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# Transforming Vacant Land to Manage Storm Water and Benefit Neighborhoods

he City of Detroit has over 80,000 vacant residential properties and is demolishing thousands of vacant houses each year. This project uses Detroit's vacant property demolition process as an opportunity to design and assess green infrastructure innovations that aim to make rivers cleaner and neighborhoods more attractive as a result of the demolition process. It will also identify governance processes that support the long term success of Green Infrastructure (GI). GI uses vegetation and soils to soak up and store storm water. Project partners have constructed high efficiency storm water storage that also fills former sites of abandoned houses with beautiful flower gardens called bioretention gardens.

The City of Detroit sewer system can be overtaxed during storms and when snow melts – causing untreated sewage to flow into the Rouge River and Detroit River. In cities, storm water flows over the ground, off rooftops, and down roads into storm sewers carrying chemicals and debris from urban surfaces. In Detroit, the storm sewers flow into sanitary sewer systems, and when these combined storm water and sanitary systems are overtaxed with too much storm water, they sometimes overflow, polluting rivers and, ultimately, the Great Lakes.

The new bioretention gardens store storm water in gravel below ground at the level of the former basements of demolished houses, keeping storm water separate from sanitary sewers and reducing the amount of storm water flowing to the combined system. Above the gravel, gardens of flowering shrubs and perennials have been designed to bring a valuable amenity to the neighborhood, while also protecting the storm water storage area from compaction.

This innovation in GI is the result of work by a University of Michigan (U-M) Water Center research team working with partners from the Detroit Water and Sewerage Department (DWSD), the Detroit Land Bank Authority (DLBA), and Detroit residents. Joan Nassauer, Professor in the School of Natural Resources and Environment, is leading the interdisciplinary research team. Faculty on the team have worked in Detroit for decades, paving the way for effective collaboration with key partners to explore how the demolition process can contribute to improved water quality and more attractive neighborhoods.

#### An Interdisciplinary Team

**Joan Nassauer**, (Natural Resources and Environment), is leading an interdisciplinary project team, including:

Alicia Alvarez law Allen Burton Natural Resources **Margaret** Dewar Urban Planning Shawn McElmurry Engineering, Wayne State University Catherine Riseng Natural Resources Natalie Sampson Health and Human Services, U-M Dearborn Amy Schulz Public Health Noah Webster Institute for Social Research

#### Partners and stakeholders include:

Detroit Water and Sewerage Department Detroit Land Bank Authority Detroit Department of Neighborhoods Cody Rouge Community Action Alliance Warrendale Community Organization Advisory Committee



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### SUCCESSFUL PILOT PROJECTS

In the Warrendale neighborhood, which drains into the Rouge River west of downtown Detroit, the research team, City staff, and community leaders worked together to bring the bioretention gardens from concept to reality. Originally designed with an interdisciplinary student team in Professor Nassauer's lab, this new form of GI was developed by the U of M team with DWSD. As DWSD's Green Infrastructure Program consultant, Tetra Tech led the technical design and implementation of two different bioretention gardens designs on eight properties owned by the DLBA and managed by DWSD. Tooles Contracting Group, LLC led the garden construction. Now, the research team and their partners are collaborating to assess the social and environmental effectiveness of the pilot gardens, and to explore forms of governance that could ease the transition from vacant property to green infrastructure.

#### **EXPANDING EFFORTS**

The team is expanding their work with City of Detroit and neighborhood partners, to collaborate with non-government organizations, like the Nature Conservancy and the Alliance for the Great Lakes, through the support of the U-M Water Center, and the Erb Family Foundation. The new grant will allow the research team to draw on Gl scholarship from across their disciplines to develop evidence-based guidance for local Gl decision-makers. The team also will assess the performance of the bioretention gardens over time: how the gardens affect water quality, and how the garden might affect residents' perceptions of the neighborhood and their own health. In addition, the team will work with the City to develop new green infrastructure design concepts for Detroit and to identify governance systems that will support the sustained, successful installation and maintenance of green infrastructure.

### PROJECT OBJECTIVES

- Design: Conduct a performance evaluation of two alternative green infrastructure designs, based on integrating project cost, human, water quality, and governance characteristics; Provide alternative design concepts for sub-watershed scales and wider application in the City of Detroit.
- People: Conduct a post-construction assessment of the effects of green infrastructure on residents' satisfaction and well being in surrounding neighborhoods, and the effects of neighborhood residents' perceptions and behavior on green infrastructure function over time.
- Water: Assess the effectiveness of the Warrendale neighborhood pilot installations in alleviating wet weather water flows (quantity/quality) as well as potential for additional storm water management benefits (e.g., alleviation of local flooding).
- Governance: Assess the ways that governance characteristics affected the phase I pilot installations, compared with best-practice governance characteristics and community models for maintaining effective green infrastructure for water quality and community well-being benefits.
- Interdisciplinary Synthesis: Draw on green infrastructure research from different team disciplines to develop policy-relevant and actionable information to inform on-the-ground decision-making. Conduct an integrated assessment of all dimensions of the pilot project over time.

### ANTICIPATED OUTCOMES

- Increased understanding of long-term benefits of green infrastructure design, project costs, ecosystem function, management options, and community well being, based on the assessment of pilot projects.
- Development and implementation of a larger project effort, including new design and management options; and ongoing community-academic collaboration to apply green infrastructure concepts, as well as social and environmental systems concepts to green infrastructure design in Detroit.



Cross section of a bioretention garden. Illustration by Tetra Tech.

#### CONTACT

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## LEARN MORE

- U-M Water Center: http://graham.umich.edu/water
- See the Video: bit.ly/1Lk2Qc8

### SUPPORT

The University of Michigan (U-M) Water Center is supporting this project – *Providing* Support for Watershed-based Policy and Management Decisions: Lake Erie and *City of Detroit* – with support from the Erb Family Foundation. The Water Center addresses critical and emerging water resource challenges to improve the policy and management decisions that affect our waters by integrating decision makers, other end users, and natural and social scientists in collaborative research projects. The Water Center is part of the Graham Sustainability Institute, which integrates faculty and student talent across the University of Michigan, and partners with external stakeholders, to foster collaborative sustainability solutions at all scales.