

The United States Environmental Protection Agency Region 4
Water Protection Division

**Proposal for Regional Sustainability and Environmental Sciences
Research Program**

**Using Green Infrastructure to Address Climate Change Resiliency:
A Case Study in North Birmingham, AL**



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Project Schedule: October 2015-2017

Background:

As different parts of the country become drier, wetter, or hotter, green infrastructure can help communities improve resiliency and adapt to climate change by increasing the capacity of drainage systems to handle large storms, increasing the resilience of water supply systems in times of drought, and mitigating the urban heat island effect. Urban vegetation can also mitigate climate change by reducing the levels of greenhouse gases in the atmosphere. The area of North Birmingham, AL is one of three of Region 4's priority environmental justice communities for integrated, cross-program approaches to address multiple environmental problems. North Birmingham communities are facing contaminated industrial Superfund sites, surface water quality problems (e.g., dieldrin, fecal coliform, sediment, zinc, and pH) and significant flooding due to the heavy urban/industrial land use of the area. The existing flooding issues are expected to be exacerbated in the future due to extreme weather effects associated with climate change. Village Creek's floodplain (a watershed within the City limits of north Birmingham) comprises 53 percent of Birmingham's Special Flood Hazard Area. In some locations, floodwaters can rise as quickly as 3 feet per hour. Village Creek has flooded nearby neighborhoods over 20 times in the past 20 years. Since 1977, federally declared flooding events have occurred 11 times. This history of repetitive flooding and associated damages prompted the City and the US Army Corps of Engineers (USACE) to seek congressional funding to accomplish both structural and non-structural solutions to resolve the cycle of repetitive flooding. We can expect to see these cycles of extreme storm events increase in the future with climate change.

In an effort to be better positioned to address the future anticipated exacerbation of flooding issues caused by climate change, and improve the well-being of the community, the City of Birmingham has an interest in incorporating significant green infrastructure into its comprehensive watershed plan for Village Creek. Village Creek runs from its headwaters under the Birmingham airport to Locust Fork and eventually discharges to the Black Warrior River. The City has limited experience in communicating the value of green infrastructure to its citizens or in the actual design of green infrastructure, and has expressed enthusiastic interest in working in partnership with the Region and ORD to obtain assistance on green infrastructure options through the RESES program.

In this proposal, ORD will pilot in the Village Creek watershed a prototype web-based version of the EPA National Stormwater Calculator currently under development by ORD. This project will fund a prototype that includes a cost/benefit component that will help users, such as citizens and local developers, estimate the costs and benefits of green versus grey infrastructure practices. The City will provide the cost data to verify and calibrate the results of the tool. Once developed by ORD, this new additional capability of the Stormwater Calculator would be available to be utilized by cities and communities across the country for their own site specific analysis.

This pilot project will assist the City in determining the most economically and ecologically beneficial green infrastructure projects to bring to its citizens for their consideration. The City has on-going plans to start initial meetings with stakeholders in the Village Creek watershed in October 2014 (including Neighborhood Associations, NGOs, and industry) on potential green infrastructure solutions to the community's stormwater flooding and infrastructure issues. The City is also seeking assistance from ORD and the Region in communicating the value of green infrastructure in urban and industrialized areas using the ORD EnviroAtlas tool, and ultimately the results from the Stormwater Calculator. The final green infrastructure projects selected by the stakeholder group will be included in the Village Creek watershed plan and the City's Comprehensive Plan to be implemented as resources allow.

Approach and Expected Outcomes:

- **EnviroAtlas**

As part of the project, ORD will collaborate with the City to implement the Community Component of the EnviroAtlas to provide high resolution data on ecosystem services and community benefits specific to the City of Birmingham. The City will use the results of the EnviroAtlas analysis in their green infrastructure planning processes to gain a better understanding of how its decisions can affect ecological and human health outcomes. ORD funding for the EnviroAtlas in Birmingham is already planned and RESES funding will not be needed to accomplish this portion of the project. The web-based EnviroAtlas will allow the City to make strategic choices about green infrastructure and development in the watershed based on a more comprehensive understanding of the interactions between human activities and the many goods and services (often referred to as "ecosystem services") that people derive from nature.

- **ORD National Stormwater Calculator Online and Cost Benefit Component**

As part of the project, ORD will work with the City of Birmingham to develop a prototype web-based version of the National Stormwater Calculator to include a cost-benefit component on green versus grey infrastructure. When complete, the tool can be transferred to other communities in the nation. In the project, the City will provide cost data from the City of Birmingham and the Alabama Department of Transportation to verify and calibrate the results of the tool. The Stormwater Tool will include three screening options to help the City, and other users, model the effects of climate change on the hydrology. The project is anticipated to provide important information to the community on the cost savings of utilizing green infrastructure for flood protection and community resiliency. The RESES Research Program will fund this portion of the project.

Resources Needed and Assignments:

Project Activity and/or Deliverable	Responsible Party	Resources Needed if Applicable	Estimated Completion
Stakeholder Engagement Technical Assistance	Alice Gilliland	ORD Staff Time. ORD will participate in the stakeholder process for community engagement in Village Creek, which will be led by the City of Birmingham during their watershed plan and green infrastructure practice selection.	October 2016
Community Component of EnviroAtlas for Birmingham	Anne Neale	ORD Staff Time. ORD will develop the ecosystem goods and services data for Birmingham as one of their selected communities in EnviroAtlas. This will include high resolution (1 m) land cover classification.	October 2016
Stormwater Calculator Tool Web-based Version Development	Alice Gilliland	ORD Staff Time to continue the development of the Stormwater Calculator by the ORD Safe and Sustainable Water Resources (SSWR) research program. ORD will pilot this component with the City of Birmingham, once available.	October 2016
Stormwater Calculator Cost/Benefit Analysis Component	Alice Gilliland	\$80K for the ORD SSWR program. Will be leveraged with in-kind services from the City of Birmingham which will provide costing data for grey options.	October 2017

Project budget and duration

- Breakdown of extramural resources
 - \$80K will be for contractor support to incorporate the grey infrastructure options into the Stormwater calculator, incorporate costing data and grey options based on Birmingham input, refine the calculator based on Birmingham demonstration/testing input.
- Federal FTE's involved (% time of each participant)
 - The SW Calculator will need approximately 10-15% FTE investment by R4 (WPD Watershed Coordinator); approximately 10-25% of 3 ORD FTEs to participate in the stakeholder process, and provide technical guidance and work assignment management of the contractor. ORD will also consider bringing a student on board to support/test the tool.

Citations

<http://www2.epa.gov/water-research/national-stormwater-calculator>
<http://enviroatlas.epa.gov/enviroatlas/atlas.html>