



SCIENCE TO DESIGN

**THE WATERY, REEDY SITES OF BIOHABITATS
ARE MEANT TO OVERCOME HUMAN DISTURBANCE
AND REMAKE ROOM FOR ALL CREATURES.**

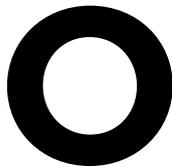
BY KIM O'CONNELL

STUART PEARL PHOTOGRAPHY



ACACIA RESERVATION
Native grasses sway
in a restored meadow
at this reclaimed
golf course outside
Cleveland.

ACACIA RESERVATION



ON A BRISK SPRING MORNING, I find myself tramping across a forbidden patch of land in Staten Island, New York. The ground offers ample evidence of the site's difficult former life:

broken glass, old tires, random shoes, doll parts. I pick my way carefully, trailing after Cait Field, the science and research development manager for the site, and Terry Doss, the leader of the Hudson River bioregional office of Biohabitats, a national ecological restoration and design firm. We wind our way through the trash and reedy brush until we reach our destination: a newly restored streambank along a sizable creek, with bulrushes and cordgrass anchoring the shoreline. As I inhale the sweet smell of the native grass and hear birdcalls from nearby trees, it's hard to believe that we are so close to the New Jersey Turnpike and the towers of Lower Manhattan. Stranger still is the thought that this site was formerly the Fresh Kills Landfill.

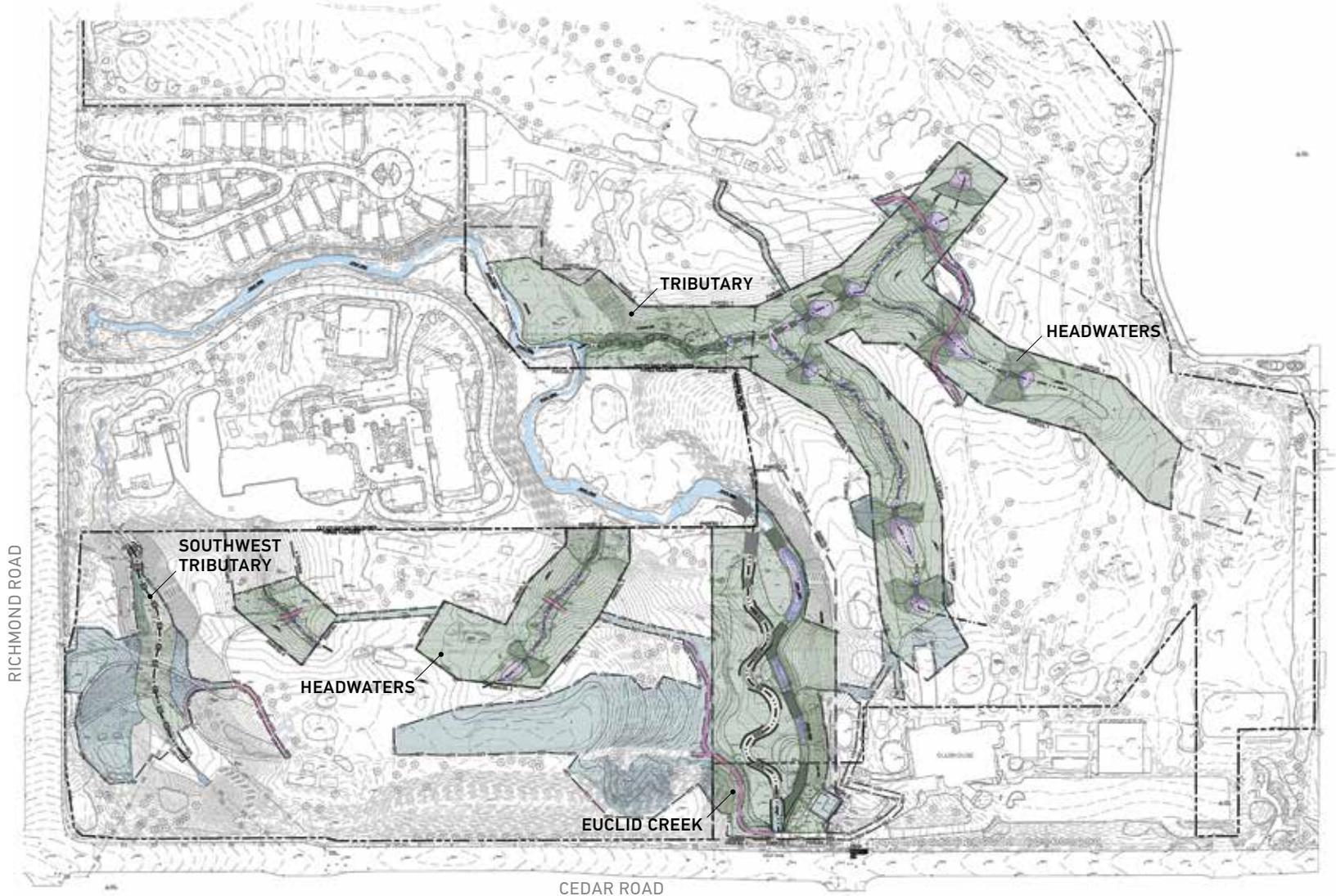


Opened just after World War II, Fresh Kills Landfill once had the dubious distinction of being the largest landfill in the world. After decades as a fetid eyesore for New Yorkers, the landfill closed in early 2001, only to reopen briefly after 9/11 as a repository for debris from Ground Zero. Derived from the Dutch word “kill,” which means “stream,” Fresh Kills’s name had always seemed unfortunate, with people emphasizing the darker implications of the second word “kills” versus the first. And yet the site had once been a sanctuary of tidal wetlands, streams, and natural habitat before the garbage came. Ever since the landfill closed, the New York City Department of Parks & Recreation has slowly been reclaiming and

ABOVE
At the Acacia Reservation, long-buried streams have been daylighted and reconnected to natural sources.

LEFT
Reclamation involved installing a series of riffles, cascades, and berms to facilitate water flows and naturalize the formerly manicured spaces.

ACACIA RESERVATION — EUCLID CREEK, TRIBUTARIES, AND HEADWATERS



RICHMOND ROAD

CEDAR ROAD

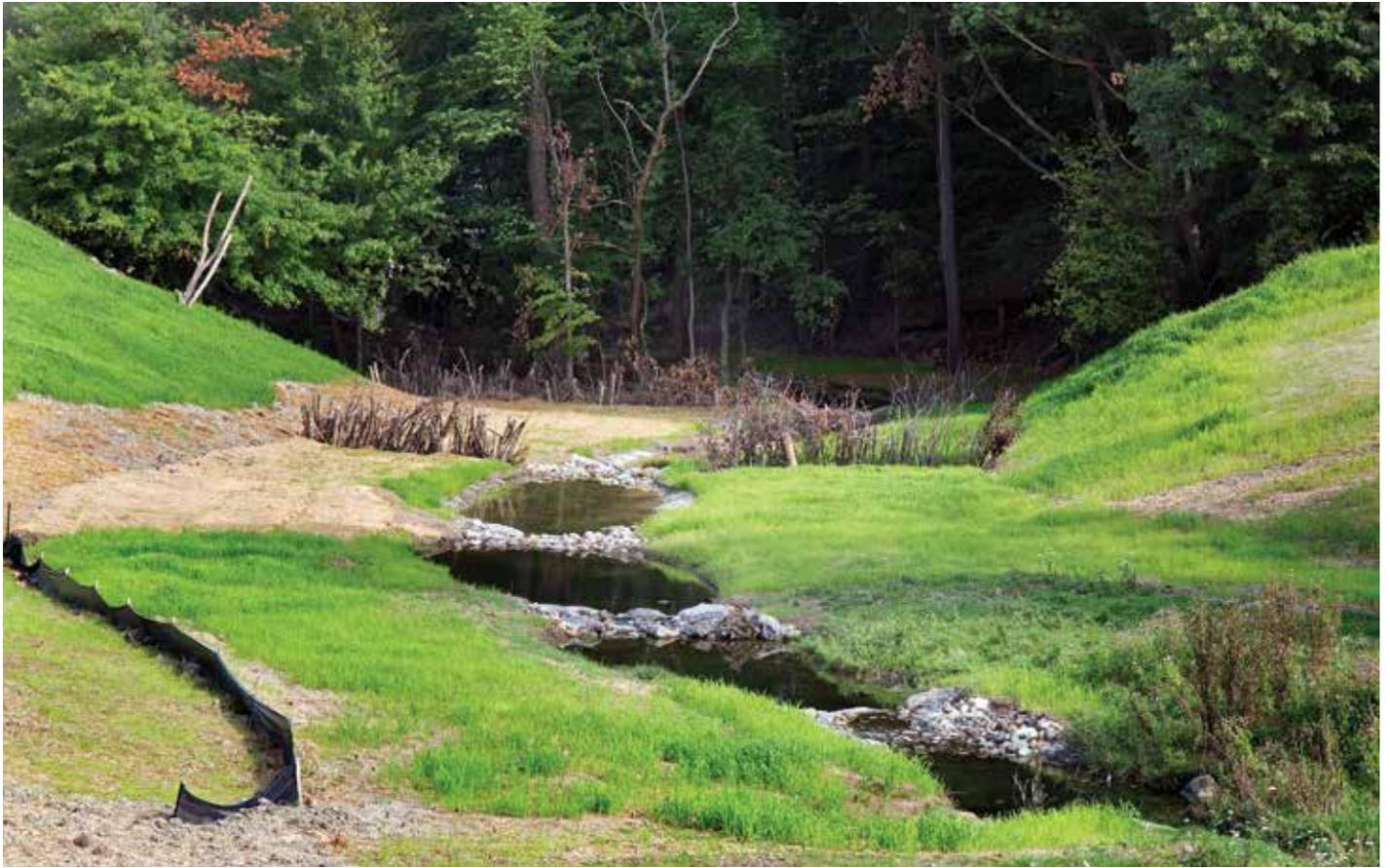


restoring the site as Freshkills Park—turning the former two-word name into one, and changing this blighted landscape into a green space that will be three times the size of Central Park when completed. Working on a multidisciplinary team led by James Corner Field Operations, Biohabitats has been a longtime partner at Freshkills, helping devise strategies to restore native habitat and wetland plant communities and control invasive species such as *Phragmites*.

This kind of disturbed environment is familiar to Biohabitats—where urban development has interrupted or buried or polluted natural systems, where erosion has destabilized waterways, and where wildlife habitat has been divided or lost. “We see the development of Freshkills Park as an opportunity to pilot potential new methodologies

for urban environmental restoration,” Field says. “The work of Biohabitats is directly in line with this goal, as they are at the forefront of exploring new techniques and pushing the limits of what is possible in these disturbed landscapes.”

With headquarters in Baltimore, Biohabitats is a multidisciplinary firm of landscape architects, ecologists, engineers, and wetland specialists who work out of more than a dozen offices across the country, which are located according to their bioregions. The idea behind the bioregions is to organize their work in areas that share physical and ecological attributes and cultural connections, irrespective of political boundaries, allowing the firm to better apply science to design. In addition to the Hudson River office and the headquarters, which represents the Chesapeake/Delaware Bays



bioregion, other bioregional offices cover the Great Lakes, the Ohio River, the Southeast Atlantic, the Southern Rocky Mountains, the Southwest Basin & Range, and Cascadia—representing more than 70 employees in all. The firm’s diverse

portfolio includes wetland and streambank restoration projects, campus and institutional plans, golf course reclamations, and wastewater treatment facilities, all addressed in highly localized, site-specific ways.

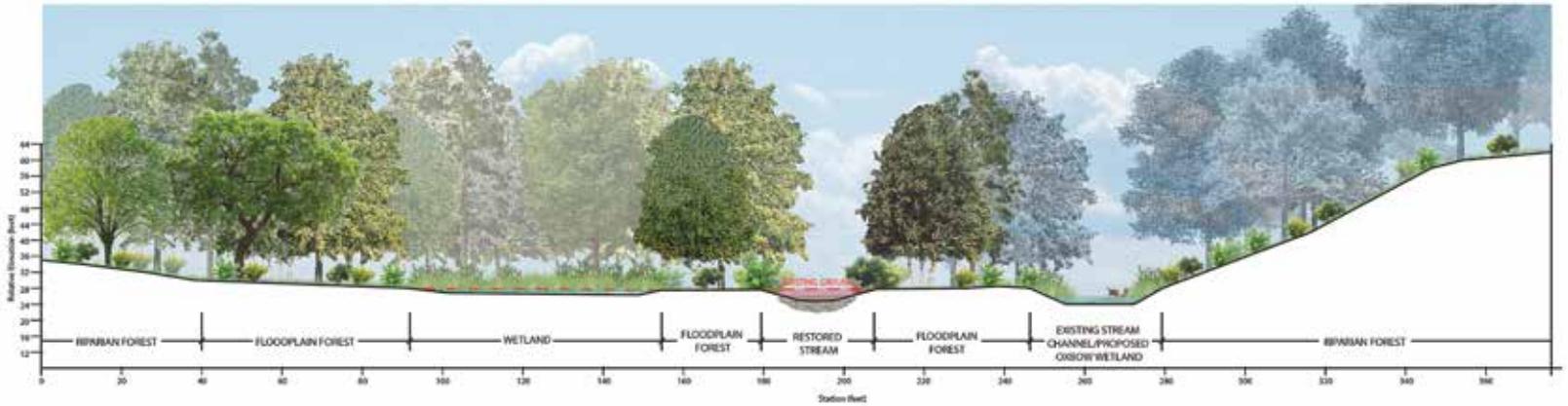
TOP
A newly visible and functional stream at Acacia Reservation leads into a wooded forest to connect with an existing creek.



Helming the firm is Keith Bowers, FASLA, who founded Biohabitats in 1982, the year he graduated from West Virginia University. While he was a landscape architecture student there, Bowers spent his summers along the Chesapeake Bay, studying both that storied waterway and the barrier islands of the mid-Atlantic. At the time, the bay was a cause for ecological alarm, with its first known marine “dead zone” recorded in the 1970s. Bowers had been strongly influenced by the work of the late Edgar Garbisch, who had built a practice restoring tidal wetlands along the bay, and he wanted to make a firm that would focus on ecological restoration at a time when that was hardly a popular or well-understood enterprise. Today, the firm has completed some 600 projects and regularly finds itself working for and with government agencies, nonprofit organizations, and other landscape architecture and design firms.

BOTTOM
Biohabitats team members Pete Muñoz; Chris Streb; Keith Bowers, FASLA; and Matt Koozer stand in front of an engineered logjam at a habitat restoration project along Oregon’s Sandy River, downslope from Mount Hood.

CONCEPT FOR EUCLID CREEK — SECTION



TOP

Essential to the Acacia restoration is the reintroduction of urban ecology layers that have been depleted and eroded from this site.

BOTTOM

Making water visible is usually anathema in an urban area but is part and parcel of reconnecting the waterways to their floodplains.

“I see my work as embodying two main drivers,” Bowers says. “Number one is ecological restoration. Number two is operating this company in a way that embodies those principles. The organization allows our regional staff to have a deep-seated connection with their communities and a greater sense of place.”

I see this as Doss, Field, and I drive to the highest point at Freshkills Park and get out, where I am treated to a magnificent 360-degree view as wind whips our hair around our faces. Doss explains how she and her colleagues have developed ecological schematic designs for the park and restored native plant communities, drawing on biotic studies of nearby natural areas. Yes, there are mechanical systems from the landfill still poking up from the earth; yes, there is an adjacent housing development and the Lower Manhattan skyline still visible on the horizon; but there is also a wide swath of interconnected green space where once there was only trash, now marshy and woody and grassy, for ospreys, killdeer, snowy owls, and other species, including our own.

The best term to describe what Biohabitats does is “deep ecology,” an idea coined by the Norwegian philosopher Arne Næss in the early 1970s. This is a branch of the environmental movement that disavows a human-oriented view of nature

as something that exists primarily to serve human needs. Although this movement has been criticized as being antihuman, that’s not the deep ecology that Bowers and his colleagues aspire to. The firm’s ideal is a world where humans coexist with other species in a far more balanced way. Five core values drive the practice, Bowers says: to revere wild nature, to heal compassionately, to practice a wholeness of being, to deliver uncompromising integrity, and to evolve to be the best. Bowers wants to promote the idea of ecological democracy, meaning that all living things have value and should be allowed to reach their natural and evolutionary potential.



HASSALO ON 8TH



LEFT
For the Hassalo on 8th development in Portland, Oregon, a new wastewater treatment system has made the process visible to residents and visitors.

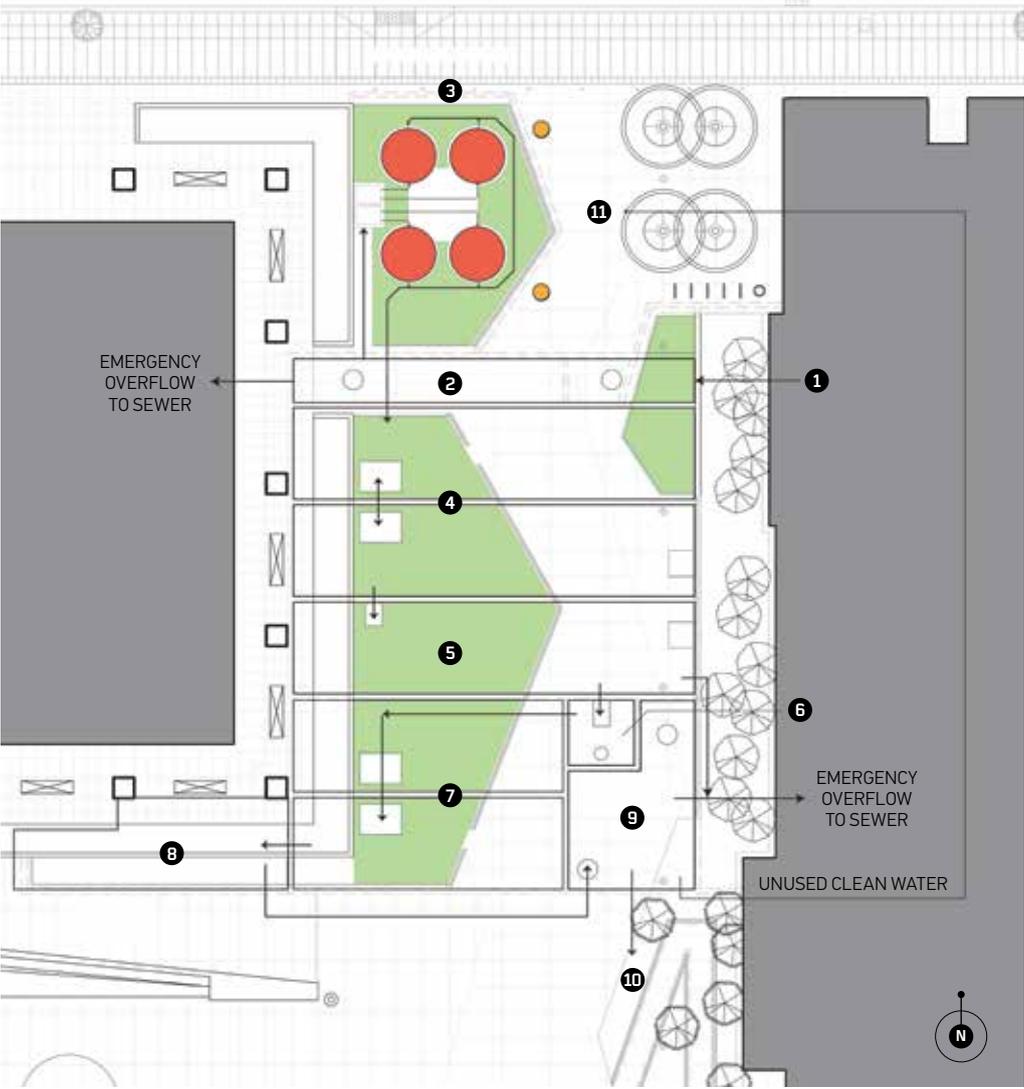
“Scientists say that at least half of all species will be extinct by 2100,” Bowers says. “So our primary question is, how do we conserve and restore ecosystems and stop the loss of biodiversity? You can’t just insert ecology into urban areas. We have to also conserve wilderness and wild areas. Our landscape is fragmented, so how do we reconnect landscapes in the most ecological way?”

Reconnecting landscapes is exactly what Tom Denbow, Biohabitats’s Great Lakes bioregional leader, is trying to do in and around Cleveland. I join him on a weekday morning as rush-hour cars fly by on Interstate 90, the highway that hugs the Lake Erie shoreline, effectively cutting off the waterfront from the people who live inland. We have

walked out onto a peninsula of land known as Dike 14, which was originally a public park around the turn of the 20th century but became a solid waste dumping ground and then later a containment facility for sediment dredged from the Cuyahoga River. Now, the site has transformed again into the Cleveland Lakefront Nature Preserve, a surprisingly wild oasis for migratory birds within view of the Cleveland skyline. As Denbow and I walk into the interior of the preserve, the roar of the highway falls away, and instead I pick up on the sound of the dozens of mergansers and other waterfowl that have gathered on the water around the site. To help the city increase public access to the waterfront, the firm created a master plan that regenerated the site’s natural processes by remov-

PLAN — DETAIL

- 1 PRIMARY TANKS
- 2 ANOXIC REACTOR
- 3 TRICKLING FILTERS
- 4 TIDAL WETLAND
- 5 WOODCHIP WETLAND
- 6 DENITRIFICATION REACTOR
- 7 POLISHING TIDAL WETLAND
- 8 FILTRATION & DISINFECTION ROOM
- 9 CLEAN WATER REUSE TANK
- 10 NONPOTABLE REUSE SUPPLY TO TOILET FLUSHING, COOLING TOWER, AND SITE IRRIGATION
- 11 GROUNDWATER RECHARGE WELLS



BELOW
Treated water feeds geometric pools that help tell the story of the water circulating both above- and belowground.

ing invasive species, planting trees, and creating a variety of wetland and woodland habitat areas. Of particular importance to Denbow is the ability of the residents of the closest neighborhood, Glenville, a predominantly African American community that has suffered from crime and poverty, to be able to come easily to the water again. As we walk along a perimeter trail on the site, Denbow becomes contemplative, as I imagine everyone who comes here does. Explaining his work, he says, “We’re trying to restore the rhythm of the earth.”

Later, Denbow and I travel to the Acacia Reservation, a reclaimed golf course nestled between residential



RIGHT
Tidal wetlands on the site work with drain and fill cycles to reduce organics in the water.

development and two suburban malls that is now a new park managed by Cleveland Metroparks. This seems like an even less obvious place for a natural park than Dike 14, and yet this is exactly what this place has become. To keep a golf course dry and playable, water is channeled underground, its natural flows and cycles disrupted. Denbow and his team created a master plan for the new site that included restoring an existing but depleted creek, along with an intermittent stream. They have made the water visible again, bringing it to the surface, where it flows in a series of riffles, cascades, and berms that slow and retain water on site. As we walk through the park on a cloudy and wet April morning, the damp earth seeps into my shoes. All around us, where there were once manicured fairways, long-neglected riparian areas erupt with native vegetation.

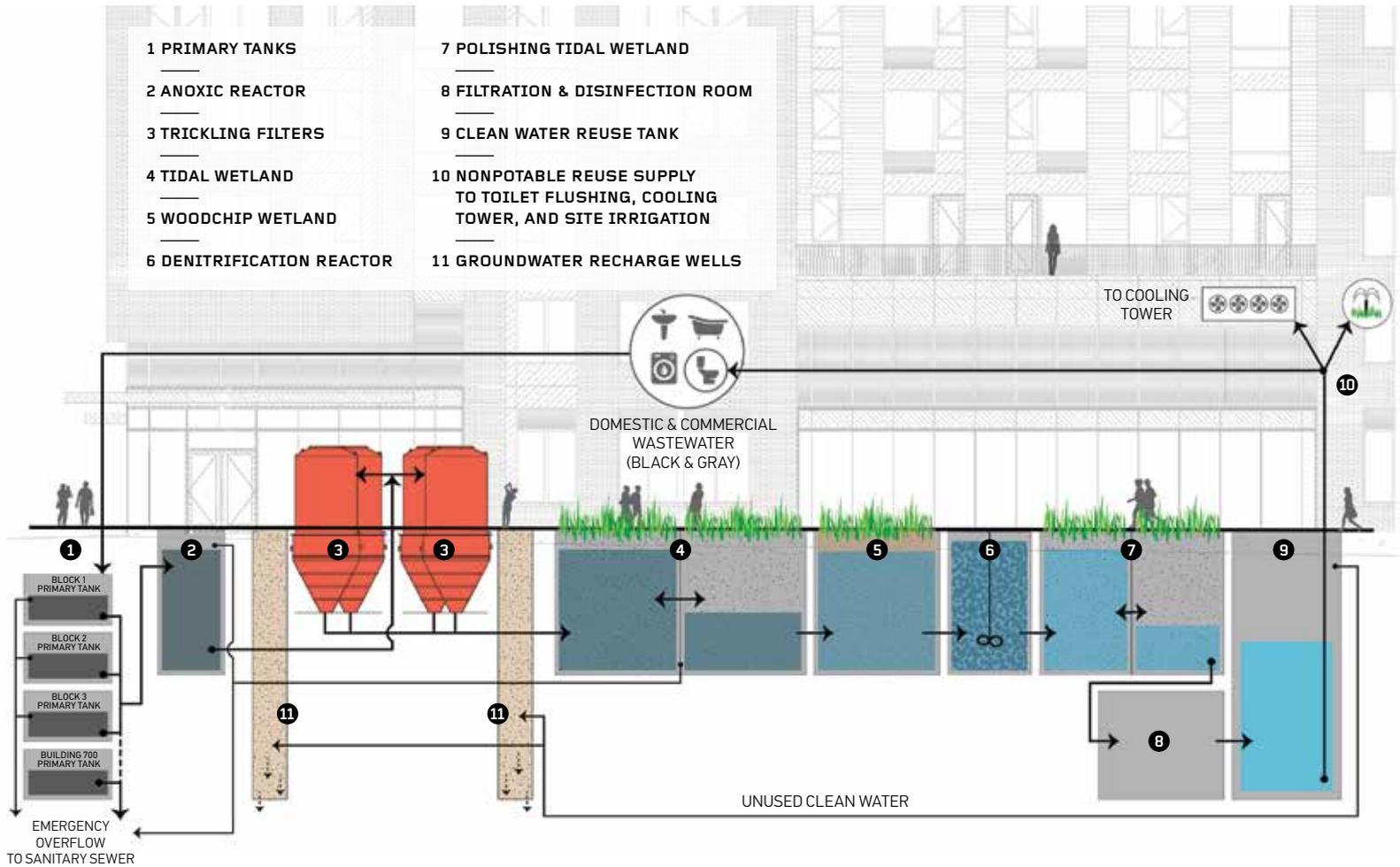
“Biohabitats allowed us to explore options for both the Acacia Reservation plan and our first large restoration project on the site,” says Terry Robison, the director of natural resources for Cleveland Metroparks. “Since we completed the restoration, we have seen remarkable increases in avian and aquatic diversity and numbers and positive feedback from park guests.”

On the other side of the country, something similar is happening at the Fernhill Wetlands, located less than an hour west of Portland, Oregon. Here, the Coast Range looms on the

horizon, teasing the rocky Oregon coast just beyond. East of the mountains is a rural province of berry farms and, until recently, three dead-looking wastewater lagoons, which were left stagnant when the local utility, Clean Water Services, channeled treated water straight into the Tualatin River. Seeking a more environmentally sound solution, the utility contracted with Biohabitats to turn the deep lagoons into a 90-acre mosaic of riparian wetlands, including heavily planted marshy areas and open water at various depths, to attract a variety of birds and wildlife and provide recreational opportunities for the community.



HASSALO ON 8TH — NATURAL TREATMENT AND REUSE AT THE URBAN DISTRICT SCALE



The variation in the design, which goes from planted areas to open water and back again, allows the treated wastewater to meander and mix and not just carve new channels through the marsh. Again, the idea is bioretention and filtration. As I walk around the lagoons with Biohabitats’s Cascadia team leader, Pete Muñoz, he tells me that some 750,000 native plants were installed here. The site is profuse with both vegetation and birds of many kinds. Muñoz relates a story of a time he was at the site and thousands of geese flew overhead, squawking as loudly as a jet engine. As we walk, we see a beaver family swimming across a section of water, one after the other, and a huge blue heron scudding to a stop in a mudflat.

Like the other bioregions, the Cascadia office has worked on projects at various scales. One of Biohabitats’s recent projects involved working with the Portland Water Bureau and the Oregon Parks

and Recreation Department to restore salmon and steelhead habitat along the Sandy River, downslope from Mount Hood, through the creation of engineered logjams. Biohabitats led the construction and installation of the project, which required excavating a historic side channel in the river and then using a heavy lift helicopter to hoist and lower the massive logs into place. A second logjam will be installed later this year.

Before I leave Portland, Muñoz shows me one of Biohabitats’s most urban projects, a wastewater system for a new urban residential development called Hassalo on 8th. Nicknamed NORM (Natural Organic Recycling Machine), the system is designed to divert all of the wastewater generated in a three-building complex away from the municipal sewer, representing some 45,000 gallons a day, using trickling filters and constructed wetlands. The treated and disinfected wastewater is

FERNHILL WETLANDS



then reused for toilet flushing, cooling systems, and landscape irrigation, and any excess wastewater is injected into dry wells for groundwater discharge. (The Hassalo design team included PLACE, the landscape architecture firm that also worked on the Fernhill Wetlands with Biohabitats.)

What's interesting about the range of the firm's work is that sometimes, as with Hassalo on 8th, it's important that the work be visible. Here the wastewater trickling filters have been brought aboveground as an educational tool and to celebrate the process, rather than keep it out of view of the people who depend on it. (NORM even has

its own Twitter handle—@PortlandNORM—which recently posted, “I’m all for #TGIF but my water purifying wetlands work right on through the weekend.”) Sometimes, however, the work is invisible, such as with the living shoreline project that Biohabitats has worked on with the NY/NJ Baykeeper group at the Naval Weapons Station Earle, just across New York Harbor from Lower Manhattan. There, under the water, unseen by most human eyes, is a constructed oyster reef that is providing new aquatic habitat and stabilizing the shoreline, providing resiliency against the effects of climate change and superstorms like 2012’s Sandy, which destroyed several structures at the station.

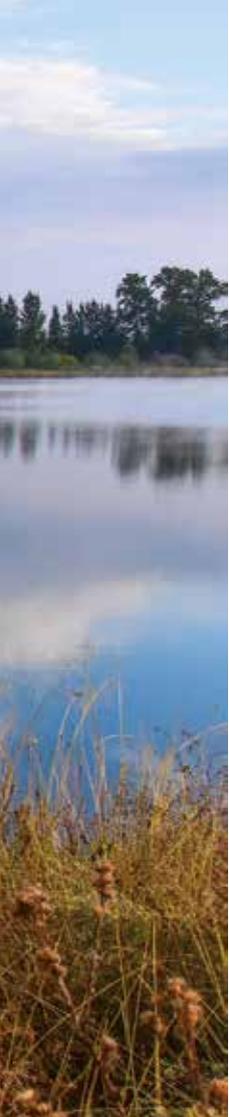
ABOVE

A landscape of formerly stagnant wastewater lagoons has been transformed into the lush and wild Fernhill Wetlands west of Portland.

OPPOSITE

At Fernhill, Biohabitats created a wetland mosaic that slows and treats wastewater on site, while providing a range of habitats for birds and other wildlife.

FERNHILL WETLANDS — PROPOSED DESIGN



In other urban areas, the firm is also engaged with some large-scale projects, including a plan to create a green network for Baltimore and a new urban ecology framework for the city of Atlanta. In Baltimore, the green network plan envisions an interconnected system of green spaces across the city, with a special focus on stream corridors. In Atlanta, the Urban Ecology Framework will similarly determine a system of natural and recreation areas that will serve all city residents. Both projects will emphasize social equity and inclusiveness, so that underserved populations are involved throughout the process. “We look at a city as a complete ecosystem,” says Aiman Duckworth, a landscape architect who works in the firm’s Baltimore headquarters. “These are large-scale planning efforts, but it still comes down to looking at a place block by block.”

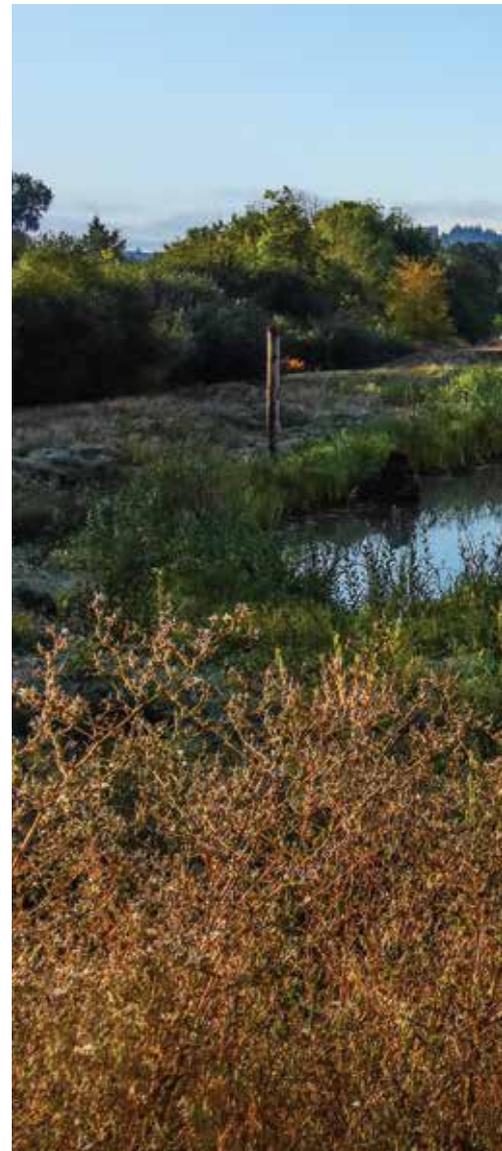
Last year, the firm formally began Bioworks, a research and development practice within Biohabitats, to address a long-held desire to apply scientific research methods to their work, with Christopher Streb, an ecological engineer, heading up the practice. I meet Streb and his colleague, Jennifer Missett, the Chesapeake Bay bioregional leader, one day at Washington, D.C.’s new District Wharf, a mixed-use waterfront development along the Washington Channel of the Potomac River. Here, the firm has installed four floating

wetlands near a new urban park designed by Michael Vergason Landscape Architects. Floating wetlands are a specialty of the firm, providing visual softness to a hardscaped urban area, as well as aquatic habitat and nutrient absorption. The ones at the wharf are more sculptural and sleek in appearance than some of the other ones the firm has installed in Baltimore and elsewhere, reflecting the modern, high-end detailing of the site. Yet, almost subversively, they are doing the same ecological work as the wetlands the firm has

created all across the country. The location was intentional for the clients, a partnership between the developers PN Hoffman and Madison Marquette. “We installed them by the pier where so many residents and visitors engage directly with the water,” says Shawn Seaman, a principal and executive vice president at PN Hoffman and project director for the wharf. “We have always been committed to building and operating the wharf as a sustainable neighborhood.”

Streb explains that the idea behind Bioworks is to better understand the ecosystem benefits of the firm’s work, and to do it with evidence. “If an intervention isn’t providing benefits,” he says, “we

RIGHT
Some 750,000 plants were installed at the Fernhill Wetlands, as well as 180 anchored logs and snags that provide wildlife habitat.





want to be honest about it, to get feedback and get better at it.” The firm also recently took on a biomimicry fellow, Elena Stachew, who works out of the Great Lakes bioregional office. Biomimicry is the practice of using biological systems as inspiration for solving human problems, an approach that the firm uses whenever it can. At one point, as Streb, Missett, and I walk around the Kenilworth Aquatic Gardens in northeast Washington, D.C., where Biohabitats did a marsh restoration project years ago, Streb picks up a dark, cup-shaped lotus seedpod, its face pocked with holes long since emptied of seeds. He turns it over in his hand and says, “Wouldn’t this make for a great biomimicry design for a floating wetland?”

The idea behind most of Biohabitats’s work is not so much to exactly restore a place to what it was before human intervention, because that is often impossible, but to plant the vegetation and install the materials that allow a place to be much more than what it is. By drawing on the lessons learned from the natural world, the land can once again be healthy and wild and beautiful for animals and humans alike—a distinction that perhaps we should no longer be making. Speaking for his dedicated staff, Bowers explains, “We view this work not as a job or a career, but as a calling.” ●

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