



CASE STUDY | Taking Steps to Protect Our Communities

THERE'S LOTS TO LOVE ABOUT THE GREENING OF VACANT SPACES IN CLEVELAND

To prevent stormwater from polluting Lake Erie, the Cleveland Botanical Garden and a local sewer utility installed rain gardens and bioretention features in vacant lots in the Slavic Village area of Cleveland, Ohio. The Slavic Village rain gardens and bioretention areas have helped to improve local water quality, add green space, enhance aesthetics of otherwise empty land, and improve safety and quality of life for residents of Cleveland. This case study demonstrates the challenges of implementing green infrastructure and how those challenges can be met to achieve community goals.

BACKGROUND

For the past two decades, Cleveland has faced two significant challenges: a steady decline in population and continued pollution of Lake Erie from stormwater runoff and sewer overflows. Population decline has led to a reduction in occupied residences throughout the city, often leading to vacant lots. By 2008, an estimated 20,000 vacant lots accounted for 3,300 acres of unused space in Cleveland. Additionally, the city demolishes about 1,000 residences each year, leaving empty land that can attract trash and pests.

Cleveland has a combined sewer system, where wastewater and stormwater runoff share the same underground pipes. Heavy precipitation can overflow the system, causing diluted sewage to be released into local waterways. These combined sewer overflow (CSO) events can dump nutrient pollution, high levels of pathogens such as E.coli, and chemicals such as pesticides into public water bodies.

Cleveland saw the dual problems of vacant lots and CSO pollution as an opportunity to use the empty spaces to control stormwater with green infrastructure. Two groups, the Cleveland

AT-A-GLANCE

PROJECT NAME:

Slavic Village Vacant Lot Renewal

TIMELINE: 2011 - 2014**LOCATION:** Cleveland, Ohio**SQUARE FOOTAGE:**

Nine 4,000-square-foot lots for the Botanical Garden and approximately 48,000 square feet of lots for the utility

BUDGET:

\$5,000 per lot (\$45,000 total) for the Botanical Garden and \$329,000 for the utility lots

GREEN INFRASTRUCTURE:

Rain garden, bioretention cells

RESULTS:

More than 600,000 gallons per year of stormwater captured

BENEFITS:

Improved water quality, enhanced aesthetics, public safety



A vacant lot prior to construction. Courtesy of the Cleveland Botanical Garden.



Excavation of vacant lot. Courtesy of the Cleveland Botanical Garden.

Botanical Garden (CBG) and the Northeast Ohio Regional Sewer District (NEORS), initiated projects to use vacant lots for stormwater management and to improve local communities. CBG developed its plans after participating in a Vacant Land Working Group focused on how to repurpose the large number of vacant lots in Cleveland for the community's benefit. Meanwhile, in 2011, NEORS had started a program to implement green infrastructure as part of the [Cleveland Consent Decree](#), which is a legal mandate for NEORS to reduce CSO pollution events using green infrastructure, as well as gray infrastructure such as underground storage tunnels.

Both organizations identified the Slavic Village neighborhood, which is located atop a combined sewer system, as a great place to demonstrate the benefits of green infrastructure. Slavic Village is a neighborhood in the southeast section of Cleveland that was hit particularly hard by the 2008 recession, and one area with the most vacant lots in the city. At the time, the regional U.S. Environmental Protection Agency (EPA) office and U.S. Geological Survey (USGS) were working in the area to characterize soil quality and permeability, so CBG and NEORS partnered with these agencies to develop green infrastructure projects in the area.

PLANNING AND FUNDING

In addition to partnering with EPA and USGS, CBG and NEORS worked with Slavic Village Development, a local organization that advocates for community development in the area, to select the best vacant lots for green infrastructure installations. The CBG-led project selected nine sites that were owned by the Cleveland Land Bank. All the selected sites had a slope suitable to direct water to green infrastructure on the lot, which reduced the need for additional construction to alter the lot. Additionally, CBG tried to select sites that would not be developed

NEORS'S GREEN INFRASTRUCTURE GRANT PROGRAM

NEORS also has a [Green Infrastructure Grant Program](#). This program focuses on funding local development groups, government entities, and non-profits to install green infrastructure on their properties. The program has granted \$8.3 million in project awards using sewer fees. These projects have reduced stormwater runoff by up to 26.3 million gallons per year.

for 20 to 30 years to ensure the green infrastructure would have a lasting impact in the community. For the NEORSD-led initiative, Slavic Village Development focused on selecting lots to add to the existing green areas in the neighborhood, settling on three sites near an existing hiking and biking trail.

After initial site selection, Slavic Village Development created fliers, hosted community meetings, and worked directly with landowners to gather their feedback and help remove obstacles to the projects. For example, some neighbors stored broken down cars on the lots. Slavic Village Development worked with the owners to remove the vehicles.

The two groups each took a different approach to the design of their projects. CBG's initial idea was to create replicable rain gardens in each of the nine vacant lots. The design team proposed curb cuts and downspout disconnections to direct water from neighboring rooftops, roadways, sidewalks, and driveways into the vacant lots. However, the group did not receive the required permission from city officials to install curb cuts on the sidewalks or permission from neighboring property owners to



A NEORSD vacant lot during the construction process. Courtesy of the Northeast Ohio Regional Sewer District.

GREEN INFRASTRUCTURE TERMS DEFINED

RAIN GARDEN: Vegetation planted in a shallow depression to retain stormwater.

BIORETENTION: Green infrastructure that treats and filters stormwater through layers of soil, sand, gravel, and other substrates.

CURB CUT: A depression in a curb that allows stormwater to flow into a certain area.

DOWNSPOUT DISCONNECTION: Rerouting a spout to direct stormwater to an area where it can be stored, such as a rain garden or rain barrel.

install downspout disconnects across multiple properties. Without these two elements, the planned gardens would not capture as much rain as possible at the site. Meanwhile, NEORSD focused on creating sites that would help meet the requirements of the consent decree and would help enhance the aesthetic value of the neighborhood.

To fund their green infrastructure installations, CBG and NEORSD took different paths. The CBG team applied for a grant from EPA's Urban Waters Small Grant program and was awarded approximately \$5,000 per lot, for a total amount of approximately \$45,000 for the nine lots. NEORSD used sewer district funds designated for green infrastructure as part of the consent decree for its three lots.



A CBG vacant lot following clean up and excavation of the shallow depression. Courtesy of the Cleveland Botanical Garden.

PROJECT DETAILS

In October 2013, CBG's contractor graded each of the nine sites to direct water into a shallow depression. The contractor then filled each depression with layers of mulch and a soil mix blend. Next, native plants were added to create rain gardens, and the rest of the lot was seeded with yarrow, micro clover, dwarf perennial ryegrass, and at least 10 species of native flowers.

CBG calculated that the rain gardens help filter over 55 percent of the rain that falls on each lot, reducing the amount of stormwater runoff from each lot from approximately 600,000 gallons per year to 225,000 gallons per year. However, the installations were not quite as successful as expected. The first major problem was the inadequate drainage in the rain gardens. Most of the gardens stayed damp after rainfall, most likely due to layers of mulch and soil mix. The dampness stunted the growth of the plants in the rain gardens. Next, the rain gardens were only able to treat stormwater that fell directly on the lot,

because they did not receive runoff from nearby properties via curb cuts or downspout disconnections. However, the lots still provided a benefit to the city, since the soil helped filter any stormwater that fell on the lot. Of the nine original rain gardens, six are still functioning today, while three of the gardens have been replaced with housing.

NEORS D installed bioretention features in the Slavic Village on the three vacant lots near the hiking and biking trail. First, the contractor excavated each property to create three deep depressions for the bioretention installations. Next, layers of sand, pea gravel, aggregate stone, and soil mix were added to help filter and slow water down as it soaks into the ground. On top of the layers of gravel and soil, the contractor added native plants to beautify the site while also helping soak up runoff.

RESULTS

The combined work of CBG and NEORS D greatly improved the Slavic Village neighborhood and laid the foundation for more investment in vacant lot renewal



One of the completed NEORSD bioretention features. Courtesy of the Northeast Ohio Regional Sewer District.



A CBG rain garden just after planting and seeding with native plants. Courtesy of the Cleveland Botanical Garden.

in the greater Cleveland community. The NEORSD bioretention features, designed to capture approximately 300,000 gallons of stormwater per year, are still functioning today. As permanent fixtures in the community, the rain gardens help to beautify an area next to the local bike and hiking trail. Overall, the rain gardens and bioretention features—as well as the overall renewal of a dozen vacant lots—created a variety of benefits in the community.

IMPROVED WATER QUALITY:

The green infrastructure installations hold and filter stormwater, which helps to protect local waterways from pollution and reduce CSO pollution events.



ENHANCED AESTHETICS:

The addition of native plants and attractive landscaping to both projects helps to enhance the appearance of the vacant lots and show investment in the local community.



IMPROVED SAFETY:

Vacant lots can contain debris from previous demolition projects and become dumping grounds



for trash, furniture, and appliances from neighbors. Vacant lots can also attract pests and affect the overall public safety of the neighborhood. Cleaning up these lots helps improve the safety of the neighborhood for the local community.

LESSONS LEARNED

The combined work of the Botanical Garden and sewer utility illustrates the challenges and benefits of completing a green infrastructure initiative and highlights the importance of constantly learning and adapting to make future projects a success. Both groups learned valuable lessons including how to select the best green infrastructure for a vacant lot, how to achieve community buy-in on a project, and how to choose the right soil mix or vegetation.

Following are some tips and strategies that both teams learned from this effort:

- **Partner up.** Partnering with local community development groups is necessary to gather feedback on a project. For vacant lot projects, it is important to understand how a community would like to use the land before developing plans.
- **Right-size.** Green infrastructure features should be sized based on the



Adding a tree sapling to one of the CBG rain gardens. Courtesy of the Cleveland Botanical Garden.

amount of stormwater the feature will receive. Even small installations can help to reduce stormwater runoff from lots.

- **Choose carefully.** CBG faced problems when the rain garden plants did not grow because the chosen soil mix and mulch held too much moisture. It is important to select the right soil mix to filter water quickly, while providing a good soil bed for your chosen vegetation.
- **Keep it simple.** Simple designs such as the easily replicable CBG rain gardens ensure a project can get up and running quickly at a low cost. Every project does not need to be a large-scale installation.

CBG was also able to use the lessons from the Slavic Village project to inform its next large initiative, Vacant to Vibrant. Funded by the Great Lakes Protection Fund, the

Vacant to Vibrant project worked to revitalize vacant lots in several Great Lakes cities, including Cleveland. CBG identified lots that were connected and owned by one entity so they could add features such as downspout disconnections. They revamped engineering of the rain gardens to include two feet of engineered soils, one foot of aggregate, and one foot of soil mix to help collect stormwater. Additionally, the group took lessons learned in community outreach into the Vacant to Vibrant project, such as working with local community development groups to determine community needs for the land in the early planning stages.

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