

QUICKNOTES

Green Infrastructure

Most public officials and community leaders are probably familiar with “gray infrastructure,” the network of roads, sewers, and other utilities necessary to support the growth and development of communities. Green infrastructure (GI) is the network of green spaces that protects natural ecosystems and provides associated benefits, such as clean water and air, to communities. For these reasons, its protection should be a high priority for local governments. Green infrastructure assessment and planning began in the early 1990s with state and regional biodiversity conservation efforts. It focuses on strategic planning to identify and protect forests, wetlands, and other landscape elements that provide critical ecosystem services.

For some, GI includes community “greening,” in which vegetation is used strategically for urban stormwater runoff management and other functions. Greening practices range from planting street trees and rain gardens to installation of vegetated green roofs and planters on high-rise balconies. While these actions are important and provide several types of benefits, true green infrastructure is a broader ecosystems concept.

THE IMPORTANCE OF GREEN INFRASTRUCTURE FOR COMMUNITIES

For communities at all scales, green infrastructure is all about function. At state and regional scales, GI focuses on the network of natural areas that, if converted to development, would eliminate or endanger species of plants or wildlife. At the community scale, GI focuses on the remaining areas of forests and wetlands that are critical to the functioning of local ecosystems. In this way, GI is a complex concept because of the diverse range of ecosystem functions and how these are affected at different scales.

Despite this complexity, many ecosystem functions are scale-independent; therefore, GI is important for communities large and small. Many scientific studies have demonstrated that the loss of GI elements, especially forests and wetlands, significantly degrades local water quality; their loss also results directly in the loss of local habitat. Green infrastructure is widely relevant, evidenced by the many national policy and regulatory programs that protect water quality, air quality, and endangered species. Internet-based ecosystem services calculators can be used to show tangible benefits to communities from GI elements such as forests.

Protecting green infrastructure elements is in the public interest of all communities, as the penalties for environmental pollution of air, water, and land are placed squarely at the feet of local governments. If a forest is not appreciated for its habitat and air quality benefits, including management of atmospheric carbon, it is well understood as a strategic tool for maintaining water quality. Protecting existing green infrastructure should be a higher priority than urban greening practices, because these dispersed efforts are a poor substitute for the broad “ecosystem services” provided by the forest. The challenges for public officials and community leaders, then, are to define their green infrastructure networks and protect them from conversion or degradation.

ASSESSING GREEN INFRASTRUCTURE

Green infrastructure planning starts with a strategic assessment of landscape elements most important for biodiversity conservation. Several state programs for green infrastructure assessment, including those in Florida, Maryland, Oregon, and Massachusetts, provide excellent examples. Because of the integrated nature of its elements, GI assessment identifies “networks” of ecological features, connecting large “hubs” with linear “corridors.” Water quality and habitat are most often enhanced where forests and wetlands intersect, so many GI networks at regional, state, and county levels consist of

*Planning fundamentals
for public officials and
engaged citizens*

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*Large forest patches and riparian corridors
provide critical water quality and habitat
functions, which are important elements
of green infrastructure planning.*



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large forest patches and wetland areas with connecting riparian corridors.

Geographic Information System (GIS) technology is vital in identifying the local GI network and its connection to larger state and regional scales. Planners can obtain basic GIS data layers from state and federal environmental agencies, universities, and conservation organizations if they are not already available at the county level. The most important elements of the local GI network can be identified by mapping the distribution of large forest patches, streams and riparian corridors, wetlands, and publicly owned open spaces and conserved lands. The vulnerability of the GI network to loss from development and conversion can be evaluated by adding local property boundaries and zoning classifications that allow development at intensities greater than three to five units per acre. The potential for expanding elements of green infrastructure such as riparian corridors can also be determined by mapping hypothetical buffers of 100 feet or greater on each side of streams and wetlands and by determining the distance between larger forest patches, wetlands, and undeveloped open space. Staff with experience in GIS analysis can perform these assessments relatively easily.

PROTECTING GREEN INFRASTRUCTURE

Developing a green infrastructure network involves protecting important habitats and the ecosystem functions described above, which is in the interest of local governments. Protecting GI not only helps communities comply with environmental regulations but also adds value to private properties, supporting and maintaining “working landscape” economies including forestry, farming, recreation, and tourism. Open space protection also adds to the fiscal health of communities because it encourages a conservation approach to land-use planning that reduces capital expenditures for infrastructure by avoiding costly sprawl. Baltimore County, Maryland, where successful integration of habitat protection and land-use planning has resulted in a “Nature-Friendly Community” designation by the Consortium on Biodiversity and Land Use, is a leading example of the multiple benefits of protecting green infrastructure. More than 85 percent of the county’s approximately 800,000 citizens live within an urban growth boundary that covers only one-third of the county’s land area. The rural areas protected include two-thirds of the drinking water supply watersheds for 1.8 million residents in the Baltimore region, nearly 60,000 acres of productive farmland, and some of the finest native trout streams in the eastern U.S. The county, second lowest in the region in terms of median household income, has also maintained three AAA bond ratings for many years and has not increased its property tax rate for two decades.

Communities have an extensive set of traditional, accepted tools available for protecting their green infrastructure. Local planners must ensure that the community’s GI is acknowledged through policies in the local comprehensive or master plan, and that its multiple habitat, ecosystem services, and economic benefits are emphasized. The plan should then establish the framework for implementing GI protection. Effective tools include “smart growth” and conservation planning mechanisms such as urban growth boundaries, land preservation programs, conservation zoning, and stream buffer ordinances. Cluster development regulations, transfer of development rights, and similar tools can help provide flexibility for developers to accommodate appropriate intensities of development while assuring that critical habitat and high-function forest and wetland systems are not affected.

COLLABORATION

Just as the benefits of green infrastructure accrue to the whole community, the protection and maintenance of GI are a shared responsibility. Fortunately, green infrastructure is a concept that has been developed and applied widely. Many good resources are available to assist communities, and detailed case study examples exist. Many agencies, universities, and conservation organizations are also available to collaborate or provide advice. Communities are also encouraged to educate citizens about the benefits of green infrastructure and to consider adopting simple indicators to measure the results of conservation planning and the ecosystems services provided. Building a local constituency can help local elected and appointed public officials take the actions needed to assure the long-term protection and benefits of a community’s green infrastructure.

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REFERENCES

1. Published by American Planning Association

Duerksen, Christopher with Suzanne Richman. 1993. *Conservation Ordinances: Land-Use Regulations Go Green*. Planning Advisory Service Report 446. Chicago: American Planning Association.

Schwab, James C., General Editor. 2009. *Planning the Urban Forest: Ecology, Economy, and Community Development*. Planning Advisory Service Report 555. Chicago: American Planning Association.

2. Other Resources

Duerksen, Christopher J. and Cara Snyder. 2005. *Nature-Friendly Communities: Habitat Protection and Land Use Planning*. Washington, D.C.: Island Press.

Benedict, Mark A. and Edward T. McMahon, 2006. *Green Infrastructure: Linking Landscapes and Communities*. Washington, D.C.: Island Press.

Green Infrastructure Community of Practice. The Conservation Fund. Available at www.greeninfrastructure.net.