Targeting Storm Water Retrofits to Improve Urban Streams

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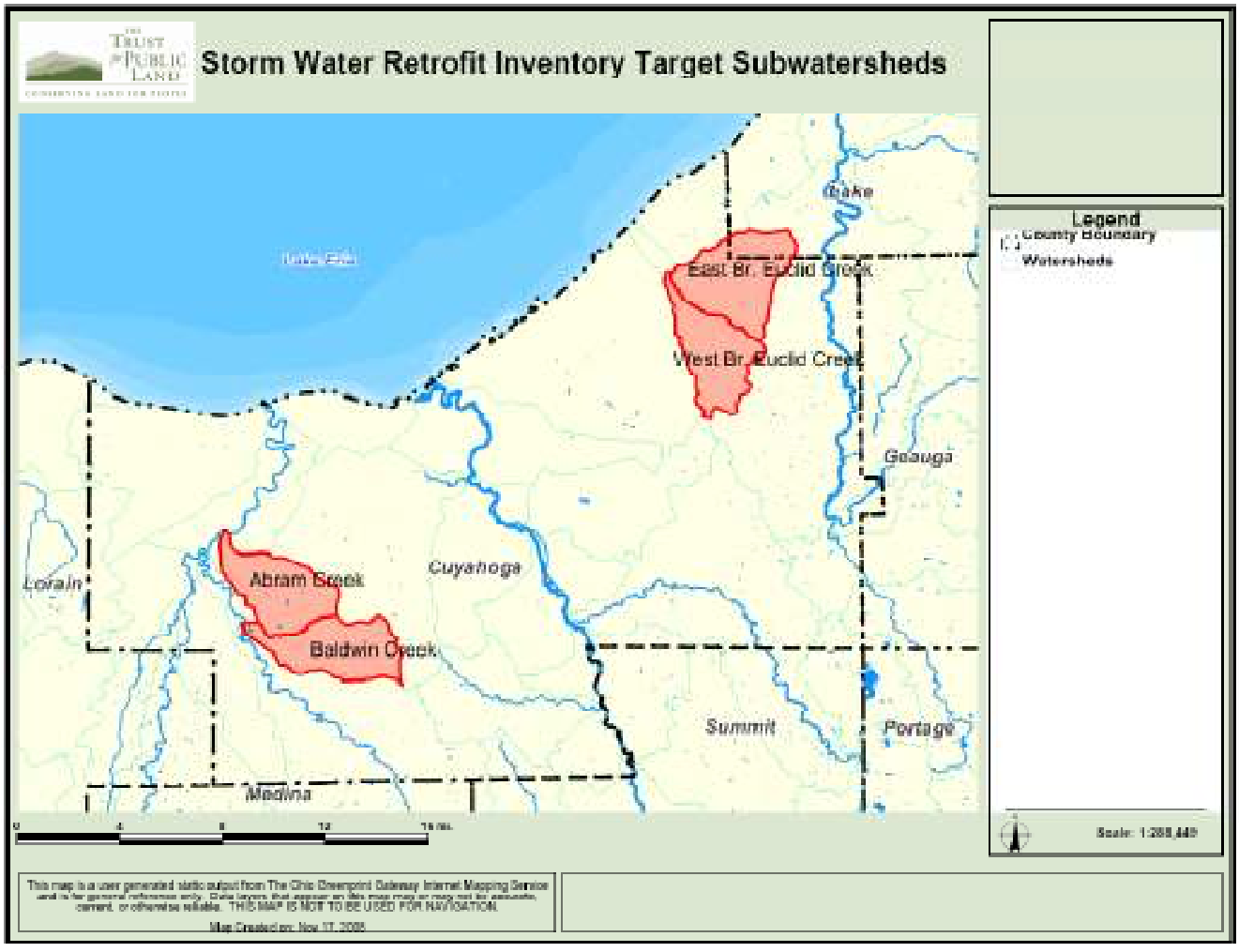
Cuyahoga County is the most highly urbanized county in the state of Ohio, with nearly 90% of the land area considered developed. The vast majority of this development occurred before any state or local regulations requiring storm water management were in place, leading to widespread degraded water quality and stream habitat conditions, especially in headwater stream systems. This degradation is caused by the effects of storm water runoff generated by the increased impervious area (such as parking lots, rooftops, and roads) that accompanies urban and suburban development. Specifically, the increased quantity of water delivered to the stream system and the increased speed at which this water is delivered lead to large spikes in stream flow, even during common rain events. This increased flow scours the stream bed and erodes stream banks, both of which result in increased sediment loads and poor habitat conditions for fish and benthic macroinvertebrates, as well as increased flood frequency. Increased loading of nonpoint source pollutants such as nitrogen and phosphorus that are carried in the storm water runoff or in the sediment from the eroded bank material further contributes to the ecological degradation of these urban and suburban stream systems.

The subwatersheds targeted by this project, Abram and Baldwin Creeks in the Rocky River drainage and the East and West Branches of Euclid Creek, are archetypical Northeast Ohio urban subwatersheds. All are listed on the 303(d) list as either partially or fully impaired with regard to their designated aquatic life uses, meaning they are incapable of supporting fish and/or benthic macroinvertebrate communities representative of the Erie/Ontario Lake Plain ecoregion. They are dominated by low- to medium-density residential development, ranging in impervious cover from 26% to 45%, and are characterized by eroding banks and elevated nutrient loading. Rocky River and Euclid Creek each empty into Lake Erie.

Despite these challenges, many positive factors exist that suggest a focused strategy for recovery is likely to lead to delisting of these impaired stream segments from the 303(d) list. The Cleveland Metroparks and other public entities have significant stream and wetland holdings within the project area, including the largest remaining intact wetland in Cuyahoga County. Large-scale restoration projects, such as low-head dam removal, are being planned and implemented in the lower reaches of these subwatersheds. Additionally, many of the communities in the target subwatersheds have adopted ordinances controlling Riparian and Wetland Setbacks, Construction Site Sediment and Erosion Control and Post-Construction Water Quality as part of their NPDES Phase II storm water programs, effectively limiting the negative impacts any new development that is occurring. Furthermore, the Northeast Ohio Regional Sewer District (NEORSD) is in the process of forming a storm water utility that will levy fees based on impervious surface area, and offer fee credits for implementing storm water management measures on individual parcels. This will provide financial incentive for the adoption of best management practices (BMPs) for storm water treatment, especially among the impervious surface-intensive commercial, industrial, institutional and municipal landowners. Finally, awareness of watershed and storm water issues is growing thanks to the engagement of watershed-based

organizations like the Rocky River Watershed Council, Euclid Creek Watershed Council, and Friends of Euclid Creek.

The proposed project will advance restoration in the targeted subwatersheds by identifying locations where storm water BMPs could be retrofit into the landscape, determining which BMPs are most appropriate given conditions at the subwatershed and catchment level, prioritizing identified retrofit BMPs and providing preliminary designs for the highest priorities. Having the designs in place will all but guarantee funding through existing mechanisms such as the Ohio Mitigation Clearinghouse, the Ohio Surface Water Protection and Restoration Clearinghouse, state and federal grant programs such as 319 grants, or by individual property owners seeking storm water fee credits. The ongoing implementation of the prescribed BMPs will lead directly to water quality and stream habitat improvements.



Additionally, one 756 acre catchment in the Abram Creek subwatershed will serve as a pilot for the deployment of a residential BMP incentive program. This program would provide a cost-share to homeowners for soil fertility analyses and the installation of rain barrels and rain gardens. This pilot program will lead to immediate improvements to both the quantity and quality of storm water draining to Abram Creek, as well as generating important information about the programmatic effectiveness of

this kind of program (through both environmental monitoring and an analysis of program response and adoption rates).

The intended outcome of the proposed project is the improvement of water quality and aquatic habitat in four urban streams tributary to Lake Erie in Cuyahoga County, Ohio. Projects utilized in the restoration of urban-impacted streams often rely heavily on directly altering the properties of the instream habitat or channel morphology. While this can have a significant impact, it is generally limited to a single stream segment and is cost-intensive. Furthermore, these stream restoration projects are vulnerable to the same conditions that lead to the impairment in the first place – changes in upstream land use or storm water management practices. In essence, they are a band-aid solution that addresses only the effects of urbanization within the stream channel. The proposed project looks to restore stream systems by addressing the root-cause of the problem: the generation of uncontrolled or poorly controlled storm water runoff in the developed landscape. The proposed project will achieve this through two parallel efforts:

1. The identification and prioritization of feasible storm water retrofit practices will be conducted in four targeted, urban subwatersheds in Cuyahoga County, Ohio. These subwatersheds comprise a total of 40 square miles (~10 square miles each), and are representative of small watersheds in Cuyahoga County – the most urbanized county in Ohio. Storm water retrofits are a series of structural storm water practices designed to mitigate erosive flows, reduce pollutants in storm water runoff, and promote conditions for improved aquatic habitat that are retrofit into developed watersheds.. The retrofit inventory will focus on public, commercial, industrial and institutional properties. Approximately 15-20 retrofit projects will be evaluated in the field and prioritized in each of the target subwatersheds, and 30% engineering designs will be completed for four of the highest priority retrofit projects. Once fully implemented, the storm water retrofits identified and prioritized by the project will, in combination with other planned efforts, lead to the delisting of over 20 miles of urban streams tributary to Lake Erie.

2. A pilot residential storm water BMP incentive/cost-share program will be deployed in a 750 acre catchment of one of the priority subwatersheds to demonstrate and measure the effectiveness of such a program in an urban setting. Incentive programs such as the Conservation Reserve Program, incorporated as part of the Farm Bill, have long been used in agricultural settings to improve water quality. Providing incentive to adopt residential BMPs, such as rain barrels, rain gardens and soil fertility analyses, could be equally as successful in an urban setting if implemented sufficiently intensively. The proposed program would outreach to 1200 residences in the target catchment through direct mail, public presentations, and if necessary, by going door-to-door explaining the program. Roughly 300 rain barrels, 30 rain gardens, and 300 soil fertility analyses would be available for cost-share in the selected catchment. These practices will reduce storm water runoff volume by at least 1,000,000 gallons per year, with phosphorus and total suspended solids removal rates of up to 90% in the areas treated by rain gardens.

1.7 Basic Steps in Stormwater Retrofitting

An eight step process is recommended to systematically search for retrofit storage in a subwatershed (Figure 1.8). The process begins with retrofit scoping and concludes with maintenance of the constructed retrofit. Chapter 4 provides more information on each step of the retrofit process.

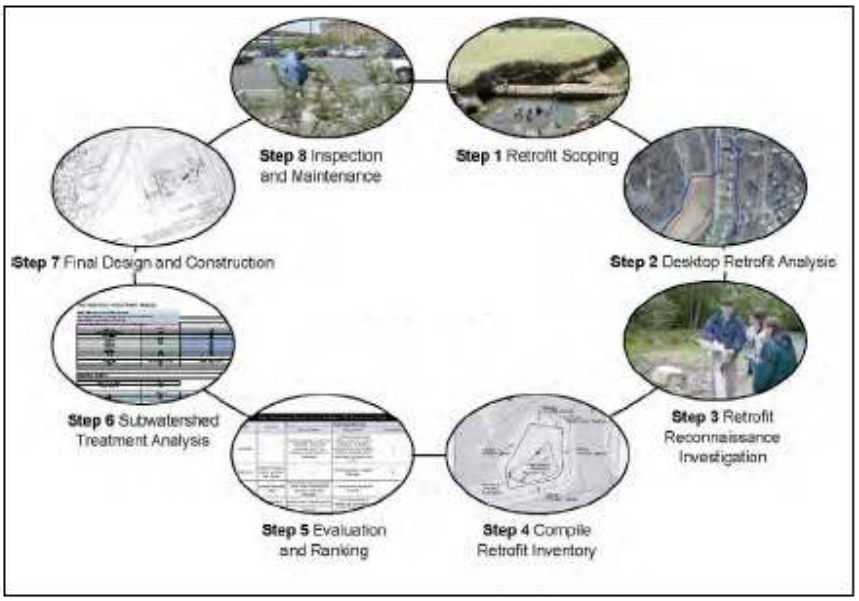


Figure 1.8: The eight basic steps of the stormwater retrofitting process.