Barack Obama issued his Executive Order calling for a stronger federal role in the Chesapeake Bay clean up effort, a newly formed coalition of environmental groups launched the Choose Clean Water Campaign. The campaign, now representing over 150 organizations from each of the six states in the Chesapeake watershed, seeks federal leadership to improve water quality in the hundreds of streams and rivers that flow into the Chesapeake Bay.

It's been a big year for the fledgling coalition. In January 2010, over 250 people attended the first annual Choose Clean Water conference. Legislators from local, state, and federal levels came to speak to the group. Environmental Protection Agency Administrator Lisa Jackson chose the conference as the venue to announce new federal rule-making on stormwater and confined animal feeding operations (CAFOs).

The conference focused primarily on harnessing the energy of the coalition around a single legislative priority for the year. The bill at the forefront is the Chesapeake Clean Water and Ecosystem Act of 2009, introduced concurrently in the Senate and the U.S. House of Representatives by Benjamin Cardin (MD) and Elijah Cummings (MD-7).

Cardin and Cummings both spoke at plenary sessions to explain the terms of their introduced bill. The legislation would give the EPA more authority to hold Bay-area states accountable for meeting pollution reduction goals, and the power to clamp down on states by withholding federal funds if they break their promises.

The proposed law would also provide new tools for controlling stormwater

Continued on p. 16

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Clean Water, *continued from p. 15*

runoff and would authorize $1.5 billion in new federal grants to build better stormwater control systems. In addition, the bill sets a firm deadline of 2025 for states to have all necessary programs in place to meet Chesapeake Bay water quality restoration goals, with interim checks on progress to be conducted every two years.

Though the proposed legislation was a major focus, the conference also exposed participants to a suite of issues related to water quality in the Bay watershed. Sessions explored emerging threats to water quality in the headwaters, such as the sediment stored behind the Conowingo dam and the boom of natural gas exploration in the Marcellus Shale rock formation in Pennsylvania. Extensive discussions also took place on preparations for a Baywide TMDL (total maximum daily load), which will prescribe a specific discharge cap for nutrients such as nitrogen and phosphorus. Another session provided a hands-on workshop on tools for effective communication about water quality.

Hilary Harp Falk, the senior manager for the Choose Clean Water coalition, could not have been more pleased about the conference outcome. "It was wonderful to have such an outpouring from community," she says. "What we really loved is that it was a great kickoff for the coalition, a chance to talk about why this moment for clean water is so critical."

But despite this strong start, the coalition has its work cut out for itself, Falk says. The group is working to engage those who care about clean water but who are often left out, such as local sportsmen's organizations. Coalition leaders are working to help people on the ground understand their connection to the federal level. "We have a long way to go. Many don't appreciate the power they have to make change."

Knauss Fellow Links Science & Education

Biology has intrigued Maria Murray ever since elementary school. After an undergraduate field course in San Salvador in the Bahamas, she decided to make marine biology her life's work. It was not just the beautiful coral reefs. She also loved the links between the island ecosystem and the people who live there, the joining of marine science and public awareness.

Murray focused first on the science. As a Ph.D. student in biology at the University of Maryland, she's analyzing the genetics of Florida populations of the eastern oyster, *Crassostrea virginica*. She plans to finish her degree by the end of this year.

Now, as a Knauss Fellow, she's found a place where can use her scientific training to contribute to a nationwide public education effort. At the National Oceanic and Atmospheric Administration (NOAA), she'll work on the Environmental Literacy Grants program and help to support both formal and informal education efforts.

The Knauss Fellowship, established in 1979, is designed to present outstanding graduate students like Murray with an opportunity to spend a year working with policy and science experts in Washington, D.C. The program, named for marine scientist and former NOAA administrator, John A. Knauss, is coordinated by NOAA's National Sea Grant Office.

Fellowships run from February 1 to January 31 and pay a stipend of $33,000 plus $7,000 for health insurance, moving, and travel. Applicants must apply through the Sea Grant program in their state.

For more about the fellowship, visit the web:

Maryland Sea Grant,
www.mdsg.umd.edu/education/knauss/

National Sea Grant program
www.seagrant.noaa.gov/knauss/

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