Rain Gardens Reign

Kansas City sets an ambitious goal, and communities around the country follow.

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Rain gardens may have started in Maryland and been developed in Maplewood and Burnsville, MN, but it was Kansas City, MO, that put them on the map of public awareness. If, as Rodgers and Hammerstein told us in their musical *Oklahoma!*, "Everything's up to date in Kansas City," the 10,000 Rain Gardens project there is on the cutting edge of stormwater management.

Rodgers and Hammerstein aside, one thing in Kansas City is very out of date: its water and wastewater infrastructure. Some pipes have been in the ground for more than 100 years. So in August 2005, voters approved a $500 million bond issue that will fund new and improved water infrastructure for Kansas City.

The bond issue is part of KC-ONE, a comprehensive plan for the management of stormwater throughout the city and its suburbs. It will be years until all of the necessary work is completed. To help manage stormwater now, Kansas City officials started the 10,000 Rain Gardens project.

The idea came from a Stormwater Coordinating Committee meeting in May 2005.

Six months later, Kansas City's former mayor, Kay Barnes, together with Jackson County Executive Katheryn Shields and Johnson County Commission Chairman Annabeth Surbaugh, launched the program at a regional rally.

The project's Web site (www.rainkc.com) is listed as a resource in the handouts of rain garden programs all around the country. Scott Cahail, manager for the Water Services Department of Kansas City, said in the summer of 2007 that the Web site had received more than 100,000 hits.

But that number is steadily rising, just like the number of rain gardens. Officials believe there are more than 1,000 rain gardens now in place. A new program will give owners an incentive to register their rain gardens so the count is accurate. The program's goal is 10,000 rain gardens in five years, by 2010.

Barnes installed a rain garden at her home, as did Dan McCarthy, president of Black & Veatch, a global engineering company that works in the water and energy fields. Black & Veatch employees planted the first corporate rain garden in Kansas City. McCarthy wrote an editorial for the local paper, urging other corporations to install their own rain gardens.

One by one, the number of rain gardens in Kansas City grows. There are two at City Hall. The local ReHabitat store has a small rain garden. Hallmark has one at its corporate headquarters. One of the most interesting is shaped as a boomerang and measures almost 5,500 square feet. It was installed in Theis Park by students at the Kansas City Art Institute. For good measure, they added messages on taking care of the environment.

Photo: Sara Cohen, Massachusetts of Conservation and Recreation
A rain garden in front of a home in Partridgeberry Place, Ipswich MA

Mt. Airy Rain Catchers

Influenced by the efforts in Kansas City and other cities, community rain garden programs are starting in many locations. One such program is in Ohio.

Until the post–World War II expansion of suburbs, the Mt. Airy section of Cincinnati, OH, was a small community of farms and country homes surrounded by woodlands. Now more than 9,500 residents live in the 3-square-mile area. As in other suburban areas, the growth of population and corresponding paved surfaces has increased stormwater runoff in Mt. Airy and pollution in its Shepherd Creek watershed.

Part of the hope for improving the situation rests with what is known officially as the Mt. Airy Rain Catchers Project, a joint venture of interested and motivated homeowners, the EPA, Horticultural Asset Management Inc., and Tetra Tech Inc. Funded by the EPA, the Rain Catchers Project is the largest of its kind in the country. It is also a pilot program to test a reverse-auction-based method of encouraging participation by homeowners, an idea of staff members in the EPA's Sustainable Environments branch.

The Mt. Airy Rain Catchers Project began with the creation of a demonstration site in December 2006. Its location, the Mt. Airy Arboretum, was guaranteed to draw the attention of the public. The arboretum is situated on 120 acres of Mt. Airy Forest, the largest public park in Cincinnati. Many visitors each day would see the rain barrel at the arboretum building and two rain gardens beside the road leading to the arboretum.

Signs were added to educate the public on how rain gardens and rain barrels function.

Information about the project, in an attractive, easy-to-understand brochure, was mailed to property owners in the spring of 2007. Each house was eligible to receive up to four rain barrels and a rain garden. Homeowners could choose to receive either or both. Installation, planting, and hardware costs were paid for by the EPA.

The novel reverse-auction approach called for homeowners to submit bids with a dollar amount they wished to be paid for permitting the installation and maintenance of rain gardens and/or rain barrels on their property. Those who submitted the lowest bids were most likely to be selected.

"Most of the bids were for $0, meaning that the owner did not ask for any payment," says Ward Wilson of Tetra Tech, the project manager. Of the bids that asked for payment, "Most were less than $200," he adds.

Photo: Tetra Tech
Constructing a demonstration rain garden with an excavator and a worker tilling the soil (first); A garden installed in a backyard just after construction and before planting (second); A contractor planting one of the two demonstration rain gardens at the Mt. Airy Arboretum (third); The same garden two months after planting (fourth).

Homeowners whose bids did not win did not complain, but several asked to be included in any future efforts. People who expressed interest in installing rain gardens themselves were referred to the Rain Catchers' Web site (www.mtairyraincatchers.org). The Rain Garden Alliance of Cincinnati, working within the Mill Creek watershed, conducted a workshop on rain gardens, including a tour of the new rain gardens in Mt. Airy.

In the summer of 2007, the EPA's designated contractors installed 50 rain gardens, each measuring 150 to 160 square feet, and 101 rain barrels at the selected homes. Employees of Tetra Tech and Horticultural Asset Management drove trucks marked with "Mt. Airy Rain Catchers" signs, which further publicized the program to area residents.

Each property owner selected for the program received an owner's manual. The EPA contractors will maintain the rain barrels and rain gardens and monitor water quality in local streams through 2010. Homeowners are asked only to empty the rain barrels after each rainfall and to close the valve before the next rainfall. They will receive e-mail updates about the project approximately four times each year.

A quick glance at the Rain Catchers' Web site shows an example of highly effective communication, which no doubt has contributed to the program's initial success. In the middle of the home page, boxed off to draw the reader's attention, is the latest communication from the program's directors.

The entry for the fall of 2007 reported that all of the gardens were draining properly and that Tetra Tech employees were continuing to check water infiltration rates. Forestalling any concern from property owners, the boxed section alerted them to what would happen next: replacement of lost mulch and removal of dead plant material. The section concluded with a reminder that with the onset of colder weather, rain barrels should be drained and their outlets left open. Of course, these instructions also served as reinforcements for seasonal maintenance that the homeowners will themselves be performing beginning in three years.

Improving Stormwater in Muncie

In Muncie, IN, officials of the Sanitary District's Bureau of Water Quality, the Muncie Delaware County Department of Stormwater Management, and the Delaware County Health Department were thrilled to receive one of only eight national grants from the Centers for Disease Control's National Center for Environmental Health.

The three agencies had joined forces to seek this $120,000 grant to minimize flooding and pollution from stormwater runoff in Whiteley, one of Muncie's oldest neighborhoods. The funds will be allocated in annual installments of $40,000 each.

The Whiteley neighborhood has an outdated, inadequate sewer system that left rainwater standing for days after storms. The neighborhood wasn't scheduled to get any new infrastructure within the next 10 years. Although Muncie is updating sewers in other parts of the city, even the members of Whiteley's active neighborhood association realized that fixing the sewers in Whiteley wasn't financially feasible.

The three-phase program now under way with the funding is intended to improve awareness and communication among local agencies, foster effective stormwater and flood management, create an interagency partnership, and replicate the neighborhood rain garden model for the city of Muncie.

The program began in October 2007, when four rain barrels were installed as a demonstration at the building housing Motivate Our Minds, an after-school program in the Whiteley neighborhood. The rain barrel phase of the program will continue through 2008.

The original plan called for a minimum of 20 rain barrels, but thanks to a generous donation from a local company and high neighborhood interest, more barrels will likely be installed. They will be available to residents of any neighborhood.

Shareen Wagley, municipal separate storm sewer system coordinator of the Muncie Sanitary District, says the agency "had an overwhelming community response to our rain barrel project, and the Whiteley community is very excited about their upcoming community rain garden. Not only the neighborhood association but people from all over Muncie have expressed an interest in the rain barrels and workshops."

Wagley admits to being surprised by the "incredible response and excitement that we are receiving from both the neighborhood and the community as a whole."

That favorable public response has spurred more interest from residents. Wagley says plans are under way to install several rain gardens in other sections of Muncie. Ball State University's Department of Natural Resources has its students working with the project. These college students teach younger students from the Burris Laboratory School and Motivate Our Minds about local water-quality issues.

Members of the White River Watershed Project provided rain barrels for the children and their college mentors to decorate. The barrels will be installed at Minnetrista, a local cultural center.

At the county fair in the summer of 2007, more than 75 people signed up for future workshops so they could receive a rain barrel. A day after the first workshop, in September 2007, 50 additional people had registered.

In the summer of 2009, the second phase of the program will see the installation of a large community rain garden in the Whiteley neighborhood. This garden will be not only a tool to manage stormwater but also an attractive asset to the area.

Photo: Sara Cohen, Massachusetts of Conservation and Recreation
Roads only 18 feet wide help reduce total pavement area at Partridge Place.

Municipal officials believe it will not be difficult to recruit a neighborhood maintenance team of avid gardeners and people who care about neighborhood beautification to care for Whiteley's community rain garden. They'll have some help from a local nonprofit organization and the Muncie Sanitary District staff.

The third year of the program, 2010, will focus on rain gardens for Whiteley homeowners. Before any Muncie residents can receive a free rain barrel or rain garden kit, they must attend a free workshop. There, leaders will teach recipients the benefits of the barrel or garden, installation techniques, and what maintenance is necessary. When all of the installations are finished, the Delaware County Health Department and other organizations will study the impact of the program on reducing health risks from West Nile virus and *E. coli*.

Public and Private LID

Two new developments in Massachusetts incorporate rain gardens and other low-impact development (LID) elements both on individual homeowners' lots and on common roads and walkways. By doing so, one developer was able to build five houses instead of four, and another was able to keep almost 75% of the development area as woods and open space.

The major LID change was to retain all of the stormwater in the road, in a bioretention cell within a cul-de-sac. This change allowed space for the fifth single-family home to be built. Water-quality swales were installed along the uncurbed road's right of way. The last home was completed in September 2005.

The bioretention cell in the cul-de-sac and the swales will require periodic removal of sediments. Trees and shrubs were planted within the cul-de-sac, so routine landscape maintenance will also be required. Tyngsborough's Department of Public Works agreed to take on both of these maintenance responsibilities when the town accepted the road.

A narrower street (24 instead of 28 feet) and narrower driveways reduced paved areas and runoff. The homes were located closer to the street, reducing the length of driveways as well as sewer and utility lines. Street proximity also meant less disturbance to the land, and fewer trees needed to be removed.

Each of the five homes has its own rain garden. Owners are required to maintain their gardens, including removal of debris and sediment, remulching, and replanting vegetation as needed. With the public and private LID elements in place, rainwater will overflow into the town's drainage system only in extreme storm events.

This innovative project took longer to achieve—three years—than would a conventional development. City officials, unfamiliar with LID elements, required additional review time before granting final approval. R. Carter Scott, president of Transformations, explains on the company's Web site that he saved time and money by meeting with the Tyngsborough planning board to discuss his ideas before he invested in engineered plans.

Strong selling points were that the project was designed to minimize the loss of open space and to reduce stormwater runoff and the long-term costs of dealing with it. These points, as Scott suggests, "can greatly reduce concerns by local officials and citizens" anywhere.

Open Space in Massachusetts

In Ipswich, MA, the Partridgeberry Place project involves 20 innovative home sites built on 38 acres in the Ipswich River watershed. By clustering the single-family homes on lots less than 0.2 acre in size, or 8,000 to 12,000 square feet, 74% of the site was kept as woods and open space. Hiking trails lead to a nearby state park.

Meridian Associates of Beverly, MA, did the design and engineering work for the project. The Martins Companies of Danvers, MA, developed and built the subdivision. The main LID features were constructed by December 2006.

The Massachusetts Department of Conservation and Recreation (DCR) chose Partridgeberry Place as a LID subdivision demonstration site. The DCR also selected an adjacent conventional subdivision as a basis for comparison. Runoff percentages for both subdivisions will also be compared to those found in the literature for LID development and conventional development for a yearlong monitoring of stormwater runoff relative to rainfall. The US Geological Survey designed the monitoring plan and installed the equipment for the study in the winter and spring of 2007.

Sara Cohen, Massachusetts DCR water resources specialist, believes there will be significant interest in the study results once they are available. “The DCR is conducting a flow assessment study to determine the best way to move forward with a full engineering study of the impacts of the LID features on the site,” she explains.

Tours of the site have been conducted for developers and engineers, primarily focusing on the clustered nature of the development. “Tours more recently focused on the rain gardens, too,” Cohen notes.

LID features of Partridgeberry Place include minimal land disturbance; reduced pavement areas and a subdivision road that is only 18 feet wide; reduced setbacks, resulting in shorter driveways and smaller front yards and backyards; grass pavers for visitors’ parking; an open grass swale that drains to a central bioretention area; rain gardens on each homeowner’s lot; less space for lawns and more landscapes of native vegetation; and infiltration of roof runoff through drywells.

Photos: Muncie Delaware Stormwater Management
Ball State University students worked with Burris Laboratory School eighth graders on the rain barrel project. The barrels were judged and five will be installed at the Minnetrista Cultural Center Children's Garden in the spring.

Installing a shared septic system made the clustering of the homes work and preserved more open space. The system allows onsite recharge of wastewater.

Building the Future

Port Angeles, WA, is home to another project that combines rain gardens with other LID techniques. Funded by a US Department of Energy grant of $109, 242, the Linn Acres Project is a streetscape for a new 18-lot development.

Linn Acres is not only a demonstration project for local builders but also a project that may influence the entire career of some builders and developers. That’s because the development is sponsored by the North Peninsula Building

Association in cooperation with the Future Builders program. These future builders—students from the local school district and community college programs—learned LID practices as they helped construct Linn Acres.

The development includes such LID elements as a narrower street with a curvilinear design and pervious concrete sidewalk. The project is finished, with the rain gardens, the last part, installed in the spring of 2008. The houses are gradually being built by each year's class of students.

Aiming for 2010 in Lexington

In Lexington, KY, a conference on rain gardens drew 110 interested people in September 2007. From this group of landscape architects, engineers, master gardeners, and just plain citizens, various environmental groups are gearing up to be ready to publicize and install rain gardens. A grant of $200,000 from the state is expected to be awarded in 2008.

The goal of the Lexington alliance is to install 2,010 rain gardens by 2010. The number wasn't chosen at random but rather to tie into a special event. In 2010, the World Equestrian Games will be held for the first time in the United States. The site of this 16-day equestrian competition, which involves hundreds of riders from other countries, will be the Kentucky Horse Park in Lexington.

Rain gardens in Lexington will complement another LID program already in existence: the rain barrel auction, which is conducted by Bluegrass PRIDE (Personal Responsibility in a Desirable Environment). Local artists decorate the plastic rain barrels, which are then auctioned off on eBay. Minimum bids are $125.

Because the bidder must pay shipping, which can be as much as the cost of the barrel, virtually all bidders are within driving distance of Lexington. When successful bidders come to pick up their barrels, they receive educational brochures about stopping stormwater runoff.

Amy Sohner, executive director of Bluegrass PRIDE, says her group receives many calls from people in other states about setting up their own auctions of rain barrels. "We've even had calls from Canada," she notes.

Importing Ideas

Another group working on getting more rain gardens and LID features installed is the Upper Des Plaines River Ecosystem Partnership (UDPREP). This regional coalition of environmental groups serves interested citizens and municipal officials in 74 communities from southern Wisconsin through Chicago and its suburbs.

UDPREP President Patty Werner of the Lake County Stormwater Management Commission says, "UDPREP has generated and supported a lot of local interest in rain gardens. We adopted rain gardens and watershed-friendly landscaping as our focus topic for 2007 and 2008."

UDPREP has the distinction of having had two national experts on rain gardens speak to its members within the same year. In March 2007, more than 100 members attended a presentation by Roger Bannerman of the Wisconsin Department of Natural Resources. The event was held at the Ryerson Woods Welcome Center in Lake County, where attendees could see several LID features: two rain gardens, bioswales, two cisterns (one above and one below ground), and permeable asphalt paving.

Inspired by this program, Steve McLevich, the Libertyville, IL, Parks & Recreation Department maintenance supervisor, got the idea for a project to improve the quality of water in Butler Lake, which is a high-quality (advance identification, or ADID) wetland. The Village of Libertyville applied for a Watershed Management Board grant for cost-share to install two rain gardens and a vegetated swale to handle runoff from a parking lot at the lake.

Photo: Sara Cohen, Massachusetts of Conservation and Recreation
Clustering these single-family homes on smaller lots allowed more the site to be preserved as woods and open space.

For UDPREP's annual meeting in September, the speaker was Commissioner Sam Adams of the Portland, OR, Bureau of Environmental Services. Adams spoke on street-side infiltration practices, showing scenes of successful retrofits in Portland, part of that city's Green Streets program.

"The combination of [the two] programs has spurred the interest of several of our municipalities, who are following up on designing rain gardens in their public works projects—streets especially," says Werner. "UDPREP will be following up these events with a rain garden installation workshop."

Portland's Green Streets

Adams and Portland's other stormwater officials deal with runoff from an average annual rainfall of 37 inches. Portland's Green Streets program combines rain gardens with such LID features as permeable pavement, green roofs, curb extensions with plantings, and planters that let water infiltrate.

With these features, Portland can reduce peak stormwater flows by as much as 85%, stormwater volume by 60%, and pollution in runoff by up to 90%. But there's still a lot of runoff and more impervious surfaces from new developments. Adams told the UDPREP members that Portland's goals include 3,700 green streets; 250 acres of ecoroofs; and 250 acres of planters, swales, and rain gardens.

An impressive example of a Portland project with multiple LID features is the retrofit at the Mt. Tabor Middle School. This innovative joint project of the Portland Public Schools and the Department of Environmental Services manages runoff from a total area of about 2 acres. It includes a swale, six planters, three drywells, a curb extension adjacent to the school, and, of course, a rain garden. In 2007, the American Society of Landscape Architects gave a national award to the project's rain garden, which replaced 4,000 square feet of asphalt.

"Rain gardens are a decentralizing strategy," says Tom Evans, a landscape architect with URS Corp. in Cleveland, OH. That decentralization means that rain gardens, even those installed through community projects, become the homeowner's responsibility to maintain. Requiring homeowners to attend workshops to learn about their rain gardens and other LID features, such as the programs profiled do, connects the homeowners to the programs long-term and convinces them that their efforts benefit everyone.

There's also peer pressure to keep the gardens looking as well as their neighbors' gardens do. Kari Mackenbach, a water resource specialist with URS in Columbus, OH, says that a follow-up study showed 95% of the Maplewood, MN, homeowners maintained their rain gardens. Maplewood has been installing rain gardens for years as part of an ongoing street reconstruction program. Mackenbach mentions one case where the neighbors were maintaining the rain garden for a homeowner who had stopped caring for it.

The varied projects described here show that rain gardens—by themselves or combined with other LID practices—can improve water quality by lessening stormwater runoff. Rain gardens are cost-effective, low-maintenance, and attractive. Projects such as these can also help satisfy the EPA's National Pollutant Discharge Elimination System Phase II requirements for public involvement and education.