Green Infrastructure Center, Inc.

2009 - 2011 Strategic Plan

Review and comments welcomed

This strategic plan is organized as follows. An introduction to green infrastructure planning, a rationale for why we need an active Green Infrastructure Center, strategies to address center objectives, a timeframe for activities. This version of the document was last updated in February 2009. A simple timeline for activities is found in the appendix.

Introduction

Most land use decisions in the United States are made at the local level and there is growing recognition of the enormous aggregated ecological consequences of local land use decisions. There are more than 39,000 local government entities – counties, municipalities and townships – that manage 70% of the U.S. land base. While there is great desire at the local level to make land use decisions that restore, rather than deplete, our environment the use of green infrastructure planning practices are not widespread.

The Green Infrastructure Center**,** Inc. (GIC) was formed to build local capacity for protecting green assets by providing the resources for local decision makers to make informed land use decisions about what to conserve and how to do it. The GIC's mission is to help communities develop strategies for protecting and conserving their ecological and cultural assets through environmentally-sensitive decisions, lifestyles, and planning. The GIC is helping localities conserve their best ecological assets by guiding them to develop in patterns that enhance and restore their ecological assets.

Green infrastructure is a strategically managed network of natural lands, working landscapes and other open spaces that conserves ecosystem values and functions and provides associated benefits – ecosystem services – to human populations. This green infrastructure includes the connected natural systems and ecological processes that provide critical functions, such as habitat for wildlife, water storage and filtration, air quality, and healthful lifestyles. This network of ecological systems makes human life possible.

Louisiana waterthrush

Mapping and protecting intact habitats and connections are critical to ensuring species diversity. Many species need intact areas that are not bisected by roads, power lines, or other divisions. Often referred to as "hubs" or "cores," these intact zones are required by some species, such as the Louisiana water thrush, which prefers interior forest and requires clear, clean streams. When habitats are fragmented, other species can invade fragmented areas and compete with native species. For example, brown headed cow birds invade fragmented areas and place their eggs in the nests of other birds, thus competing for food and resources. Green infrastructure planning seeks to protect and connect intact areas, so that threats to species can be avoided and genetic diversity can be maintained.

Green infrastructure planning is linked to watershed planning, since land uses and development patterns are directly tied to water storage and quality. Waterways, bays, and wetlands are critical components of "blue" infrastructure; they provide habitat links for fish and wildlife and they are

included in green infrastructure planning. Ground water resources are also part of green infrastructure. River corridors and stream valleys often provide the only remaining green connections for wildlife to move across landscapes. Wetlands provide areas for water storage and ground water recharge, while also hosting many unique and rare species of plants and animals. In coastal areas, wetlands provide shellfish grounds and nurseries for young fish. Watershed plans should seek to connect wildlife habitats and provide connections across watersheds so that green infrastructure is integrated with watershed plans.

Unfortunately, green assets are often overlooked or mismanaged. Green infrastructure planning entails inventorying green assets, identifying opportunities for their protection and/or restoration, and developing a coordinated strategy to channel development and redevelopment to the most appropriate locations. Green infrastructure planning is a unique approach because it combines conservation planning methodologies within a systematic framework that can be applied in the context of developing or developed landscapes. Taking a green infrastructure approach requires identifying and understanding natural systems and protecting those systems first, before development begins, as well as seeking to restore connections and habitats in already-developed landscapes.

In short, the GIC seeks to make integrated ecological asset management, or green infrastructure planning, the basis for local land use planning. Integrating natural asset management into the land use planning process can provide significant local and global benefits. These benefits include:

- Preserving biodiversity and wildlife habitat.
- Combating global warming (carbon sequestration) and improving air quality.
- Protecting and preserving local water quality and supply.
- Providing cost-effective stormwater management and hazard mitigation.
- Improving public health, quality of life and recreation networks.
- Providing food security by helping to preserve local farms and ensure that farms reduce environmental impacts.
- Preserving cultural resources such as historic landscapes and scenic vistas.
- Creating more resilient local economies through green asset conservation.

Land use planning that is based on managing and harvesting the enormous benefits provided by natural systems will be a major step towards creating a sustainable economy in the 21st century. The Green Infrastructure Center is committed to making green infrastructure planning the fundamental basis for land use planning in the United States and the world.

Why Do We Need to Act Now?

Green infrastructure planning is not an entirely new concept and the principles that form the basis for the concept have arisen from multiple disciplines. George Perkins Marsh, who is often credited as the father of the modern conservation movement, wrote his seminal book Man and Nature in 1864 in which he proposed the idea that humans were degrading their environment and thus have an obligation to become stewards of the land. The field of natural resources management and adaptive management are based on the idea that we can seek to influence the health of ecological systems. The fields of conservation biology and ecology contributed central ideas such as “keystone species” that helped to create an understanding that ecological systems are nested and connected and certain species may play key roles in ecosystem resilience.

Other fields, such as landscape architecture and planning, also played a role in understanding the environment. Frederick Law Olmsted, the father of the modern landscape architecture movement, was known for his work to connect park systems throughout urban areas such as his famous "Emerald Necklace" in Boston that created a linked system of parks and green spaces. In 1969, Ian McHarg set forth his idea of overlaying multiple sources of information, such as drainage areas and soils, as layers on the landscape in order to understand limitations and opportunities for conservation and development in his book Design with Nature. This work led to the basis for geographic information systems or GIS. In the 1970s, landscape architect R.T.T. Forman contributed ideas of landscape mosaics or habitat cores and patches and the need to connect habitats to avoid extinction and to ensure that habitats are large enough for populations to be sustainable.

Despite the development of the fields of ecology and environmental planning, grey infrastructure planning continues to be the norm. However, ***green infrastructure planning*** is beginning to take hold. So why now? Why has the early 21st century given rise to green infrastructure as a new planning paradigm? The answer is both simple and complex, but can be summed up in a word, "sprawl." Sprawl is threatening America's landscape at a rate that is unprecedented. For example, over a 12-year period, population in southern states grew 22.23 percent while the rate of land utilization grew 56.61 percent (*Fulton, Pendall, Nguyen, Harrison: Who Sprawls Most: How Growth Patterns Differ Across the U.S., July 2001*). By the time you finish reading this page, America will have lost another three acres of open space.

At greatest risk are intact forest habitats. Virginia is projected to lose 1 million acres of forest in the next 25 years (VA Dept. of Forestry 2006). Considering that the state's forests currently remove 606,033 tons of pollutants each year, including carbon that leads to global warming, a loss of a million acres is cause for alarm. Moreover, it is not just the number of trees but also the size and health of the forest. Forests are becoming fragmented by roads, houses, power lines and other intrusions which invasive species that out-compete native plants and animals. Forests that are too small cannot support a strong forest economy, nor can they support a diverse mix of species.

To maximize species diversity and health, interior forest dependent species need at least 100 acres of intact, unfragmented forest. Yet, mixed ownership patterns spanning multiple jurisdictions have resulted in a fragmented landscape. The impacts of land parcelization on forest sustainability far exceed the impacts of all other forest threats in the south (USDA Southern Research Station). Seventy percent of land ownerships in the south consist of parcels of less than 100 acres (USDA Southern Research Station or SRS).

Evidence for declining resources abounds nationwide as well. Almost 2 million acres of farmland and half a million acres of private forest are developing each year, leading to loss of species, groundwater declines, climate change and lost recreation and open space. Loss of habitat not only degrades the quality of life and the environment but it also has real economic consequences. Parks, protected rivers, scenic lands, wildlife habitat, and recreational open space support a tourism industry valued at $502 billion annually. Preserving and expanding our natural assets is thus central to sound economic policy.

Our nation's health and food security are also at risk. Consider that lands threatened by imminent development produces 79% of the nation's fruit, 69% of vegetables, 52% of dairy products, 28% of meat, and 27% of grains. Climate change is perhaps the greatest threat to environmental sustainability faced by mankind. While greenhouse gases are proliferating, tools for sequestering carbon – the world's forests – are fast disappearing. Deforestation accounts for 20% of worldwide greenhouse gas emissions.

Although there are major natural resource challenges facing the United States, perhaps the most pressing issue in many people's minds today is the national and global recession. In 2008-09 the United States experienced a major economic downturn. Some have questioned whether we can afford to tackle environmental issues while others have suggested that the U.S. now take this 'opportunity' to position our nation as a leader in green technologies, primarily energy production and conservation. However, in addition to developing new technologies, the downturn can serve as a motivating force for developing land in ways that are more productive, strategic and less impactful. We should be redoubling our efforts to develop in patterns that save resources (e.g. less sprawl patterned development = less roads, less time lost at work due to traffic, less school bus trips, more effective service delivery of fire and rescue etc.) while harnessing the positive outcomes of conserving the key attributes of our natural land assets (sustainable farm and forest economies, viable agritourism opportunities, housing that sells faster and creates healthy communities because it is closer to green space and walkable communities). The economic downturn is a wakeup call to be smarter about our investments; not only in our choices for what stocks to buy but also in where and how we invest in conserving the natural resource assets that provide clean water, clean air, healthy communities, less stress and improved quality of life and a *great return on investment*.

How Can We Act?

The growth of GIS tools and computer modeling are now making conservation planning and landscape protection more accessible and easy to implement than ever before. Yet these tools need to be connected to planning on the ground in order to be most effective. For example, in 2007, Virginia completed a model known as the Virginia Conservation Lands Needs Assessment (VCLNA), an historic and ambitious project to provide Virginia with its first statewide map of intact forested habitats and wildlife and plant community connections. The project has taken several years and involved all state land, water and wildlife management agencies. However, a method for utilizing the data to implement local land conservation plans is missing from this effort. The model does not incorporate local zoning, road and utility plans or local land use plans, such as park and open space plans. Similarly, other large models such as "Two Countries One Forest" -- New Brunswick Canada and five New England states – has difficulty connecting land conservation priorities to the hundreds of local governments that most affect conservation outcomes on the ground.

To make state and regional models viable, we need to apply them at the local level and make them relevant to local needs and we need to ensure they are accessible and easy to use. Models show us only a static view of "what is" but not what will or may occur. Unless the models are linked to local land use planning and strategies, unique habitats and high quality watersheds will not be conserved as there will be no way to apply the models to implement conservation plans at the local level where most land use decisions occur. We need to connect the science and analysis to real planning on the ground.

Based on current projections, Virginia will develop more land in the next 40 years than in the last 400. Unless we create tools to assess and protect our natural and cultural resources now, we will lose the very assets that currently provide a high quality of life for us (VA Outdoors Plan, 2007). Similarly, programs that utilize Purchase of Development Rights or Transfer of Development Rights should use the best possible science in targeting lands for conservation or development. Many of these programs lack any scientific or defensible method for how lands are selected for conservation or growth. Finally, not only do we need to make it easy for localities to use and apply this data, we need to make the case for why they should conduct this planning. In short, we need to make land conservation the basis for land planning at the local level. To do this, we need to identify and overcome the central obstacles to green infrastructure planning.

Local Obstacles to Green Infrastructure Planning:

We believe that there are four questions that define the obstacles to making green infrastructure planning the predominate approach to land use planning at the local level:

#1. **What is Green Infrastructure Planning?** While the concept of green infrastructure has been around for several decades, most local governments are not familiar with the concept of making this approach the basis for their land use planning process.

#2. **Why should we do Green Infrastructure Planning?** Once local governments understand the purpose and principles of green infrastructure planning, the full benefits of taking such an approach must be made clear such as, maximizing economic returns and creating livable communities.

#3. **How do we do Green Infrastructure Planning?** While the concept of Green Infrastructure Planning (GIP) has been around for decades, well-known approaches and methodologies for implementing GIP at the local level are lacking from most local planning efforts. We believe GI approaches and methodologies must be developed in a way that works within the current paradigm of local land use planning. In short these approaches and methodologies need to be designed to replace or be integrated into existing practices, not developed as additional steps that overburdened localities must take on.

#4. **Where do we find the resources to do Green Infrastructure Planning?** Perhaps the biggest long-term challenge to making GIP widespread is dealing with the fiscal challenges faced by local governments. As articulated in #3, one of the keys is to make the process of GIP resource neutral by modifying and replacing existing practices. In addition, there is a need to get greater collaboration across agencies and organizations in order to better manage resources and provide local governments with cost-effective tools to promote GIP.

The Green Infrastructure Center's 2000-2011 strategic plan is designed to address the obstacles to the widespread understanding and use of green infrastructure planning at multiple scales. There are four main goals:

Vision. *To make Green Infrastructure Planning the basis for all local land use planning in order to create resilient and healthy communities.*

> **Goal A: Develop new planning and implementation tools for use by localities, land trusts and other conservation organizations.**
>
> **Goal B: Expand awareness of the need and applications for green infrastructure planning amongst localities and organizations.**
>
> **Goal C: Make the link between green infrastructure planning and public health.**

Proposed Activities 2009-2011

Goal A: Develop new planning and implementation tools for use by localities, land trusts and other conservation organizations.

Objective A1: Develop new green infrastructure planning methodologies.

Problem: Local governments lack the methods and knowledge to create green infrastructure plans. Many small and rural localities do not have access to environmental planning professionals on their staffs and even those that do may not know how to go about creating a green infrastructure plan. As a result they build subdivisions on prime farmland, pave over water recharge areas and fragment forests with roads and power lines, thereby making them too small to support wildlife or silviculture and foreclosing future options.

Solution Approach: *Virginia Green Infrastructure Planning Strategies* *$500,000 or $100,000 per plan*
The *Green Infrastructure Planning Tools for Connected Communities* project will create 5 to 7 field tests to demonstrate how forest, agriculture and watershed protection goals can be implemented through a green infrastructure planning process at the local and regional scales for effective conservation outcomes. The GIC has formed a partnership with the state of Virginia to field test how the new statewide conservation lands model http://www.dcr.virginia.gov/natural_heritage/vclna.shtml can be retooled and applied to local decision making for land conservation. Currently, the Commonwealth of Virginia does not have the tools needed to create locally relevant data tools, nor does the VCLNA offer specific recommendations that localities can follow to implement their own green infrastructure strategies.

Starting in fall 2007, the GIC began a two-year project to field test green infrastructure planning methods. The field tests are being developed for different ecoregions, in different types of landscapes and for different levels of development pressure and land patterns, such as rural, suburban or urban. The GIC will review local zoning and development patterns and show how to conserve important resources by changing regulations, offering voluntary incentives and crafting innovative funding strategies. Maps will be developed for assets, risks and recommended strategies. We are seeking $150,000 to complete the remaining field tests.

Charlottesville City (completed 03/08)

Madison County (completed10/08)

Lynchburg City (completed 12/08)

New Kent County (completion 07/09)

Crater and Richmond Regional Planning Districts – 18 locality region (completion 07/09)

Next: Eastern Shore and the Shenandoah Valley (start spring 09)

Timeframe: Fall 2007 – Summer 2010

Products: In 2009, on-line methods guidance and by 2010, a series of green infrastructure planning methods designed for various ecoregions, landscapes, development patterns and scales. A full methods

guidebook will be available on line. This guidebook will be distributed free to local governments as well as to state and regional planning organizations.

Long term plans: Once green infrastructure methods and planning tools are in place, the GIC will be available to assist localities in crafting their green infrastructure plans if they request help. GIC has already begun serving in an advisory role for a consortium of groups in South Western Virginia who are crafting a green infrastructure plan for the New River Planning District. Fees will be developed on a sliding scale so that localities who are less able to afford services can afford to have assistance. Technical assistance can be tailored to the unique needs of each locality such as, an audit of green infrastructure assets and threats, a review of local policies (comprehensive plan, land use plans and open space plans, zoning and related regulations) and recommended strategies for fixing conflicts and improving coordination, public education and community planning processes, or simply serving as advisors to localities that are creating green infrastructure plan. For those localities that cannot afford to hire the GIC, the GIC plans to create a technical assistance fund that may be tapped to pay for environmental planning.

Based on lessons learned in Virginia, the GIC would like to expand green infrastructure planning to other states. Under a grant from the USDA Forest Service State and Private Forestry Funds, the GIC is researching the green infrastructure planning capacities of the states within the Southern Region. Results will be reported to USDA FS and also serve to inform the GIC's strategic direction for expansion, research and work in the Southern Region. For example, while Kentucky is a state that is rich in green infrastructure, they are at high risk from mining, forest fragmentation and sprawl. They lack a statewide assessment and local models. See objective A3 for GIC's potential role as a networking hub.

Objective A2: Develop and Tap New Technologies for Local Green Infrastructure Planning

Problem: Local governments lack the resources to create green infrastructure plans. They often do not have technical staff and digital tools in house to do a plan. Since green infrastructure planning usually requires the use of geographic information systems, many smaller or more rural localities lack the resources to buy the software, hardware and train staff. Since localities are funded by real estate taxes, many (if not most) rural counties often lack planning staff. In addition, community groups often want to develop their own green infrastructure plans but are ahead of their local governments. Land trusts and other conservation groups also are seeking tools to more effectively evaluate and manage their assets.

Solution Approach: Staff have been researching potential tools such as a green infrastructure wiki where citizens or organizations might be able to upload priority conservation lands, share conservation goals and provide field data. The challenge will be to ensure adequate quality control for data uploaded from multiple sources. In similar on line databases available for public upload of data, such as for Virginia Save Our Streams, volunteers were trained to collect data and a webmaster reviewed and checked the data before it went 'live' to ensure that no garbage data were loaded. Some projects have worked to upload street tree data. Street trees provide are an example of data that are easily collected and verifiable. The GIC proposes to assemble a roundtable of experts to discuss the potentiality of a green infrastructure wiki as well as other software needs that could then inform a research and development proposal to be put forward for funding.

Timeframe: Fall 2009-2010

Products: Since our goal is to build the field of green infrastructure planning and to provide technical assistance, we would propose to create the Wiki site (or other software tool) as open access. It would require staff time to develop protocols that can be used for quality assurance for uploading multiple

types of data. Step one would be to create a roundtable of experts and end users to develop the tool. This is envisioned as a three year process; 2009, assemble national planning roundtable to develop the tool, 2010, launch several beta tests and in 2011, promote the tool.

Long term plans: For the most part, the Wiki tool or other similar tool is envisioned to be self-creating and sustaining. It is possible that there could be advanced technical assistance and subscription services to pay for on-going maintenance and improvements to the data tool. Determining who would do this would be developed as part of the scoping exercise in year one.

Objective A3: Serve as a networking hub for best practices and research.

Problem: The growing popularity of green infrastructure as a planning construct has led to new efforts and projects arising across the country. However, there is no central networking hub where methods, data and planning approaches can be shared. While the Conservation Fund has a case study database that provides valuable examples, it is not a research and methods portal. The GIC has received requests from the South the Midwest and the North Atlantic states for technical assistance. In February 2009, the GIC, along with other organizations, assisted the Region Three of the U.S. Environmental Protection Agency in organizing a mid-Atlantic planning conference concerning research needs and the proposal for establishment of a "community of practice" for the region. Many attendees at the workshop requested assistance with myriad aspects of green infrastructure planning from messenging to network design to planning applications.

Solution Approach: Create a networking hub: <u>$75,000 per year for coordinator, web, travel.</u>
The GIC proposes to assist the EPA in establishing the new community of practice by serving as a regional center for sharing methodologies, research and funding. The GIC would establish an advisory board with representatives from each state and work with agencies to secure funds to hire a full time coordinator. The coordinator would work in partnership with the member states to establish a research agenda for the community of practice and to help facilitate obtaining grants to meet research goals. The scope of work for the coordinator would be established by the advisory board and would likely include tasks such as researching and disseminating best practices, determining knowledge needs and establishing targeted training workshops, managing a web blog or other on-line communication tool, creating web-casts and speaking at conferences and workshops.

Timeframe: Begin in summer 2009 to host a scoping meeting with agencies and partner groups. Develop a job description and work plan, fund the position and begin operations in fall 2009. Continue through 2011 and evaluate future needs and potential for rotation to another host organization.

Long term plans: Eventually the function of a community of practice could be rotating amongst interested groups in the mid-Atlantic or continue to be housed at GIC and funded by contributions of states and partner agencies and foundations. This would be determined in concert with partner groups. The GIC will also be determining its role in the Southern USDA FS region following its assessment of needs and capacities of Southern states in 2009-2010 and evaluating a similar approach for that region if needed.

Goal B: Expand awareness of the need and applications for green infrastructure planning amongst localities and organizations.

Objective B1: Promote green infrastructure planning to localities and local conservation groups.

Problem: All states have planning and zoning enabling legislation, and approximately half of the states require comprehensive planning. All localities use some form of land use controls – subdivision ordinances, zoning, comprehensive planning etc. However, environmental assessments are not required by most localities, and while many assume that comprehensive plans would include the environment, this is often not the case. An environment chapter within the comprehensive plan may simply state that the locality possesses rivers or mountains but say nothing about their extent, qualities or management needs. Virginia requires transportation planning within comprehensive planning but not environmental planning. We plan roads before we have even assessed what key green infrastructure assets should not be bisected by grey infrastructure. We plan for development on our best farmland and pave over water recharge areas needed for future drinking water supplies or for healthy watersheds. Localities are often not aware of the need to base planning first and foremost, on natural assets. We need to make conservation the basis for land planning. To do this, we need to build awareness.

Solution Approach: Green Infrastructure Promotional Tools: $75,000.
We need to both require green infrastructure planning and motivate localities to do this sort of planning. In order to motivate localities to undertake green infrastructure planning they need to be aware of its purpose and benefits. There are a number of activities the GIC would like to undertake to promote green infrastructure planning.

Timeframe: 2009-2011

Products:
Develop *Green Infrastructure Planning Web site:* The GIC has launched a website at www.gicinc.org. To turn this web site from a static site into an interactive data source where users can surf a database of research studies, find projects in their region, participate in blogs and on-line dialogues and watch training materials and post ideas, we need to both redesign our site to add in web-engineered databases to provide fully functioning search engines: **Cost: $25,000.**

The GIC Speaker's Bureau*:* Communicating "person to person" remains one of the most effective ways to spread the word and provide communities with practical tools for green infrastructure conservation. Studies have shown that one-on-one and hands-on education remains the most effective way to communicate messages and influence actions. The GIC receives many requests to speak at conferences and workshops. By funding GIC travel costs, staff can reach more audiences every day. GIC staff have spoken at dozens of local, state and multi-state conferences. However the GIC lacks travel funds to address audiences unless there is funding from the venue. The GIC would like to be more proactive in targeting conferences and regions, but we lack capacity to take advantage of many opportunities. Costs to speak include both travel as well as staff time to develop customized natural resources maps and findings for each region visited. The GIC funded three workshops in 2008 and is seeking continued funds for 2009 to 2011. **Cost (for ten regional trips per year – on-going each year): $10,000.**

***Educational Slide Show with Animated Graphics*:** The GIC has developed a number of educational slide shows for audiences from developers to state agencies to county governments to trail enthusiasts. These slide shows are intended to both convince the viewer of the importance of the issues and to provide tangible steps for them take action. However, the graphic tools and animations needed to

create a slide show with simulations and "before and after" design templates require staff time and design resources. We propose a graphics package (drawing and animation) to increase the effectiveness of our message: **$5,000.**

Educational Brochure and Display: The GIC needs tools to quickly and effectively communicate economic and conservation messages. In just the year of operation we have already presented at 14 workshops. We need to have handouts and educational message tools that people can learn from and take back to their communities. The cost for a full color three panel traveling display and several thousand color brochures: **$10,000.**

GIC training workshop: The GIC proposed to create a training workshop for localities to understand how to implement a green infrastructure planning approach. The GIC has received funds from the Altria Family of Companies to design and implement this day-long course for the Richmond Region in spring 2009. A travelling two-hour module from the day long workshop will also be created and implemented in four counties. GIC will train a local land trust to deliver the green infrastructure module so that they can use it as an on-going tool to build awareness and practice of green infrastructure planning. Workshop and module development and implementation cost: **$25,000.** *(funded)*

Long term plans: Once the above tools have been developed, the only on-going cost would be continuing to give workshops and speeches. This could be funded primarily through charging speaker fees (which would be set at a reasonable rate and made possible by the expanded quality of the new educational tools). The day long workshop and mini-module and related training materials will expand GIC's capacity to deliver training in 2009-2011.

Objective B2: Create legal tools for green infrastructure planning implementation.

Problem: Once localities buy into the idea of green infrastructure planning, the next question is often what are the ordinances and legal tools we need for implementation? The beauty of green infrastructure planning is that it can be integrated within existing planning frameworks. However those frameworks may need to be modified to encompass green infrastructure planning approaches. There are also many planning guides such as, how to write form based codes, but none specifically addresses green infrastructure or how to audit existing regulations to ensure that green infrastructure planning is incorporated throughout all local codes and policies.

Solution Approach: Model Ordinance Development $50,000
We can share as well as develop model ordinances (and policies) for implementing green infrastructure planning. For example, cluster ordinances can be developed such that they foster connections across the landscape between clusters while proffer policies can specifically target green infrastructure protection needs. Model ordinances and sample policies can be developed for state and local levels similar to the on-line library offered through the Center for Watershed Protection for stormwater planning. We would show how green infrastructure is used for programs such as transfer or purchase of development rights programs and develop and publish the text for use in local ordinances. For example, purchase of development rights programs often lack defensible and objective criteria for what assets should be protected and thus best assets are often overlooked. It may be the case that a tract of 100 acres is more valuable to acquire than one that is 200 acres, based on its land uses, location, species mix and watershed function.

Timeframe: 2009

Products: An on-line library of draft ordinance language, case examples and links to related resources.

Long Term Plans: Staff would update the on-line library as new tools and changes to laws enable new planning powers. It is possible that this project could evolve into a planning book or other resource such as a training workshop. In addition we are in dialogue with several groups across Virginia about the need to require environmental chapters in comprehensive plans, just as we now do for transportation. This would require a change to Virginia's state code.

Objective B3: Increase professional capacity for green infrastructure planning though university courses.

Problem: Currently there is no requirement that college planning students learn environmental planning. They may earn a 4 year college undergraduate or 2 year master of planning degree and never take an environmental course. Planners graduating without environmental planning knowledge are not equipped to address environmental issues or plan for resource protection in their future work on comprehensive and land use plans. If they enter the private sector and advise localities on comprehensive plans (since many localities engage outside consulting firms), they will not be equipped to provide sound advice on how to include green infrastructure assets.

Solution Approach: ***Develop College Course Curriculum:*** $100,000
As the source of future planners, GIS technicians, landscape architects and other related disciplines, colleges should be including green infrastructure foci in their respective curricula. The GIC has developed and implemented a university course in green infrastructure planning at the University of Virginia and has field tested the use of the curriculum in Charlottesville (2006) and Madison County, Virginia (2007) and Lynchburg Virginia (fall 2008). Each year, the curricula is expanded based on the class outcomes. To date this has been funded by small $10,000 grants from the Virginia Department of Forestry that pay only for staff time. The GIC would like to expand that curriculum to other universities and create a teaching guide and workshop so that other faculty could implement the course at other Virginia universities and universities in other states. Cost for full development of the teaching guide is $50,000 and a national/regional training workshop is $50,000 for training faculty, facilities and workshop materials for 20-30 faculty.

Timeframe: Summer 2009-2011.

Products: College curriculum guide, slide shows and training workshop.

Long Term Plans: The curriculum would be promoted at state and national conferences. The curriculum could be sold for a nominal fee to pay for updates and reprinting.

Objective B4. Expand access to sound research and information about green infrastructure planning.

Problem: Local government staff, land trusts and volunteer conservation groups often need help in making the case for taking a green infrastructure approach. In order to create ordinances and regulations, localities must base requirements on the best technical evidence. For example, the GIC has received requests from local government staff who want to make the case for why forests should be set aside to protect future drinking water supplies but they are not aware of the literature. They need to document the ecosystem services provided by the forest and show why it is more cost effective to protect the forest surrounding the water supply, than to treat the water later, once it is polluted. Green infrastructure crosses so many different disciplines that it is difficult to find relevant literature such as an

article about the effects of sprawl on salamanders that is published in conservation biology but not in the American Planning Journal, read by most planners.

Solution Approach: On line reference library for of GI planning and ecosystem services: $100,000
There are many studies across the country that put forward claims about the benefits of green infrastructure planning. However, the quality and rigor of these studies varies from in-depth peer reviewed research to grey literature and promotional pieces. Furthermore, some studies are applicable only to certain regions of the country. The GIC proposes to review and organize the existing literature. We will survey existing studies and categorize and cross reference them. This effort can also be utilized to point out gaps in the research that can be used for designing future research needs. By having a list of the existing studies and key findings summarized across the field, local governments, developers and the public will be able to quickly understand and document the benefits of conserving green infrastructure. Researchers will be able to use the findings to generate new research and add to the field. We have already reviewed 75 publications to launch the initial bibliography. To conduct the full literature review we anticipate the need to staff the project with a professional researcher, graduate student and web engineer to custom design the search engine.

Timeframe: 2009

Products: On-line searchable reference library with flexible and pre-established search categories.

Long Term Plans: Once the digital library is created, it is relatively easy to maintain. Once the library is well known, authors will upload their own references. Quality checking the references before approving them for posting takes only a minute per reference (based on staff experience running similar on-line libraries).

Goal C: Make the Link between Green Infrastructure Planning and Public Health.

Objective C1: Create an interdisciplinary planning model and link blue infrastructure and community health.

Problem: Currently there is a growing health crisis worldwide that can be linked to a lack of green infrastructure. Increases in childhood obesity, an alarming increase in early on-set Type II diabetes and a lack of recreation and physical fitness amongst youth are becoming commonplace. Lack of access to clean water – blue infrastructure -- is a known problem internationally with 1.1. billion people in developing nations lacking adequate water access, 2.6 billion lacking in basic sanitation and 1.8 million children who die each year from unclean water. In addition, those who suffer from aids, lack the basic ability to uptake their aids medications because their gastrointestinal tracts have been severely damaged by water borne parasites. As a result, people die sooner, leaving more orphans and ruined economies once productive workers are lost. Studies from UVA's Center for Global Health have also shown that children who drink dirty water are malnourished, are shorter and have lower intelligence quotients. These children will not attain economic success or match their true abilities. Engineering solutions to the problem of polluted water often fail because engineers do not seek to understand social and ecological factors leading to polluted water. In fact, two thirds of water interventions fail within the first five years because they do not take a comprehensive approach to problem assessment and do not include building capacity for long term monitoring and maintenance.

Solution Approach: Community Blue Infrastructure Planning Model: $300,000 for three years

The Green Infrastructure Center is partnering with the University of Virginia Center for Global Health to pilot an innovative multi-disciplinary approach to addressing clean water issues in the Limpopo Province in Northern South Africa. The project involves faculty from the University of Virginia, the University of Venda and the Green Infrastructure Center. The project will demonstrate how by combining multiple disciplines – civil and systems engineering, anthropology, geography, urban planning, chemistry and microbiology and medicine – holistic problem assessments and solutions can be implemented. Faculty and students from both universities have adopted two South African villages and are working with them to assess, solve and implement water pollution solutions. $250,000 has been provided for the planning and assessment phase to the UVA and GIC team. The GIC needs $30,000 a year to fund participation in years 2009 and 2010.

Timeframe: Summer – fall 2008 research design completed, Summer 2009 assessment, Summer 2010 implementation, Summer 2011 evaluation and monitoring.

Products: Water pollution management plans and implemented solutions for three villages and a planning model for assessment, implementation and evaluation for interdisciplinary blue infrastructure planning.

Long Term Plans: This project is intended to serve as a model for other African countries and developing nations. Lessons learned will also be applicable to the United States and the approach will serve as a model for interdisciplinary learning at the University level. This also builds the GIC's capacity to work internationally in the future.

GIC Capacity Building Needs

The GIC has a number of capacity building needs which are not linked to any singular objective but which are important to support the center's work in general. It is hoped that these needs will be funded through individual donors.

GI Technical Assistance Center: We can provide technical assistance to localities at various Levels. We can review existing programs and approaches for effectiveness (e.g. a GI Audit) and research new tools or methods needed by particular regions and develop a response system for pointing localities to local, regional or national resources. We also can help them with problem solving by answering particular questions or problems. This can be handled through a variety of ways such as a phone hotline, website, on-line database of resources and local projects etc. The main cost is staff time to respond to requests. The annual cost per assistance technician to respond to calls and keep website and materials updated or to make a site visit to provide advice to a particular locality is **$25,000.**

New Computer to Analyze GIS DATA: The GIC conducts many high powered computer analyses using data such as satellite imagery, aerial photos, and tools to calculate viewsheds, wildlife corridors as well as to run economic models. This data and their outputs use a good deal of computing power. The GIC needs a new PC desktop with mapping and analysis software: **$3,500**

Graduate Research Associates: The GIC benefits from extensive volunteer labor, including $20,000 worth of volunteer labor in 2007 alone. However, we also want to provide opportunities for graduate student fellowships such that students may gain valuable career experience in an emerging field while also helping the GIC with complex research needs. The GIC has hired a graduate research associate in 2008 and 2009. Cost for 9 month fellowship for 2010: **$7,000**.

GIC Management

The GIC relies on partnerships and collaboration to be effective in leveraging the resources and diverse talents needed to complete its ambitious projects. The GIC has initiated a truly unique model for nonprofit management. The GIC (www.gicinc.org) is able to leverage the staff resources of Ecology and Economics (E^2 Inc.), a national environmental consulting firm (www.e2inc.com). In 2006, E^2 Inc. helped to establish the GIC as a nonprofit 501(c)(3) entity to conduct research into new methods for environmental asset assessment and to provide technical assistance and green infrastructure land planning to localities. E^2 Inc. is particularly interested in promoting green infrastructure approaches since many of the sites they work on have opportunities for habitat restoration and already support rare and endangered species that may need additional protection as sites are returned to public uses.

The GIC and E^2 Inc. are now working collaboratively on several projects to provide services for the restoration and conservation of communities in Virginia. This partnership approach allows the GIC to tap into the 30 E^2 Inc. staff members who include ecologists, geographers, economists and attorneys, landscape architects and planners. This allows the GIC to run a lean operation while utilizing a diverse mix of highly specialized professionals on an 'as-needed' basis. The GIC confers with staff at E^2 Inc. to ensure that projects are developed collaboratively and for maximal resource efficiency. Staff are provided to the GIC at cost.

GIC Board Members 2009:

Mike Hancox
Chair
Chief Operating Officer, E² Inc.
Charlottesville, Virginia

Mike Cook
Vice-Chair
Retired, U.S. Environmental Protection Agency
Falls Church, VA

Richard Roth
Secretary
Professor of Geography, Radford University
Friends of the New River
Blacksburg, VA

Karl Bren
At-Large Member
President, GreenVisions
Program Director, EarthCraft, Virginia
Richmond, VA

Nisha Botchwey
At-Large Member
Assistant Professor, University of Virginia

David Hirschman
At-Large Member
Program Director, Center for Watershed Protection

Susan Reeve
At-Large Member
Principal, Lionfish Consulting

The GIC believes in partnerships to achieve its goals and seeks to learn collaboratively with others. For example, in the Richmond region the GIC's field test is being conducted as a partnership among the GIC and state, regional and local partners. We have a signed cooperative agreement with the **Virginia Department of Conservation and Recreation** to utilize data in the state conservation lands needs assessment for green infrastructure planning. We have a partnership with the **University of Virginia (UVA)** and the **VA Department of Forestry** to develop a green infrastructure planning curriculum. We have met formed a partnership with the **Richmond Regional Planning District Commission (PDC)** for the field test for the regional portion and they will devote staff time. The **Capital Region Land Conservancy**

will help with the project and utilize the outcomes to prioritize lands for conservation easements. **New Kent County** is serving as our local field test locality and they are donating staff time to the project.

Partnerships not only increase the budgetary efficiency of the GIC, but also spread learning opportunities across multiple organizations. In a similar vein, the GIC recently helped to plan a green infrastructure research conference for states in EPA Region III and is a participant in the federal agencies community of practice that meets quarterly in Washington D.C. The GIC also confers regularly with other partners in the conservation field to ensure that efforts are not duplicated and that we can learn from one another. For example, the GIC staff have met with other organizations such as the Conservation Fund and Defenders of Wildlife, to discuss mutual goals and develop opportunities for future collaboration. The goals outlined in this plan reflect the outcomes of those conversations. The GIC has sought to maximize its effectiveness and to fill gaps not being met by other organizations.

GIC Funding

The GIC seeks to ensure that its funding mix is diverse and not overly reliant on any one source. The long term proposed ideal mix for funds to ensure stability of the organization is:

- 50 % foundation and agency funds
- 30 % contracted funds from localities, land trusts and others
- 20 % unrestricted donations from corporations and donors

In 2009 GIC primary funders included:*

- The USDA Forest Service Urban and Community Forestry and the State and Private Forestry Funds
- The Virginia Environmental Endowment
- The Robins Foundation
- The Altria Family of Companies Inc.
- The Southwestern Virginia Green Infrastructure Network
- The University of Virginia
- E^2 Inc.

* The GIC accepts and appreciates donations from individuals and these are not listed here.

Much of the funding in 2009 is helping to build the GIC's capacity to provide technical assistance. In addition, the GIC plans to expand its outreach capabilities based on successful procurement of grants for new activities, such as the animated slide show and reference search engine. Once the GIC has developed its technical planning manual, there will be even greater demand for GIC's services and the cost to the GIC to provide those services will have decreased. The field tests are budgeted at $100,000 each because of the staff time involved in extensive research and model testing. Once the research is completed, it is our hope that green infrastructure plans could be done as a fee for service activity for between $30,000 to $50,000. An investment in growing the GIC's capacity results in free tools for use by hundreds, if not thousands, of localities, while also ensuring that the GIC can deliver high quality services at a reasonable price, using any proceeds to update and disseminate existing GIC resources.

The GIC is not seeking to capture the field of green infrastructure planning, rather we want to grow the field. In addition to building local government capacity to do green infrastructure planning, we would like to see more consulting firms engage in high quality, affordable green infrastructure planning. There

is more than enough demand for this work. The key is to have the knowledge, tools, technical capacity and affordability so that every locality and every private land holder will begin their planning with green infrastructure in mind and consider integration of multiple ecological values and functions for both healthful ecosystem and human communities.

The center's corporate documents are available for inspection at its Charlottesville office. For more information or to comment on this plan please contact

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www.gicinc.org or *info@gicinc.org*

Appendix

GIC Project Implementation Plan 2009 - 2010

Project	**2008** Jan – Dec	**2009** Jan – Mar	Apr - Jun	Jul - Sep	Oct - Dec	**2010** Jan – Mar	Apr –Jun	Jul -Sep	Oct -Dec
Method Field Tests	Madison								
	New Kent	New Kent	New Kent						
		Lynchburg	Lynchburg						
			Accomack	Accomack	Accomack	Accomack	Accomack		
				Valley	Valley	Valley	Valley	Valley	
			SW Va.	SW Va.					
Method Manual					Methods	Methods	Methods		
GI Data Tools Wiki									
GIC Training Workshop									
GIC Speakers									
GIC Slide Show									
GIC Brochure									
GIC Display									
GIC Networking Hub									
Model Ordinances									
On-line references									
GI UVA Classes									
College Curriculum									
Int'l Blue Infrastructure									