

# Study Explores Green Infrastructure's Economic Benefits for Two Great Lakes Cities

*Customizing the strategy to fit local stormwater issues is key.*

by Tashya Allen, Lori Cary-Kothera and Kitty Fahey

As the climate changes, flood-related impacts are rising for communities along the US coast and Great Lakes. Concern by community planners and other officials is also on the rise, as they look for cost-effective ways to strengthen flood resilience and lessen the financial drain of handling polluted runoff, structural damage, cleanup, and business interruptions.

Green infrastructure appeals to many communities because it provides ways to capture, store, and filter floodwater by using natural areas and man-made systems that mimic natural processes.

However, no one green infrastructure approach will work for all places, because the needs and natural features of each community differ. This was the take-home message of a pilot study that analyzed how specific green infrastructure strategies could lower the risks of current and future flooding in two cities along the Great Lakes – Duluth, Minnesota, and Toledo, Ohio. (See pilot study at [www.coast.noaa.gov/digitalcoast/publications/climate-change-adaptation-pilot](http://www.coast.noaa.gov/digitalcoast/publications/climate-change-adaptation-pilot).)

The study, funded by the US Environmental Protection Agency's (USEPA) Great Lakes Restoration Initiative, was commissioned by the National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management (previously named the Coastal Services Center).

The findings from Duluth and Toledo are leading this NOAA office to develop a process guide that will help US coastal and Great Lakes communities assess the specific benefits and costs of different green infrastructure approaches.

Slated for release in Fall 2015, the guide will join a suite of green infrastructure data, trainings, tools, and other aids featured on the Digital Coast website. The focus in bringing out the guide is to help reduce flooding impacts, but many of these approaches also can improve water quality.

## Duluth

In June 2012, this city along Lake Superior's western edge was hit by an extreme storm event that caused millions of dollars in damage to stream banks, stormwater culverts, and a community park that is a linchpin of the area's recreation economy.

Floodwater storage is a key issue for this city. Heavy rainfall cascades down Duluth's entrenched streams, overwhelming storm infrastructure and causing bank erosion and failure.

The study revealed that if Duluth would use green infrastructure to reduce peak discharge by 20 percent in the Chester Creek watershed, the economic losses associated with a 100-year storm would decrease by 27 percent under current precipitation conditions. This would help reduce the costs of maintaining the city's stormwater infrastructure and stream bank restoration.

Since the study, NOAA and Minnesota Sea Grant have worked with city officials and partners to identify potential green infrastructure options that will provide more floodwater storage. The pilot study has increased community outreach on green infrastructure and has helped to inform a new stormwater ordinance.

## Toledo

This highly urbanized city fronting Lake Erie and the Maumee River began to consider green infrastructure approaches in 2006, following a major flood.

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University of Connecticut

On the left is flooded, conventional street pavement; on the right is permeable street pavement that absorbs water to keep roads passable during heavy rains.



NOAA

Toledo and Duluth encourage homeowners to invest in water storage devices such as these rain barrels.



NOAA

Toledo has installed bioswales similar to this South Carolina one, with vegetation and sloping sides that filter the silt and pollution from runoff.

Longstanding issues with flooding and water quality led the city to take a proactive approach. Toledo has a higher water table and flatter land area than Duluth, and its Silver Creek watershed contains a great deal of impervious surface.

The city's density closed off the option of purchasing large, low-development parcels for floodwater storage, so officials looked to other green infrastructure strategies.

An early, neighborhood-scale project featured porous pavement and bioswales, which are plant-filled stormwater ditches that absorb, filter, and slow down the release of stormwater. The project cost less than \$1 million, while a gray infrastructure fix would have cost many millions more.



Photo by Alisa Goldstein

Stormwater tree trenches help channel excess water from the street through a trench or existing storm drainage, filtering and slowing the water along the way.

The NOAA pilot study found that if Toledo would use green infrastructure to lessen peak discharge by 10 percent in the Silver Creek watershed, the economic losses from a 100-year storm would decrease by 39 percent under current precipitation conditions.

These and other findings have given added momentum to local green infrastructure initiatives. Municipal and county staff members, academia, the private sector, and green infrastructure leaders all have played a part.

Influenced by the pilot study results, the City of Toledo and USEPA funded a bioswale project. Signs have been posted locally that describe how these projects help to reduce runoff and flooding.

Additional pilot studies have been launched to identify future green infrastructure projects. A stormwater utility credits manual was updated. The city is helping large industries conduct their own stormwater assessments and develop green infrastructure proposals. And a city task force is considering next steps for funding, partnerships, and further outreach.

### More Green Infrastructure Resources

Next up for the Office for Coastal Management is a technical assistance project to help a Great Lakes community in New York refine its best management practices for green infrastructure.

Meanwhile, this study joins other green infrastructure aids that continue to be added to the Digital Coast.

Products include a tool highlighting the specific benefits of wetlands within each coastal and Great Lakes county; a green infrastructure training and a mapping guide; a tool that helps users visualize green infrastructure proposals, and other resources. (See the green infrastructure offerings at [www.coast.noaa.gov/digitalcoast/topic/green-infrastructure](http://www.coast.noaa.gov/digitalcoast/topic/green-infrastructure).)

### Pilot Study Collaborators

The data, information, and green infrastructure strategies featured in the pilot study were made possible by these partners:

- Association of State Floodplain Managers
- City of Duluth
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