

# Case Study: Cleveland

## Green Stormwater Infrastructure in the Right-of-Way



### QUICK CLEVELAND STATISTICS

- **Population:** 384K in 2018
- **3.1% population decrease** since 2010
- **Area:** 82 sq. mi.
- **Mostly combined sewer system**
- **Consent decree:** Yes
- **NPDES permit:** Yes
- **Stormwater fee credit program:** Yes
- **Post-construction stormwater ordinance:** Yes
- **Snow climate:** Yes

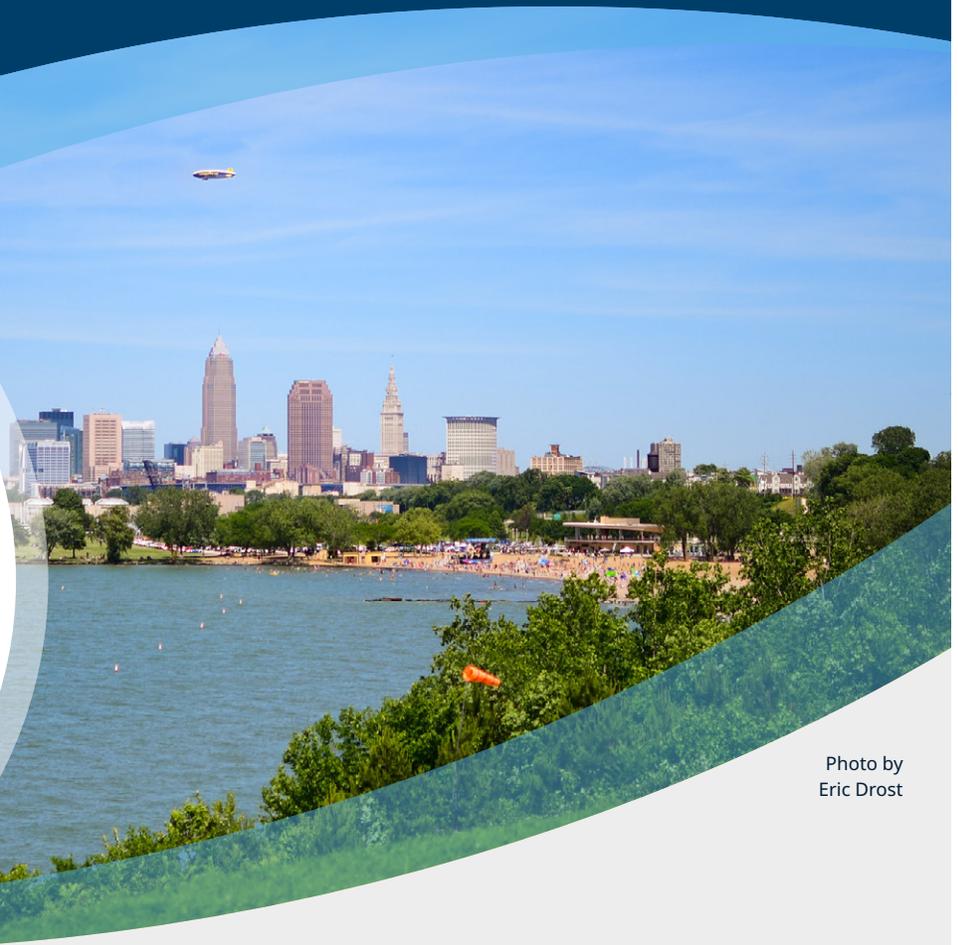


Photo by  
Eric Drost

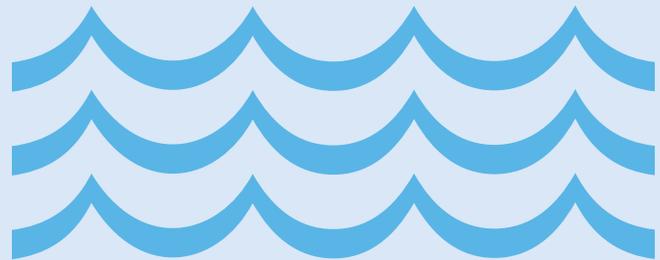
### MOTIVATIONS FOR ADVANCING GSI IN THE ROW

**Leadership and Community.** The City of Cleveland was motivated to create and pass a Complete and Green Streets Ordinance by the city council and by the mayoral administration and Office of Sustainability. There was also support from bicycle advocacy groups.

**Regulation.** The Northeast Ohio Regional Sewer District (NEORS) was initially motivated to implement green stormwater infrastructure (GSI) to assist in controlling combined sewer overflows to Lake Erie and meet the water quality standards of the Clean Water Act through its consent decree with the U.S. EPA and Ohio EPA. It is also motivated by the opportunity to address flooding, erosion, and water quality with its Regional Stormwater Management Program. Although it does not focus on GSI in the right-of-way specifically, NEORS's portfolio of projects includes exemplary practices that manage right-of-way (ROW) runoff.

## IMPACT OF CLEAN WATER ACT REGULATION

NEORSD has a regulatory obligation to implement green infrastructure, which creates opportunities for GSI projects that manage right-of-way runoff along with other types of practices. The motivation of meeting Consent Decree requirements has led to many successful GSI projects within NEORSD's service area.



### **Combined Sewer Overflow Reduction.**

NEORSD has a consent decree agreement and National Pollutant Discharge Elimination System (NPDES) permit with the U.S. EPA to reduce the volume of untreated combined sewer overflows (CSOs) from their system in order to comply with the Clean Water Act. This was one of the first Clean Water Act consent decrees to include required green infrastructure control measures in addition to gray infrastructure. NEORSD created the Project Clean Lake program to meet their water quality goals, which includes implementing GSI.

### **The Project Clean Lake Program is**

NEORSD's 25-year plan to reduce the volume of untreated combined sewer overflows per the EPA consent decree. In addition to gray infrastructure improvements, the program implemented nine large-scale GSI projects across the region between 2011 and 2019. These projects are funded by wastewater fee revenues that NEORSD collects from property owners.

## POLICIES & PROGRAMS THAT PROMOTE GSI

### **Complete and Green Streets Ordinance.**

The City of Cleveland passed a Complete and Green Streets Ordinance in 2011. Although green infrastructure is not currently a strong component, the policy will be updated to make Complete and Green Streets more enforceable and functional in the scope of capital projects, which will likely include stormwater management.

### **Stormwater Fee and Credit Program.**

NEORSD's Regional Stormwater Management Program addresses flooding, erosion, and water quality issues by planning, constructing, and maintaining stormwater-related projects. This program is funded by collecting a stormwater fee from property owners in NEORSD's service area based on the amount of impervious surface on their property, measured in Equivalent Residential Units equal to 3,000 square feet of impervious surface. The credit program provides an opportunity for property owners to reduce their stormwater fee up to 100% by managing the stormwater runoff on their property.

**Green Infrastructure Grant Program** funds implementation of GSI projects led by NEORSD member communities, government entities, and their partners (including nonprofits and businesses) within the combined sewer system area. Even though most of these projects are

outside of the right-of-way, many are parking lot retrofits and set a strong precedent for practices that decrease impermeable surfaces and manage urban stormwater runoff.

## GUIDING PLANS & STRATEGIES FOR GSI

### **The Complete and Green Streets Typologies**

**Manual** was created by the City of Cleveland in 2013 to guide the development of their Complete and Green Streets network. The manual sets the standard for road typology identification and provides recommended design elements and dimensions based on a roadway's location, function, and surrounding area. It is intended to be used as a guide for efficient pre-planning of road projects and to set expectations for Cleveland's roads both internally and externally.

**The Green Infrastructure Plan** was created by NEORSD as part of Project Clean Lake in 2012. It has guided their required investment of \$42 million over a period of eight years to plan, design, implement, and monitor green infrastructure control measures capturing a total volume of 44 million gallons of wet weather flow. The plan identifies priority areas most suitable for GSI projects and evaluates them based on performance, cost-effectiveness, and public input. It also tracks the environmental justice impacts of candidate projects such as reuse of vacant land and opportunity for community redevelopment.

## GOALS & OUTCOMES

### Goals:

- City of Cleveland intends to increase total mileage of right-of-way designed to minimize negative environmental impacts in accordance with Green Streets principles.
- Over 98% of wet weather flows in NEORSD's combined sewer system will be captured and treated when the Project Clean Lake program is complete in 2036.
- NEORSD is committed to actively pursuing opportunities to advocate for strategic and cost-effective implementation and maintenance of green stormwater infrastructure technologies that protect, preserve, enhance, and restore the natural hydrologic function of its region's watersheds.

- NEORSD seeks to maximize the co-benefits provided by green stormwater infrastructure projects, including opportunities to expand urban natural areas, enhance air quality, and improve quality of life in Northeast Ohio.

### Outcomes:

- NEORSD completed a suite of nine large-scale GSI projects between 2011-2019 under Project Clean Lake to control CSOs.
- NEORSD has provided \$8.3M in funding between 2014-2020 through its Green Infrastructure Grants Program to treat and reduce 26,348,246 gallons of stormwater runoff annually within the combined sewer area of Northeast Ohio.

Photos courtesy of NEORSD

## PROJECT HIGHLIGHT

**The Fleet Avenue reconstruction project** utilizes formerly vacant land to capture and treat approximately 15 acres of stormwater runoff from the adjacent right-of-way and surrounding property. This project was a collaboration between NEORSD, the City of Cleveland, and Slavic Village Development.

- **Practice type:** Infiltration basin
- **Annual stormwater capture:** 4.8 million gallons
- **Annual CSO reduction:** 0.5 million gallons
- **Drainage area:** 653,000 sq. ft.
- **Total project cost:** \$8.7 million
- **GSI design & construction cost:** \$2.3 million
- **GSI funded by:** Project Clean Lake Program



## ASSOCIATED BENEFITS OF GSI IN NORTHEAST OHIO

As identified by NEORS&S's Appendix 3 Green Infrastructure Anticipated Co-Benefits Analysis and program staff.



### Ecology

- Provide ecosystem benefits
- Recharge groundwater
- Increase biodiversity and habitat
- Mitigate climate change
- Reduce/sequester carbon dioxide
- Renew urban tree canopy



### Public Health

- Improve livability
- Provide recreation space
- Reduce heat island effect
- Improve air quality



### Urban Vitality

- Provide community amenities
- Cultivate public education
- Address environmental justice
- Increase property values
- Improve aesthetics



### Economy

- Create jobs
- Save on energy costs
- Improve water infrastructure system
- Capture typical year's rainfall
- Reduce combined sewer overflows

## GUIDELINES FOR DESIGNING GSI

**Rainwater and Land Development Manual.** Developed by the Ohio Department of Natural Resources and updated in 2014, the manual provides standards for integrating stormwater

management into land development projects to protect and improve water resources, especially streams. The stormwater management practices identified in the manual include specifications for structural practices such as green infrastructure, providing details regarding design criteria, performance metrics, and maintenance considerations.

## COLLABORATION & PARTNERSHIPS

### COORDINATING MUNICIPAL AGENCIES

**Mayor's Office of Sustainability**  
**City Planning Commission**  
**City Council**  
**Mayor's Office of Capital Projects**

**Division of Traffic Engineering, Public Works**  
**Water Pollution Control**  
**Urban Forestry Section, Public Works**

### EXTERNAL PARTNERS

**Northeast Ohio Regional Sewer District (NEORS)**, a public utility that provides sanitary and regional stormwater services to 62 member communities across 355 square miles

**Northeast Ohio Areawide Coordinating Agency (NOACA)**, a government planning agency that represents six counties in the Cleveland area

## FUNDING & FINANCING

The City of Cleveland uses a combination of sources to fund Complete and Green Streets projects:

- Grants (e.g. the Great Lakes Restoration Initiative)
- Regular city bonds
- Funds from partners (NOACA, NEORS)

## GSI MAINTENANCE RESPONSIBILITIES

**City:** Municipal maintenance covers rights-of way and trees, and occasionally holds contracts with local organizations for additional landscape maintenance.

**NEORS:** Consent Decree Project Clean Lake maintenance is funded by NEORS's Operation & Maintenance Program and covers all nine of their large-scale GSI projects across their service area in perpetuity. GSI projects implemented under NEORS's Green Infrastructure Grants program require operation and maintenance by agreement with the awardee for the design life expectancy of the practice at the awardee's costs.

## LESSONS LEARNED & KEYS TO SUCCESS

- Oversight of GSI design and construction installation, as well as support and capacity building for owner operation and maintenance, are critical to project success.
- Ensure practices reach their design life expectancy by conducting routine field inspections and providing training through workshops and webinars.
- A strong, detailed agreement for grant awardees is necessary to ensure good partners that have the capacity to implement, operate, and maintain GSI.

## SPECIAL THANKS

to the Erb Family Foundation, the City of Cleveland, and the Northeast Ohio Regional Sewer District for making this case study possible.

## PROTECTING WATER, SUSTAINING LIFE

The Alliance for the Great Lakes is a nonpartisan nonprofit working across the region to protect our most precious resource: the fresh, clean, and natural waters of the Great Lakes. Learn more at [greatlakes.org](https://greatlakes.org).