ROUGE RIVER WATERSHED, MICHIGAN

A CASE STUDY OF HOW GREEN INFRASTRUCTURE IS HELPING MANAGE URBAN STORMWATER CHALLENGES

TYPES OF GREEN INFRASTRUCTURE USED: Rain barrels/cisterns, permeable pavement, rain gardens, vegetated swales, street trees, downspout disconnection, wetland creation and restoration, stream buffers

Green infrastructure initiatives in the Rouge River watershed are in their beginning phases and vary somewhat due to the fact that the watershed contains 48 different communities and three counties. These jurisdictions share a watershed-based National Pollutant Discharge Elimination System permit that generally coordinates their activities, but each county maintains its own stormwater rules and ordinances, none of which require retention or the use of green infrastructure. An alliance of local jurisdictions prepares watershed-wide management plans which identify green infrastructure as one of several strategies to restore the watershed. These plans' green infrastructure components have remained largely the same since 2006. Overall, most of the watershed's communities seem to focus primarily on demonstration projects and guidance and have not yet developed strong incentives or requirements for green infrastructure. Detroit, the largest city in the watershed, faces financial challenges due to the recession and massive population decline; these challenges are leading the city to incorporate some limited green infrastructure retrofit programs into its combined sewer overflow control plan.

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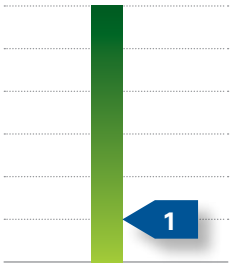

Total Criteria Score
Out of a possible 6

EMERALD CITY CRITERIA*

- ☐ Long-term Green Infrastructure (GI) Plan?
- ☐ Existing requirement to use GI to reduce some portion of the existing impervious surfaces?
- ☐ Incentives for private-party actions?
- ☐ Retention Standard?
- ☐ Dedicated funding source for GI?
- ☑ Guidance or other affirmative assistance to accomplish GI within City?

BACKGROUND

As reported in the first *Rooftops to Rivers* report, the Rouge River Watershed in southeast Michigan covers nearly 450 square miles, includes 127 miles of major streams, and is home to the historically industrial city of Detroit.[1] Fifty percent of the watershed is urbanized, with more than 1.3 million people in 48 communities and three counties living within its boundaries. The remainder of the watershed is characterized as either developing or rural.[2] As a tributary and major source of pollution entering the Detroit River, the Rouge River was designated an Area of Concern by the International Joint Commission in the late 1980s due to its significant impact on the health of the Great Lakes. In the early 1990s, the Rouge River National Wet Weather Demonstration Project (Rouge Project) was initiated by the Wayne County Department of the Environment to address the existence of 168 combined sewer overflows (CSOs) in three distinct phases.[3,4]

The Rouge Project, the Alliance of Rouge Communities, and the Michigan Department of Environmental Quality advance the use of green infrastructure to address stormwater runoff in the Rouge River watershed by transporting excess stormwater through a second, "green" conveyance system.

While the early focus of water restoration efforts was on controlling CSOs, such controls alone were insufficient to reverse the river's state of decline. Stormwater runoff, as well as discharges from illicit connections and failed on-site septic systems, had led to excessive flows into the Rouge River, eroding 60 to 90 percent of its banks, damaging riparian habitat, and introducing pollutants.[5] Eight water quality monitoring stations were installed; then data showed that standards for dissolved oxygen were met only 30 percent of the time.[6] Without addressing these issues, CSO controls alone would fail to solve the problem. Wayne County also determined that before the river could be fully restored, its wetlands, habitat, and lakes also had to be restored. In response, the county shifted its restoration focus in the early 1990s, expanding its wet weather pollution controls to include green infrastructure practices and wetland restoration projects and forming the Rouge River Project with funding support from the EPA.[7] The overarching Alliance of Rouge Communities (ARC), which helps oversee implementation of the watershed-wide National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges, is maintained largely by membership dues of its participating communities and project grants,[8] with Michigan's Wayne County playing a leadership role.

Early in its formation, the Rouge River Project adopted a watershed-based approach for wet weather pollution control. In 1997, the communities, working with the Michigan Department of Environmental Quality (MDEQ), were issued NPDES watershed-based general stormwater permits that required them to develop a watershed management plan and individual stormwater pollution prevention initiatives. To handle this large task, the communities divided the watershed into seven sub-watersheds, forming an advisory group for each. In 2001 they completed planning and began implementing a series of goals, actions, and measures designed to address wet weather pollution in the sub-watersheds. In addition to watershed-based stormwater permits, individual NPDES permits also established compliance schedules to control pollutant contributions from 168 permitted CSO outfalls in 17 Rouge River communities (see excerpt from 1990 Rouge River Remedial Action Plan as source of statistical information). Since the project's creation, major progress has been made. CSO pollutant loads have been cut by 90 to 100 percent during most storm events, 89 of the 127 miles of larger streams are free of public health threats, the majority of the waters meet standards for dissolved oxygen (monitoring stations report meeting water quality standards for dissolved oxygen 99 percent of the time), ecosystem health has improved, and, for the first time in decades, it is safe to consume certain types of fish caught in the Rouge River watershed.[9] Numerous sanitary sewer overflows (SSOs), which were also discovered throughout the Rouge, have been controlled, and progress is being made on those remaining.[10] Building upon these successes, the seven sub-watershed plans were updated and consolidated in 2008 and 2009 by the ARC, to lay the groundwork for future efforts, and a strategy to delist the Rouge River Watershed as an Area of Concern in the Great Lakes Basin Ecosystem is currently being finalized.[11,12]

While the river is generally improving, particularly with respect to control of CSOs and reduction of organic loading, certain challenges remain. Current data show a high rate of bacteria violations throughout the watershed in both dry and wet weather conditions. Many of the violations occur in areas unaffected by CSO discharges. Because the sources of dry weather violations have not been determined, bacteria violations will likely continue for the foreseeable future even after all the CSO, illicit connection removal, and stormwater management controls have been completed.[13] The watershed's high level of urbanization also remains a challenge, with impervious areas such as parking lots, roads, and rooftops reducing the ability of rainfall to be retained and infiltrated back into the soils, resulting in significant contributions to excessive flows in the Rouge River and its tributaries.[14]

WATERSHED RESTORATION THROUGH GREEN INFRASTRUCTURE

Over the years, various programs have been implemented under the Rouge River Project to restore the watershed. These include a focus on correcting SSOs and CSOs, an Illicit Discharge Elimination Program (IDEP), public education programs, community-specific projects, and green infrastructure projects. In its 2009-2013 Watershed

Management Plan (WMP), numerous structural and nonstructural green infrastructure practices are identified to help the ARC reach three overarching goals: reduce pollution sources that threaten public health; reduce the quantity and rate of runoff through sustainable stormwater management; and encourage partnerships between the ARC and local, state, and federal government.[15]

The green infrastructure practices listed in ARC's updated WMP have not changed much since the original *Rooftops to Rivers* report was released in 2006. In addition to rain gardens, rain barrels, rainfall harvesting, and catch basin disconnect programs, ARC utilizes practices such as constructed wetlands/wetland retention (e.g., the 14-acre Inkster Wetlands demonstration project discussed in the 2006 report) and dam modification or removal to reduce stormwater volume and pollution and improve hydrology, habitat, and aquatic diversity.[16] Another focus of the Rouge River Project has been the use of grow zones along streams, where designated no-mow areas are planted with native species and allowed to grow naturally. Such areas help reduce flashiness and increase the stability of riverbeds while slowing and filtering stormwater before it reaches the waterways.[17] The Rouge River WMP aims to reduce stormwater runoff volume by 300 million cubic feet over 30 years through the use of various green infrastructure technologies.[18]

UTILIZING GREEN INFRASTRUCTURE TO SOLVE CSOs IN DETROIT

Over the years, efforts of the Rouge River Project, ARC, and Michigan DEQ have helped advance the use of green infrastructure to address CSO and stormwater runoff concerns in the Rouge River watershed. The concept is simple: keep the stormwater out of the sewer system, encourage infiltration, and transport the excess stormwater through a second, "green," conveyance system. Its integration into existing CSO and stormwater programs, however, is ultimately the responsibility of local communities and the Detroit Water and Sewerage Department (DWSD).

From 1994 to 2008, more than $750 million was spent in new "gray," or conventional, infrastructure projects to construct CSO control facilities within the Rouge River watershed. Projects included the installation of 7 CSO retention/treatment basins, 5 vertical capture shafts, 1 screening and disinfection facility, and 3 equalization basins; there were also 25 sewer separation projects, 12 in-system storage projects, and a major expansion of the wastewater plant's capacity to pump and treat wet weather flows.[19] By 2008, the city of Detroit's investments alone came to $421 million.[20] That same year, however, as the nation's economic crisis worsened and major auto companies began feeling the financial crunch, Detroit's population continued its dramatic decline and the city's unemployment rate soared to 28.9 percent, leaving the city unable to continue with many of its long-term CSO plans.[21] In the face of massive debt service payments on two new major capital improvement projects totaling $1.3 billion, the city was forced to terminate those construction contracts. The city then began to develop less costly alternatives that focused on innovative green infrastructure solutions.

Part of Detroit's new plan focuses on the use of vacant lots throughout the city. Much like Pittsburgh, Detroit has seen its population decline over the years after peaking at 1.8 million in 1950. According to the most recent U.S. Census, between 2000 and 2010 the city's population declined from 951,270 to 713,777 people—a staggering decrease of 25 percent.[22] DWSD's plan calls for the removal of vacant structures, to be taken off the sewer system and replaced with pervious land covers. Other aspects of the $50 million plan, to be implemented over the next 20 years, include residential downspout disconnections, rain barrel installations, the use of bioswales and tree trenches to intercept runoff, tree plantings, and the management of stormwater runoff in underutilized parks. Officials estimate that the program will reduce stormwater inputs to the combined sewer system by at least 10 to 20 percent. The Southeast Michigan Council of Governments (SEMCOG) received funding to work with DWSD through 2012 to develop numeric goals and a long-term strategy.[23]

In total, the new CSO control plan calls for $832 million to be spent on a mix of gray and green infrastructure along the Rouge and Detroit Rivers over the next 25 years, averaging about $57 million in annual debt payments per year, much less than the annual debt payments of $115 million that the city planned to spend under its previous control program.[24] In addition to these efforts, SEMCOG has received a $2.58 million Sustainable Communities Regional Planning Grant through HUD that supports the development of a green infrastructure vision for the entire seven-county region (much of which is served by DWSD). The vision includes a land cover mapping process; an analysis of how green infrastructure can be utilized to manage stormwater runoff, provide air quality benefits, and contribute to the economic vitality of the region; and a study of the potential to reuse vacant properties to increase green infrastructure within the watershed.[25]

FINANCE STRATEGY

As a demonstration project, the Rouge River Project is supported largely by $300 million in federal grant funds, all of which was matched, dollar for dollar, by the communities. With the end of grant funding, much of the stormwater management programs are now supported through local budgets, membership dues to ARC, and community matching funds. For 2011, total local commitment to the ARC was $2.07 million (including $1 million of grant funds).

In the case of the Detroit Water and Sewerage Department, funding for green infrastructure projects as part of its alternative CSO control program comes largely from debt financing, leveraged by state and federal funding, to take advantage of low-interest loans and government grant programs. Foundations and private parties also provide support.[28] DWSD has committed $50 million over 20 years through its rate structure. To stretch its dollars further and ensure that efforts are not duplicated, DWSD's strategy is to coordinate and complement existing programs. For instance, HUD operates a Neighborhood Stabilization Program (NSP) to demolish abandoned buildings in blighted areas. While NSP focuses on areas of the community where blight is an issue, DWSD focuses its greening efforts in areas of the community where neighborhood stabilization is key, such as around schools. In the spring of 2011, DWSD planted 1,000 trees in such areas, with street trees accounting for roughly half of these, and the other half being placed in "stormwater forests"[29] and parks.[30] For the most part, DWSD and others are at the beginning stages of implementing green infrastructure projects as part of the long-term CSO control plan, and their finance strategy is not fully in place.

*EMERALD CITY RATING SYSTEM

Each of the cities profiled in *Rooftops to Rivers II* is a leader in green infrastructure investment—rethinking the design of municipal services and infrastructure. These cities leverage funding in creative ways. They provide tools to residential and commercial land owners to retrofit private properties and realize the multiple benefits provided by green infrastructure. In short, they are changing how cities look and function.

NRDC's Emerald City Rating System identifies six actions cities should undertake to maximize their green infrastructure investment. Our metric does not directly compare one city to another, due to geographical, population, budgetary and other differences. Instead, it identifies the presence or absence of common factors of success that NRDC believes are essential elements of a robust green infrastructure commitment. Only one city profiled, Philadelphia, is undertaking each of the actions identified, although each city is undertaking at least one.

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