GREEN INFRASTRUCTURE
AND THE SUSTAINABLE COMMUNITIES INITIATIVE

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

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GREEN INFRASTRUCTURE
AND THE SUSTAINABLE COMMUNITIES INITIATIVE

EXECUTIVE SUMMARY

The use of green infrastructure is an important strategy for HUD's **Office of Economic Resilience** (OER) and its Sustainable Communities Initiative (SCI) grantees, especially as communities plan for the concurrent and future impacts of climate change and natural disasters.

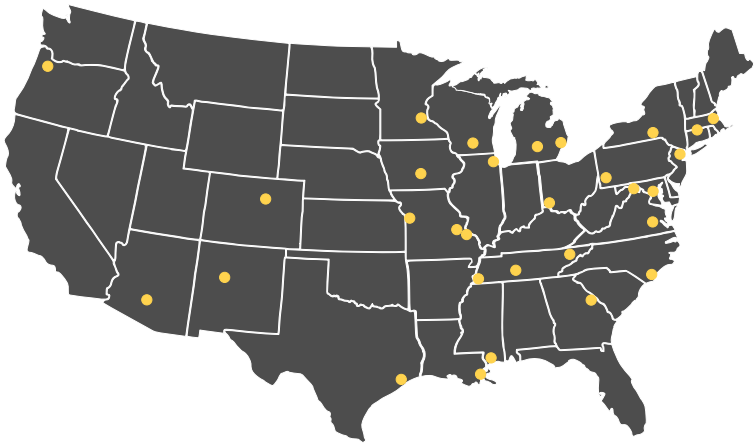
The incorporation of green infrastructure can be a cost-effective solution to help communities save taxpayer money on public infrastructure capital investment and maintenance costs, improve stormwater management and water quality, reduce combined sewer overflows (CSOs), and limit the impacts of flooding on homes and businesses. All of these efforts support communities to become more resilient to the effects of climate change and extreme weather events, while lowering future infrastructure costs and promoting community revitalization.

This report shares the green infrastructure best practices and outputs of HUD grantees under the HUD SCI grant programs as part of HUD's commitment under the **Green Infrastructure Collaborative**. These profiles present a high-level snapshot of the grantees' green infrastructure work and link to other resources with more detailed information on plans and projects.

The report features 30 HUD SCI grantees which have incorporated green infrastructure strategies and projects within their community and regional planning grants. The grantee profiles first present a brief background of the planning projects funded by HUD beyond their green infrastructure components. Then, the goals of their projects related to green infrastructure are identified. Finally, the green infrastructure outputs or outcomes that resulted from the grantees' planning and implementation efforts are highlighted.

For more information on federal government support for green infrastructure, please visit the **U.S. Environmental Protection Agency's Green Infrastructure website** here: http://water.epa.gov/infrastructure/greeninfrastructure/

GRANTEES FEATURED



HUD SCI GRANT PROGRAMS*

The Sustainable Communities Initiative at HUD is comprised of two grant programs: the **Sustainable Communities Regional Planning Grant program** and the **Community Challenge Planning Grant program**. A brief overview of these programs is described below, highlighting the number of grants, level of funding, and type of plans produced.

SUSTAINABLE COMMUNITIES REGIONAL PLANNING GRANTS

- 74 Regions
- $165 million in funding
- Multi-jurisdictional consortiums develop a regional plan for sustainable development

COMMUNITY CHALLENGE PLANNING GRANTS

- 69 Communities
- $70 million in funding
- Corridor, neighborhood, city-wide, and station area plans

*** No FY2012-FY2015 appropriation**

THE PARTNERSHIP FOR SUSTAINABLE COMMUNITIES

The Sustainable Communities Initiative grew out of the HUD-DOT-EPA **Partnership for Sustainable Communities**, which began on June 16, 2009 when the **U.S. Department of Housing and Urban Development** (HUD), **U.S. Department of Transportation** (DOT), and the **U.S. Environmental Protection Agency** (EPA) joined together to help communities nationwide improve access to affordable housing, increase transportation options, and lower transportation costs while protecting the environment.

The Partnership works to coordinate federal housing, transportation, water, and other infrastructure investments to make neighborhoods more prosperous, allow people to live closer to jobs, save households time and money, and reduce pollution.

HUD's Sustainable Communities Initiative planning grants were awarded to 143 communities and metropolitan regions across the nation in 2010-2011. Collectively, these HUD SCI grantees' consortiums represent over 936 cities, 271 counties, 24 tribal entities, and approximately 3,300 total partners.

LESSONS LEARNED FROM THE SUSTAINABLE COMMUNITIES INITIATIVE

TAKE A REGIONAL APPROACH TO GREEN INFRASTRUCTURE

Green infrastructure investments are most effective and beneficial when coordinated at the regional scale. Many individual cities, municipalities, and sewer departments are analyzing the feasibility of incorporating green infrastructure into their stormwater management plans because of its proven impacts and benefits. While these investments are certainly worthwhile, bringing individual municipalities together to plan for green infrastructure and water protection efforts at a greater and more collaborative scale increases its effectiveness and benefits. A regional approach is especially beneficial for smaller municipalities which may lack the technical expertise or staff capacity to plan for green infrastructure and watershed protection on their own.

HUD SCI Regional Planning grantees have illustrated the benefit of consolidating green infrastructure planning at the regional and watershed level. As part of their regional approaches, the grantees have provided technical assistance for green infrastructure, convened local municipalities in integrated regional planning for watershed protection, and disseminated green infrastructure resources and best practices for municipal partners in their regions.

GREEN INFRASTRUCTURE CAN BE A TOOL FOR CLIMATE RESILIENCE

Green infrastructure is an important and underutilized tool for increasing community resilience to the effects of climate change and natural disasters. Gray infrastructure (increasing sewer pumping capacity and conduit size) and structural solutions (levies, berms, and sea walls) have been the traditional approaches to stormwater management and flood prevention. These solutions generally fail to provide multiple community benefits and frequently fail during extreme weather events and natural disasters.

HUD SCI grantees have planned for climate resilience by recommending a dual approach to stormwater management that uses both traditional gray infrastructure and green infrastructure. By identifying strategic areas to implement stormwater best management practices (BMPs) and lowering the peak demand on sewer systems, these communities are becoming more resilient to the damaging effects of climate change.

GREEN INFRASTRUCTURE CAN BE USED FOR PLACE-MAKING

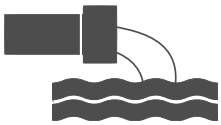
Green infrastructure investments are especially valuable because of the corollary benefits they provide communities. Typical stormwater "gray infrastructure" investments are hidden from plain sight in the form of underground pipes. Green infrastructure facilities, on the other hand, can increase property values and spur economic revitalization by providing community amenities such as parks and water features. Additionally, increased greenery and tree canopy are proven to increase property values and the desirability of neighborhoods.

HUD SCI grantees have planned for the use of green infrastructure as a feature within a larger place-making strategy to catalyze economic development with desirable community amenities and improved aesthetics.

WHY GO GREEN? THE BENEFITS OF GREEN INFRASTRUCTURE

REDUCES FLOODING DAMAGE TO HOMES AND BUSINESSES

IMPROVES WATER QUALITY AND LOWERS GROUND LEVEL OZONE



REDUCES COMBINED SEWER OVERFLOWS (CSOs) WHICH SEND RAW SEWAGE INTO WATERWAYS

PROVIDES A COST EFFECTIVE SOLUTION FOR BOTH PUBLIC AND PRIVATE SECTORS

INCREASES SEWER SYSTEM CAPACITY AND RESILIENCE TO PEAK STORM EVENTS

CREATES PERMANENT JOBS FOR CONSTRUCTION AND MAINTENANCE

REDUCES MUNICIPAL WATER USE THROUGH RAIN HARVESTING AND GROUNDWATER RECHARGE

REDUCES THE URBAN HEAT ISLAND EFFECT AND LOWERS BUILDING ENERGY CONSUMPTION

CREATES AND RESTORES WILDLIFE HABITATS IN URBAN ENVIRONMENTS

PROVIDES COMMUNITY RECREATIONAL FACILITIES AND IMPROVES PUBLIC HEALTH

INCREASES PROPERTY VALUES DUE TO INCREASE IN TREES AND GREENERY

REDUCES IMPERVIOUS SURFACES AND NATURALLY INFILTRATES STORMWATER

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FY2010

COMMUNITY CHALLENGE PLANNING GRANTEES

CITY OF CINCINNATI cincinnati, oh

project **DETAILS**

Plan. Build. Live.

2010 Community Challenge Planning Grant
Award: $2,400,000

PLAN BUILD LIVE
ideas in action

project **BACKGROUND**

The **City of Cincinnati** used HUD Community Challenge Planning Grant funding to coordinate the Plan Build Live initiative. Plan Build Live was the first step in implementing the recommendations of **Plan Cincinnati**, the city's comprehensive plan which the Cincinnati City Council approved in October 2012.

Plan Build Live's primary goal was to create a **city-wide Form-Based Code (FBC)**. The FBC is designed to spur neighborhood revitalization in Cincinnati's disinvested urban neighborhoods through pedestrian-friendly, mixed-use development, while preserving the city's historic charm. The Cincinnati City Council voted unanimously to adopt the new Form-Based Code in May 2013.

The City of Cincinnati, through partnerships with the **Metropolitan Sewer District of Greater Cincinnati** and the **Mill Creek Restoration Project**, also worked on green infrastructure and stormwater management issues in the Hamilton County area as part of Plan Build Live. As one of the top five combined sewer overflow (CSO) dischargers in the country, the Metropolitan Sewer District of Greater Cincinnati (MSD) is under a federal **consent decree with EPA** to resolve this problem. The solution is **Project Groundwork**, one of the biggest public works projects in the history of Cincinnati. This two-phased multi-billion dollar program is comprised of hundreds of sewer improvements and stormwater control projects across Cincinnati, with the local community investing over a billion dollars over the next ten years.

One of the main initiatives of Project Groundwork funded by the HUD Community Challenge grant was development of the **Lick Run Watershed Master Plan**, which includes a plan for "daylighting" Lick Run Creek. Daylighting projects bring previously channelized and submersed waterways back to the surface. The Lick Run Creek has been buried and enclosed in an 18 foot combined sewer and stormwater pipe underground for over 100 years. During dry weather, the flow of the Lick Run pipe is conveyed to the Mill Creek treatment plant in Lower Price Hill. However, during peak rain events, the Lick Run combined sewer can become filled beyond its capacity and excess flow is diverted, untreated and with raw sewage, through the CSO#005 outfall directly into Mill Creek.

green infrastructure **GOALS**

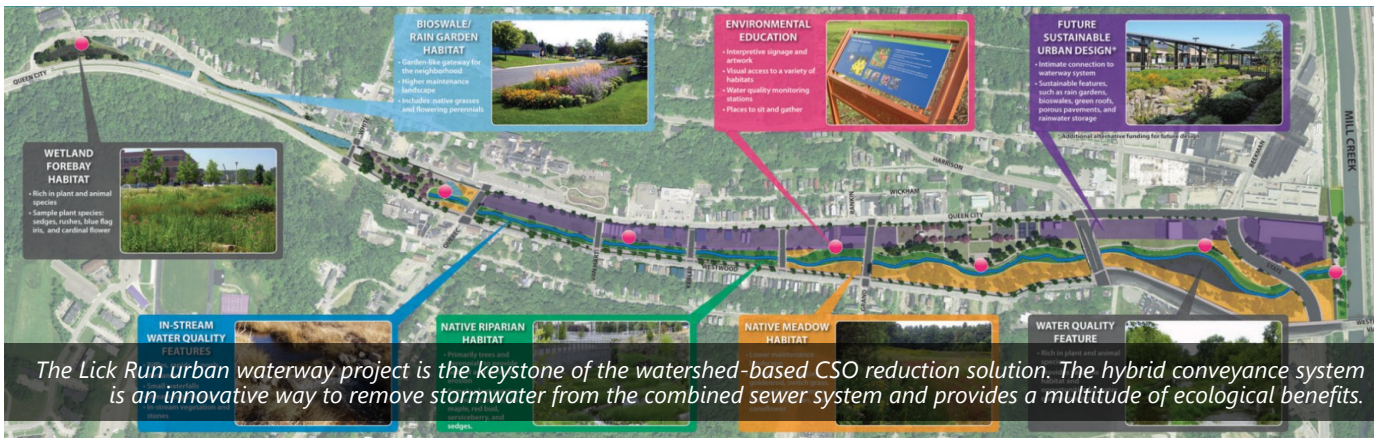
- "Daylight" Lick Run in order to remove stormwater runoff from the combined sewer system and reduce or eliminate overflows from CSO #005 into Mill Creek
- Improve water quality in the Mill Creek Watershed and convey stormwater flow from the hillsides to Mill Creek
- Develop a natural asset for the South Fairmount community through creation of a greenway along re-surfaced Lick Run Creek
- Provide a catalyst for community reinvestment and development in the Fairmount neighborhood as part of MSD's **Communities of the Future** approach

green infrastructure **OUTPUTS AND OUTCOMES**

Lick Run Watershed Master Plan

The final **Lick Run Watershed Master Plan** published by the City of Cincinnati contains the recommendations and project specifications for mitigating combined sewer overflows into Mill Creek. The following outcomes resulted from this plan:

- The project identified a hybrid conveyance system as the most suitable to meet the conveyance goals for the Lick Run watershed. The hybrid conveyance system includes the waterway on the surface (Lick Run Creek) and an underground storm sewer conveyance box.
- Once construction is complete (2018-2019), the Lick Run project will remove an estimated 1.78 billion gallons of CSOs annually from Mill Creek. The daylighted Lick Run Creek, wetlands, and new greenway will also catalyze economic development in the adjacent low and moderate income South Fairmount neighborhood.
- Three demonstration projects were completed: two biofiltration system installations and permeable paving at one site. Together, these will remove over 440,000 gallons of stormwater runoff annually from the combined sewer system.
- The City Planning Commission approved the Lick Run Watershed Master Plan on September 6, 2013 and was approved by the Cincinnati City Council on November 21, 2013.
- The U.S. EPA approved the Cincinnati's Metropolitan Sewer District's solution for reducing overflows from CSO #005 on May 30, 2013.



The Lick Run urban waterway project is the keystone of the watershed-based CSO reduction solution. The hybrid conveyance system is an innovative way to remove stormwater from the combined sewer system and provides a multitude of ecological benefits.

Source: http://projectgroundwork.org/downloads/lickrun/lick_run_master_plan.pdf

URBAN REDEVELOPMENT AUTHORITY

pittsburgh, pa

project **DETAILS**

Allegheny Riverfront Green Boulevard

2010 Community Challenge-DOT TIGER II Combination Grant

HUD Award: $675,000 | DOT Award: $825,000

project **BACKGROUND**

The **Urban Redevelopment Authority of Pittsburgh** used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to lead the **Allegheny Riverfront Green Boulevard**, a planning initiative for the transformation of 6.5 miles of the Allegheny Riverfront from downtown to the city limit.

In the 1800s, the Allegheny River was the birthplace and lifeline of industry for Pittsburgh. The riverfronts housed multiple steel mills and accommodated transport of coal and steel via both water and railroad. Over time, these industries waned and left behind many vacant and brownfield sites along the Pittsburgh riverfront. In 1999, in the wake of these declining industries, Mayor Tom Murphy established a non-profit collaborative of city leaders called **Riverlife** to create a vision and master plan for the city's riverfronts.

The Allegheny Riverfront Green Boulevard project is focused on five core tasks: establishing a rail-with-trail green boulevard that would accommodate existing Allegheny Valley Railroad freight along with regional passenger rail use; station area planning around these proposed rail station areas; creation of a new riverfront open space system with access points, habitat and ecological enhancements, and riverbank stabilization.

Planning for the Green Boulevard was based on goals of regenerative development and functional ecology, which were previously laid out in the **Allegheny Riverfront Vision Plan**. These goals are focused on creation of a riverfront that supports a high quality of life for the residents of Pittsburgh while simultaneously improving the ecological quality of the Allegheny River. The Green Boulevard project incorporated recommendations for green infrastructure throughout their final plan in order to meet their regenerative and river stabilization goals, while creating new habitats and restoring natural hydrologic functions.

The 47th Street streetscape design includes regenerative stormwater conveyance through the use of vegetative bioswales

Source: http://ura.org/pdfs/ARGB/2013.03.21_ARGB-Executive-Summary.pdf

green infrastructure **GOALS**

- Improve the quality of the natural environment, including trees and other vegetation, soil, and river water
- Restore natural hydrologic cycle and reduce environmental impacts of stormwater runoff
- Create greater physical continuity among natural spaces
- Reintroduce natural ecology by replacing invasive plant species with native species and creating new habitats for wildlife

Rendering of public open space along the Allegheny River at the 43rd Street District looking towards downtown Pittsburgh

Source: http://www.sasaki.com/media/files/01urbanallegheny-4.jpg

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final **Green Boulevard Strategic Plan**, published in March 2013, includes policy recommendations for:

- Creation of a new riverfront open space system with access points to the river, including 29 acres of new park and open space in the communities along the Green Boulevard.
- Three types of riparian buffer zones tailored to the existing river's edge and development conditions. These restored riparian buffers will help stabilize and, in some locations, restore the riverbank, while improving ecosystem functions such as habitat, flood mitigation, sediment and nitrogen removal, water temperature moderation, and aquatic food web.

Technical Studies

In addition to the plan's policy recommendations, the project produced a **Technical Appendix on Open Space and Riverfront Access** which contains information from several technical studies, including a Green Infrastructure Toolkit and sections on Ecological Observations, Ecological Buffer Typologies, Riverfront Conceptual Open Space Plans and Cost Summaries, and Performance Measures for Stormwater Management, Riparian Buffers, and Focal Species.

CITY OF NEW ORLEANS new orleans, la

project **DETAILS**

Livable Claiborne Communities

2010 Community Challenge-DOT TIGER II Combination Grant
HUD Award: $928,000 | DOT Award: $1,072,000

project **BACKGROUND**

The **City of New Orleans** used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to lead the **Livable Claiborne Communities** initiative. The project study area, in the core of New Orleans, is divided by Interstate I-10 and the Pontchartrain Expressway, which separates uptown neighborhoods from downtown. Recent public capital improvements and public-private commitments have produced investments in housing, two new hospitals, schools, community centers, libraries, a signature greenway and park, and streetscape improvements. Given these investments, the project explored ways to increase job opportunities and prosperity, increase affordable housing, improve transportation connections, and to find sustainable solutions to the flooding challenges of New Orleans along the Claiborne corridor.

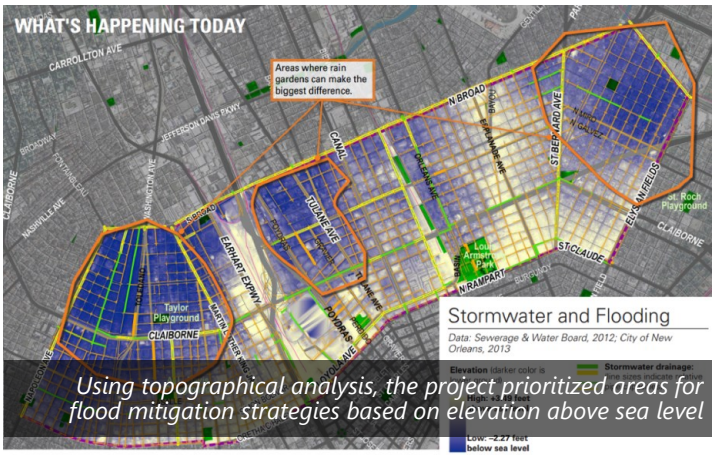
New Orleans' existing drainage network is overburdened for a variety of reasons, including low elevations, lack of catch basins, impervious surfaces, and soil subsidence. Localized floods caused by heavy rain events are a common reality for many neighborhoods across the city, causing property damage and financial burdens for New Orleans residents, as well as damage to the city's street infrastructure.

These heavy local flooding events can be attributed in part to the subsurface drainage network that has little capacity for water storage. Increasing pumping capacity or conduit size has been the typical solution. As a consequence of constant pumping, groundwater is removed from the porous soils. Subsidence, or the shrinking and sinking of soil caused by the soft clay soils in the region results, exacerbating localized flooding events, damaging subsurface and surface infrastructure, and creating excessive potholes. Stormwater runoff is not mitigated and pollution is flushed directly into Lake Pontchartrain. Traditional approaches have become economically and ecologically unsustainable.

New Orleans is also under a **consent decree with the EPA** and the **Sewerage and Water Board of New Orleans** (SWBNO) has a **Green Infrastructure Plan**, under which they have agreed to dedicate $500,000 per year over the next five years, to be used for green infrastructure projects and activities carried out pursuant to the Plan. For these reasons, they focused heavily on stormwater management and the implementation of green infrastructure to meet their goals.

green infrastructure **GOALS**

- Reduce and eliminate runoff through innovative planning and implementation of drainage, stormwater, and wastewater management
- Implement green solutions for stormwater management including rain gardens, bioswales, pervious pavement, and green roofs
- Create an environmentally resilient region by "living with water" through the proposals illuminated in the **Greater New Orleans Urban Water Plan**



Source: http://www.nola.gov/livable-claiborne-communities/9_lcc-study_-final-report/

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The **Final Livable Claiborne Communities Study** was published in June 2014 and provides a list of sustainable solutions and recommended policy actions for the flood-prone environment in New Orleans. The core green infrastructure solutions are:

- Creation of a Green Infrastructure Land Bank, working with **New Orleans Redevelopment Authority** (NORA) or a partnership led by the City to gain control of vacant lots and the SWBNO to maintain and operate a green flood control system.
- Translation of green infrastructure into neighborhood amenities by supplementing the **Lafitte Greenway Plan** with a system of rain gardens, retrofitted parks, landscape swales, and daylighted canals as linear parks.
- Promotion of green infrastructure and design; incorporation of high performance stormwater systems and green design as an essential component into all public and private development.
- Developing and funding a training program for green infrastructure jobs, both for construction and maintenance.
- Making the LCC area a priority in the **Re.invest Initiative**, an initiative sponsored by the Rockefeller Foundation that will help New Orleans prioritize its current list of "ready" projects to move from design to implementation, finalize designs of priority projects for implementation, create investment vehicles to finance priority projects, and develop storm water management best practices that respond to local soil and groundwater conditions.

Pages 63-66, 119-126 of the LCC Study highlight the findings on green infrastructure and pp. 264-267 of the additional **Technical Memorandum on Strategies and Implementation Design** identifies specific long term implementation actions and responsible actors for implementing their green infrastructure solutions.

JERSEY CITY REDEVELOPMENT AGENCY

jersey city, nj

project **DETAILS**

Canal Crossing Redevelopment Plan

2010 Community Challenge-DOT TIGER II Combination Grant

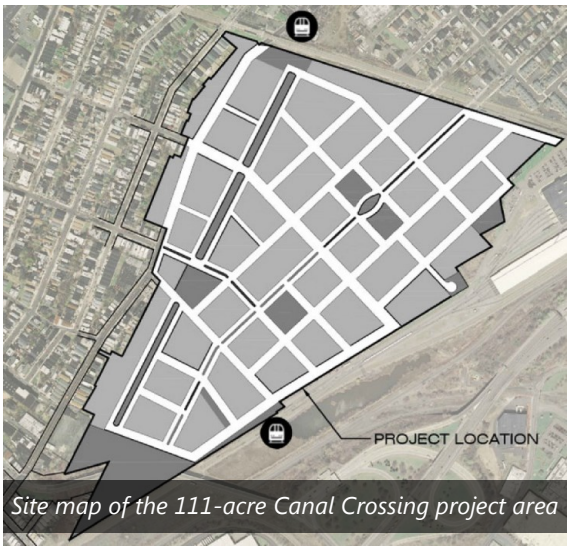
HUD Award: $308,970 | DOT Award: $1,964,400

project **BACKGROUND**

The **Jersey City Redevelopment Agency** used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to lead revitalization planning efforts at **Canal Crossing**. The Canal Crossing Redevelopment Plan area is a new transit-oriented neighborhood of approximately 111 acres, located in the southeastern section of Jersey City.

Revitalization of this area is hampered by outdated infrastructure, including: dilapidated combined sewer infrastructure that is more than 100 years old; insufficient water mains; large tracts of contaminated industrial wastelands; a road system that fails to provide sufficient linkages for pedestrian access to the region's regional rail networks; and a lack of open space amenities.

Canal Crossing is at the downstream end of a larger upstream watershed area. The upstream watershed area north of Garfield Ave. is over 358 acres, fully developed, and at a much higher ground elevation than Canal Crossing. Runoff from these areas located upstream, west and north of the Canal Crossing area, as well as areas within the project area are collected via inlets along the streets, which discharge into a combined sewer outfall on the Hudson River.



Site map of the 111-acre Canal Crossing project area

Source: http://www.thejcra.org/canalcrossing

This project focused on the incorporation of green infrastructure solutions to complement the city's ongoing work to separate the currently combined sewer system in compliance with the city's **consent decree with EPA** to eliminate its downstream pollution of the Hudson River. Separation of the sewer system will also meet state requirements under the **New Jersey Department of Environmental Protection**, which prohibits expansion of any existing combined sewer system. In addition to the sewer separation, this project planned for the use of green infrastructure to improve the water quality of the stormwater runoff before it enters the new drainage system.

green infrastructure **GOALS**

- Reduce CSOs and peak stormwater runoff events
- Use stormwater harvesting techniques for runoff retention
- Employ green roofs and green streetscapes to address NJDEP Water Quality regulations using natural methods
- Implement stormwater management Best Management Practices (BMPs) to minimize downstream impacts and prevent flooding

This diagram shows the proposed storm sewer system solutions for addressing downstream drainage into the Hudson River

Source: http://www.thejcra.org/canalcrossing

green infrastructure **OUTPUTS AND OUTCOMES**

Stormwater Management Reports

The final **Canal Crossing Redevelopment Plan** produced two extensive reports focused on site drainage patterns, reduction of stormwater and CSOs into the Hudson River downstream, and improvement of stormwater runoff quality. The reports are below:

Basis of Design Infrastructure Report

Stormwater Drainage Report

Policy Recommendations

The plan recommends using green infrastructure to harvest stormwater on-site and improve stormwater runoff quality while they simultaneously work to completely separate their sanitary sewer and stormwater systems. Green infrastructure such as porous sidewalk paving, bioswales, bioretention systems, low impact green streets techniques, and green roofs are recommended.

The new stormwater collection system, with rooftop, underground, and enlarged existing NJ Transit stormwater detention basin storage, will convey stormwater runoff from Canal Crossing to the Hudson River re-using the existing 72:84" outfall pipe, which will be cleaned and re-lined. In addition, 50 percent of the total suspended solids from street runoff are estimated to be removed using green streets techniques, including bioretention systems. The green streets techniques proposed also achieve other community goals such as traffic calming and improved pedestrian aesthetics.

CITY OF COLUMBIA columbia, tn

project **DETAILS**

The Boulevard 2050 and Tomorrow Plan

2010 Community Challenge Planning Grant
Award: $250,000

THE BOULEVARD 2050 & TOMORROW

project **BACKGROUND**

The **City of Columbia** used HUD Community Challenge Planning Grant funding to envision a new future for the **James Campbell Boulevard** in downtown Columbia. The city was historically the economic and social center for the 13-County region of south central Tennessee. However, despite its former prominence as a regional destination, the past decade has brought significant challenges and a decline in growth. It has the third slowest growth rate and highest unemployment rate of any city of its size in the state. As of 2010, twenty percent of the population of Columbia was living below the poverty line. The USDA classifies Columbia as an economically-distressed micro-urban area.

Despite the challenges, Columbia still serves as a regional destination due to its employment options, healthcare, commerce, professional services, and recreational opportunities. For example, Maury Regional Hospital in Columbia is the primary healthcare center for many residents in the region. Using the HUD grant funding, the city completed **The Boulevard 2050 and Tomorrow Plan** in order to address these challenges and revitalize downtown Columbia.

The plan incorporated stakeholder interviews and community outreach to develop a plan for the future of James Campbell Boulevard as a major corridor for the city of Columbia. The plan focuses on stormwater management as a major issue as a result of the feedback from the community. Both city officials and residents recognized the need to address stormwater management largely because of the experience of recent flash flooding events. These heavy rainfall events have shown that the existing stormwater infrastructure does not have the capacity necessary to manage the stormwater flow, especially given the amount of impervious surfaces in downtown Columbia. Additionally, residents identified a lack of landscaping or greenery as an issue in the downtown core.

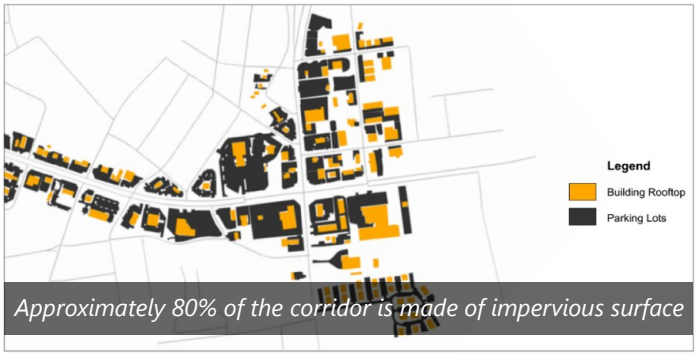
Current streetscape conditions are designed for automobile traffic only and harsh slopes contribute to flash floods

Rendering of the proposed streetscape and multimodal improvements along James Campbell Boulevard

Source: http://www.columbiatn.com/JCBoulevard/TheBoulevard2050Plan.pdf

green infrastructure **GOALS**

- Reduce impervious surfaces along the corridor to prevent flash flooding
- Maintain and repair the hydrological pattern and use natural infiltration
- Use the principles of "Light Imprint Design" to manage stormwater



Approximately 80% of the corridor is made of impervious surface

Source: http://www.columbiatn.com/JCBoulevard/TheBoulevard2050Plan.pdf

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The plan identified seven major issues that are facing the corridor. Issue Two (p. 17) details the issue of stormwater overflow and the problems faced due to the fact that 80 percent of the corridor is made up of impervious surfaces. The plan identifies two actions to improve this condition. First, stormwater infrastructure must be expanded and/or modified to meet the stormwater management needs and mitigate flash flooding events. Second, more natural "softscapes" or "greenery" should be implemented along the corridor to assist with reducing the level of imperviousness along James Campbell Boulevard.

To implement these goals, the plan recommended nine actions (pp. 108-111) that should be considered when implementing development projects: (1) maintain and repair hydrological patterns, (2) enable natural infiltration, (3) choose more permeable paving options, (4) incorporate rain gardens and bioretention swales, (5) green streets, (6) harvest rainwater to reduce the amount of stormwater flow, (7) recycle gray water, (8) encourage the planting of shade trees on both residential and commercial lots, and (9) use green roofs to reduce stormwater flow.

These nine recommendations are in line with the concept of **Light Imprint Design** that was developed by Duany Plater-Zyberk (DPZ) and Company. According to the DPZ website, the Light Imprint Design Handbook "provides a toolkit for stormwater management using natural drainage, traditional engineering infrastructure and filtration practices - employed collectively at the scales of the sector, the neighborhood and the block. This toolkit offers a set of context-sensitive design solutions that result in a range of environmental benefits, an aesthetic approach to green infrastructure, and significantly lowered construction and engineering costs."

MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

upper marlboro, md

project **DETAILS**

Southern Green Line Station Area Plan

2010 Community Challenge Planning Grant Award: $800,000

project **BACKGROUND**

The **Maryland-National Capital Park and Planning Commission** used HUD Community Challenge Planning Grant funding to develop the **Southern Green Line Station Area Plan**, a plan for four metro rail transit station areas at the southern end of the Metro Green Line operated by the **Washington Metropolitan Area Transit Authority** in southeast Washington, DC and in Prince George's County, Maryland. The four stations are: Southern Avenue, Naylor Road, Suitland, and Branch Avenue. The plan was approved by the Prince George's County Council in February 2014.

The plan assessed existing conditions, conducted market analysis, and prepared a phased implementation program for transit-oriented development (TOD) at the four stations. A major goal of the project was and is to attract new federal and other office tenants and develop mixed-income housing, facilitated by the efficient rail transit system and proximity to downtown Washington, DC.

The plan analyzed green infrastructure opportunities at the four station areas due to the project area's location within the Chesapeake Bay Watershed. Prince George's County is subject to the **Chesapeake Bay Total Maximum Daily Load** (TMDL) requirements.

The Chesapeake Bay TMDL, the largest cleanup plan ever established by the Environmental Protection Agency, sets limits on nitrogen, phosphorus and sediment pollution necessary to meet water quality standards in the Bay and its tidal rivers. The reduction requirements of the Chesapeake Bay TMDL are especially challenging in the four Green Line station areas, due to the proximity of wetlands, steep slopes, and streams. Furthermore, the area's rapid urbanization has led to habitat disruption, expansion of impervious surfaces, and alteration of natural drainage patterns. Finally, the federal government owns many adjacent parcels near the station areas so the plan examined opportunities to partner with the federal government to meet the TMDL requirements.

Nearly 1,650 acres of the plan area are within the network of the Prince George's Countywide Green Infrastructure Plan

Source: http://www.pgplanning.org/Resources/Publications/Preliminary_Green_Line_SMA.htm

green infrastructure **GOALS**

- Align the plan with state and federal watershed restoration initiatives, including the Chesapeake Bay TMDL requirements
- Minimize impervious surfaces in new development so that stormwater infiltrates naturally through the ground
- Integrate natural features into station area neighborhoods and identify gaps in the green infrastructure and open space network

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final **Southern Green Line Station Area Plan** addressed station area stormwater management and included recommendations for stormwater management in compliance with the Chesapeake TMDL. While the plan analyzed the use of green infrastructure, a central conclusion was that incorporating green infrastructure and treating stormwater on-site at the station areas may not be possible due to the size of each station and the topographical challenges. Given the site challenges and the regulations of the TMDL, finding cost-effective stormwater management solutions has been difficult. The project team continues to work with stormwater management experts to analyze opportunities for incorporation of green infrastructure at the station areas within their funding constraints.

As a result of the constraints, the planning team prioritized recommendations for using available open space adjacent to the stations for treating and mitigating stormwater offsite as a compromise. The plan advises leveraging partnerships with federal agencies to construct green infrastructure facilities on adjacent parcels to the station areas. Pages 52-53 of the plan dictate geographic locations for each of the four station areas where there are opportunities for stormwater management or stream retrofitting.

Environmental Protection Resources

The plan provides information for developers and policymakers on the following environmental protection resources (pp. 20-23):

Watersheds and Stormwater Management

The plan identified the project area's watersheds (Henson Creek and Oxon Run) and the impacts of untreated stormwater from impervious surfaces entering streams. Through this effort, impervious surfaces were calculated for the project area, resulting in findings that 32.8 percent of the total project area is made up of impervious surfaces.

Stream Corridor Assessments (SCAs)

The plan identified this resource that was developed by the Maryland Department of Natural Resources. The commission, in conjunction with the Prince George's County Department of the Environment, funds stream corridor assessments for all streams within the county.

Prince George's Countywide Green Infrastructure Plan

The commission completed this plan in 2005 to guide the development of the county's green infrastructure network through 2025. Nearly 1,650 acres of the project area fall within this designated network (see at left).

CITY OF UNIVERSITY CITY

university city, mo

project **DETAILS**

Parkview Gardens Neighborhood Sustainable Development Plan

2010 Community Challenge-DOT TIGER II Combination Grant

HUD Award: $165,687 | DOT Award: $150,000

project **BACKGROUND**

The **City of University City** used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to complete the **Parkview Gardens Neighborhood Sustainable Development Plan** initiative. The new plan seeks to build a sustainable community by integrating transportation, housing, public space, and cultural arts in a comprehensive vision for the future for the historical neighborhood of Parkview Gardens. The neighborhood is home to the famous Delmar Loop, a regional destination for entertainment, shopping, and restaurants. The neighborhood plan was adopted on July 14, 2014 as a supplement to the city's comprehensive plan from 2005.

The plan addresses the use of green infrastructure to reduce the amount of impervious surface, mitigate the environmental effects of stormwater runoff, decrease reliance on gray infrastructure, and improve the quality of the public realm by making the streetscape more walkable, attractive, and increasing green space. The addition of green infrastructure elements was viewed as an important strategy for improving the neighborhood's aesthetic appeal, while improving stormwater management.

Parkview Gardens is located at the headwaters of the River Des Peres drainage basin, the largest drainage basin in the St. Louis metropolitan region. The neighborhood is currently served by an aging combined sewer system and has a high degree of impervious surface. Sixty percent of the surface area of the neighborhood is impervious. Additionally, due to compacted urban soil conditions, the remaining 40 percent of surface area is less absorbent of stormwater. The gray infrastructure system is easily overwhelmed as a result, which contributes to CSOs and poor water quality in the watershed.

The city has historically managed stormwater in the Parkview Gardens neighborhood through the construction of gray infrastructure, such as sewer systems and channelized rivers and streams. For example, the River Des Peres, which once flowed through the neighborhood, was channelized and buried underground. This legacy of the gray infrastructure approach has resulted in expensive stormwater management over the years. The plan advocates for increased use of "blue | green infrastructure," which it defines as "the components of the neighborhood fabric that connect habitat, parks and open space while managing stormwater."

green infrastructure **GOALS**

- Mitigate the environmental effects of stormwater runoff
- Reduce impervious surfaces
- Decrease reliance on traditional and aging gray infrastructure system and improve the quality of the public realm
- Increase tree canopy coverage and green open space in order to improve the aesthetic quality of the built environment for pedestrians and neighborhood residents

This final plan rendering of Parkview Gardens illustrates a tree-lined district with green infrastructure incorporated throughout

Source: http://www.parkviewgardensvision.org/plans-drawings/adopted-final-plan

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final **Parkview Gardens Neighborhood Sustainable Development Plan** is comprised of 12 elements; one of which is focused on the implementation of blue and green infrastructure. In the plan, they highlight urban forestry, community gardens, permeable pavement, green alleyways, green medians and native plants, green roofs, and stormwater collection. See **Chapter 5-Part 8: Blue and Green Infrastructure** (pp. 199-212) for a full description of the existing conditions and plan proposals.

Clemens Ave. after green infrastructure interventions; a critical focus of the plan was the social and aesthetic value of incorporating green infrastructure in public space

Source: http://www.parkviewgardensvision.org/plans-drawings/adopted-final-plan

Additionally, the **Sustainability Action Plan**, under *Section 6: Protect, Support, and Expand Healthy Urban Environmental Systems* (pp. 300-308) summarizes the recommendations with strategies, partners, and benchmarks for rain barrels, green roofs, green alleys, permeable paving, native vegetation, bioswales, and tree canopy improvements.

BERNALILLO COUNTY albuquerque, nm

project **DETAILS**

Bridge Boulevard Corridor Redevelopment Plan

2010 Community Challenge-DOT TIGER II Combination Grant

HUD Award: $237,500 | DOT Award: $262,500

BRIDGE BLVD
CORRIDOR REDEVELOPMENT PLAN

project **BACKGROUND**

Bernalillo County used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to coordinate the **Bridge Boulevard Corridor Redevelopment Plan** initiative. Bridge Boulevard serves as the gateway to the South Valley, the historic core of Bernalillo County. As a major travel corridor that carries approximately 30,000 cars, trucks, and buses per day across the Rio Grande, it is the fourth most congested corridor in the Albuquerque metropolitan area.

The final plan identifies appropriate improvements and areas for development to transform Bridge Boulevard from a high-capacity thoroughfare into a mixed-use, pedestrian-and transit friendly corridor that maintains the unique history and character of the community. The corridor plan includes zoning regulations, roadway concepts, transit strategies, and recommendations for pedestrian amenities.

Along with several options for roadway design, the final plan supported the idea of a four-lane roadway section with a vegetated median, and "gateway" roundabouts at either end of the corridor, at the Isleta and Five Points intersections. Several other key nodes are also identified for focused investment: the Gateway District,, Five Points District, and Tower Employment District.

In order to create a more friendly pedestrian environment, development along the entire corridor encourages more vegetated medians and increased use of street trees, wider sidewalks, and other design features to manage traffic and increase safety for those walking and biking.

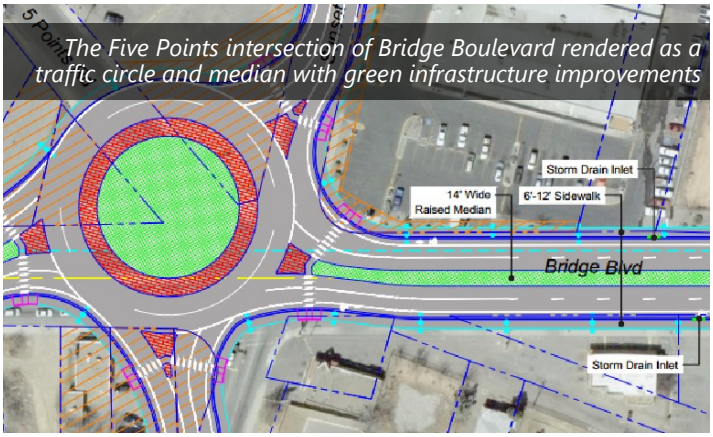
Throughout the plan, water conservation and harvesting remain central goals. Several design elements are incorporated in the plan to reduce water usage in landscaping and increase the capture of stormwater. Green infrastructure approaches lie at the nexus of these goals, and help to achieve the vision of the plan which is to create "a sustainable main street where residents, visitors, and businesses are able to enjoy a safe, pedestrian-friendly environment that celebrates the agricultural tradition and authenticity of the area."

The Bridge Boulevard Redevelopment Plan supports the use of drought-tolerant arid vegetated swales to reduce the need for offsite retention ponds and provide street landscape features

Source: http://www.bridgeboulevard.com/resources_114_1519225143.pdf

green infrastructure **GOALS**

- Reduce the volume and improve the quality of stormwater runoff
- Reduce the need for offsite stormwater treatment facilities
- Support native vegetation and shade trees to provide a hospitable pedestrian environment
- Revitalize key transportation corridor as vibrant, active, and attractive to new investment
- Promote bicycle and pedestrian infrastructure enhancements that achieve a multimodal and active transportation network along the corridor



The Five Points intersection of Bridge Boulevard rendered as a traffic circle and median with green infrastructure improvements

Source: http://www.bridgeboulevard.com/resources_114_1519225143.pdf

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final **Bridge Boulevard Corridor Redevelopment Plan**, which was passed by the County Planning Commission in August 2013, established a Design Overlay Zone which encourages sustainable development and the use of green infrastructure elements, including the incorporation of water efficiency, water efficient landscaping, native arid vegetation usage, pervious paving for parking lots, and stormwater management through rain gardens and bioswales.

Specific policy recommendations from the plan include:

- Surface runoff from paved parking areas should be directed to vegetated areas to allow for maximum percolation; permeable paving surfaces are encouraged
- 50 percent of off-street parking shall be permeable/pervious
- Landscape design shall include active and passive water harvesting techniques to reduce potable water use, and shall be water-conserving in the broadest sense

Additionally, Chapter 8 of **Appendix C: Bridge Boulevard Transportation Assessment** (pp. 46-48), highlights potential green infrastructure incorporation in creating Sustainable Complete Streets.

CITY OF AUGUSTA augusta, ga

project **DETAILS**

Augusta Sustainable Development Implementation Program

2010 Community Challenge-DOT TIGER II Combination Grant

HUD Award: $893,769 | DOT Award: $908,307

project **BACKGROUND**

The **City of Augusta** used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to develop a detailed corridor plan and implementation program for a 4.5 mile north-south "spine" in the core of the city that runs along three major thoroughfares. This spine runs from downtown Augusta to the currently vacant Regency Mall area along 15th Street, Martin Luther King Jr. Boulevard, and Deans Bridge Road. The redevelopment effort focuses nodes of redevelopment along the spine to complement planned transportation enhancements in the corridor, and improve access and quality of life for area residents.

The effort is a part of Augusta's **Sustainable Development Implementation Program**, which consisted of four interrelated initiatives:

1. Creating a detailed plan and implementation program for a cluster of transit-oriented development (TOD) neighborhoods along the corridor

2. Developing a detailed plan for a multi-modal transportation corridor

3. Revising current codes to facilitate higher-density, mixed-use and mixed-income development

4. Creating an implementation plan for green, affordable housing in this corridor

In November, 2013, Augusta finalized the document that would clarify the strategies that would be used to achieve the initiatives — including the 4.5-mile long priority corridor for redevelopment. That report, the **Augusta Sustainable Development Implementation Strategies**, reinforced the value placed by the community on green building design techniques, and the importance of integrating green infrastructure into the redevelopment.

The report calls for the community to implement green infrastructure approaches that incorporates better site planning, better site design techniques, use of low impact development practices that can help improve water quality and reduce flooding impact. These approaches complement those outlined in the **2009 Georgia Coastal Stormwater Supplement**, which was produced by the Center for Watershed Protection.

green infrastructure **GOALS**

- Reduce surface runoff to better protect waterways and other natural resources
- Reduce flooding that may result in property damage
- Prevent against increases in pollutant loads resulting from stormwater runoff
- Position properties to benefit from any applicable credits under Augusta's proposed Stormwater Utility Program

Conceptual rendering of the proposed Rocky Creek Park shows how development is insulated from flooding via wetlands and green infrastructure such as vegetated swales and detention ponds

Source: https://asdip.files.wordpress.com/2013/06/augustasustainablefinal_nov2013reduced.pdf

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final **Augusta Sustainable Development Implementation Program** contains recommendations for implementation of green infrastructure techniques to improve stormwater management, particularly flooding associated with nearby Rocky Creek and Oates Creek.

Their main green infrastructure policy recommendations include the following:

- Protecting/restoring Rocky Creek and Oates Creek greenways
- Incorporating bioswales in streetscape improvement and new street projects
- Using pervious paving for parking and pedestrian hardscape surfaces and avoiding building surface parking when feasible
- Encouraging green roofs in new development.

Several of the action items proposed in the final document propose implementation of these techniques in the Rocky Creek and Oates Creek corridors. The plan also proposes the development of a formal Stormwater Management program that would formalize a commitment to reduce the impact of increased runoff from development and explore options to use bioswale systems to remove pollutants.

City of Augusta Sustainability Best Practices

In addition to the plan's green infrastructure recommendations, the city also published a document entitled **City of Augusta Sustainability Best Practices**, which provides further guidance for area residents on how to incorporate sustainability into site redevelopment and new construction. Categorizing various stormwater interventions by zone, ranging from "suburban residential" to "urban" to "industrial", the report clarifies which approaches are allowable in each area. Possible approaches include: permeable paving, bioretention areas, and rainwater capture/reuse which are appropriate in all six zones, to bioswales, dry wells, and stormwater planters which may have more limited applicability.

CITY AND COUNTY OF DENVER

denver, co

project **DETAILS**

Denver Livability Partnership

2010 Community Challenge-DOT TIGER II Combination Grant

HUD Award: $1,797,500 | DOT Award: $1,155,872

project **BACKGROUND**

The **City and County of Denver Community Planning and Development Department** used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to coordinate the **Denver Livability Partnership**. The goal of the initiative was to expand permanent affordable housing, improve access to jobs, and create better multimodal connectivity along Denver's expanding transit corridors, specifically on the new west light rail corridor to transform Denver's disinvested west side into livable, transit-oriented neighborhoods.

The Denver Livability Partnership was focused on six main projects aimed at transforming Denver's west side into a transit-oriented and walkable communities. One of these was the completion of a catalytic revitalization plan for the Decatur-Federal light rail station area as the gateway to west Denver in the Sun Valley neighborhood.

The Sun Valley neighborhood is on Denver's west side near Sports Authority Field between Federal Boulevard and the South Platte River. The area is the poorest neighborhood in the city and the state, has a very low median household income, and the majority of residents live in subsidized housing. A variety of historical factors, including industrialization of the South Platte River, construction of large infrastructure projects and an over-concentration of public housing, have contributed to poor environmental, public, and economic health conditions in the neighborhood.

Despite the challenges, there was momentum from the city to redevelop and reconnect the Sun Valley neighborhood with the opening of the **West Light Rail** line in April 2013. The Denver Livability Partnership chose to focus on the Decatur-Federal Station area to catalyze revitalization of the neighborhood as the gateway between west Denver and downtown. Due to the location at the confluence of two gulch systems on the South Platte River and historical flooding issues, the planning for the Decatur-Federal Station area focused on incorporating green infrastructure improvements that focus on water quality and detention.

Green infrastructure improvements were implemented during the grant period and are already making a big difference in how stormwater affects Sun Valley. In 2012, the City of Denver partnered with the **Urban Drainage and Flood Control District** to open Lakewood Gulch from a box culvert and enhance it with expanded open space, new trails, natural vegetation, and a trickling water feature. This project removed much of the 100-year floodplain from the neighborhood.

green infrastructure **GOALS**

- Take advantage of opportunities for providing regional detention and water quality in parks and along streets without sacrificing the quality or usability of the park or open space.
- Implement green solutions for stormwater management including bioswales, pervious pavement, and integrated water detention and water quality systems

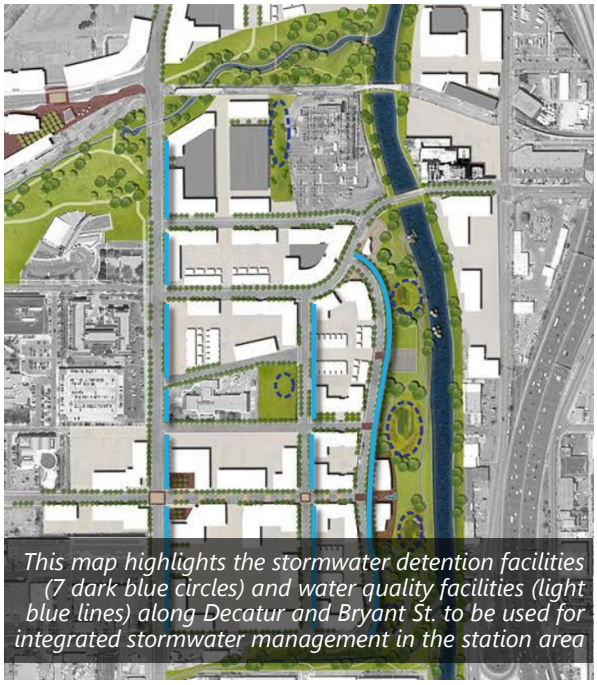
green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final **Decatur-Federal Station Area Plan**, adopted in April 2013, provided recommendations for creative stormwater solutions and integrated water detention techniques. The plan presents a concept for consolidated water quality features: properties west of Decatur would be responsible for on-site detention, while properties east of Decatur will utilize consolidated stormwater detention facilities and water quality features.

Under Recommendation B.2.E. (pp. 32-33), the plan advocated for providing regional detention and water quality in parks and along streets. Additionally, the plan proposes a new Riverfront Park on the west side of the South Platte River between Weir Gulch and 13th Avenue.

Under Recommendation C.1.E. (pp. 44-45), the plan provides further detail on these water quality systems given the Sun Valley area's location on the South Platte River, at the confluence of two gulch systems. The plan recommends four dual-purpose stormwater detention/wildlife habitat areas integrated into the new Riverfront Park, three additional stormwater detention/water quality areas in the station area outside of the new Riverfront Park, and roadside water quality features (e.g. bioswales) along the east side of Decatur Street and on the east side of Bryant Street.



This map highlights the stormwater detention facilities (7 dark blue circles) and water quality facilities (light blue lines) along Decatur and Bryant St. to be used for integrated stormwater management in the station area

Source: http://www.denvergov.org/Portals/193/documents/DLP/Decatur-Federal/Decatur_Federal_Adopted42213.pdf

CITY OF RANSON ranson, wv

project **DETAILS**

Ranson Renewed

2010 Community Challenge-DOT TIGER II Combination Grant
HUD Award: $271,500 | DOT Award: $708,500

project **BACKGROUND**

The **City of Ranson** (population 4,400) used HUD and DOT funding to complete the **Ranson Renewed** initiative, which included the:

- Development of a new zoning overlay district for downtown, as well as undeveloped, outlying areas of the cities of Ranson and Charles Town;
- Redesign of the Fairfax Boulevard-George Street Corridor into a "complete street" with green infrastructure, to promote a better transportation route for pedestrians, cyclists, and transit;
- Design of a new regional Charles Washington Commuter Center in downtown Charles Town that will facilitate access to regional rail and bus transit systems for Ranson, Charles Town and Jefferson County; and
- Creation of a master plan for downtown Ranson that spurs job growth and economic development in former dilapidated manufacturing sites

The Ranson Renewed effort builds on earlier EPA efforts which provided smart growth technical assistance to the city, and a grant to support area-wide planning around several sites in Ranson.

Together, those combined federal investments led Ranson and its neighboring city of Charles Town to identify the opportunities presented by a proposed "green corridor" to focus investment, increase jobs and amenities, and diversify the modes of transportation used by residents of these small towns. Green infrastructure approaches are central to that design. These approaches are formalized in the **Ranson Comprehensive Plan**, which was approved in April 2012.

The Green Corridor Revitalization Plan incorporates a micro-pool weir system for stormwater runoff and buried utility lines

Source: http://ransonrenewed.com/wp-content/uploads/2012/03/Green-Corridor-Concept-Plan-Report-HPE-March-2012.pdf

green infrastructure **GOALS**

- Implement sound development practices which promote smart growth strategies, walkability, water and energy conservation, and sustainable economic development
- Relieve the burden on limited, existing water infrastructure systems by handling stormwater at the surface, through a closed pre-treatment, extended filtration-based system that utilizes a built-in temporary water storage function prior to it entering a typical underground stormwater conveyance system
- Invest in stormwater facilities that can increase quality of life for residents and add value as natural buffers for pedestrians and bicyclists, as well as recreational spaces such as community parks

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The Ranson Comprehensive Plan issues policy recommendations on stormwater planning and water resource protection under the following sections:

Section 4.3.1: Stormwater Planning (pp. 64-70) recommends implementing watershed-based stormwater management by establishing a new Stormwater Utility Board for the City of Ranson, rewriting the stormwater management regulations for the city and incorporating Best Management Practices (BMPs) at all scales of the community, encouraging the design of streets integrating stormwater facilities into public right-of-ways, addressing karst issues of direct flow of surface water into ground water, and exploring opportunities for the re-use of captured stormwater.

The plan also advises for the preparation of a stormwater management plan for Old Town and construction of a storm sewer system on Mildred St. to reduce flooding. Finally, the plan proposes preparation of a Capital Improvement Program to allow for expansion of stormwater infrastructure, including a new fee structure for implementation of stormwater projects.

Section 4.5.2: Rivers and Streams (pp. 86-87) recommends protecting the natural systems and health of the surrounding watersheds by preserving and acquiring land within the 100-year floodplains, establishing minimum buffer standards, encouraging use of natural drainage swales, and requiring wetland surveys for new developments.

Green Corridor Revitalization Plan

The **Green Corridor Revitalization Plan for the Fairfax Boulevard-George Street Corridor** clarifies Ranson's approaches to stormwater management along the corridor. The plan relies on a series of best management practices that direct stormwater runoff into a tiered set of surface-level treatment facilities, which serve to both irrigate on-street plantings and reduces conveyance into Ranson's underground system (see image at left).

One of the key redevelopment opportunities along the corridor—a former brownfield site—will integrate rain gardens and other green infrastructure concepts into its redesign as a new mixed-use downtown center named "Powhatan Place." It is envisioned that bioswales are constructed in road rights-of-way, sidewalks, and parking lots. By utilizing regionally-appropriate vegetation that is tolerant of both wet and dry conditions, these bioswales not only treat water runoff on site but also contribute to the creation of habitats, and support greater community awareness of stormwater issues.

This LEED-ND development demonstrates the value of green infrastructure approaches as a part of both site redevelopment and part of the larger corridor revitalization envisioned in the Ranson Renewed initiatives. Construction on the Green Corridor commenced in December 2013.

CITY OF RICHMOND richmond, va

project **DETAILS**

Hull Street 360

2010 Community Challenge-DOT TIGER II Combination Grant
HUD Award: $300,000 | DOT Award: $100,000

HULL STREET CORRIDOR REVITALIZATION PLAN

project **BACKGROUND**

The City of Richmond used HUD Community Challenge Planning Grant funding, as well as DOT TIGER II grant funding, to complete Hull Street 360. The project identified improvements for enhancing the safety, appearance, economic potential, and community-serving uses along 4.7 miles of Hull Street Road (Route 360).

Hull Street 360 issued the following policy recommendations for revitalization of the corridor:

- Affordable Housing: recommended increased density via zoning revisions incorporating mixed-income housing
- Multimodal Transportation: developed a traffic plan with transit recommendations and proposed street section typologies
- Economic Development: analyzed current market conditions and identified opportunities for improving economic conditions for existing businesses and Hull Street area residents
- Environmental Enhancement and Greening Opportunities: identified open space opportunities and potential parkland improvements

As part of the larger corridor improvement strategies developed, Hull Street 360 incorporates recommendations for green infrastructure along the corridor to improve stormwater management and provide aesthetic benefits to the streetscape for pedestrians.

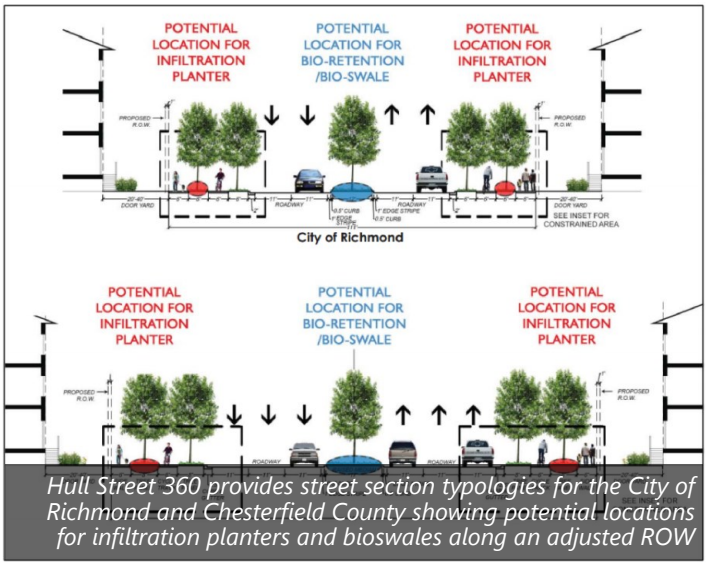
The City of Richmond adopted Hull Street 360 in February 2013. Since its adoption, the plan has won two awards, including Outstanding Overall Plan from the Virginia Chapter of the APA in 2013 and ULI Richmond awarded it the 2013 Vision Award for Best Example of Regional Collaboration.

green infrastructure **GOALS**

- Use bio-retention facilities along the corridor to improve stormwater management and beautify the corridor with pedestrian amenities
- Reduce impervious surfaces through increased use of pervious paving materials

This rendering of La Milpa Plaza visualizes the incorporation of infiltration planters between the sidewalk and ROW

Source: http://www.richmondgov.com/planninganddevelopmentreview/documents/HullStreetRevitalizationPlan.pdf



Hull Street 360 provides street section typologies for the City of Richmond and Chesterfield County showing potential locations for infiltration planters and bioswales along an adjusted ROW

Source: http://www.richmondgov.com/planninganddevelopmentreview/documents/HullStreetRevitalizationPlan.pdf

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final Hull Street 360 plan incorporated green infrastructure in Chapter 8 (pp. 88-92) with recommendations for low impact development, improved stormwater management, the use of bioswales, infiltration planters, pervious paving, and landscape design using native vegetation in the plan area. The following green infrastructure was recommended for the Hull Street corridor:

- Bio-retention facilities and bio-swales along the Hull Street corridor as a median treatment within areas that receive storm water runoff from the road surface.
- Infiltration planters in the planting strip between the pedestrian walkway and cycle track along the entirety of the corridor.
- Pervious paving with informational signage at all bus stops along the corridor. Pervious paving may also be used in other areas of the corridor, such as the pedestrian and bicycle lanes.

The plan also identified a major issue with the incorporation of green infrastructure along the corridor that must be addressed prior to implementation. The issue is the responsibility and funding for the maintenance of green infrastructure.

The plan states that the Virginia Department of Transportation may or may not assume responsibility for maintenance of the incorporated low impact development features and green infrastructure, which could prove problematic given city and county funding constraints. The plan does not issue recommendations for what entity will assume this responsibility, but does state that a third-party contractor may be necessary for maintenance of green infrastructure.

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FY2010

REGIONAL PLANNING GRANTEES

EAST-WEST GATEWAY COUNCIL OF GOVERNMENTS

st. louis, mo

project **DETAILS**

One STL: Many Communities. One Future.

2010 Regional Planning Grant

Award: $4,687,750

project **BACKGROUND**

The **East-West Gateway Council of Governments** (EWGCOG) used HUD Regional Planning Grant funding to coordinate 11 core partners and hundreds of other partners in leading the **OneSTL** regional planning initiative. OneSTL conducted extensive outreach to the St. Louis metropolitan community, including holding 94 public meetings, engaging over 2,000 residents, and leading 200 members participating in four committees to discuss priorities and strategies for the region. Through the work of the partners involved, 75 technical plans and reports were completed, including a fair housing assessment, TOD station area plans, and natural resource plans.

The **OneSTL final regional plan**, approved by the EWGCOG Board in December 2013, had a strong focus on green infrastructure due to the region's location at the confluence of America's two great rivers (the Mississippi and Missouri rivers). Flooding was one of the key public concerns identified through the OneSTL public engagement process. Between 1993 and 2013, the Mississippi River at St. Louis crested above the major flood stage 11 times. Serious flash floods have also hit the region several times in recent years, including 2008 and 2013.

Peak storm events also lead to combined sewer overflows (CSOs) due to a combined sewer system. In 2011, the **Metropolitan St. Louis Sewer District** (MSD) entered into a **consent decree with EPA** which requires MSD to make extensive improvements to its sewer systems and treatment plants, at an estimated cost of $4.7 billion over 23 years, to eliminate illegal overflows of untreated raw sewage, including basement backups, and to reduce pollution levels in urban rivers and streams.

In addition, local sewer districts have been mandated to initiate on-site stormwater detention, which increases development costs. The MSD's new site design requirements are one regional example. The costs for such changes to the system must currently be funded by extremely limited municipal, county, and regional resources. In addition, there is not a coordinated regional framework to meet these requirements in place currently. Finally, while St. Louis City and County are under the jurisdiction of MSD, the rest of the region is served by a patchwork of many sewer districts and municipalities.

green infrastructure **GOALS**

- Promote regional leadership and inter-jurisdictional coordination on planning for, funding, and implementation of green infrastructure at a regional, community, and site scale
- Map existing green infrastructure and identify opportunities for future green infrastructure implementation
- Promote rainscaping as a way individual property owners can help to reduce stormwater runoff
- Improve the health of watersheds and waterways for drinking, aesthetics, and recreation
- Establish a clearinghouse of best practices for municipalities in the region to implement green infrastructure

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

Given the region's water quality and flooding challenges, the OneSTL plan recommends a coordinated regional approach to watershed planning using green infrastructure. Under its **Green Theme**, OneSTL specifically focused on green infrastructure under *Green Goal 2: Plan for and invest in green infrastructure*.

They recommend developing GI strategic plans at a regional, community, and site scale with detailed strategies and priority implementation for specific watersheds, mapping the existing GI and identifying future GI project areas, using GIS modeling to evaluate impacts of GI on water quality, encouraging inter-jurisdictional government and sewer district cooperation on stormwater, erosion, and flooding, and encouraging the use of development incentives to protect natural resources.

Sustainable Solutions Toolkit

The **Sustainable Solutions Toolkit** is designed for communities in the region to use as a resource in implementing the vision of OneSTL. The toolkit's **Low Impact Development (LID) section** covers the use of green infrastructure to manage stormwater and synthesizes resources for LID from EPA and a **Low-Impact Development Local Codes Checklist** that fellow HUD Regional Planning Grantee Metropolitan Area Planning Council (MAPC) from Boston, MA developed prior to their grant.

The LID section of the toolkit also links to a thorough collection of other best practice guides on green infrastructure topics, including: bioswales, cisterns, complete streets, green roofs, native landscaping, pervious pavement, rain barrels, rain gardens, rainscaping, retention ponds, riparian buffers, stormwater trash separators, stream water and wetland mitigation banking, street trees, two stage ditch design, and wetland preservation. This compendium of materials provides a wealth of resources for local communities interested in implementing green infrastructure.

Green Indicators and Performance Measurement

EWGCOG and its partners established **Green Indicators** to measure progress towards the goals of OneSTL, including their green infrastructure goals. EWGCOG is measuring progress on **Rainscaping**, **Water Quality**, **Watershed Plans**, **Tree Canopy**, and **Tree Cities**.

Green Infrastructure Reports and Studies

One of the project's core partners, **Heartlands Conservancy**, assembled a variety of reports and studies related to green infrastructure and low impact development for use by local municipalities and non-profit partners:

Green Infrastructure Roadmap

Low Impact Development Best Management Practices for Greener, Affordable Living in the St. Louis Region

Green Up O'Fallon: Roadside Vegetated Swale Feasibility Study

Middle Mississippi River Partnership Best Practices

Summary of Water Infrastructure in the St. Louis Region

Summary of Conservation Best Practices

METROPOLITAN COUNCIL

minneapolis-st. paul, mn

project **DETAILS**

Corridors of Opportunity

2010 Regional Planning Grant

Award: $5,000,000

project **BACKGROUND**

The **Metropolitan Council** used HUD Regional Planning Grant funding to lead the **Corridors of Opportunity** (COO) initiative. The project brought together top leadership from the Twin Cities region to focus on the planning and development of equitable transit-oriented development (TOD) adjacent to the MetroTransit Green Line, which opened in June 2014. The COO initiative funded projects ranging from corridor-wide planning and development strategies and new methods of community engagement to direct financing of development projects and small business loans, while ensuring the distribution of equitable benefits for people of all incomes.

Although both major cities (Minneapolis and St. Paul) feature separated stormwater sewer systems, they are also both Phase I permittees under the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) program and are required to control pollutants from the municipal separate storm sewer system and to reduce pollution from public and private projects. Pursuant to this requirement and as part of their corridor planning and redevelopment strategies, the project incorporated and included green infrastructure for management of stormwater.

One of the core demonstration projects of the initiative was the **Central Corridor Stormwater and Green Infrastructure Planning Project**. The purpose of this project was to create a framework for the development of "shared, stacked-function" green infrastructure (SSGI) for stormwater management. Shared, stacked-function refers to situations where the green infrastructure is intended to provide service for more than one parcel (public or private) and provides additional community amenities beyond managing stormwater. The City of Saint Paul, MN received $382,300 for the project. The project also closely coordinated with another similar initiative named **Green Line Parks and Commons: Catalyzing Economic Development through Urban Open Space in the Central Corridor**, led by the Trust for Public Land.

green infrastructure **GOALS**

- Help cities streamline stormwater management implementation during redevelopment scenarios through shared, stacked-function green infrastructure
- Achieve compact TOD and provide new open space while also meeting stormwater requirements and allowing flexibility to developers in achieving these objectives

green infrastructure **OUTPUTS AND OUTCOMES**

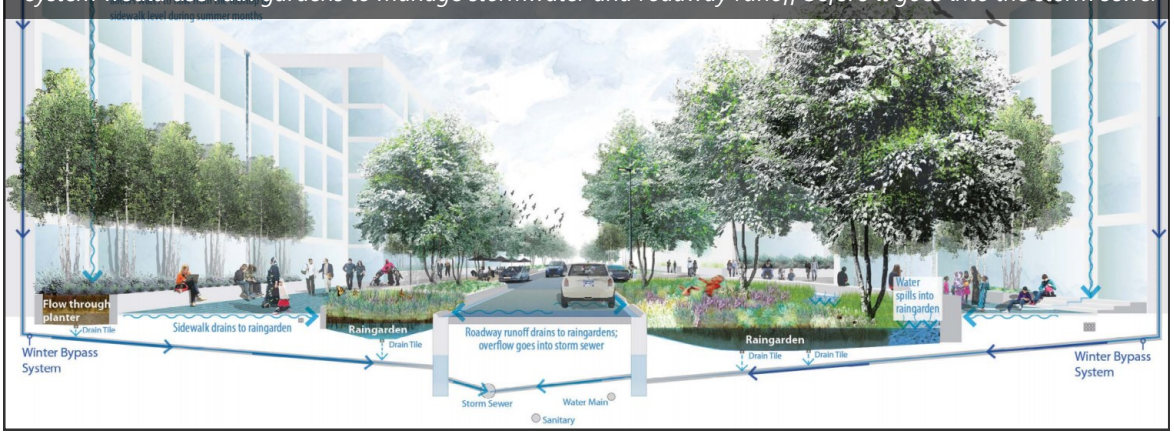
Strategic Stormwater Solutions for TOD Report

The main output of the project was the production of a final report called **Strategic Stormwater Solutions for Transit Oriented Development** which includes guidelines for cooperative green infrastructure approaches to stormwater management (SSGI) along the Central corridor. The framework is an above-standard approach that developers may implement voluntarily. To facilitate implementation, the project developed an informational brochure for developers, along with decision-making flowcharts and demonstrations of cost savings.

The report focuses on two sites where redevelopment was imminent. The first site (Boeser site) involves redevelopment of an obsolete industrial site into a multi-family apartment building. The second site (Curfew Commons) is located near the Green Line Westgate Station in Saint Paul and includes additional accessible parkland to support anticipated residential growth near the station.

Many recent site designs along the corridor addressed stormwater requirements using traditional underground systems, thus the report was clear that SSGI must achieve triple-bottom line benefits, including community benefits. Other key findings were that the SSGI approach is best applied through a public-private partnership led by the sponsoring city and that SSGI will need to be adapted to the size and unique conditions of the redevelopment site.

This street section rendering from the Boeser Site shows how a shared, stacked-function green infrastructure system would use rain gardens to manage stormwater and roadway runoff before it goes into the storm sewer



Source: http://www.corridorsofopportunity.org/sites/default/files/Strategic_Stormwater_Solutions_for_TOD_Final_Report.pdf

METROPOLITAN AREA PLANNING COUNCIL

boston, ma

project **DETAILS**

MetroFuture

2010 Regional Planning Grant

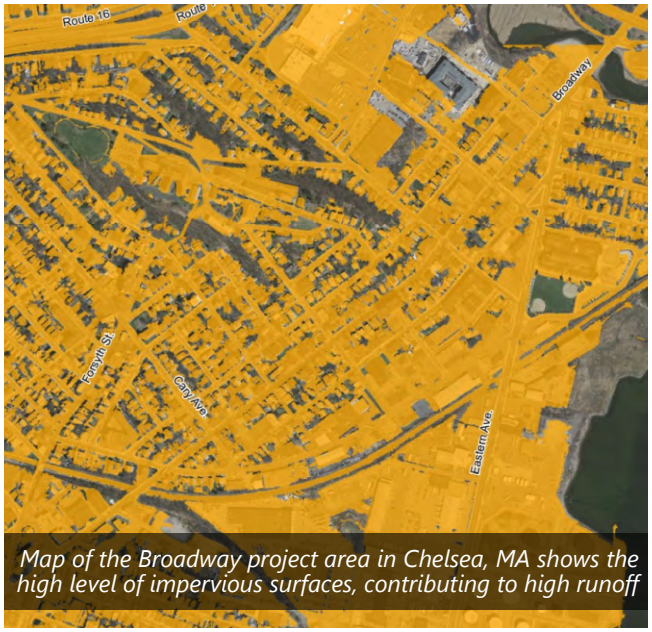
Award: $3,000,000

project **BACKGROUND**

The **Metropolitan Area Planning Council** (MAPC) used HUD Regional Planning Grant funding to coordinate implementation efforts for **MetroFuture**, the existing regional plan for the Boston metropolitan region that was adopted in 2008. The HUD funding went towards supporting local planning efforts, state and regional policy work, development of tools and data, and capacity building for local residents and leaders to ensure the ongoing implementation of MetroFuture.

The MetroFuture plan supports a vision of smart growth and regional collaboration through the promotion of efficient transportation systems and transit-oriented development, conservation of land and natural resources, improvement of the health and education of residents, and an increase in equitable economic development opportunities for prosperity.

MetroFuture focused on the protection of natural resources and urban stormwater management as part of its larger planning and implementation efforts. Similar to other regions, stormwater runoff is the leading cause of water quality problems in the Boston metro region. Problems such as beach and shellfish bed closures, fish kills, water contamination, habitat loss, and depleted groundwater are increasingly common due to untreated and poorly managed stormwater runoff. Ninety-nine of the 101 MAPC communities represented in the plan are required to meet the conditions of the National Pollutant Discharge Elimination System (NPDES) and the small Municipal Separate Storm Sewer System (MS4) permits for Massachusetts Watersheds.



Map of the Broadway project area in Chelsea, MA shows the high level of impervious surfaces, contributing to high runoff

Source: http://mysticriver.org/storage/pdfs/ChelseaSubwatershedPlan2013_Final.pdf

green infrastructure **GOALS**

- Implement water/wastewater/stormwater utility best practices across the region
- Promote local treatment and recharge of stormwater and wastewater
- Protect the quality of water supplies through source controls and land use planning

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

MetroFuture, under *Strategy #7: Protect natural landscapes* and *Strategy #13: Conserve natural resources*, issued a variety of policy recommendations to further the use of green infrastructure to protect the region's waterways, improve water quality, and meet federal and state requirements. Read full recommendations in the **MetroFuture Regional Plan Goals and Objectives** (pp. 52-55) and the **MetroFuture Implementation Strategies Outline** (pp. 8-9, 18-19).

Demonstration Projects

Chelsea, MA Green Infrastructure Project

MAPC allocated $70,000 of the HUD Regional Planning Grant for this project to the **Mystic River Watershed Association** to identify opportunities within the City of Chelsea where green infrastructure could be implemented to reduce pollution of local waterways. The project is focused on the high-density Broadway corridor in the City of Chelsea where the city is planning an upgrade of existing 'gray infrastructure' during the next five years. The funding resulted in the development of the **Subwatershed Plan for Broadway**. As a result, green infrastructure projects were designed for 6 sites in the neighborhood. Grants are being pursued to fund the construction of these projects

Smart Growth Sewering Project

MAPC allocated $30,000 of the HUD Regional Planning Grant for this project to the **Charles River Watershed Association** to promote a new growth model for smaller towns in the Boston metro region by using water infrastructure to focus future development near downtowns. 'Smart Sewering' is a proactive planning process that promotes smart growth and the preservation of open space and ecological resources.

Stormwater Utility Toolkit

The **stormwater utility toolkit** provides municipalities with a how-to guide to set up local enterprise funds that will pay for stormwater infrastructure. Two communities in the Neponset River Watershed are now exploring establishing a stormwater utility.

Mystic River Environmental Atlas

MAPC, in partnership with the Mystic River Watershed Association (MyRWA), developed the **Mystic River Environmental Atlas**, a map of natural resources and infrastructure around the Mystic River. The map shows the location of stormwater outfalls and the results of MyRWA's ongoing water sampling program. MAPC also helped MyRWA to create a database for storing and analyzing the results of the water sampling program, and is continuing to provide technical assistance.

CITY OF KNOXVILLE knoxville, tn

project **DETAILS**

PlanET: Plan East Tennessee

2010 Regional Planning Grant
Award: $4,327,500

planET A Regional Partnership of East Tennessee Communities

project **BACKGROUND**

The **City of Knoxville** used HUD Regional Planning Grant funding to coordinate **Plan East Tennessee**, a regional partnership of 15 cities, four towns, and other community partners in the five-county region of Anderson, Blount, Knox, Loudon, and Union counties in eastern Tennessee. The project also partnered extensively with the **University of Tennessee College of Architecture and Design**.

The PlanET region's history and vitality is inextricably linked to water. During the post-Great Depression New Deal era, the **Tennessee Valley Authority** (TVA) harnessed the power of these rivers in the 1930s to provide the low-cost electricity, infrastructure, and flood control that enabled population growth and economic prosperity in the region. The same water resources continue to support the region's robust recreation and tourism economy.

Over time, however, the health of these waterways has become impaired. Many creeks and streams now flow underground, piped and made into culverts. Pollution and trash fill the banks of rivers and reservoirs. Streams and rivers often run brown or red, laden with sediment, and flash flooding and contaminated well-water are persistent issues. The Tennessee River is now the 14th most contaminated river in the nation.

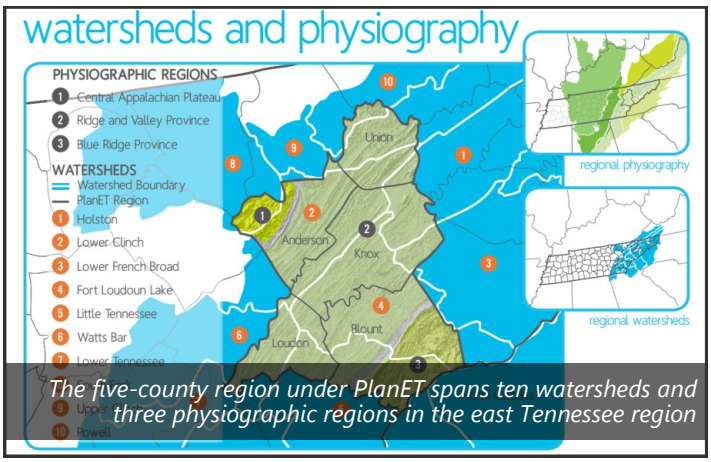
At the beginning of the PlanET project, the team conducted community interviews and discovered high public concern and interest over water quality and preservation of water resources. Given the community's input, water became a central element of the plan, woven throughout the PlanET planning process and resulting documents. PlanET includes assessments and goals for water quality, protection of source water supplies, water infrastructure, and recommendations for regional watershed management.

Pollution and litter are shown here at the confluence of Third Creek and Fort Loudon Lake in Knoxville, TN

Source: http://www.planeasttn.org/GrowStronger/DemonstrationProjects/LowImpactDevelopment.aspx

green infrastructure **GOALS**

- Implement Low Impact Development (LID) Best Management Practices (BMPs) to manage stormwater and runoff at various site typologies (rural, urban, residential, and institutional)
- Minimize the impacts of non-point source pollutants as the leading cause of contamination to regional waterways
- Improve stormwater quality and reduce stormwater quantity
- Limit the amount of impervious surfaces



The five-county region under PlanET spans ten watersheds and three physiographic regions in the east Tennessee region

Source: http://www.planeasttn.org/GrowStronger/DemonstrationProjects/LowImpactDevelopment.aspx

green infrastructure **OUTPUTS AND OUTCOMES**

Low Impact Development Resource Manual

The main green infrastructure output of the project was the production of a resource manual on implementing Low Impact Development (LID) strategies to reduce impact to the region's waterways:

Low Impact Development: Opportunities for the PlanET Region

Produced in collaboration with the UT Landscape Architecture Program, this PlanET publication analyzes existing conditions and threats to regional water resources and proposes the implementation of Low Impact Development (LID) as an approach to watershed planning, community design, and site development to avoid, minimize, and manage impacts from various land uses in the region on the region's shared water resources.

Regional Performance Measurement

PlanET's annual **Livability Report Card** measures water quality. The region's waterways encompass ten different watersheds; 1100 miles of waterways and five water bodies were identified as "impaired" by the **Tennessee Department of Environment and Conservation** in 2012 according to the 2013 PlanET Livability Report Card.

Reports and Demonstration Studies

PlanET also incorporated green infrastructure and Low Impact Development (LID) principles in the following reports and demonstration projects:

Knoxville 2040: Centers and Corridors

Greenway Guidelines for the East Tennessee Region: Recommendations for Water, Rail, and Roadside Trails in Regional Landscapes

S.R. 61 Corridor in East Anderson County

Regional Greenway Corridors

CAPITAL AREA REGIONAL PLANNING COMMISSION

madison, wi

project **DETAILS**

Capital Region Sustainable Communities

2010 Regional Planning Grant

Award: $1,997,500

Capital Region Sustainable Communities

project **BACKGROUND**

The **Capital Area Regional Planning Commission** (CARPC) used HUD Regional Planning grant funding to coordinate the **Capital Region Sustainable Communities** initiative. This initiative worked to implement and the region's current land use and transportation plan, the **Dane County Comprehensive Plan**, which was adopted in 2007 and amended in 2012.

This comprehensive plan provides the comprehensive land use and development policy framework for the capital region in Wisconsin. The regional framework delineates *Urban Service Area* boundaries for urban growth with the full range of urban services, *Limited Service Area* boundaries for special or unique areas requiring only some urban services, *Rural or farmland preservation areas* for agricultural land uses, and *resource protection corridors* to protect sensitive natural resource areas.

One of the central goals of the project was to preserve natural resources and ensure that the resource protection corridors of the comprehensive plan remain intact. CARPC, under the Regional Planning Grant, pursued the development of regional and local plans which promote urban growth in walkable, diverse neighborhoods. By directing future development inward, within towns, villages, and city boundaries, the natural resources and farmland surrounding the capital region will remain unharmed by development impacts.

To accomplish these outcomes, Capital Region Sustainable Communities conducted long-range, multi-jurisdictional scenario **Future Urban Development Area** (FUDA) planning in communities and surrounding rural areas throughout the region. FUDA planning assessed the existing conditions of natural, agricultural, and built environments, and conducted GIS-based modeling, which enabled analyses of alternative growth scenarios with community input. The project team conducted FUDA planning in six cities or villages as well as 11 unincorporated townships.

In addition to the FUDA planning efforts designed at redirecting development inwards and protecting existing green resources and assets, the project focused on the incorporation of green infrastructure to manage stormwater runoff from future urban development. To provide a model for communities in the region, the project funded a report which analyzed stormwater management for both traditional single-family neighborhood development and more dense, transit-oriented development. The project also funded the study of impacts of development on surrounding waterways.

green infrastructure **GOALS**

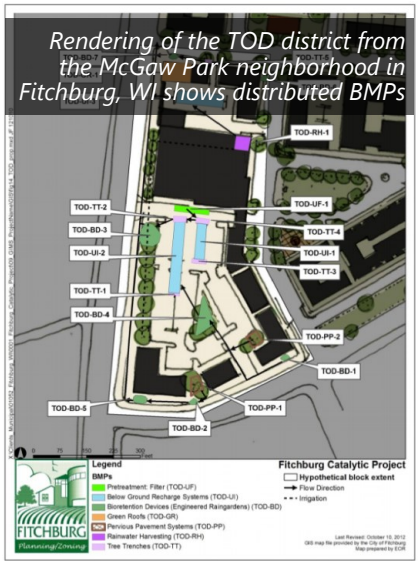
- Protect vital natural resources, promote efficient development, and preserve farmland through cooperative planning for long-term growth
- Demonstrate sustainable development through catalytic projects
- Establish sustainability indicators and measure progress towards goals

green infrastructure **OUTPUTS AND OUTCOMES**

City of Fitchburg Post-Development Runoff Volume Study

The City of Fitchburg was funded $30,000 by CARPC under the HUD grant to complete the **City of Fitchburg Post-Development Runoff Volume Study**, which analyzed different methods of meeting CARPC stormwater management requirements for new developments in the city. The project team conducted a literature review and modeled several stormwater management plans for two hypothetical blocks (one residential (R2) and one transit-oriented development (TOD) in nature) within the McGaw Park neighborhood in Fitchburg.

The study demonstrated that using a distributed approach to stormwater management, new development could result in a net zero increase in runoff volume. This distributed approach results in a number of volume control Best Management Practices being used throughout the site to capture and treat stormwater runoff as close to the source as possible. By locating the BMPs in the roadways, private or public right-of-ways, or underground, a stormwater management plan can be developed that achieves volume control without decreasing developable area.



Rendering of the TOD district from the McGaw Park neighborhood in Fitchburg, WI shows distributed BMPs

Source: http://www.city.fitchburg.wi.us/DocumentCenter/Home/View/6412

Ecological Limits of Hydrological Alteration (ELOHA) Report

CARPC completed this report, in partnership with the Wisconsin Department of Natural Resources, the U.S. Geological Survey, and the Wisconsin Geological and Natural History Survey. The **ELOHA Report** and model correlates changes in measures of the ecological health of Dane County streams with changes in the stream flow resulting from urban development. ELOHA provides a computer model to better estimate impacts of groundwater withdrawal and rainfall runoff volume increases from urbanization on stream biology; this tool can be used for evaluating mitigation measures to address the adverse impacts of urban growth, to minimize biological impacts in surrounding streams.

CHICAGO METROPOLITAN AGENCY FOR PLANNING

chicago, il

project **DETAILS**

Local Technical Assistance (LTA) Program

2010 Regional Planning Grant

Award: $4,200,000

project **BACKGROUND**

The **Chicago Metropolitan Agency for Planning** (CMAP) used HUD Regional Planning Grant funding to assist with the implementation of **GO TO 2040**, the Chicago metropolitan region's long-range comprehensive regional plan for the seven counties and 284 communities of the region. GO TO 2040 was adopted in 2010.

With the grant funding, CMAP launched the **Local Technical Assistance (LTA) Program**, which provided technical assistance and built staff capacity in communities across the Chicago metropolitan region to undertake planning projects that would advance the principles of GO TO 2040 and the Partnership for Sustainable Communities' Livability Principles. The LTA program's focus on the community level was deliberate as land use regulation is a local responsibility, and the community level is where livability principles and place-based solutions must be applied.

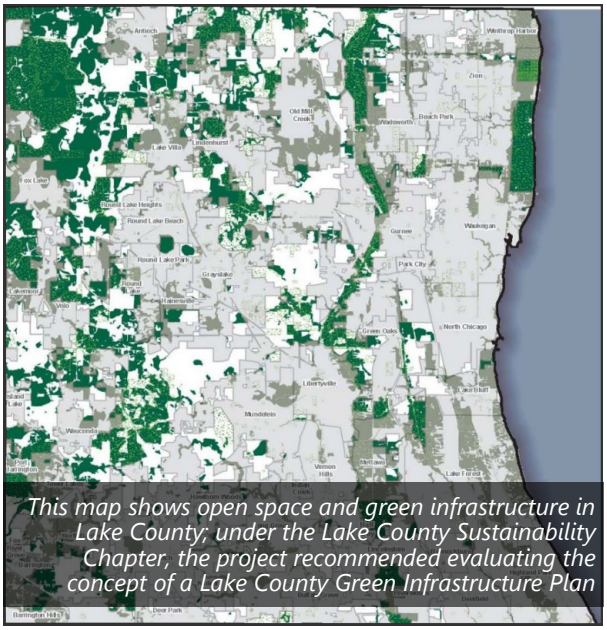
As a result of the LTA program funded by HUD, CMAP initiated approximately 70 local projects with governments, nonprofits, and intergovernmental organizations to address local issues at the intersection of transportation, land use, and housing, including the natural environment, economic growth, and community development. The LTA program continues to live beyond the grant period. To date, CMAP has initiated a total of over 160 LTA projects, including the 70 projects funded under the Regional Planning Grant. The latest projects funded under the LTA program emphasize implementation of past plans, such as updates of zoning and regulations, creation of capital improvement plans, and analysis of municipal review procedures.

As part of the LTA program, CMAP initiated several projects which employed green infrastructure as part of their planning and policy recommendations. One of CMAP's main goals, as a regional entity, was to encourage watershed-wide planning. As such, they funded and provided technical assistance to several watershed planning projects.

The initiative was also very supportive of water conservation projects, which lower wastewater treatment quantities and improve the capacity of combined sewer-stormwater systems to handle precipitation events. Under an ideal scenario, water supply, wastewater, and stormwater systems would be addressed and managed as an integrated water system realizing that changes to one system affect all three systems. Therefore, the LTA program also funded several water conservation projects and studies.

green infrastructure **GOALS**

- Encourage watershed planning and stormwater infrastructure retrofits
- Integrate land use policies and site planning with water resources
- Support water use conservation efforts and optimize the scale of water operations



This map shows open space and green infrastructure in Lake County; under the Lake County Sustainability Chapter, the project recommended evaluating the concept of a Lake County Green Infrastructure Plan

Source: http://www.cmap.illinois.gov/documents/10180/116236/Lake+County+Sustainability+Chapter/2fcea886-f3e4-47a6-a0db-28ae77ddcba6

green infrastructure **OUTPUTS AND OUTCOMES**

Reports and Policy Recommendations

The LTA program supported a multitude of communities plan for the incorporation of green infrastructure projects in the Chicago region. The following is a sampling of the green infrastructure outputs from the LTA program:

Silver Creek & Sleepy Hollow Creek Watershed Comprehensive Plan and Ordinance Assessment (for the Cities of Crystal Lake and McHenry, and the Villages of Oakwood Hills and Prairie Grove)

City of Elgin Ordinance Assessment: An Implementation Step of the Ferson-Otter Creek Watershed Plan

A Corridor Plan for the Fox River in the Villages of Algonquin and Carpentersville

Village of Elmwood Park Comprehensive Plan (pp. 81-89)

Village of Park Forest Sustainability Plan

Sustainability Planning for Lake County

Village of Niles Environmental Action Plan

Chicago Green Healthy Neighborhoods Land Use Plan

Read more about other **LTA projects and plans**.

CAPITOL REGION COUNCIL OF GOVERNMENTS

hartford, ct

project **DETAILS**

Sustainable Knowledge Corridor

2010 Regional Planning Grant

Award: $4,200,000

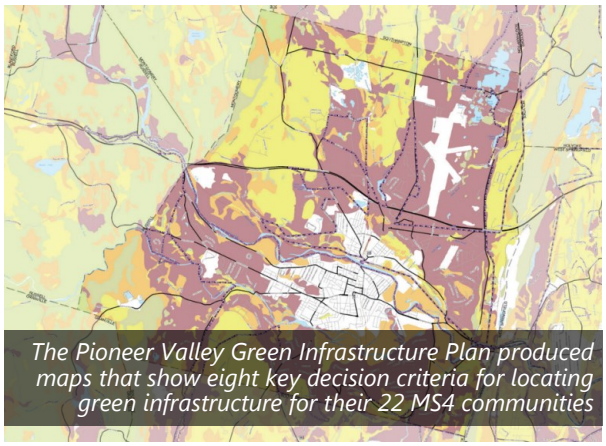
New England's Sustainable KNOWLEDGE CORRIDOR
Our region. Our future.

project **BACKGROUND**

The **Capitol Region Council of Governments** (CRCOG) used HUD Regional Planning Grant funding to coordinate two other regional planning agencies (**Pioneer Valley Planning Commission** and the **Central Connecticut Regional Planning Agency**) under the **Sustainable Knowledge Corridor** initiative. The three regional agencies, which represent approximately 80 communities and 1.6 million residents in Connecticut and Massachusetts, partnered in successfully recruiting more than thirty diverse agencies to join as partners. The Sustainable Knowledge Corridor is a concept that evolved over the last 10 years through the work of these Metropolitan Planning Organizations and the partner agencies of the **Hartford Springfield Economic Partnership** (HSEP).

The Knowledge Corridor Consortium used the grant funding to: (1) update and integrate existing regional plans to form the **Capitol Region Plan of Conservation and Development**, a regional plan for the Knowledge Corridor, which was approved in May 2014; (2) plan for energy-efficient, affordable housing opportunities near transit and job centers in mixed-use settings; and (3) establish imaginative new efforts such as affordable housing training for zoning commissioners; incentives for density creation in transit-rich locations; studies to help establish pilot feeder bus service to link jobs, housing and transit; a web-based platform to share information on successful land use strategies and progress toward a more sustainable Knowledge Corridor, opportunity mapping, and studies on how to harvest increased land values near stations and plow it back into affordable housing and transit infrastructure.

One of the main issues the regional plan addresses is the importance of improving the water quality of the Connecticut River and other waterways in the region that do not meet water quality standards. In large part, this is due to polluted stormwater flows; large storm flows can also overwhelm treatment facilities and cause combined sewer overflows into the Connecticut River. The project addressed the implementation of green infrastructure to address these issues.



The Pioneer Valley Green Infrastructure Plan produced maps that show eight key decision criteria for locating green infrastructure for their 22 MS4 communities

Source: http://www.pvpc.org/sites/default/files/Executive%20Summary%20Green.pdf

green infrastructure **GOALS**

- Improve stormwater management practices to capture stormwater near to where it falls
- Reduce combined sewer overflows (CSOs) across the region
- Identify potential locations for green infrastructure, drawing on planning for upcoming roadway and other construction projects, and provide specific strategies for promoting green infrastructure throughout the region

green infrastructure **OUTPUTS AND OUTCOMES**

PVPC Green Infrastructure Plan

The main green infrastructure output was the **Pioneer Valley Green Infrastructure Plan** that is designed to assist communities in the region as they seek to develop environmentally sustainable stormwater management programs.

The plan identifies the three existing infrastructures (stormwater, combined sewers, and roads) where green infrastructure could be integrated; describes useful criteria for mapping potential green infrastructure facilities; explores important opportunities and challenges; and proposes workable strategies for local and regional actions that will help to address polluted stormwater flows and meet forthcoming stormwater permit requirements.

Policy Recommendations

The plan outlines recommendations for green infrastructure, specifically under Chapter 4 (pp. 43-52) and Chapter 8 (pp. 85-98) of the final **Capitol Region Plan of Conservation and Development**.

Capacity Building for Green Infrastructure

PVPC staff conducted extensive outreach in their region with local municipal officials and the broader community on green infrastructure, including collaborating with EPA Region 1 to provide two workshops on green infrastructure to municipal officials and developers, as well as two workshops to groups of homeowners on stormwater best management practices.

Additionally, the Sustainable Knowledge Consortium led the creation of a **Booklet of Sustainable Land Use Model Regulations**, which includes a section on model regulations for providing green roof incentives for local municipalities to implement.

Finally, the PVPC contracted with a design/build firm to assist with a program to build ten rain gardens in Springfield, MA.

Performance Metrics

The consortium established **sustainability indicators** to track progress towards their goals. One of the performance metrics is to track Combined Sewer Overflows (CSOs) on Rivers.

GULF REGIONAL PLANNING COMMISSION

gulfport, ms

project **DETAILS**

Plan for Opportunity

2010 Regional Planning Grant

Award: $2,000,000

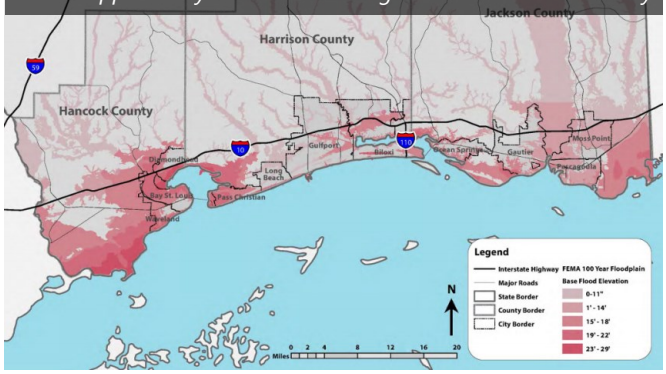
project **BACKGROUND**

The **Gulf Regional Planning Commission** used HUD Regional Planning Grant funding to develop a regional plan for a tri-county area along the Mississippi Gulf Coast. The regional **Plan for Opportunity** initiative included seven key areas of sustainability planning: (1) air quality, (2) economic and workforce development, (3) food systems, (4) housing, (5) resilience, (6) transportation and land use, and (7) water. The Project Management Committee (PMC), composed of 10 key partners in the consortium, managed the project and established the seven topical areas, with each area guided by a subcommittee. The final reports for each topical area constitute the final **Plan for Opportunity**, adopted in 2014.

One of the foremost concerns in this region and communities all along the Gulf Coast is the issue of water and how to foster a water-based economy while reducing the inherent vulnerabilities of flooding and natural disasters, preserving ecological habitats, and maintaining or improving water quality.

The Gulf Coast economy is largely sustained by recreation, tourism, fishing, and energy production industries. Some of these industries have been in decline in recent years due largely to the effects of Hurricane Katrina in 2007 and the 2010 Deepwater Horizon oil spill. Like many other coastal areas, the area is also rapidly losing wetlands due to development and impervious surfaces increased 58 percent between 1972 and 2000.

FEMA's 100-Year Flood Plain Map of the 3 counties in Plan for Opportunity illustrates the region's coastal vulnerability



Source: http://www.gulfcoastplan.org/the-plan/plan-for-opportunity/

green infrastructure **GOALS**

- Restore bayous and streams to their natural conditions
- Expand the documentation of water, wastewater, and stormwater infrastructure
- Decrease water pollution and improve water quality
- Implement stormwater improvement projects to reduce the impacts of flooding and extreme weather events

The Gulf Coast region's economic vitality is tied to its coastal and freshwater resources which support many regional industries

Source: http://gulfcoastplan.org/wp-content/uploads/2012/07/Tides-of-Change-Web-Quality.pdf

green infrastructure **OUTPUTS AND OUTCOMES**

Reports and Policy Recommendations

The **Water Subcommittee**'s responsibility under Plan for Opportunity was to examine how the region's water resources can be used to increase economic competitiveness while maintaining the region's natural resources, furthering ecological stability, and reducing flooding and pollution. The following reports were outputs related to green infrastructure:

Mississippi Gulf Coast Water Assessment Report

The subcommittee undertook a water assessment to understand how water is being used in the region, the quality of the water, and key issues facing the coast. This report details those findings.

Mississippi Gulf Coast Stakeholder Analysis Report

The subcommittee completed a stakeholder assessment to engage with many different types of water users to understand the key issues facing the region. This report details those findings.

Tides of Change: A New Wave of Sustainability Final Report

The subcommittee issued a summary of their findings on the challenges and opportunities facing the region's water resources in this final report on water in the region.

Under *Goal 2: Provide Equitable Infrastructure* of the report (pp. 9-11), one of the main objectives is to promote green infrastructure and one of the main indicators is to increase capacity for management of stormwater. The recommended strategies for achieving these goals are:

Strategy 1: Enable Stormwater Revenue Streams

Strategy 2: Encourage the Gulf of Mexico Alliance to Coordinate Policies Among the States

Strategy 3: Expand the Digital Inventory of Water, Wastewater, and Stormwater Infrastructure

Strategy 4: Encourage and Incentivize Development Codes

Strategy 5: Encourage Daylighting of Streams through Capital Improvement Planning

DES MOINES AREA METROPOLITAN PLANNING ORGANIZATION

des moines, ia

project **DETAILS**

The Tomorrow Plan

2010 Regional Planning Grant

Award: $4,200,000

project **BACKGROUND**

The **Des Moines Area Metropolitan Planning Organization** used HUD Regional Planning Grant funding to coordinate **The Tomorrow Plan**, a regional plan to address the previous years of patchwork growth in the Greater Des Moines region and usher in a new era of regional planning and collaborative growth management. While new development had previously been located according to the needs of each municipality rather than the region as a whole, the planning effort funded by HUD allowed the Des Moines Area MPO the opportunity to coordinate anticipated change in the region and collaborate with 17 local communities, four counties, and numerous civic organization partners. The Des Moines Area MPO estimates that by 2035 the population of Greater Des Moines will grow to 650,000 people, an increase of 35 percent.

The Tomorrow Plan resulted in land use, policy, and implementation recommendations to address economic competitiveness, social equity and public health, environmental resilience, and regional coordination at all levels. Under Goal 2 of the Tomorrow Plan (Improve the Region's Environmental Health and Access to the Outdoors), the plan focused on improving stormwater management and mitigation of the negative environmental and economic impacts of natural disasters, climate change, and poorly designed developments.

The Tomorrow Plan was awarded the Daniel Burnham Award for a Comprehensive Plan by the Iowa Chapter of the American Planning Association in 2013

This graphic diagram illustrates the recommendation that 90% of urban development areas' stormwater runoff be retained on-site

Source: http://www.thetomorrowplan.com/documents/ttp-final.pdf

green infrastructure **GOALS**

- Develop a regional stormwater approach emphasizing the use of natural processes to carry out the functions of built systems
- Reduce flooding and improve water quality in rivers and streams
- Develop watershed management authorities (WMAs) in order to manage stormwater at the watershed level

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The final **Tomorrow Plan** (pp. 92-96) identifies five tools essential for improving water quality and stream stability in the region and furthering the implementation of green infrastructure practices:

1. Complete a regional soil-type analysis to identify areas that are suited for stormwater management via infiltration practices. For areas that are not suitable, identify alternative stormwater management practices.

2. Develop watershed management authorities.

3. Manage stormwater runoff via natural stormwater utilities.

4. Investigate the range of policy options that exist to develop a regional natural stormwater utility.

5. Develop a model ordinance for best stormwater practices.

Additionally, *Initiative 2: Greenways* (pp. 100-106), issues a series of recommendations for expanding the green infrastructure network and conserving natural resource lands, establishing natural stormwater utilities, and improving tree canopy coverage. The plan identifies targets for these goals on p. 106.

Development of Watershed Management Organizations (WMOs)

The Des Moines Area MPO is spearheading the formation of the Walnut Creek Watershed Management Authority. Recently allowed under Iowa statutes, several other WMAs have formed or are in the process of formation: **Fourmile Creek WMA**, the South Raccoon River WMA, and the Middle South Raccoon River WMA. These will serve as models for Walnut Creek, Beaver Creek, North and Middle Rivers, and the other major watersheds in the region. The region will prioritize creation of WMOs in watersheds that cross jurisdictional boundaries.

Development of a model stormwater ordinance

In order to comply with Phase II of the Clean Water Act, most municipalities in the Greater Des Moines region have changed their stormwater ordinances. As an example, the Tomorrow Plan outlines the items a model stormwater ordinance should address.

Implementation Toolbox on Stormwater Management

The Implementation Toolbox was developed as a resource for local municipalities to use as reference in their planning efforts. Under subgoal *2D. Develop a regional stormwater approach emphasizing the use of natural processes to carry out the functions of built systems*, the **implementation toolbox for 2.D.** contains numerous reports and case studies related to low-impact development, green infrastructure, and stormwater management best practices.

SOUTHEAST MICHIGAN COUNCIL OF GOVERNMENTS

detroit, mi

project **DETAILS**

Regional Plan for Sustainable Development

2010 Regional Planning Grant

Award: $2,850,000

project **BACKGROUND**

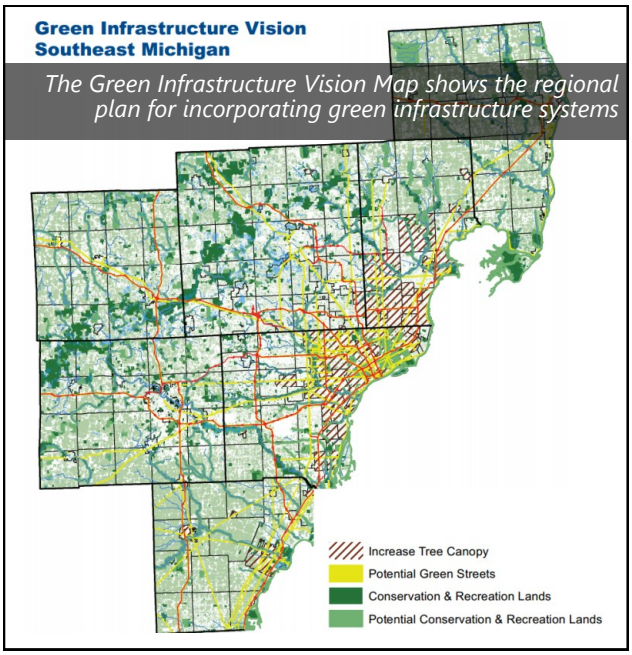
The **Southeast Michigan Council of Governments** (SEMCOG) used HUD Regional Planning Grant funding to develop a **Regional Plan for Sustainable Development** for the Detroit metropolitan region. SEMCOG engaged in a variety of projects under their grant, including: linking workforce development with business creation and emerging sectors, redeveloping community assets in commercial and industrial areas, developing a regional housing plan and neighborhood resilience strategy, developing a green infrastructure vision, creating a sustainable infrastructure system, building capacity at the local level, evaluating sustainability efforts, and promoting sustainability through public outreach.

Task 4 of SEMCOG's project was specifically focused on green infrastructure with an emphasis on assessing the current resources available, identifying the future vision of its use in the region, and laying forth recommendations for expanding its integration across jurisdictional boundaries. Given the large number of vacant parcels and foreclosures in metropolitan Detroit and the surrounding counties, determining the appropriate use of the landscape is a vital part of creating a sustainable region. While efforts are currently underway to redevelop vacant properties, another option available is to green vacant properties to enhance the quality of life and reduce the amount of built infrastructure, impervious surfaces, and associated costs required by developed land.

SEMCOG is the Clean Water Act-designated water quality management agency and operated under their **Water Quality Management Plan for Southeast Michigan**, which was adopted in 1999. However, that plan lacked any substantial incorporation of green infrastructure. While some green infrastructure implementation has occurred, it has been in a piecemeal fashion across the region. In response to these needs, SEMCOG set up by a **Green Infrastructure Vision Task Force** responsible for providing guidance, monitoring progress, and development of a report to establish a plan and vision for converting underused and vacant land in the Detroit metropolitan region into green assets that lead to multiple economic, ecological, and social benefits.

This map shows the high percentage of vacant land in the city of Detroit available for use as green infrastructure

Source: http://www.semcog.org/GIVision/index.html#/1/



The Green Infrastructure Vision Map shows the regional plan for incorporating green infrastructure systems

Source: http://www.semcog.org/GIVision/index.html#/1/

green infrastructure **GOALS**

- Convert vacant land and properties into green infrastructure assets that improve quality of life and the regional ecology
- Benchmark the state of green infrastructure in the region including impacts on water, air, land, and the economy
- Determine the future of green infrastructure in the region and provide recommendations on reaching the vision
- Engage stakeholders through the GI Vision Task Force and workshops

green infrastructure **OUTPUTS AND OUTCOMES**

Green Infrastructure Vision for Southeast Michigan

The main green infrastructure output was the development of the **Green Infrastructure Vision for Southeast Michigan** report which includes recommended policies, benchmarking of existing conditions, targets and metrics, and case studies. The report was the result of extensive community outreach and produced a data-intensive snapshot of existing conditions, as well as a wealth of resources for implementing green infrastructure in the Detroit metropolitan region.

Chapter 8 of the plan (pp. 47-49) specifically focuses on the use of green infrastructure on vacant land and highlights the current work of the **Detroit Water and Sewer Department** and **Greening of Detroit** to use vacant land for a variety of green infrastructure-related uses.

HOUSTON-GALVESTON AREA COUNCIL

houston, tx

project **DETAILS**

Our Great Region 2040

2010 Regional Planning Grant

Award: $3,750,000

project **BACKGROUND**

The **Houston-Galveston Area Council** (H-GAC) used HUD Regional Planning Grant funding to develop **Our Great Region 2040**, a regional plan for sustainable development for the 13-county Texas Gulf Coast region.

Our Great Region 2040 is the Houston-Galveston metropolitan region's new plan for addressing the interaction of land use, transportation, housing, economic development, infrastructure, and environmental elements—and the social equity issues related to each. The plan contains appropriate implementation strategies identifying context-specific strategies and illustrative case studies from the region for the Houston-Galveston region's urban, suburban, rural, and coastal communities. The plan also includes regional metrics that create a baseline sustainability level for the region and allow for the measurement of future progress.

Green infrastructure is identified as a way to achieve the Houston-Galveston region's environmental conservation and climate resilience goals. The plan envisions using green infrastructure projects as a triple-bottom-line tool for conserving sensitive natural resources in the coastal region, especially given the pressure of sprawling development. There is also a focus on climate resilience and the use of green infrastructure as a lower-cost solution to protect key assets from hurricanes and flooding events.

The 13-county Houston-Galveston region under 'Our Great Region 2040' focused on green infrastructure as a resilience strategy for dealing with the region's coastal vulnerability

Source: http://www.ourregion.org/OurRegion2040Supporting_Documents/OurGreatRegion2040-FINAL.pdf

green infrastructure **GOALS**

- Value and preserve regional ecosystems, working landscapes, parks, open spaces, and the ecological benefits they provide
- Enjoys clean and plentiful water, air, soil, and food resources to sustain healthy future generations
- Ensure resilience to economic downturns and environmental or natural disasters

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

The **Our Great Region 2040 final regional plan** includes the following policy goals related to green infrastructure:

- Create watershed protection plans to protect recharge zones, water sources, as well as waterways and wetland buffer areas
- Conserve natural assets through multi-benefit green infrastructure projects and designing with nature, such as Low Impact Development and expanding the region's network of open space and trails along waterways
- Establish alliances to coordinate water conservation and protection efforts across the region, including through sharing data and best practices, developing financial incentives, and implementing public awareness programs
- Develop a regional plan which identifies high quality natural areas for conservation
- Develop an integrated regional storm defense system, which includes both structural and green infrastructure elements
- Support innovative adaptation strategies that help communities prepare for potential environmental changes, such as sea level rise and severe weather events

Brazoria County Plan for Public Parks and Sustainable Development

As part of Our Great Region 2040, six **Case Studies** were completed as models for communities in the region. One of these was the **Brazoria County Regional Plan for Public Parks and Sustainable Development**.

This plan's specific goal was to enhance recreational and economic health through environmental conservation by developing a new set of best management practices to handle and protect the coastal natural resources through interventions in county parks. The plan advocates for incorporating green infrastructure facilities into parks to conserve public green spaces and assist with stormwater management in the coastal region.

County Profiles

The project developed **county profiles** for each of the 13 counties in the region that provided a data baseline for measuring progress and change over time for each county's population, housing and household demographics, economy, education and poverty, health, environment, and transportation. Under the environment, they are measuring environmental attributes (forests, wetlands, etc.) and impaired waterways.

FY2011

COMMUNITY CHALLENGE PLANNING GRANTEES

CITY OF BINGHAMTON binghamton, ny

project **DETAILS**

Blueprint Binghamton

2011 Community Challenge Planning Grant Award: $486,058

project **BACKGROUND**

The **City of Binghamton** used HUD Community Challenge Planning Grant funding to update its comprehensive plan and develop a corridor plan focused specifically on the design and redevelopment of Court and Main Streets in downtown Binghamton. Since the last comprehensive plan was completed in 2003, new businesses and housing have brought new life to the downtown, the City's population has stabilized, and the waterfront trail and parks have given a boost to the quality of life and regional image of Binghamton. The new comprehensive plan, **Blueprint Binghamton: Forward Together**, will guide the growth and development of the city over the next 10 years and will be complemented by a future corridor plan.

Given that the city lies at the confluence of two large rivers, the Susquehanna, and its tributary the Chenango, floodplain and stormwater management were important considerations of the plan update. In 2011, the City was hit with a devastating flood which damaged nearly 13 percent of the city's land parcels; the **Broome County 2013 Hazard Mitigation Plan** estimates that the 2006 flood caused $5.5 million in damages to the county and estimates that 30 percent of the county population lives within the floodplain as defined by the current Flood Insurance Rate Map. Within the City of Binghamton alone, over 11,000 residents live in the National Flood Insurance Program Special Flood Hazard Area as of 2012.

The city faces many water-related challenges. It has aging infrastructure, including a sewer system that is still made up of 40 percent combined sewer and stormwater lines. The geographical location along two large river poses the threat of flooding. There are combined sewer overflow (CSO) discharges at nine sites along the rivers, including eight into the Susquehanna River alone. Finally, the city is financially constrained with a limited budget to make the long -term improvements it needs. In the new plan, the city places a strong emphasis on the incorporation of green infrastructure to address these challenges, as the city continues to move incrementally towards a completely separated storm and sanitary sewer system.

The lighter blue circles in this image show the locations of the nine permitted Combined Sewer Overflow (CSO) sites along the rivers

Source: http://blueprintbinghamton.com/index.php/plan/binghamton-tomorrow/

green infrastructure **GOALS**

- Protect Binghamton residents and businesses from river flooding through mitigation strategies and compliance with new floodplain standards to reduce flood insurance costs
- Reduce effects of small scale and flash flooding events through smaller-scale interventions
- Incentivize low impact development and green infrastructure practices for private residents and business owners
- Improve stormwater management and river water quality
- Increase tree canopy cover

green infrastructure **OUTPUTS AND OUTCOMES**

Policy Recommendations

Blueprint Binghamton outlines a list of strategies for implementing green infrastructure to address the flood-prone environment in **Chapter 10: Action Plan** (pp. 355-356, 358-359). Further background on these strategies is found in **Chapter 6: Infrastructure Mini-Plan** (pp. 195-202, 208-219) and **Chapter 7: Environment and Open Space Mini-Plan** (pp. 234, 244-245). Key strategies and policy recommendations include:

- Implementing Binghamton's established priority projects from the Broome County 2013 Hazard Mitigation Plan
- Proactively managing land in the floodplain to reduce blight and implement flood mitigation measures
- Enforcing and enhancing the Urban Runoff Reduction Plan requirements in the city's **Erosion Control and Stormwater Ordinance**
- Implementing stormwater management BMPs for green mitigation
- Integrating stormwater management into parks, specifically riverfront parks and trails

Recommendation for Expanding Incentive-Based Green Infrastructure Grant Programs

The city had previously created two grant programs to incentivize green infrastructure projects on private property. Under the plan, they propose expanding incentives for green infrastructure through these programs.

The **Green Stormwater and Landscaping Matching Fund** supports the implementation of small-scale green infrastructure projects by homeowners and business owners that will increase resilience to flooding and help improve water quality. This program was created with funding from a local community foundation.

The **50/50 Stormwater Management Fund** supports the implementation of green infrastructure projects on larger development projects. It assists landowners to use green infrastructure to exceed the requirements of the city's Erosion Control and Stormwater Ordinance; this helps to lower development costs for stormwater management and incentivizes green infrastructure techniques. This program was created with a grant the National Fish and Wildlife Federation Chesapeake Bay Stewardship Fund.

CITY OF PHOENIX phoenix, az

project **DETAILS**

Reinvent Phoenix

2011 Community Challenge Planning Grant
Award: $2,935,634

project **BACKGROUND**

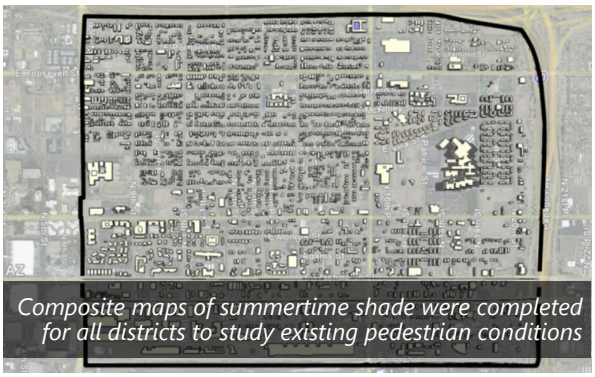
The **City of Phoenix** is using HUD Community Challenge Planning Grant funding to coordinate **Reinvent Phoenix**, which will produce sustainable action plans for five transit-oriented development (TOD) districts along the existing Valley Metro light rail line in the core of the Phoenix region. These plans will establish a new transit-oriented model for urban development in a city known for its traditionally auto-centric development.

The project is structured in a three-phase process: planning, design, and implementation. The planning phase involved building a collaborative environment among partners and working with stakeholders in each of the five districts to establish a community vision for the future and a list of strategies to move toward those visions. City staff and a consultant led the second design phase of the project, which developed visuals and form-based codes. Once implemented, these steps will update zoning, codes, regulations, and city policies to enable efficient future development along the transit corridor. Finally, the implementation phase will leverage city partnerships with the Urban Land Institute, **Local First Arizona**, and the **Sustainable Communities Collaborative** to develop a new model of walkable development in Phoenix.

The City of Phoenix is incorporating green infrastructure standards and classifications for the five TOD area plans as a model for future green infrastructure development in greater Phoenix. The main drivers for addressing green infrastructure are the high daytime temperatures (urban heat island effect), insufficient tree canopy and green space (particularly in lower income areas), and an expensive development-inhibiting stormwater retention standard. Stakeholder feedback was instrumental in deciding to use green systems for improved health, mobility, and water conservation efforts.

green infrastructure **GOALS**

- Increase tree cover and open green space in order to reduce daytime surface temperature (urban heat island effect) for pedestrian comfort and walkability
- Reduce stormwater loads and use off-site green infrastructure to ease the stormwater retention requirements on development
- Reduce potable water consumption
- Increase permeability and use of green streets techniques



Composite maps of summertime shade were completed for all districts to study existing pedestrian conditions

Source: http://reinventphx.org/

Rendering of a revitalized and walkable Van Buren Street with permeable paving, street trees, and stormwater planters

Source: http://reinventphx.org/

green infrastructure **OUTPUTS AND OUTCOMES**

Data-Based Research, Strategies, and Metrics

One of the city's project partners is **Arizona State University's Global Institute of Sustainability**, which led the research and GIS mapping efforts for the green infrastructure portion of the project.

The Institute completed 'Assessment of Green Systems' reports for each district, analyzing current conditions using data analysis and geospatial mapping. These assessments and quantitative data informed their development of corresponding 'Sustainable Green Systems Strategy' reports for each district, which outline concrete steps to achieve the vision established by stakeholders for each district and prioritize areas for green infrastructure investment.

Finally, these reports established green infrastructure metrics for each district, including targets for tree cover, permeable paving, rainwater harvesting, stormwater runoff capture, surface temperatures, white roofs, and quantity of asphalt surface parking. The reports will be publicly available on the project website.

Fiscal Estimates for Implementation

The city designed conceptual diagrams and cost estimates for implementing full scale green infrastructure strategies in each of the districts. This provides a tangible tool for prioritizing green infrastructure investments.

EPA Technical Assistance

Phoenix was selected as one of 16 communities nationwide in 2012 to receive technical assistance on green infrastructure from EPA and EPA's contractor, **Tetra Tech**. As a part of this technical assistance, Tetra Tech and the city team completed a **Green Infrastructure Evaluation** which reviewed the city's plans, policies, and codes to identify current practices that either support or present barriers to green infrastructure. This evaluation considered a range of green infrastructure techniques. Moving forward, the city will incorporate the green infrastructure recommendations into code revisions.

Demonstration Projects

The project has completed two small demonstration projects on green infrastructure, including tree planting and rain garden installation at local elementary schools.

CITY OF BEAVERTON beaverton, or

project DETAILS

Beaverton Creekside District Master Plan

2011 Community Challenge Planning Grant

Award: $1,000,000

project BACKGROUND

The City of Beaverton used HUD Community Challenge Planning Grant funding to plan for the revitalization of their downtown through the creation of the Beaverton Creekside District Master Plan and Implementation Strategy. The final Beaverton Creekside District Master Plan was adopted by the City of Beaverton on November 18, 2014.

The Creekside District Master Plan builds upon the goals of the Beaverton Civic Plan, which was adopted in 2011. The Creekside District Master Plan builds upon the existing assets of downtown Beaverton and previous plans for the redevelopment of underutilized properties in the district, improvement and beautification of the city's creeks, and transportation and infrastructure improvements.

As with the Civic Plan, the revitalization of downtown Beaverton's creeks is one of three major components of the Beaverton Creekside District Master Plan: housing and redevelopment, creeks and natural resources, and transportation.

Beaverton was once a small town with a creek system along a wide and shallow floodplain. As the city grew, the forests were logged, ponds and marshes were drained, and nearly a third of the downtown creek system was channelized to make the land suitable for agriculture and industry. Today, the remaining floodplain in downtown Beaverton has been largely filled in and paved over with impervious surfaces. The result is a largely buried creek system, with poor water quality, regular flooding, and few opportunities for recreation or public access.

With many partners, the city and Clean Water Services worked to create a compelling vision and plan for the entire creek corridor. The Creekside District Master Plan provides clarity and predictability for property owners and identifies public and private investment opportunities to create open spaces and enhance water quality. The plan also includes design and engineering for a new downtown park and plaza north of The Round development and light rail transit station to bring people and the creeks together. The final plan incorporates the use of green infrastructure to restore creek water quality and mitigate against the impacts of proposed development.

Digital rendering of the proposed downtown park and plaza north of The Round mixed-use development in Beaverton, OR

Source: http://www.beavertoncivicplan.com/wp-content/uploads/2014/10/Creekside-MasterPlan-v2_small.pdf

green infrastructure GOALS

- Implement district-scale green infrastructure strategies
- Create additional open space and improve stormwater treatment and quality while balancing the need for affordable housing in the community
- Mitigate impacts of frequent flooding from the City's creeks
- Design and engineer a new park/plaza north of The Round development to connect people to the creek system

Section illustration of a redesigned downtown creek with riparian buffers on each side and wide pedestrian promenade

Source: http://www.beavertoncivicplan.com/wp-content/uploads/2014/10/Creekside-MasterPlan-v2_small.pdf

green infrastructure OUTPUTS AND OUTCOMES

Policy Recommendations

Goal 3 of the final Creekside District Master Plan is to make the downtown creek system a beautiful destination and focal point for people who live, work and visit the District. In order to achieve this goal, the plan identifies four solutions (pp. 58-61):

1. Require new development to incorporate on-site stormwater treatment facilities located to maximize benefits to the downtown creek system. (p. 58)
2. Build regional stormwater treatment facilities. (p. 59)
3. Develop public and private programs designed to clean and restore the downtown creeks and stream bank areas. (p. 60)
4. Provide incentives to daylight Beaverton Creek. (p. 60)

The plan also recommends the creation of a creekside plaza north of The Round mixed-use development. This plaza is proposed to connect people with the creeks via a contiguous multi-use path, named the 'Crescent Connection,' along Beaverton Creek.

Other aspects of the plan, especially the transportation and housing elements, recommend incorporation of stormwater treatment facilities and green infrastructure aimed at improving the water quality of the creeks and the connection of people with the creeks. More information can be found on the project website.

Creekside District Vegetated Corridor Mapping

In coordination with Clean Water Services, the city mapped the creekside vegetated corridor district-wide to remove regulatory barriers to redevelopment along the creeks. This process eliminates several steps for District property owners seeking a Service Provider Letter in order to pursue development and is estimated to save an average of $6,000-$10,000 per development project in mapping and consulting costs and an estimated 4-6 weeks in permitting time.

MID-AMERICA REGIONAL COUNCIL

kansas city, mo

project **DETAILS**

Sustainable Code Framework

2011 Community Challenge Planning Grant Award: $403,432

project **BACKGROUND**

The **Mid-America Regional Council** used HUD Community Challenge Planning Grant funding to align codes and policies to encourage and foster sustainable development and redevelopment using the **Sustainable Code Framework** in the Kansas City metro region. This project complements the Regional Planning Grant that MARC was awarded in 2010 from HUD to lead the **Creating Sustainable Places Initiative**.

The 19 members of Kansas City's **First Suburbs Coalition** have worked together with MARC for ten years to promote sustainable growth in the Kansas City region. The main goal of the project was to establish a consistent set of sustainable, redevelopment-ready codes, policies, and incentives and then analyze current city codes with this framework as the standard for sustainability. MARC has conducted eight city code audits using the Sustainable Code Framework as the basis for the audits and will work with the cities on an ongoing basis to adopt the audit recommendations. MARC also worked to establish a clearinghouse of these codes for other municipalities in the region.

In addition, MARC used this funding to develop a zoning code strategy for the **Troost-Cleaver Boulevard Redevelopment and Implementation Plan**. Troost Avenue is the western boundary of the **Green Impact Zone**, a nationally recognized place-based initiative spearheaded by U.S. Congressman Emanuel Cleaver that has generated significant housing redevelopment and community revitalization in a formerly disinvested area of south Kansas City.

The Sustainable Code Framework incorporated green infrastructure in both of these initiatives as a multiple-benefit strategy and tool for increasing the sustainability of future development while improving the quality of the public realm.

This street section of Troost Boulevard illustrates the use of infiltration planters and street trees for improving the quality of public space for pedestrians while also managing stormwater

Source: http://www.marc.org/Regional-Planning/Creating-Sustainable-Places/Planning-sustainable-Places/2012-Grantees-and-Projects/Assets/Land-Clearance/Troost-Cleaver-Final-Plan-11-27-13.aspx

green infrastructure **GOALS**

- Build green infrastructure strategies into city codes and policies; "greening the codes"
- Establish a clearinghouse of green infrastructure and other sustainable development code best practices
- Incorporate green infrastructure into the design of streetscapes

green infrastructure **OUTPUTS AND OUTCOMES**

Sustainable Development Navigator

The Sustainable Code Framework and its correspondent **Sustainable Development Navigator** website contains a section focused on incorporating green infrastructure under its **Resource Conservation and Energy Efficiency** principle.

The **Green Infrastructure section** provides nine basic strategies for furthering the incorporation of green infrastructure elements, as well as ten relevant code examples from across the nation to draw upon.

The website also contains relevant sections on **Stormwater Systems**, **Tree Preservation**, and **Open Space and Landscape Design**, which showcase low impact development, open space typologies, and tree canopy preservation examples.

Policy Recommendations

The zoning code strategy for the Troost-Cleaver Redevelopment Plan area contained recommendations for green infrastructure incorporation into the design of the area's streets.

Under the plan's urban design strategy and public realm enhancement concepts (pp. 21, 30), it recommends including rain gardens, permeable paving, and other techniques into streetscape design to capture and treat storm water and add greenery to the public realm. This plan was adopted in 2013.

Sustainable Code Audits

As mentioned earlier, MARC conducted eight city code audits using the Sustainable Code Framework with eight member cities from the First Suburbs Coalition. This involved meeting with city staff, reviewing city zoning and development codes, identifying key issues and opportunities, and preparing final reports for each city on how to make their codes more sustainable.

For green infrastructure, the audits showed that none of the eight cities had any green infrastructure codes or policies in place. The final reports will include strategies for those cities to incorporate green infrastructure.

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FY2011

REGIONAL PLANNING GRANTEES

RUTGERS: STATE UNIVERSITY OF NEW JERSEY

new brunswick, nj

project **DETAILS**

Together North Jersey

2011 Regional Planning Grant

Award: $4,200,000

project **BACKGROUND**

Rutgers: The State University of New Jersey is using HUD Regional Planning Grant funding to coordinate **Together North Jersey**, a regional planning initiative for the 13-county region in northern New Jersey. The project is developing a Regional Plan for Sustainable Development (RPSD) for the 13-county planning region, 18 local demonstration projects are completed or underway, and the effort has provided technical assistance and offered educational opportunities to build the capacity of jurisdictions, organizations, and the public to advance sustainability projects and initiatives in the region.

The Livability & Environment Committee is focused on the physical nature of the region, including the built environment, infrastructure and natural systems. One of the main tasks the committee is addressing is the incorporation of natural systems, with **New Jersey Future** serving as the project lead. This final report will look at several aspects of natural systems including air quality, the network of natural and agricultural lands, and water quality and quantity. It will assess traditional water infrastructure systems for drinking water, wastewater, and stormwater.

Additionally, the final report will address green infrastructure approaches to managing urban stormwater. Given the devastating effects of Hurricane Sandy in the region and in neighboring New York City shortly after the project got kicked off, the importance of green infrastructure, stormwater management, and resilience planning has been elevated even further during the course of the project.

In order to provide a model for the region on green infrastructure planning as a strategy for increasing community and regional resilience to extreme weather events, Together North Jersey included the **Hoboken Green Infrastructure Plan** as one of their **18 local demonstration projects**. This plan developed site-based stormwater management and flood control strategies and identified climate adaptation actions for flood-prone Hoboken, NJ. The specific goal of the project was to demonstrate how green infrastructure strategies can help create a more resilient transit system and transit-oriented community.

green infrastructure **GOALS**

- Reduce flooding of local rail transit stations and damage to private property from peak storm events
- Use city-owned land as leverage in a more comprehensive manner, potentially engaging in public-private partnerships
- Implement innovative regulatory measures such as performance-based zoning and establishment of Stormwater Trust Funds
- Identify city-wide strategies for green infrastructure distribution tailored to the specific needs of different areas

green infrastructure **OUTPUTS AND OUTCOMES**

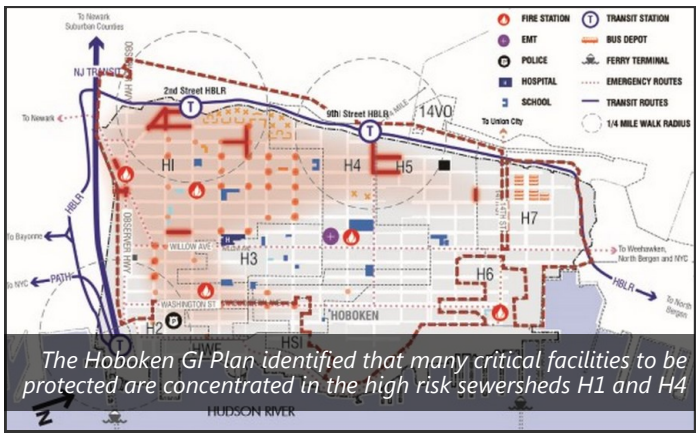
Hoboken Green Infrastructure Plan

The final **Hoboken Green Infrastructure Plan** is the main green infrastructure output of the Together North Jersey project. The report serves as a model for other cities and towns in the region for addressing the threat of stormwater, flooding, and combined sewer overflows from peak storm events. The plan identifies a small city-wide strategy for retention, detention, and infiltration of stormwater in order to reduce property damage and flooding to Hoboken's transit stations, business, and homes.

By analyzing the city's resilience to stormwater at the sewershed basin level, they identified locations for the most beneficial best management practices (BMPs) tailored to the unique topographies and ground conditions of the areas, while considering the impacts on local residents, businesses, land use, and capital and maintenance costs. The city's flooding problems are attributed to multiple sources: high tides on the Hudson River, low topography, surface runoff, high levels of impervious surfaces, outdated sewer infrastructure, poor interconnections between sewersheds, and insufficient pumping capability. The southwestern portion of the city has the highest risk due to a mix of those factors.

Through an analysis of the soil conditions and water table conditions, the plan proposes a conceptual framework that organizes the city into three zones: (1) a "gray zone" where above-ground BMPs such as rainwater harvesting and green roofs should be prioritized, (2) a "green zone" where vegetated BMPs like rain gardens, swales, and stormwater trees should be prioritized, and (3) a "blue zone" where the lowest elevations in the city are and where detention of stormwater should be prioritized due to the topography.

The demonstration project resulted in a comprehensive plan for implementation of green infrastructure across the city of Hoboken as a model for many other cities and towns in the region.



The Hoboken GI Plan identified that many critical facilities to be protected are concentrated in the high risk sewersheds H1 and H4

Source: http://togethernorthjersey.com/?grid-portfolio=hoboken-green-infrastructure-strategic-plan

SHELBY COUNTY memphis, tn

project DETAILS

Mid-South Regional Greenprint

2011 Regional Planning Grant

Award: $2,619,999

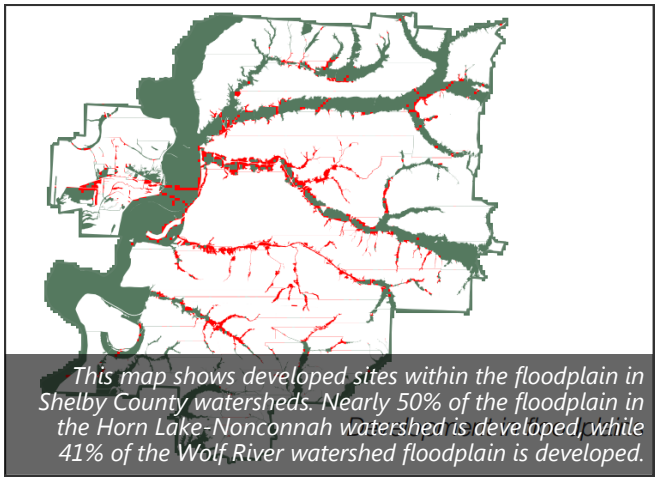
project BACKGROUND

Shelby County used HUD Regional Planning Grant funding to enhance regional livability and sustainability by establishing a unified vision for a region-wide network of green space areas, called the 'Greenprint'. The **Mid-South Regional Greenprint** also addresses housing and land use, resource conservation, environmental protection, accessibility, community health and wellness, transportation alternatives, economic development, neighborhood engagement, and social equity in the Greater Memphis Area.

The Greenprint study area includes the Memphis and West Memphis Metropolitan Planning Organizations (MPOs), covering four counties and 18 municipalities located in the states of Tennessee, Arkansas, and Mississippi. The consortium which managed the planning process, led by the Memphis and Shelby County Office of Sustainability, was made up of over 80 organizations, including municipalities, nonprofits, businesses, and individuals.

By expanding green space to enhance livability in the region, the project addressed water issues such as surface and groundwater quality and protection, as well as stormwater management across the region. Much of the region's drinking water comes from underground aquifers, which provide high-quality and low-cost water for the region. At the same time, because the water source is invisible and high quality, there is not a great emphasis on protecting recharge zones and water quality conservation and protection does not resonate strongly with residents in the region. Accordingly, one aim of the Greenprint was to educate local residents about the importance of water quality conservation.

Finally, in spite of the high quality drinking water, some rivers in the region have been classified as "impaired waters" under Section 303 (d) of the Clean Water Act. Certain areas of the region, particularly North Memphis, were formerly industrial areas which in some cases led to environmental degradation and poor water quality. The **City of Memphis' Municipal Separate Storm Sewer System (MS4) permit** requires additional treatment of stormwater. Due to all of these considerations, the Greenprint had an emphasis on using green infrastructure for addressing these issues.

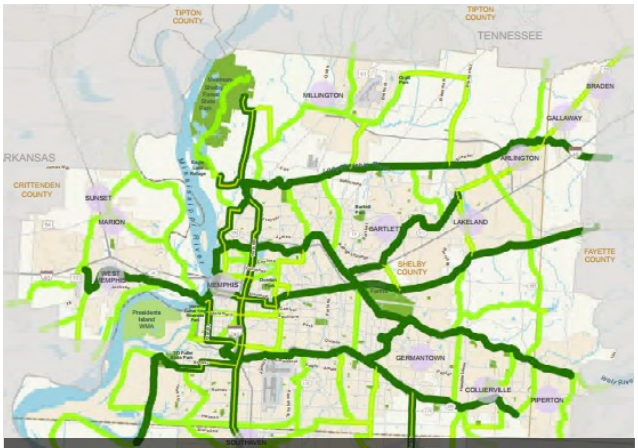


This map shows developed sites within the floodplain in Shelby County watersheds. Nearly 50% of the floodplain in the Horn Lake-Nonconnah watershed is developed, while 41% of the Wolf River watershed floodplain is developed.

Source: http://www.midsouthgreenprint.org/plan/

green infrastructure GOALS

- Expand and improve a network of green space hubs linked by greenways and trails, which provide triple bottom line benefits to Memphis residents
- Create productive green assets from underused lands and brownfields
- Promote sustainable watershed management policies/practices



The Greenprint plans for the expansion of nearly 500 miles of off-road trails and 200 miles of on-road trails to connect communities with an interconnected network of green infrastructure. Existing greenways are shown in dark green and proposed greenways are shown in light green.

Source: http://www.midsouthgreenprint.org/plan/

green infrastructure OUTPUTS AND OUTCOMES

Policy Recommendations

The principal outcome of the final **Mid-South Regional Greenprint** is the vision and final plan for an expanded green infrastructure network, which expands tree cover, limits impervious surfaces, prioritizes infill development, preserves natural resources and undeveloped land, and provides connectivity and recreational opportunities for the region's residents.

By mapping the region's green hubs and corridors, the Greenprint brought greater focus to the importance of rivers and streams in the greater Memphis area. This regional analysis has created an opportunity to take a watershed approach to water quality enhancement, and it also helps to highlight the vital interconnectivity of the region's waterways.

In a series of sustainability and livability indicators, the plan identifies impervious surface and undeveloped land in floodplains as two of several causes of water quality damage. The plan includes strategies and action steps to help address these water quality concerns (pp. 81-87).

In addition to the water quality benefits associated with the expanded green infrastructure network, the Greenprint plan will provide other economic, environmental, and social benefits to the Memphis region. These benefits include improved open space access and recreational amenities, increased tree canopy cover, improved streetscape aesthetics, preservation of undeveloped land, increased multimodal transportation options, and connections between separated Memphis communities.

TRI-COUNTY REGIONAL PLANNING COMMISSION

lansing, mi

project **DETAILS**

Mid-Michigan Program for Greater Sustainability

2011 Regional Planning Grant

Award: $3,000,000

project **BACKGROUND**

The **Tri-County Regional Planning Commission** (TCRPC) used HUD Regional Planning Grant funding to lead the **Mid-Michigan Program for Greater Sustainability** initiative in the central Michigan counties of Clinton, Eaton, and Ingham. The initiative was made up of nine projects, including an affordable housing plan, community reinvestment fund, energy audit of built structures, and a plan for the expansion of the existing green infrastructure system.

Under the sixth project, **Greening Mid-Michigan**, TCRPC and partners focused on the preservation and expansion of green infrastructure to protect the region's waterways from environmental degradation. This project was a partnership between TCRPC, the Groundwater Management Board, and the **Middle Grand Regional Organization of Watersheds** (MGROW). TCRPC allocated approximately $75,000 of their HUD funding specifically for furthering green infrastructure in the region.

The first phase of this project identified and ranked Potential Conservation Areas (PCAs) across the tri-county region. Working with **Michigan State University's School of Planning, Design, and Construction**, TCRPC identified the region's existing green infrastructure through GIS mapping. The second phase provided a detailed analysis of flora and fauna, water resources, watershed quality, and land cover change within each county. The third phase focused on community outreach and engagement; including meeting with 55 local governments, community groups, and over 150 residents to map PCAs and identify linkages between sites.

As a regional entity, TCRPC focused on how green infrastructure can fit together at different scales (site, neighborhood, city, and regional) to improve regional water quality and provide local community benefits such as improved streetscape aesthetics and recreational opportunities, including trails and parks.

Two sample posters from the 'Pollution Isn't Pretty' advertising campaign which educates local residents about conservation

Source: http://www.pollutionisntpretty.org/

green infrastructure **GOALS**

- Preserve and protect riverside corridors
- Implement local plans that connect and preserve green spaces
- Increase tree canopy coverage
- Utilize natural filtration systems along the main corridor of Michigan Avenue in Lansing
- Educate local government staff and local residents about water resource preservation

green infrastructure **OUTPUTS AND OUTCOMES**

Greening Mid-Michigan Map

The primary output of the Greening Mid-Michigan project was the '**Greening Mid-Michigan Map**,' a GIS map of the existing green infrastructure system in the region, with proposed linkages/greenways developed through community outreach. These proposals will be implemented locally through land use decisions at the municipal level.

Media and Outreach Campaign

The project included an extensive media and outreach campaign to highlight the region's green infrastructure, including proposed pathway connections and water resources protection efforts. They made videos which are available on their website and were aired on local Public Broadcasting System (PBS) stations across Michigan.

TCRPC, MGROW, and several Mid-Michigan watershed groups and agencies partnered to rollout a recently developed water resources brand and advertising campaign named **Pollution Isn't Pretty**. The campaign streamlined multiple organization's educational efforts to create clear, consistent messages that continue to educate area residents about water quality concerns and what they can do to reduce pollution of the region's water resources. The campaign received the **2013 Gold ADDY Award** from regional advertising leaders.

Assessments of municipal groundwater policies

Assessments of current municipal policies for groundwater protection were completed and summaries with recommendations for improvements for future action are being drafted.

Integrating water protection and recreation planning across jurisdictional boundaries

Project staff held regular meetings with municipal parks and recreation departmental staff across jurisdictional boundaries to identify opportunities to integrate water protection and non-motor trails development with municipal recreation programming.

MSU Student Designs for green infrastructure along Michigan Avenue

MSU Landscape Architecture Design studio students developed sample design projects at key nodes and sites along the Michigan Ave./Grand River Ave. corridor to further refine recommendations and create case examples for use in the **Corridor Design Portfolio**.

WEB RESOURCES

FY2010 COMMUNITY CHALLENGE PLANNING GRANTEES

1. City of Cincinnati (Cincinnati, OH)

City of Cincinnati website: http://www.cincinnati-oh.gov/planning/
Plan Cincinnati: http://www.plancincinnati.org/
Citywide Form Based Code: http://www.cincinnati-oh.gov/planning/assets/File/CFBC_1703_FBC_FinalDraft_021513_web(1).pdf
Consent Decree with EPA: https://msdgc.org/consent_decree/
Metropolitan Sewer District of Cincinnati: http://www.msdgc.org/
Mill Creek Restoration Project: http://groundworkcincinnati.org/
Project Groundwork: http://projectgroundwork.org/
Lick Run Watershed Master Plan: http://www.projectgroundwork.org/downloads/lickrun/lick_run_master_plan.pdf

2. Urban Redevelopment Authority (Pittsburgh, PA)

Urban Redevelopment Authority website: http://www.ura.org/
Allegheny Green Boulevard project website: http://www.greenboulevardpgh.com/
Final Green Boulevard Plan: http://ura.org/pdfs/ARGB/2013.03.21_ARGB-Executive-Summary.pdf
Riverlife: http://www.riverlifepgh.org/
Allegheny Riverfront Vision Plan: http://www.pittsburghpa.gov/alleghenyriverfront/Technical Appendix on Open Space and Riverfront Access

3. City of New Orleans (New Orleans, LA)

City of New Orleans website: http://www.nola.gov/city-planning/
LCC project website: http://www.nola.gov/livable-claiborne-communities/
Final LCC Study: http://www.nola.gov/livable-claiborne-communities/9_lcc-study_-final-report/
EPA Consent Decree: http://www.swbno.org/docs_consentdecree.asp
Sewerage and Water Board of New Orleans (SWBNO): https://www.swbno.org/
SWBNO Green Infrastructure Plan: http://www.swbno.org/getfile.asp?documents/Consent%20Decree/GreenInfrastructurePlan.pdf
Greater New Orleans Urban Water Plan: http://livingwithwater.com/
Lafitte Greenway Plan: http://www.nola.gov/dpw/projects/lafitte-greenway/
New Orleans Redevelopment Authority: http://www.noraworks.org/
LCC Technical Memorandum: http://www.nola.gov/livable-claiborne-communities/6_lcc-study_-technical-memorandum-strategies-and-i/
Rockefeller Re.Invest. Initiative: http://www.reinvestinitiative.org/partner-cities/new-orleans/

4. Jersey City Redevelopment Agency (Jersey City, NJ)

Jersey City Redevelopment Agency website: http://www.thejcra.org/
Canal Crossing project website: http://www.thejcra.org/canalcrossing
NJ Department of Environmental Protection: http://www.nj.gov/dep/
Jersey City EPA Consent Decree: http://www2.epa.gov/enforcement/jersey-city-municipal-utilities-authority-jcmua-settlement
Basis of Design Infrastructure Report: http://www.thejcra.org/jcra_files/File/development_projects/canal_crossing/plan/Reports/Canal%20Crossing%20Redevelopment%20Area_Basis%20of%20Infrastructure%20Design.pdf
Drainage Report: http://www.thejcra.org/jcra_files/File/development_projects/canal_crossing/plan/Reports/Drainage%20Report.pdf

5. City of Columbia (Columbia, TN)

City of Columbia website: http://www.columbiatn.com/
Project website: http://www.columbiatn.com/JCBoulevard/JCBoulevard.htm
The Boulevard 2050 Plan: http://www.columbiatn.com/JCBoulevard/TheBoulevard2050Plan.pdf

6. Maryland-National Capital Park and Planning Commission (Riverdale, MD)

MNCPPC website: http://www.mncppc.org/commission_home.html
Southern Green Line website: http://www.pgplanning.org/Projects/Completed_Projects/Completed_Plans/Green_Line_TOD.htm
WMATA: http://www.wmata.com/
Final Plan: http://issuu.com/mncppc/docs/sgl_book_web?mode=embed&layout=http%3A%2F%2Fskin.issuu.com%2Fv%2Fcolor%2Flayout.xml&backgroundColor=336699&showFlipBtn=true&proShowMenu=true&proShowSidebar=true&autoFlip=true&autoFlipTime=6000
Chesapeake Bay Total Maximum Daily Load (TMDL): http://www.epa.gov/chesapeakebaytmdl/

7. City of University City (University City, MO)

City of University City website: http://www.ucitymo.org/index.aspx?nid=354
Project website: http://www.parkviewgardensvision.org/
Ch. 8: http://www.parkviewgardensvision.org/sites/default/files/files/15_PVG_Final%20Report_CHAP_5_08_2013-12-20_WEB.pdf
Ch. 9: http://www.parkviewgardensvision.org/sites/default/files/files/16_PVG_Final%20Report_CHAP_5_09_2013-12-20_WEB.pdf
Sustainability Action Plan: http://www.parkviewgardensvision.org/sites/default/files/files/21_PVG_Final%20Report_CHAP_5_14_2013-12-20_WEB.pdf

8. Bernalillo County (Albuquerque, NM)

Bernalillo County website: http://www.bernco.gov/
Bridge Boulevard project website: http://www.bridgeboulevard.com/
Final Plan: http://www.bridgeboulevard.com/resources_114_1519225143.pdf
Appendix C: http://www.bridgeboulevard.com/resources_112_2860856213.pdf

9. City of Augusta (Augusta, GA)

City of Augusta Planning website: http://www.augustaga.gov/290/Planning-and-Development
Augusta Sustainable project website: http://augustasustainable.com/
Augusta Sustainable Development Implementation Strategies: https://asdip.files.wordpress.com/2013/06/initiative4_final1.pdf
2009 Georgia Coastal Stormwater Supplement: http://documents.atlantaregional.com/gastormwater/Georgia-CSS-Final-Apr-09.pdf
Final Plan: http://asdip.files.wordpress.com/2013/06/augustasustainablefinal_nov2013reduced.pdf
City of Augusta Sustainability Best Practices: http://asdip.files.wordpress.com/2013/06/city-of-augusta-sustainability-best-practices.pdf

10. City and County of Denver (Denver, CO)

City and County of Denver Website: http://www.denvergov.org/Default.aspx?alias=www.denvergov.org/cpd
Denver Livability Partnership project website: http://denvergov.org/tod/DenverLivabilityPartnership/tabid/438465/Default.aspx
West Light Rail: http://www.rtd-fastracks.com/wc_1
Station Area Plan: http://denvergov.org/Portals/193/documents/DLP/Decatur-Federal/Decatur_Federal_Adopted42213.pdf
Urban Drainage and Flood Control District: http://www.udfcd.org/

11. City of Ranson (Ranson, WV)

City of Ranson website: http://www.cityofransonwv.net/
Renewed Ranson project website: http://ransonrenewed.com/
Green Corridor Revitalization Plan: http://ransonrenewed.com/wp-content/uploads/2012/03/Green-Corridor-Concept-Plan-Report-HPE-March-2012.pdf
EPA Report on Green Corridor Revitalization Plan: http://www.epa.gov/landrevitalization/download/Final%20Green%20Infrastructure-9-16-14.pdf
Final Comprehensive Plan: http://ransonrenewed.com/wp-content/uploads/2012/04/RansonCompPlan_2012_Adopted-Reduced.pdf

12. City of Richmond (Richmond, VA)

City of Richmond website: http://www.richmondgov.com/PlanningAndDevelopmentReview/index.aspx
Hull Street 360 project website: http://hullstreet360.com/
Final Plan: http://www.richmondgov.com/planninganddevelopmentreview/documents/HullStreetRevitalizationPlan.pdf

FY2010 REGIONAL PLANNING GRANTEES

13. East-West Gateway Council of Governments (St. Louis, MO)

EWGCOG website: http://www.ewgateway.org/
OneSTL project website: http://www.onestl.org/
OneSTL final regional plan: http://www.onestl.org/media/site/documents/reports/onestl_plan/OneSTL_FinalPlan-web.pdf
Metropolitan Sewer District of St. Louis: http://www.stlmsd.com/
Consent Decree with EPA: http://www.epa.gov/region7/enforcement_compliance/MSD_consent_decree_cwa.htm
Green Theme: http://www.onestl.org/plan/plan-implementation-goals/themes-goals-objectives-strategies
Chapter on Blue-Gray-Green Infrastructure: http://www.onestl.org/plan/regional-opportunities/blue-gray-green-infrastructure
Sustainable Solution Toolkit: http://www.onestl.org/toolkit
Low Impact Development Toolkit section: http://www.onestl.org/toolkit/category/practice/low-impact-development-lid
Metropolitan Area Planning Council Low-Impact Development Local Codes Checklist: http://www.mapc.org/sites/default/files/LID_Local_Codes_Checklist.pdf
Green Indicators: http://www.onestl.org/indicators/green | Rainscaping Metric: http://www.onestl.org/indicators/green/metric/rainscaping | Water Quality Metric: http://www.onestl.org/indicators/green/metric/water-quality | Watershed Plans Metric: http://www.onestl.org/indicators/green/metric/watershed-plans | Tree Canopy Metric: http://www.onestl.org/indicators/green/metric/tree-canopy | Tree Cities Metric: http://www.onestl.org/indicators/green/metric/tree-cities
Heartlands Conservancy: https://www.heartlandsconservancy.org/
Green Infrastructure Roadmap: http://www.onestl.org/media/site/documents/reports/environment/Green%20Infrastructure%20Roadmap_small.pdf
Low Impact Development Best Management Practices Report: http://www.onestl.org/media/site/documents/reports/environment/BMP%20Booklet%20small%20size.pdf
Middle Mississippi River Partnership Best Practices Guide: http://www.onestl.org/media/site/documents/reports/environment/HeartLands%20Best%20Practices%20Guide-MMRP.pdf
Green Up O'Fallon Report: http://www.onestl.org/media/site/documents/reports/environment/Green%20Up%20OFallon%20Final.pdf
Summary of Water Infrastructure Report: http://www.onestl.org/media/site/documents/reports/environment/St.LouisRegion-WaterInfrastructureReport-Final.pdf
Summary of Conservation Best Practices Report: http://www.onestl.org/media/site/documents/reports/environment/Conservation%20Best%20Practices.pdf

14. Metropolitan Council (Minneapolis-St. Paul, MN)

Metropolitan Council website: http://www.metrocouncil.org/
Corridors of Opportunity project website: http://www.corridorsofopportunity.org/
Central Corridor Stormwater and Green Infrastructure Planning Project: http://www.corridorsofopportunity.org/activities/sgi
Strategic Stormwater Solutions for TOD Report: http://www.corridorsofopportunity.org/sites/default/files/Strategic_Stormwater_Solutions_for_TOD_Final_Report.pdf
Green Line Parks and Commons: http://www.tpl.org/sites/default/files/Green%20Line%20Parks%20%26%20Commons%20Guidebook.pdf

15. Metropolitan Area Planning Council (Boston, MA)

MAPC website: http://www.mapc.org/
MetroFuture: http://www.mapc.org/metrofuture
LID Guide: http://www.mapc.org/sites/default/files/LID_Local_Codes_Checklist.pdf
Mystic River GI: http://mysticriver.org/chelsea/
Final Chelsea Subwatershed Plan for Broadway: http://mysticriver.org/storage/pdfs/ChelseaSubwatershedPlan2013_Final.pdf
Stormwater Utility Toolkit: http://www.mapc.org/Stormwater_Financing
CRWA: http://www.crwa.org/
MRWA: http://mysticriver.org/
Smart Growth Sewering Project: http://www.mapc.org/project-summaries
MetroFuture Regional Plan Goals and Objectives: http://www.mapc.org/sites/default/files/MetroFuture_Goals_and_Objectives_1_Dec_2008.pdf
MetroFuture Implementation Strategies: http://www.mapc.org/sites/default/files/MetroFuture_Implementation_Strategies_outline.pdf
Mystic River Electronic Environmental Atlas: http://maps.mapc.org/myrwa/

16. City of Knoxville (Knoxville, TN)

City of Knoxville website: http://www.cityofknoxville.org/development/
PlanET project website: http://www.planeasttn.org/
Tennessee Valley Authority: http://www.tva.gov/
Regional Livability Report Cards: http://www.planeasttn.org/Learn/LivabilityReportCard.aspx
Greenway Guidelines for the East Tennessee Region: http://www.planeasttn.org/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=1427&Command=Core_Download&PortalId=0&TabId=143
Regional Greenways: http://www.planeasttn.org/GrowStronger/DemonstrationProjects/RegionalGreenways.aspx
S.R. 61 Corridor in E. Anderson County: http://www.planeasttn.org/GrowStronger/DemonstrationProjects/AndersonSR61Corridor.aspx
Low Impact Development: Opportunities for the PlanET Region Resource Manual http://www.planeasttn.org/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=1287&Command=Core_Download&PortalId=0&TabId=143
Knoxville 2040: Centers and Corridors Demonstration Project: http://www.planeasttn.org/GrowStronger/DemonstrationProjects/CentersandCorridors.aspx

17. Capital Area Regional Planning Commission (Madison, WI)

CARPC website: http://www.capitalarearpc.org/
Capital Region Sustainable Communities project website: http://www.capitalregionscrpg.org/
Dane County Comprehensive Plan: http://www.daneplan.org/plan.shtml
Final Plan: http://danedocs.countyofdane.com/webdocs/PDF/PlanDev/ComprehensivePlan/Volume1.pdf
FUDA Planning: http://www.capitalarearpc.org/FUDA.html
City of Fitchburg Post-Development Run-Off Volume Study: http://danedocs.countyofdane.com/webdocs/PDF/capd/2013_postings/Publications/ModelingReport_FINAL_web.pdf
ELOHA Report: http://danedocs.countyofdane.com/webdocs/PDF/capd/2014_Postings/misc/ELOHA/CARPC_ELOHA_report.pdf
Wisconsin Department of Natural Resources: http://dnr.wi.gov/

18. Chicago Metropolitan Agency for Planning (Chicago, IL)

CMAP website: http://www.cmap.illinois.gov/
GO TO 2040: http://www.cmap.illinois.gov/about/2040
Local Technical Assistance (LTA) program: http://www.cmap.illinois.gov/programs-and-resources/lta
Silver Creek & Sleepy Hollow Creek Watershed Comprehensive Plan and Ordinance Assessment: http://www.cmap.illinois.gov/programs-and-resources/lta/silver-creek-sleepy-hollow-watershed
City of Elgin Ordinance Assessment: http://www.cmap.illinois.gov/programs-and-resources/lta/ferson-otter-creek-watershed
A Corridor Plan for the Fox River: http://www.cmap.illinois.gov/programs-and-resources/lta/fox-river
Village of Elmwood Park Comprehensive Plan: http://www.cmap.illinois.gov/programs-and-resources/lta/elmwood-park
Lake County Sustainability Planning: http://www.cmap.illinois.gov/programs-and-resources/lta/lake-county
Village of Niles Environmental Action Plan: http://www.cmap.illinois.gov/programs-and-resources/lta/niles
Village of Park Forest Sustainability Plan: http://www.cmap.illinois.gov/programs-and-resources/lta/park-forest
Chicago Green Healthy Neighborhoods Land Use Plan: http://www.cmap.illinois.gov/programs-and-resources/lta/ghn-chicago
LTA projects: http://www.cmap.illinois.gov/programs-and-resources/lta/projects

19. Capitol Region Council of Governments (Hartford, CT)

CRCOG website: http://www.crcog.org/
Pioneer Valley Planning Commission: http://www.pvpc.org/
Central Connecticut Planning Agency: http://www.ccrpa.org/
Sustainable Knowledge Corridor: http://www.sustainableknowledgecorridor.org/
Hartford Springfield Economic Partnership: http://www.hartfordspringfield.com/
Capitol Region Plan of Conservation and Development: http://www.crcog.org/community_dev/regional_plan.html
Final Regional Plan: http://www.crcog.org/publications/CommDevDocs/regional_plan_documents/2014%20Plan/CRCOG_Regional_Plan_2014_FINAL_090914_low-res.pdf
Pioneer Valley Green Infrastructure Plan: http://www.pvpc.org/plans/pioneer-valley-green-infrastructure-plan
Booklet of Sustainable Land Use Model Regulations: http://www.sustainableknowledgecorridor.org/content/sustainable-land-use
Sustainability Indicators: http://www.sustainableknowledgecorridor.org/content/how-are-we-doing

20. Gulf Regional Planning Commission (Gulfport, MS)

Gulf Regional Planning Commission website: http://www.grpc.com/
Plan for Opportunity project website: http://www.gulfcoastplan.org/
Final Regional Plan: http://www.gulfcoastplan.org/wp-content/uploads/2014/04/Plan-for-Opportunity-Small.pdf
Water Subcommittee: http://www.gulfcoastplan.org/topics/water-subcommittee/
Water Assessment Report: http://gulfcoastplan.org/wp-content/uploads/2012/07/Water-Assessment-Web-Quality.pdf
Stakeholder Analysis Report: http://gulfcoastplan.org/wp-content/uploads/2012/07/Water-Stakeholders-Analysis-Web-Quality.pdf
Tides of Change Final Report: http://gulfcoastplan.org/wp-content/uploads/2012/07/Tides-of-Change-Web-Quality.pdf

21. Des Moines Area Metropolitan Planning Organization (Des Moines, IA)

Des Moines MPO website: http://dmampo.org/
Tomorrow Plan website: http://www.thetomorrowplan.com/
Final Plan: http://www.thetomorrowplan.com/documents/ttp-final.pdf
4 Mile Creek WMA: http://www.fourmilecreekwatershed.org/
Implementation Toolbox for Stormwater: http://www.thetomorrowplan.com/toolbox-goal-2/#2D

22. Southeast Michigan Council of Governments (Detroit, MI)

SEMCOG website: http://www.semcog.org/
Regional Plan project website: http://www.semcog.org/Sustainability_Consortium.aspx
Water Quality Management Plan for Southeast Michigan: http://library.semcog.org/InmagicGenie/DocumentFolder/Water%20Quality%20Management%20Plan.pdf
GI Task Force: http://www.semcog.org/Sustainability_GreenInfrastructureTaskForce.aspx
Green infrastructure Vision: http://www.semcog.org/GIVision/index.html
Detroit Water and Sewer Department: http://www.dwsd.org/
Greening of Detroit: http://www.greeningofdetroit.com/

23. Houston-Galveston Area Council (Houston, TX)

HGAC website: www.h-gac.com/
Our Great Region 2040 project website: http://www.ourregion.org/
Final Our Great Region 2040 regional plan: http://www.ourregion.org/OurRegion2040Supporting_Documents/OurGreatRegion2040-FINAL.pdf
Case Studies: http://www.ourregion.org/casestudies.html
Brazoria County Regional Plan for Public Parks and Sustainable Development: http://www.ourregion.org/documents/Brazoria_Final_Copy.pdf
County Profiles: http://www.ourregion.org/countyprofiles.html

FY2011 COMMUNITY CHALLENGE PLANNING GRANTEES

24. City of Binghamton (Binghamton, NY)

City of Binghamton website: http://www.binghamton-ny.gov/
Blueprint Binghamton project website: http://blueprintbinghamton.com/index.php/plan/binghamton-tomorrow/
Broome County 2013 Hazard Mitigation Plan: http://gobroomecounty.com/planning/hazardmitigation/plandocuments
Chapter 10: Action Plan: http://blueprintbinghamton.com/files/2814/0751/9792/10_ActionPlan_BlueprintBinghamton.pdf
Chapter 6: Infrastructure Mini-Plan: http://blueprintbinghamton.com/files/2214/0751/9721/06_Infrastructure_BlueprintBinghamton.pdf
Chapter 7: Environment and Open Space Mini-Plan: http://blueprintbinghamton.com/files/2814/0751/9735/07_EnvironmentandOpenSpace_BlueprintBinghamton.pdf
Erosion Control and Stormwater Ordinance: http://www.binghamton-ny.gov/sites/default/files/227%2C%20Erosion%20Control_0.pdf
Green Stormwater and Landscaping Matching Fund: http://www.binghamton-ny.gov/sites/default/files/files/GSLMF%20Application%202014%20Final.pdf
50/50 Stormwater Management Fund: http://www.binghamton-ny.gov/sites/default/files/files/50_50%20Stormwater%20Fund%20Matching%20Grant%20FAQ.doc__0.pdf

24. City of Phoenix (Phoenix, AZ)

City of Phoenix Planning website: https://www.phoenix.gov/pdd/pz
Reinvent Phoenix: http://reinventphx.org/
Sustainable Communities Collaborative: http://www.sustainablecommunitiescollaborative.com/
Local First Arizona: http://www.localfirstaz.com/
ASU Global Institute of Sustainability: https://sustainability.asu.edu/
EPA Technical Assistance Green Infrastructure Evaluation: http://water.epa.gov/infrastructure/greeninfrastructure/upload/Phoenix_GI_Evaluation.pdf
Tetra Tech: http://www.tetratech.com/

25. City of Beaverton (Beaverton, OR)

City of Beaverton website: http://www.beavertonoregon.gov/
Creekside District Master Plan project website: http://www.beavertoncivicplan.com/creekside-master-plan/
Beaverton 2011 Civic Plan: http://www.beavertoncivicplan.com/about/
Clean Water Services: http://www.cleanwaterservices.org/
The Round: http://theroundbeaverton.com/
Final Creekside District Master Plan: http://www.beavertoncivicplan.com/wp-content/uploads/2014/10/Creekside-MasterPlan-v2_small.pdf

26. Mid-America Regional Council (Kansas City, MO)

MARC website: http://www.marc.org/Home
Sustainable Code Framework: http://www.marc.org/Regional-Planning/Creating-Sustainable-Places/Tools/Sustainable-Code-Framework
Creating Sustainable Places: http://www.marc.org/Regional-Planning/Creating-Sustainable-Places
First Suburbs Coalition: http://www.marc.org/Community/First-Suburbs-Coalition
Green Impact Zone: http://www.greenimpactzone.org/
Sustainable Development Navigator: http://codes.sustainable-kc.org/
Resource Conservation and EE principle: http://codes.sustainable-kc.org/resource-conservation-and-energy-efficiency
Green Infrastructure section: http://codes.sustainable-kc.org/green-infrastructure
Stormwater Systems section: http://codes.sustainable-kc.org/stormwater-systems
Tree Preservation section: http://codes.sustainable-kc.org/tree-preservation
Open Space and Landscape Design section: http://codes.sustainable-kc.org/open-space-and-landscape-design
Troost-Cleaver Boulevard Redevelopment and Implementation Plan: http://www.marc.org/Regional-Planning/Creating-Sustainable-Places/Planning-sustainable-Places/2012-Grantees-and-Projects/Assets/Land-Clearance/Troost-Cleaver-Final-Plan-11-27-13.aspx

FY2011 REGIONAL PLANNING GRANTEES

28. Rutgers: State University of New Jersey (Rutgers, NJ)

Rutgers: State University of New Jersey website: http://policy.rutgers.edu/
Together North Jersey project website: http://togethernorthjersey.com/
New Jersey Future: http://www.njfuture.org/
Hoboken Green Infrastructure Plan project site: http://togethernorthjersey.com/?grid-portfolio=hoboken-green-infrastructure-strategic-plan
Local Demonstration Projects: http://togethernorthjersey.com/?page_id=14208
Final Hoboken GI Plan: https://onedrive.live.com/view.aspx?resid=2F0F556D773BC90F!2343&app=WordPdf

29. Shelby County (Memphis, TN)

Shelby County website: http://www.sustainableshelby.com/
Mid-South Regional Greenprint project website: http://www.midsouthgreenprint.org/
Mid-South Regional Greenprint Final Regional Plan: https://www.dropbox.com/s/wcq1fkefp37ww7t/GP-Final-ReviewCopy.pdf?dl=0
City of Memphis MS4 Permit: http://tn.gov/environment/water/docs/wpc/TNS068276.pdf

30. Tri-County Regional Planning Commission (Lansing, MI)

TCRPC website: http://www.tri-co.org/
Mid-Michigan Program for Greater Sustainability project website: http://www.midmichigansustainability.org/
Greening Mid-Michigan: Green Infrastructure System: http://www.greenmidmichigan.org/green_infrastructure.shtml
Middle Grand Regional Organization of Watersheds: www.mgrow.org/
Greening Mid-Michigan Map: http://www.greenmidmichigan.org/Publications/Side_1p.jpg
Pollution Isn't Pretty advertising campaign: http://www.pollutionisntpretty.org/
MSU School of Planning, Design, and Construction: http://www.spdc.msu.edu/
ADDY Award: http://www.tri-co.org/Enviro/2013ADDYaward.pdf
Corridor Design Portfolio: http://www.spdc.msu.edu/about_us/mid_mi_program_for_greater_sustainability#designportfolio

Office of Economic Resilience
Office of Community Planning and Development
United States Department of Housing and Urban Development
hud.gov/resilience

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