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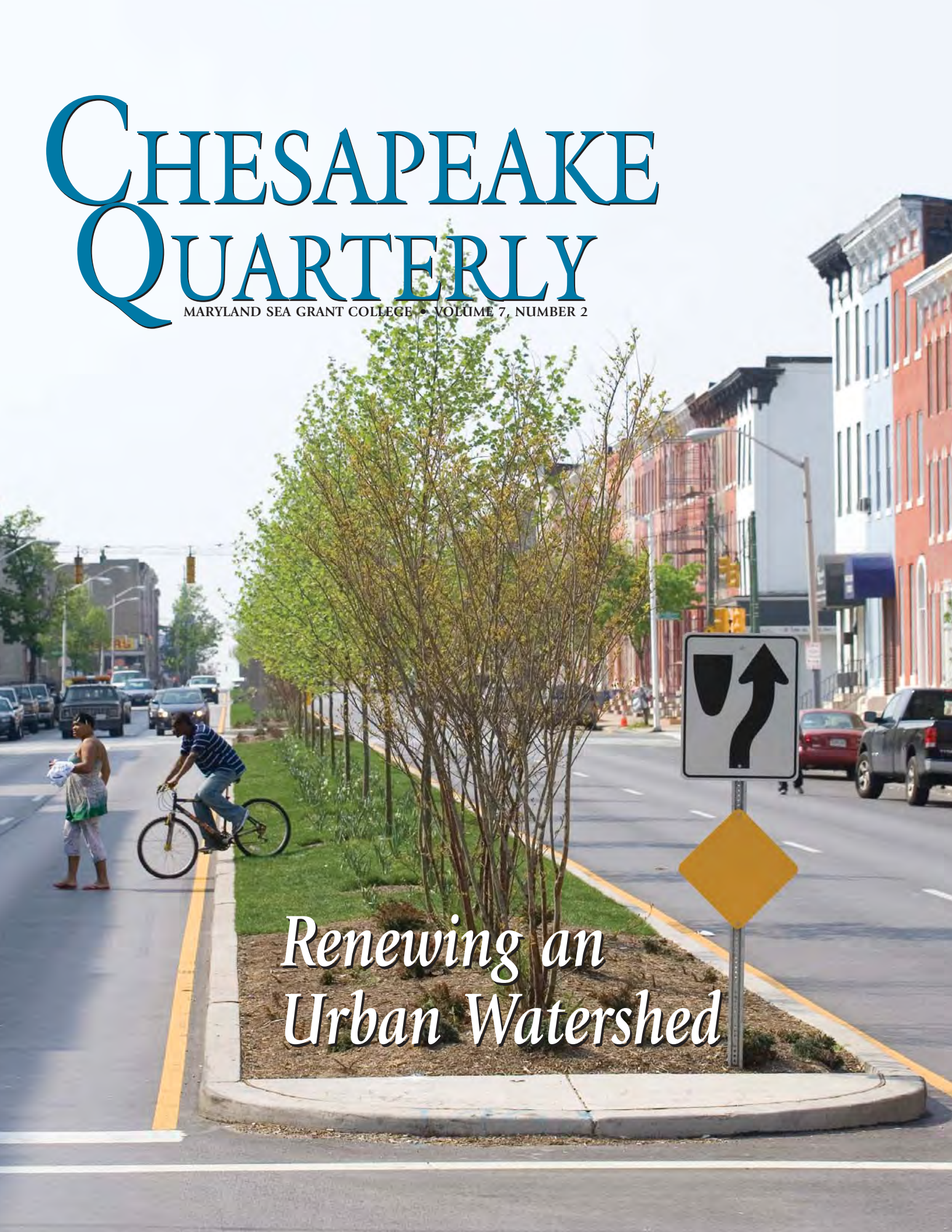

Renewing an Urban Watershed

contents

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Chesapeake Quarterly

June 2008

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

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Cover photo: Green returns to Fulton Street. *For a long time local residents fought to bring back a median originally designed in the early 1900s by Frederick Law Olmsted, Jr., son of the famed landscape architect who created New York's Central Park. The historic median disappeared in 1951 with the widening of Route 1, a north-south trucking route. With truck traffic drawn to bigger highways and after 12 years of community pressure, the city restored a 1.5-mile-long tree-lined median to this West Baltimore neighborhood.* PHOTOGRAPH BY SKIP BROWN. ***Opposite page:*** *The children of Franklin Square Elementary Middle School helped design and plant the flowering "reading circle" that stands in the middle of their schoolyard. This island of green led to the removal of more than an acre of asphalt from the schoolyard.* PHOTOGRAPH BY SKIP BROWN.

Power of Green

If you believe in green, a little bit can go a long way.

In 2005, the city of Silver Spring, Maryland, tore down a parking lot in the downtown area, leaving an unsightly heap of dirt in the center of the business district, where the new civic center would soon be built. That summer, while plans for the proposed Veteran's Plaza were being finalized, the Montgomery County Department of Public Works and Transportation needed a quick way to create public space for upcoming events. They arrived at a temporary solution. Put Astroturf — SoftLawn, to be exact — down over the dirt. Overnight, a new town square was born.

It's green space, but it's not even real grass. Vacuum cleaners, not lawn mowers take charge of its upkeep. The "Turf" becomes a sodden sponge when it rains. It has no bioretentive qualities and probably doesn't help much with stormwater management.

But Silver Spring was so hungry for green that all it took was a 35,000-square-foot swatch of artificial turf, some security lights, and evening patrols to bring toddlers and teenagers to the same hangout, to gin up impromptu picnics and raucous Frisbee games, to bring a seasonal farmer's market to the town center, and to draw a world-class jazz festival in the summer.

The Turf in Silver Spring was never meant to be a permanent feature of the downtown. Now three years later, the long-awaited construction of Veteran's Plaza and Civic Building is scheduled to begin this summer. And although the design plans promise plenty of green space — real grass and trees — many residents are loudly protesting the impending loss of the green carpet.

All of this in a county with some of the best parks in Maryland. Just over a mile from downtown Silver Spring, Sligo Creek runs into the Northwest Branch of the Anacostia River. With it comes 13 miles of multi-use trail. The nearby Rachel Carson Greenway, which is now almost complete, spans Montgomery and Prince George's counties with nearly 25 miles of creek-lined trails. On those trails in the spring, I've watched families of frogs and tadpoles in vernal ponds. I've seen foxes, deer, and hawks.

Green has the power to transform the health of the environment and to build community. At least that's the idea.

So if a square of artificial turf could bring so much community to a county already rich with green spaces, what could grass and trees do for an ultra-urban watershed in Baltimore — one where all the streams are buried below ground, where there's no urban forest, no foxes, no deer — a place where pavement encases more than 75 percent of its surface area?

It's an experiment in progress in a 72-block area of West Baltimore that encompasses twelve neighborhoods — an area defined as a watershed by the network of storm drains that carry runoff beneath the streets. Dedicated people are working to build a network of green through gray streets — ripping up schoolyard asphalt, planting trees, and cultivating rain gardens.

The hope is that less asphalt will improve the quality of water that flows through these urban storm drains. Gardens and greenways will bring people together to tend to the health of their local environment.

Whether this experiment will work remains to be seen. West Baltimore lacks the surfeit of riches, ecological and otherwise, that Montgomery County claims. But those working to green this troubled watershed possess a rare determination — their stories reflect the connection of person to place, of human and ecological resilience intertwined.

These people — community volunteers, nonprofit leaders, public servants, and scientists — are working to combat real financial, social, and ecological obstacles in this West Baltimore watershed. They believe in the power of green. Isn't that a good place to start?

— *Erica Goldman*

When rain falls in West Baltimore, *loads of trash and contaminants wash off city streets and begin a subterranean journey that ultimately ends in the Chesapeake Bay. Pipe 263 (opposite page) drains urban stormwater into the Patapsco River, where it flows untreated under a network of highway overpasses (above) into Baltimore Harbor and beyond.* PHOTOGRAPH ON PAGE 4 BY ERICA GOLDMAN; INSET ON PAGE 4 AND PHOTOGRAPH ON PAGE 5 BY SKIP BROWN.

Greening Gray Streets
Can It Clean the Waters Below?

By Erica Goldman

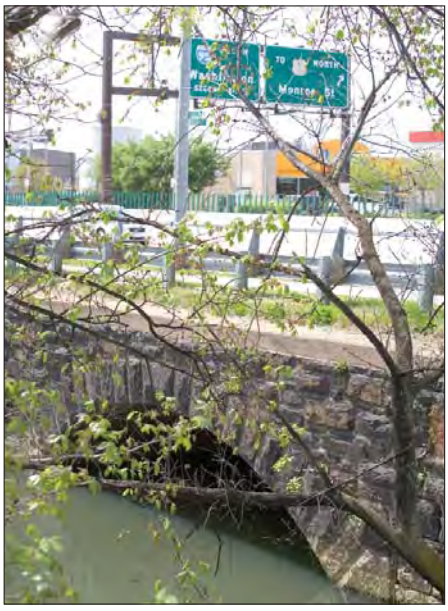
Beneath the vroom of traffic on Russell Street, the mouth of an outflow pipe yawns into the Middle Branch of the Patapsco River. Hidden under this busy Baltimore thoroughfare, the 25-foot-wide masonry pipe opens onto garbage-lined banks. Plastic bags and newspaper hang from drooping tree branches. Styrofoam containers bob in sickly green water.

That is just what's visible. Unseen are loads of unsavory substances — heavy metals, bacteria, nitrogen, and phosphorus, not to mention millions of suspended particles that bind toxics tight. This spoiled backwater flows under a criss-crossing tangle of highway overpasses before emptying its load into the main expanse of Baltimore Harbor. Out of this pipe flows some of the dirtiest water heading for the Chesapeake Bay.

They call it pipe 263.

Pipe 263 drains untreated stormwater from the most urban of urban watersheds. It's filled with pollutants that wash off streets and sidewalks or seep into the system from illicit sewage connections. Far from the Bay itself, the pavement here stretches in concrete waves and crabs come only as carry-out. Watershed 263 doesn't harbor a single flowing stream. Not one rocky streambed. No fish. No water striders. No ducks.

Watershed 263 is more accurately a "stormshed," an antiquated system of underground pipes that carry away stormwater coursing off Baltimore's city streets. Named simply for the giant pipe



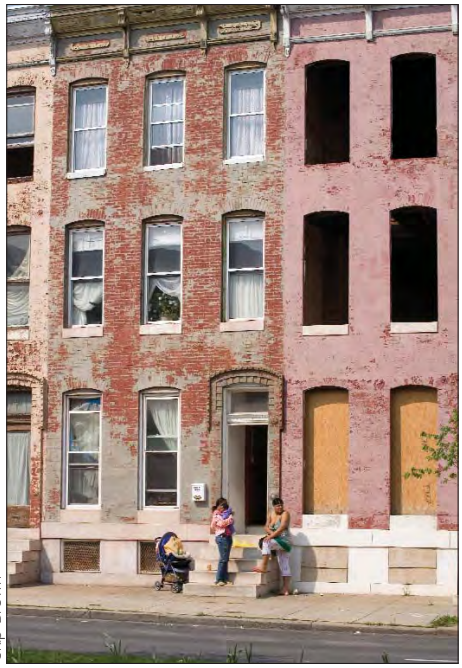
at its terminus, Watershed 263 drains 930 acres encompassing twelve neighborhoods in West Baltimore. Few trees dot the landscape — too few to support even birds and squirrels, the hardiest residents of an urban forest. If not for the vibrant colors of Baltimore's rowhouses, Watershed 263 would be a very gray place.

On Lanvale Street, Matt Cherigo pulls on latex gloves and a Tyvek suit. He's getting ready to climb into a storm drain in the mid-watershed neighborhood of Harlem Park, where he works as a field technician. His two assistants, Emma Noonan and Melissa Grece, are hooking up a barrel-shaped, automated water sampler to a steel cable. Cherigo's head is uncovered. He forgot to order the suits with hoods.

The day's forecast warns of heavy rain and the air hangs low. That's why Cherigo and his field team are taking water quality samples from the Lanvale storm drain, as well as from another storm drain at nearby Baltimore Street. Over the last four years they've sampled each major storm event and taken baseline samples every two weeks from the two sites. Cherigo works for the Dundalk, Maryland-based contract lab called Microbac, but the overall sampling effort is conducted through a partnership between the Baltimore Department of Public Works and the Baltimore Ecosystem Study, a project that studies urban Baltimore as an ecological system. The water samples are analyzed for levels of nitrogen, phosphorus, bacterial load, and heavy metals. The resulting data make up the first quantitative record of stormwater quality from an ultra-urban area within the Chesapeake watershed.

Cherigo cleans rust off battery terminals on the automated sampler and programs the computer. He's going to anchor the sampling device inside the storm drain, where it will remain through the duration of the storm. Rising water levels inside the storm drain will activate the automated sampler. The trick is to get the sampler in place, then get out of the way before the storm hits.

Stormsheds like Watershed 263 interweave much of Baltimore City's subterranean landscape. There are 114 outflow pipes like pipe 263 that deliver untreated



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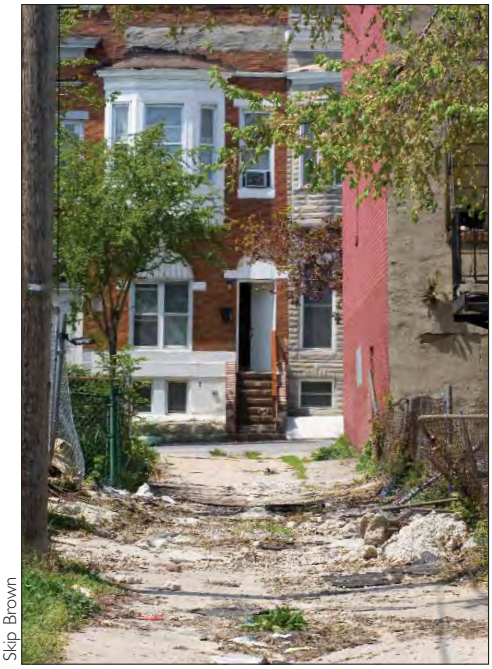


Skip Brown

Urban life and urban decay *exist side-by-side in Watershed 263 (shown outlined in red on map). In some neighborhoods, more than one in three rowhouses stand abandoned. Drugs, crime, and unemployment plague the quality of life of watershed residents.* MAP SOURCE: BALTIMORE CITY DEPARTMENT OF PUBLIC WORKS; WATERSHED DETAIL FROM THE PARKS & PEOPLE FOUNDATION.

stormwater directly into Baltimore Harbor or the Patapsco River. In Watershed 263, as urban growth paved over natural streams, city planners built a 43-mile network of 355 storm drains to funnel water out of the city. Like the natural streams they replace, many of these storm drains have base flow, even in dry weather. Due to a deliberate structural decision to leave the joints leaky, groundwater percolates into the pipes — an engineering solution designed to shunt water away from basements and house foundations.

The water that flows beneath Baltimore's streets contains concentrations of nitrate comparable to the region's agricultural areas (nearly 6 milligrams per liter during low flow periods). And levels of lead, copper, and zinc routinely exceed the Environmental Protection Agency's legal levels during storm events, according to water quality monitoring data.

This stormshed has actually been defined as a watershed based on water flow patterns (hydrology). And it's being managed as such.

This pilot project is the first of its kind — a joint effort begun in 2004 between the Baltimore City Department of Public Works and the Parks & People Foundation, a nonprofit organization that focuses on enhancing the quality of life in Baltimore. Their goal: to enlist the community in restoring water quality and "greening" the watershed. Their plans focus on reducing impervious surfaces, growing the tree canopy, cleaning streets and alleys, and creating biofiltration sites by cleaning and landscaping vacant lots and schoolyards — all to improve the health of the community and water quality in Watershed 263.

It's daunting. Life is hard in the neighborhoods within this watershed. Residents grapple with economic hardship, crime, drugs, and homelessness. Block after block, houses stand abandoned. In some neighborhoods, the number of unoccupied homes exceeds one in three. The median income of the watershed is $20,000 and unemployment tops 60 percent. In these neighborhoods, no streams flow through urban parks. The stormwater pipes that drain into Baltimore Harbor hide out of sight, buried deep under asphalt. The Chesapeake Bay — its flat expanses of water, its marsh grass, and its osprey — seems a distant world. Given this gaping disconnect between city and Bay, can the people of Watershed 263 come together to improve the health of the urban environment? Can they help clean the waters that flow through hidden streams?

At the bottom of the square-shaped storm drain, Cherigo's white Tyvek suit lights up the dark tunnel. He shouts numbers to Noonan and Grece as they record background measurements and qualitative descriptions of conditions in the drain.

Cherigo is still in the hole when Bill Stack arrives. Dressed for the weather in a long gray raincoat, Stack pauses briefly to answer a quick email on his Blackberry before heading toward the storm drain. The sampling efforts in Watershed 263 hold intense interest for Stack, the water quality chief for the Baltimore City

The Problem with Pavement

Anticipating the approaching storm, *the field crew (opposite page, right) — Matt Cherigo (middle), Emma Noonan (left), and Melissa Grece (right) — lower an automated water sampler into a storm drain in Watershed 263. There it will record flow rates and take samples for measuring water quality. The Baltimore Department of Public Works, under the leadership of water quality chief Bill Stack (above, bottom), oversees the effort to collect water quality data from two sites within the watershed. Cherigo (above, top) heads underground to see that the device is working.* PHOTOGRAPHS ABOVE AND OPPOSITE PAGE, RIGHT BY ERICA GOLDMAN.

Department of Public Works. Stack's the one who manages pollution control efforts for the city's stormwater, the one charged with making things better. He needs a way to assess whether community greening and other Best Management Practices (BMPs) are actually improving the quality of Baltimore's stormwater.

Before monitoring efforts began in Watershed 263 in 2004, Stack had no quantitative data to identify the scope and

Continued on p. 9

Missing chunks of concrete leave large pockmarks in the curb at the corner of Lanvale and Stricker streets, maybe knocked loose by a car taking the turn too fast. The chipped curb leaves the stenciled red letters on the opening of the storm drain hard to read. But from the top, the words remain legible — "Trash Kills Crabs."

The banged-up corner captures the neighborhood's contradictions. It carries an environmental message, one crafted to educate the public about the connection between city storm drains and the Bay. On the other hand, as chunks of the curb came loose and fell into the street, they no doubt ended up in that very drain, sending crumbled bits of pavement laced with nutrients and heavy metals into the stormwater network.

Dirty streets make the biggest contribution to the water quality problem in Watershed 263. Streets contribute 70 to 80 percent of the total suspended solids and 30 to 40 percent of the nitrogen and phosphorus to stormwater in this watershed, according to data from the sampling effort. Most of that comes from car emissions depositing chemicals onto asphalt. Impervious street surfaces also serve up other nasty substances, such as volatile organics from fossil fuel combustion, heavy metals, and vehicle fluids like oil and antifreeze.

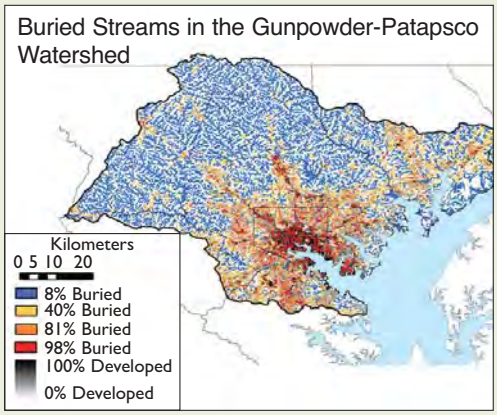
Bill Stack and his colleagues at the Department of Public Works are experimenting with a suite of urban Best Management Practices (BMPs) to figure out which efforts might bring the biggest benefits for water quality. This summer, the Department plans to implement six different urban BMPs in tandem, with the city of Baltimore contributing over $300,000 for this effort. Stack is particularly excited about a curb-extension greening project that will bring biofiltration capacity to the storm drains. These will help to treat stormwater before it reaches the drain and improve the aesthetic characteristics of the area, he explains.

The ongoing water quality monitoring data allow for a before-and-after comparison of the success of these practices in improving water quality. So far, street sweeping is the only BMP that has been studied in a rigorous experimental manner.

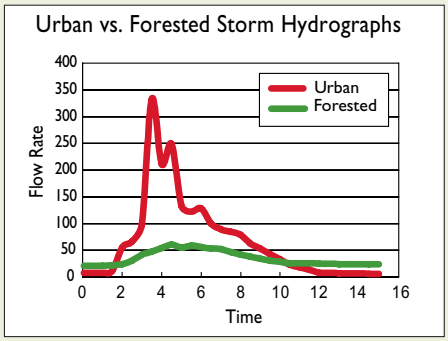
Street sweeping dates back to the 1930s and, with new technologies developed in the 1990s, it's become an effective way to prevent coarse particles of organic matter from reaching the stormwater network. This is key, Stack says, since pollutants like heavy metals tend to enter the system attached to larger particles.

An unswept street delivers 75 percent more particulate matter than one that has been swept, according to findings by graduate

Erica Goldman



Frontiers in Ecology and the Environment



Ken Belt

Streams go underground *in increasing numbers as they move from forested areas toward urban centers like Baltimore (map above). In Watershed 263, where all the streams lie buried underground, impervious surface area tops 75 percent — which leads to high-volume, flashy stormwater flows, compared with forested areas where rain is absorbed by the ground (storm hydrograph above).*

student Catherine DiBlasi at the University of Maryland Baltimore County. But her research also found that increasing the frequency of street sweeping has little effect on the overall concentration of contaminants in the stormwater. Baltimore should keep sweeping its streets, but that alone will not likely prove a magic bullet for the health of the city's stormwater.

— E.G.

Organic Overload

When Ken Belt looks around West Baltimore on rainy days, he sees streams everywhere. A strange thing, since streams in this part of the city went underground long ago to make way for streets, parking lots, rowhouses, and storefronts. Belt's not imagining things. He just looks at the situation a bit differently than most.

For Belt, a hydrologist and professional engineer with the United States Forest Service, each gush of water that runs down a street and into a storm drain is a headwater stream, a small waterway that eventually joins others to form larger streams. If underground pipes are branches of a tree, he says, then these street-level "streams" are twigs. Belt estimates that every city block has at least two connections to the drain, meaning that hundreds of these "zero order" streams cover urban neighborhoods. When he counts these untraditional streams, he sees an exponential increase in the number of tributaries.

Storm drains are designed to get water off the landscape as quickly as possible, Belt explains. It's a design that appears to work too well in Watershed 263, a hydrologic basin in West Baltimore that flows entirely through storm drains (see "Greening Gray Streets, p. 5"). This subterranean watercourse is the product of what Belt feels was less enlightened engineering in a previous era. With nearly three-quarters of the watershed covered by impervious surfaces like roads and parking lots, few grassy areas remain to absorb the flow. During a storm, torrents of rainwater flow from gutters, driveways, and roads, picking up leaves, dust, dirt, and trash — what Belt calls "schmutz" — along the way. This schmutz can make its way into storm drains and ultimately through the outfall pipe into the Patapsco River, a tributary of the Chesapeake Bay.

The components of storm flow — especially organic matter — have grabbed Belt's attention. With carbon as its backbone, organic matter forms the base of the food web and supports all life on earth. In both its dissolved and particulate forms, organic matter plays an important role in traditional stream ecology. Bits of leaves, algae, and debris serve as food for microorganisms, including those that take up nitrogen and phosphorus — nutrients frequently blamed for poor water quality throughout the Bay and its watershed.

But organic matter has downsides too. Its decomposition can suck up oxygen and lead to hypoxia in aquatic ecosystems. The Chesapeake experiences this nearly every summer when vast swaths of algae die and decompose, creating low or no oxygen zones. Organic matter is also described as chemically "sticky" because it can bind tightly to metals and toxic compounds, including carcinogenic polyaromatic hydrocarbons (PAHs), pesticides, and flame retardants.

Belt thinks leaves and other debris that get washed into storm drains may be loading urban stormwater with organic matter. While leaves are part of natural stream ecology, urban areas don't have the natural landscape characteristics that allow leaves and other organic matter to decompose — helping to form soil, for example. In an urban landscape, leaves and other woody debris, along with chemicals and trash, wash directly into storm drains and into the Bay.

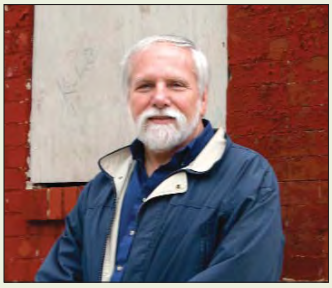
All this adds up to what Belt calls the "gutter subsidy," the idea that a city's vast network of storm drains provides a sometimes forgotten pathway for organic material. It's an urban myth that urban streams are devoid of organic matter, Belt feels. Curious to find out whether organic matter entering storm drains has ecological effects, he approached his friend and colleague Sujay Kaushal at the University of Maryland Center for Environmental Science.

As a biogeochemist, Kaushal's first instinct was to suggest that he and Belt study the chemistry of the water to determine the amounts and sources of organic carbon present. The project became part of the Baltimore Ecosystem Study, a long-term effort to better understand the city's urban environment.

Belt, Kaushal, and their team collect water samples at thirteen study sites ranging from 100-percent forested in Baltimore County's Pond Branch to 75 percent impervious surface-covered in Watershed 263.

Ken Belt

Ken Belt



Erica Goldman

A mix of matter — *grass, leaves, and everything in between — litters this West Baltimore alley. As gutters and rainspouts empty onto streets and alleyways, this organic debris begins its journey toward the Patapsco River. Ken Belt (above) and Sujay Kaushal have teamed up to study the effects of organic matter as it washes from the urban ecosystem downstream to the river and the Bay.*

Belt uses innovative sampling techniques to study transport along gutters, inside underground storm drains, and along streams, while Kaushal analyzes the chemistry of the water. Using instruments from handmade sieves to state-of-the-art automated samplers, they record measurements at one-to-two-week intervals and throughout storm events.

One indicator of the abundance of organic matter, Kaushal says, is oxygen consumption. As microbes decompose organic material, they use up oxygen. Data from Watershed 263 show the highest oxygen demand of all the sites, especially during storm events.

Kaushal suspects this is because the high percentage of impervious surface cover in Watershed 263 allows organic matter-laden water to wash into storm drains efficiently and quickly. The drains act like huge funnels, he says, collecting and concentrating organic matter. "It's coming in at a much faster rate than organisms can take it up or remove it." Efforts to add more green space in the watershed could help slow the flow. Landscaping features like grassy medians and rain gardens act like sponges, soaking up water before it can reach the drain.

From their work so far, Kaushal says, they've found there's a significant amount of organic matter coming into these urban streams. But it's a cocktail, a mix of compounds. Their next steps will entail confirming the matter's exact source and make-up and studying what its presence means for the ecosystem. Recent funding from the National Science Foundation and the Chesapeake Bay Program will help them crack this chemical recipe for organic matter in urban streams.

It's work that could have implications for the larger Bay restoration effort, Kaushal says. Their research may ultimately "link up what happens in the storm drain down to the Chesapeake Bay."

Because of its ability to bind toxic chemicals and deplete oxygen, organic loading deserves more attention, Kaushal believes. "Nitrogen and phosphorus are the elements that people talk about, but ultimately it's organic matter that does all the damage."

— Jessica Smits

scale of the problem. Monitoring data from the Chesapeake Bay Program reaches only as far as the outer portion of Baltimore Harbor, where tidal water mixes and dilutes pollutant loads flowing from the outfall pipes.

Data also help Stack make the case for urban stormwater as part of the bigger landscape of Bay restoration priorities. He recently presented some of the data from Watershed 263 at the annual meeting for the Bay Tributary Strategies, roadmaps for implementing river-specific cleanup strategies for the state. Stack also testified before the state legislature in March to appeal for targeted funding for urban stormwater BMPs in the new Chesapeake Bay Trust Fund created this year.

Cherigo climbs out of the drain, strips off his grimy Tyvek suit and gloves and walks over to greet Stack, who quickly finishes typing a message and stuffs his Blackberry in the pocket of his raincoat. Data collection has been running smoothly at the Lanvale site, Cherigo reports, but nearby Baltimore Street has problems. The base flow in the storm drain at Baltimore Street is so high that the added storm flow velocity seems to be overwhelming the automated sampler. It may be necessary to alter the sampling protocol, Cherigo tells Stack.

As it turns out, high base flow isn't the only irregularity in the Baltimore Street catchment area. The water quality data from this site show unusually high levels of nitrogen and phosphorus — high even for Watershed 263. Where might these nutrient loads be coming from?

Arriving at Bruce Street, a street so narrow that a single car can fill its width, Guy Hager closes and locks the car door and crosses the street. On one side of the street sneakers hang from overhead power lines in an empty lot, overgrown and full of litter. On the other side of the street metal doors barricade the opening to the Bruce Street stables. The doors stand partially ajar, framing several bright red wagons with yellow wheels.

Standing outside the stables, Hager announces his presence, identifying himself with the Parks & People Foundation. Wearing a baseball cap, he squints against the glare as he looks inside. Over the barks of a large dog tethered just inside a gate, a young man working in the outer courtyard nods at Hager and shouts to stable owner Ed Chapman to alert him that he has visitors.

"The Chesapeake Bay model doesn't have point-source pollution from city horse manure in its calculations."

Inside the stable, where ponies live in close quarters, Hager finds Chapman stooping low under the weight of a shovelful of horse manure. His small, wiry frame tenses with the effort. The pungent smells of manure and hay fill the stable, a historic building that has stood on Bruce Street for more than 150 years.

Chapman turns the shovel over an empty wheelbarrow and pushes the load toward the stable entrance, arousing a whinny of interest from a small brown pony in the corner. Steering the wheelbarrow over a makeshift ramp — a board propped over the uneven curb — he pushes into the glare of the outside courtyard. There the manure shed stands with doors open.

When the younger man starts unloading the manure from the wheelbarrow Chapman finally stops to greet Hager. They haven't seen each other for a while.

Chapman and his friends are part of a dwindling group of Baltimore "arabbers." The term "arabber" derives from British slang, "arab," used to describe people who made their living hawking on the street. Arabbers drove colorful horse-drawn carts filled with fruits and vegetables to areas underserved by grocery stores, announcing their arrival by distinctive hollers or songs. A historic way of life in Baltimore, arabbing was once common all over the East Coast, an entrepreneurial practice that dates back to the Civil War. Now it's disappeared from every city except Baltimore. The number of arabbers today hovers around a dozen. Chapman has been doing the job since he was 12, and on occasion he still drives his horse-drawn cart to sell produce in West Baltimore. At 88, he'll probably retire soon.

Back in 2006, Hager knew nothing about the Bruce Street stables. He was working across the street on a greening project when a film crew from *The Wire*, an HBO police drama, showed up on Bruce Street and began painting a mural of horses and cowboys on the outside of the stables. That tipped Hager off to the horses and gave him the clue that horse manure might be leaching into the catchment area's stormwater.

He discovered Chapman and other elderly stable hands had been leaving manure on the concrete pad outside the stables. When it rained, the manure washed straight through a hole into the alley adjacent to the stables. The nutrient-laden water then rushed into the storm drain and through the pipe that runs under Baltimore Street.

At the Bruce Street stables, Hager and his team had uncovered an off-grid hotspot of pollution — one that had been missed by the detailed Geographic Information System (GIS) mapping conducted at the beginning of the project in 2005.

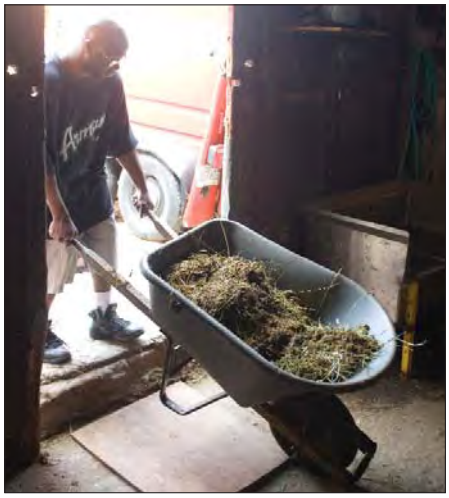
The runoff of manure in Baltimore City came as a surprise. "I can tell you that the Chesapeake Bay model doesn't have point-source pollution from city horse manure in its calculations," says Hager.

Hager quickly realized that any solution that would require hauling the manure an extra distance would prove difficult for these elderly men. But clearly the problem needed to be addressed.

Hager and his team from the Parks & People Foundation began to work with the men at the stables, first helping Chapman and fellow arabbers build an exercise yard for their horses in the adjacent lot. They worked to explain the watershed connection and brainstormed ways to troubleshoot the manure problem. The team proposed a metal pallet-

Skip Brown

Skip Brown

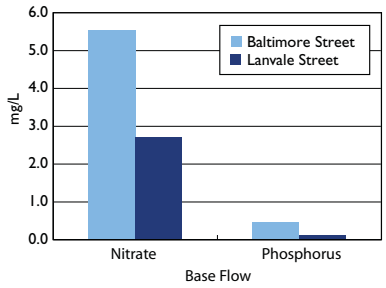


Skip Brown

Guy Hager

Horse-drawn commerce survives *in Baltimore, thanks to a dwindling number of produce vendors known as "arabbers." Stable owner Ed Chapman (above right) works with Gerryl Louden (top, with Chapman, and middle) to make sure that manure doesn't add unwanted nutrients to the city's stormwater. In 2006, manure sat uncontained outside the stable (bottom), causing a pollution problem when it rained. Chapman's work and a rebuilt manure shed have stopped this runoff.*

Nitrate and Phosphorus Concentrations in Watershed 263



At the Baltimore Street *sampling station, concentrations of nitrate and phosphorus rival agricultural watersheds under base flow conditions — the median values shown in the graph above were derived from water quality analysis conducted in biweekly intervals between October 2004 and January 2006.* GRAPH DATA SOURCE: WATERSHED 263.

type device that would keep the manure off the concrete pad. The men could wheel it out to meet a garbage truck that could pick up the manure on the street. It would be a fairly low-cost solution. But so far, Hager says, he's not succeeded in making the case for funding.

Chapman understands there's a lot at stake in keeping manure out of the storm drains and making sure that his stable is well run and clean. The city-owned stable at Retreat Street was closed last year, condemned by the Housing Authority. When that stable closed, 49 horses faced relocation outside the city.

Arabber stables are generally exempt from city zoning laws because of their historic designation and the priority placed on preserving the cultural heritage of arabbing in the city. According to Baltimore city health code, only arabbers and participants in the carriage trade are allowed to keep horses within city limits. But the stables have recently come under scrutiny for their structural integrity and horse care practices. Chapman has a lot vested in making sure the Bruce Street stable does it right. And he's made some changes to make sure he's on track.

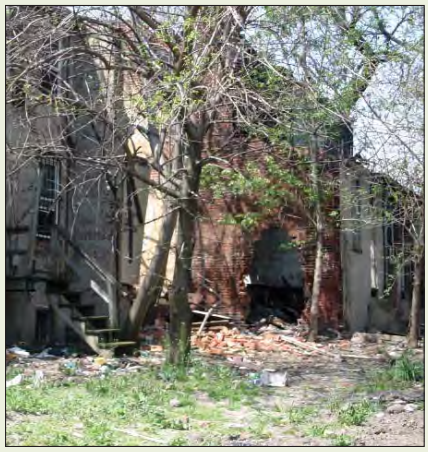
The manure shed now boasts a new roof, sidewalls, and wooden doors — Chapman has overseen its recent rebuilding. He and his fellow arabbers are now using the shed properly, storing the manure piled high behind closed doors until it can be bagged and moved out. It's tough going, shoveling manure and negotiating the heavy wheelbarrow at his age. He's not sure how much longer he'll be able to do it. But for now there's no other way. And Chapman is still going strong. For 75 years and counting, he's been selling on the streets of Baltimore. And now he's buying into cleaning them up.

Tension crackles in the air of the drab conference room at the Bon Secours Hospital Community Center on North Fulton Street. The turnout at the monthly meeting of the Watershed 263 Stakeholder Advisory Committee is smaller than usual. Only three out of the twelve neighborhoods have representatives present, and one of them is upset.

This is despite today's good news. A considerable infusion of cash is coming into the watershed — the Department

Continued on p. 12

A Tree Grows on Bruce Street



Charlene Pinkney crouches near the base of her newly budded dogwood tree, her slight frame bent low. She points to a daylily poking up near the rain barrel she maintains in the corner of her garden.

"It's a determined flower," she says. "That daylily keeps poking its way through, even though the rain barrel blocks its path."

Some might say the same of Pinkney. For over 10 years, she's lived on Bruce Street, in the heart of West Baltimore, just down the block from the Bruce Street stables (see opposite page). She lives in the only occupied house on her side of the street, next to an overgrown lot. Trash and broken glass litter the alleys and lots — it crunches underfoot as you walk. On the other side of the block, more than half of the rowhouses are boarded up. And where the boards are not secure, as she points out in one house, unauthorized tenants often make themselves at home. The street also sees its share of vandalism and "traffic," she says, meaning drug deals.

Pinkney grew up in this area and it pulled her back home. She's raised her two children here, now 15 and 16. And she's worked hard to cultivate a peaceful oasis on her corner of Bruce Street.

On the alley-facing side of the garden, two evergreen trees provide shade from the afternoon sun. Pinkney says that she sometimes brings a chair out here just to sit. "I need this place. The solitude gives me peace of mind."

But it takes most of her spare time to make her garden the place that it is — a green space filled with carefully chosen flowers and detailed landscaping. She can't grow anything edible in the garden because rats will get to it. "It's a constant struggle to keep them away," she says.

Early on, Pinkney's interest in gardening helped her connect with the Parks & People Foundation. They helped her get started with her garden initially and worked with her to set up a rain barrel to help with stormwater management. Now Pinkney also serves on the Watershed 263 Stakeholder Advisory Council.

Parks & People planted two large trees on the curb outside her garden and she helps maintain them, which makes the whole corner a little greener. Pinkney's children are both alumni of KidsGrow — an after-school program run by the Baltimore Ecosystem Study since 1994 to help children understand their connection to the environment and promote stewardship.

Charlene Pinkney's garden helps her find the center of her inner world. But it also flickers a bright light on Bruce Street, helping to anchor the troubled block she lives on. Amidst the abandoned houses and littered lots, her corner is clean and her garden is carefully tended.

When Pinkney's hydrangeas bloom, she cuts them and hands them over the fence to children who pass by on their way to school. They've asked if they can take them to their teachers. She smiles at the thought that her flowers spread flashes of color to the neighborhood beyond. Something beautiful from Bruce Street.

— E.G.

Charlene Pinkney's flowering dogwood tree *(top right) casts a graceful silhouette on troubled Bruce Street. Her carefully tended garden (below, with Pinkney looking on) provides a welcome oasis on a block plagued by abandonment, vandalism, and drugs.* PHOTOGRAPHS BY ERICA GOLDMAN.

A bright spirit, *community leader Inez Robb (left) has served her Sandtown-Winchester neighborhood ever since she became a homeowner there 20 years ago (her block above, with its new grassy median). Robb's connection to community made her a natural for her role on the Watershed 263 Stakeholder Advisory Council. She helps link residents in the watershed with an ambitious pilot project aimed at improving both environmental quality and the quality of life.*

of Transportation has earmarked $900,000 for a proposed greenway, and it's put a plan on the table for how to spend it. But Inez Robb isn't ready to buy in. Not yet.

"It looks like it's already planned," she objects. "We only have a couple of people from the watershed here. Had we known this [would be discussed], we could have had a huge crowd.… That is what should have happened."

The problem isn't the plan. Jessica Keller, the Planning Division Chief for the DOT in Baltimore, proposes putting the money into greening efforts in the area near the MARC train, where the city is already investing a hefty sum. Keller's plan would leverage the impact of a relatively small dollar amount.

The problem is the process. The decision on where to spend the money seems to be a done-deal — and a deal done when many of the stakeholders are not in the room, especially those representing the affected neighborhoods of Union Square and New Southwest. "I believe in teams, in hearing people, in buy-in," says Inez Robb, who represents the watershed from the neighborhood of Sandtown-Winchester. Without that buy-in, the best-laid plans will seldom work, whether it's cleaning old stables or building new greenways.

Community plans have a better shot at success when people like Robb buy in. Soon after she bought her first home in Sandtown-Winchester, on a newly renovated block in an otherwise troubled neighborhood, she joined the board of her condominium association and soon became its president. It is "not a thankful job," she says, but she's served faithfully for 17 years. "I'm a committed person," she says. "That's with everything. If I say I'm going to do it, I'll do it."

Robb's work with her condo board spawned a deeper involvement in community issues. She now serves on at least five different neighborhood or community advisory groups, including the Watershed 263 Stakeholder's Advisory Council. That's in addition to her day job as an IT specialist for the Social Security Administration in Woodlawn, where she's worked for 41 years.

But it is not just about doing it herself. It's about building capacity, she says. "I like empowering, sharing what I know to help you grow…I'm there with you 110 percent, but you need to do it."

True to character, Robb takes her commitment to Watershed 263 seriously. She sees communication and education as essential to success. "Those that are aware of the watershed and make the connection between greening, renovated lots, [Baltimore] Harbor, and the Bay, I think they love it.… But [with water] being underground, we don't often think about it." She says it is hard for people to make the link between eating crabs from the Bay and trash on the streets of Baltimore.

Starting the construction of the long-anticipated greenway project in Watershed 263 offers an exciting opportunity for the project — Robb agrees with that. She realizes that many decisions remain to be made about exactly what $900,000 will buy and what the project will entail. But Robb knows that the people affected by new construction of any sort should be at the table. She'll make phone calls. She'll go door-to-door. She'll do whatever she can to help get them there.

Hager walks into the center of the "reading circle" at Franklin Square Elementary Middle School. His baseball cap shields his eyes from the noon sunshine, a distinctive white beard on his otherwise youthful face. He sees dogwood trees just

beginning to flower around the ring, shrubs growing full and thick and grass in the center that needs trimming — all signs that the rich organic soil is doing its job, all signs that community buy-in can work in unexpected ways.

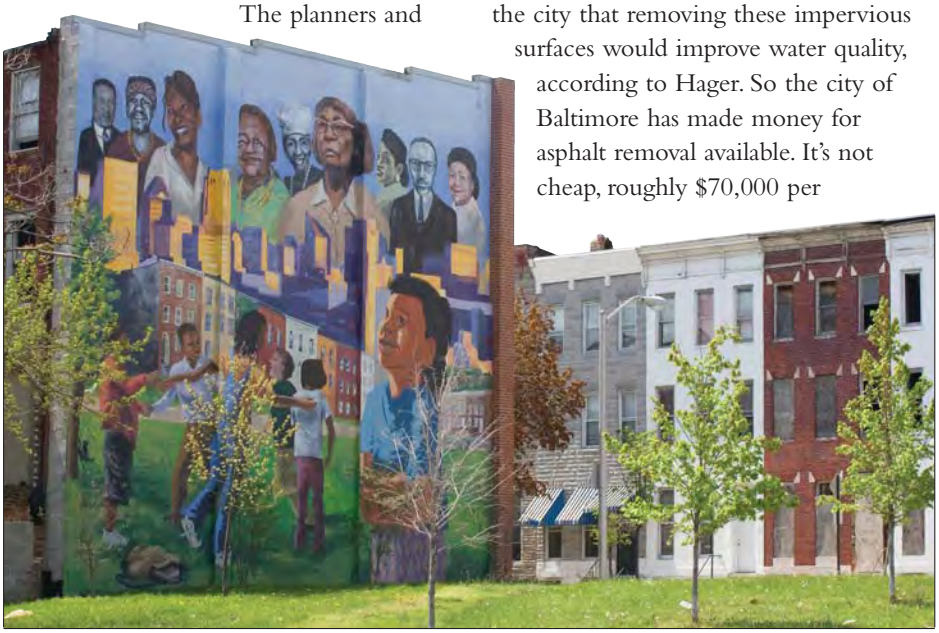
A reading circle in the middle of an asphalt schoolyard didn't seem to make sense from a landscaping standpoint, says Hager, but the students asked for it. And it made a visual statement — an island of green in a sea of black asphalt.

Then the island grew. The city pitched in the funds to remove the rest of the asphalt in the courtyard. Volunteers from the community and the school went to work with Parks & People to fix up the schoolyard. Their tally: 24 trees planted along with 200 perennials and shrubs, 3 benches built, 100 square feet of garden habitat installed, all designed by the students at Franklin Square. Green now covers the 1.1-acre schoolyard, except for one small parking area near the school entrance.

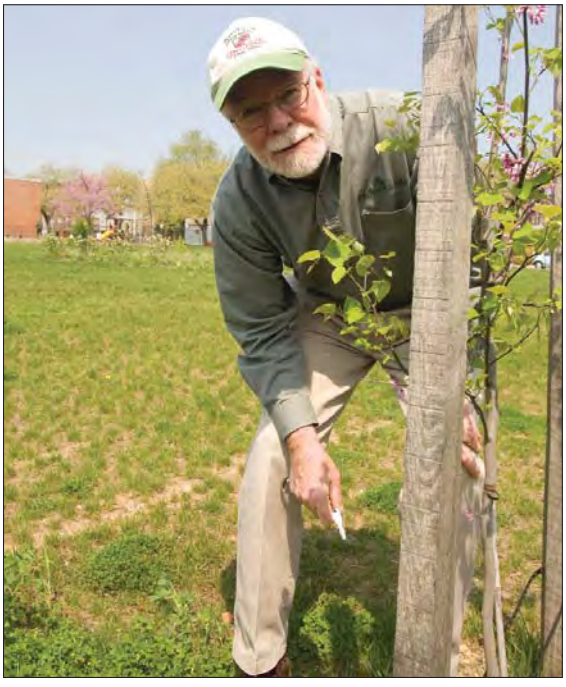
There were no "reading circles" when schools were built in West Baltimore. In the 1970s, during a period of attempted urban renewal, the city quickly tore down residential houses, and schools were literally "dropped in place," says Hager.

The planners and builders failed to remove existing basements, simply laying asphalt over existing property, thinking it would be easier to maintain, he explains. Paving over existing foundations instead generated the so-called "heat island" effect, Hager says, a dome of elevated temperatures that baked the asphalt schoolyard, discouraging recess and outside play.

So far Watershed 263's efforts have removed more than 4 acres of asphalt in schoolyards and 14 acres citywide. Schoolyard asphalt removal has been one of the "runaway successes" of the project, says Hager. Bill Stack made the case to the city that removing these impervious surfaces would improve water quality, according to Hager. So the city of Baltimore has made money for asphalt removal available. It's not cheap, roughly $70,000 per



Celebrating a heroine *of the Franklin Square neighborhood, a building-sized mural (right) honors the legacy of Ella Thompson (third from left). After her daughter Andrea was murdered near Fayette Street in 1988, Thompson embarked on a personal crusade to safeguard and enrich the lives of West Baltimore's youth. Within a year of her daughter's death, she became the director of the nearby Martin Luther King Jr. Recreation Center, a post she held for seven years. In 1996, she joined the Parks & People Foundation as one of the directors of KidsGrow, a program that introduces urban youngsters to ecological sciences and community stewardship. In 1998, while driving a car full of donated computer equipment to a city recreation center, Thompson, only 47, suffered a fatal heart attack.*



In the new green space *by Franklin Square Elementary Middle School, Parks & People's Guy Hager (left) clips a tie from a young tree that's now strong enough to stand on its own. Only a small fringe of asphalt remains in this once paved-over schoolyard, where children now enjoy a backdrop of green as they congregate during a break from class (above, bottom).* PHOTOGRAPHS ON PAGES 12 AND 13 BY SKIP BROWN.

acre in each schoolyard. But it is money well spent, says Hager.

School children at the four different West Baltimore schools have helped green their schoolyards, planting trees and wetland plants to create bioretention areas by the schoolyard storm drains. Harlem Park Elementary School now hosts an Urban Watershed Ecology Center, which teaches students and trains teachers in environmental education. Franklin Square Elementary Middle School hosts the KidsGrow Environmental Education Program, developed by the Baltimore Ecosystem Study. Since 1994, the after-school curriculum has helped elementary and middle school youth in Baltimore appreciate their natural environment and become better stewards of their community.

These efforts to green the watershed, beginning with the schoolyards, have built momentum and capacity, according to Hager. The original Schoolyard Greening Task Force has now evolved into a Green School Task Force, which is working to implement a green school certification process. An active and committed Community Stakeholder Council, with representatives from each of the neighborhoods, now helps to monitor the overall efforts of Watershed 263 and set priorities.

One of the most ambitious elements of Watershed 263's so-called "Framework for Greening" is a proposed "greenway," six miles of trail that would link parks, schools, trails, and business districts, explains Hager. The trails would be more than an intervention to reduce impervious surface area, although it will do that too. The network could have a key impact on the quality of life in the watershed, Hager says. The proposed greenway, which will see its first progress with money from the DOT earmark, would connect with the existing 15 miles of the Gwynn Falls Trail in the adjacent watershed. The hope is that it will help foster a pedestrian and bicycle culture in Watershed 263, help build community, and provide safe outdoor spaces for neighborhood youth.

Like a stone tossed in a pond, the "reading circle" spread outward, the island of green grew wider. Hager now points to the success of asphalt removal in the schools with a sense of pride. In his 10 years with Parks & People, and his 40 years as a public official and city planner before that, Hager sees his work with greening efforts in Watershed 263 as a highpoint in his career of service to the community.

Noontime traffic roars down Russell Street, a continuous stream of cars heading for I-95 and the Baltimore-Washington Parkway. Guy Hager parks at the BP gas station adjacent to Watershed 263's outfall pipe and starts down the "riverwalk," part of the 15-mile Gwynns Falls Trail. He's walked this chainlink fence-lined path dozens of times, but the water looks pretty bad — even to him.

The Watershed 263 demonstration project can point to many significant accomplishments — more than 800 trees planted, 4 schoolyards and 200 vacant lots restored, 14 acres of asphalt removed, school children engaged, and stakeholder involvement growing everyday.

The "kicker," says Hager, would be "if we've changed the quality of stormwater… if we've had environmental outcomes that we can detect and monitor," he says. But the water quality data does not show signs of improvement yet. "We're not quite there."

Where the garbage strewn, murky green water flows from the outfall of Watershed 263 marks the site of the proposed "Celebration Park," according to the project's Framework for Greening. But the watershed has a long way to go before it will be celebrating improved water quality.

To make a difference in water quality in Watershed 263 will take a full frontal assault: removal of impervious surfaces combined with focused greening, construction of a pedestrian and bicycle "greenway" throughout the watershed, and full implementation of urban Best Management Practices.

It won't come cheap. Roughly $7.5 million will buy treatment of only 25 percent of the watershed's impervious surfaces, according to the Watershed Management Plan developed to meet the requirements of the City's stormwater permit (see Urban Stormwater and the Bay, p. 15). And that price tag does not include the greenway or the treatment of stormwater in the remaining 75 percent of the watershed's impervious surfaces.

Watershed 263 will need more than public funds. The health of the water flowing beneath Baltimore's streets depends on the people above. The watershed needs the professional commitment of people like Bill Stack and Guy Hager, the personal investment of community residents like Inez Robb and Ed Chapman, and ultimately the stewardship of the next generation, the school children that are learning to cherish green space in their lives.

Improving water quality remains a tall-order task for a watershed with an already overflowing plate. The fix will not be quick or easy. But people are hard at work.

— email the author, goldman@mdsg.umd.edu

For More Information

Parks & People
www.parksandpeople.org/

Baltimore Ecosystem Study
www.beslter.org/

Tales from Urban Forests (Watershed 263 radio program)
www.talesfromurbanforests.org/index.php?theme=1

Center for Watershed Protection
www.cwp.org/

A Stormwater Primer
www.mdsg.umd.edu/CQ/V04N4/side1/

Baltimore Department of Public Works – Bureau of Water & Wastewater
www.ci.baltimore.md.us/government/dpw/water/

Urban Stream Research

Sujay Kaushal
www.kaushallab.cbl.umces.edu/
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Margaret Palmer
www.palmerlab.umd.edu/#research

Andrew Elmore
www.al.umces.edu/research_new/watershed_hydrology_biogeochemistry/buriedstreams.html

Chris Swan
userpages.umbc.edu/~cmswan/index.htm

Urban Stormwater and the Bay

By Erica Goldman

Stormwater from city streets ends up in the Chesapeake Bay, carrying heavy metals, organic carbon, nitrogen, and phosphorus to the mix. But among the expensive problems facing the troubled estuary, where does urban stormwater fit in?

This is not easy to answer, says Tom Simpson, who's served for 10 years as chair of the Nutrient Subcommittee of EPA's Chesapeake Bay Program. The subcommittee's Urban Stormwater Work Group devotes most of its energies right now to planning for stormwater management in new development, he explains, not on retrofitting older systems.

To him, this allocation of effort within the Bay Program makes sense. New development offers an opportunity to get it right the first time when it comes to stormwater infrastructure. "The dumbest thing we can do is to keep creating new problems when we can't solve existing ones," Simpson says.

Skip Brown

National Resources Conservation Service

Urban issues like stormwater *receive less attention than agriculture in the context of Baywide restoration efforts. With limited dollars and big problems, many argue that focusing on agriculture will bring more bang for the buck when it comes to reducing nutrient loads to this troubled estuary. But with the combined pressures of suburban development and aging infrastructure, Baywide goals to reduce of nitrogen, phosphorus, and sediment in urban areas are losing ground.*

Cost and Benefit

But existing stormwater infrastructure, especially in older urban areas, clearly needs to be upgraded to protect local waters as well as tidal waters downstream. And the Bay Program has a mandate to address large-scale urban stormwater problems, explains Simpson. Maryland's Tributary Strategy, in fact, requires a retrofit of 40 percent of all stormwater infrastructure in developed land by 2010.

"Frankly, the 40 percent was not something that anyone ever felt was achievable," says Simpson. He says that this high number came as a concession to bring other practices, like agriculture, to higher levels. "It's the piece we'll never get to."

According to calculations, retrofitting 40 percent of existing stormwater infrastructure would reduce nutrient loadings by 5 to 10 percent — at a cost of $7 to $8 billion. By comparison, changes in agricultural practices and sewage treatment plant upgrades could cut nutrient loads by 80 percent — at price tag of $2 to $3 billion. "If the priority is nutrient reduction in the Chesapeake Bay, urban stormwater is not the wisest expenditure," he says. Targeting agriculture would bring the greatest impact, he says, which "leaves the urban side out in the cold in terms of retrofitting."

There is a disconnect between local stormwater issues and Baywide restoration goals, says Simpson. "We keep trying to portray our need for good stormwater management under the auspices of trying to restore the Chesapeake Bay. Maybe that isn't why we should do it.… We need to build a case on local merits of needs for stormwater [management]."

Local governments are well aware of the merits of managing stormwater. Right now, the responsibility for managing stormwater falls squarely on their shoulders, thanks to regulatory requirements from the National Pollution Discharge Elimination System (NPDES). "We want to do our part to protect Bay and tidal tributaries, but we have significant problems within … local streams," says Meosotis Curtis, who administers the stormwater permitting system for Montgomery County's Department of Environmental Protection. Local governments need money to meet those requirements, he says, but they are getting little financial assistance from watershedwide efforts like the Bay Program.

Permits and Pollution

The NPDES permitting process for stormwater, created in 1972 by the Clean Water Act, requires municipal separate storm sewer systems (MS4s), like Watershed 263, to develop stormwater management programs that prevent harmful pollutants from being washed into the system and then discharged into local waters.

Currently MS4 permits are more "programmatic" than regulatory. Counties must monitor water quality of stormwater, work to reduce discharges of compounds (such as nitrogen, phosphorus, and total suspended solids), and provide outreach and education.

An MS4 permit says that whatever you are doing must improve water quality, explains Curtis. It is basically a mandate to "do good things." The current language does not set any limits for how much nitrogen and phosphorus, for example, can

Continued on p. 16

Stormwater, *continued*

be present in stormwater. But future permits may set "load limits" for stormwater runoff.

Such so-called "load limits" already apply to the permitting process for industries, power plants, and sewage treatment plants. These daily limits, or Total Maximum Daily Loads (TMDLs), were originally established by the Clean Water Act to protect local waters from cumulative pollutant loads from a range of potential sources. Both Simpson and Curtis say that these TMDLs would also set more stringent requirements for the quality of stormwater runoff. With such a change, stormwater outfall pipes, like sewage treatment plants, would not be allowed to discharge nutrients or sediment above a certain fixed amount. In some instances, these load limits already exist, says Curtis. In the Anacostia, for example, load limits have been established for sediment, coliform bacteria, and biological oxygen demand (a proxy for the metabolic activity of bacteria). Tougher regulations will soon be coming nationwide, Curtis says, and these will act as a big "regulatory hammer" for stormwater management.

New load limits for stormwater may produce positive ripple effects in other environmental areas — such as air pollution. "If we have to actually remove nitrogen from stormwater, we don't have a lot of tricks," says Simpson, so prevention is key. Since much of the nitrogen loading in stormwater comes from airborne exhaust from cars and power plants that drifts down to road surfaces, urban areas may have to push for more stringent air pollution controls. "The best BMP [Best Management Practice] is for it [nitrogen oxides, etc.] not to fall," he says.

Finding Funds

With load limits required by MS4 permits, it would be easier to make the case for funding stormwater management — at both local and federal levels. When the Clean Water Act was first passed, the federal government provided money for municipal wastewater upgrades. If load limits are imposed on stormwater, says Curtis, "we would hope that funding would come from higher levels. It will cost a huge amount of money."

Some good news for funding urban stormwater projects came this year when the state legislature created the new Chesapeake Bay Trust Fund, seeded at $25 million for the first year. Within the Trust Fund will be the Chesapeake Bay Nonpoint Source Fund to provide financial help for urban and suburban stormwater management.

So is urban stormwater a local or Baywide issue? The answer appears to be that it is both. "To build a case for stormwater, urban stormwater can't be about the Bay," says Curtis. It's about the quality of life in the urban environment, she says.

Simpson agrees. "If you've got people feeling good and connected to local waters, he says, "just as the waters connect to the Bay, they will connect too."

New Online Features

Check out our new BayBlog and our photo gallery, two new features of *Chesapeake Quarterly Online*, www.mdsg.umd.edu/cq. Read and comment on the first blog entry, some behind-the-story thoughts about West Baltimore by Erica Goldman. The photo gallery contains more images of the Baltimore neighborhoods she visited and the people she spoke to while working on this issue of the magazine. These online features are part of an effort to provide readers with more in-depth coverage of the challenges facing the Chesapeake and its watershed.

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