

COMING TO TERMS WITH GREEN INFRASTRUCTURE

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*Kris Hoellen,
The Conservation Fund*

When using the term "green infrastructure," coastal resource managers may be referring to anything from a street-side rain garden to a statewide land conservation network. And while these examples may technically both be correct, some believe that the phrase has undergone "definition creep" and often means different things to different people.

"A lot of places wouldn't consider rain barrels as green infrastructure," notes Kevin Shafer, executive director of the Milwaukee Metropolitan Sewerage District, which sells rain barrels as part of its green infrastructure efforts. "By defining it and using common terminology throughout the country, we can learn more about it and help get those [green infrastructure] measures in place in a more efficient fashion."

While the term is broadly used, what is commonly agreed upon is

that implementing a holistically conceived green infrastructure program has many benefits. These include improving stormwater and wastewater management, helping to mitigate impacts from natural hazards and adapt to climate change, and providing other ecological and recreational services.

"There's a great deal of benefit in restoring a natural landscape," says Mike Friis, manager of the Wisconsin Coastal Management Program. "In addition to water quality benefits and resolving water quantity issues, we're providing environmental corridors for wildlife and habitat for endangered species. This is a multifaceted approach to dealing with problems."

What is also agreed upon is that implementing green infrastructure—or the blue infrastructure some coastal managers are creating—will not eliminate the need for more traditional "gray" infrastructure.

Defining Moment

While green infrastructure is a fairly new term, the concept dates back over a hundred years to Frederick Law Olmstead, the 19th century founder of American landscape architecture, who believed connected systems of parks and greenways were more beneficial than isolated green spaces.

Coined by Edward T. McMahon, former vice-president of The Conservation Fund and now a senior fellow at the Urban Land Institute, the phrase was trumpeted in a May 1999 report of the President's Council on Sustainable Development, *Towards a Sustainable America: Advancing Prosperity, Opportunity, and a Healthy Environment for the 21st Century*.

In the report, the council defined green infrastructure as "... an interconnected network of protected land and water 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."

In 2006, McMahon and The Conservation Fund's Mark Benedict co-authored, *Green Infrastructure: Linking Landscapes and Communities*, which outlines green infrastructure principles and practices. In it, green infrastructure is defined as "an interconnected network of green space that conserves natural ecosystems values and functions and provides assorted benefits to human populations."

A Natural Approach

For Shafer, green infrastructure means "using a natural approach to try to manage stormwater," which for his Milwaukee agency includes selling rain barrels, creating rain and roof gardens, and implementing the Greenseams Program, where flood-prone properties with hydric soils are purchased and left undeveloped to maximize their water-absorbing capacities.

Robert Christianson, director of the St. Johns River Water Management District's Department of Operations and Land Resources, conducts a similar land-acquisition program in Florida to prevent flooding. "The heart of the matter," he says, "is recognizing that non-structural flood protection has to be one of the keys to our success as water managers."

"Maryland coastal managers are expanding an existing statewide green infrastructure program to better incorporate what they are calling 'blue infrastructure,' or aquatic priorities in the nearshore coastal zone, such as finfish habitat and submerged aquatic vegetation."

"We are creating a framework to identify coastal habitats and areas where conservation and restoration activities can be targeted to maintain and improve coastal resources," says Catherine McCall, natural resource planner for the Maryland Chesapeake and Coastal Program.

Big Picture

"First and foremost, green infrastructure is an *approach* to strategic conservation," explains Will Allen, director of strategic conservation at The Conservation Fund. While it is the preferred strategy of The Conservation Fund, he notes that "there are other approaches to strategic conservation."

For instance, open space planning and ecosystem-based management use different terminology but often have similar holistic goals.

Green infrastructure planning, Allen says, is proactive, systematic, coordinated with other policies, and most importantly, large- or broadscale.

High-Priority Systems

Fundamentally, green infrastructure means working with a broad group of stakeholders—what The Conservation Fund calls establishing a "leadership forum"—to look at existing plans and barriers, and identify high-priority natural resources, such as woodlands, wetlands, rivers, and grasslands.

"Collaboration is the key that helps green infrastructure move forward," notes Shafer. "It's the building block of all this. You need a lot of people to collaborate on how you're going to implement programs, how you're going to pay for these programs, and what the priorities and benefits will be."

The second step is developing a "network design," where the resources are mapped using a geographic information system (GIS) and important habitat and ecosystem functions are identified and connected. Decisions can then be made on where it makes the most sense to conserve lands.

"Developing an interconnected network is the most critical part from our standpoint," Allen says.

Only after that process is complete should the group decide where development and gray infrastructure, such as storm drains and tunnels, should go.

"We don't want haphazard conservation any more than we want haphazard development," says Kris Hoellen, director of The Conservation Fund's Conservation Leadership Network. "What tends to happen in a lot of areas is the focus is on built development, and then they look at where they have natural resources. It should be done together, with the emphasis on proactively looking at natural resources—not managing what's left."

A Matter of Scale

The last step in the green infrastructure planning process, Allen says, is also the one that contributes most to "definition creep."

This step is developing an "implementation quilt," where an array of tools can be implemented, such as installing a rain garden and green roof at the "site scale," developing greenways or hazard mitigation at the "community scale," and maintaining intact forests by doing land acquisition at the regional or "landscape scale."

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“This regional scale is the one we most frequently work at,” Allen says. “That, in essence, is our broad recommendation to coastal managers. Start at the watershed scale and then drill down.”

Green is Good

The green and blue infrastructure programs in Florida, Wisconsin, and Maryland have helped reduce flooding, improved water quality, and are supporting diverse plant and animal populations. Other green infrastructure benefits include enabling valuable natural processes to take place, such as sequestering large amounts of carbon and generating economic benefits through farming, forestry, fishing, and passive recreation.

Adding nearshore resources and habitat—such as submerged aquatic vegetation, oyster bars, tidal wetlands, fish spawning and nursery areas, and shoreline buffers—to green infrastructure efforts will expand the interconnected resource network and help protect coastal communities from storm surge and erosion, says McCall.

Maryland is working to incorporate sea level rise and climate change into strategic land and habitat planning using the state’s green and blue infrastructure networks. McCall says, “This will help identify coastal habitats threatened by sea level rise and will direct management and restoration activities to protect their long-term viability, and will shape policies regarding when and where lands are purchased in areas vulnerable to sea level rise.”

Marrying Green and Gray

With more than 1,881 flood-prone acres conserved in Milwaukee, green infrastructure has been an undeniable success. Friis notes, however, that what has worked best is marrying the green with the gray infrastructure.

“Green infrastructure is a valuable device, but it can be overplayed pretty quickly,” says Christianson, whose St. Johns River Water Management District has conserved 700,000 acres. “It’s important for the citizens of our area to understand the contributions from green infrastructure—and they are many—but we have to maintain [the gray infrastructure] we have, while we continue to increase our green tools.”

“Just lead with the green,” advises Allen. “That’s the best recommendation.” ❖

For more information on The Conservation Fund’s green infrastructure definition and support services, you may contact Kris Hoellen at (304) 876-7462, or khoellen@conservationfund.org, or Will Allen at (919) 967-2223, ext. 124, or wallen@conservationfund.org. For information on Greenseams, contact Kevin Shafer at (414) 225-2088, or kshafer@mmsd.com, Mike Friis at (608) 267-7982, or michael.friis@wisconsin.gov, or Peg Kohring at (269) 426-8825, or pkohring@conservationfund.org. For more information on Maryland’s blue infrastructure program, contact Catherine McCall at (410) 260-8737, or cmccall@dnr.state.md.us. For more information on the St. Johns River Water Management District’s green infrastructure efforts, contact Robert Christianson at (386) 329-4470, or rchristianson@sjrwmd.com.

Helpful Links

For more information on green infrastructure, point your browser to

Green Infrastructure: Linking Landscapes and Communities by Mark A. Benedict and Edward T. McMahon
www.conservationfund.org/pubs_product_list/131

The Conservation Fund’s strategic conservation services
<http://greeninfrastructure.net>

The Conservation Fund’s upcoming green infrastructure courses
www.conservationfund.org/training_education/upcoming_training_courses

The National Oceanic and Atmospheric Administration Coastal Services Center and The Conservation Fund’s course, “GIS Tools for Strategic Conservation Planning”
www.conservationfund.org/course/gis_tools_strategic_conservation_planning

Maryland Shorelines Online
<http://shorelines.dnr.state.md.us>

Green Infrastructure Community of Practice
www.greeninfrastructure.net/content/community-practice

Reserve Creating Fish and Human-Friendly Habitat Restoration in Oregon

In the past, severe storms felled large trees and swept them into rivers, streams, estuaries, and even into the ocean, where they created a variety of natural habitats. For about the past hundred years, the number and size of trees being carried downstream has decreased, and the trees that do make it into the water are often removed to facilitate boating and prevent damage to dams, culverts, and other development.

Returning “large wood” to the natural system has become a well-known method for restoring stream habitat, but a National Estuarine Research Reserve in Oregon has recently used this method to restore juvenile salmon habitat and to develop an environmentally friendly canoe access ramp.

“Large wood in an estuary hasn’t been much on people’s radar screens,” says Mike Graybill, manager of the South Slough National Estuarine Research Reserve in Coos Bay, Oregon. “We’re helping to influence how other people are approaching habitat work in estuaries.”

Getting at the Root

For large wood structures in estuaries, “big trees with the root wads intact are most desirable,” says Craig Cornu, the coordinator of monitoring programs at South Slough. “Whole trees placed in estuarine channels cause scour holes in the channel bottom to form, which combined with the tangle of roots and branches, provide important refuge for fish.”

Graybill notes that the benefits of large trees vary depending on the environment. For instance, large trees provide food and hiding places for a variety of species in a stream or estuarine system and can absorb wave energy along the coast during storms, helping to prevent shoreline erosion.

The goal of large wood restoration is to facilitate and mimic the environment-specific natural processes.

In the estuarine environment, Graybill notes, trees would become stranded. While the trees can and do move around, the function in the estuary is most beneficial “when they are calm and experience relatively little movement.”

Eight Months and Five Hours

A landslide in a local state park near the reserve severely damaged a road, and in order to relocate it, about 60 spruce trees were going to be harvested. The reserve was asked in February of 2004 if it had any beneficial use for the trees. The reserve selected 40 that were between 18 and 38 inches in diameter and averaged about 60 feet long—of adequate size for a large wood juvenile salmon habitat restoration project.

Partnering with the local watershed association, the reserve acquired grant funding and permits, as well as worked with the reserve’s advisory group of researchers and scientists to help finalize the design of the restoration project.

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South Slough National Estuarine
Research Reserve*



By October, the project was a go, and in five hours a large helicopter airlifted all 40 trees from the road construction project and placed them in their assigned locations in the restoration site.

“At \$850 an hour to rent the helicopter and crew, it had to happen quickly,” Cornu says.

Preserving Human Use

In the same area where the large wood restoration project was constructed, a fragile creek bank was often used as a site to launch canoes and kayaks into the shallow tidal waters of South Slough.

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