LAST PRINT ISSUE: THE DIGITAL FUTURE BEGINS NOW

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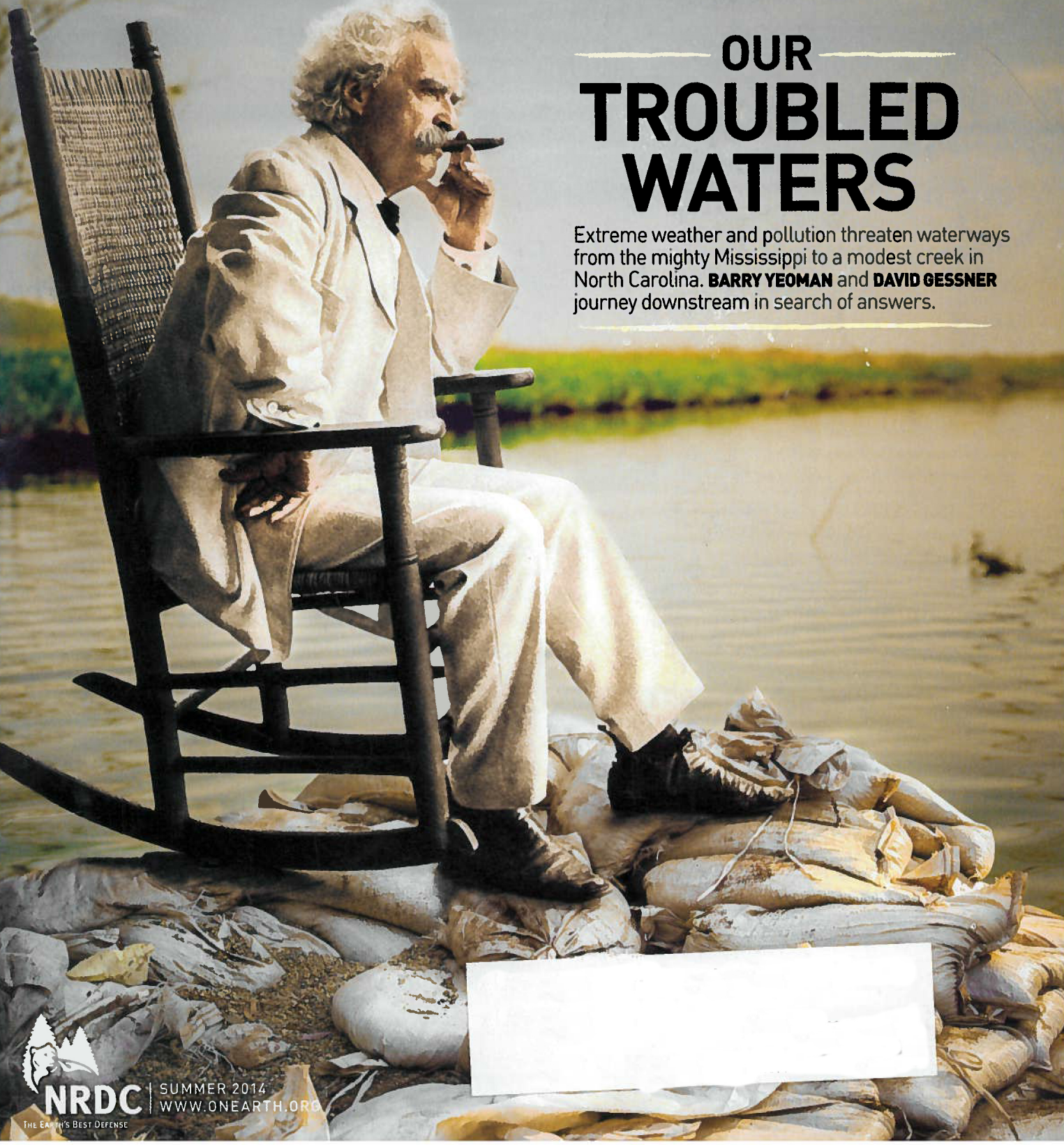

OUR TROUBLED WATERS

Extreme weather and pollution threaten waterways from the mighty Mississippi to a modest creek in North Carolina. **BARRY YEOMAN** and **DAVID GESSNER** journey downstream in search of answers.

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MILWAUKEE SEES THE LIGHT

HOW ONE RUST BELT CITY FOUND THE KEY TO ITS REBIRTH: BRINGING NATURE AND PEOPLE CLOSER TOGETHER

BY RICHARD MANNING

MILWAUKEE MAYOR Tom Barrett is known for taking prickly offense at the term "Rust Belt." Nonetheless, the belt fits. The old-line manufacturing cities of the upper Midwest preceded the rest of the nation in collapse by decades. Foreclosure, blight, drugs, failed schools, homelessness, brownfields, pollution, decay, and crime: there's plenty to justify the term, and Milwaukee has it all. Or maybe had it all. Because a closer look at the city reveals whole vats of lemonade where once were heaps of lemons.

Wisconsin may be a national poster child for dysfunctional politics and red-blue tensions, yet Barrett, a Democrat, is serving his third term, winning reelection twice with more than 70 percent of the vote. Political scientists no doubt can explain his popularity in their fashion, but the more satisfying analysis comes from an ant man. Three decades ago, the reigning eminence of conservation biology, E. O. Wilson, offered up the biophilia hypothesis—*biophilia*, from the Latin, meaning love of life, all life, as in nature. In a 1984 book, Wilson argued that love of nature makes humans more attentive to their surroundings, just as affection allows attachment to and knowledge of a loved one's face. In evolutionary terms, attentiveness and attachment confer fitness. Now this bit of arcane evolutionary theorizing has wended its way through a web of disciplines and experiments, through education and public health, landscape architecture, psychiatry, urban planning, and banking to become a playbook for politicians like Barrett, who is consciously using environmental science to loosen the bind of the rusty belt.

Wilson's idea has given rise to the closely related concepts of biophilic design and biophilic cities, the latter actively promoted by Tim Beatley, a landscape architect at the University of Virginia. In interviews, Beatley and Stephen Kellert, Wilson's co-editor on an early book about biophilia and a chief proponent of biophilic design, both stressed that the idea includes—but more crucially goes beyond—concepts like green building and simple sustainability to capture the innate human attachment to nature and increase well-being by honoring it.

Beatley has developed a list of criteria that includes this extension and has compiled a list of biophilic cities worldwide: Portland, Oregon; San Francisco; Phoenix; Singapore; Wellington, New Zealand; Oslo; Vitoria-Gasteiz, Spain; Birmingham, England—and Milwaukee. Part of the reason for including Milwaukee, he told me, is the city's explicit attention to and understanding of the larger idea. With that in mind, I went to talk to Mayor Barrett about the transformation that is under way in his city.

"When I was growing up, being an environmentalist was like, 'If you're going to San Francisco, be sure to wear some flowers in your hair.' It meant you were opposed to economic growth and anything having to do with money," Barrett said. "I don't think it is a fuzzy issue. It's real. You are hitting people where they live. There's not a lot of theory here. This is all real stuff."

Biophilia remains in each of us, expressed in traits like preference for waterfront property or an

PHOTOGRAPHS BY MICHAEL WESCHLER

BIG CHANGES Milwaukee's Urban Ecology Center began life as a classroom operating out of a double-wide trailer. This is what it looks like today.

apartment with a view of a park. More to the point, though, Wilson's hypothesis says that satisfying these desires makes us physically and emotionally healthier. The hypothesis has been tested not just in labs but in offices, hospitals, schools, slums, and suburbs; in Korea, throughout Europe, in the United States, and especially in Japan.

An attachment to nature is embedded in Japanese culture, expressed in a formal movement known as *shinrin-yoku*, which translates roughly as "forest bathing." The Japanese are fond of walks in the woods and believe these deliver real benefits, which is a demonstrable assertion. For instance, one set of experiments involving Japanese businessmen looked at the strength of immune system response and the body's production of a weapon called "natural killer cells," or NK cells. Walking in the woods showed a significant and enduring increase in these cells, which seek and destroy invaders.

Scientists initially assumed that biophilia would produce a rather vague and low-level psychological response having to do with reducing stress. Clearly that kind of benefit accrues. But something as precise and measurable as immune response? Yes, and more. In hospitals, for instance, it has been demonstrated that surgery patients recover faster if they have a room with a view of trees and open space. A psychiatric hospital in Sweden designed explicitly to incorporate natural light and access to the outdoors showed dramatic decreases of 25 percent in involuntary injections and 50 percent in use of physical restraints after one year.

FRANK LLOYD WRIGHT DESIGNED HIS BUILDINGS TO MIMIC NATURE, BECAUSE HE BELIEVED IT MADE THEIR OCCUPANTS HAPPIER AND MORE AT EASE—AND, IN THE CASE OF OFFICE WORKERS, MORE PRODUCTIVE

Schoolkids who go for a walk in a park before testing score higher than kids who walk a city street. Office workers get sick less often and are more productive if their work spaces have natural lighting and views of the outdoors, or access to it; even steps as simple and elemental as introducing potted plants have a positive effect. Frances Kuo, a psychologist at the University of Illinois at Urbana-Champaign, has done research that shows a decline in violence and aggression in low-income housing projects with access to green space. In separate studies in the United States, the Netherlands, Denmark, Scotland, and Japan, scientists have found that people living close to forests, parks, beaches, and lakes have fewer health problems.

Over time, the topics of research have cut across the usual subdivisions of policy, and relatively easy measures like the design of a park have shown spinoff benefits for things as disparate as community violence and stormwater drainage. Disparate, but all relevant for a mayor like Barrett, and this is the heart of the matter. The threads eventually weave together to enmesh those very social and economic problems that plague any city's budget: crime, productivity, health care, education, to name just a few.

JULI KAUFMANN IS a developer, so one would expect a business suit, especially given her background as an executive at Procter & Gamble. But she's in jeans, lugging a bicycle helmet. We are standing on a former brownfield. Her family's house is nearby in this older Milwaukee neighborhood, dotted with boarded-up warehouses, skinned-out tanneries, and hollowed hulls of food packing plants. Her neighbors are mostly Hispanic and poor. The genesis of Kaufmann's Clock Shadow Building was her wish to transform an abandoned site that was a blight on the neighborhood into a positive asset for the community. She also didn't want a Starbucks or Applebees sprouting in a cookie-cutter box-building. So she did some deals, and by 2011 investors had committed $7 million to this four-story, 30,000-square-foot sculpture of brick, wood, and glass. Most of the siding and bricks are recycled, most of the doors and trim salvaged. Much of the wood comes from old pickle barrels from food processing factories.

Throughout, the building makes light of its old-to-new theme, literally so. Kaufmann points to a monster light fixture just overhead in the atrium, a rack of bulging incandescent bulbs—former factory lights that once weighed in at 1,000 watts each. Their filaments are dead now, and the retro bulbs are backlit by LEDs to yield the glassy glow. A long strip of fabric reaches to the light straight up an open center column of

LIGHT FANTASTIC Frank Lloyd Wright wanted the S C Johnson building "to be as inspiring to live in and work in as any cathedral ever was to worship in."

air wrapped by a four-story winding stairway. Thus the eye is drawn to the vertical, and unconsciously, the beholder is drawn to use the stairs.

The first floor is retail space, occupied by an artisanal cheese maker, but on the second floor, things begin to change. That space is given over to a walk-in medical clinic for poor and homeless people, who typically get primary care in hospital emergency rooms. The clinic had operated before in run-down quarters. The new space has a south wall of glass that bounces natural light through a waiting room detailed in the same pickle-barrel wood, brick, and steel as the rest of the building.

The clinic routinely treats problems like diabetes and obesity, just like any medical clinic in a poor neighborhood, but staffers also inquire about a history of child or sexual abuse. And when they find it, they send people to the fourth floor, which houses a counseling center specializing in these issues. And then maybe to the third-floor yoga and massage studio, a wide-open space blessed with wood warmed by abundant sun. Or perhaps to the building's rooftop gardens, where people grow food and learn about nutrition. The building's design is as integral to the well-being of its users as it is to the use of energy and water.

Buildings can harm or heal, depending, and this is not a new idea. Head south from Kaufmann's building 40 minutes to Racine, to one of Frank Lloyd Wright's most famous masterworks. The odd part of walking into his administration building for S C Johnson, of Johnson Wax fame, is the sense of stillness and peace. This is a working office building in a sprawling cluster of manufacturing plants, but is nonetheless silent and, at the same time, capacious. It's wide open inside, the verticality of its three stories enforced by a series of columns that Wright called "dendriform," like trees, meant to mimic trees of a savanna. The effect is reinforced by a ceiling of translucent glass tubes, flooding the place with light and creating the illusion of a sunlit sky seen through the not-quite-closed savanna canopy made by the "trees."

Wright consciously designed his buildings to mimic nature, because he believed it made their occupants happier and more at ease—and, in the case of office workers, more productive. This is biophilic design, and S C Johnson has now had 75 years of experience to judge whether it makes hard-core business sense. Maybe the best indicator of the result is that when the company needed more space, it commissioned a new administration building a stone's throw from Wright's that, if anything, amped up his ideas. In similar spaces nationwide, research has demonstrated that they make for fewer sick days, decreased absenteeism, and lower staff turnover—in short, increased productivity. That is to say, businesses leave money on the table when they cage workers in Cratchity quarters like the ubiquitous, windowless, fluorescent-lit cubicle.

HEAD OUT OF JULI KAUFMANN'S BUILDING AND walk a couple of short blocks northwest toward downtown, to the confluence of the Menomonee and Milwaukee rivers. Then head upstream against the flow just a few blocks to what was once one of the nation's largest brownfields, an overly polite term for a festering urban ulcer of collapsed manufacturing and food processing plants, coal-and-steam-age decay.

The Menomonee Valley has been integral to human habitation of this place since long before there was a Milwaukee (the city's name is thought

ILLUSTRATION BY BRUCE MORSER

from NRDC THE POWER OF CITY HALL

KAREN HOBBS

Senior policy analyst in NRDC's water program, based in Chicago, focusing on water efficiency policy in the Great Lakes Basin

How much can mayors like Milwaukee's Tom Barrett do to revitalize our cities and make them more sustainable?

Mayors have an enormously important role to play. They can provide not only the vision but also the political muscle—and the money! Before coming to NRDC I worked for former Mayor Richard Daley in Chicago. He was fond of saying that cities were in the forefront of every issue, which was why they couldn't afford to stand around waiting for the federal government—or anyone else—to act. Mayor Daley was an early leader of the city greening movement, which he saw not only as a way of protecting the environment but as a means of revitalizing Chicago's economy. His successor, Rahm Emanuel, clearly gets it as well. He's investing $50 million over the next five years to increase the amount of green infrastructure in the city. Michael Bloomberg also oversaw the development of a comprehensive green infrastructure plan when he was mayor of New York City. And after Superstorm Sandy battered the East Coast in October 2012, he unveiled a $19.5 billion program to help the city recover and be more resilient in the future.

Tell us a little more about green infrastructure.

Green infrastructure means using both natural and man-made systems such as rain gardens, bioswales (plantings that absorb rainfall), street trees, and permeable pavement to prevent sewer overflows and flooded basements. Green infrastructure can help combat climate change by making our cities cooler and using plants to store carbon. Their root and leaf systems are also additional ways of storing rainwater.

Richard Manning's article cites green infrastructure as one of the many positive things that are happening in Milwaukee.

It's become a big issue for mayors all across the country, and Milwaukee is a great example. In working to revitalize his city, Mayor Barrett has a valuable partner in the Milwaukee Metropolitan Sewerage District. It may sound surprising that a wastewater utility would play this role, rather than just focusing on building more sewers and pipes to whisk water off the streets and highways, which is what most such utilities do. But MMSD is looking at how it can make strategic investments aboveground. It has already invested millions in green infrastructure, supporting the installation of green roofs, tree planting, and permeable pavement. And the goal is not only to help manage stormwater and prevent flooding but to make streetscapes and neighborhoods more attractive.

to be derived from its Native American name, which meant something like "gathering place by waters"). Post-conquest, the Menomonee, like most American river valleys, became a gathering place for industry, and so it would remain until manufacturing went bust in the 1980s.

"When they left, some manufacturers left a giant mess for the taxpayers to clean up," says Matthew Howard, the city's sustainability director. Tens of thousands of jobs disappeared from a two-mile-long and quarter-mile-wide sprawl of brick and mortar. The troubles metastasized through the city. Takeovers and conglomeration sapped the industry that made Milwaukee famous. Just north of the valley, the 10-square-block complex that brewed Pabst Blue Ribbon, the quintessential American working class beer, shut down operations in 1996.

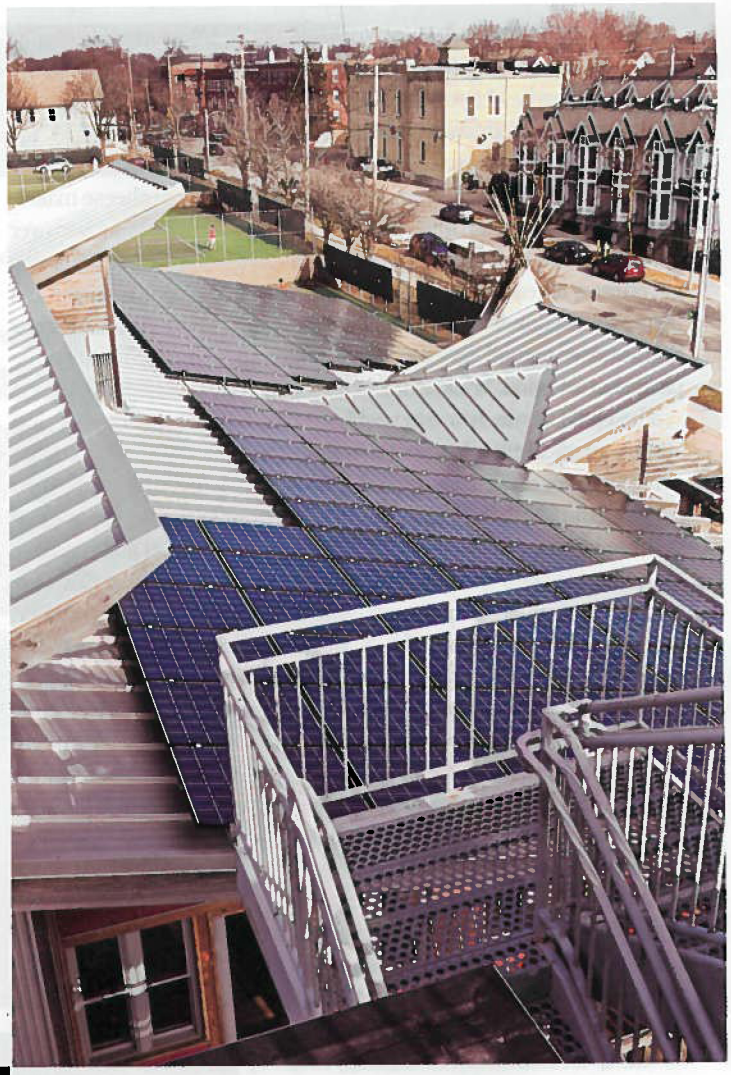
In 2004, just as Barrett was taking office, the city rounded up some pump-priming—$16 million in tax increment financing and $14 million in grants—then knocked down the sullied bricks and mortar. Ten years later, the first thing a visitor notices, even in winter, is a freakish anomaly: cured seed heads of big bluestem, little bluestem, and Indian grass—the charismatic megaflora of tallgrass prairie—poking through the snow. But restoring native plants to a brownfield was not just an ecologically correct choice; it was a matter of hard-headed practicality. These prairie species are deep-rooted and suited to survive the catastrophic storms and floods that are occurring in the upper Midwest with appalling frequency. Sixty acres of the valley, about half of the city's redevelopment project, have been set aside to catch runoff and filter it with the deep roots of a working wetland, before slowly leaching it to the river.

Meantime, abandoned houses were demolished and the lots became community gardens. Asphalted schoolyards were ripped up and replaced with prairie grass, outdoor classrooms, and gardens, all layered over soils engineered to soak up rain. New green infrastructure along city streets catches and channels water.

"We went from 50 to 60 combined sewer overflows in the mid-1990s to one last year," says Howard.

The industrial age alternative was to dig holes, bury pipes, and build treatment plants. The grasses do the job a whole lot more cheaply, and so it made sense for the city to pay the extra costs of greenways out of its capital budget. In the early going, the city was also able to attract grants for these projects, partly because the work was seen as cutting-edge by a variety of funders. That flow of money continues, but Howard says the city has learned enough to trim the extra cost of bells and whistles like greenways to near zero. As people gained experience in handling, treating, and cleaning water, Milwaukee found a new line of work. Now there is a Water Business Council with 150 members doing consulting, construction, and design. The University of Wisconsin–Milwaukee is at work on a shiny new building for its school of freshwater management, not on its main campus, but in the city's inner-harbor area, which happens to be the next moribund industrial center targeted for biophilic redevelopment.

MOST LOTS ARE OCCUPIED BY NEW FACTORIES THAT HAVE AGREED TO ADOPT GREEN DESIGN STANDARDS AND TO PAY FOR THE UPKEEP OF ADJACENT WETLANDS



The 60 acres not set aside for wetlands in the Menomonee Valley were diced up into industrial park spaces. All of those lots are now sold, allowing the city to recover some of its seed money. Most are occupied by new factories that have agreed to adopt green design standards and to pay for the upkeep of the adjacent wetlands. One explicit goal was to maintain some continuity with the city's manufacturing tradition. The Falk Corporation, for instance, continues to manufacture giant wheels, 40-foot-wide gears, and such, big steel things of the sort Milwaukee and Falk have always made. The next factory over makes wind turbines and the one after that controls for solar panels. There are now at least 1,300 new manufacturing jobs in the valley.

JUST ACROSS THE RIVER, WHERE FLY FISHERS ARE NOW drawn to the spring and fall runs of steelhead and coho salmon, another new building nicely harmonizes with the common brick, wood, and LEED theme. The first thing one notices in the vertical open interior is a clutter of snowshoes, cross-country skis, and racks of backpacks, some of the gear being handed off to clutches of kids who jostle and scamper about. This is one of three similar buildings in the city, the work of the Urban

NEW VISIONS At the Urban Ecology Center, far left, students see solar power in action. Left, local artist Ryan Foat created this light fixture for the Clock Shadow Building from giant bulbs salvaged from shuttered factories.

Ecology Center, which has set out to reconnect Milwaukee's kids to nature, especially kids in the toughest neighborhoods. The Menomonee Valley's restored prairie and river corridor has created a giant open-air classroom and romping ground, the sort of habitat the center needs.

Across town, the rooftop of another of the organization's centers offers a bird's-eye view of a restored oak savanna along a section of the Milwaukee River. This facility sits a few miles north of downtown and is linked by paths to the city's river walkway of restaurants, pubs, and coffee shops, as well as boat slips that rent kayaks and canoes. The park adjacent to the new ecology center had been there a long time, but went feral from disuse and was claimed by drug dealers, until finally neighborhood dog walkers combined forces and squeezed out the thugs. Now the park has been restored with native grasses and is alive with dogs, runners, paddlers, and kids.

The building's vertical aspect is echoed by a connected tower that adds another story, elevation that is more than an aesthetic. The wood and stone lobby—complete with twig furniture and a roaring wood-fired stove—features a map of the city embedded in the floor. Beth Heller, the center's director of education and planning, says the map and the vertical vantage combine to support a key element of environmental education: teaching scale, showing kids how their lives are embedded in a larger context. Reaching the second floor they watch the map shrink, then head up the tower to see the river, the park, and the neighborhoods where they live. They see how it all comes together, how reality replicates the map, and how rivers run through it. Many fourth-graders had never seen Lake Michigan, even though it's just a few blocks from their homes. When field trips took these same kids to the lake, instructors needed to correct a common assumption that it was the Atlantic Ocean, which they had seen on maps in school.

The kids also learn to overcome fear. One story is told here of a high-school girl taking her first walk in the woods. A butterfly fluttered on her, and she suffered a full-blown panic attack. "When kids come to the park the first time they are thinking lions and tigers and bears," Heller says. "Even just the experience of walking into that space is transformative for them. Once they get over that fear, there is a sense of awe."

The ecology centers have partnered with 55 urban schools, each of which sends students there at least 24 times a year. The three centers now serve about 51,000 kids annually on a budget of $3.7 million. This is not classroom time. The students are outside during each session, doing what looks for all the world like field science. Follow-up research has demonstrated that children who are so engaged perform better on standardized math, science, and language tests. So the restored ecosystem does something for the schools, just as it does for the city's water problems, using exactly the same land base of greenways, parks, and gardens.

THERE IS NOTHING NEW ABOUT ENVIRONMENTAL education, of course, or for that matter about using natural systems to deal with problems like runoff, or about energy efficiency and green building, or parks and greenways and nature trails and sweeping vertical buildings with skylights. So what does the biophilia hypothesis give us that we didn't have before?

Marcia Caton Campbell has long studied the evolution of this idea, and as more than a student. She is the executive director of the Center for Resilient Cities, which has offices in both Milwaukee and Madison, quartered in the former in a brick, wood, and steel LEED Platinum development that once was the boiler house of the Pabst brewery complex.

Campbell is a refugee from academia, a Ph.D. in urban planning, a former professor at the University of Wisconsin–Madison. What makes biophilia such a valuable idea, she says, is that there is now an evidence base strong enough to prove that the biophilia hypothesis can untangle many disputes about the environmental costs of development. But it's also valuable because it is an umbrella. It is indeed assembled from some old ideas, but it provides a way to weave those ideas together into a complex whole.

"It's almost as if it is reawakening part of our DNA and parts of our psychological makeup that have been dormant," she says.

DNA? A nature-loving gene? Maybe. But at the very least, we humans are pre-wired in some way to head in this direction. That fact in itself is a signpost marking a pathway toward cities that are at once sustainable and fulfilling, even in the Rust Belt.

Richard Manning is a frequent contributor to OnEarth. *His latest book is* Go Wild: Free Your Body and Mind from the Afflictions of Civilization *(Little, Brown).*