KAREN FIREHOCK

STRATEGIC
Green Infrastructure
PLANNING

A MULTI-SCALE APPROACH

STRATEGIC GREEN INFRASTRUCTURE PLANNING

STRATEGIC GREEN INFRASTRUCTURE PLANNING:

A multi-scale approach

By Karen Firehock and R. Andrew Walker
The Green Infrastructure Center Inc.

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PREFACE

This book is a product of many years of work by the Green Infrastructure Center (GIC). The GIC is a nonprofit organization which helps federal, state and local government agencies, conservation groups, land trusts and communities to make better informed decisions about how to balance growth and development with conservation of their highest quality natural assets.

The GIC seeks to ensure that land-use decisions about what to conserve and how to do it are well informed by the best possible data and objective information. Its overarching goal is to focus development into those patterns that maximize resource conservation and economic efficiency.

This book is intended to help people make land management decisions which recognize the interdependence of healthy people, strong economies and a vibrant, intact and biologically diverse landscape. Green infrastructure consists of our environmental assets – which GIC also calls ‘natural assets’ – and they should be included in planning processes. Planning to conserve or restore green infrastructure ensures that communities can be vibrant, healthful and resilient. Having clean air and water, as well as nature-based recreation, attractive views and abundant local food, depends upon considering our environmental assets as part of everyday planning.

While there are other books and guides about the benefits of green infrastructure planning, this book provides practical steps for creating green infrastructure maps and plans for a community. It draws from twenty field tests GIC has conducted over the past eight years to learn how to evaluate and conserve natural resources. These field tests were conducted in a diversity of ecological and political conditions, at multiple scales, and in varied development patterns – from wildlands and rural areas to suburbs, cities and towns.

During these field tests, the GIC determined three things:

- How to create green infrastructure maps that highlight the most significant resources for conservation.
- Steps to integrate those maps into local and regional plans.
- How to communicate the importance of this work to local officials, planners, developers and others.

While we also draw upon outside case studies, the steps and advice offered here are the GIC’s own interpretation of the most effective ways to evaluate and conserve natural assets. We hope our advice and practical tips can help you become even more effective in your work.

ABOUT THE AUTHOR

Karen E. Firehock is the primary author of this book. She is the executive director and co-founder of the GIC and is on the adjunct faculty in the Departments of Urban and Environmental Planning and Landscape Architecture at

the University of Virginia. She has worked in the environmental field for 30 years. In 1999, she became certified as a mediator to help groups realize common visions for their environmental plans. She also served as the national Save Our Streams program director at the Izaak Walton League of America, where she directed stream and wetland conservation and education programs. She has been the recipient of numerous local, state and national awards for her work, such as a National Greenways Award, a Renew America Award, a United Nations Environment Programme Award and a Virginia River Conservationist of the Year Award, among others. She holds a Bachelor of Science Degree in Natural Resources Management from the University of Maryland and a Master of Planning Degree from the University of Virginia.

R. Andrew Walker is the GIS Analyst and Spatial Planner at the GIC. He wrote Chapter Seven which describes tools for green infrastructure mapping and modeling. He specializes in the intersection of geospatial technologies and planning applications, database development, remote sensing for environmental applications, the development of custom GIS models and tools. He manages the GIC's mapping and land planning and provides technical assistance to local governments, regional planning agencies, communities, land trusts and conservation groups. He holds a bachelor's degree in Geography from Arizona State University and a Master of Urban and Environmental Planning degree from the University of Virginia.

SPECIAL THANKS

The GIC wishes to extend special thanks to the many partners and colleagues without whom this book would not be possible. While we cannot thank everyone who has supported the GIC – there have been many – we want to specifically acknowledge the GIC's past and present Board of Directors and the states of Virginia, North Carolina, South Carolina, Arkansas and New York which provided funds and opportunities to build models and field test them. We also want to thank the U.S. Forest Service's Urban and Community Forestry Program as well as the Blue Moon Fund for their sponsorship of this book's development.

Other field tests were funded by the U.S. Environmental Protection Agency's Healthy Watersheds Initiative, the Chesapeake Bay Program, the Virginia Environmental Endowment, the Robins Foundation, the Oak Hill Fund, the Altria Group, Dominion Virginia Power, several planning district commissions, and others. These partners, as well as community members of the regions, counties and towns in which we worked, have made this planning book possible. Many agencies and technical staff -- too numerous to mention here -- provided peer review of our methods and ensured that we utilized the best science in all of our analysis and plans.

INTRODUCTION

Imagine a world where clean water is plentiful, air in our towns and cities is clean and fresh, native species of plants and animals are abundant, access to outdoor recreation is plentiful, natural beauty and verdant landscapes envelop our communities, historic landscapes are well preserved and protected and locally grown food is easily accessible. And imagine that these resources are available to everyone, regardless of income or social status.

While this vision may seem difficult to achieve, it is not impossible. However, it requires greater awareness and more thoughtful attention to how we plan our communities and care for our natural resources. We can have communities that are healthful and people that are healthy – but only if we plan for it. And the time to do that is now.

As far back as 1863, George Perkins Marsh, long considered the father of America's conservation movement, cautioned in his book *Man and Nature* that, "The earth is fast becoming an unfit home for its noblest inhabitant... [and]...to threaten the depravation, barbarism, and perhaps even extinction of the species."

Since Marsh wrote that statement, the United States has come a long way in recognizing the need to actively protect its natural resources. It now has an impressive array of national and local regulations to protect and clean its air, water and soil which compliment voluntary actions, such as reforestation or adopt-a-stream programs. Yet we have been developing landscapes in patterns that are not sustainable over the long term and do not account for the many ecological services provided by forests, wetlands, rivers, aquifers, soils and geology.

Consider the enormously aggregated ecological consequences of more than 39,000 local government entities – counties, municipalities and townships – that are regulating the use of 70 percent of the U.S. land base. At the site scale, add to that those private landowners and consumers who are making decisions about how they develop or manage their land, such as which forest to harvest, where to channel water flow, or how to draw water from a river or aquifer or how to fertilize their lawns. Without offering all these decision-makers a comprehensive understanding of the interconnectedness of our air, water and land systems, we risk taking steps that could inadvertently compromise or damage the present and future health of our environment. Until we see our natural resources as being part of a connected infrastructure that supports our everyday lives by providing clean air, water and soil, we may not recognize the need to actively conserve them.

While most people would prefer to make land-use decisions that restore rather than deplete our environment, land planners and decision makers may still overlook key natural resources. Just as we plan for our gray infrastructure – roads, bridges, power lines, pipelines, sewer systems, and so on – so should we plan to conserve landscapes and natural resources as our 'green infrastructure.'

Green infrastructure is
 “a strategically planned
 and managed network of
 wilderness, parks, greenways,
 conservation easements, and
 working lands with conservation
 value that supports native
 species, maintains natural
 ecological processes, sustains
 air and water resources, and
 contributes to the health and
 quality of life for America’s
 communities and people.”

— Benedict and McMahon

GREEN INFRASTRUCTURE

Green infrastructure can be thought of as the sum of all our natural resources. It includes all the interconnected natural systems in a landscape, such as intact forests, woodlands, wetlands, parks and rivers, as well as those agricultural soils that provide clean water, air quality, wildlife habitat and food. In their book *Green Infrastructure*, Benedict and McMahon defined it as “a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America’s communities and people” (2006).

Conserving green infrastructure is critical to building and sustaining wildlife and human communities that are healthy, both ecologically and economically. For example, American Forests has estimated that trees in the nation’s metropolitan areas contribute \$400 billion in storm water retention by eliminating the need for expensive storm water retention facilities (Benedict and McMahon 2006).

This is *not* a guide about how to stop development or to limit population growth. Rather, it describes the steps a community can take to determine what is important and to develop a rationale for what to protect. Development can then occur in a manner that recognizes and protects the area’s most important landscape resources. This guide presents a way to think about and catalogue a community’s natural assets as its ‘green infrastructure.’ It shows how to evaluate the different natural assets and to prioritize them for long-term stewardship. This guide provides the steps for determining how to *facilitate* development in ways that reduce its impact on the landscape, or to restore environmental functionality where it has been lost. Its application can benefit residents, businesses and government.

AUDIENCE

The intended audience for this book comprises local land-use decision-makers, such as appointed and elected officials (planning commissioners, planning boards, boards of commissioners, boards of supervisors, city and town councils, town or city managers, and staff of planning district commissions or regional government councils); college students and faculty in fields such as architecture, natural resources management, conservation biology, environmental science and landscape architecture; natural resource agencies and professionals (rural and urban foresters, extension agents, game and inland fisheries, wildlife managers and conservation groups); associations that manage significant land holdings (land conservancies and land trusts); homeowner associations charged with taking care of open-space lands; and realtors, developers and builders.

While the above list covers an extremely diverse audience, it includes those people who make decisions on how, when and where to develop and conserve land. It is a challenging audience to address because the level of its members’ knowledge of natural resources and planning regulations

varies greatly. In order to ensure a level playing field for all readers, the book includes several definitions of the field's more common technical terms. Text boxes and sidebars are utilized whenever possible to avoid slowing down the more advanced reader.

This book also includes examples that demonstrate several different approaches to creating green infrastructure plans, as well as examples of the GIC's field tests. It is hoped that this book will spur its users to evaluate, map and conserve their natural assets. Finally, citizens who read this book can use its ideas to educate local officials about the importance of planning to conserve their community's natural assets.

STRUCTURE OF THIS GUIDE

This guide is structured as follows:

In **Chapter One**, we provide an overview of green infrastructure planning, its definitions and a short history of the field.

In **Chapter Two**, we provide the reasons for undertaking a green infrastructure planning process.

In **Chapter Three**, we provide the steps to organize a planning initiative including stakeholder engagement and expert consultation.

In **Chapter Four** we cover steps to evaluate and prioritize natural assets.

Chapter Five provides case examples for mapping natural assets.

Chapter Six includes ideas to build community support for a green infrastructure plan, key messages and options for expanded engagement.

Chapter Seven covers essential data and processes for creating maps.