Green (and blue) Infrastructure Planning in VA

Presentation to Rural Resiliency Forum

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Slide Show Topics

Definitions:
  Resilience
  Green Infrastructure

Benefits of GI Planning

Example: Albemarle

Applications and Discussion
The Green Infrastructure Center helps communities evaluate their green assets to maximize ecological, economic and cultural returns.

We do this by:

- Building landscape models
- Teaching courses and workshops
- Research into new methodologies
- Helping communities create strategies
Some examples of GIC’s work in rural landscapes...

**Albemarle County, VA**
Connecting and conserving intact landscapes to conserve biodiversity, clean water and cultural landscapes.

**Darlington County, SC**
Protecting the cultural of hunting, fishing and farming in a historic landscape of the rural South.

**Accomack County, VA**
Conserving green infrastructure in the face of rising seas and protecting the fisheries of the Chesapeake Bay.

**Ulster County, NY**
Protecting world class ecosystems and water for New York City and towns in the Hudson River Valley.
GIC created state guides and models for green infrastructure planning at the national, state and county scale. Our state guide (left) discusses Virginia’s state green infrastructure model and our national book (right) has a national focus and more urban examples.
Term Origin

Florida coined the term “Green Infrastructure.” in a 1994 report to the governor on land conservation strategies. The intention was to show that natural systems are important components of our “infrastructure.”

They built a state model to find priorities.
Definition: What is green infrastructure?

A map of a city for one of GIC’s projects (left) shows a neighborhood’s gray infrastructure including buildings and roads. Classified high-resolution satellite imagery (right) adds a green infrastructure data layer (trees and other vegetation).
Benefits of Conserving Green Infrastructure

- Preserving biodiversity and wildlife habitat.
- Conserving working lands such as farms and forests, that contribute to the economy.
- Protecting and preserving water quality and supply.
- Providing cost-effective stormwater management and hazard mitigation.
- Improving public health, quality of life and recreation networks.
**Green Infrastructure:** You may have heard of this as raingardens, bioswales or green rooftops. This is *constructed green infrastructure* for stormwater management. EPA added this idea in 2006 to the definition.

The key is to
1) Conserve natural green infrastructure (trees, forests, wetlands)
2) Protect and connect the landscape
3) Build in the least impactful manner
4) Then mitigate impacts with best management practices

*First conservation, then mitigation.*
Trees: the original –best – green infrastructure!

Trees give us cleaner air, shade, beauty and stormwater benefits at a cost that is far cheaper than engineered systems!

Estimates for the amount of water a typical street tree can intercept in its crown, range from 760 gallons to 4000 gallons per tree per year, depending on species.

GIC is studying the role of trees for stormwater management in 6 states and 12 cities. In VA they are Harrisonburg, Lynchburg and Norfolk. VA DOF and USFS fund this work!
What is resilience?

Resiliency has three characteristics:

1) The amount of change the system can undergo and still retain the same controls on structure and function.
2) The degree to which the system is capable of self organization.
3) The ability to build and increase the capacity for learning and adaptation.

In short, identifying what to protect or restore and taking direct action to do so builds resilience!
Green Infrastructure Planning Requires Thinking About How to Connect the Landscape

It’s about connecting the landscape!

Not just key habitat patches but how we connect them!

The more connected the landscape, the more resilient it is!
Who Prefers Interior Forest Cores?

Birds, e.g. cerulean warbler, Scarlet tanager

Mammals, e.g. black bear, bobcat, n. flying squirrel

Amphibians, e.g. spotted salamander
We need to protect habitat cores to conserve ‘interior habitats.’

Take the average tree height e.g. @ 100 feet and multiply by 3 to get edge. Subtract that to learn what remains and whether there is enough area to constitute a core. If smaller, it may still be a key “patch” or “site.”

Interior = Total Area – 3(h)
How we evaluate the quality of habitat cores = Core Metrics

- Total Area & Area of Interior Forest
- Depth of Interior
- Stream Conservation Units
- Rare, Threatened, Endangered species
- Length of Streams Within Interior Forest
- Soil Productivity Index
- Area of Wetlands
- Topographic Diversity
- Area of Surface Water/Aquatic Habitat
- Landscape Diversity
Corridors Connect Cores

The ideal is 100 meters of safe space in the middle and 100 meters of edge.

minimum width = 300 meters wide
Who Can Use the Corridors? (300 meters is ideal...)

- Bear in the forest
- Flying bird
- Ferns
- Flower
- Bee
- Human figures walking
Wildlife Crossings

Rendering of crossing over highway 101 in Agoura Hills, CA. Construction proposed in 5 years: 200’ L by 165’ W.

Crab bridge at Christmas Island, Australia

Design Resources:
https://guides.libraryconnectivity.org/Wildlife_Crossing
When direct corridors are lost, some species can still hop across.
However, sometimes when cores are lost, species may decline.

If cores or patches are too far apart, or if a core is lost, species may become isolated and decline over time.

Isolation = less resilience
Six Steps for Green Infrastructure Planning

1) **Set Your Goals**: What does your community/organization value?

2) **Review Data** – What do we know or need to know, to map identified values?

3) **Map Your Community’s Ecological and Cultural Assets** – Based on the goals established in Step One and data from Step Two.

4) **Risk Assessment** – What assets are most at risk and what could be lost if no action is taken?

5) **Rank Your Assets and Determine Opportunities** – Based on those assets and risks you have identified, which ones should be restored or improved?

6) **Implement Opportunities** – Include natural asset maps in both daily and long-range planning (park planning, comp plans, zoning, tourism and economic development, seeking easements etc)
Virginia Natural Landscape Assessment

A landscape-scale GIS analysis for identifying, prioritizing, and linking natural habitats in Virginia. Download the data for free!

www.dcr.virginia.gov/natural_heritage/vclnagrn.shtml
Green Infrastructure Planning Applications

- Zoning Tools and Comp Plans
- Park and open space planning
- I.d. lands for PDR or TDR programs
- New ordinance development
- Species protection
- Heritage tourism and viewsheds
- Ag and Forestall Districts
- Easements
- Transportation plans: roads/trails
- Land management
Case Example:

Albemarle County, VA
Connecting and conserving intact landscapes to conserve biodiversity, clean water and livability.

GIC has conducted more than 20 projects in VA. Today we will show Albemarle County which received technical assistance from GIC for green infrastructure planning.

Funded by a technical assistance grant from the USDA Forest Service and the Virginia Department of Forestry. Albemarle County matched the grant with in-kind (staff and volunteer hours).
**Albemarle Model:** improves on the state model by creating a finer grained picture – using 1 meter resolution rather than 30 meters.

At 726 square miles, the county is one of the largest in Virginia. We can’t survey every inch of the county – we can model the habitat that is most likely to support native species.
Mapping Process
A landscape from above (complexity!)
Land Cover
Where is the interior habitat?

Identify Distinct Habitat Cores, and Supporting Fragments
Countywide Summary

179 areas meet the criteria for core habitat (> 100 contiguous acres of interior forest)

This area accounts for 44% of forested land in the county

Habitat Fragment = 10 – 99 acres
Small = 100 – 999 acres
Medium = 1,000 – 10,000 acres
Large = 10,000 acres or larger
Dark green = Park  
Pink = Conservation easement  
Orange = Open space use agreement parcels  
Light blue = Water protection ordinance buffers
Cores Will Need to Be Updated
Results help to place site-scale surveys in context

Biodiversity Work Group
Important Sites in Orange
Which Cores are Most Important for Connectivity?
Habitat maps can be used to inform comprehensive plans, transportation plans, economic development plans and more.

**Strategy 4g:** Provide information to potential land subdividers on the importance of protecting habitat when creating lots for development.
Green infrastructure plans connect corridors before development ...
Agriculture Assets in Context
Agriculture Assets in Context
Popular running routes were created by GIC to better represent recreation assets in the county.
Wineries, Cideries, and Breweries

- Can be landscape dependent as people visit them for beverages and views!
- Part of the rural area economy
Drinking Water

• How does the landscape support water quality and drinking water sources?
Historic Resources with Landscape Context

- Rural historic districts
- National Register Sites
- House museums
- Scenic byways
- Scenic rivers
Habitat maps can be used to inform comprehensive plans, transportation plans, industrial development plans and more.

Albemarle County VA is using the maps to inform future growth and development.
Relation to Comprehensive Plan:

Albemarle’s ecosystems and natural resources will be thoughtfully protected and managed in both the Rural and Development Areas to safeguard the quality of life of present and future generations.

**Strategy 4a:** Develop an Action Plan for Biodiversity to protect significant areas of biological importance in the County.

**Strategy 4b:** Regularly repeat the land use/land-cover data-gathering process (as begun in 2009) for the purpose of monitoring landscape changes
Strategy 4a and 4b have now been achieved!

Data and maps have been created to inform the new Biodiversity Action Plan and will inform future updates to the comprehensive plan.

Maps can be used for daily planning in working with landowners and developers to conserve as much intact and connected high value landscape as possible.
CP Obj. 4: Protect the biological diversity and ecological integrity of the County in both the Rural Area and Development Areas.

Locally endangered examples:

- James spiny mussel (Pleurobema collina)
- Northern Long eared bat (Myotis septentrionalis)

Protect RTE + preventing listings!
Protecting Water Supply

Forests also protect surface water sources and aquifer recharge zones and reduce the cost of drinking water treatment.

American Water Works Association found a 10% increase in forest cover reduced treatment costs for drinking water by 20%. (Ernst et al. 2004)

Intact Forests Protect Water Supply and = cheaper water treatment

**CP Objective 1:** Ensure clean and abundant water resources for public health, business, healthy ecosystems, and personal enjoyment by preventing shortages and contamination.
Protecting Air Quality

Forests remove volatile organic compounds, particulate matter and sequester carbon – trees are the lungs of Albemarle County.

Even at the neighborhood scale, trees significantly improve air quality.

Well treed landscapes = healthier communities.
Green Assets = Real Estate $$$

$ Having a park within 1,500 feet of a home increased its sale price between $845 - $2,262 (in 2000 dollars). Economic Benefits of Recreation, Open Space, Recreation Facilities and Walkable Community Design, 2010

$ The larger the park, the more significant the property value increase. (ibid)

Parks = better tax base = $!

$ Large natural forest areas have a greater positive impact on nearby property prices than smaller urban parks or developed parks such as playgrounds, skate parks or golf courses.

Bigger intact forests/natural areas = more $!
Job development

Small companies, especially those that are have well paid and skilled workforce place a strong importance on the “green” of the local environment.  
Crompton Love and Moore, 1997

The creative class: artists, media, lawyers, analysts, make up 30 percent of the U.S. workforce and they place a premium on outdoor recreation and access to nature.  
Florida, 2002

Natural assets attract better paid jobs and thus a better tax base = $
The maps can help inform where future parks might be located based on population centers, need to protect key habitats or species, opportunities to increase recreation or site interpretation.
Heritage Tourism

Heritage Tourists spend – on average – about 2.5 times more than all other types of tourists. They want to hike, see and touch history and they prefer to stay in close to where they visit.

CP Economic Development Strategy 1c: Promote tourism that helps preserve scenic, historic, and natural resources.
Viewshed Protection

For tourism and heritage, identify views where visual character is important.

GIS tools, such as spatial analyst can create a digital elevation model to understand what is visible from where.

While voluntary, more analysis could be conducted. Monticello has worked with local developers to disguise rooftops and minimize building visibility.
Considerations for the Urban Ring

Smaller scales still need open spaces…

In urban areas we focus on:
Trees and woodlots
Habitat patches
Streams and wetlands
Trails and smaller parks

Still can connect to larger networks …

The goal was to protect the rural area and rural economy by encouraging growth in the urban ring and discouraging additional suburban developments in the rural area. And it’s working!
In conclusion ...

Identify the most important assets – high quality ag soils, forests, views, water supply and recharge areas and ensure they are protected (buffer then, change zoning, add incentives, educate the public).

Map the most important habitats and assets first – plan for roads to avoid them and pathways to enjoy them. Adopt maps into your policy documents and add them to your county GIS – use them everyday!

Identify hazards and avoid building in those areas, let nature be your buffer (don’t build in floodplains, avoid steep slopes, cluster development and conserve open space).