

## **APPENDIX A**

Python Script to Convert CAD to Shapefile

The following text is a copy of Python script used to convert CAD data into shapefiles. The Python file can be found on the CD that accompanies this report.

```
#CAD2SHAPE.py
#This Python script was written to convert the Virginia Base Mapping Project (VBMP)
hydrology tiles from CAD into shapefiles.
#To use, create a new Toolbox in ArcToolbox and add this script to it.
#Open the script in ArcToolbox and following the prompts, choose the workspace
#containing the .DGN files and then choose a different workspace for the output
shapefiles.
```

```
#Written by:
# Sara Kidd
# Hampton Roads Planning District Commission
# 723 Woodlake Dr
# Chesapeake, VA 23320
# 757-420-8300
# skidd@hrpdc.org
# April 2005
```

```
from win32com.client import Dispatch
import sys
gp = Dispatch("esriGeoprocessing.GpDispatch.1")
gp.SetProduct("ArcInfo")
```

```
# Load required toolboxes...
gp.AddToolbox("C:/Program Files/ArcGIS/ArcToolbox/Toolboxes/Data Management
Tools.tbx")
```

```
#Set Workspace
gp.Workspace = sys.argv[1]
OutWorkspace = sys.argv[2]
```

```
#Local Variables
seltype = "Polyline"
CAD_Featureclass = "\\Polyline"
CADLayer = "Polyline_Layer"
Filter_Expression = "Layer" = \41\
```

```
try:
```

```
    #Get list of CAD layers
    fcs = gp.ListDatasets()
```

```
    #Reset enumeration so first object is returned
    fcs.reset()
```

```

#Get first feature class name
fc = fcs.next()

#While the CAD name is not empty...
while fc != "":
    #Overwrite if necessary
    gp.overwriteoutput = 1

    #Assign workspaces
    fciw = sys.argv[1] + "\\\" + fc

    #Process: Make Feature Layer from CAD
    gp.MakeFeatureLayer(fciw + CAD_Featureclass, CADLayer, "", ,
OutWorkspace)

    #Process: Copy the new features to another directory
    gp.CopyFeatures_management(CADLayer, OutWorkspace + "\\\" + fc)

    #Go to next CAD layer
    fc = fcs.next()

except:
    gp.AddMessage(gp.GetMessages(2))
    print gp.GetMessages(2)

```

## **APPENDIX B**

### Stakeholder Worksheets

## Analytical Hierarchy Process (AHP)

### Weighting GIS Model Criteria Exercise - Habitat

#### Data layer key

LU: Land Use

RA: Riparian Areas

WL: Wetlands

VC: VCLNA Cores

IMPORTANCE LEVEL	RATING
Extremely less important	1
Very strongly to extremely less important	2
Very strongly less important	3
Moderately to strongly less important	4
Equally important	5
Moderately to strongly more important	6
Very strongly more important	7
Very strongly to extremely more important	8
Extremely more important	9

#### Natural Resource Perspective Response

Fill in the blanks with the appropriate importance level from the above table as it relates to the following statement:

“When identifying areas that are suitable for the protection of critical habitat...”

- (LU vs. RA) — *Land use* is \_\_\_\_\_ than *riparian areas*.
- (LU vs. WL) — *Land use* is \_\_\_\_\_ than *wetlands*.
- (LU vs. VC) — *Land use* is \_\_\_\_\_ than *VCLNA core areas*.
- (WL vs. RA) — *Wetlands* are \_\_\_\_\_ than *riparian areas*.
- (VC vs. RA) — *VCLNA Cores* are \_\_\_\_\_ than *riparian areas*.
- (VC vs. WL) — *VCLNA Cores* are \_\_\_\_\_ than *wetlands*.

## Analytical Hierarchy Process (AHP)

### Weighting GIS Model Criteria Exercise – Water Quality

#### Data layer key

LU: Land Use

RA: Riparian Areas

WL: Wetlands

VC: VCLNA Cores

IMPORTANCE LEVEL	RATING
Extremely less important	1
Very strongly to extremely less important	2
Very strongly less important	3
Moderately to strongly less important	4
Equally important	5
Moderately to strongly more important	6
Very strongly more important	7
Very strongly to extremely more important	8
Extremely more important	9

#### Natural Resource Perspective Response

Fill in the blanks with the appropriate importance level from the above table as it relates to the following statement:

“When identifying areas that are suitable for the protection of water quality...”

- (LU vs. RA) — *Land use* is \_\_\_\_\_ than *riparian areas*.
- (LU vs. WL) — *Land use* is \_\_\_\_\_ than *wetlands*.
- (LU vs. VC) — *Land use* is \_\_\_\_\_ than *VCLNA core areas*.
- (WL vs. RA) — *Wetlands* are \_\_\_\_\_ than *riparian areas*.
- (VC vs. RA) — *VCLNA Cores* are \_\_\_\_\_ than *riparian areas*.
- (VC vs. WL) — *VCLNA Cores* are \_\_\_\_\_ than *wetlands*.

## **APPENDIX C**

AHP Worksheet

The following is a portion of the spreadsheet that was used to average the responses of the natural resource agency stakeholders during the AHP exercise. There were nine participants in total. This spreadsheet represents the habitat protection perspective. This spreadsheet was adapted from the spreadsheet available as supplemental material with Berry's online book, [Map Analysis](#).

Participant #1					
<b>Step 1: Complete matrix calculating reciprocal values</b>					
<i>More important than --&gt;</i>	<b>LU</b>	<b>RA</b>	<b>WL</b>	<b>VC</b>	
<b>LU</b>	<b>1</b>	8	7	5	
<b>RA</b>	<b>0.125</b>	<b>1</b>	<b>0.167</b>	<b>0.143</b>	
<b>WL</b>	<b>0.143</b>	6	<b>1</b>	<b>0.167</b>	
<b>VC</b>	<b>0.200</b>	7	6	<b>1</b>	
<b>Step 2: Sum column values</b>					
<i>More important than --&gt;</i>	<b>LU</b>	<b>RA</b>	<b>WL</b>	<b>VC</b>	
<b>LU</b>	<b>1</b>	8	7	5	
<b>RA</b>	0.125	<b>1</b>	0.167	0.143	
<b>WL</b>	0.143	6	<b>1</b>	0.167	
<b>VC</b>	0.200	7	6	<b>1</b>	
	<b>1.468</b>	<b>22.000</b>	<b>14.167</b>	<b>6.310</b>	
<b>Step 3: Divide matrix values by column sums</b>					
<i>More important than --&gt;</i>	<b>LU</b>	<b>RA</b>	<b>WL</b>	<b>VC</b>	
<b>LU</b>	<b>0.68</b>	<b>0.36</b>	<b>0.49</b>	<b>0.79</b>	
<b>RA</b>	<b>0.09</b>	<b>0.05</b>	<b>0.01</b>	<b>0.02</b>	
<b>WL</b>	<b>0.10</b>	<b>0.27</b>	<b>0.07</b>	<b>0.03</b>	
<b>VC</b>	<b>0.14</b>	<b>0.32</b>	<b>0.42</b>	<b>0.16</b>	
	1.00	1.00	1.00	1.00	
<b>Step 4: Sum row values</b>					
<i>More important than --&gt;</i>	<b>LU</b>	<b>RA</b>	<b>WL</b>	<b>VC</b>	
<b>LU</b>	0.68	0.36	0.49	0.79	<b>2.33</b>
<b>RA</b>	0.09	0.05	0.01	0.02	<b>0.17</b>
<b>WL</b>	0.10	0.27	0.07	0.03	<b>0.47</b>
<b>VC</b>	0.14	0.32	0.42	0.16	<b>1.04</b>
	1.00	1.00	1.00	1.00	
				Min=	0.17
Note: Complete steps 1-4 for each participant, then average the weights and determine the minimum value for calculating the overall weights (step 5).					
<b>Average LU for all participants</b>		<b>0.26</b>			
<b>Average RA for all participants</b>		<b>0.02</b>			
<b>Average WL for all participants</b>		<b>0.05</b>			
<b>Average VC for all participants</b>		<b>0.12</b>			

<b>Step 5: Divide each weight by the minimum weight</b>					
		<b>Weights</b>			
LU	0.26	<b>14.13</b>			
RA	0.02	<b>1.00</b>			
WL	0.05	<b>2.83</b>			
VC	0.12	<b>6.28</b>			
Minimum =	<b>0.02</b>				
Sum=		<b>24.24</b>			

## **APPENDIX D**

Video Script

# “Make the Connection! Green Infrastructure for the Future of Hampton Roads” Video Script

Video	Audio
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Opening montage of NN park (people), birds flying, North Landing River</li> </ul> <p>Aerials:</p> <ul style="list-style-type: none"> <li>❑ Shots of intact natural systems               <ul style="list-style-type: none"> <li>○ Digital Orthos: South end of False Cape State Park, Plum Tree Island south to pick up Factory Point.</li> </ul> </li> </ul>	<p>The natural environment provides us with a host of benefits and services: it protects human health; it enhances our quality of life; and it provides habitat for wildlife.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Newport News Reservoir shots – dog walkers/birds and squirrel</li> </ul>	<p>Networks of green space provide a greater variety of outdoor recreational opportunities to our communities, and unbroken habitat supports healthier wildlife populations. These green space networks, incorporating trees and plants that help to clean the air and water, are the building blocks for stronger, healthier communities.</p>
<ul style="list-style-type: none"> <li>❑ Shots of urban development               <ul style="list-style-type: none"> <li>○ Digital Orthos of natural systems interrupted by development</li> <li>○ Video of Newmarket Creek</li> </ul> </li> </ul>	<p>But as land development takes place, natural areas become fragmented and lose the ability to provide these valuable services.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Gloucester Point – subdivisions</li> </ul> <p>Aerials:</p> <ul style="list-style-type: none"> <li>❑ Gloucester Point</li> </ul>	<p>Urban, suburban and rural development patterns all contribute to this fragmentation.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Pungo Ferry Bridge – subdivisions</li> <li>❑ Warwick River – Condos</li> <li>❑ Coliseum – Convention Center</li> </ul>	<p>In Hampton Roads, new residential development continues to expand from the urban central cities to surrounding rural communities. When the region’s robust commercial and institutional construction is also considered, the pressures of development on natural areas become clear.</p>

<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Coliseum shots – traffic</li> <li>❑ Gloucester Point – Amoco plant</li> </ul> <p>Photos:</p> <ul style="list-style-type: none"> <li>❑ General construction (Transportation)</li> </ul>	<p>A city, county or state would never build a road, water or electrical system piece by piece, with no advanced planning or coordination between different system components and jurisdictions. These built infrastructure systems are planned, designed and financed far in advance of their actual use. We should plan, design and invest in networks of green space following the same principles and approaches that are used for traditional infrastructure.</p>
<p>Aerials:</p> <ul style="list-style-type: none"> <li>❑ Port Warwick, Newport News</li> <li>❑ Downtown Norfolk</li> <li>❑ Town Center, Virginia Beach</li> </ul>	<p>Just as road networks and utility networks are dependent on interconnection, green space networks are most functional when highly interconnected</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ North Landing River from bridge</li> </ul>	<p>A new approach to natural resource protection and management is emerging to address these pressures and maximize human and ecological benefits. This approach is known as Green Infrastructure.</p>
<ul style="list-style-type: none"> <li>❑ Digital Ortho of York River State Park Area.</li> </ul>	<p>As the name implies, Green Infrastructure involves identifying critically important natural features and protecting them as part of an interconnected system.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Gloucester – wooded shoreline</li> </ul> <p>Aerials:</p>	<p>Often these systems include hubs, which are large unbroken natural areas, and spokes, which are the corridors that connect the hubs.</p>
	<p>Both the environment and human health benefit from protection and conservation of this type of a linked system.</p>
<ul style="list-style-type: none"> <li>❑ Image of words →</li> </ul>	<p>So what is Green Infrastructure?</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Southampton County – Nottoway River</li> </ul> <p>Aerials:</p> <ul style="list-style-type: none"> <li>❑ Southampton County forest</li> </ul>	<p>Green Infrastructure is our region’s natural life support system –</p>

<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Southampton County – Birds</li> <li>❑ Colonial Parkway – wetlands/mud flats</li> <li>❑ Hampton – Newmarket Creek wetlands</li> </ul>	<p>An interconnected network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas;</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Newport News Reservoir – people walking</li> </ul>	<p>Greenways, parks and other conservation lands;</p>
<p>Photos/stock footage:</p> <ul style="list-style-type: none"> <li>❑ Farming equipment operating near forest edge</li> </ul>	<p>Working farms, ranches and forests;</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Coliseum/Nottoway/Newport News Reservoir – birds</li> </ul>	<p>And wilderness and other open spaces that support native species, maintain natural ecological processes, sustain air and water resources and contribute to the health and quality of life for communities and people of Hampton Roads.</p>
<p>Photos:</p> <ul style="list-style-type: none"> <li>❑ Stormwater rushing into river over lawns, flood waters threatening houses protected only by lawns</li> </ul>	<p>Green infrastructure preserves and enhances water quality through flood control and storm water management.</p>
<p>Photos:</p> <ul style="list-style-type: none"> <li>❑ Show animals crossing roads in subdivisions</li> </ul>	<p>Green infrastructure prevents habitat fragmentation and unnecessary wildlife encounters.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ The Preserve – General</li> </ul>	<p>Green infrastructure also improves quality of life. It can enhance the appearance of a community, which in turn can enhance nearby housing values and help attract business.</p>
<p>Photos/Aerials:</p> <ul style="list-style-type: none"> <li>❑ Chesapeake Bay general views</li> </ul>	<p>Establishment of a green infrastructure network will also help keep pollutants out of the Bay and other waters, help Hampton Roads meet the goals of the Chesapeake Bay 2000 Agreement, and may help to avoid additional regulations to protect Bay tributaries.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>❑ Pungo Ferry Bridge – General sweep</li> <li>❑ Pungo Ferry Bridge – North Landing shore with birds</li> <li>❑ Pungo Ferry Bridge – Boaters on</li> </ul>	<p>In Hampton Roads, the basis for such a Green Infrastructure program is already in place. The Southern Watershed Area Management Program, or SWAMP, grew out of a cooperative effort between the Hampton Roads Planning District Commission, the cities of Chesapeake and Virginia Beach and the</p>

<p>North Landing River</p> <p>Text:</p> <p>Add <u>Hampton Roads Planning District Commission, City of Chesapeake, City of Virginia Beach, and the Virginia Coastal Zone Management Program</u> as they are read.</p>	<p>Virginia Coastal Zone Management Program. In an effort to protect and enhance the natural resources, sensitive lands, and water supplies of the Southern Watershed Area, which encompasses the Back Bay, the Northwest River, and the North Landing River, this multi-agency, multi-jurisdictional partnership explored development of a Special Area Management Plan. The project was funded through the Virginia Coastal Zone Management Program.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>□ Pungo Ferry Bridge – Intact riparian forests</li> </ul>	<p>The SWAMP program helped identify areas of high value that should become part of a conservation corridor network. And the need for it is becoming more apparent...</p>
<ul style="list-style-type: none"> <li>□ SWAMP graphic – corridor map</li> </ul>	<p>A network of protected lands has the potential to provide a broad range of benefits and services to the growing Hampton Roads population and will contribute greatly to the region's quality of life.</p>
<ul style="list-style-type: none"> <li>□ Graphic of SWAMP with HRPDC logo...aerial of Oceana...Southern Watershed views</li> </ul>	<p>Through the Southern Watershed Area Management Program, a set of conservation corridors was identified. The corridor system has since been used in comprehensive planning efforts and the creation of a Purchase of Development Rights program in Chesapeake. Both of these efforts help to save valuable natural areas from development by directing building to other areas.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>□ Pungo Ferry – southern views</li> </ul>	<p>Conservation corridors are also places that accommodate wetlands creation when it becomes necessary to compensate for wetlands impacts.</p>
<p>GIS/Maps:</p> <ul style="list-style-type: none"> <li>□ Conservation corridors – general</li> </ul>	<p>Expanding on the Conservation Corridor system developed through SWAMP, a Regional Conservation Corridor plan for Hampton Roads is under development. The goal of this project is to identify a corridor system that provides opportunities for multiple benefits, including habitat protection, water quality protection, storm water management, wetlands mitigation, and human use and recreation. The corridor system also identifies opportunities for linkage across jurisdiction boundaries and within individual localities. Geographic data for the Hampton Roads area has been used to analyze and overlay important natural features.</p>
<p>GIS/Maps:</p> <ul style="list-style-type: none"> <li>□ Conservation corridors – Suitability and Opportunities layers in succession</li> </ul>	<p>This map of potential conservation corridors in Hampton Roads contains two layers of information, the Suitability for Conservation layer and the Opportunities for Connectivity layer. The Suitability</p>

	<p>for Conservation layer contains three components. Areas highly suitable for water quality protection are shown in blue, areas highly suitable for habitat protection are shown in green, and areas where both of these attributes overlap are shown in gray. The Opportunities for Connectivity overlay is shown in red. This map layer is intended to highlight areas where it may be possible to create linkages between important natural features on the landscape. Opportunities have been highlighted in both urban and rural areas. The type of linkages that are possible and the functions served will differ depending on the degree of urbanization, existing land use and future land use.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>□ Montage of housing and agriculture</li> </ul>	<p>Together, the SWAMP program and the Regional Conservation Corridor planning effort are providing tools to help local governments have a positive influence on land development patterns through consensus building, through local comprehensive planning efforts, land acquisition programs and development regulations.</p>
<p>Photos:</p> <ul style="list-style-type: none"> <li>□ Clean the Bay Day...other stewardship</li> </ul>	<p>You too can do your part to contribute to a Green Infrastructure network in Hampton Roads.</p>
<p>Photos:</p> <ul style="list-style-type: none"> <li>□ Homeowners planting trees in yard</li> </ul>	<p>Homeowners can replant corridors and buffers in their own back yards to help connect green infrastructure networks</p>
<p>Photos:</p> <ul style="list-style-type: none"> <li>□ Farmers planting trees alongside tilled fields</li> </ul>	<p>Farmers can receive incentive payments for installing specific conservation practices like planting permanent vegetation on their idle, highly erodible farmland.</p>
<p>Video:</p> <ul style="list-style-type: none"> <li>□ Nova Chemicals buffer</li> </ul> <p>Photos:</p> <ul style="list-style-type: none"> <li>□ Nova Chemical tree planting</li> </ul>	<p>And business and industry can sponsor or participate in programs that help restore or establish buffers in their communities.</p>
<ul style="list-style-type: none"> <li>□ People reviewing documents with officials/attorneys</li> </ul>	<p>Conservation easements are another way to help. They provide landowners with a legal way to protect natural habitats on their property from unwanted development, without giving up ownership. Owners who participate in this program may also be eligible for a tax deduction.</p>

<p>Video/photo montage:</p> <ul style="list-style-type: none"> <li>❑ Downtown Norfolk</li> <li>❑ Hampton Coliseum</li> <li>❑ Yorktown or Gloucester subdivisions on the water</li> <li>❑ Southampton agricultural canal w/ geese</li> </ul>	<p>Working together we can help to preserve the natural heritage of Hampton Roads.</p>
<ul style="list-style-type: none"> <li>❑ HRPDC logo</li> </ul>	<p>This program was produced by the Hampton Roads Planning District Commission, a regional organization representing the sixteen local governments of Hampton Roads, Virginia. With a focus on the quality of life in Hampton Roads, the HRPDC provides regional vision, leadership, and innovation in the fields of physical and environmental planning, transportation, and economics.</p>
<ul style="list-style-type: none"> <li>❑ Coastal Program/NOAA logos/graphics <u>on white background or clear on photos/video</u></li> </ul>	<p>Funding for this program was provided in part by the Virginia Coastal Zone Management Program and the National Oceanic and Atmospheric Administration.</p>
<ul style="list-style-type: none"> <li>❑ Coastal Program/NOAA PDC logos/graphics</li> </ul>	<p>Through funding from NOAA, the Virginia Coastal Zone Management Program supports projects that promote coastal resource protection, sustainable use, and coastal management coordination.</p>
<ul style="list-style-type: none"> <li>❑ Graphic of Virginia's coastal zone/logo and the HRPDC logo</li> </ul>	<p>The Virginia Coastal Zone Management Program: Protecting and Restoring our Coastal Ecosystems, Strengthening our Coastal Economy</p>
<p><b>Include as on-screen text only (no voice over):</b> This report was funded in part by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NAO4NOS4190060 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its sub agencies.</p>	

## **APPENDIX E**

PowerPoint Presentations

## Hampton Roads Conservation Corridor Study Natural Resources Stakeholder Meeting

Eric Walberg  
Sara Kidd

September 19, 2005



## Project Review

- Obtained grant from the Virginia Coastal Program based on the success of the SWAMP project
- Will work with all localities in the HRPDC to develop a corridor system that fits with local planning goals
- Corridor is framework to prioritize and potentially link several categories of open lands

## Goals for the Project

- Determine local planning needs
- Identify a corridor system that provides multiple benefits:
  - Habitat protection
  - Stormwater management
  - Wetlands Mitigation
  - TMDL & Tributaries Strategy compliance
  - Comprehensive Planning
  - Recreation/Tourism
- Provide GIS mapping of corridor system to localities
- Educate public on benefits of the corridor system

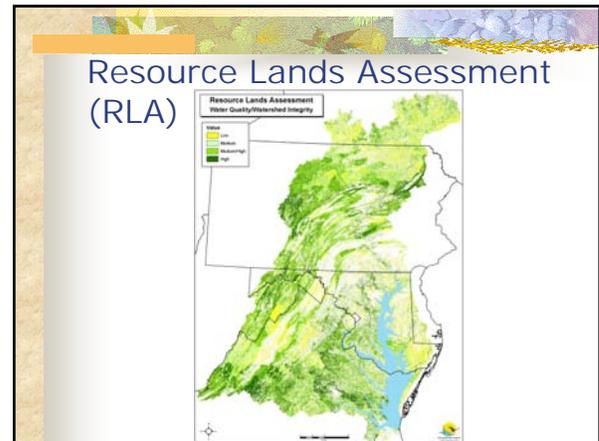
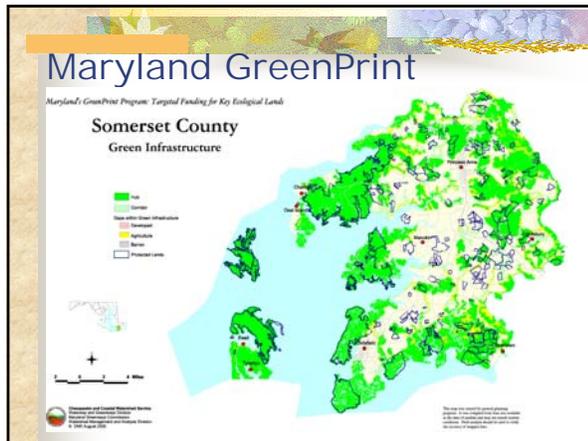
## Stakeholder Input

- Review initial model output
- Discuss and refine priorities for the conservation corridor system
- Review maps and reports and provide comments

## Examples of Green Infrastructure Projects

## Southeastern Ecological Framework





## Data Layers

- ## National Land Cover Dataset (NLCD 2001)
- Produced by USGS beginning in 2001 through 2006
  - Terrain corrected Landsat imagery classified into land use/land cover
  - Only way to get consistent land use/land cover data for a large region

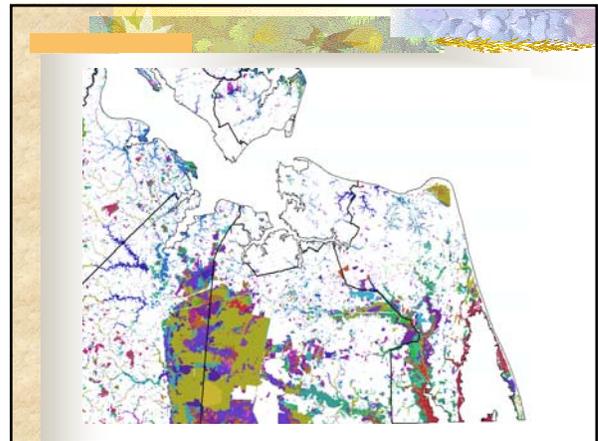


- ## Riparian Corridors
- Developed from the products of the Virginia Base Mapping Project (VMBP)
  - Data is from 2002
  - Hydrology was extracted from DTM (digital terrain model)
  - Created buffers in GIS of 100, 200, 300, 400, and 500 feet around features identified as streams, shorelines, and swamps



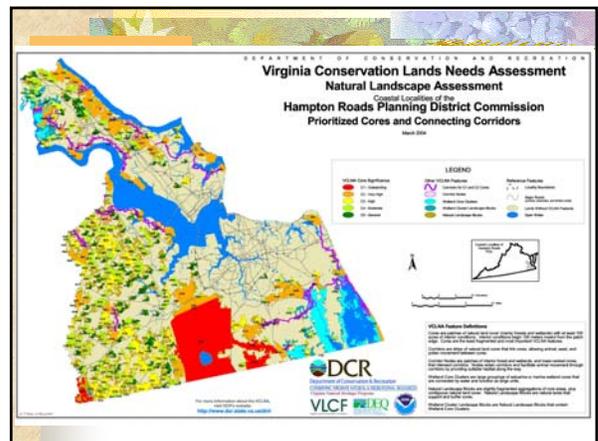
### National Wetlands Inventory

- Produced by US Fish & Wildlife Service
- Extracted from interpretation of aerial photography over several years
- Updated infrequently



### VCLNA Cores

- A landscape-scale GIS analysis for identifying, prioritizing, and linking natural habitats in Virginia
- Interior patches of forest greater than 100 acres - "cores"
- Cores were prioritized as 1-5 using several data sources such as species and stream data



# Suitability Analysis

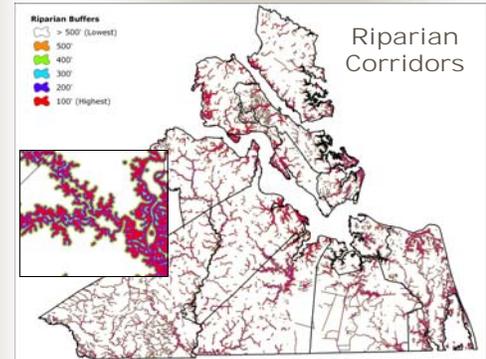
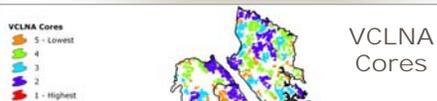
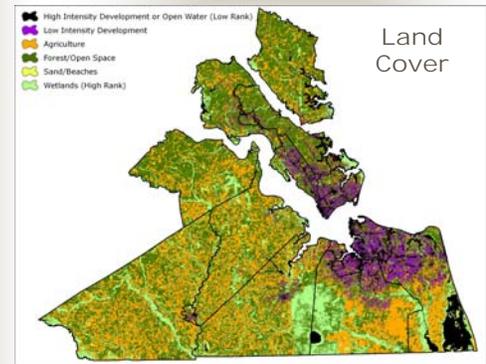
## Suitability in GIS

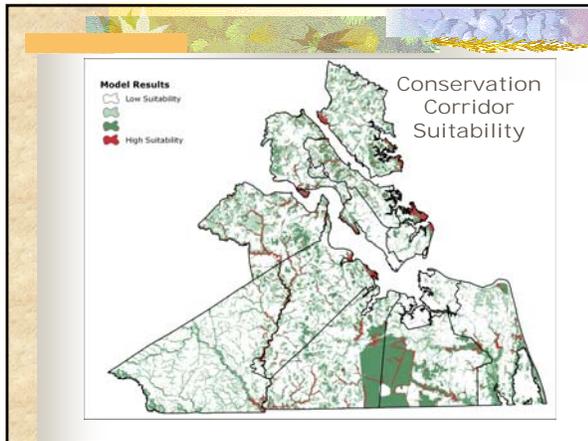
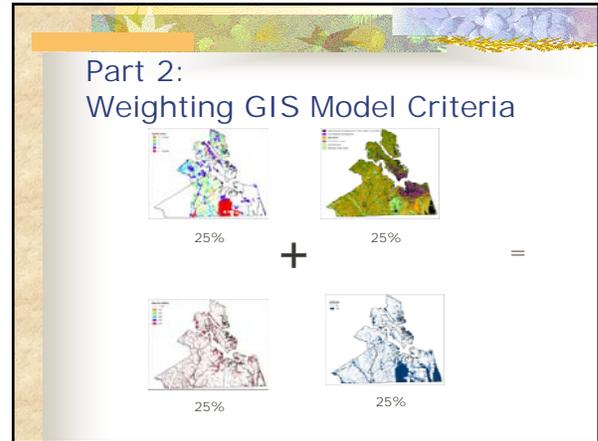
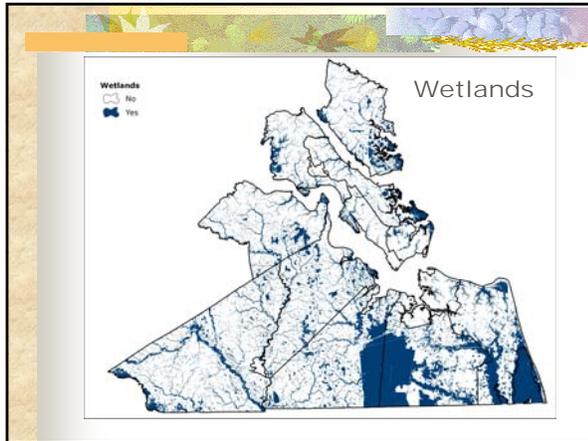
- Two steps:
  - Ranking (calibrating) GIS model criteria
  - Weighting GIS Model Criteria
- Use raster datasets

1	2	4	1: Residential
1	4	4	2: Water
3	3	3	3: Forest
			4: Wetlands

## Part 1: Ranking Model Criteria

- Prioritizing the selected attribute within the individual data layer
- Each cell in a raster layer is assigned a number 1-9 for the attribute of interest
- 9 = most suitable; 1 = least suitable
- Sometimes consolidating categories is required





- ### Today's Exercise
- Open discussion
    - Current process
    - Future data layers
    - Other issues
  - Analytical Hierarchy Process (AHP)
    - A more sophisticated weighting technique
    - Create two corridors
      - Habitat perspective
      - Water quality perspective

- ### Analytical Hierarchy Process
- A quantitative method for ranking decision alternatives by developing a numerical score to rank each alternative based on how well each alternative meets the decision maker's criteria
  - Results used in GIS suitability models

- ### Analytical Hierarchy Process
- Each participant will compare importance of each data layer to the others and score that relationship
- “When identifying areas that are suitable for conservation, land use is \_\_\_\_\_ than wetlands.”
- | IMPORTANCE LEVEL                          | RATING |
|---|--------|
| Extremely less important                  | 1      |
| Very strongly to extremely less important | 2      |
| Very strongly less important              | 3      |
| Moderately to strongly less important     | 4      |
| Equally important                         | 5      |
| Moderately to strongly more important     | 6      |
| Very strongly more important              | 7      |
| Very strongly to extremely more important | 8      |
| Extremely more important                  | 9      |

## Analytical Hierarchy Process

- Responses are entered into a spreadsheet and are averaged
- Relative weights are calculated for each data layer
- GIS analysis is run with the results of the AHP weighting to produce map of corridor

## What's Next

- Local government groups will use results from today's meeting as a backdrop for compiling overlay maps
- Overlay maps will show areas of preference for habitat protection, water quality protection and open space/recreation
- Participants will have a chance to review results and provide comments by email

## Hampton Roads Conservation Corridor Study

Local Government Planners Stakeholder Meeting

Eric Walberg  
Sara Kidd

September 29, 2005



## Project Review

- Obtained grant from the Virginia Coastal Program based on the success of the SWAMP project
- Will work with all localities in the HRPDC to develop a corridor system that fits with local planning goals
- Corridor is framework to prioritize and potentially link several categories of open lands

## Goals for the Project

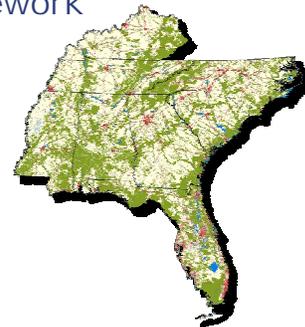
- Determine local planning needs
- Identify a corridor system that provides multiple benefits:
  - Habitat protection
  - Stormwater management
  - Wetlands Mitigation
  - TMDL & Tributaries Strategy compliance
  - Comprehensive Planning
  - Recreation/Tourism
- Provide GIS mapping of corridor system to localities
- Educate public on benefits of the corridor system

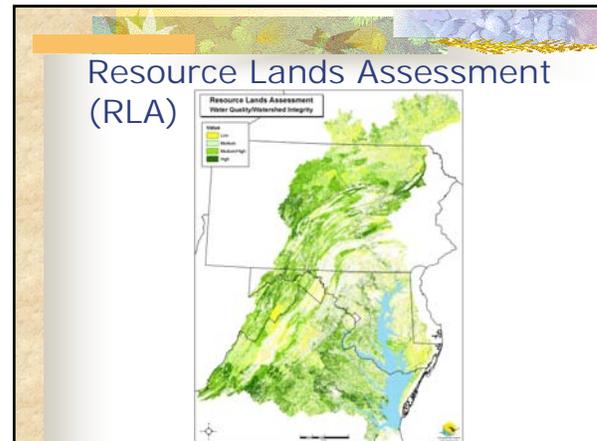
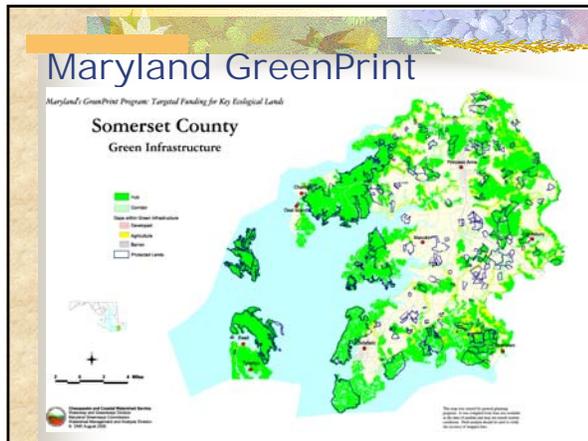
## Stakeholder Input

- Review initial model output
- Discuss and refine priorities for the conservation corridor system
- Review maps and reports and provide comments

## Examples of Green Infrastructure Projects

## Southeastern Ecological Framework





## Data Layers

- ## National Land Cover Dataset (NLCD 2001)
- Produced by USGS beginning in 2001 through 2006
  - Only way to get consistent land use/land cover data for a large region

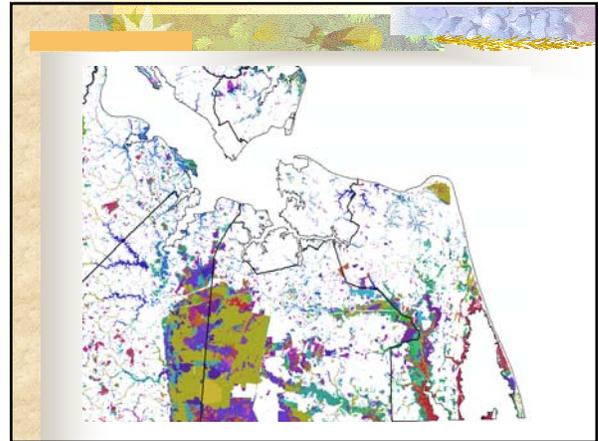


- ## Riparian Corridors
- Developed from the products of the Virginia Base Mapping Project (VMBP)
  - Data is from 2002
  - Hydrology was extracted from DTM (digital terrain model)
  - Created buffers in GIS of 100, 200, 300, 400, and 500 feet around features identified as streams, shorelines, and swamps



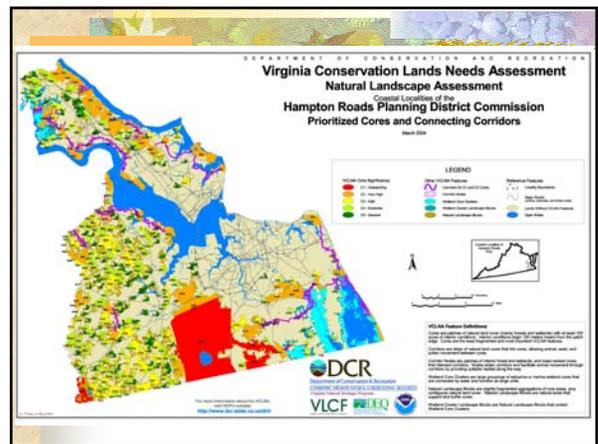
## National Wetlands Inventory

- Produced by US Fish & Wildlife Service
- Extracted from interpretation of aerial photography over several years
- Updated infrequently



## VCLNA Cores

- A landscape-scale GIS analysis for identifying, prioritizing, and linking natural habitats in Virginia
- Interior patches of forest greater than 100 acres - "cores"
- Cores were prioritized as 1-5 using several data sources such as species and stream data

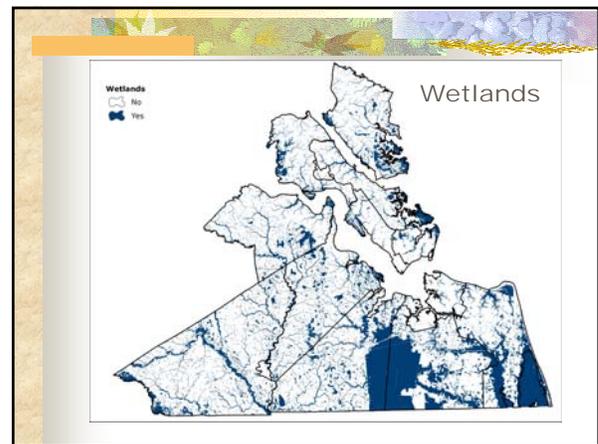
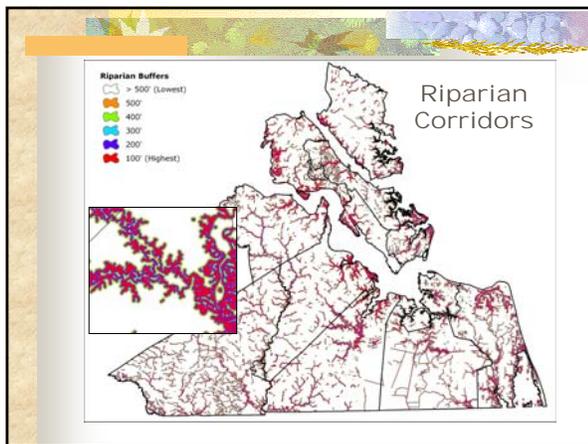
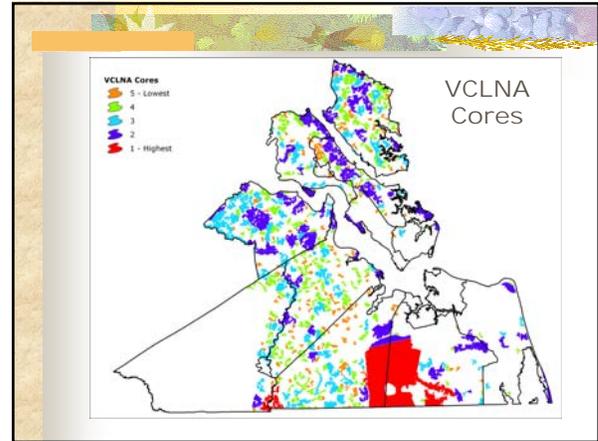
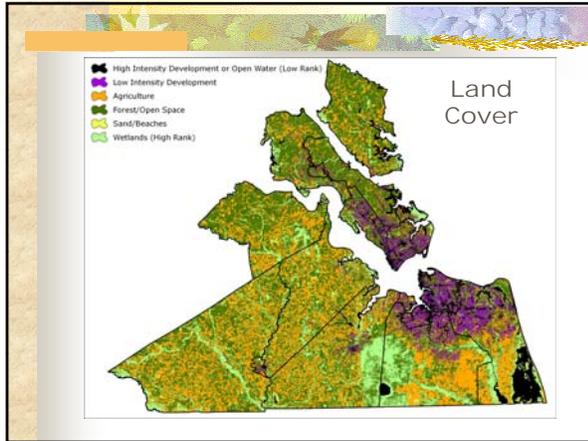


# Suitability Analysis

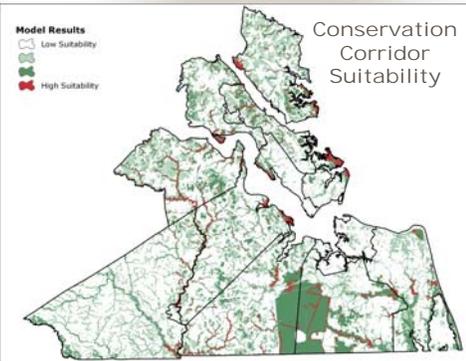
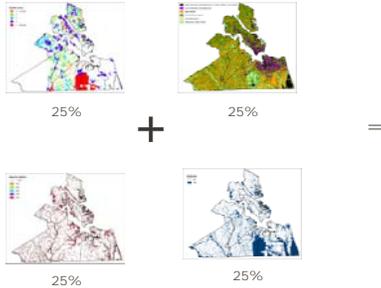
## Suitability in GIS

- Two steps:
  - Ranking (calibrating) GIS model criteria
  - Weighting GIS Model Criteria
- Use raster datasets

1	2	4	1: Residential
1	4	4	2: Water
3	3	3	3: Forest
			4: Wetlands



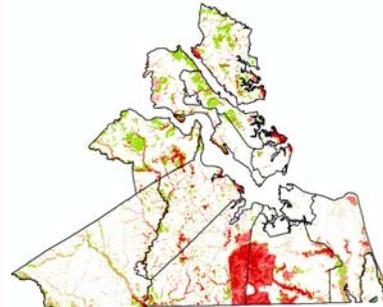
## Weighting GIS Model Criteria



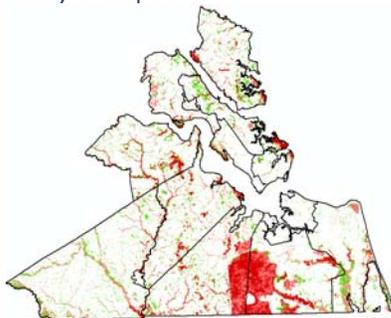
## Natural Resources Meeting Review

- The group performed a weighting exercise to create two new suitability maps
  - Habitat perspective
  - Water quality perspective

## Conservation Corridor from Habitat Preservation Perspective



## Conservation Corridor from Water Quality Perspective



## Today's Agenda

- Discuss corridor model
- Review comprehensive plans, future land use plans, etc. and identify locations on the maps to include in the corridor
- Mark up maps with recommendations
- Discuss linkages between jurisdictions
  - Regional recreation network
  - Future land use network impediments



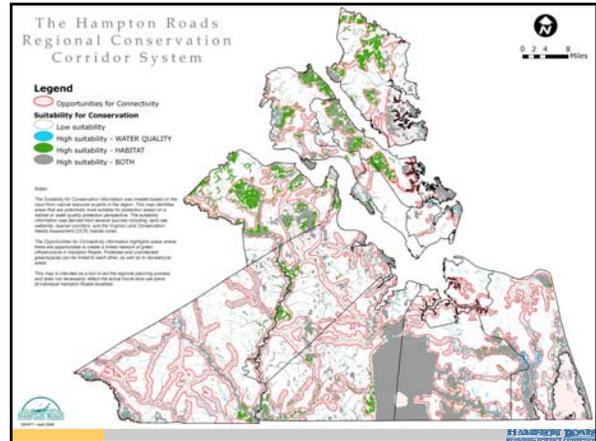
## What's Next

- Participants will have a chance to review changes and provide comments by email



## *Application of the Hampton Roads Conservation Corridor Study*

Eric Walberg, AICP  
Sara Kidd


## *Application of the Corridor Study*

**\*Conservation Goals:**

- Water Quality and Habitat Protection
  - Wetlands
  - Riparian Buffers
  - Forested Areas
  - Linked Systems




## *Application of the Corridor Study*

**\*Park, Recreation and Open Space Goals:**

- Trail and Greenway Opportunities
  - Linking with Existing Parks or Trails
- Purchase of Development Rights
- Agricultural Preservation




## *Application of the Corridor Study*

**\*Regulatory Compliance:**

- Chesapeake Bay Preservation Act
- Compensation for Wetlands Impacts
- Stormwater Management
- TMDLs
- Chesapeake 2000 Goals
- APNEP Goals
- Floodplain Management




## *Application of the Corridor Study*

**\*Other Planning Goals:**

- Limiting Encroachment of Development on Military Bases
- Support of Urban Growth Areas
- Control of Infrastructure and Service Provision Cost
- Buffering of Incompatible Uses
- Water Supply Protection



## **APPENDIX F**

ReadMe File for HRCCS Project CD

## **README FILE**

### The Hampton Roads Conservation Corridor Study

This CD accompanies the written report for the HRCCS. The following files have been included on the CD:

#### **\GIS**

This directory contains GIS data layers and other related reference data. ArcGIS 9.1 and Spatial Analyst were used for this project. It also contains HRCCS.mxd, which is an ArcGIS 9.1 map document contains the data layers from this CD in a ready-to-view format.

#### **\GIS\Documents**

- Metadata for each GIS layer
  - Provided in HTML format
  - May also view within ArcCatalog
- CAD2SHAPE.py
  - Python script that converts CAD data to shapefiles in batch form

#### **\GIS\Layerfiles**

Layer files preserve symbology in ArcMap and may be added to a map document in lieu of the original data.

- NLCD.lyr
- NWI.lyr
- Riparian Corridor.lyr
- VCLNA.lyr
- Suitability for Conservation.lyr
- Opportunities for Connectivity.lyr

#### **\GIS\Raster**

- nlcd\_rank
  - The National Land Cover Dataset as ranked for the HRCCS analysis
- nwi\_rank
  - The National Wetlands Inventory as ranked for the HRCCS analysis
- riparian\_rank
  - The riparian corridors as ranked for the HRCCS analysis
- vclna\_rank
  - The Virginia Land Conservation Needs Assessment cores as ranked for the HRCCS analysis
- Suitability
  - The final result of the GIS analysis which shows the areas suitable for conservation

## **\GIS\Shapefiles**

- HRPDC.shp
  - Boundary file for the Hampton Roads Planning District
- Majorroads.shp
  - Major roads in the HRPDC
- Corridors.shp
  - The Opportunities for Connectivity shapefile

## **\MAPS**

- HRCCSmap\_D.pdf
  - Final map for the HRCCS formatted for a “D” size plot (22 x 34 in)
- HRCCSmap\_B.pdf
  - Final map for the HRCCS formatted for a “B” size plot (11 x 17 in)
- HRCCSconsmap\_D.pdf
  - Final map for the HRCCS (including conservation areas) formatted for a “D” size plot (22 x 34 in)
- HRCCSconsmap\_B.pdf
  - Final map for the HRCCS (including conservation areas) formatted for a “B” size plot (11 x 17 in)

## **\POWERPOINTS**

- NaturalResources.ppt
  - Presentation given to the natural resource stakeholders meeting
- LocalGovt.ppt
  - Presentation given to the local government planners stakeholders meeting
- Applications.ppt
  - Presentation given to the Joint Environmental Committee about the potential applications of the corridor study

## **Contact:**

Sara Kidd  
Environmental GIS Planner  
Hampton Roads Planning District Commission  
723 Woodlake Drive  
Chesapeake, VA 23320  
757-420-8300  
757-366-4378 (fax)  
Email: skidd@hrpdc.org

## **APPENDIX G**

Newsletter Articles



# HAMPTON ROADS REVIEW

A QUARTERLY PUBLICATION OF THE HAMPTON ROADS PLANNING DISTRICT COMMISSION Fall '05



**BRAC 2005:  
Uncertainty**

**Regional  
Toll Study**

**Regional  
Conservation  
Corridor Study**

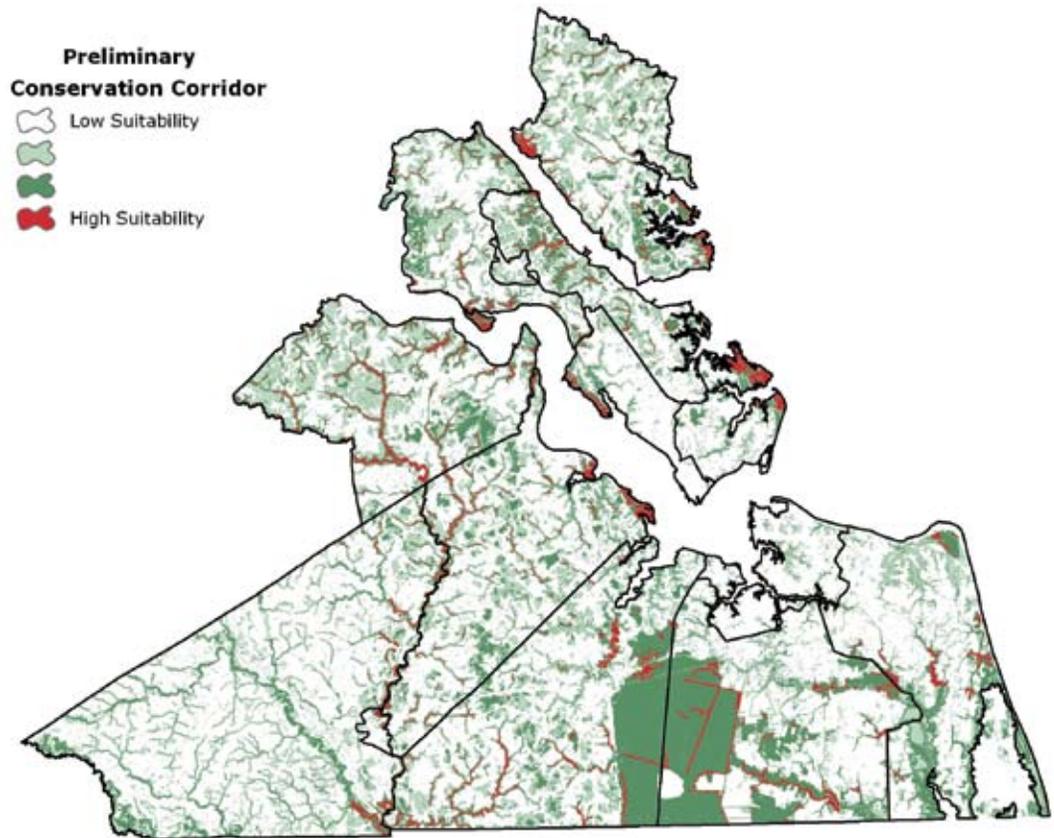
## Regional Conservation Corridor Plan Underway

The HRPDC is currently developing a Regional Conservation Corridor Plan for the Hampton Roads area. The goal of the project is to identify, prioritize, and potentially link several categories of open lands while taking into account local planning goals. Ideally, the conservation corridor system will provide multiple benefits to the region, such as habitat protection, stormwater management, wetlands mitigation, and recreation opportunities. This Plan is being developed under a grant from the Virginia Coastal Program in support of its Blue-Green Infrastructure initiative.

The model for identifying areas to include in the corridor was developed in GIS primarily using data layers such as riparian areas, wetlands, and land use. In addition, the model incorporates the recent work done by the Department of Conservation and Recreation (DCR) with its Virginia Conservation Lands Needs Assessment (VCLNA) Natural Landscape Assessment (NLA). The ecological “cores” identified and prioritized by DCR are one of the main components of the conservation corridor model.

A group of local stakeholders (including planners and natural resource experts) will be contributing knowledge about each jurisdiction’s planning goals in order to help refine the areas to include in the corridors.

There are also a series of educational materials being developed for the project. These include an educational video and several articles to be published online and in the media.



# Physical Planning

## HR WET Trailer Schedule

The Hampton Roads Water Efficiency Team (HR WET) education trailer is on the move again this fall! After a visit to the Virginia Beach Farmers Market for *Farm Days* (October 6-8<sup>th</sup>), the Trailer will be at the Virginia Beach Convention Center during the *Fall Home Show* sponsored by the Tidewater Builders Association from November 18<sup>th</sup> to the 20<sup>th</sup>.

This is the eleventh year HR WET has been in action, building public awareness of the region’s water

resources and emphasizing the need to use these resources more efficiently.

Stop by the HR WET education trailer to pick up information and water conservation tools to aid you and your family in using water more wisely. If you can’t make it to the education trailer this season, check out the HR WET website, [www.hrwet.org](http://www.hrwet.org), for additional water conservation information and the HR WET trailer schedule.

## **Hampton Roads Conservation Corridor Study Completed**

(To be published in the Summer 2006 HRPDC newsletter)

The Hampton Roads Planning District Commission (HRPDC) has completed development of the Hampton Roads Conservation Corridor Study. The conservation corridors were identified utilizing geographic information systems (GIS) modeling to analyze data from a variety of sources, including the National Land Cover Dataset, the National Wetlands Inventory, and the Virginia Land Conservation Needs Assessment. The result is a summary map that identifies highly suitable areas for conservation. The suitability was based on water quality and habitat protection perspectives. In addition, opportunities for connectivity between these areas was identified and highlighted.

Multiple opportunities were provided for stakeholder involvement as the project progressed. These included presentations by state and federal natural resource agencies, discussions at regular HRPDC Joint Environmental Committee meetings, a meeting with natural resource experts, and meetings with planners from Hampton Roads jurisdictions. Draft maps were also sent to local parks and recreation and planning departments for review and comment.

In addition to GIS products, an educational video about the conservation corridor system was developed. The video discusses the concept of green infrastructure and encourages business, industry, and individual landowners to help in establishing and maintaining these corridors in their communities. The video will be provided to local governments for use on cable access stations.

Educational materials related to the study will be available on the HRPDC web site: <http://www.hrpdc.org/>.