# Green Infrastructure Policies and Ordinances

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The mission of the nonprofit
Green Infrastructure Center is to
help communities evaluate their

green assets and manage them to maximize ecological, economic and cultural returns.

# We do this by:

Technical and mapping consulting

Teaching courses and workshops

Research into new methodologies

www.gicinc.org



# What is Green Infrastructure?



At left, Washington DC's gray infrastructure including buildings and roads. Classified satellite imagery at right adds a green infrastructure data layer (trees and other vegetation). Source: American Forests



# Green Infrastructure Planning For A Connected Landscape

It's about connecting the landscape!

Not just key habitats but how we connect them!









# **Traditional Development**



Clustering = setting buildings closer together to conserve green space

Within a subdivision, clustering can add to open spaces and provide an amenity for wildlife and recreation. But which land is protected and how it is connected are critical.



# A problem of clusters that don't look beyond parcel boundaries ...



# Why Do Planners Need Better Information?

They need to have better data for decision making. We tell them:

You don't write blank checks so you shouldn't give away resources without knowing their value. Most people will not choose to be without information when given the choice.

A map of key forests or a green infrastructure map does not make one do something, but it does help with establishing priorities.







# 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 goals established in Step One and data from Step Two.
- 4) Assess Risks What assets are most at risk and what could be lost if no action is taken?
- 5) 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, economic development, easements etc).

# County Scale Demonstration: New Kent

# Set Your Goals: What does your community value?

#### Themes important for the county:

- Forested Lands and Agricultural Soils
- Water Resources and Riparian Habitat
- Ecological Cores for Habitat
- Natural Resource-Based Recreation
- Heritage Resources and Rural Character



# Make goals and objectives specific!

Bad example: Save the water!

Better example:

Select and prioritize intact habitat areas that help buffer surface waters from runoff and also provide wildlife habitat.

From this you can write a mapping rule to give to your GIS staff such as selecting cores of X value within X feet of an open waterbody/stream etc.

You may also rank areas more highly that meet multiple goals, such as those which provide habitat, views from scenic roads and contain historic artifacts.

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

#### APPENDIX A - PROJECT DATA INVENTORY

The following table is an inventory of the spatial data used to develop New Kent County's asset maps.

Data related to the built environment		
Dataset	Source	Description
Transportation	Available county data and VA Department of Transportation	Primary and secondary roads, bridges, driveways, and intersections
Parcels	Available county data	Parcel boundary and associated tax assessment information for each parcel
Buildings and Structures	Available county data	Building and structure polygons and 911 address location points
Zoning	Available county data	New Kent County zoning
Land Cover	VA Department of Forestry	2006 grid (raster image) showing land uses in Virginia
Places	US Geological Survey	Populated and non-populated locations (towns, mountain peaks, schools, etc.)

Data related to the non-built environment			
Dataset	Source	Description	
Water	Available county data, National Hydrography Dataset, National Wetlands Inventory	Rivers, streams, open water (ponds, reservoirs), wetlands, and watershed basins	
Floodplain	FEMA	FEMA designated floodplains	
Soils	U.S. Dept. of Agriculture, Natural Resources Conservation Service	Soil productivity derived from the Soil Survey Geographic (SSURGO) database	
Forest Cover	Virginia Department of Forestry	2006 grid (raster image) showing forested, non-forested and water areas in Virginia	
Elevation	USGS National Elevation Dataset	Topography, elevation, slope, landform can be derived from NED	
Impaired Streams	VA Department of Environmental Quality	2008 303(d) impaired rivers and streams	
Species	VA Department of Conservation and Recreation Division of Natural Heritage and Department of Game and Inland Fisheries	Rare, threatened, and endangered species information is available	

# Map Your Community's Ecological and Cultural Assets – Based on the goals established in Step One and data from Step Two.



# Cores May Need to Be Updated



If a core is developed, the fragmented landscape may no longer constitute a core.

# Method to update cores

 Use existing structure GIS data layers, aerial photography and ecological core GIS data to identify newly constructed structures not accounted for in the model data 2. Add new structures as digital points and compare with aerial photography.



3. Buffer structures that intersect the ecological cores with 100 meter buffers.



- 4. Remove structure buffers from ecological cores.
- 5. Recalculate core acreage, eliminate remaining core fragments below acreage threshold.
- 6. Recalculate ecological integrity score.











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





# Intact Forests = possibility for sustainable timber or wildlife management



loo Feet

Small parcels fragment forest into many owners

Large parcels create contiguous forest blocks

We use local parcel data to determine current and future intactness.

Timber Asset = Contiguous Large Forested Parcels (>25 acres). A wildlife asset = > 100 acres







# 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)





### 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





### **Comprehensive Planning**

Comp Plans should be reviewed annually and updated at least every several years. Generally they provide for ....

"...careful and comprehensive surveys and studies of the existing conditions and trends of growth, and of the probable future requirements of its territory and inhabitants." "...guiding and accomplishing a coordinated, adjusted and harmonious development ...which will, in accordance with present and probable future needs and resources, promote the health, safety, morals, order, convenience, prosperity and general welfare of the inhabitants...

Usually, zoning must be "in accordance" with comprehensive plans – so comp plans should include maps of key natural assets.



### Land Use Controls: Zoning

- States have broad "residual" power to legislate for the health, safety, morals and general welfare of their citizens. Also called the "police powers" and provides the authority for zoning.
- As part of these "police powers" we have the ability to prevent "nuisance."
   Zoning can use the police powers to prevent nuisance.

### Rezoning: Change Rights

- Rezoning sought by landowner to enable them to do something different – must choose an existing zoning class (e.g. change R1 to R3).
- Re-zonings must be in accordance with the comprehensive plan.
- Does your comp plan include key natural assets and areas to conserve?



### PUDs and Proffers

- A Planned Unit Development (PUD) must achieve the following purposes.
- 1. More efficient use of land;
- 2. More efficient use of public facilities;
- 3. More usable open space through structure grouping and other design techniques; and
- 4. Preservation of appropriate natural and /or physical features.

Planned Unit Developments are rezonings. As part of a rezoning, a developer can offer a "proffer" to offset the impact of the rezoning. Proffers can conserve natural assets by adding more open space, connecting to trails.

### **Overlay Zoning**

This is an approach to add additional conditions on top of the underlying zoning. This may be done to protect special natural and cultural assets.

For example:

- Historic Districts
- Streamside Buffer Overlays
- Agricultural and Forestal Districts



### Park and Open Space Planning

Where might future parks be located based on population centers, need to protect key habitats or species, opportunities to increase recreation or site interpretation?



### New Ordinance Development

- Scientific basis for new ordinance development such as:
- Upzoning or downzoning
- Historic districts, landscapes
- Watershed protection e.g. drinking water reservoirs







# Identify Lands for PDR or TDR Programs

Purchase of Development Rights: What land, where and why?

Transfer of Development Rights: Where to send from (sending zone) and to (receiving zone)?







### Meet or Avoid Regulations

- **TMDLs:** Identify areas that may be subject to impairment and protect them to prevent future TMDL's. Use your natural assets maps to indentify areas to restore to mitigate the pollution loadings. Choose practices that will affect runoff such as retain or restore forested stream buffers etc.
- Stormwater Programs: Prevent new stormwater problems and erosion by identifying sensitive landscapes, steep slopes as well as natural assets to retain on site.



### **Viewshed Protection**









### Ag / Forestal Districts

Districts: ✓ Promote contiguous farm and forest lands

✓ Incentive based

✓ Not permanent



Where should the district expand?

Where are opportunities to add stewardship plans in the green infrastructure network?





### Easements

- A voluntary agreement by a landowner to put land into easement, permanent land use protection
- ✓ Carries with the land, in perpetuity
- Reserves rights to the land but generally restricts land to certain uses (e.g. can still farm land but can't convert use to a subdivision)
- ✓ Can reduce tax rate

### Natural Assets Planning at the Site Scale

Sites change focus, but still need to connect to larger scales. May also include restoration.



#### Example Parcel Strategy: strategic conservation

Existing riparian buffer



### Parcel Strategy: strategic conservation

# Conventional Development



### Parcel Strategy Example

Existing riparian buffer preserved by clustering development



### Parcel Strategy: Comparison



	# of Lots	# of Lots
Parcel (acres)	Conventional Development (1 lot/acre)	Clustered Development (1.5 lots acre)
A (32)	26	39
B (38)	30	45
Total	56	84

#### Site level planning to protect water quality



Sites designed to protect and enhance buffer for waterways. Multiple opportunities for water infiltration. Improvements to increase habitats for people, animals, fish.

### Site Scale Example



### A Proposed Rezoning

 The owner considered a conditional rezone to R-5 "Single-Family Residential."

#### Benefits:

- Smaller lots permitted by the R-5 District would lead to a more environmentally friendly design with smaller overall footprint.
- The development would be conditioned (proffered) to provide quality assurance that are not guaranteed by the existing zoning.
- Additional improvements could be set aside within the open area for the benefit of the surrounding residents.

### R-2/R-5 Comparison

Both are consistent with Master Plan recommendation of "Single-Family (Low Density)" – Includes R-1 to R-5.

Same uses/accessory uses permitted.

Density is the difference:

	<u>R-2</u>	<u>R-5</u>
Lot Width:	90 feet	50 feet
Lot Area:	15,000	6,000

The smaller R-5 lots allow for a smaller development footprint at the same density.



ELEVATION C

	R-2	R-5	
Area in Lots:	30.28 ac.	11.59 ac.	
Area in Roads:	4.16 ac.	2.92 ac.	
Open Space:	0.0 ac.	19.88 ac.	

62% reduction 30% reduction

#### Modeling Different Development Scenarios



Adams Park Site

Current development

Scenario 1. Original development plan



Scenario 2. Revised cluster development plan





Scenario 3. Revised cluster development plan with rear Scenario 4. Revised cluster development with 40' 40' of lots protected

protected and low impact development (LID) features

#### Scenario 1: Original development plan



Scenario 1. Original development plan

#### Scenario 2: Cluster development plan



Scenario 2. Revised cluster development plan

Trail examples. Top: Woodchip, gravel or crusher run walking path Bottom: Partially paved walk/bike trail

# Scenario 3: Cluster development plan with rear 40' of lots protected



1-60 hours

Lot section examples. Approx. 110' deep lot with rear 40' protected woodland.

Top: Lot section with required 30' setback from street.

Bottom: Lot section with alternative setback requirement.

\* Alternative to 10' trail easement includes modifying parcels boundaries to accommodate trail within common space

Scenario 3. Revised cluster development plan with rear 40' of lots protected

Developed by Skeo Solutions for the Green Infrastructure Center

# Scenario 4: Cluster development plan with rear 40' of lots protected & LID



Stormwater Mitigation Strategies Top: Rain garden example Middle: Street plantings example Bottom: Alternative street section Scenario 4. Revised cluster development with 40' protected and low impact development (LID) features

\* Alternative to 10' trail easement includes modifying parcels boundaries to accommodate trail within common space

### **Analysis Results**

Scenario	As is	1	2	3	4	
nitrogen (lb/yr)	1.5	90	51.4	46.9	42.3	
phosphorus (lb/yr)	0.2	10.2	5.5	5.2	4.6	
sediment (tons/yr)	0.1	1.1	0.8	0.8	0.6	

Traditional development = 60 x more nitrogen 50% less nitrogen with cluster development



#### % Increased Loading

nitrogen (lb/yr)
phosphorus (lb/yr)
sediment (tons/yr)

What are your opportunities?

- 1) What are your next steps?
- 2) Do you currently have a strategy or plan?
- 3) How will you use the tools from today?



4) How can you share the values of your natural assets with decision makers?
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