Green Infrastructure in the Mid-South

Recommendations for Implementing and Financing Green Infrastructure Elements of the Mid-South Regional Greenprint Vision Plan

Prepared by Environmental Finance Center Network for Memphis and Shelby County Government Office of Sustainability
Sustainable Communities Learning Network | June 2014

Report background

This report was developed by the Environmental Finance Center Network (EFCN) through the Capacity Building for Sustainable Communities program funded by the US Department of Housing and Urban Development and the US Environmental Protection Agency. EFCN is a national partnership of ten public universities funded in part by EPA and specializing in the questions of *how to pay* for environmental compliance and improvement. As a member of the Sustainable Communities Learning Network, EFCN is providing technical assistance to recipients of grants from the federal Partnership for Sustainable Communities.

The report was prepared by request of the Memphis and Shelby County Government Office of Sustainability, which in 2011 was awarded a Sustainable Communities Regional Planning Grant to develop the Mid-South Regional Greenprint & Sustainability Plan. This Plan is designed to enhance regional livability and sustainability by establishing a unified vision for a region-wide network of green space areas, or Greenprint, which addresses long-term 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. Shelby County requested guidance from EFCN on financing and implementing the green infrastructure or low-impact development elements of the Greenprint Vision, so that the region can enhance water quality while simultaneously extending its network of trails for recreation, active transportation, public health, and other community benefits.

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I. Recommendations for Developing a Green Infrastructure Implementation Strategy

In setting forth plans for parks, greenways, conservation lands and natural areas in the Mid-South, the Greenprint Vision Plan lays a strong foundation for implementing and funding green infrastructure stormwater management practices in the region. But there are opportunities – both within the Plan and beyond it – to go further in developing a robust green infrastructure strategy. Below, we:

- → Outline the major steps involved in designing a green infrastructure program, highlighting what the Vision Plan has already accomplished and where we recommend further action.
- → Take a closer look at the Vision Plan's outcomes and actions, underscoring those that will be most critical in advancing green infrastructure and suggesting where the strategies might be augmented.
- → Summarize our key near-term recommendations for launching a green infrastructure program in Shelby County.

A. Steps for implementing change: successes and recommendations

Using green infrastructure techniques to manage stormwater is a relatively new approach, and launching a program to finance and implement this approach in Shelby County will likely present a complicated set of issues at both the municipal and regional level. For this reason, it's important to carefully consider the process for bringing about change. In its recent *Local Government Stormwater Financing Manual*,[1] the University of Maryland EFC presents a five-phase model for reforming public policies, specifically applied to stormwater financing. Below, we have presented each step in the process, highlighting achievements the Vision Plan has made as well as recommendations for next steps. Please refer to the *Financing Manual* for in-depth discussion of each step.

→ Step 1: Gain Initial Agreement

This step involves bringing together key stakeholders to agree that there is a need to change the status quo in how green infrastructure is currently being implemented and/or funded. In Shelby County, this will mean convening relevant stakeholders to agree to pursue policies and funding to implement green infrastructure BMPs within new green spaces (trails, parks, etc).

Accomplishments:

- Convened a partnership of key stakeholders needed to initiate and champion change (the Consortium); this group can act as an advisory committee to provide ongoing advice and support as more a detailed green infrastructure strategy is developed.
- Established leadership to guide the process of change (Shelby County Office of Sustainability).
- Developed effective committees to collect resources, establish objectives, move meetings along and communicate with stakeholders and the public (Parks and Greenways Working Group and the Resource Conservation and Environmental Protection Group Working Group).
- Agreed on a clear vision, which encompasses the need for change; discovered that the region lacks coordination between large scale aspirations and locally scaled plans and policies.
- Developed and are implementing a strong public communications strategy.

Recommendations:

- Consider whether the Consortium and/or the Working Groups are fully representative of stakeholders that influence stormwater, including stormwater managers at the City and County levels. Are there other key public and private partners that could champion green infrastructure? You might deem it necessary to convene a separate working group or other stakeholder committee dedicated specifically to this issue.
- Coordinate planning processes across departments, working especially closely with stormwater staff to ensure that green infrastructure connects to existing stormwater management permits and plans, as well as with departments of public works, parks and recreation. While it represents a significant innovation, it is advantageous to work across departments to coordinate planning, share project implementation, and perhaps even combine budgets. Such coordination will foster a transparent process and encourage buy-in.
- Possibly augment the Greenprint Vision to more clearly articulate the need for green infrastructure *stormwater management* (or LID) to be integrated across the watershed, especially within new and existing green spaces.

[1] University of Maryland Environmental Finance Center. 2014. *Local Government Stormwater Financing Manual: A Process for Program Reform.* http://efc.umd.edu/assets/publications/2efc_stormwater_financing_manual_final_(1).pdf

→ Step 2: Formulate the Problem

This step requires clearly defining the need(s) surrounding green infrastructure, including the need for additional funding to implement projects. A clear problem definition will help the Consortium and any other stakeholder team agree on how to respond, help decision makers become convinced that they should authorize changes, and build support throughout the community for your eventual projects.

Accomplishments:

- (as above) Agreed on a clear vision, which encompasses the need for change. Further, each Strategic Direction is based on an analysis of regional context and an explanation of why action is needed to change the current state of affairs.
- Identified specific desired environmental outcomes, including safe drinking water, improved water quality and more adequate and innovative stormwater management that reduces runoff and treats water close to the source.
- Created a robust GIS database of existing parks and greenways, natural and cultural features, equity issues, and green space distribution.

Recommendations:

- More clearly define the problem and goals surrounding green infrastructure stormwater management on trails. The *Financing Manual* includes a checklist of questions to help formulate specific goals, including what stormwater standards you need to comply with (and how green infrastructure might integrate with current stormwater management programs), what is driving change, what green infrastructure services you're already providing, and what targets you need to set based on stormwater permit requirements, citizen expectations, and local government's goals.
- Integrate your goals into the Vision Plan, and consider preparing a smaller written report focusing specifically on this issue, so that your stakeholder team and elected officials have a clear, common set of problems and goals to discuss. This will make the Mid-South region more competitive for funding opportunities.

→ Step 3: Create a Solution

In this step, you will identify solutions to bridge the gaps between what you have and what you want in terms of green infrastructure implementation and financing. After defining the universe of possible solutions (engineering, financial, organizational), you will choose a realistic, coherent set to serve as your recommended green infrastructure program.

Accomplishments:

- Laid the groundwork for identifying the universe of possible solutions by inventorying and mapping natural assets, as well as high priority areas for green infrastructure investments based on extensive research and input. This includes field analysis of greenway corridors, greenspace distribution for the development of parks and trails, health and social indicators, and physical analysis of floodplain development and impervious surface areas.
- Commissioned an inventory and analysis of existing plans and initiatives, including many related to stormwater.

Recommendations:

- Conduct more detailed analysis to identify the specific GI BMPs that you want to promote. The Vision does an excellent job of identifying desired large-scale green infrastructure improvements, such as new parks and trail connections, but it stops short of outlining particular stormwater management facilities that may be appropriately integrated with existing and planned green spaces.
- Develop a prioritized list of practical and synergistic BMPs that cohere into one proposed program. Keep in mind that BMPs might be technical, legal, financial, and/or organizational. For example, your program might encompass a set of desired green infrastructure demonstration projects on specific parcels, the development of a green infrastructure design manual for towns, the roll-out of a homeowner rain barrel program, and an audit of municipal development regulations to find barriers to green infrastructure. Whatever elements you choose, the program should also include a financing strategy (see Section II).
- In deciding your ideal blend of BMPs, you may consider the following factors:
    - Which BMPs are most cost-effective. Cost-benefit analysis can help determine whether a BMP's incremental benefit outweighs its incremental cost. Further, input-output models such as IMPLAN enable you to estimate the economic benefits of green infrastructure improvements.
    - Which BMPs are most appropriate for each part of the watershed, for example, rain gardens on residential lots toward the top of the watershed and larger wetlands near the bottom.
    - Which strategies coordinate with goals and initiatives already underway throughout the region or outlined in existing plans (drawing on your analysis of existing plans).
    - How your large-scale vision might be implemented in local policies. Your proposed program might entail developing resources such as sample codes and design manuals, for example.
- Conduct further mapping, if needed, to link concept maps to specific parcels targeted for BMP investments.

- Determine the costs of your preferred program over a 10-year horizon. Consider costs for program administration as well as those associated with BMP installation: land, pre-construction, construction, capital, and O&M.
- Choose a mix of revenue and funding sources adequate to meet costs (again, see Section II).

→ Step 4: Communicate Solution and Develop Support

This step is an ongoing one in which you explain for decision-makers and the public what needs to be done. Your projects and financing proposals need to be technically, politically, legally and ethically acceptable, and you have the best chance of success if your program reflects the goals and interests of key stakeholders.

Accomplishments:

- Established partnerships between important stakeholders in the region regarding the larger vision for an interconnected network of green spaces.
- Undertaken an extensive and effective public engagement effort.
- Rolled out a LID competition, a great way to build excitement and garner attention.
- Clearly defined large-scale sustainability and livability indicators that are equitable and realistic as well as easily digestible for public review and consumption.

Recommendations:

- Consider ways to continue building strong support for specific green infrastructure projects and strategies, especially for potential new methods of financing GI. For example, brief elected officials about how green infrastructure represents a stronger approach to stormwater management that improves water quality, while simultaneously achieving other goals of the Vision Plan. As with the rest of the Greenprint process, reach out to the public early and often about your green infrastructure progress.
- Continue communicating the powerful, positive message about the multiple benefits of green infrastructure, especially those that correlate with the major priorities in the Vision Plan (transportation, public healthy, economic development, recreation, air and water quality, etc); emphasize that green infrastructure makes efficient use of limited resources. Additionally, implementing GI projects can be a cost-effective way to meet permit requirements.
- Bring in credible experts to communicate information to decision makers and the public.
- Modify your proposed programs and/or funding solutions as needed to maintain support, without sacrificing key components.
- Anticipate opposition when developing a new funding strategy

→ Step 5: Design Implementation

In this step, you will conduct the administration and coordination tasks needed to effectively implement your proposed green infrastructure program.

Accomplishments:

- (as above) Commissioned the Sustainability & Livability Indicators Analysis, which presents a "series of data-driven metrics which can be monitored as a way of tracking progress towards the Plan's goals" (Vision Plan p. 53).
- Identified the community partners and resources capable of making change happen.

Recommendations:

- Consider whether you have the right personnel to implement the program, and ensure they have made room for green infrastructure program implementation among their day-to-day activities.
- As you go, document your work to evaluate and communicate progress.
- When choosing which portions of your overall program to implement first, think about what is *easiest, most rapid, and most visually and emotionally appealing*. Early successes will help build support for additional phases. Examples of concepts that are particularly appealing and likely to enjoy wide support are:
    - Using trees and plants to absorb and filter rainfall;
    - Interconnecting greenways, wetlands, parks and forests to capture water;
    - Convening relevant actors to identify and remove land use code barriers to green infrastructure such as parking requirements, road widths, storm sewer connection requirements and low impact development practices;
    - Setting benchmark standards for on-site stormwater retention;
    - Requiring green infrastructure designs for government projects; and
    - Reducing impervious areas by various means such as setting footprint caps and providing incentives for infill and compact development.
- Consider starting with a high-profile demonstration project to build momentum.

B. Augmenting the Vision's objectives and actions

Many of the Vision Plan's implementation actions are excellent strategies for implementing green infrastructure, especially those under Strategic Directions 1 (A Regional Interconnected Network of Parks, Greenways and Open Spaces) and 6 (Sustainable Resources and a Quality Environment). Below we highlight some of the most relevant objectives and actions, and we suggest places for augmenting the strategies to more explicitly support green infrastructure.

An overarching recommendation is to make a clearer distinction between landscape-scale green infrastructure (i.e. the network of open spaces) and specific green infrastructure stormwater management techniques, perhaps referring to the latter type of green infrastructure as low-impact development as you have done in Strategic Direction 6, Objective 2.

→ **Strategic Direction 1: A Regional Interconnected Network of Parks, Greenways and Open Spaces**

- Regional context: Green infrastructure investments and policies can expand opportunities for all people.
- Why action is needed: Incorporate green infrastructure into new development or redevelopment; untapped benefits of green infrastructure (economic, social, health, environmental)
- Leadership & partners: *Great list of partners; consider engaging stormwater interests if this has not already been done. Additionally, businesses may partner not only to fund project but also to be the site of LID demonstration projects, and to help champion the economic case for LID.*
- Objective 1.1 Expand and improve a network of green space hubs linked by greenways and trails
  - 1.1.5 Promote environmental quality benefits of green infrastructure, such as stormwater mitigation, air quality improvement, and aquifer recharge, when advocating for new facilities.
  - Add: *Seek opportunities to incorporate LID or green infrastructure BMPs into existing and new green spaces.*
- Objective 1.2 Improve the access and use of existing parks and green spaces for the benefit of people and wildlife
  - 1.2.2. Prepare, and regularly update, prioritized plans for park improvements, maintenance safety and facility assets management. *Within these plans, identify LID elements to be included where possible, either as part of planned improvements or as added projects.*
  - 1.2.3 Create, fund, and execute a pilot project to address maintenance and safety issues in one or more underutilized parks. *Could add LID to these pilot projects.*
  - 1.2.5 Institutionalize continued activities by securing necessary commitments, resources and organizational capacity to perpetuate activities / improvement. *Excellent action item; applies to LID elements as well.*
  - 1.2.6 Identify and consider converting underutilized parks into wildlife and habitat restoration areas/corridors. *Add LID for stormwater management.*
- Objective 1.3 Develop a strong regional identity and management entity to coordinate development of the green space network
  - *The regional management entity may be tasked with overseeing LID integration into the green space network.*
  - 1.3.3 Align people and organizations, public policy, and public and private funding sources in support of implementation. *Include stormwater managers and sources of stormwater funding.*
- Objective 1.4 Coordinate regional strategies for setting priorities, policies, funding, maintenance, advocacy and stewardship.
  - 1.4.1 Appoint a regional coordinator responsible for coordinating, managing, and seeking funding for regional trails efforts *including those incorporating LID.*
  - 1.4.3 Align municipal and county policies regarding recreational use, trail construction, open space conservation, stream buffers, and floodplain development *and LID standards and designs.*
  - 1.4.4. Coordinate operations and maintenance planning of facilities that cross jurisdictions or could be co-managed – *including O&M for LID facilities, which will be especially important given the learning curve and possible need for additional staff training.*

→ **Strategic Direction 3: Enhanced Access and Transportation Choices**

- Objective 3.4 Improve transportation system impacts on the built environment, natural environment, and regional quality of life
  - 3.4.1 Change public policy to include design standards, incentives, and encourage density in support of efficient transportation, transit-served development, and Complete Streets. *Opportunity for greening streets as well so that they provide stormwater management services.*

→ **Strategic Direction 5: Improved Neighborhoods and Fair Housing Choices**

- Objective 5.2 Ensure neighborhood access to green spaces

- 5.2.4 Develop incentives and regulations encouraging housing developers to incorporate green space (or open space conservation), links/access to green space, *and LID,* in their projects
- 5.2.7 Improve pedestrian comfort through traffic calming, well-designed streets, and low-impact development practices

- Objective 5.4 Spur (re)development of neighborhoods that are clean, attractive and convenient to a wide range of community facilities
  - *Incentivize or require LID for onsite stormwater management*
  - *Review land use codes and remove barriers to LID*

→ **Strategic Direction 6: Sustainable Resources and a Quality Environment**

- Why action is needed: *More efficient treatment of stormwater using green infrastructure approaches (or LID) will improve water quality and achieve additional community benefits*
- Objective 6.1 Conserve and protect natural resources including air, water and land
  - 6.1.2 Develop policies and actions to restore surface waters, improve water quality and in-stream habitat and better sustainable stormwater and watershed management practices
  - 6.1.5 Measure and communicate the economic benefits of green infrastructure and an ecologically sensitive approach to planning and development
  - *Could be more specific here about incentivizing LID*
- Objective 6.2 *All actions under this objective are especially relevant, especially in specifically identifying low-impact development as a goal and in recommending that LID be incorporated into municipal policies and stormwater plans.*
- Objective 6.3 Create productive green assets from underutilized lands and brownfields
  - 6.2.2. Determine the potential for reusing brownfields and underutilized properties for low impact development, sustainable agriculture, buffer zones, or alternative energy sources

C. Key recommendations for launching your program

- Understand and celebrate your successes – how the Vision Plan has laid the groundwork for integrating green infrastructure practices throughout the watershed to support the Vision's broad priorities.
- Identify key gaps in getting your program off the ground, using the above analysis. What needs to happen so you can start moving ahead with implementation? Do you need to bring on additional partners, especially stormwater managers? Better articulate the need for green infrastructure? Start digging in to identify specific green infrastructure BMPs?
- It may be necessary to create a separate, small GI strategy that can be attached to the larger Vision Plan.
- Use the LID competition as a lever for ramping up the conversation about implementation and financing GI, both internally and with the public.
- Pick one or two feasible demonstration projects to serve as early wins and build momentum, choosing ones that will be the easiest, most rapid, and most visually and emotionally appealing.
- Simultaneously, conduct additional analysis and mapping in order to bridge the gaps that you identify and to become eligible for funding as described below.
- Even as you achieve seed funding for your pilot project(s) (as we recommend in the next section), start developing your long-term financing plan.

II. Financing Strategy

In this section, we present a menu of mechanisms that Memphis and other Shelby County municipalities can use to finance green infrastructure projects. While decisions about the optimal funding mix are necessarily up to the local community, we offer recommendations about which financing mechanisms might be most appropriate, as well as key suggestions for developing a funding and financing strategy.

A. Menu of financing and funding mechanisms

The most common funding mechanisms for gray and green stormwater management programs are taxes, bonds, fees, grants, loans, and public-private partnerships; each is profiled in the following table and described in greater detail below.

Source of Funding	Appropriate Costs		Pros and Cons
	Capital	Operations & Maintenance	
General fund / property taxes	Yes	Yes	Familiar and accepted funding source; not equitable; competes with other community priorities; amount changes from year-to-year
Bonds	Yes	No	Dependent on fiscal capacity, can be utilized for large, long-term expenditures; must repay with interest
Stormwater utility fees	Yes	Yes	Generate ample revenue and are generally considered sustainable, dependable & equitable; require significant public dialogue to implement
Development impact & permitting fees	Yes	No	Require new development to help pay for itself; can discourage development in sensitive areas; don't generate significant revenue; may deter development
Special assessment district fees	Yes	Yes	Offer a way to link the costs of new services in an area to the benefits of new capital projects and can be used to pay back initial bond or capital reserve investment in a project
System development charges	Yes	No	Require new development to help pay for itself
Compensatory mitigation	Yes	Yes	A well-designed mitigation banking or trading program can be used to direct green infrastructure investment to areas targeted for conservation
Stormwater in-lieu fees / credit trading programs	Yes	Yes	Exempt developers from installing onsite stormwater management practices; funds can be pooled to install and maintain larger-scale GI BMPs. Generally do not generate the scale of funding need and are not consistent year to year.
Grants and Loans	Yes	No	Can launch program and fund pilot projects; often highly competitive; loans must be repayed with interest; not sustainable in the long-term
Public-Private Partnerships	Yes	Yes	Provide access to private capital; efficient; transfers some risk to private sector

To develop a sustainable financing program, municipalities should consider using a diverse mix of the above mechanisms in order to reduce risk and cover all types of costs associated with the program. Considerations for evaluating each mechanism: [2]

- Is it legal in my jurisdiction?
- Is it equitable in the sense that it is proportional to the level of services that payers receive and in that it takes into consideration the needs of special groups of payers?
- Is it flexible (adjustable to changing conditions)?
- How costly is it to administer during the initial set up and for ongoing oversight and maintenance? (For example, what are the data requirements, and how compatible is it with existing data processing systems?)
- How consistent is it with other local funding and rate policies?
- How stable a source of revenue is it?

[2] University of Maryland Environmental Finance Center. 2014. *Local Government Stormwater Financing Manual: A Process for Program Reform.* http://efc.umd.edu/assets/publications/2efc_stormwater_financing_manual_final_(1).pdf

- Can it be used to create opportunities and incentives for payers to reduce their contributions to stormwater by changing their behavior?
- Is it appropriate for meeting capital costs and/or O&M costs (see table above)
- How does the mechanism line up with the community's long-term strategic budgeting goals and scenarios?

→ General fund / property taxes

Traditionally, local governments pay for stormwater management – including any LID elements – from taxes paid into their general fund. Benefits of using the general fund for supporting new GI programs are that it is a familiar and uncomplicated financing mechanism and that it allows the community to weigh GI financing relative to other community priorities. However, there are several drawbacks to relying solely on the general fund for GI funding:

- Typically, there is a high level of competition for general fund dollars between municipal programs; generating sufficient funds for new GI without sacrificing other programs may require raising taxes.
- If the costs of green infrastructure are dispersed among general fund departmental budgets (as is often the case in communities that lack stormwater programs with clear budgetary authority), it can be tough to be transparent about the total costs of green infrastructure.

The general fund is not an equitable funding source, in that tax-exempt properties such as large properties including government properties, churches, and schools do not contribute to the fund even though they generate stormwater that makes GI necessary. Further, property taxes are based on assessed property value, which bears no relationship to the cost of stormwater services.

→ Bonds

General obligation bonds are a low-interest method of financing debt that communities can use to pay for green infrastructure. Bonds backed by the full faith and credit of the state or local government are called unlimited tax bonds, while limited tax bonds are used when the issuer's constitution or statutes limit the issuer's taxing power.[3] These bonds usually must be approved by voters and integrated into an approved Capital Improvement Plan. However, since bond financing relies on borrowed funds, the debt must be repaid. In the case of many local governments, bond debt is often paid off through the general fund. This leads to the underfunding of other governments programs in the future. Therefore, though bond financing may make short term stormwater management projects possible, as part of a blended funding scenario (see below), it is not a sustainable financing solution.

→ Fees

Stormwater utility fees

In a time of stagnant or declining general fund revenue, many local governments are finding stormwater utility fees to be an effective method of funding both gray and green infrastructure. This financing mechanism imposes user-service fees on owners of properties that create runoff; the utility is administered separately from general property taxes. Stormwater utilities and enterprise programs provide several distinct advantages over tax-supported programs. Unlike taxes, stormwater fees:

- Are a designated source of funding for stormwater services, removing the need to compete for limited tax revenue
- Are generally considered equitable in that they can be used to link fee levels to the service benefits that payers receive
- Can provide an opportunity and incentive for payers to reduce their fees by installing BMPs on their properties
- Can be designed to obtain payments from tax-exempt properties, such as churches, hospitals, public properties and schools

Since 2006, the City of Memphis has had a Stormwater Enterprise Fund in place to fund its NPDES-required stormwater management activities. While stormwater fee revenue has not been used to implement green infrastructure BMPs in the City to date, there seems to be an opportunity to do so. Memphis Ordinance No 5135, the ordinance establishing the Stormwater Enterprise Fund and the Stormwater Fee, states that the fund's purposes include "the provision of adequate systems of collection, conveyance, detention, treatment and release of storm water; the reduction of hazard to property and life resulting from storm water runoff and flooding; improvement in general health and welfare through reduction of undesirable storm water conditions and flooding; and improvement to the water quality in the storm water and surface water system and its receiving waters."[4] Green infrastructure can achieve all of these benefits, often at lower cost than traditional gray infrastructure.

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[3] Temel, Judy. 2001. *The Fundamentals of Municipal Bonds*. New York: John Wiley and Son.

[4] City of Memphis, TN. 2005. *Ordinance No. 5153 Amending the City of Memphis Code of Ordinances Chapter 33 Article IV by Adding Thereto a New Division 3. Storm Water Enterprise Fund, Establishing a Storm Water Enterprise Fund, Providing for the Powers, Duties and Responsibilities of the Enterprise, Establishing a Storm Water Fee, Establishing a Policy Regarding Expenditure of Enterprise Revenues*. http://www.memphistn.gov/portals/0/pdf_forms/ordinance5135.pdf

Because stormwater fee revenues can only be used for "operation, maintenance, repair, replacement and debt service for construction of the storm water drainage and flood protection improvements comprising the Storm Water Enterprise Fund,"[5] it will be important to write green infrastructure BMPs into stormwater management plans. The Storm Water Enterprise Fund is managed by the Director of the Division of Public Works, who should be engaged as a key partner in promoting green infrastructure throughout the City.

In addition to the City stormwater fee, Shelby County assesses a stormwater fee to comply with its MS4 permit covering all unincorporated areas in the County.[6] The current rate is $1.50 per month for improved residential lots and individually-metered apartments, and $2.50 per month for all improved non-residential lots. There may be opportunities to utilize this fund for green infrastructure projects outside Memphis City limits.

Development impact and permitting fees

Impact fees are based on the notion that new development should share in the costs it brings for new infrastructure, including stormwater infrastructure. Fees can also be implemented for reviewing and permitting new development. These fees may be used for green infrastructure, assuming that the enabling language allows for it or doesn't exclude it. Even in cases where these fees are directed towards hard infrastructure solutions, they can incentivize green infrastructure if there is some sort of credit system in place that enables developers to reduce fees by installing green practices. Because these are one-time fees typically collected from developers at the time of permitting, impact fees typically do not represent a significant source of revenue, particularly for long-term operations and maintenance, and in some communities these types of fees are viewed as discouraging development.

Special assessment district fees

Special assessment fees are implemented to pay for infrastructure projects that only benefit a designated portion of a city or county. A district may span several towns in cases where an impaired watershed includes land from multiple jurisdictions, representing a regional approach to generating infrastructure revenue.[7] Besides funding infrastructure projects, special district assessment fees may also be used with the intent of discouraging development in environmentally sensitive areas or other land integral to the community's green infrastructure plan. An example of a community that has used this mechanism is the City of Bowie, Maryland, which implements special taxing districts to finance the construction and maintenance of stormwater BMPs within new large commercial developments.

System development charges

Also known as connection fees or tie-in charges, these are one-time fees charged to new customers at the time of connection to a water or sanitary sewer system. System development charges may also be assessed for stormwater; these fees are usually based on the new customer's lot size.[8] As with development impact fees, system development charges can augment a green/gray stormwater management program budget but typically do not represent a significant source of revenue.

Compensatory mitigation

Compensatory mitigation represents a regulatory opportunity for financing water management. CWA Section 404 and subsequent regulations and guidelines by US EPA and Army Corps of Engineers require that permitted development projects causing unavoidable impacts to wetland and aquatic resources must mitigate these impacts. Mitigation can take the form of restoration, establishment, enhancement or preservation of wetlands, streams or other aquatic resources.[9] There may be an opportunity to use this mechanism to leverage the development of recreational areas if they are part of a new, restored, or enhanced wetland in the same watershed as a development activity required to mitigate its impact.

There are three mechanisms for compensatory mitigation:[10]

- **Permittee-responsible mitigation**: A permitted entity completes mitigation (whether restoration, establishment, enhancement or preservation of wetlands) to compensate for impact from a project.
- **Mitigation banking**: A mitigation bank is a wetland that has been mitigated (restored, established, enhanced or preserved) and then set aside to compensate for future impacts on other wetlands. Permitted entities can purchase credits from a mitigation bank to fulfill their mitigation requirement for a specific project. Credits can be purchased from banks not adjacent to the impacted site but the sites must be within the same watershed.

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[5] Ibid.
[6] Shelby County, TN website. Accessed May 2014: http://www.shelbycountytn.gov/index.aspx?nid=429
[7] US EPA. April 2009. *Funding Stormwater Programs.* http://water.epa.gov/infrastructure/greeninfrastructure/upload/FundingStormwater.pdf
[8] Ibid.
[9] US EPA. Undated. *Wetlands Compensatory Mitigation Factsheet.*
http://water.epa.gov/lawsregs/guidance/wetlands/upload/2003_05_30_wetlands_CMitigation.pdf
[10] Ibid.

- **In-lieu fee mitigation**: Instead of performing mitigation, the permitted entity pays a fee to an authorized organization (nonprofit, public agency, etc), which then pools funds to create and maintain a mitigation site. Like banking, in-lieu fee mitigation also occurs offsite from the impacted parcel, but unlike mitigation banking, creation or maintenance of the bank usually happens after the impact.

In Tennessee, compensatory mitigation for wetlands impacts has been required since 1988, and in 2000 the Tennessee Water Quality Control Board adopted rules that require compensatory mitigation for impacts to Tennessee streams. A Stream Mitigation Guidelines document published by TDEC Division of Water Pollution Control in 2004 overviews federal and state regulations governing compensatory mitigation, describes steam alterations that require mitigation, and gives information on mitigation requirements, treatments, classification, and site selection.

Tennessee has a number of active mitigation banks and in-lieu fee mitigation programs,[11] some of which are single-client, such as many operated by Tennessee DOT's wetland mitigation banking program to offset the impacts of its permitted transportation activities. If planned correctly, there may be an opportunity to leverage these mitigation programs to implement desired green infrastructure BMPs.

- Mitigation banks
  - Madison County Wetland Mitigation Bank, est. 1996, Tennessee DOT, wetland
  - Obion Wetland Mitigation Bank Site Plan, est. 2000, Tennessee DOT, wetland
  - PictSweet Stream and Wetland Bank, PictSweet Rossville Farm, wetland and stream
  - Wolf River Wetland Mitigation Bank, est. 1997, Wolf River Mitigation Bank LLC, wetland
  - Coffee County Wetland Mitigation Bank, est. 1995, National Ecological Foundation, wetland
  - Harpeth Wetland Mitigation Bank, est. 1998, Harpeth Wetland Bank LLC, wetland
  - Indian Creek Wetland Mitigation Bank, est. 2002, Wetland and Environmental Technologies of Tennessee LLC, wetland
  - Shady Valley Wetland Mitigation Bank, est. 1997, The Nature Conservancy, wetland
- Umbrella banking agreements
  - Tennessee Department of Transportation Umbrella Bank, est. 1995, Tennessee DOT, wetland
- In-lieu fee mitigation programs
  - Tennessee Stream Mitigation Program, Tennessee Wildlife Resources Foundation, statewide, stream
  - Tennessee Mitigation Fund, est. 2012, Tennessee Wildlife Federation, wetland

For more information on compensatory mitigation:

- **EPA's compensatory mitigation website** - www.epa.gov/wetlandsmitigation/ - provides information on federal wetlands mitigation regulations and guidance, including EPA's 1980 Section 404(b)(1) Guidelines as well EPA and the Army Corps' joint regulation *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule*, which expanded the Guidelines to include standards for all three mechanisms of providing compensatory mitigation, including mitigation banks and in-lieu fee mitigation. The website also includes links to mitigation reports and technical resources for stream mitigation.
- **Environmental Law Institute** has a wealth of resources on compensatory mitigation, including a handbook for prioritizing stream restoration with mapping tools, a webinar series on in-lieu fee mitigation, model language that can be incorporated into in-lieu fee programs, and numerous reports on the state of compensatory mitigation mechanisms (including banking and in-lieu fees). Visit http://www.eli.org/compensatory-mitigation
- **The Conservation Fund** offers five-day training courses for mitigation banking and in-lieu fee mitigation, designed to give participants a grounding in relevant federal policy and regulations guiding the review, establishment and management of mitigation banks and in-lieu fee programs, expertise in how to review and oversee mitigation banks and in-lieu fee programs, and the skills necessary to be an effective member of an interagency review team. Visit http://www.conservationfund.org/our-conservation-strategy/major-programs/conservation-leadership-network/cln-resources/mitigation-resources/wetland-and-stream-mitigation-banking-resources/
- **US Army Corps of Engineers Memphis District** published *Mitigation Guidance and Monitoring Guidelines* in 2004.

Stormwater in-lieu fees / credit trading programs

Stormwater in-lieu fee programs are similar to in-lieu fee compensatory mitigation described above, but applied specifically to development projects impacting stormwater. Generally imposed by local governments as part of stormwater regulations, these fees exempt developers from having to implement on-site water retention and/or water quality treatment practices by instead requiring them to pay into a fund than can be used to finance green infrastructure projects in priority areas.

[11] Environmental Law Institute. 2006. *2005 Status Report on Compensatory Mitigation in the United States.* http://www.epa.gov/owow/wetlands/pdf/ELIMitigation2005.pdf

Case study: DC's Stormwater Retention Credit (SRC) Trading Program. Through DC's SRC trading program, development projects subject to stormwater retention regulations may meet their requirements by paying an in-lieu fee or purchasing stormwater retention credits (SRCs). Credits are generated by other properties in the District that exceed their own regulatory requirements or that choose to install BMPs such as green roofs and rain gardens. DC's SRC market "provides flexible and cost-effective compliance options for the regulated community as well as financial incentives to voluntarily increase stormwater retention in the District."[12] The program is incorporated into DC's stormwater regulations, which also establish a process for properties with eligible retention practices to apply for certification, use, transfer, and retirement of SRCs.[13]

One of the key benefits of using stormwater in-lieu fee programs is that they can significantly reduce green infrastructure O&M and monitoring costs. While many communities emphasize the importance of retaining and treating stormwater on site to the extent possible, many small-scale green infrastructure BMPS require significant operations and maintenance, which can be difficult and expensive to monitor for performance. By using a stormwater mitigation bank program and "consolidating many small scale disturbances into a large-scale BMP, local governments can significantly reduce O&M costs while at the same time ensuring the long-term performance of the project."[14]

→ Grants and low-interest loans

Grants and loans are not typically considered a stable source of long-term funding for a green infrastructure program, because they change from year to year, are competitively won, and in many cases may not be used to fund operations and maintenance. However, they can provide critical seed funding for a green infrastructure program and might be especially appropriate for pilot projects. Good potential sources of grant revenue – both governmental and private – are listed below. A comprehensive list of federal funding programs along with other resources on funding options can be found on EPA's Green Infrastructure website., and the National Association of Regional Councils has produced a helpful Roadmap to Green Infrastructure in Federal Agencies. Additional grant opportunities are included in the companion Grant Database.

Federal / state grants and loans

EPA Clean Water Act Nonpoint Source Management Program (Clean Water Act Section 319) can fund stormwater projects that are not required as part of a NPDES permit.[15] In Tennessee, this program is administered by the Department of Agriculture. It funds the installation of BMPs that stop nonpoint source pollution; provide training, education, and demonstrations; and monitor water quality. Highest priority is given to 303(d) impaired streams with small watersheds, where measurable water quality improvements are likely to result after the project is completed. No BMP implementation or watershed restoration project can be funded with a 319 grant unless it is based on an approved watershed-based plan (WBP) developed for that watershed. A template for the WBP can be found in Attachment A of the RFP; the WBP may be submitted simultaneously with the grant proposal.

- Many of the Greenprint's objectives and actions would be eligible for 319 funding, provided that they are implemented within the watershed for which funding is sought. These include: expanded green space acreage (1.1); installation of green infrastructure BMPs on public and private land (6.2); code changes to promote LID within new and existing development (5.2.4, 6.2.3, 6.2.4); policies to restore surface waters, improve water quality and in-stream habitat and better sustainable stormwater and watershed management practices (6.1.2); conversion of park land into wildlife habitat restoration areas (1.2.6); education and training that reduces nonpoint source pollution (6.1.4, 6.2.5, 6.2.8)
- Considerations for completing a watershed based plan (WBP): Many elements of the WBP can be completed with information that is already available, while some may require additional study. Components of the WBP include:
    - Causes and sources of nonpoint source pollution: narrative describing all that is known about water quality problems in the watershed. The application provides links to sources for information, including TDEC's latest 303(d) list, an assessment database, TMDLs, and watershed management plans. By choosing a 303(d) impaired stream, much of this information will be available without further research. See Section III for a list of threatened and impaired streams in each of the three main watersheds in the Memphis area.
    - BMPs list, educational activities and budget: This section asks the applicant to list all BMPs needed to protect and restore the watershed, along with quantity and cost estimates and a total budget. This is likely to be the area requiring the most additional study. However, BMP identification is a necessary step in designing an implementable green infrastructure program, so this exercise can serve double-duty: developing a fundable WBP and kicking off a

[12] District of Columbia District Department of the Environment. Stormwater Retention Credit Trading Program Website. Accessed 6/4/14: http://ddoe.dc.gov/src
[13] Ibid.
[14] University of Maryland Environmental Finance Center. 2014. *Local Government Stormwater Financing Manual: A Process for Program Reform.* http://efc.umd.edu/assets/publications/2efc_stormwater_financing_manual_final_(1).pdf
[15] US EPA. April 2009. *Funding Stormwater Programs.* http://water.epa.gov/infrastructure/greeninfrastructure/upload/FundingStormwater.pdf

larger green infrastructure effort in a designated sub-watershed. Once BMPs are identified, estimated costs are available through the National Resources Conservation Service's State Average Cost List.
    - Timeline, tasks, and assessment of progress: Here the applicant is asked to outline the schedule for completing restoration tasks (319 grants can only fund 3-year projects), along with how progress will be assessed.
    - Monitoring and documenting success: The applicant is asked to define criteria to determine whether substantial progress is being made.
- Developing a WBP is not an insignificant task; however, several of the Greenprint's objectives are consistent with and would help achieve WBP requirements, such as:
    - Goals related to developing policies and management plans to improve surface water, improve water quality and in-stream habitat and advance sustainable stormwater and watershed management practices (6.1.2, 6.2)
    - Action 6.2.6 (mislabeled 6.3.6 in the draft Plan) to develop and adopt comprehensive watershed management plans that include community-based approaches for each watershed, is especially relevant
    - Various goals related to public education and stakeholder engagement (1.1.5, 6.1.4, 6.2.4, 6.2.5) can help fulfill EPA's encouragement to build partnerships and conduct outreach activities in developing a WBP[16]
- Step-by-step guidance on developing a watershed plan is available via EPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters*.

EPA Clean Water State Revolving Fund (CWSRF) is one of the largest and most readily available sources of funds for water infrastructure projects. SRF can only be used for capital costs of water quality improvement projects (not O&M), but capital costs are defined very broadly to include not only traditional infrastructure (pipes, pumps, etc) but also land conservation, equipment, environmental education programming. Sample green infrastructure elements that would be eligible include "land conservation, reforestation, tree boxes, cisterns [and] rain barrels, downspout disconnections, wetland restoration, parks [and] greenways, rain gardens [and] bioinfiltration practices, permeable pavements, [and] green roofs."[17] In Tennessee, the Clean Water SRF is administered by the State Revolving Fund Loan Program at the Department of Environment and Conservation.

- While SRF can be used for green infrastructure BMPs, some states are more innovative than others in funding such non-traditional projects. According to the TN SRF draft 2014 Intended Use Plan, 10% of funds – just over $2m – will be set aside for "Green Projects" to include green infrastructure, water or energy efficiency improvements or other environmentally innovative activities.[18] However, some of the 2014 priority ranking list projects that are defined as "green" do not appear to be especially innovative, such as repairing WWTP sludge pumps and replacing water meters.
- Because many of the core elements of the Greenprint Vision are technically eligible for SRF, it may be worth contacting TN's SRF Loan Program to explore using more SRF dollars for these purposes. A face-to-face meeting with program operators will give you the opportunity to describe how RLF dollars would be used, how the loan would be repaid, and how the innovative GI project would become a showcase not only for the state but probably for EPA, which is eager to see more communities use their SRF for GI.

EPA National Wetland Program Development Grants provide grants of $75,000 - $200,000 for projects that promote research, training, surveys and studies related to the causes, extent, prevention, reduction and elimination of water pollution. Priority is given to projects that address three priority areas: developing a comprehensive monitoring and assessment program, improving the effectiveness of compensatory mitigation, and refining the protection of vulnerable wetlands and aquatic resources. Only non-governmental agencies are eligible, so Shelby County would need a nonprofit partner or fiscal agent.

- This funding source could help fill gaps in knowledge about the causes of water pollution and ways to reduce it, which are requirements for receiving 319 funds.

HUD Community Development Block Grant Program provides funds for economic and community development projects that principally benefit low and moderate income people and/or address imminent health or safety problems – including water and other infrastructure. In Tennessee, the CDBG Program is administered by the Tennessee Department of Economic and Community Development (TNECD). Shelby County and Memphis are entitlement communities receiving dedicated CDBG funds, and towns outside these areas can receive funding via the TNECD Small Cities CDBG program.[19]

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[16] US Environmental Protection Agency. 2008. *Handbook for Developing Watershed Plans to Restore and Protect Our Waters.* http://water.epa.gov/polwaste/nps/handbook_index.cfm#contents

[17] US Environmental Protection Agency. 2009. *Managing Wet Weather with Green Infrastructure Municipal Handbook: Funding Options*. http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_funding.pdf

[18] Tennessee Department of Environment & Conservation. 2014. *CWSRF Loan Program Intended Use Plan for FY 2014*. http://www.tn.gov/environment/water/docs/srf/cwsrf_2014_draft_iup.pdf

[19] Tennessee Department of Economic and Community Development. Community Development Block Grant Program Website. Accessed June 2014: http://www.tn.gov/ecd/CDBG/

- CDBG funds would be especially appropriate for green stormwater infrastructure projects that are installed in new or expanded green spaces near hotspots identified in the Greenprint Equity Analysis, including areas with higher rates of poverty, fewer vehicles per household, greater percentage of non-white population, and Limited English Proficiency.

National Park Service Land and Water Conservation Fund (LWCF) State and Local Assistance Program provides matching grants to state and local governments to acquire and develop public outdoor recreation areas and facilities.[20] Grants may be used for planning, land acquisition, and/or site development or redevelopment. To be eligible for LWCF funds, states must have an approved Statewide Comprehensive Outdoor Recreation Plan (SCORP), which TN has (Tennessee 2020: Vision for Parks, People, and Landscapes). States with approved SCORPS receive LWCF grant allocations and then conduct grant competitions and make awards based on their own selection criteria, although projects must accord with priorities identified in the SCORP.

- To pursue a LWCF grant, the first step is to contact the state office administering this grant, which in TN is the TNDEC's Recreation Educational Services office; contact info is available on the state LWCF Program website.
- The trail and park network envisioned in the Greenprint should be highly competitive for LWCF funds, as it accords with many of the priorities in Tennessee's SCORP, including the need for Tennessee cities and counties to provide diverse, close-to-home recreation opportunities for residents. According to the SCORP, Memphis ranks far below other southeastern states in terms of park acres per thousand residents, so there is demonstrated need for additional recreation space. Public opinion surveys administered to help develop the SCORP indicated the highest level of demand for connecting greenways, trails, bicycle lanes, and sidewalks into an integrated network to facilitate alternative transportation – key elements of the Greenprint Vision. More specifically, Greenprint is consistent with several of the SCORP's 2015 Action Plan items, including quality growth, alternative transportation, children in nature, public health, environmental education, and recreational waters.[21]

TN Department of Environment and Conservation Green Development Grant Program is administered in partnership with the Tennessee Stormwater Association, the Tennessee Valley Authority and the Tennessee Department of Transportation. These grants fund low-impact development projects as well as outreach and education that promotes green development in Tennessee communities. Memphis and Shelby County Office of Sustainability will be familiar with this grant program, as it was awarded $21,900 in 2013 to develop a Low Impact Development / Green Infrastructure workshop and design competition. This may be a good source of funds for future LID demonstration projects. Learn more: http://www.tn.gov/environment/water/green-development.shtml

USDA Urban and Community Forestry Challenge Cost Share Grant Program, which requires a one-to-one match for grant funds, has three grant categories for FY2015: incorporating urban forests and green infrastructure into urban planning practices that will result in improvements for ecologically underserved communities and regions (including Memphis); green infrastructure jobs analysis; and utilizing green infrastructure to manage and mitigate stormwater to improve water quality. The first and last goals are particularly relevant to Greenprint goals. Learn more: http://www.fs.fed.us/ucf/nucfac.shtml

Private foundation grants

Of the top 40 giving foundations in Tennessee, the following prioritize projects related to trails, green infrastructure, and water quality.

Community Foundation of Greater Memphis manages hundreds of donor-advised funds, many of which support health and environmental causes. Establishing – or strengthening – your relationship with the Community Foundation is a highly recommended first step to accessing local donors interested in funding Greenprint goals and projects.

- Contact: Robert Fockler, President; 901-728-4600; 1900 Union Avenue Memphis TN 38104; http://www.cfgm.org/
- EIN: 58-1723645
- Total grant money available annually: $44,154,098
- Geographic focus: Eastern AR; Northern MS; Western TN

Plough Foundation, is most interested in programs that aid aging citizens, however it does have a funding target area related to parks, trails, and other quality of life amenities.

- Contact: Mike Carpenter, Executive Director; 901-521-2779; 62 North Main Street Suite 201 Memphis TN 38103; http://ploughfoundation.org/
- EIN: 23-7175983
- Total grant money available annually: $7,492,757
- Geographic focus: Memphis, TN; Shelby County, TN

[20] National Park Service. Land and Water Acquisition Fund Website. Accessed June 2014: http://www.nps.gov/lwcf/

[21] Tennessee Department of Environment and Conservation. 2009. *Tennessee 2020: Parks, People & Landscapes.* http://www.tn.gov/environment/recreation/docs/2020_full_version.pdf

J.R. Hyde, Sr. Family Foundation holds $114 million in assets and funds nonprofit organizations serving Memphis. One of the Foundation's three major focus areas is Memphis' livable communities program, which includes greenway networks and green infrastructure. According to the Foundation website, "We know that accessible green infrastructure—like parks, community gardens, trails, and walkable and bikeable streets—as well as reliable transit are key to excellent quality of life in an urban center." The site recently published an article on the need for more bike trails. To be most competitive, applications should align with three "impact levers:" a strong urban core, connected people "via a network of green assets, streetscapes, and transit opportunities" and thriving neighborhoods "through inside out leadership and engagement."

- Contact: Lauren Jenkins, Grants Manager; ljenkins@hydefoundation.org; 901-685-3400; 17 West Pontotoc Ave Suite 200 Memphis TN 38103; http://www.hydefoundation.org/
- EIN: 62-0677725
- Total grant money available annually: $7,104,139 according to The Grantsmanship Center; $20m according to Hyde Foundation
- Geographic focus: Memphis, TN

First Horizon Foundation funds several environmental organizations in Memphis, including Shelby Farms Park Conservancy, Overton Park, Wolf River Conservancy and the Greater Memphis Greenline, the latter of which is turning unused railway right-of ways and easements into a recreational park/hiking-biking trail system. Only nonprofit organizations are eligible to apply.

- Contact: Melissa Duong, Community Investment Manager in the Memphis region; MDuong@FirstTennessee.com; 901-523-4357 (Memphis grants: 901-523-4207); 165 Madison Ave Memphis TN, 38103; http://www.firsttennesseefoundation.com/
- EIN: 62-1533987
- Total grant money available annually: $5,102,850
- Geographic focus: Memphis, TN; Cookeville, TN; Johnson City, TN; Knoxville, TN; Lavergne, TN; Lebanon, TN; Murfreesboro, TN; Nashville, TN; Smyrna, TN; Watertown, TN

Tennessee Parks and Greenway Foundation focuses on conserving treasured natural features like waterfalls and corridors and on conducting conservation education and advocacy. Through the Emergency Land Bank, it makes loans available to other private or public organizations to purchase "national treasures." It also awards small grants ranging from $500-$2,500, which require matching funds. Projects are eligible for funding if they create local greenways or trails connecting to a nearby state park, natural area, or other public land or if they enhance a state park or natural area.

- Contact: Iris Smith; iris@tenngreen.org; 615-329-4441; 117 30th Avenue South Nashville, TN 37212; http://www.tenngreen.org
- Total grant money available: Unknown; $316,544 for 190 projects in TN since 1999
- Geographic focus: TN

→ Public-private partnerships

Private funds may be available to fund green infrastructure projects, especially demonstration or pilot projects in public places. Corporate sponsorships will be most effective if the business receives publicity through signage and/ or media attention. Nonprofit organizations concerned with water quality or habitat may also be helpful in recruiting donations from their members. Below are two case studies that demonstrate this approach:

- Portland, ME: Private donations from individuals and businesses supported the installation of a demonstration rain garden along the tidal Back Cove in Portland, Maine. The garden covers 2.5 acres of land adjacent to a popular recreational trail that is heavily used by walkers, joggers, and cyclists. The garden was funded by a $34,000 federal grant, a $10,000 grant from a private foundation, and $20,000 in donations from local businesses and garden clubs. [22] The project was managed by the Cumberland County Soil and Water Conservation District, with volunteers providing much of the labor needed for construction and maintenance. The project's popularity led to the installation of a second rain garden adjacent to the trail's parking area, which was designed and funded by Stantec, a national engineering firm with local offices.[23] Signage at the rain gardens provides educational opportunities as well as visibility for corporate sponsors. Additionally, the nonprofit Portland Trails, has an effective sponsorship program for trail construction and maintenance.
- Lynchburg, VA:[24] A corporate sponsorship program in Lynchburg, Virginia is successfully funding the installation of demonstration rain gardens in prominent public places throughout the City. Each garden is sponsored by a local business,

[22] Bouchard, K. June 11, 2012. "Portland Gardens Show How to Nurture Nature Naturally." *Portland Press Herald.* http://www.pressherald.com/news/new-gardens-nurture-nature-naturally_2012-06-11.html?searchterm=back+cove

[23] Atwell, T. July 4, 2010. "Maine Gardener: Rain Garden Gives City a Green Way to Stop Flow of Pollution." *Portland Press Herald. http://www.pressherald.com/2010/07/04/rain-garden-gives-city-a-green-way-to-stop-flow-of-pollution-_2010-07-04/*

[24] Learn more: http://www.sage-project.com

which is then credited with an attractive sign onsite. To date, this program has raised over $1.6 million and established 50 gardens. Virginia has a related statewide program called Streetscape Appearance Green Enhancement (SAGE), a comprehensive roadside management program that has been in existence since 2006. Funded entirely by donations but managed by municipalities, the program aims to beautify local streetscapes, boost civic and community pride, and facilitate future economic development. Through corporate sponsorship, businesses and individuals help create favorable impressions to visitors and businesses. The program is embraced by municipalities because the rain garden design and installation are covered by private donations. Money is then put aside to pay for maintenance. An example of the contribution is two donors contribute $12,500 each. The garden construction costs $5,000. One year of maintenance is $2,000. There is a $25,000 renewal required after five years. Low impact development installation costs approximately $15,000 to $20,000 extra. The municipalities are the program champions helping to manage the donations through a 501 (c)3 non-profit.

→ Blended funding

Blended funding allows stormwater management programs to be financed through several sources of funding, such as stormwater taxes, grants, and loans. This financing mechanism is the reality for most local governments and allows them to spend more on stormwater management than would be possible with a single revenue stream. At the same time, funding fluctuates from year to year as one source or another temporarily dries up. Thus, while blended funding decreases the risks associated with individual financing components, such as instability and unsustainability, the risks of each funding mechanism and its ability to sustain a stormwater program still exist.

B. Key recommendations for funding your program

In short, the steps for developing a funding and financing strategy are: (1) define your goal, (2) be realistic about what that goal will cost, (3) determine your existing ability to pay, (4) define the funding gap, (5) assemble a collection of cost-reducing , revenue-generating, and market-based mechanisms that enable you to close the gap. Specific recommendations:

- Developing a sustainable, adequate strategy for financing a green infrastructure program in Shelby County will begin with a clear understanding of your **green infrastructure goals**, as described in Section I. The program might include two phases: a series of pilot or demonstration projects to build support and momentum for a bigger program, and a more comprehensive, long-term set of BMPs and strategies.
- Once you have developed a set of specific GI goals, the next step is to develop a **realistic budget** that covers all costs including planning, administration, land acquisition, construction, operations & maintenance, etc. It is important to keep these factors in mind when developing a realistic budget: equitable, adequate, and dedicated. Choose a **mix of funding and financing mechanisms** that generates sufficient revenue to cover all costs, is politically acceptable, and is diversified in order to minimize risk. While you can fund individual green infrastructure projects in a more piecemeal fashion, you will have better long-term success if you develop a strategy for acquiring funds need to accomplish your major goals, including providing ongoing O&M.
- As you develop your comprehensive financing strategy, move forward with **pilot projects** that will give you early wins and build support. Grants – especially those without extensive application or reporting requirements – may be appropriate for funding these first projects.
- As you are aware, some additional **watershed planning** and research is needed in order to be eligible for 319 and other federal funds, gaps that will be filled in part if the County's pending EPA R4 grant is successful. It is important to recognize that watershed planning and identifying BMPs to improve water quality will help achieve goals identified in the Greenprint Vision. Any watershed planning efforts that you undertake should be celebrated as advancing the Greenprint.
- Going after a **big federal grant such as 319** could be a useful strategy for helping you define your program. The 319 grant application requires you to focus on a 303(d) impaired sub-watershed and walk through the same process that you might use when developing your GI plan for the entire region (albeit more comprehensively): identifying water quality problems, developing a list of effective BMPs, and establishing a budget, timeline, and monitoring protocol. Not only would a successful grant application give you the funds to implement BMPs and achieve water quality and trails goals, it would help you hone an effective model for prioritizing BMPs in other parts of the region.
- There is a significant opportunity to use revenue from the **Memphis stormwater fee** to better advantage in funding green infrastructure. This recommendation is consistent with Objective 6.2.2 (mislabeled 6.3.2 in the draft Vision) to "incorporate green infrastructure and low impact development practices into municipal policies and storm water plans." Integrating green into gray stormwater infrastructure plans will help create a cohesive stormwater program as well as potentially opening up additional sources of funding.
- Develop an effective **community education and outreach campaign** for green infrastructure/stormwater. Utilizing the same process for engaging the community during the Greenprint planning process, it is important to continue the momentum with key community members to share with them the importance of incorporating green infrastructure. A successful campaign will

inform the community in a way that develops a demand for improved green infrastructure and stormwater management and engages them in decision-making and implementation.

- Establish or strengthen your relationships with major **private foundations** in the area, especially the Community Foundation of Greater Memphis, which can link you to like-minded individual donors. Remember the truism that if you want advice, ask for money; if you want money, ask for advice. It's worth approaching a foundation to explore partnership, even if there are no relevant grants available at that moment.
- **Partnerships** with relevant community organizations, key stakeholders, and other government agencies are necessary in implementing green infrastructure projects, and they can also help develop and access funding sources (especially any grants that are only available to nonprofit entities). See list of watershed organizations in the Appendix for potential partners to engage.

III. Appendix

A. Local partners to engage in green infrastructure efforts

The following organizations are potential allies in planning, funding, and implementing green infrastructure goals of the Greenprint Vision; many of them may already be engaged in this effort. Organizations are listed in descending order in terms of how relevant their work may be to the Greenprint's objectives.

→ Nonprofit watershed organizations[25]

Wolf River Conservancy is the largest and most organized watershed organization in Memphis. It is focused on education & service learning, watershed protection, and low impact recreation activities on the Wolf River. The Conservancy is spearheading a greenway project along the "Urban Wolf," which will be a 30 mile long, 10 foot wide trail connecting Memphis, Germantown and Collierville. Wolf River Conservancy is also a land trust and member of the Land Trust Alliance. It works with local land owners to procure conservation easements in the watershed with a priority on 100 year floodplains in Shelby and Fayette counties. These easements are usually to restrict subdividing the land, not farming activities. They have conserved considerable tracks of land in the watershed in Mississippi and Tennessee: see map.
Contact: Keith Kirkland, Executive Director; wrc@wolfriver.org; 901-452-6500; PO Box 11031, Memphis, Tennessee 38111-0031; http://www.wolfriver.org/

Watershed Land Trust, Inc - Tennessee is a newly-formed land trust focused on acquiring easements on wetlands, waterways, and riparian areas. Its mission is to hold large sections of land with the ability and expertise to work with any mitigation bank or in lieu fee arrangement. Its sister organization, the Watershed Institute, works more broadly with nonprofits and governments to monitor, restore, and enhance wetlands.
Contact: Frank Austenfeld, Executive Director; frank@watershedinstitute.biz; 913-685-4600 ex 15; 7211 W. 98th Terr., Ste. 140 Overland Park, KS 66212; http://www.watershedinstitute.biz/

Tennessee Environmental Council is a statewide environmental advocacy and education organization. TEC has a Watershed Support Center which works with local communities to coordinate education and technical assistance and it offers consulting services related to water quality assessment, watershed and wetland restoration, low impact design, and other topics. Currently, TEC is developing the Citizen Engagement in Urban Watershed Restoration Project, which will include trainings and demonstrations on low-impact development techniques such as rain gardens.
Contact: John McFadden, Executive Director; John@tectn.org; 615-248-6500; One Vantage Way, Suite E 250, Nashville, Tennessee 37228; http://tectn.org/

Shelby Farms Park Conservancy is a nonprofit organization that manages and operates Shelby Farms Park and Shelby Farms Greenline through a public-private partnership with Shelby County Government. SFPC cares for 2,900 acres of parkland and 6.5 miles of urban trail with an annual operating budget of $2.5 million, a staff of 20, and a volunteer core logging more than 20,000 hours per year. SFPC's master plan is to expand parkland in the community.
Contact: Jen Andrews, Director of Development & Communications; 901-767-7275 x 308; 500 North Pine Lake Drive Memphis, TN 38134; http://www.shelbyfarmspark.org/

Tennessee Clean Water Network's mission is to "promote a greater base of knowledge about clean water issues in TN, and to provide a vehicle for networking between organizations including environmental, paddling, and angler groups in order to answer tough questions, get advice, and gather needed support to ensure the protection and restoration of individual watersheds."
Contact: Renee Hoyos, Executive Director; renee @tcwn.org; 865-522-7007; 123A Gay St. Knoxville, Tennessee 37902; http://www.tcwn.org/

Lictherman Nature Center Environmental Science Group is an environmental science group that works with Lictherman Nature Center, a 65-acre certified arboretum with lakes, meadows, and forest that features exhibits and conducts numerous education activities. The Science Group is primarily focused on monitoring water, soil, and air quality in the Memphis area.

[25] For additional watershed organization resources, see EPA's Surf Your Watershed portal: http://cfpub.epa.gov/surf/locate/index.cfm, as well as Middle Tennessee State University's directory: http://www.mtsu.edu/waterworks/groups.php

Contact: Ruth Archer; rutharcher1@yahoo.com; 901-761-8820; 2009 Ridgeway Rd Memphis, Tennessee 38119; http://www.memphismuseums.org/lichterman-overview/

Izaak Walton League is a national conservation nonprofit founded in 1922 and dedicated to protecting the nation's soil, air, woods, waters and wildlife. Based in Gaithersburg, MD, the League has 240+ local chapters throughout the country, including one in Knoxville. Contact: Alicia Kelly; alicia@tnike.com ; 865-523-6650; Mellen Rd. Knoxville, TN 37919; http://www.iwla.org/

Keep Fayetteville/Lincoln County Beautiful, Inc. and Friends of Elk River work to improve and protect the natural resources of the Elk River through the cooperative efforts of local government, businesses, organizations, state and federal agencies, and citizens.
Contact: Gail Randolph, Director; LCTNrecycles@yahoo.com; 931-433-8208; P.O. Box 515 208 S. Elk Ave Fayetteville, Tennessee 37334

The Nature Conservancy – Tennessee Field Office: the state branch of this well-known national nonprofit has protected more than 280,000 acres throughout the state.
Contact: Andrew Walker; 615-298-3111; 50 Vantage Way #250 Nashville, Tennessee 37228; http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/tennessee/

→ Government agencies / partnerships

Division of Natural Areas, TN Department of Environment & Conservation provides technical assistance and educational programs for governmental agencies, non-governmental organizations, industrial and other private landowners, and educational institutions on conservation, restoration and management of Tennessee's natural resources. The Division manages the state's Scenic Rivers program and participates with The Nature Conservancy's science and data affiliate, Natureserve, which can provide information about threatened ecocystems.
Contact: Roger McCoy, Director; roger.mccoy@tn.gov; 615-532-0437; TN Tower 312 Rosa L. Parks Avenue, 2nd Floor Nashville, TN 37243; http://www.tn.gov/environment/natural-areas/

Tennessee Stormwater Association assists local government entities in complying with state and federal NPDES and stormwater regulations, acting as a coordinator and conduit for information. The partnership is composed of several MS4s, universities, local governments, military installations and other entities such as the TN Department of Transportation. The association partners with TDEC to provide Green Development Grants described above.
Contact: Jennifer Watson, Executive Coordinator; jennifer@tnstormwater.org; 615-926-7094; http://www.tnstormwater.org/

B. Threatened and impaired streams within Memphis area watersheds

EPA's Water Quality Assessment Database contains information on water quality conditions reported by states under Sections 305(b) and 303(d) of the Clean Water Act. Following is information for threatened and impaired streams within the three major Memphis area watersheds. Causes of impairment can be found by clicking the watershed name, and a detailed report for each stream can be found by clicking on the stream name.

→ Horn Lake – Nonconnah watershed

Waterbody Name	Location	Length (Miles)	Status	State TMDL Development Status
Black Bayou	Black Bayou From Nonconnah Creek To Headwaters. Ecoregion 74b Shelby County	7.9	Impaired	
Cane Creek	Cane Creek From Nonconnah Creek To Headwaters. Ecoregion 74b Shelby County	7.2	Impaired	
Cypress Creek	Cypress Creek From Mckellar Lake To Headwaters. Ecoregion 74a & 74b Shelby County	18.2	Impaired	TMDL needed
Days Creek	Days Creek From Nonconnah Creek To Headwaters. Ecoregion 74b Shelby County	10.6	Impaired	
Horn Lake Creek	Horn Lake Creek From Mississippi Stateline To Horn Lake Cutoff. Ecoregion 73a Shelby County	10.3	Impaired	TMDL needed

Horn Lake Creek	Horn Lake Creek From Horn Lake Cutoff To Mississippi Stateline. Ecoregion 73a & 74a Shelby County	5.2	Impaired	TMDL needed
Horn Lake Cutoff	Horn Lake Cutoff From Horn Lake Creek To Headwaters. Ecoregion 73a & 74a Shelby County	16.4	Impaired	TMDL needed
Hurricane Creek	Hurricane Creek From Nonconnah Creek To Headwaters. Ecoregion 74b Shelby County	13.3	Impaired	
Johns Creek	Johns Creek From Nonconnah Creek To Headwaters. Ecoregion 74b Shelby County	13.7	Impaired	TMDL needed
Nonconnah Creek	Nonconnah Creek From Mckellar Lake To Cane Creek. Ecoregion 73a & 74b Shelby County	3.2	Impaired	
Nonconnah Creek	Nonconnah Creek From Cane Creek To Hurricane Creek. Ecoregion 74b Shelby County	4.9	Impaired	
Nonconnah Creek	Nonconnah Creek From Hurricane Creek To Johns Creek. Ecoregion 74b Shelby County	4.1	Impaired	
Nonconnah Creek	Nonconnah Creek From Johns Creek To Gaging Station At Winchester Road. Ecoregion 74b Shelby County	8.3	Impaired	
Nonconnah Creek	Nonconnah Creek From Gaging Station At Winchester Road To Confluence Of Unnamed Trib (Near Bailey Road). Ecoregion 74b Shelby County	6.2	Impaired	
Nonconnah Creek	Nonconnah Creek From Confluence Of Unnamed Trib Near Bailey Road To Headwaters Near Mississippi Stateline. Ecoregion 74b Shelby County Fayette County	6.5	Impaired	
Tenmile Creek	Tenmile Creek From Nonconnah Creek To Headwaters. Ecoregion 74b Shelby County	13.3	Impaired	
Unnamed Trib To Nonconnah Creek	Unnamed Trib To Nonconnah Creek From Nonconnah Creek To Headwaters. Northside Trib Just West Of Kirby Parkway. Ecoregion 74b Shelby County	3.9	Impaired	
Unnamed Trib To Nonconnah Creek	Unnamed Trib To Nonconnah Creek From Nonconnah Creek To Headwaters. Northside Trib Near Germantown Road. Ecoregion 74b Shelby County	4	Impaired	
Unnamed Trib To Nonconnah Creek	Unnamed Trib To Nonconnah Creek From Nonconnah Creek To Headwaters. South Of Collierville. Ecoregion 74b Shelby County	3.1	Impaired	
Unnamed Trib To Nonconnah Creek	Unnamed Trib To Nonconnah Creek From Nonconnah Creek To Mississippi Stateline. (On The Topo, This Is Also Called Nonconnah Creek Going Into Mississippi.) Ecoregion 74b Shelby County	10.1	Impaired	
Unnamed Trib To Nonconnah Creek	Unnamed Trib To Nonconnah Creek From Nonconnah Creek To Headwaters Near Mississippi Stateline. (Database Calls This Tributary 1.) Ecoregion 74b Shelby County	8.9	Impaired	
Unnamed Trib To Unnamed Trib. To Noconnah Creek	Unnamed Trib To The Unnamed Trib Of Nonconnah Creek From The Mouth On Unnamed Trib To Mississippi Stateline. Ecoregion 74b Shelby County	2.5	Impaired	

→ Loosahatchie watershed

Waterbody Name	Location	Length (Miles)	Status	State TMDL Development Status
Baxter Bottom	Baxter Bottom From East Beaver Creek To Headwaters. Ecoregion 74b Tipton County	38	Impaired	TMDL needed

Bear Creek	Bear Creek From Jakes Creek To Headwaters. Ecoregion 74b & 74a Shelby County Tipton County	14.5	Impaired	TMDL needed
Beaver Creek	Beaver Creek From Loosahatchie River To Confluence With East Beaver Creek. Ecoregion 74b Shelby County Fayette County	30.4	Impaired	TMDL needed
Big Creek	Big Creek From Loosahatchie River To Confluence Of Royster Creek. Ecoregion 74b Shelby County	8.3	Impaired	TMDL needed
Big Creek	Big Creek From Royster Creek To Confluence Of Crooked Creek. Ecoregion 74b Shelby County	6.3	Impaired	TMDL needed
Big Creek	Big Creek From Confluence Of Crooked Creek To Big Branch. Ecoregion 74b Shelby County Tipton County	27.8	Impaired	TMDL needed
Big Creek	Big Creek From Confluence Of Big Branch To Headwaters. Includes Big Branch. Ecoregion 74a & 74b Tipton County	35.1	Impaired	TMDL needed
Black Ankle Creek	Black Ankle Creek From Loosahatchie River To Headwaters. Ecoregion 74b Fayette County	27	Impaired	TMDL needed
Buckhead Creek	Buckhead Creek From Loosahatchie River To Headwaters. Ecoregion 74b Shelby County	14.6	Impaired	TMDL needed
Clear Creek	Clear Creek From Loosahatchie River To Point It Becomes Cypress Creek (Beyond Hall Creek). Ecoregion 74b Shelby County	2.7	Impaired	TMDL needed
Crooked Creek Canal	Crooked Creek Canal From Big Creek To Headwaters. Ecoregion 74b Shelby County	31.2	Impaired	TMDL needed
Cypress Creek	Cypress Creek From Clear Creek To Headwaters. (Downstream Section Called Clear Creek) Ecoregion 74b Shelby County Fayette County	13.7	Impaired	TMDL needed
East Beaver Creek	East Beaver Creek From Beaver Creek To Headwaters. Ecoregion 74b Tipton County Fayette County	66	Impaired	TMDL needed
Howard Creek	Howard Creek From Loosahatchie River To Headwaters. Ecoregion 74b Shelby County	7.2	Impaired	TMDL needed
Jakes Creek	Jakes Creek From Big Creek To Headwaters. Ecoregion 74b & 74a Shelby County	22.8	Impaired	TMDL needed
Jones Creek	Jones Creek From Loosahatchie River To Headwaters. Ecoregion 74b Fayette County	36.9	Impaired	TMDL needed
Kelly Branch	Kelly Branch From Middle Beaver Creek To Headwaters. Ecoregion 74b Tipton County	16.7	Impaired	TMDL needed
Laurel Creek	Laurel Creek From Loosahatchie River To Headwaters. Ecoregion 74b Fayette County	38.2	Impaired	TMDL needed
Little Cypress Creek	Little Cypress Creek From Loosahatchie River To Headwaters. Ecoregion 74b Fayette County	17.1	Impaired	TMDL needed
Loosahatchie River	Loosahatchie River From Mouth On Mississippi River To Big Creek Ecoregion 73a & 74b Shelby County	7.8	Impaired	TMDL needed
Loosahatchie River	Loosahatchie River From Big Creek To Howard Creek. Ecoregion 74b Shelby County	10.3	Impaired	TMDL needed

Loosahatchie River	Loosahatchie River From Howard Creek To Clear/Cypress Creek. Ecoregion 74b Shelby County	8.2	Impaired	TMDL needed
Loosahatchie River	Loosahatchie River From Clear/Cypress Creek To Laurel Creek. Ecoregion 74b Shelby County Fayette County	10	Impaired	TMDL needed
Loosahatchie River	Loosahatchie River From Laurel Creek To Jones Creek. Ecoregion 74b Fayette County	9.6	Impaired	TMDL needed
Loosahatchie River	Loosahatchie River From Jones Creek To Howell Creek. Ecoregion 74b Fayette County	5.8	Impaired	TMDL needed
Loosahatchie River	Loosahatchie River From Howell Creek To Headwaters. Ecoregion 65e Fayette County Hardeman County	14.1	Impaired	TMDL needed
Middle Beaver Creek	Middle Beaver Creek From Beaver Creek To Headwaters. Ecoregion 74b Tipton County	65.4	Impaired	TMDL needed
North Fork Creek	North Fork Creek From Big Creek To Headwaters. Ecoregion 74b & 74a Shelby County Tipton County	37.6	Impaired	TMDL needed
Oliver Creek	Oliver Creek From Mouth On Loosahatchie River To Headwaters Ecoregion 74b Shelby County	7.4	Impaired	TMDL needed
Rocky Branch	Rocky Branch From Loosahatchie River To Headwaters. Ecoregion 74b Shelby County	6.6	Impaired	TMDL needed
Royster Creek	Royster Creek From Big Creek To Headwaters. Ecoregion 74b Shelby County Tipton County	37.4	Impaired	TMDL needed
Scotts Creek	Scotts Creek From Loosahatchie River To Headwaters. Ecoregion 74b Shelby County	7.2	Impaired	TMDL needed
Todd Creek	Todd Creek From Loosahatchie River To Headwaters. Ecoregion 74b Shelby County	4.9	Impaired	TMDL needed
Treadville Botttom	Treadville Bottom From Loosahatchie River To Headwaters. Ecoregion 74b Fayette County	32.2	Impaired	TMDL needed
Unnamed Trib To Loosahatchie River	Unnamed Trib To Loosahatchie River From Loosahatchie River To Headwaters. (Used To Be Grace-Chromasco) Ecoregion 74b Shelby County	5	Impaired	TMDL needed
West Beaver Creek	West Beaver Creek From Beaver Creek To Headwaters. Ecoregion 74b Shelby County Tipton County	31	Impaired	TMDL needed

→ Wolf watershed

Waterbody Name	Location	Length (Miles)	Status	State TMDL Development Status
Alexander Creek	Alexander Creek From Shaws Creek To Headwaters. Ecoregion 74b Fayette County	21.8	Impaired	TMDL needed
Cypress Creek	Cypress Creek From Wolf River To Summer Avenue. Ecoregion 74b Shelby County	8.6	Impaired	TMDL needed
Cypress Creek	Cypress Creek From Summer Avenue To Headwaters. Ecoregion 74b Shelby County	5	Impaired	TMDL needed
Early Grove Creek	Early Grove Creek From Wolf River To Headwaters. Ecoregion 74b Fayette County	2.5	Impaired	

Fletcher Creek	Fletcher Creek From Wolf River To Headwaters. Ecoregion 74b Shelby County	10.7	Impaired	TMDL needed
Grays Creek	Grays Creek From Wolf River To Headwaters. Ecoregion 74b Shelby County Fayette County	15.8	Impaired	TMDL needed
Grissum Creek	Grissum Creek From Wolf River To Mississippi Stateline. Ecoregion 74b Fayette County	17.9	Impaired	TMDL needed
Harrington Creek	Harrington Creek From Wolf River To Headwaters. Ecoregion 74b Shelby County	16.5	Impaired	TMDL needed
Hurricane Creek	Hurricane Creek From Wolf River To Headwaters. Ecoregion 74b Fayette County	12.5	Impaired	
Johnson Creek	Johnson Creek From Wolf River To Headwaters. Ecoregion 74b Shelby County Fayette County	10.4	Impaired	TMDL needed
Marys Creek	Marys Creek From Grays Creek To Sr 205. Ecoregion 74b Shelby County	17.4	Impaired	TMDL needed
Marys Creek	Marys Creek From Sr 205 To Herb Parsons Lake Dam. Ecoregion 74b Shelby County Fayette County	2.5	Impaired	
May Creek	May Creek From Mckinnie Creek To Headwaters. Ecoregion 65e Fayette County Hardeman County	27.1	Impaired	
Mckinnie Creek	Mckinnie Creek From North Fork Wolf River To Headwaters. Ecoregion 65e Fayette County Hardeman County	35.1	Impaired	TMDL needed
Moody Creek	Moody Creek From Indian Creek To Mississippi Stateline. Ecoregion 74b Hardeman County	3.1	Impaired	
North Fork Creek	North Fork Creek From North Fork Wolf River To Headwaters. Ecoregion 65e & 74b Fayette County Hardeman County	39	Impaired	
North Fork Wolf River	North Fork Wolf River From Wolf River To Headwaters. Ecoregion 65e Fayette County	10.8	Impaired	
Russell Creek	Russell Creek From Wolf River To Headwaters. Ecoregion 74b Fayette County	12.8	Impaired	
Shaws Creek	Shaws Creek From Wolf River To Headwaters. Ecoregion 74b Fayette County	20.1	Impaired	TMDL needed
Stout Creek	Stout Creek From Grissum Creek To Mississippi Stateline. Ecoregion 74b Fayette County	6.7	Impaired	TMDL needed
Sweetbriar Creek	Sweetbriar Creek From Wolf River To Headwaters. Ecoregion 74b Shelby County	2.5	Impaired	TMDL needed
Teague Branch	Teague Branch From Grissum Creek To Mississippi Stateline. Ecoregion 74b Fayette County	17	Impaired	TMDL needed
Unnamed Trib To Fletcher Creek	Unnamed Trib To Fletcher Creek (Near Reece Road) From Fletcher Creek To Headwaters. Ecoregion 74b Shelby County	23.1	Impaired	
Unnamed Trib To Fletcher Creek	Unnamed Trib To Fletcher Creek (Near La Grange Road) From Fletcher Creek To Headwaters. Ecoregion 74b Shelby County	6.5	Impaired	TMDL needed
Unnamed Trib To Grays Creek	Unnamed Trib To Grays Creek (Near Cordova) From Grays Creek To Headwaters. Ecoregion 74b Shelby County	8.4	Impaired	TMDL needed

Unnamed Trib To Wolf River	Unnamed Trib To Wolf River (Between Morrison And Russell Creek) From Wolf River To Mississippi Stateline. Ecoregion 74b Fayette County	23.6	Impaired	
Unnamed Trib To Wolf River	Unnamed Trib To Wolf River (Near Yager Road) From Wolf River To Mississippi Stateline. Ecoregion 74b Fayette County	2.4	Impaired	TMDL needed
Wolf River	Wolf River From Mississippi River To Fletcher Creek. Ecoregion 73a & 74b Shelby County	12.8	Impaired	TMDL needed
Wolf River	Wolf River From Fletcher Creek To Highway 177. Ecoregion 74b Shelby County	6.3	Impaired	TMDL needed
Wolf River	Wolf River From Highway 177 To Grays Creek. Ecoregion 74b Shelby County	3.8	Impaired	TMDL needed
Wolf River	Wolf River From Grays Creek To Shaws Creek. Ecoregion 74b Shelby County	9.7	Impaired	TMDL needed
Workhouse Bayou	Workhouse Bayou From Wolf River To Headwaters. Ecoregion 74b Shelby County	3.7	Impaired	TMDL need

C. Additional resources

→ Funding and financing green infrastructure

Title	Link	Date	Author	Type	Description
Green Infrastructure Funding Opportunities	http://water.epa.gov/infrastructure/greeninfrastructure/gi_funding.cfm	On-going	US Environmental Protection Agency	Website	Comprehensively lists potential federal funding sources for green infrastructure projects, along with resources to help local stormwater managers understand the many funding options for local stormwater and green infrastructure programs.
Financing Alternatives Comparison Tool	http://water.epa.gov/grants_funding/cwsrf/fact.cfm	On-going	US Environmental Protection Agency	Online tool	A financial analysis tool that helps to identify the most cost-effective method to fund a wastewater or drinking water management project. This tool produces a comprehensive analysis that compares various financing options for these projects by incorporating financing, regulatory, and other important costs.
Local Government Stormwater Financing Manual: A Process for Program Reform	http://efc.umd.edu/assets/publications/2efc_stormwater_financing_manual_final_(1).pdf	2014	Environmental Finance Center, University of Maryland	Manual	Inspired by and written for local government leaders, this manual is intended to provide local leaders with the foundation for establishing and growing effective stormwater management programs that maximize the value and impact of every dollar invested in their communities.
Municipal Handbook: Funding Options	ttp://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_funding.pdf	2009	US Environmental Protection Agency	Handbook	Describes strategies and provides case study examples of how local governments are generating reliable funding for green infrastructure.
Stormwater Financing Presentations	http://www.efc.sog.unc.edu/	2008 - 2010	Environmental Finance Center, University of North Carolina	Workshop presenta-tions	UNC hosts workshops and trainings on how to plan and fund stormwater programs and watershed protection efforts. Downloadable presentation slides provide an overview of

					funding and financing options, including fees, mitigation banks, nutrient trading, and state revolving funds.

→ Regulatory strategies for implementing green infrastructure

Title	Link	Date	Author	Type	Description
Water Quality Scorecard	http://www.epa.gov/smartgrowth/pdf/2009_1208_wq_scorecard.pdf	2009	US Environmental Protection Agency	Online tool	A program evaluation tool that local governments can use to collaboratively identify the barriers to green infrastructure in local codes and ordinances. The scorecard guides municipal staff through 230 policies, codes, and incentives that could be adapted to promote sustainable stormwater management. The scorecard also provides extensive references and case studies.
Better Site Design: A Handbook for Changing Development Rules in Your Community	http://www.cwp.org/documents/cat_view/77-better-site-design-publications.html	1998	Center for Watershed Protection	Handbook	Covers everything from basic engineering principles to actual vs. perceived barriers to implementing better site designs. Outlines 22 guidelines for better developments and provides detailed rationale for each principle. Also examines current practices in local communities, details the economic and environmental benefits of better site designs, and presents case studies from across the country.
Better Site Design Code and Ordinance Worksheet	http://www.cwp.org/documents/cat_view/77-better-site-design-publications.html	1998	Center for Watershed Protection	Worksheet	Allows you to enter data to see how the local development rules in your community stack up against the model development principles outlined in the Better Site Design Handbook (above).
Green Infrastructure Case Studies	http://www.epa.gov/owow/NPS/lid/gi_case_studies_2010.pdf	2010	US Environmental Protection Agency	Case study	Examines the policies adopted by 12 local governments that have successfully promoted green infrastructure, as well as the policy drivers and policy outcomes. A menu of policy options is presented and barriers and lessons learned are summarized.
Managing Wet Weather with Green Infrastructure Municipal Handbook	http://water.epa.gov/infrastructure/greeninfrastructure/gi_policy.cfm	2008	US Environmental Protection Agency	Handbook	Provides local governments with a step-by-step guide to growing green infrastructure in their communities. Chapters address funding options, retrofit policies, green streets, rainwater harvesting, and incentive mechanisms. Each chapter provides a discussion of available programs and policies and several case studies.
Using Local Codes to Cultivate Green Infrastructure and Foster Sustainable Stormwater Management	http://water.epa.gov/infrastructure/greeninfrastructure/gi_training.cfm	2011	US Environmental Protection Agency, Region 5	Webcast	Describes the interaction of zoning and building codes with water quality; presents several examples of code audits conducted in Illinois, Ohio, and Minnesota; and highlights the top 10 obstacles to green infrastructure in local codes and ordinances.
Top Ten Green Infrastructure Issues in Plans and Codes	http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_webinar_part5.p	2011	Tetra Tech	Webcast slides	Part of the webcast listed above "Using Local Codes to Cultivate Green Infrastructure." Identifies common code barriers in local codes and ordinances, and offers solutions.

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Revising Local Plans, Codes, and Ordinances	http://cfpub2.epa.gov/npdes/courseinfo.cfm?program_id=0&outreach_id=409&schedule_id=1045	2009	US Environmental Protection Agency	Webcast	One of six two-hour webcasts on green infrastructure offered by EPA in the spring and summer of 2009. Presented by Abby Hall of US EPA, Chris Kloss of the Low Impact Development Center, and Bill Davis of Progressive Design and Planning.
Managing Wet Weather with Green Infrastructure Municipal Handbook	http://water.epa.gov/infrastructure/greeninfrastructure/gi_policy.cfm	2008	US Environmental Protection Agency	Handbook	Provides local governments with a step-by-step guide to growing green infrastructure in their communities. Chapters address funding options, retrofit policies, green streets, rainwater harvesting, and incentive mechanisms. Each chapter provides a discussion of available programs and policies and several case studies.
Low Impact Development Strategies and Tools for NPDES Phase II Communities	http://www.lowimpactdevelopment.org/lidphase2/	On-going		Website	Contains various resources to assist stormwater Phase II communities integrate low impact development (LID) strategies into their compliance programs.

→ Incentivizing green infrastructure

Title	Link	Date	Author	Type	Description
Municipal Handbook: Incentive Mechanisms	http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_incentives.pdf	2009	US Environmental Protection Agency	Handbook	Green infrastructure on private property can significantly reduce the public cost of stormwater management. This chapter of EPA's green infrastructure municipal handbook describes a number of incentives that municipalities can offer to promote the implementation of green infrastructure on private properties and reduce their stormwater management costs.
The Value of Green Infrastructure: A Guide to Recognizing its Economic, Environmental, and Social Benefits	http://www.cnt.org/repository/gi-values-guide.pdf	2010	Center for Neighborhood Technology and American Rivers	Report	Cumulatively assesses the multiple benefits of low-impact development (LID) and green infrastructure (GI) as a municipal or private investment. Since methods and tools for assessing benefits have been lacking, municipalities more easily can assess gray infrastructure cost-benefits and favor those solutions. This guide provides simplified ways to assess the full benefits of LID and GI to aid decision-makers in evaluating options for water management.
Green Infrastructure Case Studies: Municipal Policies for Managing Stormwater with Green Infrastructure	http://www.epa.gov/owow/NPS/lid/gi_case_studies_2010.pdf	2010	US Environmental Protection Agency	Case studies	Examines the policies adopted by 12 local governments that have successfully promoted green infrastructure, as well as the policy drivers and policy outcomes. A menu of policy options is presented and barriers and lessons learned are summarized.