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Encouraging Efficient Green Infrastructure Investment



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The Environmental Finance Center (EFC) is located at the National Center for Smart Growth Research and Education at the University of Maryland in College Park. The EFC is a regional center developed by the Environmental Protection Agency to assist communities and watershed organizations in identifying innovative and sustainable ways of implementing and financing their resource protection efforts throughout the Mid-Atlantic region. The EFC is non-advocacy in nature and has assisted communities and organizations in developing effective sustainable strategies for specific watershed protection goals for a variety of clients including state and local governments, watershed organizations, and land trusts.

Cover photos

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Executive Summary

There are currently dozens of policies, funding, and technical assistance programs at the federal level designed to support the implementation of green infrastructure or its components. While this level of interest and support for using natural systems to address environmental, social, and economic goals is important, the multitude of opportunities can make it difficult, if not overwhelming, for communities to piece together effective green infrastructure implementation and financing strategies.

The Environmental Finance Center at the University of Maryland (EFC), with support from the US Forest Service's National Urban and Community Forestry Advisory Council, spent the past year examining the numerous federal green infrastructure programs available to see if there are ways to improve their efficiency, address gaps, and accelerate additional public and private sector investment in this approach. To do this, the EFC spoke with federal personnel, stakeholder organizations, and community-level practitioners to get a sense of how well the existing level of support is meeting needs.

Because green infrastructure can yield a number of benefits, the reason communities turn to this approach is varied. Water quality and land conservation were found to be the most common drivers behind local green infrastructure efforts; however, few program staff, stakeholder groups, or community representatives were looking at these motivations in concert. Yet, because of its holistic nature, a green infrastructure network functions at its highest level when the full collection of practices and activities are considered in their entirety.

Green infrastructure has the potential to serve as a “great integrator” – across community goals, jurisdictional boundaries, and landscape needs – and currently this capacity is not being fully realized. Issues of coordination, financing, and cohesion are impeding the development of a wider-scale green infrastructure network that responds to a variety of drivers, functions on multiple scales, addresses otherwise competing community priorities related to natural resources and local economies.

Coordination – While a federal government structure that is spread across multiple agencies provides a specificity of focus that is clearly needed, this same specificity of mission makes the kind of cross-agency approach green infrastructure demands difficult to achieve. The EFC identified agency differences in mission, data management, program administration, funds disbursement, and promotion of success stories that make it challenging for communities to act holistically in developing green infrastructure implementation and financing strategies.

Financing – Risk and transaction costs are factors that can make decision-makers at all levels hesitant to use a green infrastructure approach or invest in green infrastructure practices. Performance concerns relate both to skepticism regarding the ability or consistency with which these practices deliver the level of benefits expected, as well as uncertainty that investing in green infrastructure will deliver better returns than more traditional practices.

Cohesion – The lack of one agreed upon definition of green infrastructure creates flexibility in how the approach is applied that can accommodate a variety of local drivers, priorities, and goals. However, often green infrastructure is so narrowly defined in its application that opportunities are missed. Although it is understandable that an agency' authority, organization's mission, or a community's local priorities may dictate focusing on specific components of green infrastructure, drivers and benefits are incredibly interwoven, and a more holistic vision can reduce costs, better leverage benefits, and improve overall return on investment.

Based on our investigation, the EFC would suggest that addressing the issues hindering broader adoption of a green infrastructure approach and more efficient and effective use of federal support opportunities requires an innovative solution. ***The solution will need to be developed through a collaborative process that makes use of the collective intelligence of a host of federal and non-federal green infrastructure stakeholders – in other words a new forum for raising the profile of green infrastructure and advancing its implementation.***

While federal leadership will be a critical component in developing and implementing a solution, it does not necessitate that any agency or group of agencies alone carry the load of managing this process. Cross-agency collaboration is not in and of itself a novel concept, and there are many successful examples referenced in this report; yet, there is not currently an effort that attempts to consider green infrastructure advancement collectively across scales and drivers in a way that maximizes the impact of the network. There are many “good things” happening on the ground through the support of many federal players; however, the collective impact of these “good things” can be improved significantly.

A hybrid solution that draws from past successes in this arena and others and includes high-level agenda setting, cross-agency dialogue, and elements of the original Green Infrastructure Community of Practice could be most effective in determining how advancing a broader green infrastructure effort might be structured. Regardless of what it ultimately looks like, shaping the solution will need the collaborative efforts of the green infrastructure “intelligence community” coming together to write the business plan for green infrastructure in the US.

This new forum should be charged with defining the green infrastructure research agenda. While some green infrastructure efforts have been comprehensive in data collection, resource mapping, and information sharing, the EFC’s investigation also identified a pressing need for a better data set to reduce the risk associated with a green infrastructure approach, as well as a better way of integrating new data into the management and policy decision-making process. Incomplete information has held too many communities hostage for too long. Green infrastructure decision making must make use of the best available current data, and allow for adjustments as new information becomes available. Compilation of existing data to better understand the national-scale information base, expansion and standardization of success story sharing, and collaborative filling of performance-related information gaps will be needed to maximize the impact of green infrastructure networks.

Regardless of how well-crafted the solution is, little forward progress can be made without giving thought to the financing strategy that will support it. ***Improving the flow of green infrastructure funds and using evolving best available data to make strategic investment decisions will undoubtedly reduce the risk and transaction costs associated with this process, as well as improve efficiencies.*** However, federal resources are but a fraction of the level of funding necessary to implement all that is needed. Therefore it is critical that federal funds be used in a way that not only supports green infrastructure in traditional ways, but also in innovative financing models that can become catalytic in attracting investments from other public and private sector sources.

Green infrastructure can no longer be thought of as a luxury communities cannot afford. It is a necessary and cost-effective way of addressing multiple community needs. While the type of effort we are suggesting will be a significant undertaking, perhaps a good first cross-agency task would be to ***collaborate on branding, promotion, and the telling of green infrastructure success stories – essentially identifying a collective way of talking about green infrastructure – what it is, what it does, and what it is doing for the communities that are implementing this approach.*** Cobranding

the green infrastructure effort will require identifying messaging and communications vehicles that would better engage both a broader audience, as well as specific audience sectors, and does so in a way that shifts the dynamic from a mere acceptance of green infrastructure practices to a wide-scale demand for this approach.

The precise combination of expanding and strengthening the green infrastructure dialogue across federal agencies, improving decision support data and adapting management practices as needed, diversifying financing strategies, and sharing marketing of green infrastructure that is needed cannot be defined by any one agency, organization, or stakeholder. This would seem inherently contradictory to the pressing need for the more wide-scale, collaborative green infrastructure effort that the EFC suggests exists. Using the collective intelligence of the broader green infrastructure community to create a framework for a long-term green infrastructure conversation will enable the development of a national-scale support system that maximizes the functionality of green infrastructure networks and advances implementation across scales, while allowing each of the participating agencies and stakeholders to take on roles true to their individual missions.

Introduction

Background

Green infrastructure is an approach to resource management decision making that considers how natural areas and the built environment interact and looks to use natural systems to address environmental, social, and economic needs. Federal agencies and other organizations are increasingly recognizing the environmental and economic benefits of green infrastructure, as is demonstrated by the host of policies, funding, and technical assistance programs now offered at the federal level.

It has been suggested that there are more than two dozen applicable funding programs across no less than seven federal departments and agencies. It has also been suggested that the process communities go through to unravel these programs and knit them together on a case-by-case, project-by-project basis causes them to essentially “[turn] themselves inside out.”¹ Enduring such a process is hardly an efficient use of resources. In fact, this wealth of opportunity may, in some cases, be so overwhelming that communities may be deterred from even attempting to navigate the possibilities.

With support from the US Forest Service’s National Urban and Community Forestry Advisory Council, a team from the Environmental Finance Center at the University of Maryland (EFC) conducted a national-scale scoping study investigating the numerous federal green infrastructure opportunities currently available. This effort went above and beyond simply identifying the different policies and programs in place, to include an analysis of what is working well and where the areas of potential improvement might be.

Project Approach

The term “green infrastructure” can mean vastly different things to different audiences, spanning everything from a site level stormwater management practice to large-scale conservation of entire landscapes. The EFC used a rather broad and inclusive vision of green infrastructure for this study, believing that ultimately green infrastructure functions at its greatest efficiency when the systemic impacts of all of these scales are considered collectively.

The EFC’s approach to this study included top-down and bottom-up methodology. This involved a series of dialogues with a variety of federal personnel as well as with key green infrastructure stakeholder groups and communities across the country. These conversations were designed to determine priorities with respect to green infrastructure and to assess whether and to what extent the existing organizational structures and distribution patterns of federal resources are meeting communities’ needs. This assessment was intended to lead to findings about what is working well, what barriers exist that could inhibit additional success, and ways the existing federal green infrastructure landscape might be further strengthened and improved.

These conversations took the form of both individual dialogues with federal program or stakeholder staff, as well as listening session discussions that arose from the EFC’s involvement in other activities. For example, the EFC’s work as a green infrastructure technical assistance provided to Housing and Urban Development (HUD) Sustainable Communities awardees, the EFC’s interaction with a few Urban Waters Federal Partnership communities, the EFC’s participation in the

¹ Mark Muro of Brookings Institute’s Metropolitan Policy Program.

Department of Interior's Urban Parks Forum, and the EFC's capacity to tap into the nine other centers in the EFC Network all provided opportunities to leverage our other work and expand the reach of our information gathering process.

In addition, colleagues at Virginia Tech are conducting a parallel study designed to map the institutional landscape of green infrastructure in the United States, which included partners at the National Association of Regional Councils. While their investigation focused on what an effective institutional support system for green infrastructure might look like, the EFC examined what the financing strategy for such a system would require. Both project teams collaborated broadly and the EFC's findings have certainly been informed by the work of the Virginia Tech team.

Federal Green Infrastructure Programming

Federal support of green infrastructure takes a number of forms. Some agencies have policies that encourage communities to take a green infrastructure approach to planning, transportation, water or air quality, or other efforts, while other agencies have funding and technical assistance programs that directly support on-the-ground green infrastructure activities and implementation. Of course many agencies employ some combination of these approaches. The specific details of many of these programs can be found in the appendices of this report.

While the reasons communities turn to a green infrastructure approach are varied, Virginia Tech's investigation identified six primary drivers: regulatory compliance; climate adaptation and mitigation; ecologically responsible growth management; habitat conservation; community and economic development; and asset and risk management. The EFC's examination has found similar results, with water quality, particularly in the context of regulatory compliance, and land conservation dominating community motives. Interestingly, this seems to be an either-or situation; very few of the stakeholders, communities, or federal personnel the EFC spoke with ever mentioned both motivations. Players tended to focus on one vision of green infrastructure or the other, and these camps continue to remain largely independent.

The US Environmental Protection Agency (EPA) and the US Forest Service (Forest Service) have had the longest standing history of involvement in federal green infrastructure support. However, as green infrastructure benefits beyond water quality and strategic land management – such as public safety, economic revitalization, health and wellness, and job creation – are increasingly acknowledged, the collection of federal agencies supporting green infrastructure efforts has expanded significantly resulting in greater opportunity, and in fact *necessity* to coordinate.

While water quality and land conservation were the most commonly expressed motivations behind local green infrastructure efforts and federal support programs, there is an opportunity to better coordinate across these drivers.

From a federal perspective, the concept of green infrastructure as a network of strategically protected landscapes, resources, and communities is deeply rooted in the work of the Forest Service. This makes sense given the agency's mission "to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations," and motto of "Caring for the land and serving people."² While green infrastructure is clearly applicable to all three aspects of the Forest Service's work – the National Forest System, State and Private Forestry, and Research and Development – certain activities are of particular interest.

The Forest Service's formal involvement in green infrastructure dates back to participation on the Metropolitan and Rural Strategies Task Force for President Clinton's Council on Sustainable Development in 1996. Over the course of several years, this evolved into the development of a training course, in collaboration with the Conservation Fund, designed to help incorporate green infrastructure into federal, state, and local planning, policies, and decision-making. The Forest Service continues to support this course as well as other state, regional, and local green

² As stated at www.fs.fed.us/aboutus/mission.shtml.

infrastructure efforts. Recognizing that federal resources alone will never match implementation needs, the agency has worked extensively to engage other public, as well as private and nonprofit sector resources, in green infrastructure efforts.

Other agencies also have missions that are inextricably tied to a land conservation vision of green infrastructure. The US Department of Agriculture (USDA), National Park Service, Fish and Wildlife Service (FWS), Bureau of Land Management (BLM), and Department of Defense (DOD) are all now considering how the lands, refuges, and bases they invest in and/or manage relate to surrounding lands and how these lands can make critical and strategic linkages to other ecologically significant lands. The Federal Highway Administration is doing this as well, through their Eco-Logical program, and has developed a number of policies and a suite of resource materials designed to encourage incorporation of a green infrastructure approach to transportation decision-making at state, regional, and local scales.

In recent years, however, there has been a gradual expansion in focus, both at Forest Service as well as more generally, to urban applications of green infrastructure. With 82% of the US population now residing in the nation's cities and that trend on the rise,³ the Forest Service's mission of "Caring for the land and serving people," now grapples with a far more complex urban-rural gradient, as exemplified in their recent study of the urban watershed continuum.⁴ Many of the nongovernmental and nonprofit organizations that have historically focused strictly on the larger-landscape vision of green infrastructure now too are considering their mission and role(s) in the urban context.

Expanding urbanization adds a multitude of stresses to the strained infrastructure systems that serve these communities, many of which are already in need of major upgrades and repairs. Green infrastructure can be an appropriate and effective approach to developing a solution that reduces the burden, and often price tag, of gray infrastructure systems. The National Oceanic and Atmospheric Administration, the Fish and Wildlife Service, the Federal Emergency Management Administration, and the Army Corps of Engineers are looking at green infrastructures' role in coastal zone management from both large-scale floodplain and urban infrastructure perspectives. Housing and Urban Development, the Centers for Disease Control, the Department of Transportation, and the Forest Service's Urban and Community Forestry program all have expanded programming to include the support of green infrastructure practices that improve public health, increase access to open space and recreational activities, and reduce climate impacts. All of these activities contribute to improved resiliency and local economies.

Currently, the EPA is the most significant federal player in urban green infrastructure implementation, and as the agency assigned to uphold the Clean Water Act, the EPA's vision for green infrastructure is closely tied to water quality. What began as a Statement of Intent to promote green infrastructure in 2007, was soon followed by the 2008 "Managing Wet Weather with Green Infrastructure" Action Strategy. By April of 2011, EPA's Office of Water and Office of Enforcement and Compliance Assurance issued a joint memorandum "encouraging and supporting the use of green infrastructure approaches to manage wet weather . . ."⁵ The EPA made significant strides in advancing green infrastructure practices by enabling communities to make them an

³ www.cia.gov/library/publications/the-world-factbook/fields/2212.html

⁴ More details and a link to the full report can be found at www.nrs.fs.fed.us/news/release/expanded-concept-urban-watershed

⁵ The text of this memo can be found at http://water.epa.gov/infrastructure/greeninfrastructure/gi_regulatory.cfm

integral part of National Pollutant Discharge Elimination System (NPDES) permits addressing stormwater management, Long Term Control Plans addressing combined sewer overflow (CSO) issues, and Total Maximum Daily Loads (TMDLs) that address specific water body impairments.

The EPA is incorporating green infrastructure beyond compliance programming. The Healthy Watersheds initiative considers the state of green infrastructure as a part of its assessment process, and the April 2012 publication of [The Economic Benefits of Protecting Healthy Watersheds](#) is a valuable quantification of the impact of some green infrastructure practices.

Water quality has quickly become the most significant driver for expanded use of green infrastructure practices. Jurisdictions face major penalties for not meeting Clean Water Act requirements and now that green infrastructure practices are an acceptable method of achieving compliance, while many landscape scale practices such as conservation easements receive no credit, communities expressed that, except in some cases which are compelled by Endangered Species Act compliance, engaging in cross-jurisdictional landscape-scale planning is a luxury they have neither the time nor resources to invest in.

While it is important that the number of federal agencies looking to a green infrastructure approach is expanding steadily, green infrastructure by its very nature necessitates coordination. Cross-

Considering green infrastructure collectively at a national scale would allow for planning and implementation decision-making that maximizes the functionality of the network.

cutting benefits create a need for cross-agency, cross-sector, and cross-stakeholder discussions around the planning, implementation, and long-range operation of green infrastructure networks, regardless of the driver that brought these players to the table initially. While having an understanding of the driver motivating an agency, community, or stakeholder organization to engage in green infrastructure is significant at the local or regional scale and informs coordination, in order to function systemically and maximize benefits, green infrastructure must also be viewed at a national scale. A national green infrastructure network is strengthened by the connectivity of *all* of these efforts working in concert.

Common Themes and Findings

One of green infrastructure's greatest values is its potential to serve as an effective framework for integration on a variety of fronts. The executive director of one NGO the EFC spoke with described it as the "glue that can hold economic, social, and environmental priorities together."⁶ Green infrastructure can serve as the vehicle for meeting otherwise competing community goals; for addressing multiple federal priorities and agency missions; for linking jurisdictions, practitioners, and support organizations in a way that better serves the management of both fiscal and natural resources; and for connecting otherwise disparate programs that focus only on specific aspects or features of the landscape. Given that a green infrastructure system's strength is directly tied to the level of connectivity it possesses, this is perhaps the most important opportunity of all.

While there are an increasing number of communities turning to green infrastructure solutions spurred by a variety of driving forces and at a broad spectrum of scales, the role of green infrastructure as the "great integrator" is not currently being fully realized. A member of the Forest

⁶ Personal communications with City Park Alliance personnel on June 20, 2012.

Service explained that while there is “lots of good stuff” happening on-the-ground, without a cohesive plan, the impact cannot be systemic, and while pockets of “good stuff” are an important start, this approach will never allow green infrastructure to reach its full potential.⁷ This also has some very real finance implications in terms of lost efficiencies and expanded implementation costs.

The EFC’s investigation identified issues related to coordination, financing, and cohesion that impede the development of a wide-scale green infrastructure network that more fully realizes its capacity.

Coordination

There are major differences among the federal agencies that address green infrastructure that create challenges to coordinating and accessing available resources. While a rather obvious statement, the extent to which this influences both cross-agency and external interactions merits further discussion. At the very core of these differences are those tied to agency authority and/or mission. Depending on how green infrastructure is defined, as many as a dozen federal agencies, and countless departments and divisions within those agencies, have missions, or portions of thereof, that relate to green infrastructure or its components. But, an agency’s specific authority or mission may limit its ability to address green infrastructure needs with the type of holistic vision called for with this approach.

While having a federal government structure that is spread across numerous agencies, services, and departments allows for a specificity of focus that is clearly necessary, this specificity of mission and authority makes it challenging for cross-agency implementation, and even more difficult for cross-agency funding of activities. Some the EFC spoke with suggested that White House level green infrastructure agenda setting, as was done with the Interagency Climate Change Adaptation Task Force that established key cross-cutting national climate priorities, could provide a framework that would enable agencies to find ways to define their green infrastructure role in a way that was consistent with other agencies while still respecting their own mission and authority.

The Great Lakes Restoration Initiative is another model of federal collaboration that was cited as effective. Others suggested that a new level of dialogue around green infrastructure is needed, like the Urban Waters Federal Partnership model is initiating around the issue of revitalizing urban communities, and that this would enable agencies to better understand how to coordinate support and resources while still respecting their individual authorities and missions.

Great Lakes Restoration Initiative

President Obama has made restoring the Great Lakes a national priority. A task force of 11 federal agencies collaborated to develop the [Great Lakes Restoration Initiative Action Plan](#) that will guide implementation of the largest investment in the Great Lakes in over two decades. Five principal focus areas have been identified and will guide decision-making within the various agencies involved. Steps have been taken to share data and mapping resources, streamline grant application and reporting processes, and coordinate distribution of funds. While EPA will administer some funds individually, interagency agreements will allow for the transfer of funds to other agencies for distribution when appropriate as well.



⁷ Personal communication with the Forest Service’s Northeast Research Station personnel on March 5, 2012.

The differences among agency authorities and missions results in issues of clarity, within and between agencies as well as with the stakeholders and communities they serve, as to how a given agency can or should address green infrastructure needs . As could be anticipated, this difference in authority and mission also results in differences in how an agency defines green infrastructure or which aspects of green infrastructure an agency chooses or is required to focus their efforts. In some cases, green infrastructure or aspects of it are an integral part of what an agency does, but it simply goes by another name.

Differences in mapping and Geographic Information Systems were also described as an issue by both federal personnel and stakeholder groups. Resource mapping is often at the very core of green infrastructure prioritization and planning, and having complete and coordinated data strengthens the impact of a green infrastructure network. One member of the National Park Service described variations in mapping and spatial database management across agencies like members of an orchestra all playing off different sheet music – while each song may be lovely individually, the full potential of the orchestra is never truly realized.⁸

Administratively, differences in funding cycles and proposal submission requirements, methods of accounting for outcomes, and reporting process were all mentioned as additional challenges to weaving together federal programming in a way that meets the needs of a community’s green infrastructure efforts in a way that satisfies agency requirements. Many stakeholders and communities felt that too much time was being spent “spinning their wheels” compiling information for a proposal at one agency that might address one part of their green infrastructure system and having to recraft and repackage much of the same information to meet the requirements of other opportunities at other agencies that address other parts of local plans. The National Association of Regional Councils new web-based [Green Infrastructure Roadmap](#) tool has taken an important first step in assembling federal green infrastructure program information in a way that is collective and user-friendly, but addressing the many requests for a more streamlined federal process will require more on the part of the federal agencies involved.

The way funding programs are currently structured and how these funds flow can inhibit the ability of federal agencies to be nimble in responding to on-the-ground green infrastructure needs or opportunities. This was a frustration expressed by virtually every community and stakeholder group the EFC spoke with. While a green infrastructure approach to decision-making and resource management encourages a holistic vision and thinking across a host of community priorities, federal programming designed to support these efforts tends to be fractured both in terms of where these programs are housed and what piece of the green infrastructure puzzle they address. This makes it incredibly difficult for already capacity-strapped communities to piece together opportunities in a way that is efficient, effective and serves the needs of their green infrastructure vision and plans.

In addition, many federal funding programs applicable to green infrastructure, like EPA’s Clean Water State Revolving Fund and many Department of Transportation programs, flow from federal agencies down to state agencies for distribution. This adds additional layers of procedures, priorities, and personalities for communities to navigate. In many cases, the dispersal of these funds at either the federal or state level, or both, are formulaic in nature and reliant on distribution metrics not directly indicative of where the funds may be best invested, further reducing the efficiency with which these funds are spent.

⁸ Personal communication with National Park Service’s Rivers, Trails, and Conservation Assistance Program personnel on February 10, 2012.

One funding pot referenced with some frequency was the Land and Water Conservation Fund (LWCF), the program that provides funds and matching grants to federal, state and local governments to acquire land water and easements parks, recreation, or protected areas. The fund is primarily monetized through offshore oil and gas drilling fees. The fund is authorized for up to \$900 million annually; however this cap has only been reached twice since the program’s inception in 1964 due to Congressional diversion of funds to other purposes. Many felt that ensuring full funding of the LWCF could significantly advance both urban and rural green infrastructure applications, and one member of the private sector with a long career with Department of Interior further suggested revising the dissemination language when the fund is up for reauthorization in 2015 to move away from the formulaic decision-making towards a model that is more strategic.⁹

While there are clearly increased federal efforts to collaborate across agencies on a number of green infrastructure related issues, stakeholders expressed frustration that this is not translating to on-the-ground results more quickly. Many of the NGOs and communities the EFC spoke with said that although they were encouraged by the amount of collaborative discussions taking place around green infrastructure, there seemed to be little on-the-ground action to back up this support.

The Urban Waters federal Partnership which spans more than a dozen agencies, the EPA-HUD-DOT Sustainable Communities efforts, USDA’s National Water Quality Initiative, EPA and National Park

Bolstering the federal role in the telling of green infrastructure success stories may help address the perception that little federal support trickles down to the ground level.

Service’s Groundwork communities, and a host of other collaborations taking place demonstrate federal recognition that improved interagency efforts are needed and that many program personnel are committed to advancing this approach. The resulting conversations among agencies are a critical first step in a long-haul process.

As one EPA official explained, “Seeing the results of silo-smashing requires patience, and to see on-the-ground what stakeholders define as action will take time as well as ingenuity on the part of the federal champions working on these efforts.” It will likely also require a greater executive

level involvement in these conversations to ensure internal agency decision-making that institutionalizes this approach.¹⁰

On the other hand, what may also be at play in the opinions that were expressed on this issue, is a *perceived* lack of action because the significance of these early steps and the on-the-ground results that *are* taking place are not being effectively communicated to the broader green infrastructure community. There may be a need to bolster the federal role in facilitating the “telling of success stories” and how green infrastructure is “branded.”

⁹ Personal communications with Outdoor Recreation & Park Services, LLC personnel on May 24, 2012.

¹⁰ Personal communications with EPA’s Urban Waters Federal Partnership personnel on June 8, 2012.

Financing

Risk is a major factor that makes decision-makers at all levels hesitant to use a green infrastructure approach or invest in green infrastructure practices. Perhaps the most frequently mentioned concern regarding green infrastructure was the level of uncertainty involved with this approach. These performance concerns – expressed by federal personnel, stakeholders, and communities alike – related both to skepticism regarding the ability or consistency with which green infrastructure practices deliver the level of benefits expected, as well as uncertainty that investing in green infrastructure will deliver better returns than more traditional practices. As one EPA official explained, green infrastructure’s “potential to yield multiple benefits makes it an intriguing approach to resource management problem-solving, but the performance track record makes some hesitant to build decision-making around it.”¹¹

The broad variation across green infrastructure practices, applications, and geographies involved creates a lack of uniformity that makes it difficult to scale results up in a way that remains meaningful at larger scales. This becomes a particularly pressing issue when agencies and/or communities explore applying existing programs or financing models to green infrastructure efforts in an innovative way. Two emerging examples are tapping into the Clean Water State Revolving Program’s Green Reserve or some of the energy efficiency financing models that rely on future savings for loan or investor pay back. Recent reports from the Trust for Public Land¹² and the Natural Resources Defense Council¹³ identified the difficulty in securing a reliable, dedicated revenue stream for loan or investor repayment as perhaps the most significant barrier to

Innovative Risk Reduction: Ohio’s Clean Water State Revolving Fund

CWSRF programs are typically used for construction or upgrades to wastewater treatment facilities. The EPA now requires each state to use at least 20% of these funds as a Green Project Reserve for green infrastructure, water and energy conservation and efficiency, or other innovative projects. While this is an important revenue source for green infrastructure projects, the challenge becomes identifying a steady revenue stream for loan repayment. For stormwater-related projects, there may be a local fee system in place that can be tapped for this need, but this is rarely the case for land conservation oriented projects. This repayment risk presents a significant barrier to broader use of the CWSRF for these projects, and in many states, these funds sit idle. Ohio, however, seems to be the only state that has consistently used their CWSRF for land conservation projects, and has done so by incentivizing sponsorship of these types of projects.

Through the [Water Resources Restoration Sponsorship Program](#), utilities and local governments are offered significantly reduced loan rates for traditional wastewater projects if they offer to also borrow and implement or sponsor watershed protection or restoration projects. The loan rates are so below standard market rates that the borrower still sees a repayment reduction despite the additional amount borrowed for protection and restoration activities. Borrowers who do not want the responsibility or lack the capacity to implement these projects themselves can transfer the funds to a land trust, park district, or other partner to do so.

¹¹ Ibid

¹² *Financing Land Conservation with the Clean Water State Revolving Fund System* can be found at cbey.research.yale.edu/uploads/Conservation%20Finance%20Camp%202011/agenda/Tuesday/CWSRF_REPORT_FINAL.pdf

broader use of innovative green infrastructure financing scenarios. In financing for other sectors, publically backed loss reserves have been used effectively to engage private sector investment in financing scenarios that rely on future cost savings for investor repayment and reduce the level of risk involved until the data is available to determine the extent to which these future cost savings will bear out.

Risk and uncertainty also become an issue when a jurisdiction would like to receive credit for these practices as part of a compliance or enforcement agreement. Compliance with the Clean Water Act, for example, is a legal matter and this leaves little room for an approach that cannot guarantee performance results. The EPA's 2011 memo encouraging the use of these practices to the "maximum extent possible," advances in modeling and planning efforts to incorporate green infrastructure, and the EPA's efforts to better quantify the benefits of these practices, particularly as they relate to stormwater management applications, are all important steps that open the door to wider incorporation of green infrastructure solutions. However, a more coordinated federal effort to collect and analyze data across all scales could move this process forward much more quickly.

It was suggested by one NGO that sheer volume of data can help to overcome the risk created by the lack of uniformity across practices and the details surrounding their application. A federal effort to support, enable, and/or require monitoring with some level of standardization will help build the case for the efficacy of these practices, in terms of both scientific and investment performance, and

The Business Case for Green Infrastructure

There is an intensifying level of opportunity for public-private partnerships that reduce federal burden while advancing green infrastructure.

Two dozen Fortune 500 companies have formally recognized the value of ensuring natural systems function as intended and have committed to a different approach. In the recent report [*The New Business Imperative: Valuing Natural Capital*](#), these companies, including Coca Cola, Nike, Disney and 21 others, outline why prioritizing ecosystems in their planning is not a matter of corporate philanthropy, it is good business. KPMG estimated that companies held financially responsible for the cost of their environmental impacts [would lose 41¢ of every dollar earned.](#) Protecting and restoring natural systems can help avoid supply chain disruptions, address climate impacts, allow for the recapture of valuable materials, attract investors, and leverage emerging markets.

allow for an adaptive management that adjusts implementation and investment decision-making based on the latest data available and improves return on investment.

In addition, standardizing the accounting of benefits and better valuing ancillary benefits in cost-benefit scenarios is needed. It was suggested that current accounting methods at many agencies are not sophisticated enough to adequately incorporate the value of secondary and tertiary benefits.

In the end, what will perhaps be the strongest incentive for expanded green infrastructure implementation will be the ability to make the business case for this approach. Public and private sector decision-makers alike are held accountable for the bottom line impact of their choices. Looking beyond the cost of regulatory compliance (or lack thereof), understanding the price of degraded ecosystems and unstable communities that can result from the loss of natural infrastructure will provide a more balanced view of what green infrastructure really costs

¹³ *Financing Stormwater Retrofits in Philadelphia and Beyond* can be found at www.nrdc.org/water/files/StormwaterFinancing-report.pdf

and what the return on that investment truly is.

Transaction costs can also limit the move to a green infrastructure approach. There are a number of factors, or transaction costs, which can inflate the bottom line of a green infrastructure approach. Outreach, planning, site design, legal matters, monitoring and maintenance can all add to the “cost of doing business.” These costs tend to exist at the same scale regardless of project scale, making smaller projects a much less efficient investment. While many of these activities are necessary for hard infrastructure approaches in urban green infrastructure as well, the fact that these hard infrastructure approaches have a longer history and tend to happen at larger scales have enabled advances and standardizations in the technologies involved that minimize these costs. Outreach, mapping, prioritization, legal investigations, and long term parcel management are all examples of the transaction costs that exist on the land conservation side of green infrastructure.

Regardless of the type of green infrastructure practices at play, having multiple agencies offering multiple support programs, and having communities and stakeholders reinventing the wheel to access each one, maintain multiple types of records, and file multiple types of reports means additional transaction costs for both sides. Any steps that could be taken to standardize processes or make use of existing systems would lower these costs and reduce administrative burdens. What has proven particularly effective at minimizing transaction costs has been to outsource loan or grant processes to banks or foundations that have the institutional structure in place to handle these processes more efficiently. For example, a number of states use a linked-deposit system that shifts the evaluation and administration of Clean Water State Revolving Fund loans to private sector banking institutions where these activities take place already at high volume. In some cases, federal agencies have turned to foundations for grants management services.

Innovative Cost Reduction: Pay-for-Performance

An experimental financing mechanism first used in the United Kingdom encourages private sector firms to invest in social causes with the promise of profits if the program meets certain performance standards. This process is just getting its feet wet in the US and could be adapted to green infrastructure and other environmental issues if performance of practices is properly tracked.

Social impact bonds, also called pay-for-success bonds, are in the inaugural stages or under consideration in a number of states in the US, with a primary focus on social services. One such program emerging in New York has Goldman Sachs providing a \$9.6 million loan to cover the cost of a reoffender avoidance program at Rikers Island. These funds will cover the expenses of an accomplished social services provider to manage the effort. If recidivism drops by 10%, Goldman Sachs will receive full repayment of the loan; if the rate drops by a higher percentage, they could make several million in profit. If rates do not drop, investors could lose several million.

While this approach may reduce risk and improve efficiencies for public sector players, it does not reduce risk to the investor (although in the New York example, a private foundation is providing a partial loss reserve to offset risk to the investor). It does however, incentivize innovation by encouraging the private sector to pay attention to performance, find more efficient ways of doing business, and determine their own level of profit margin.

www.nytimes.com/2012/08/02/nyregion/goldman-to-invest-in-new-york-city-jail-program.html?_r=1&pagewanted=print

The National Fish and Wildlife Foundation (NFWF), again because of the volume of grants they manage for a host of public and private sector entities, has become particularly adept at standardizing grant processes and managing funds in a way that simplifies matters and reduces transaction costs for both the federal agencies involved and those accessing these funds. In addition, coordination of green infrastructure funding programs through NFWF or a similar organization would also open up opportunities to pool federal funds, both across agencies, as well as with private sector sources. By example, although it is but one of more than three dozen grants programs managed by NFWF, the Chesapeake Bay Stewardship Fund disburses in the neighborhood of \$10 million annually to projects in the Bay region with support from EPA and USDA's Natural Resources Conservation Service and Forest Service, as well as the private sector Altria group.

Several European models of green banking are worth considering as well. The United Kingdom's Green Investment Bank, proposed in 2010 but endorsed by parliament just this year, expects to leverage £3 billion UK government dollars with another £15 billion in private investment to fund green projects and businesses, with an initial focus on waste, wind, and energy efficiency sectors, but plans to broaden beyond that in coming years. The program's critics argue that this particular structure is not ambitious enough. They are skeptical that funding will be at the levels suggested because government investment in the bank is tied to the country's national debt. In addition, the institution has not been established as a true bank and is therefore extremely limited in its ability to borrow from other sources.¹⁴ Many cite the German KfW Bankegruppe, a state owned bank, as a more effective model as state ownership enables the bank to borrow and leverage funds more freely; however, this bank's focus has primarily been energy efficiency improvement, where return on investment is better documented and investments bear less risk than the broader family of green infrastructure projects. While neither is a direct fit for federal needs in the US, valuable lessons could likely be learned through a closer investigation of both.¹⁵

Cohesion

There is a need to look at the application of green infrastructure more cohesively. The lack of one agreed upon definition of green infrastructure is a double-edged sword. While this creates flexibility in how the approach is applied in a way that can accommodate a variety of local drivers, priorities, and goals, in many cases it is so narrowly defined in its application that opportunities to maximize benefits are missed.

The 2011 [National Green Infrastructure Conference](#) did an excellent job of being inclusive of multiple stakeholders, federal agencies, and green infrastructure drivers and initiated the difficult task of bridging the urban and rural, stormwater and large landscapes. However, since that time, without designated leadership, institutional structure, or funding support the momentum gained as a result of that event has languished.

The current movement to expand the use of green infrastructure in urban areas was described by many the EFC spoke with as long overdue, and the recent White House Conference on Green Infrastructure hosted by the Council on Environmental Quality demonstrates that those at the very highest levels are taking notice. The need for a larger scale vision was discussed, as well. Katherine Baer with American Rivers described the need to "build on the good work being done around the

¹⁴ news.uk.msn.com/environment/articles.aspx?cp-documentid=157792518

¹⁵ www.guardian.co.uk/environment/damian-carrington-blog/2012/may/24/green-investment-bank-energy-efficiency

country,” and make the green infrastructure approach “a key component of water management more broadly.”¹⁶

Again, while this is an important step to advancing green infrastructure, rural or large landscape applications seemed to be missing from the conversation. Most respondents stressed the need for green infrastructure to serve as the bridge tying urban and rural and stormwater and land conservation activities together in a way that strengthens the network as a whole. One individual with both NGO and local government experience explained that green infrastructure is about promoting more livable communities which requires a strong balance of urban and rural priorities.¹⁷

Coordination is significant even if an agency is not providing direct financial support to green infrastructure efforts. The Bureau of Land Management, the National Park Service, the Department of Defense, and the Forest Service are all responsible for large tracts of land. Informed land management decision-making can enhance, strengthen, and possibly help address gaps in green infrastructure efforts at work in surrounding communities. Other agencies are framing programming internally to be more holistic and may encourage green infrastructure-type practices, like EPA compliance opportunities already discussed, or the Centers for Disease Control and prevention’s Healthy Community Design Initiative which looks to integrate health strategies into community planning, transportation, and land-use decision making.

Although it is understandable that an agency’s authority, organization’s mission, or a community’s local priorities may dictate focusing on specific pieces of green infrastructure – everything from site-scale stormwater management to large landscape-scale habitat conservation – these drivers and resulting benefits are incredibly interwoven. If a national green infrastructure network is to ever be achieved, these efforts must be done on the context of the larger scope of green infrastructure and the conversation that incorporates both perspectives must happen at even the highest levels. When room is made for all at the table, more can be accomplished, efforts are better leveraged, the collective voice is stronger, efficiencies are gained, and implementation costs are reduced.

¹⁶ www.americanrivers.org/newsroom/blog/kbaer-20120927-white-house-conference-on-green-infrastructure.html

¹⁷ Personal communications with Loyola University/Chicago Wilderness personnel on June 1, 2012.

Recommended Next Steps

The concept of a “wicked problem” first arose in the early 1970s in the urban planning arena. These have since been described by organizational theorist Russell Ackoff as “social messes.” While the breadth of issues this concept has been applied to has expanded, wicked problems have been defined to have a number of common characteristics regardless of subject matter. Wicked problems tend to be unique, complex, evolving problems that have multiple causes at play and whose resolution is rarely the responsibility of any one specific organization. Their solutions are neither right nor wrong, but rather a matter of the best guess for moving forward based on incomplete information. Essentially, wicked problems are so complex that traditional or existing problem solving strategies cannot begin to address them and must evolve to develop more innovative solutions.¹⁸

Based on this description, it would seem that maximizing green infrastructure, particularly on a national scale, qualifies as a wicked problem in need of a solution that will require the efforts of many and an approach unlike any used previously. Jeff Conklin’s “Wicked Problems and Social Complexity,” suggests that the collective intelligence that comes from collaborative problem-solving can combat fragmentation and serve as the basis for developing a solution that makes the most of existing data and can evolve as better data becomes available. A collective intelligence-based process may hold the key to addressing the fragmentation and collaboration issues raised as a part of the EFC’s investigation of green infrastructure support.¹⁹

A new forum for advancing green infrastructure is needed.

As previously discussed, maximizing the functionality of green infrastructure will require a greater level of integration – across federal agencies, as well as across implementation scales and stakeholder activities. There is a need for a new structure for broader, national-scale green infrastructure agenda setting, prioritizing, and information exchange. The Green Infrastructure Community of Practice was a good first effort at addressing integration needs and certainly initiated conversations between players that had not previously collaborated, federal and non-federal alike. However, convening, facilitating, and maintaining the momentum of this type of effort can be incredibly burdensome for any one entity to carry alone.

For federal agencies, being a leader on these issues does not have to mean taking first-hand responsibility for implementation of this integration. It does, however, require actively coordinating with fellow federal players, supporting research needs and implementation activities (much of which may be more efficiently handled by other stakeholders), and promoting available resources and success stories more collectively.

As previously discussed, large-scale federal coordination has been successful in a number of instances. White House level agenda setting on issues such as climate change and regional efforts

Federal agencies can lead the charge in advancing green infrastructure efforts without having to solely shoulder the responsibility for all that is needed.

¹⁸ This discussion was informed by Jeff Conklin’s chapter “Wicked Problems and Social Complexity” as found at cognexus.org/wpf/wickedproblems.pdf

¹⁹ Ibid.

such as Great Lakes restoration have provided a framework for agency decision-making and collaborative targeting of resources. Cross-agency dialogues are happening around community revitalization, water quality, land conservation, sustainability, and a host of other resource management issues. The Urban Waters Federal Partnership, for example, although more narrow in focus than the broad-scale vision of green infrastructure under discussion, provides a strong model for how a place-based approach can provide an opportunity for cross-agency coordination, and these dialogues are advancing resource protection priorities in pilot communities across the country.

Also, there are likely ways to build upon the original Community of Practice concept to include a more standardized federal presence, improved access to resources, alternative methods of communications, and expanded participation, particularly by those representing health and wellness, economic development, and private sector interests. This coordination might likely be best handled by an institution interested in advancing green infrastructure, but with a mission not necessarily inextricably tied to its success. This would not only alleviate the burden to the federal players involved, but it would ensure that all participating agencies, stakeholders, and institutions would be fairly represented.

A hybrid that includes high-level agenda setting, cross-agency dialogue, and elements of the original Community of Practice may prove most effective in determining how advancing a broader green infrastructure effort might be structured. Regardless of what it ultimately looks like, shaping the solution will need the collaborative efforts of the green infrastructure “intelligence community” coming together to write the business plan for green infrastructure in the US.

This forum should help define the green infrastructure research agenda.

There is a great deal of energy behind using a green infrastructure approach to addressing a variety of issues – sprawl that continues to fragment the landscape, cities and towns that are struggling to find cost effective solutions to failing infrastructure, urban and rural communities alike that are faced with addressing an increase in the intensity and frequency of storm events, and local economies of all scales that need a powerful boost. At the same time, there is a significant need for additional information to facilitate broader implementation of green infrastructure solutions and improve the efficiency of on-going efforts. The EFC’s investigation identified a need for a better

Investment decision-making that evolves with advances in knowledge base will improve the efficiency of green infrastructure spending and the impact of green infrastructure networks.

informed body of technical data to help reduce the risk associated with this approach, as well as better integration of new data into management and policy making decisions in both the public and private sector.

Some green infrastructure efforts to date have been comprehensive in certain aspects of data collection, for example there are many examples of resource mapping and prioritization at the local and regional level, and in cases such as Maryland’s Greenprint efforts and earlier Green Infrastructure Assessment process, at the state level. In addition, there have been advances in federal data collection protocols and information sharing, and tools like

the Center for Neighborhood Technology’s green infrastructure valuation tools developed in concert with American Rivers have proven valuable. And, undoubtedly, the EPA’s current Request for Proposals to begin quantification of the work underway in Philadelphia will be immensely informative. However, compilation of existing data sets to get a better sense of the national-scale

information base, expanded and standardized telling of success stories, and collaborative filling of information gaps related to performance results and return on investment will be needed to maximize the impact of green infrastructure networks. The American Society of Landscape Architects' recent report [Banking on Green](#), developed in conjunction with American Rivers, Water Environment Federation, and ECONorthwest, did an excellent job of cataloguing project-based green infrastructure data, but the adaptive management approach suggested here will require more standardized and scientifically robust data and analysis.²⁰

Based on EFC's investigation, outstanding research questions include: what types of data could help clear hurdles to broader implementation; how might performance metrics be measured over time to enable an adaptive management approach; where are the mapping gaps that could help prioritize green infrastructure needs across scales and drivers; and what additional decision-support tools might better enable adoption of green infrastructure approaches across scales? While these issues represent the green infrastructure needs expressed to the EFC, developing a comprehensive list and identifying the agencies or stakeholder institutions best equipped to take on these needs is best addressed by the "new forum" for advancing green infrastructure described above.

This forum should help identify a supporting financing strategy that reduces cost and attracts other public and private sector funding streams.

While all of the stakeholder organizations and communities the EFC spoke with appreciated existing federal support of green infrastructure, all felt more was needed and that more innovative dispersal patterns would improve the impact this funding would have on-the-ground. Many, including federal personnel, expressed a need to improve the flexibility with which agencies and program personnel are able to respond to opportunities and emerging needs and suggested that some of the emerging federal partnership platforms offer motivated and engaged federal

Public-Private Innovation: Red Fields to Green Fields

A host of urban communities have turned to greening vacant lots as a community revitalization strategy. The City Parks Alliance, working in conjunction with the Georgia Tech Research Institute, has developed a [Red Fields to Green Fields Initiative](#) that takes these efforts to another level, looking to redefine underserved communities and create jobs by converting financially distressed properties into green space, parks, and conservation areas through public-private partnerships. The goal is to reduce blight, encourage development, stabilize neighborhoods, improve public health, and expand employment opportunities – all of which working together improve local economies and create livable communities – essentially making communities competitive again.

Properties acquired in the RF2GF program are assessed as to their most appropriate role in the overall master plan for the city and are torn down, land banked, converted to green space, or redeveloped more efficiently. In addition to the inherent improvements to property value, public safety, and public health that come with a reduction in distressed properties and an increase in green space, redevelopment incentives like low to no interest loans, land banking until property values rise, urban easement and new market tax credits, tax increment financing, and reinvestment zoning are all mechanisms used to spur private sector engagement.

²⁰ The full report is available at www.americanrivers.org/assets/pdfs/reports-and-publications/banking-on-green-report.pdf

personnel the opportunity to “work outside the norm.”

Comingling funds, or at least application, accounting or reporting processes, would certainly ease the administrative burden to communities and stakeholders attempting to access and manage these funds, which reduces transaction costs, and very likely to the federal agencies involved as well. In addition, the leveraged capacity of pooled funds from multiple agencies can be assumed to have greater impact than separate, fractured sources. There are precedents for both internal (Great Lakes Initiative) and external (NFWF) pooling of resources and this approach seems particularly appropriate given green infrastructure’s holistic and cross-cutting nature. Several the EFC spoke with suggested that allowing fed-to-fed cost sharing might provide one avenue for great cross-agency coordination in a way that does not add any additional burden to the agencies involved.

Improving the flow of green infrastructure funds and using evolving best available data to make strategic investment decisions will undoubtedly reduce the risk and transaction costs associated with this process, as well as improve efficiencies. However, federal resources are but a fraction of the level of funding necessary to implement all that is needed. Therefore it is critical that federal funds be used in a way that not only supports green infrastructure in traditional ways, but also in innovative financing models that can become catalytic in attracting investments from other public and private sector sources. A just released report from global economic analysts at Organisation for Economic Co-Operation and Development concurs on the issue of leveraging public sector dollars, whether through public private partnerships, tax increment financing or other mechanisms, and success in doing so is predicted on reducing risk and maximizing return on investment.²¹

No one agency or organization can develop this financing strategy in a vacuum. Agency personnel will know how best to balance innovative approaches and agency authorities and requirements, and external stakeholder organizations will understand what will, or will not, be effective on-the-ground. So again, just as shaping the “new forum” will need the collaborative efforts of the green infrastructure “intelligence community,” so too will the supporting financing strategy.

This forum should develop cross-agency branding.

While the possibility and logistics of potentially comingled funds is explored, perhaps a good first cross-agency effort could be to collaborate on branding, promotion, and the telling of green infrastructure success stories – essentially identifying a collective way of talking about green infrastructure, what it is, what it does, and what it is doing for the communities that are implementing this approach.

One lesson on messaging comes from climate change work recently done by George Mason University’s Center for Climate Change Communication. Their 2009 study, *Global Warming’s Six Americas*²² documented the personality types of Americans as they relate to climate issues and identified a spectrum of six personalities that ranged from “dismissive” to “alarmed.” Oddly enough, regardless of which personality type an individual fell into, messaging around public health resonated with everyone. The conclusion was that if a handful of pithy messages around climate and public health could be repeated across a variety of reliable print, electronic, and social media

²¹ Merk, O., Saussier, S., Staropoli, C., Slack, E., Kim, J-H (2012), —Financing Green Urban Infrastructure , OECD Regional Development Working Papers 2012/10, OECD Publishing as found at www.oecd.org/regional/regionaldevelopment/financinggreenurbaninfrastructure.htm

²² environment.yale.edu/climate/files/Six-Americas-March-2012.pdf

sources, public engagement on the issue could be advanced. A similar scenario could work for green infrastructure, creating an increased demand for this approach.

Sightline Daily, an online publication supporting sustainability efforts in the northwest, recently convened both public and private sector individuals to identify ways to expand urban green infrastructure in the Puget Sound area and had similar findings around messaging. Their “[Six Tips for Selling Green Stormwater Solutions](#)” discusses the merits and impact of communicating early, often, and from every angle.²³

In [Barriers and Gateways to Green Infrastructure](#), Clean Water America Alliance and partners echoed the need for research-based green infrastructure outreach and education that did a better job of explaining the importance of the issues at play and relaying the costs and benefits associated with a green infrastructure approach.²⁴ Many the EFC spoke with directly also contend that this need exists, but is it possible for federal agencies to develop a standardized and collective branding of green infrastructure in a way that maintains and does not threaten each agency’s individual identity?

If this proves possible, the co-branding effort would need to include a discussion identifying what messaging and what types of communications vehicles would better engage both a broader audience, as well as specific audience sectors, and does so in a way that shifts the dynamic from a mere acceptance of green infrastructure practices to a wide-scale demand for this approach, where green infrastructure is no longer thought of as a luxury that only a few communities can afford, but rather a truly necessary and cost effective way of addressing multiple community needs.

²³ The full text of “Six Tips for Selling Green Stormwater Solutions” can be found at daily.sightline.org/2012/09/27/six-tips-for-selling-green-stormwater-solutions/

²⁴ *Barriers and Gateways to Green Infrastructure* can be found at www.cleanwateramericaalliance.org/pdfs/gireport.pdf

Conclusions

On the surface it may seem that this study has identified additional questions rather than provided definitive answers. While the EFC is clear that the solution lies in a combination of cross-agency dialogue, improved research and adaptive management, a diversified financing strategy, and shared marketing, for any one agency, organization, or stakeholder to define this new vision for green infrastructure independently would seem inherently contradictory to the pressing need for the broader-scale collaboration that the EFC suggests exists. Creating a framework for a long-term, collective green infrastructure conversation will enable the development of a national-scale support system that maximizes the functionality of green infrastructure networks, advances implementation across scales, and allows each of the participating agencies and stakeholders to take on roles true to their individual missions.

Appendix 1: Federal Green Infrastructure Programming

While this list is intended to provide a collective source of green infrastructure opportunities at the federal level, it is not intended to be comprehensive. A user-friendly, web-based version of this data is available through the National Association of Regional Councils and can be found at <http://narc.org/issueareas/environment/areas-of-interest/green-infrastructure-and-landcare/roadmap/>.

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
CDC		Community Transformation Grants (CTGs)	state/local government tribes/territories national/community-based organizations	\$103 million FY 2011; capacity building grants: \$147,000-\$500,000 implementation grants: \$500,000-\$10 million	supports the implementation, evaluation, and dissemination of community preventive health activities and information
Army Corps of Engineers	Civil Works				the Corps oversees wetland permits and mitigation activities and dredging and uses an Integrated Water Resources Management (IWRM) framework to collaboratively manage the built and natural environment
DHS	Federal Energy Management Program	Hazard Mitigation Grant Program	state and local governments, tribal organizations, some nonprofits	75% FEMA with 25% local match which cannot be federal except in the case of HUD CDBG funds	land acquisition, flood control activities, and property retrofits can be funded
DHS	Federal Energy Management Program	Flood Mitigation Assistance Program	only national flood insurance program communities with approved Flood Mitigation Plans can apply for FMA Project grants		planning, project, and management grants for communities looking to plan and implement practices that minimize losses due to flooding

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
DHS	Federal Energy Management Program	Pre-Disaster Mitigation Program			support for hazard mitigation planning and implementation of mitigation projects prior to a disaster event
DOI	FWS	Endangered Species Act			endangered species act requirements may encourage local governments to protect critical habitat and other green infrastructure components
DOI	FWS	Urban Bird Treaty	"bird friendly" cities are eligible and are "challenged" to raise matching funds from non-federal sources	up to \$70,000	preserve or improve green infrastructure components such as trees and forests as bird habitat
DOI	FWS	Schoolyard habitat program	schools/organizations that are working cooperatively with FWS	up to \$8,000 per school/organization	habitat creation, protection, and enhancement activities
DOI	FWS	Migratory Bird Conservation Fund (MBCF)		over 1,900 high priority projects approved for funding; \$1 billion of protected wetland habitat	habitat creation, protection, and enhancement activities
DOT	Federal Highway Administration	Surface Transportation Program	states/localities on federal-aid highways	varies year to year	surface transportation planning provides opportunities to incorporate green infrastructure components across jurisdictional boundaries

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
DOT	Federal Highway Administration & Federal Transit Administration	Congestion Mitigation and Air Quality Improvement Program	state DOTs and metropolitan planning organizations that face the challenge of attaining or maintaining the NAAQS	varies by area	congestion mitigation to improve air quality can incorporate green infrastructure components
DOT	Federal Highway Administration	Transportation, Community, and System Preservation Program	states, metropolitan planning organizations, local governments, and tribal governments	\$61.25 million in 2009	research and grants examine the relationships between transportation, community, and system preservation plans and practices and identify private sector-based initiatives to improve these relationships
DOT	Federal Highway Administration	National Scenic Byways Program	states and Indian tribes with highways designated as scenic byways	varies - funds should be proportionate to the proposed project's benefits to byway travelers	planning, design, maintenance, and improving scenic byways and All-American roadways
DOT	Federal Transit Administration	Paul S. Sarbanes Transit in Parks Program	federal land management agencies; State, tribal, or local governmental authorities with eligible land acting with consent of federal land management agencies	varies	program funds may support capital and planning expenses for new or existing alternative transportation systems in the vicinity of an eligible area and can include transportation by bus, rail, or any other public transportation, as well as non-motorized transportation systems such as pedestrian and bicycle trails

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
DOT	Federal Transit Administration	Metropolitan Planning Program and State Planning and Research Program	state DOTs and Metropolitan Planning Organizations	varies	funds are available for planning activities that support the economic vitality, increase safety, increase security, increase accessibility and mobility, protect and enhance the environment, promote energy conservation, improve the quality of life, enhance connectivity, promote efficient system management and operation, and emphasize preservation of the existing system.
DOT	Federal Highway Administration	Transportation Enhancement Activities	communities engaging in the 12 specified action areas	varies	funding opportunities to help expand transportation choices and enhance the transportation experience through 12 eligible TE activities related to surface transportation, including pedestrian and bicycle infrastructure and safety programs, scenic and historic highway programs, landscaping and scenic beautification, historic preservation, and environmental mitigation
DOT	Federal Highway Administration	The Safe Routes to School Program	state DOTs	\$612 million over five Federal fiscal years (FY 2005-2009), administered by state DOTs	provides funds to the States to substantially improve the ability of primary and middle school students to walk and bicycle to school safely

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
DOT	Federal Highway Administration	Recreational Trails Program	states	\$840,000 per year from the Federal Highway Trust Fund; half of the funds are distributed equally among all States, and half are distributed in proportion to the estimated amount of nonhighway recreational fuel use in each State	provides funds to the States to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses
DOT	Federal Highway Administration	Surface Transportation Environment & Planning Cooperative Research	state and local governments, metropolitan planning organizations, Universities, federal agencies, private sector	authorized \$16.875 million per year for FY2006-FY2009	research program to improve the understanding of the complex relationship between surface transportation, planning, and the environment
DOT	Federal Highway Administration	Eco-Logical Grant Program	state and local DOTs, state resource agencies, Metropolitan Planning Organizations, local governments, non-governmental organizations, and academic institutions	\$1.4 million total for 15 cooperative agreements	looks to integrate transportation and resource management planning in a way that creates ecosystem-based infrastructure projects

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
DOT	DOT	TIGER (Transportation Investment Generating Economic Recovery) Discretionary Grants	state, local, and tribal governments, transit agencies, port authorities, metropolitan planning organizations (MPOs), other political subdivisions of State or local governments	grants from \$10 million to \$600 million	provides funding for innovative transportation projects that will have a significant impact on the nation, a region, or a metropolitan area and foster livable, sustainable communities; funding for a green corridor revitalization in West Virginia was approved this year
EPA	Brownfields & Land Revitalization	Brownfields Area-Wide Planning Pilot Program	23 communities already chosen	up to \$175,000 per grant	area-wide plan which will inform the assessment, cleanup and reuse of brownfields properties
EPA	Brownfields & Land Revitalization	Brownfields Assessment Grants		up to \$200,000 per site	provide funding to inventory, characterize, assess, and conduct planning, and community involvement
EPA	Brownfields & Land Revitalization	Brownfields Clean Up Grants		up to \$200,000 per site	provide funding for cleanup activities at brownfield sites
EPA	Brownfields & Land Revitalization	Targeted Brownfields Assessments	states, tribes, and municipalities	varies by region	minimize the uncertainties of contamination often associated with brownfields
EPA	Brownfields & Land Revitalization	Brownfields Sustainability Pilots	communities	varies	promote environmental sustainability at local brownfields projects- need to implement GI to do so
EPA	Brownfields & Land Revitalization	Revolving Loan Fund Grants	state, local, and tribal governments	up to \$1,000,000 per entity	provides funding to capitalize a revolving loan fund to be used to carry out cleanup activities at brownfield sites.

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
EPA	Community Planning	<u>Smart Growth Implementation Assistance Program</u>	a tribal, state, local, or regional government; a nonprofit organization	technical assistance	technical assistance to help applicants develop in ways that protect the environment, use resources efficiently, create economic opportunities, and promote smart growth
EPA	Community Planning	<u>The Building Blocks for Sustainable Communities Program</u>	communities	technical assistance	technical assistance provided in the form of one day workshops to assist communities using a variety of tools to overcome land use challenges and promote smart growth. This includes tools to educate communities about implementing stormwater management.
EPA	Office of Air and Radiation	<u>Community Action for a Renewed Environment</u>	non-profit; tribal government	varies by year	community creates a partnership that reduces releases of toxic pollutants and minimize people's exposure to them
EPA	Office of Environmental Justice	<u>Environmental Justice Small Grants Program</u>	community-based or local and tribal organizations working with communities facing EJ issues	up to \$25,000 per grant	provides funding for communities to identify and solve environmental/health issues; many past projects incorporated green infrastructure components
EPA	Office of Environmental Justice	<u>Environmental Justice Collaborative Problem-Solving Cooperative Agreements Program</u>			provides funding for projects addressing local environmental and/or public health issues in eligible communities

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
EPA	Extramural Research	P3: People, Prosperity and the Planet	Institutions of higher education located in the US are eligible to apply as the recipients of grants to support teams of undergraduate and/or graduate students. Collaboration and partnerships with colleges and universities outside the US are permitted	given to the best student designs, this is an award and opportunity for grant funding up to \$90,000 to further the project design, implement it in the field, and move it to the marketplace.	this award encourages college students to address environmental challenges from a wide range of categories and whose services could prove valuable to communities in need of design assistance
EPA	Water	Clean Water State Revolving Fund (CWSRF)	all 50 States and Puerto Rico	more than \$5 billion a year	low-cost funding for projects that improve water quality, renew wastewater infrastructure, and support local economies
EPA	Water	Drinking Water State Revolving Fund (DWSRF)	States	varies by state	makes funds available to drinking water systems (esp in small/disadvantaged communities) to finance infrastructure improvements
EPA	Water	Targeted Watershed Grants Program	Any governmental or nonprofit non-governmental entity	varies by grant; Since 2003, more than \$50 million has been provided to 61 organizations	encourage successful community-based approaches and management techniques to protect and restore the nation's waters
EPA	Water	Managing Wet Weather with Green Infrastructure	N/A	N/A	informing local decision-making

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
EPA	Water	Clean Water Act 319(h) Funds	designated state and tribal agencies	varies	variety of nonpoint source reduction and mitigation projects
EPA	Office of Wetlands, Oceans & Watersheds	Office of Wetlands, Oceans & Watershed Funding (OWOW)	N/A	N/A	EPA's web site to provide tools, databases, and information about sources of funding to practitioners and funders that serve to protect watersheds
EPA		Section 106 Water Pollution Control Grants			includes permitting, water quality standards, TMDLs, monitoring and enforcement, and outreach and education
EPA	via the National Fish and Wildlife Foundation	Five Star Restoration Program grants	students, youth groups, or other similar organizations that are able to leverage funds from other community partners	\$10,000-\$40,000 per project; (average is approx. \$20,000 or less)	grants to create or restore wetlands, stream buffers, riverfronts, and other green infrastructure components
EPA	via the National Fish and Wildlife Foundation	Chesapeake Bay Stewardship Fund	federal agencies; federal buildings; relevant contractors	\$8 to \$12 million in grants, plus additional funds for technical assistance programs	collection of four programs that support projects designed to reduce nutrient loading and improve water quality in the Chesapeake Bay
HUD	Community Planning & Development	Community Development Block Grant Program (CDBG)	units of local governments and states	varies - on formula basis	flexible program that provides communities with resources to address a wide range of unique community development needs

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
HUD	Sustainable Housing Communities	Sustainable Communities Regional Planning Grants	consortium of units of government, regional planning agencies, and non-profit organizations	varies based on size and density of community applying for grant	supports metropolitan and multijurisdictional planning efforts that integrate housing, land use, economic and workforce development, transportation, and infrastructure investments
HUD	Community Planning & Development	Brownfields Economic Development Initiative (BEDI)	Community Development Block Grant (CDBG) communities and non-entitlement communities	varies, available on competitive basis	encourage local governments and private sector to initiate or continue redevelopment efforts on brownfields sites
USDA	Rural Development	Water and Waste Disposal Direct Loans & Grants	Public entities, ie: municipalities, counties, special-purpose districts, Indian tribes, and nonprofits	rates that are used to calculate loans are subject to change quarterly; Loans are made based on the applicant's authority and the life expectancy of the system's project, which may be up to the maximum of 40 years.	applicable to stormwater systems

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
USDA	Rural Development	Water and Waste Disposal Guaranteed Grants	public entities, non-profit corporations and Indian tribes; To qualify, applicants must be unable to obtain the required credit without the loan guarantee from private, commercial or cooperative sources at reasonable rates and terms.	the lender will structure repayment as established in the loan agreement between the lender and borrower. Normally, guarantees do not exceed 80 percent of the loan. Interest rates are fixed or variable and are determined by the lender and borrower subject to USDA Rural Development review and approval.	applicable to stormwater systems
USDA	Rural Development	Technical Assistance and Training Grants	private nonprofit organizations with tax exempt status	\$17 million total; estimated 6 awards	can be applied to green infrastructure practices that improve existing systems
USDA	FS/NUCFAC	Challenge Cost-Share Grant		\$900,000 total, 10 awards in 2009; 1:1 match requirement	
USDA	FS	Community Forestry Program	local governments, Tribal governments, and qualified nonprofit entities	up to \$400,000	provides financial assistance grants to establish community forests that can be sustainably managed and provide public benefit
USDA	FS	Forest Legacy Program	private forest landowners	up to 75% of the project cost	provides grants to state partners to protect important forests threatened by conversion

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
USDA	NRCS	Environmental Quality Incentives Program	owners of land in agricultural or forest production or persons who are engaged in livestock, agricultural or forest production on eligible land and that have a natural resource concern	a cost share program with up to \$300,000 per person or \$450,000 for projects of special environmental significance determined by the USDA; contracts are from 1 to 10 years	provides technical and financial assistance to help with planning, installation, and implementation of conservation practices on agricultural and forest land; specific components of this program vary by state
USDA	NRCS	Conservation Innovation Grant (CIG)	landowners that meet Environmental Quality Incentive Program (EQIP) eligibility requirements		encourage adoption of innovative conservation practices on working lands
USDA	NRCS	Wildlife Habitat Incentive Program (WHIP)	agricultural and nonindustrial private landowners that meet criteria defined in Farm Bill		
USDA	NRCS	Healthy Forest Reserve Program	private landowners	50% cost-share for conservation practices, or 75% easement value for 30-year contracts, or 100% easement value for permanent easements	help preserve, enhance, or protect forests on private lands
USDA	NRCS	Wetland Reserve Program	private landowners	75% cost-share for restoration practices, or 75% easement value for 30-year contracts, or 100% easement value for permanent easements	help preserve, enhance, or protect wetlands on private lands

Federal Agency	Department	Program	Eligibility	Level of Funding	Green Infrastructure Connection
USDA	Farm Service Agency	Conservation Reserve Enhancement Program (CREP)	land that meets certain requirements can be enrolled in the program	enrolled landowners receive rental payments and other incentives	can be used for riparian buffers, easements, and other green infrastructure components
USDA	FSA	Conservation Reserve Program (CRP)	land that meets certain requirements can be enrolled in the program	enrolled landowners receive rental payments and other incentives	can be used for riparian buffers, easements, and other green infrastructure components
USDA	FS	Great Lakes Restoration Initiative			restoration projects in Great Lakes region, e.g. Chicago Wilderness
USDA	N/A	Chesapeake Bay Watershed Initiative			provides additional funds for Farm Bill conservation activities in the Chesapeake watershed, which likely involves stream buffers, etc.
USDA	NIFA	Small Business Innovation Research Program	small businesses and private sector firms	estimated \$19 million total; awards range from \$70,000-\$100,000	supporting research and projects that promote balance between productivity and land, air and water quality
USDA	NIFA	Agriculture and Food Initiative	very broad	subject to appropriations for AFRI program, which is then divided over subject areas: security, climate, safety, etc.	applicable to urban agriculture components of green infrastructure
USDA & DOI	FS, Park Service, FWS, BLM	Land and Water Conservation Fund (LWCF)		depends on Congressional appropriations	can be used to acquire and conserve valuable lands and ecosystems

Appendix 2: Agencies, Organizations, Communities, and Events

Role	Contact	Affiliation	Location	Date
Advisory	Donna Murphy	USDA Forest Service	Northeast Area, Morgantown, WV Field Office	on-going
	Phil Rodbell	USDA Forest Service	Northeast Area, Newton Square, PA	on-going
	Bill Jenkins	US EPA	Region 3, Philadelphia, PA	on-going
	Tom Demoss	US EPA	Region 3, Fort Meade, MD	on-going
	Dana Coehlo	Western Forestry Leadership Coalition	Lakewood, CO	on-going
	Jeff Lerner	Consultant to Conservation Fund	Washington, DC	on-going
	UMD EFC staff	UMD EFC	College Park, MD	on-going
Coordinated With	Virginia Tech team	Virginia Tech	Arlington, VA	on-going
	National Association of Regional Councils	Virginia Tech Team	national scope, Washington, DC	on-going
	Colleagues in the EFC Network	EFC Network	national scope	on-going
Interviewed	Glenn Barnes	Region 4 EFC	University of North Carolina, Chapel Hill, NC	2/10/2012
	Charlie Bartsch	US EPA	Assistant Administrator's Office, Washington, DC	6/8/2012
	Aaron Durnbaugh	Center for Urban Environmental Research & Policy, also Chicago Wilderness	Loyola University, Chicago, IL	6/1/2012
	Alice Ewen	USDA Forest Service	Urban & Community Forestry, Washington, DC	2/10/2012
	Carrie Gallagher	Alliance for Community Trees	College Park, MD (national scope)	2/1/2012
	Morgan Grove	USDA Forest Service	Baltimore Ecosystem Study, UMBC, Baltimore, MD	4/23/2012
	Peter Harnick	Center for City Park Excellence	Trust for Public Land, Washington, DC	5/30/2012
	Wink Hastings	National Park Service's Rivers, Trails, & Conservation Assistance Program	Chesapeake Bay Program Office, Annapolis, MD	2/10/2012
	Destry Jarvis	Outdoor Recreation & Park Services	Hamilton, VA	5/24/2012

	Chris Kloss	US EPA	Water Permits Division, Washington, DC	12/23/2011
	Michael Lamprecht	US Dept. of Transportation	Federal Highways Administration, Washington, DC	3/16/2012
	Beth Larry	USDA Forest Service	Urban Research, Washington, DC	6/5/2012
	Larry Levine	Natural Resources Defense Council	Water Program, New York, NY	6/12/2012
	Catherine Nagel	City Park Alliance	Washington, DC (national scope)	3/5/2012
	Michael Rains	USDA Forest Service	Northern Research Station, Newton Square, PA	6/20/2012
	Surabhi Shah	US EPA	Urban Waters Program, Washington, DC	6/8/2012
	Shari Schafflein	US Dept. of Transportation	Federal Highways Administration, Washington, DC	3/16/2012
	Alisa Valderrama	Natural Resources Defense Council	Center for Market Innovation, New York, NY	6/12/2012
Listening Sessions & Leveraged Events	Baltimore Urban Waters Team Meeting	The EFC was invited to participate in this (and future) meeting of the team managing the Urban Waters pilot in Baltimore. This provided excellent insight as to how the collective federal dialogue functions in these communities, as well as the on-the-ground issues affecting Urban Waters pilots.		3/28/2012
	Urban Parks Forum	Held in Washington, DC this event provided an opportunity to hear from both federal agencies, as well as a number of urban green infrastructure stakeholder groups		4/18/2012
	Green Infrastructure Office Hours	This was a day spent in one-hour sessions with five HUD Sustainable Communities awardees of varying sizes from across the country. It was an opportunity to get direct feedback from local level green infrastructure implementers.		5/9/2012
	Sustainable Communities Leadership Academy	The EFC led a green infrastructure discussion session for east coast HUD Sustainable Community awardees at this event. This provided another opportunity to get direct feedback from local level green infrastructure implementers.		6/20/2012
	Source Water Collaborative	The EFC routinely participates in the quarterly meeting of this group, which provides an opportunity to hear the issues faced by source water protection practitioners from both federal and stakeholder organization perspectives.		6/26/2012
	Groundwork USA	The EFC participated in an informational session on Groundwork USA and learned how National Park Service and EPA's Brownfields program coordinate delivery of services.		10/3/2012

Webinar Research	Military Implementation of Green Infrastructure	This Conservation Fund webinar featured case studies from three US military installations and provided details as to how land management decision making is coordinated with the priorities of the surrounding communities.	11/14/2011
	Updating Local Codes to Cultivate Green Infrastructure & Foster Sustainable Stormwater Management	This US EPA sponsored webinar featured examples from around the country on the challenges communities face when addressing conflict between green infrastructure goals and local ordinances.	12/13/2011
	Green City, Clean Waters	This US Water Prize Winner Webinar focused on green infrastructure efforts in the City of Philadelphia, the federal role in promoting green infrastructure, and innovative financing mechanisms being explored.	6/28/2012