Virginia Conservation Lands Needs Assessment



Setting Priorities for Land Conservation



DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES
Virginia Natural Heritage Program

DCR mission

The Department of Conservation and Recreation works with Virginians to conserve, protect, and enhance their lands and improve the quality of the Chesapeake Bay and our rivers and streams, promotes the stewardship and enjoyment of natural, cultural and outdoor recreational resources, and insures the safety of Virginia's dams.

Fulfilling the mission….

DCR's Seven Program Divisions

Each Division offers program elements that when integrated create a comprehensive conservation and recreation agency.

State Parks

Soil and Water

Dam Safety

Chesapeake Bay Local Assistance

Planning and Recreational Resources

Land Conservation

Natural Heritage

Division of Natural Heritage

- Mission: Identify, protect & conserve Virginia's biological diversity
- Focus on:
  - Rare plants and animals
  - Natural communities
- 33 Years of methodological development, 21 years of data collection and analysis
- Manage 49 Natural Area Preserves

Land Conservation

- How do we set priorities for land conservation?
  - ❖Operate under the idea of "Green Infrastructure" defined as:
    - ➢ an interconnected network of protected land and water that sustains air and water resources, maintains natural ecological processes, supports native species, and contributes to the health and quality of life for the people in our communities.
    - ➢"…it looks at conservation values and actions in concert with land development and growth management"

Healthy ecosystems provide free "services" to human communities, including: water filtration, groundwater recharging, stormwater control, air purification, nutrient recycling, crop pollination, and soil enrichment.

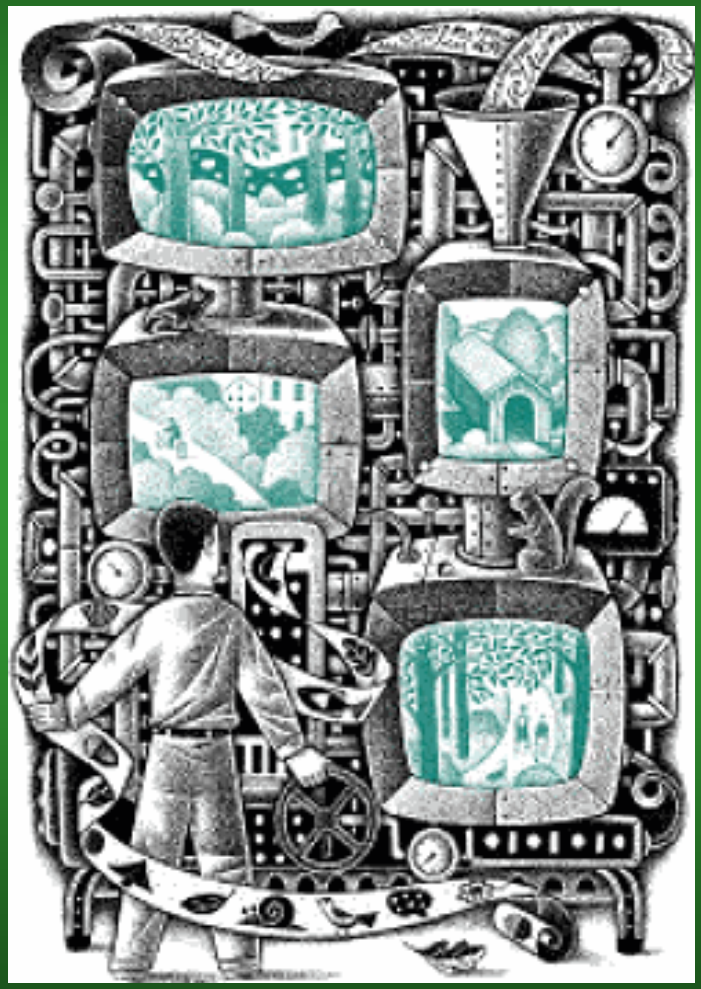
Green Infrastructure Planning

Communities don't build transportation networks or water and sewer infrastructure without advanced planning and coordination.

- These "grey" infrastructure systems are carefully designed and financed to ensure their utility.
- We should plan and invest in our Green Infrastructure following the same principles and approaches used for grey infrastructure.

How do we develop a Green Infrastructure Plan?

- Use Chesapeake Bay Program Resource Lands Assessment as a model template for the creation of Virginia specific models
- Develop a Green Infrastructure Advisory Workgroup
- Identify high level goals for the individual models
- Identify potential partners
- Research, research, research
- Develop, review, alter as needed, develop, review, alter as needed
- Implementation plans



Green Infrastructure Advisory Workgroup

- **Participants included identified end users:**
  - Federal
  - State
  - Local Government
  - Non-Profit Groups
  - Academia
- **Green Infrastructure Advisory Workgroup:**
  - Define what green infrastructure means to the different end users
  - Identify "green infrastructure" datasets (as related to their specific definitions) and identify sources (Coastal GEMS)
  - User input on how the VCLNA will be used for decision making
  - Identify products / deliverables that will be most useful for end user to implement green infrastructure planning

Green Infrastructure Advisory Committee

Federal Agenices
USFWS
USGS
NPS
Chesapeake Bay Program

State Agencies
DGIF
DOF
DCR/CBLA
VEDP
VDOT
VOF
Dept of Ag
DEQ Coastal Program

Universities
VCU
VA Tech
VIMS
W&M CCB

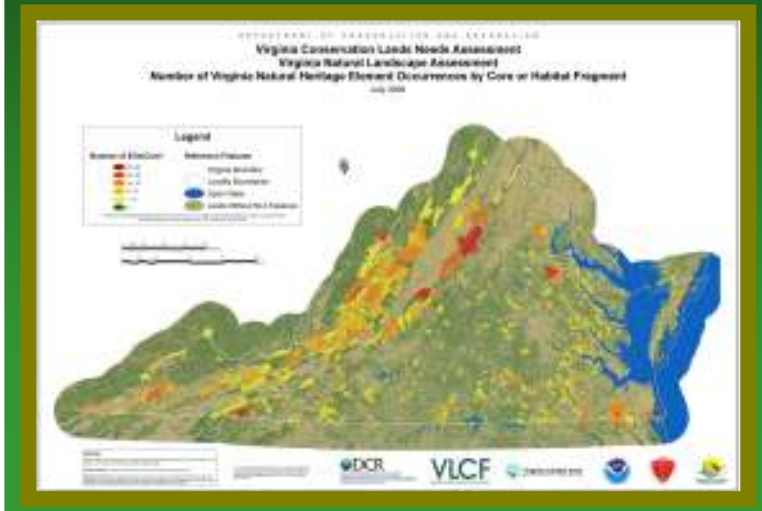
PDC
HRPDC
MPPDC
NVPDC
Crater PDC
RRPDC
NNPDC
A-NPDC
Richmond Regional PDC

Locals
Richmond County
Stafford County
Thomas Jefferson PDC
City of Virginia Beaach

NGO's
Conservation Fund
Friends of the Dragon Run
Citizens for a Better Eastern Shore
The Nature Conservancy
The Nature Conservancy
Ches Bay Foundation
Northern Neck Land Conservancy
James River Association
Western VA Land Trust
Piedmont Env Council
VLCF
E. Shore Land Trust
Blue Ridge Conservancy

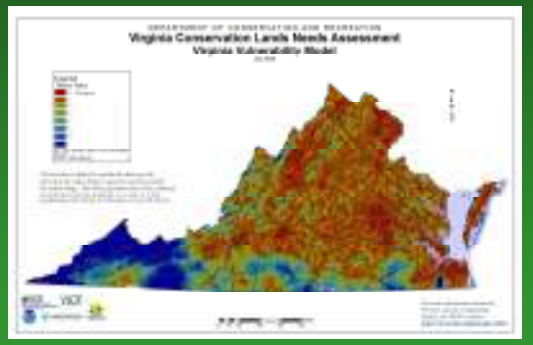
VCLNA Models

Ecological



Cultural

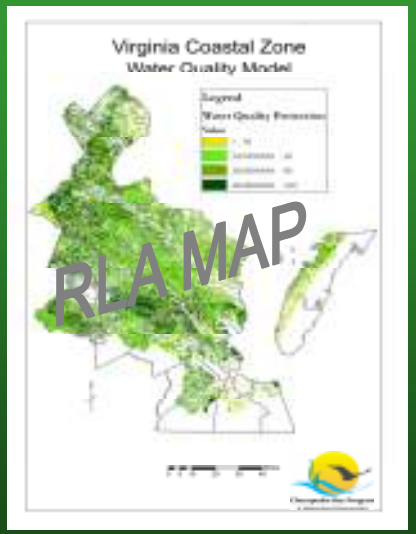
Vulnerability



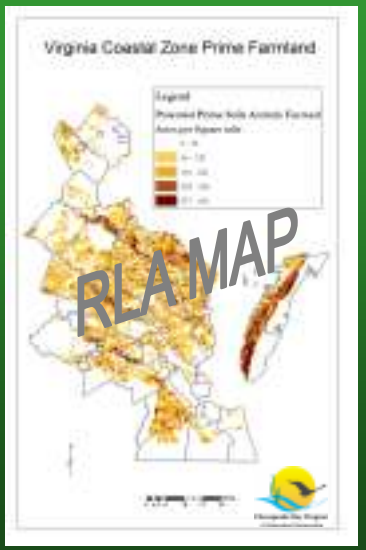
Forest Economics

Recreation

Water Quality



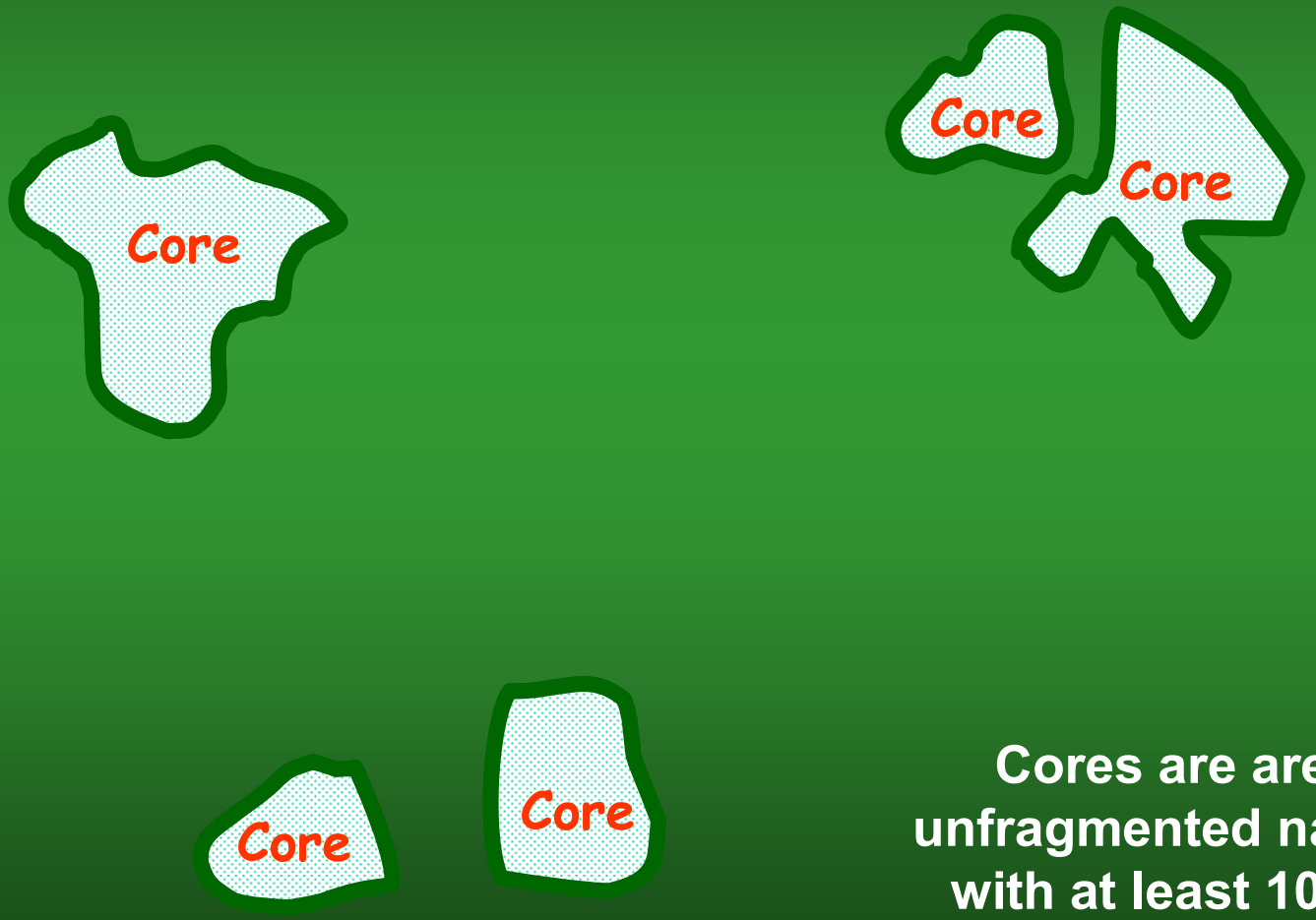
Agricultural



Ecological Models

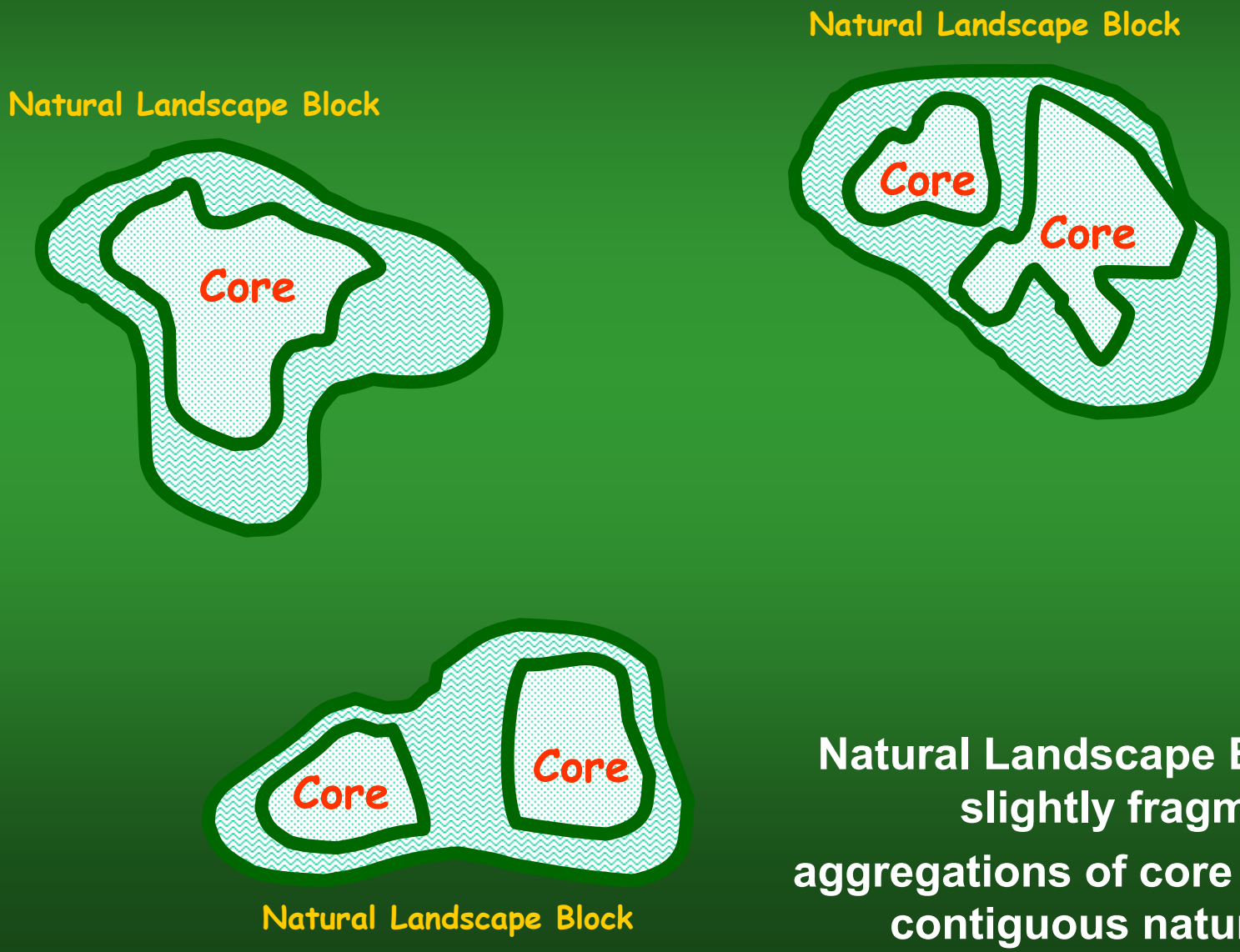
- The ecological models include the Virginia Natural Landscape Assessment (VaNLA), an independent biodiversity assessment, Natural Heritage data, and products from the DGIF Wildlife Action Plan.
- The ecological models section of this presentation will pertain only to the VaNLA.
- The VaNLA is a landscape-scale GIS analysis for identifying, prioritizing, and linking natural habitats in Virginia.
- The VaNLA generates ecological data layers that complement other conservation interests and needs.

Conceptual Model of the VaNLA



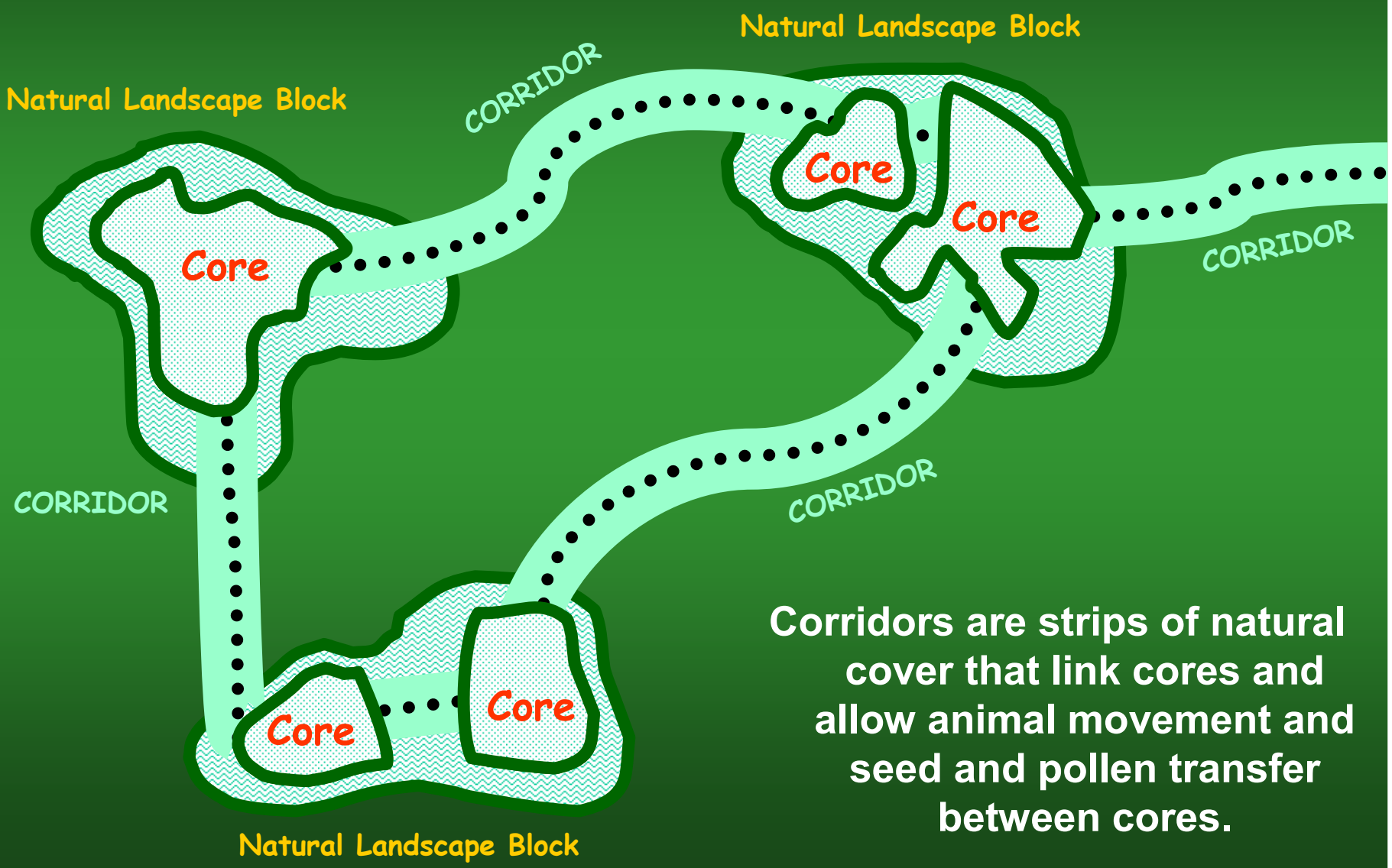
Cores are areas of unfragmented natural cover with at least 100 acres of interior conditions.

Conceptual Model of the VaNLA



Natural Landscape Blocks are slightly fragmented aggregations of core areas, plus contiguous natural cover.

Conceptual Model of the VaNLA

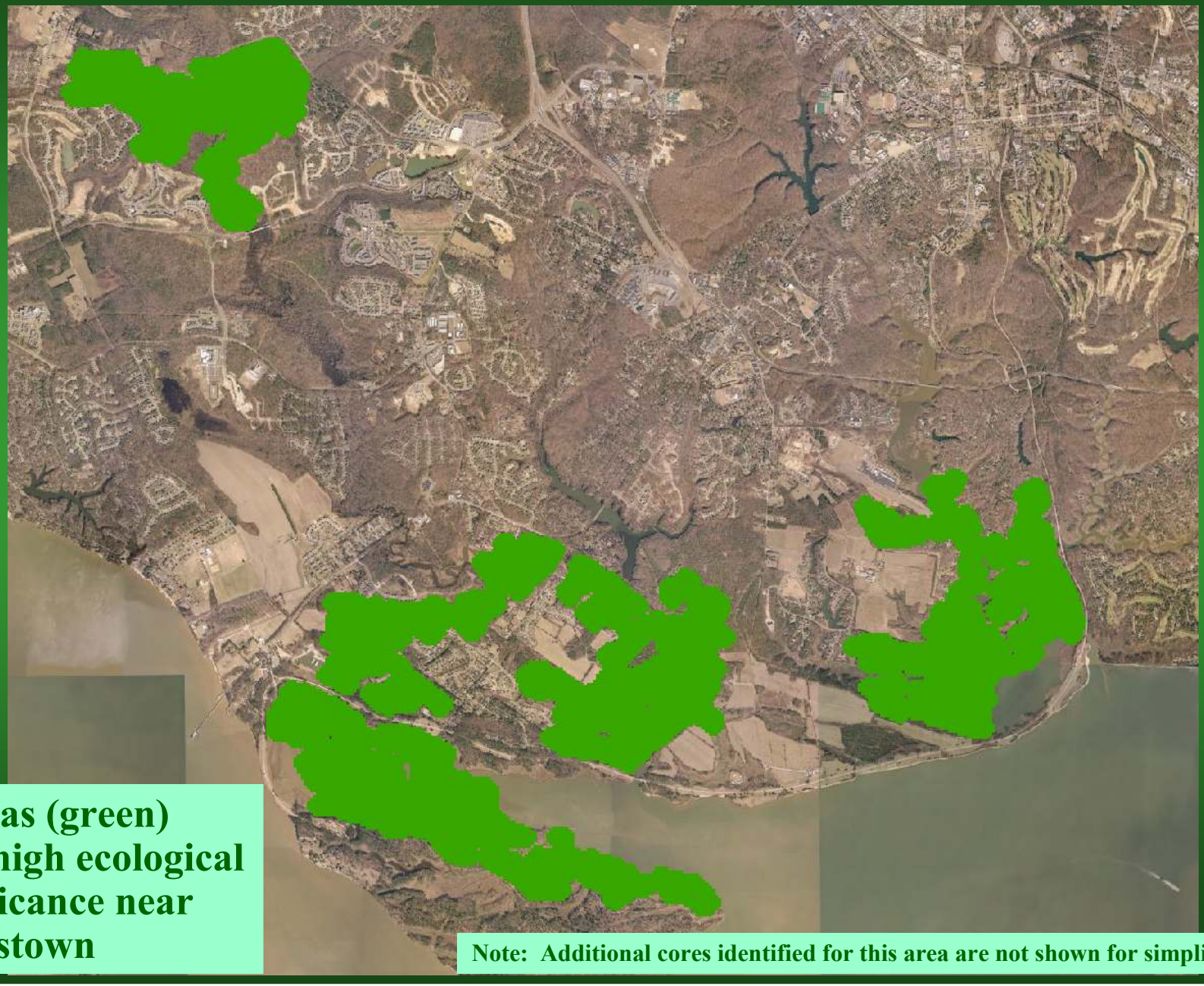


Corridors are strips of natural cover that link cores and allow animal movement and seed and pollen transfer between cores.

Example of a VaNLA Network

Aerial view of the fragmented landscape around Jamestown, VA

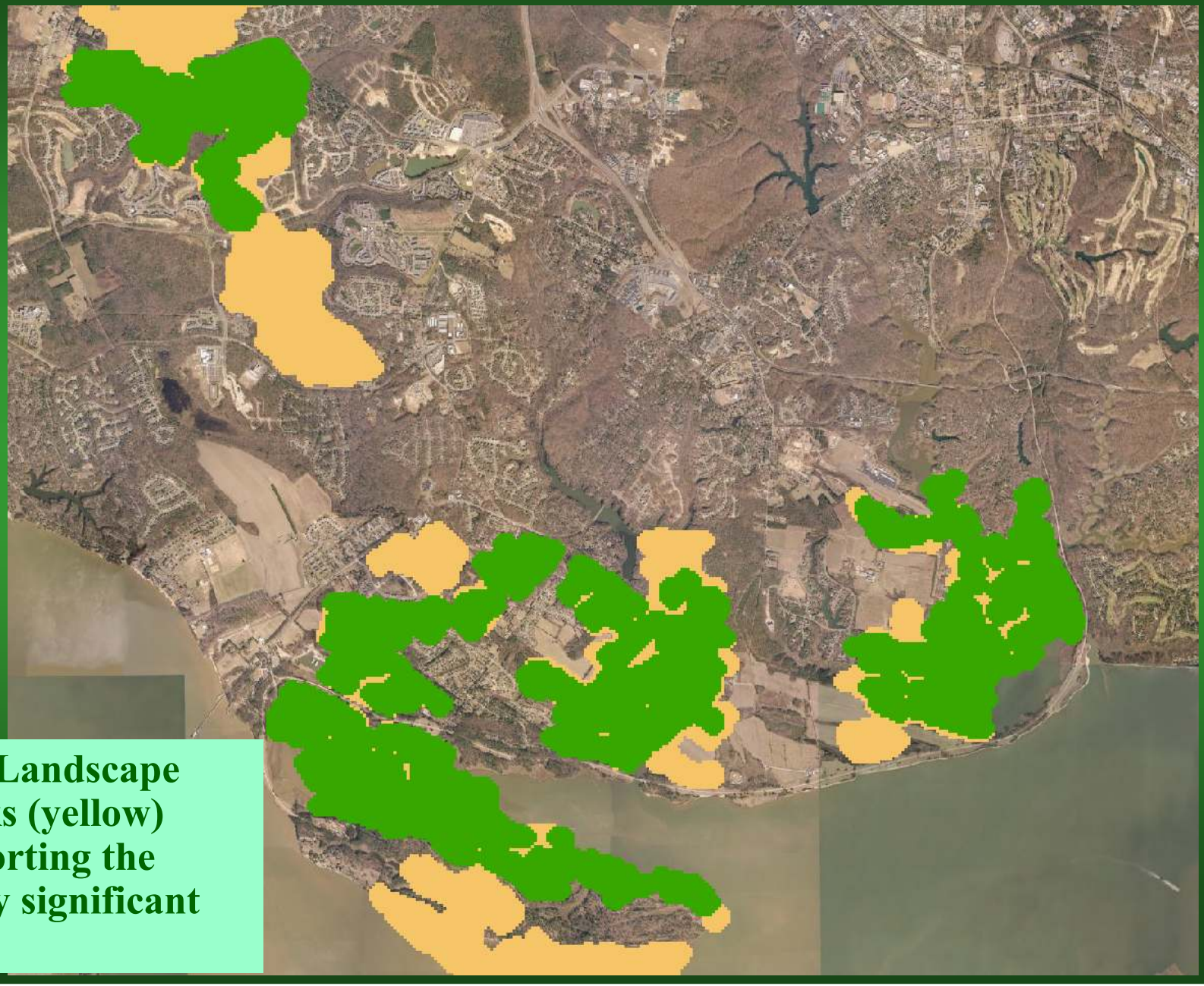
Example of a VaNLA Network



Core areas (green) with high ecological significance near Jamestown

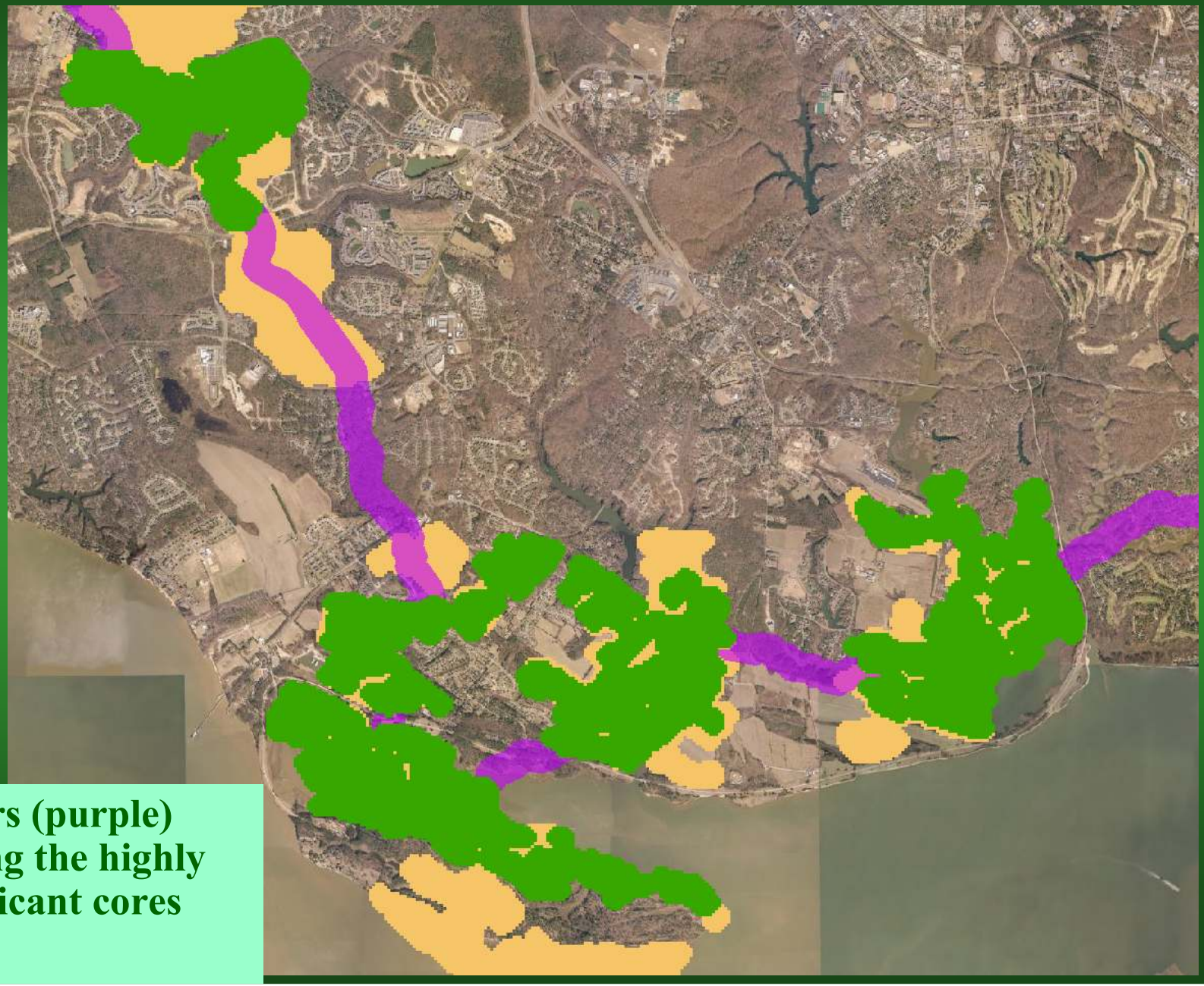
Note: Additional cores identified for this area are not shown for simplicity.

Example of a VaNLA Network



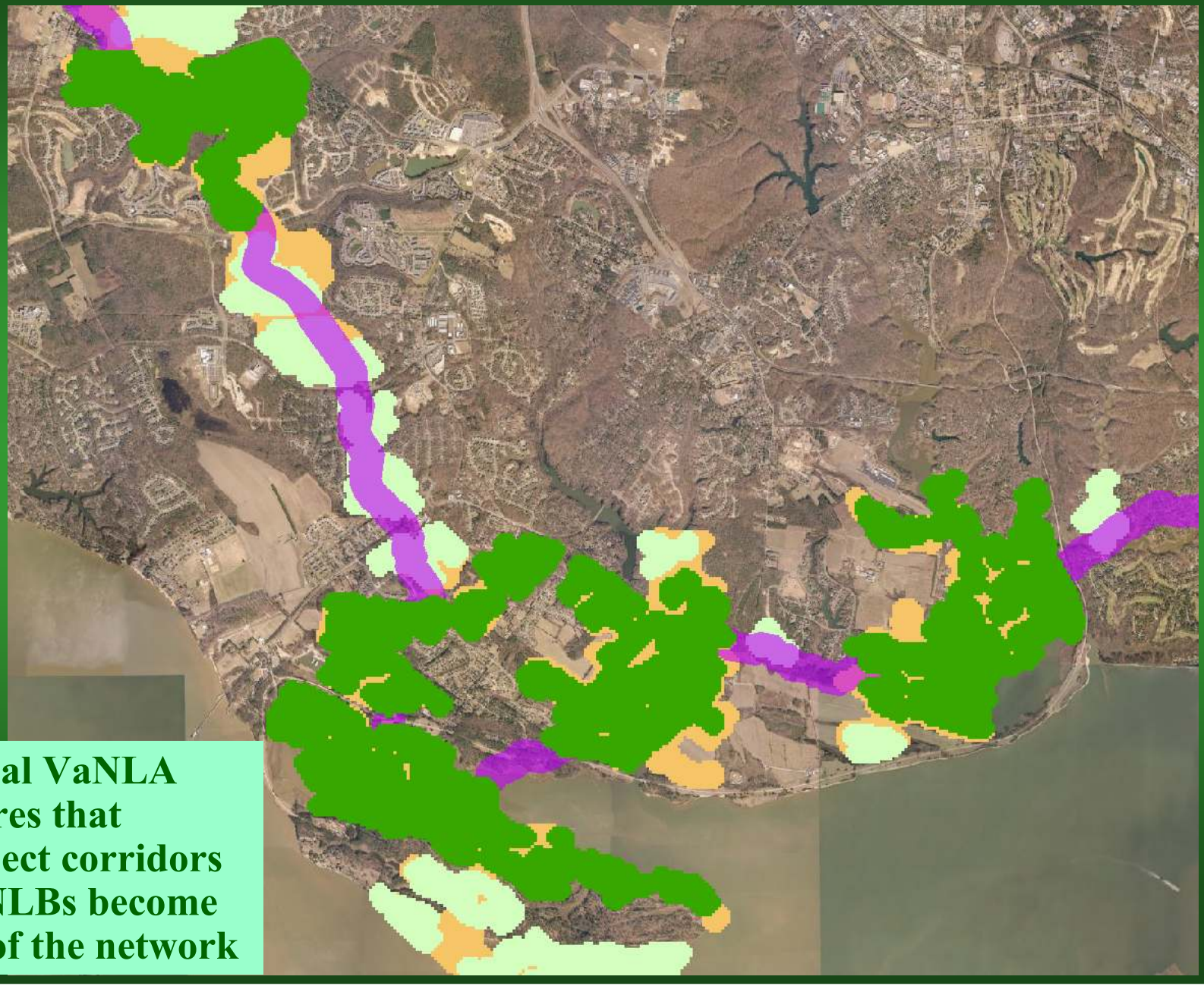
Natural Landscape Blocks (yellow) supporting the highly significant cores

Example of a VaNLA Network



Corridors (purple) linking the highly significant cores

Example of a VaNLA Network



Additional VaNLA features that intersect corridors and NLBs become part of the network

Benefits of VaNLA Networks

- wildlife and plant habitat
- biodiversity conservation
- open space
- recreational opportunities
- groundwater recharge
- maintenance of water quality
- carbon sequestration
- crop pollination
- protection from storm and flood damage
- erosion control and sediment retention

Cores and Natural Landscape Blocks contain:

♦Large blocks of interior forest

♦ Large wetland complexes

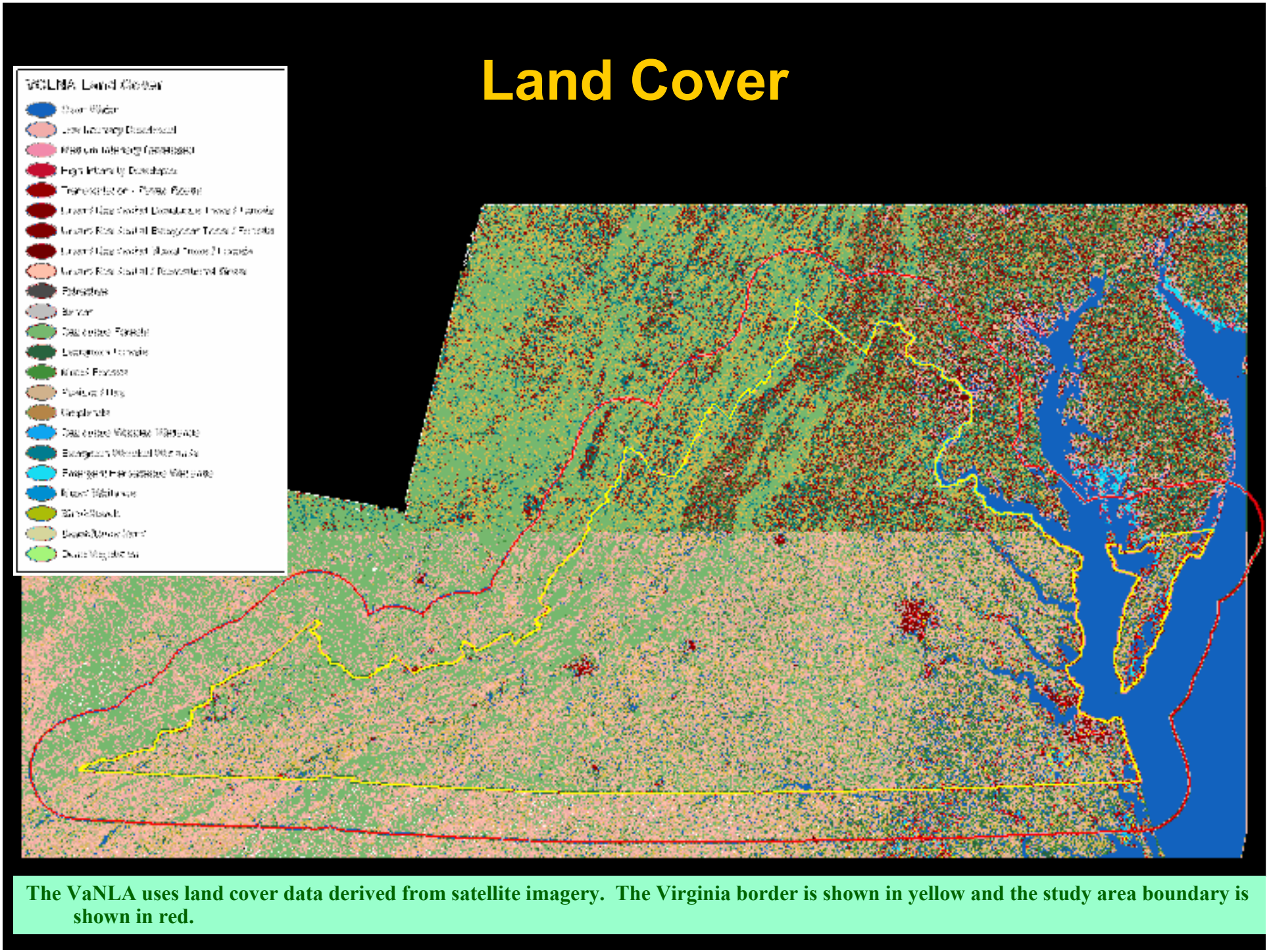
♦Relatively pristine rivers and streams

Cores and Natural Landscape Blocks contain:

- Sensitive species habitat

- Existing parks and conservation lands

Land Cover



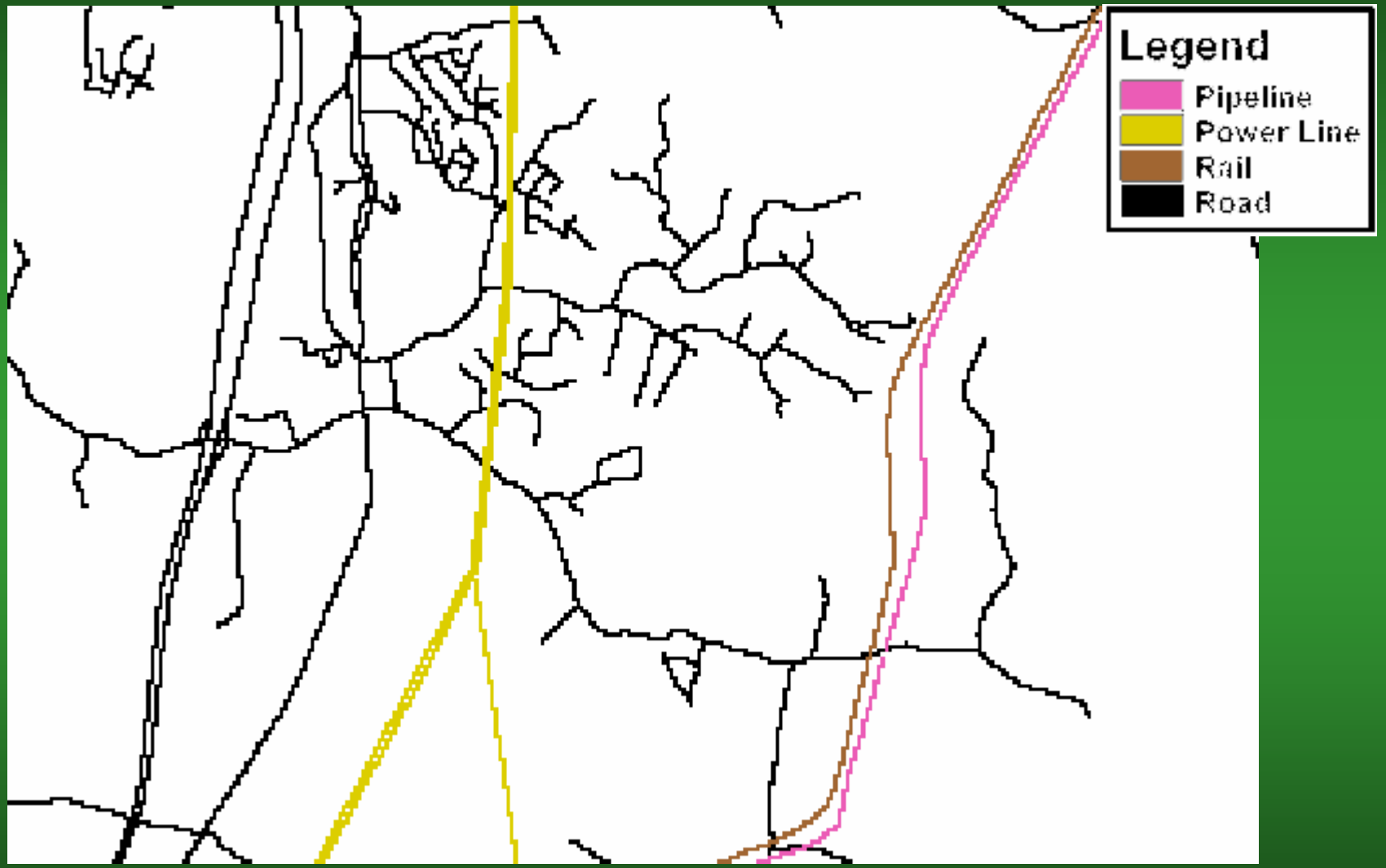
The VaNLA uses land cover data derived from satellite imagery. The Virginia border is shown in yellow and the study area boundary is shown in red.

Cores Development

Cores are areas of unfragmented natural cover with at least 100 acres of interior cover.

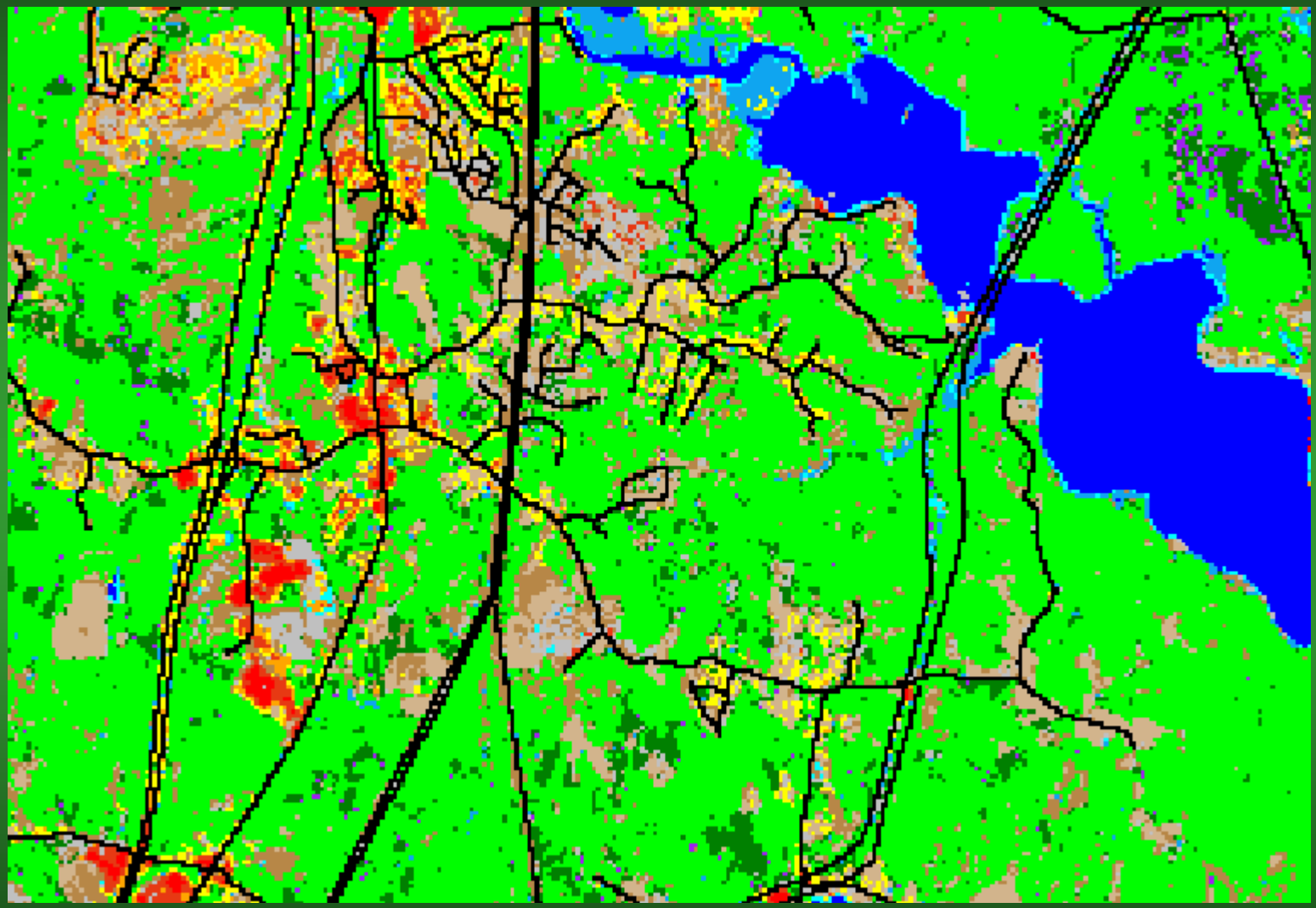
They are bounded by anthropogenic land cover, roads, railroads, power line corridors, and pipeline corridors

Fragmentation Layer



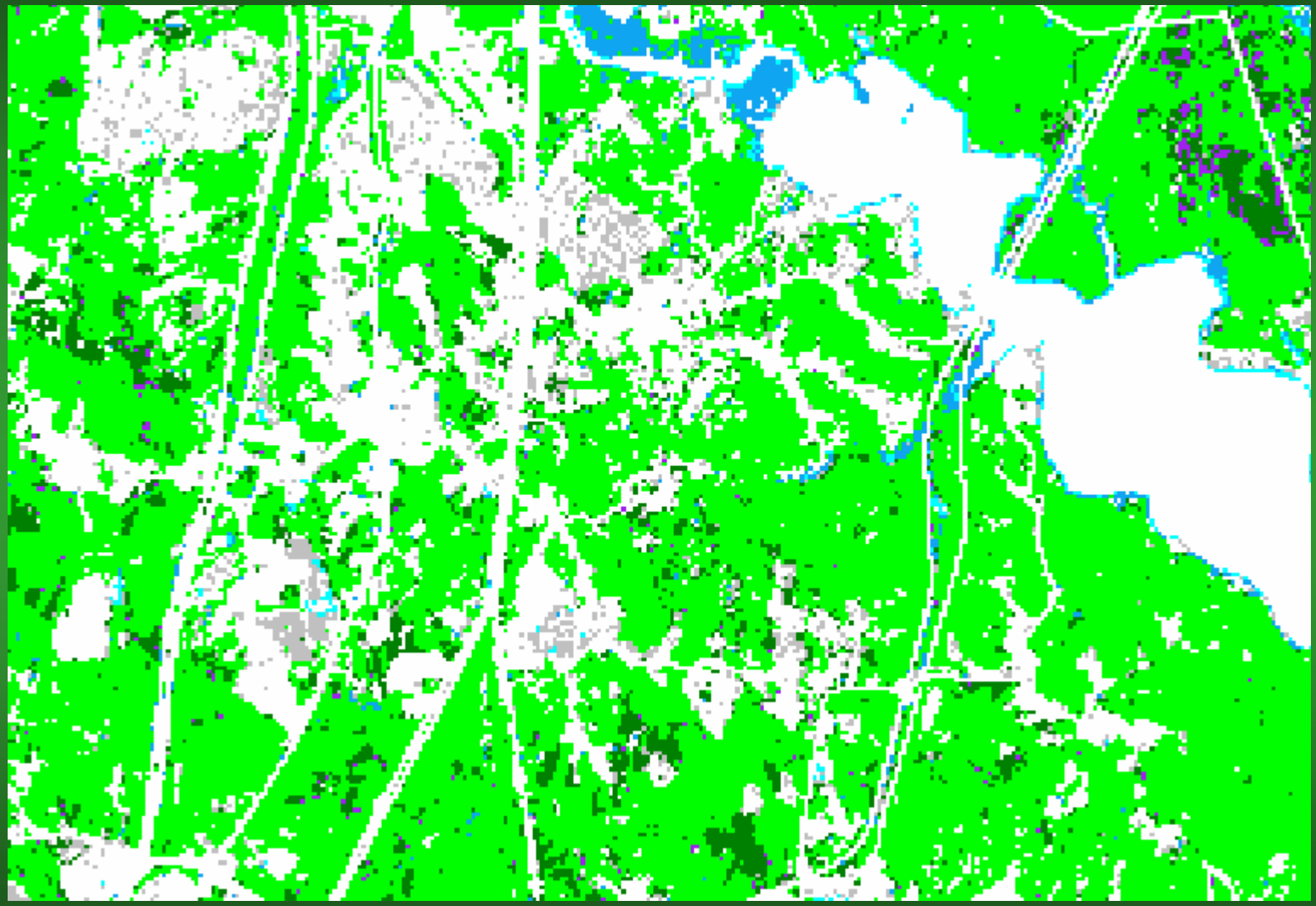
The fragmentation layer contains linear fragmentation features that might not be represented in the land cover layer.

Fragmented Land Cover Image



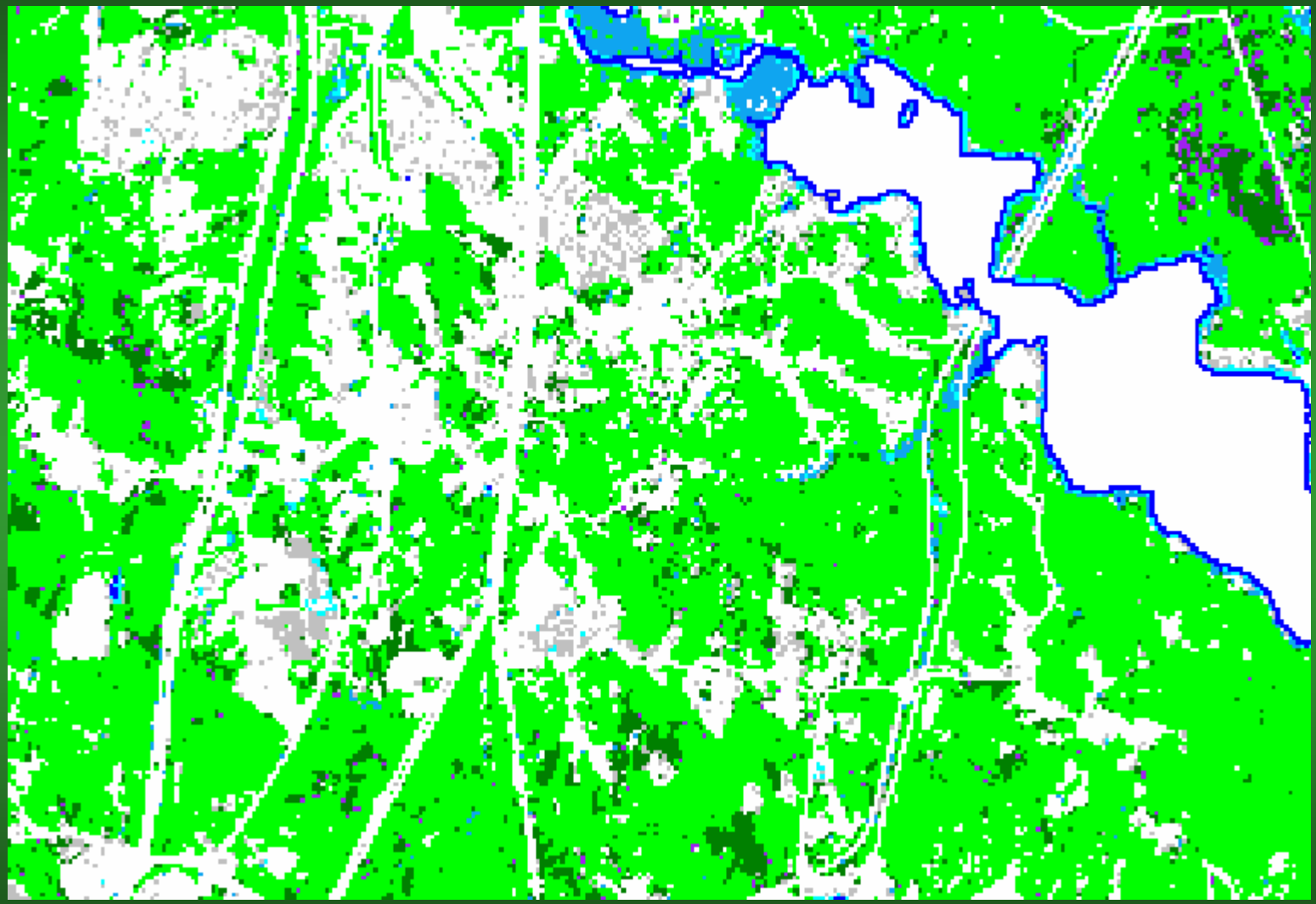
The fragmentation layer was used to fragment the land cover layer.

Natural Land Cover



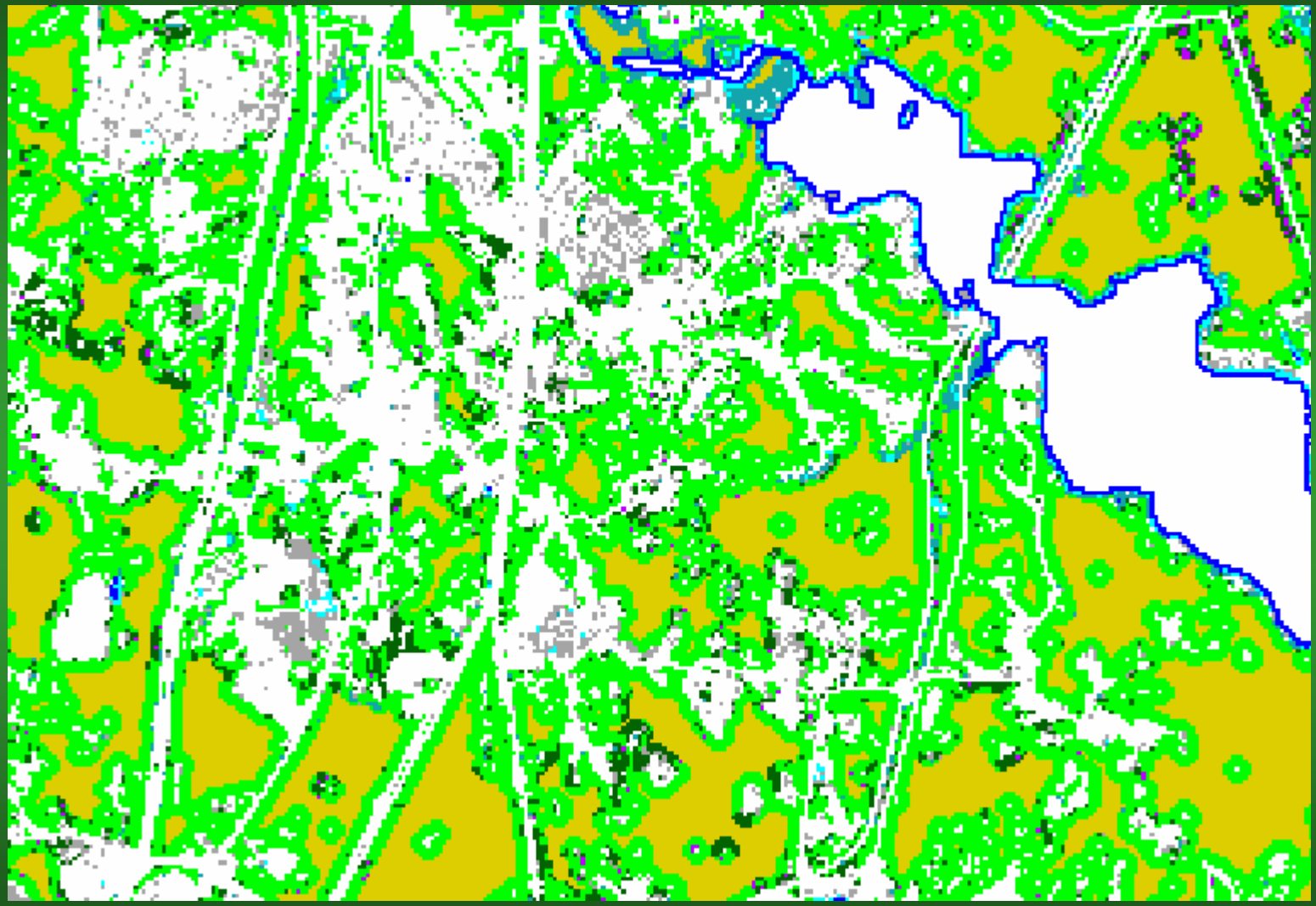
The natural cover types (forests, wetlands, beaches, etc.) were extracted to create this layer.

Natural Land Cover Plus Near-Shore Water



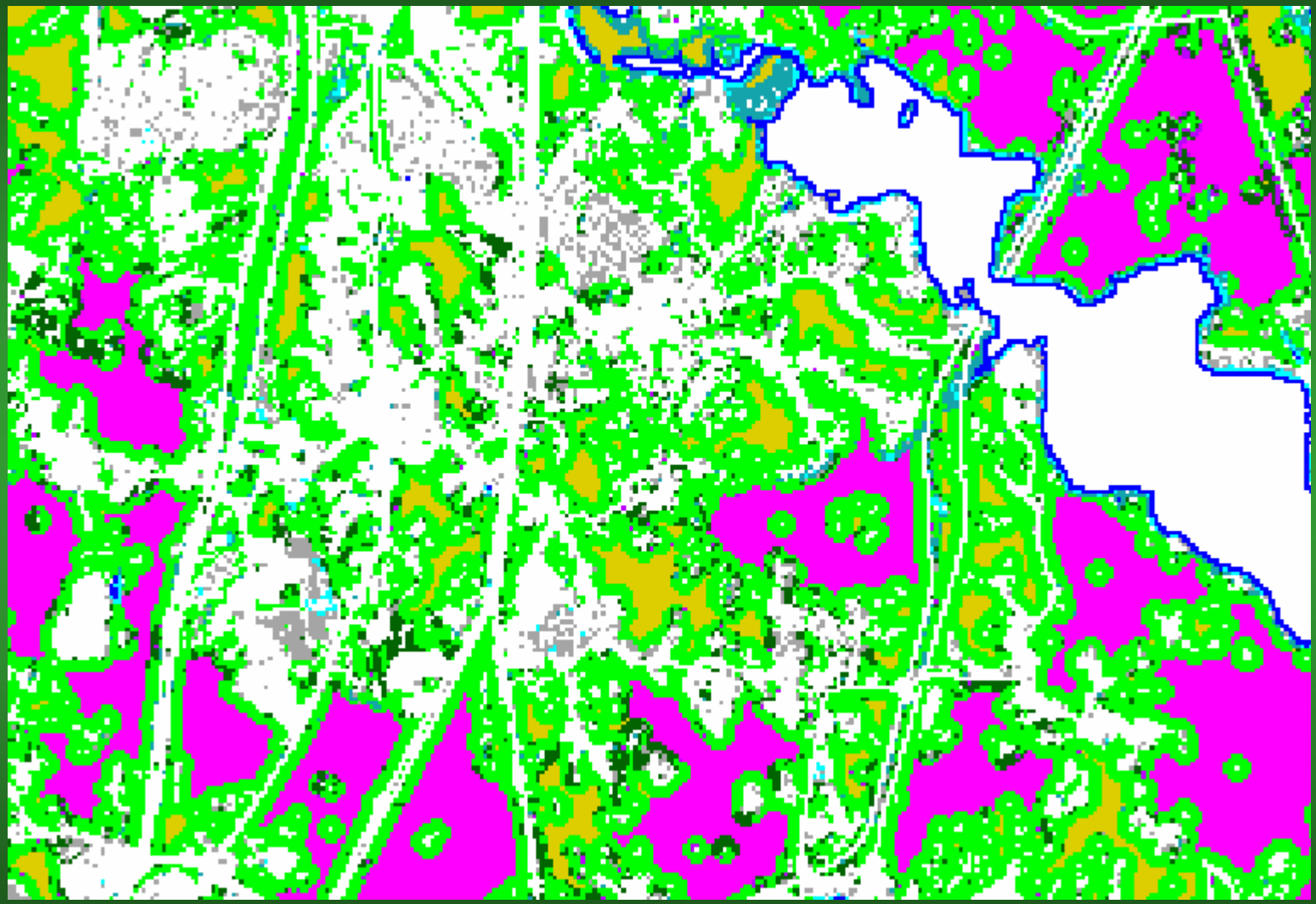
One pixel width of near-shore open water was added back into this layer to prevent narrow strips of water from splitting cores.

Interior Natural Area



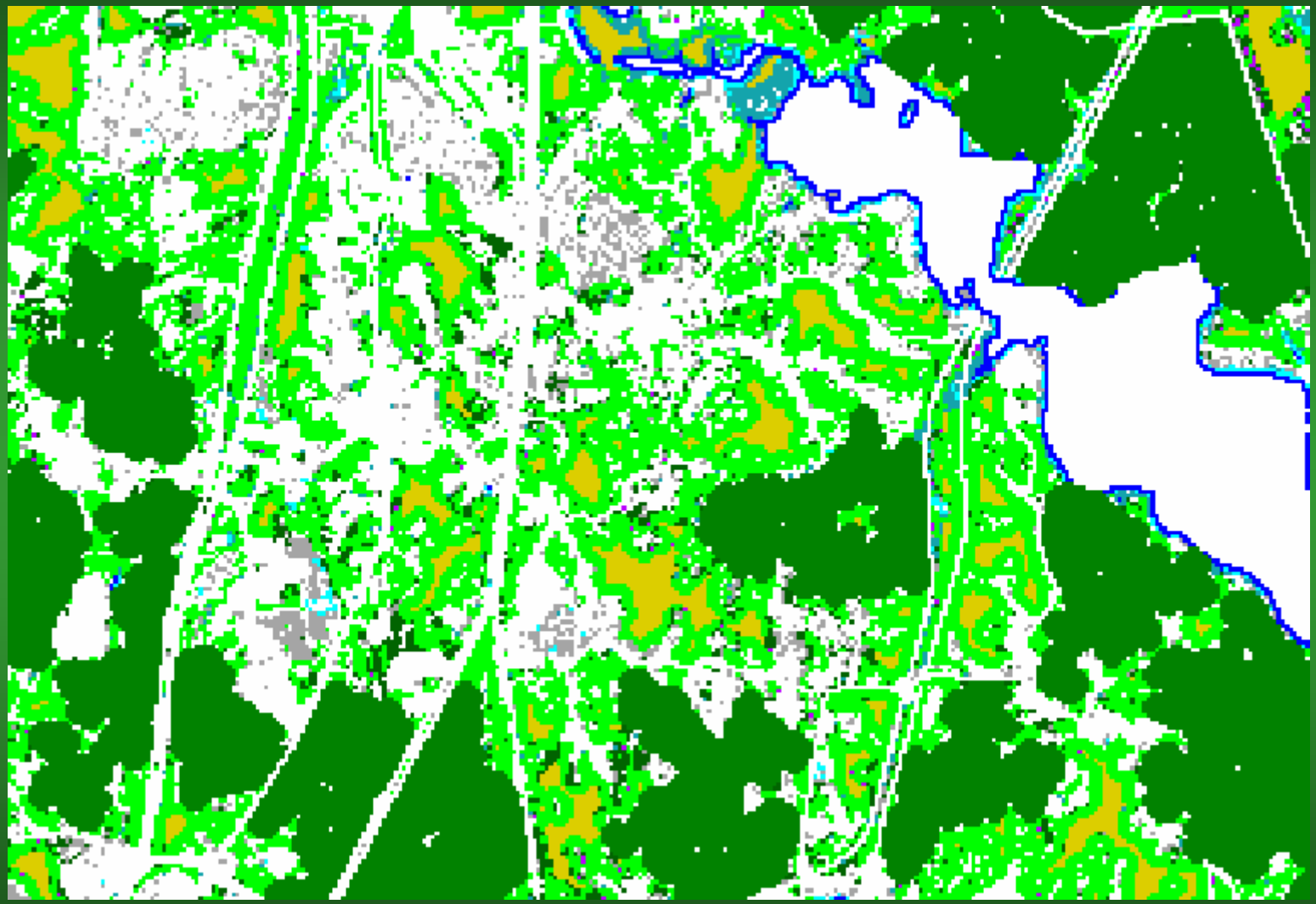
Interior areas, defined as areas at least 100 meters inward from patch edges, were identified and are shown here in gold.

Interior Natural Area >100 Acres



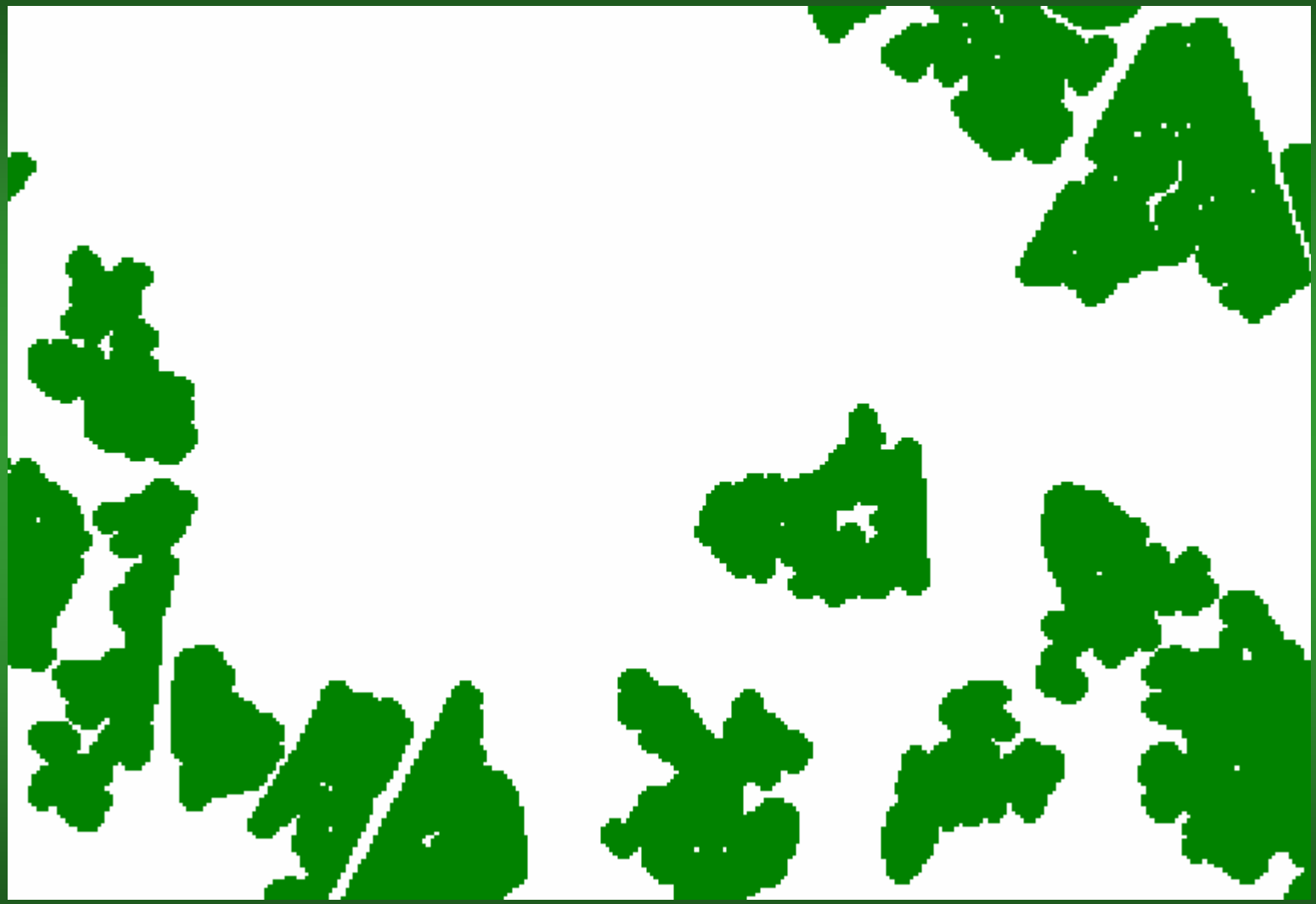
Interior areas at least 100 acres in size were identified and are shown here in magenta.

Cores



The 100-meters edge transitions were reintroduced for patches meeting the cores criteria.

Cores

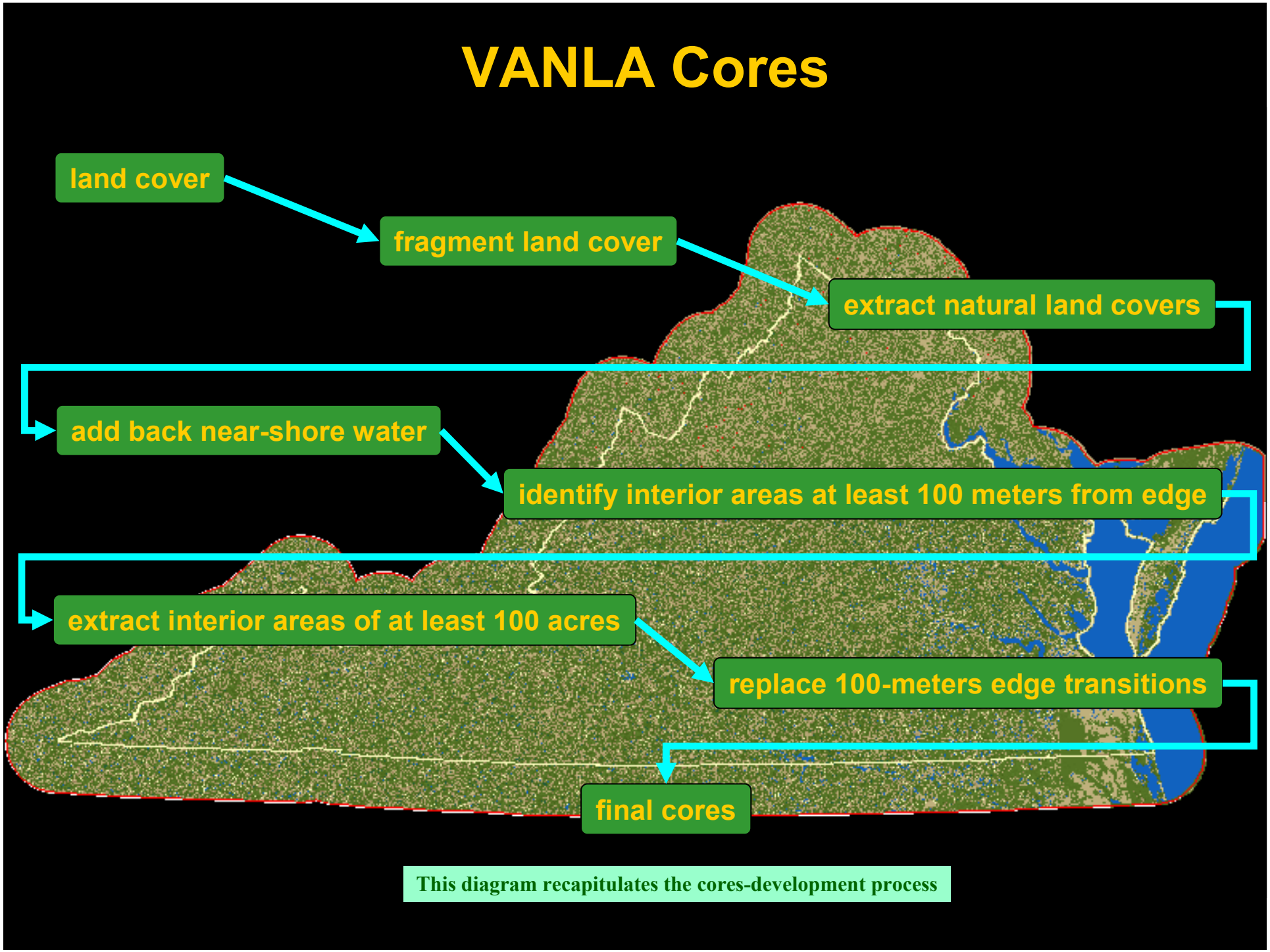


All patches of natural land not meeting the cores criteria were eliminated from the cores analysis. The final cores for this example area are shown here.

VANLA Cores

The cores for the entire study area are shown here.

VANLA Cores



This diagram recapitulates the cores-development process

Core Prioritization Themes

Rare Species and Habitats:

- Conservation Sites and Stream Conservation Units
- Natural Heritage Element Occurrences
- Wildlife Action Plan (Tier 1 Essential Habitats)
- Important Geologic Types (e.g. diabase and karst)
- Critical Neotropical Migratory Bird Habitat

Core Prioritization Themes

Species Diversity Surrogates:

- Area and Diversity of Wetlands
- Diversity of Geologic Types and/or Soil Types
- Topographic Variability
- Number of Physiographic Provinces

Core Prioritization Themes

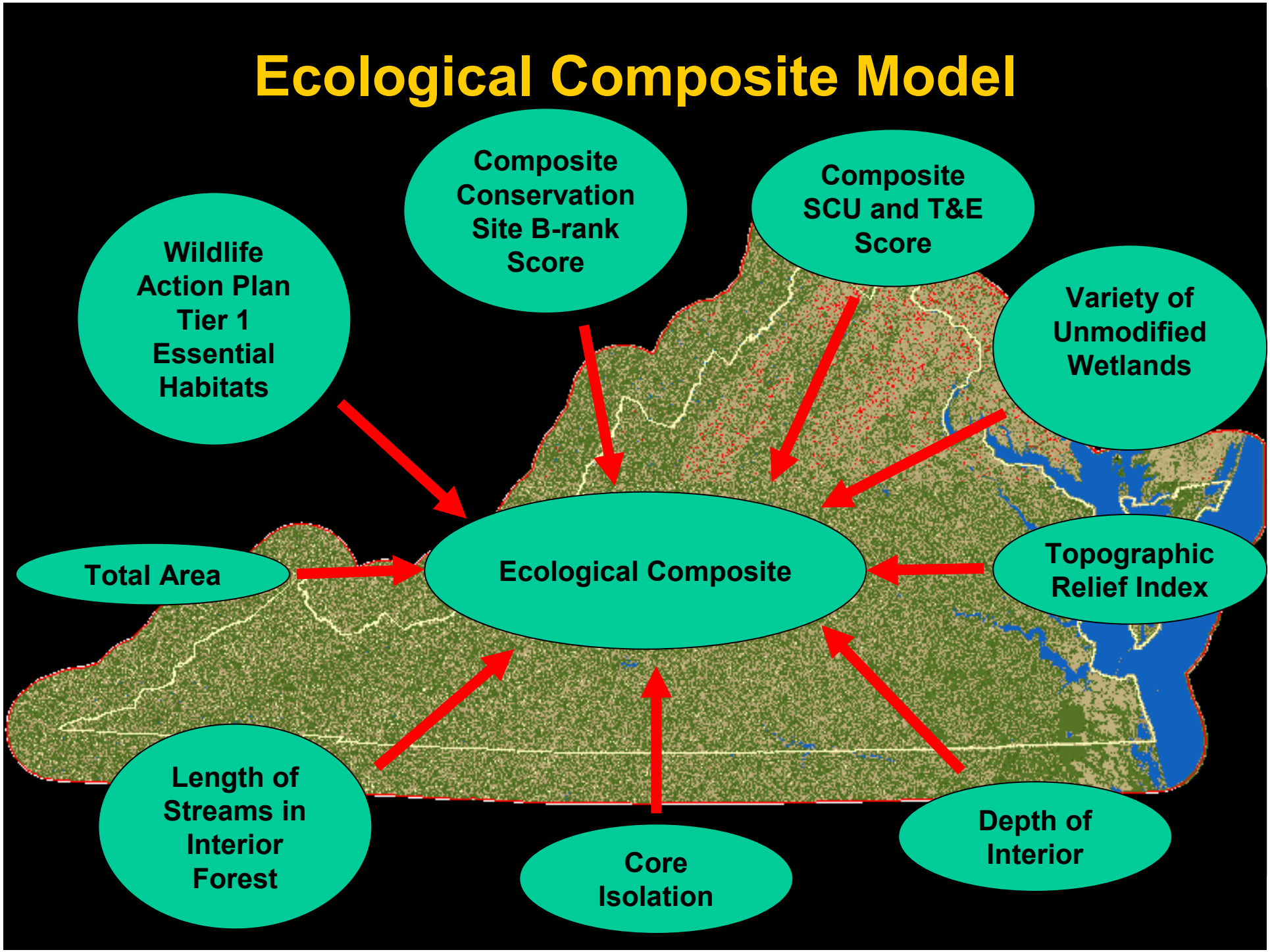
Core Characteristics and Context:

- Size of Interior
- Depth of Interior
- Remoteness
- Surrounding Buffer Suitability
- Adjacency to Existing Conservation Lands
- Isolation (Proximity Zones)

Core Prioritization Themes

Water Quality:

- Drinking Water Sources
- Streams in Interior Forests


Ecological Composite Model
Composite Conservation Site B-rank Score
Composite SCU and T&E Score
Wildlife Action Plan Tier 1 Essential Habitats
Variety of Unmodified Wetlands
Total Area
Ecological Composite
Topographic Relief Index
Length of Streams in Interior Forest
Core Isolation
Depth of Interior

Natural Landscape Block Development

Natural Landscape Blocks

- **slightly fragmented aggregations of cores, plus contiguous natural cover.**
- **bounded by major roads and unsuitable land cover gaps greater than 100 meters across.**
- **natural lands that support and buffer cores.**

Natural Landscape Blocks were developed using natural land covers from the imagery and eliminating areas of detected and estimated human disturbance (e.g. roads, residential areas, and other developed lands).

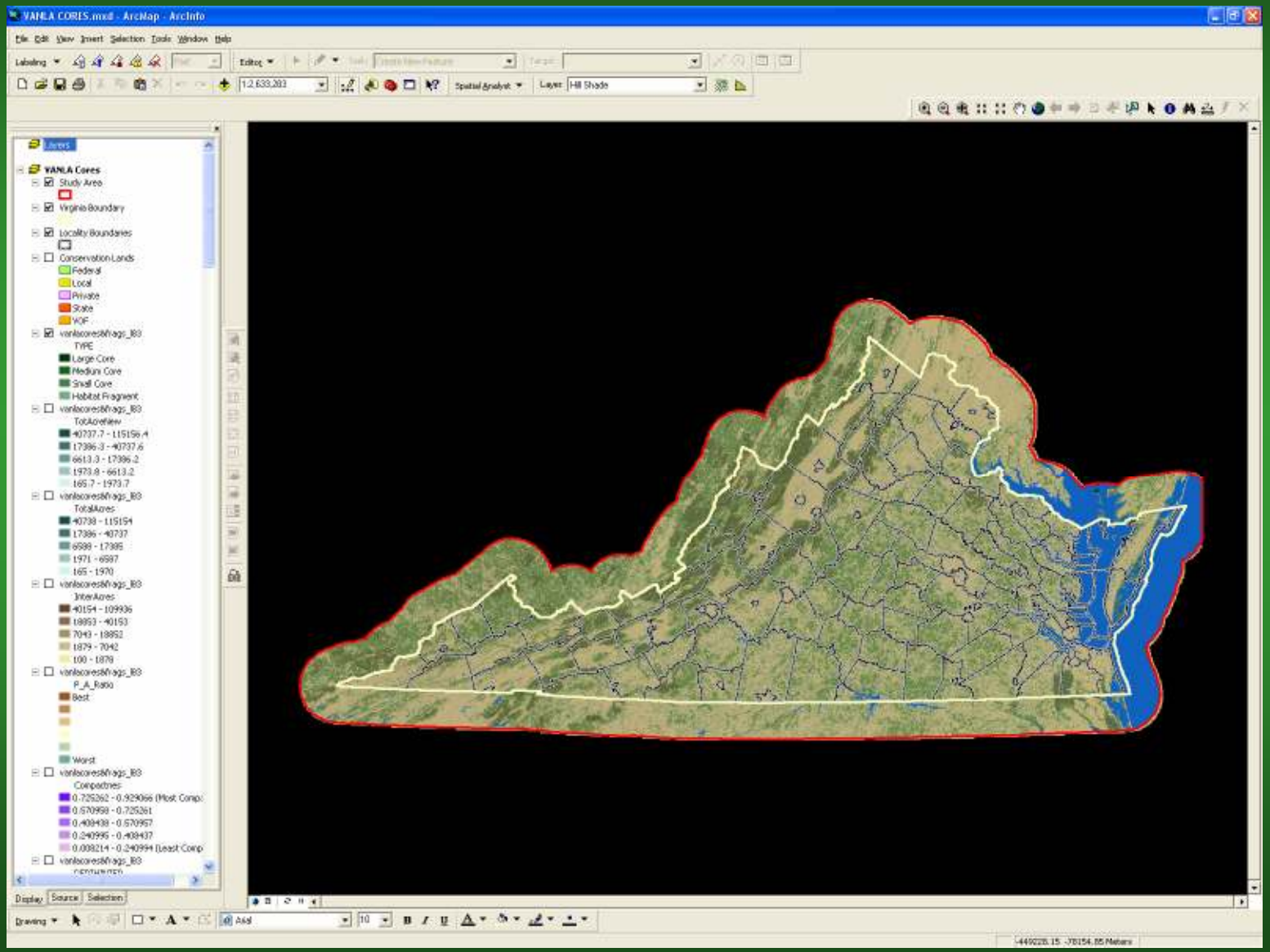
Corridor Analysis

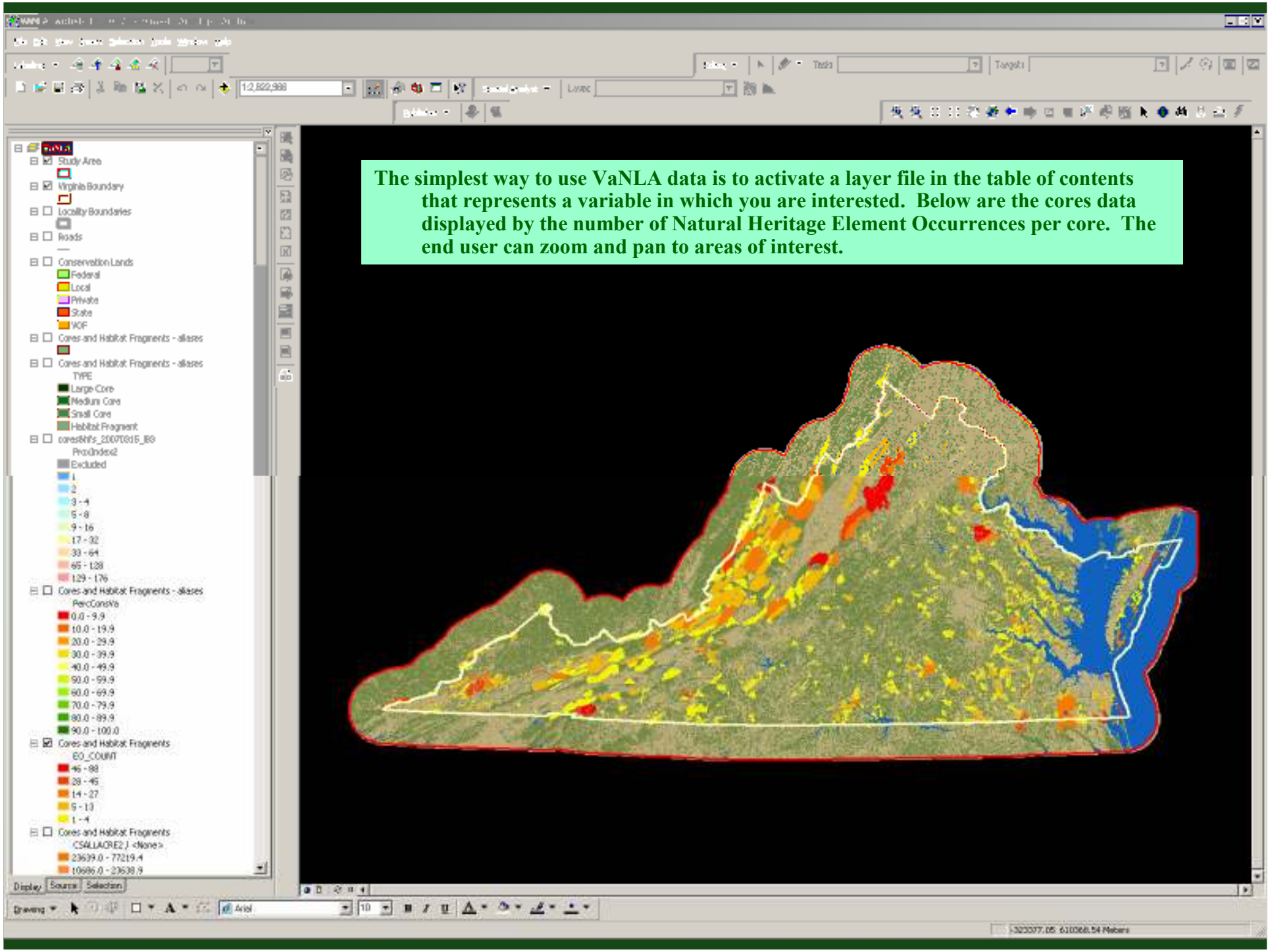
Corridors

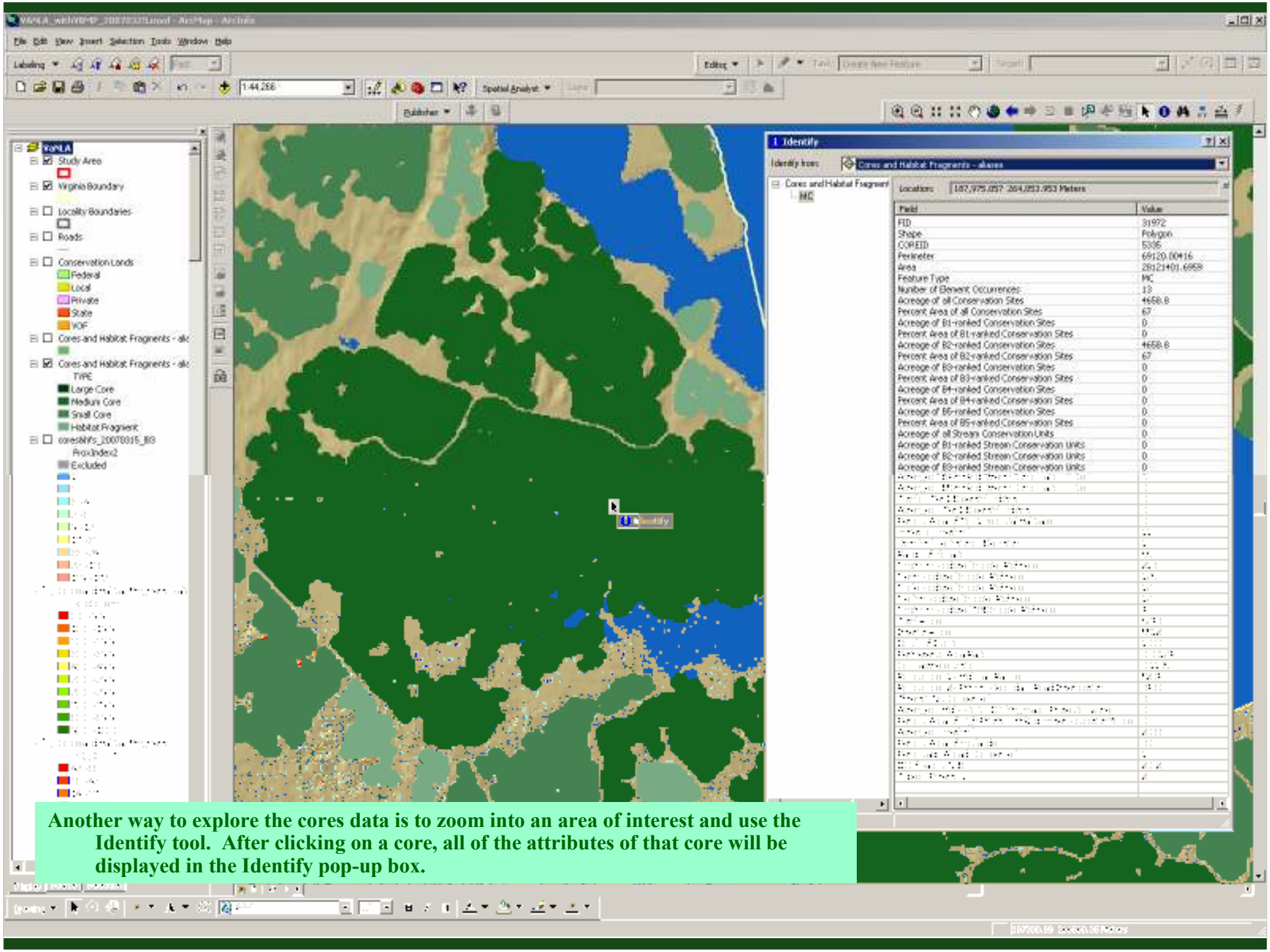
- **are strips of natural cover that link cores**
- **allow animal movement between cores**
- **facilitate seed and pollen transfer between cores**

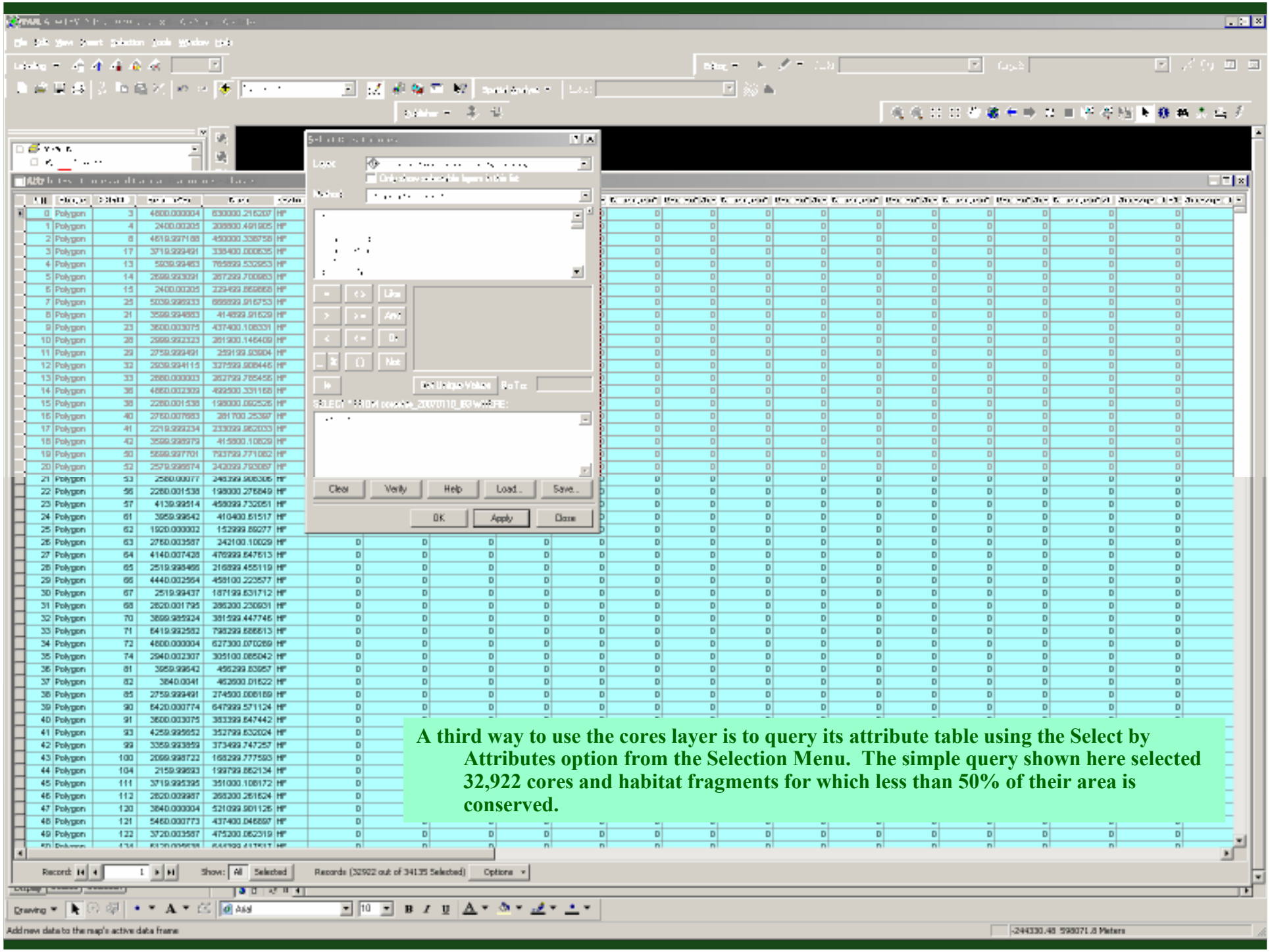
Corridors were developed using least-cost-path (LCP) analysis to identify the best routes to link the most ecologically significant cores. LCP finds the shortest distance through the most suitable combinations of landscape features.

VaNLA Demo in ArcMap

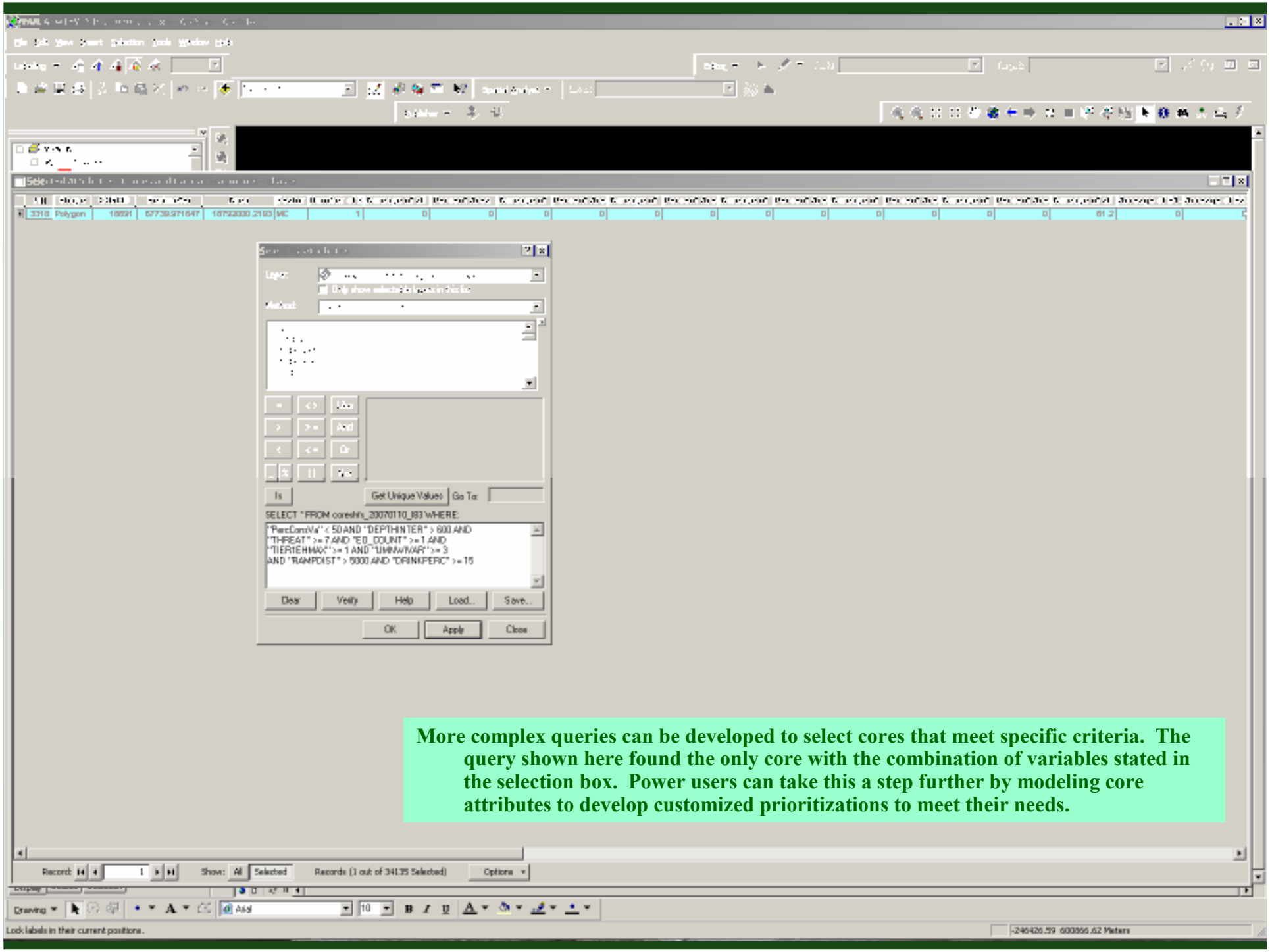



The simplest way to use VaNLA data is to activate a layer file in the table of contents that represents a variable in which you are interested. Below are the cores data displayed by the number of Natural Heritage Element Occurrences per core. The end user can zoom and pan to areas of interest.
VaNLA
Study Area
Virginia Boundary
Locality Boundaries
Roads
Conservation Lands
Federal
Local
Private
State
VOF
Cores and Habitat Fragments - aliases
Cores and Habitat Fragments - aliases
TYPE
Large Core
Medium Core
Small Core
Habitat Fragment
Excluded
1
2
3 - 4
5 - 8
9 - 16
17 - 32
33 - 64
65 - 128
129 - 176
Cores and Habitat Fragments - aliases
PercConsVa
0.0 - 9.9
10.0 - 19.9
20.0 - 29.9
30.0 - 39.9
40.0 - 49.9
50.0 - 59.9
60.0 - 69.9
70.0 - 79.9
80.0 - 89.9
90.0 - 100.0
Cores and Habitat Fragments
EO_COUNT
46 - 88
28 - 45
14 - 27
5 - 13
1 - 4
Cores and Habitat Fragments
CSALLACRE2 (<None>
23639.0 - 77219.4
10686.0 - 23638.9
Display
Source
Selection
Drawing
Arial
10


Identify
Another way to explore the cores data is to zoom into an area of interest and use the Identify tool. After clicking on a core, all of the attributes of that core will be displayed in the Identify pop-up box.



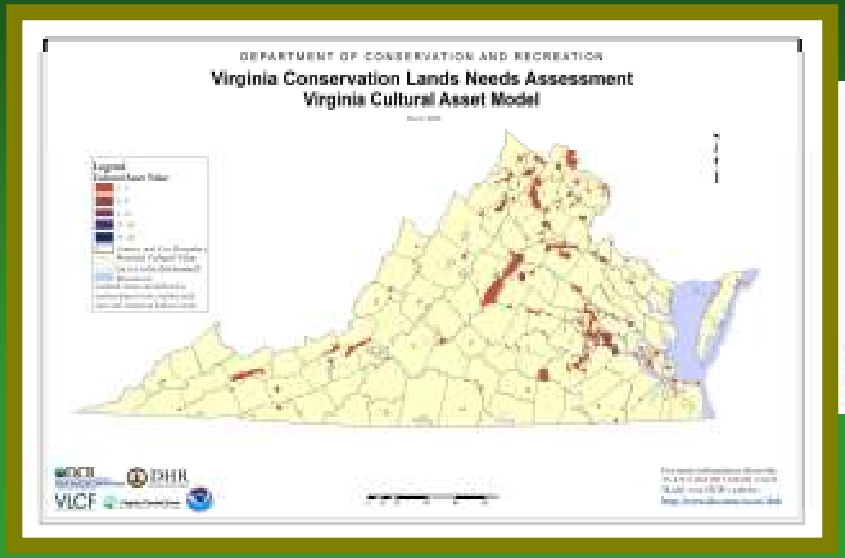
A third way to use the cores layer is to query its attribute table using the Select by Attributes option from the Selection Menu. The simple query shown here selected 32,922 cores and habitat fragments for which less than 50% of their area is conserved.



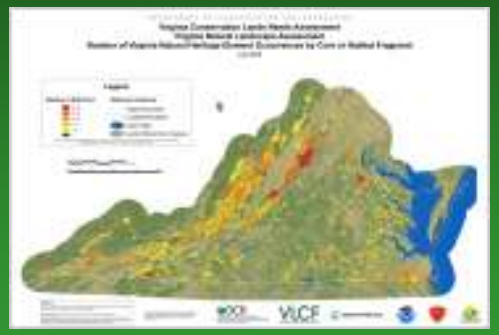
More complex queries can be developed to select cores that meet specific criteria. The query shown here found the only core with the combination of variables stated in the selection box. Power users can take this a step further by modeling core attributes to develop customized prioritizations to meet their needs.

VCLNA Models

Cultural



Ecological (VANLA)

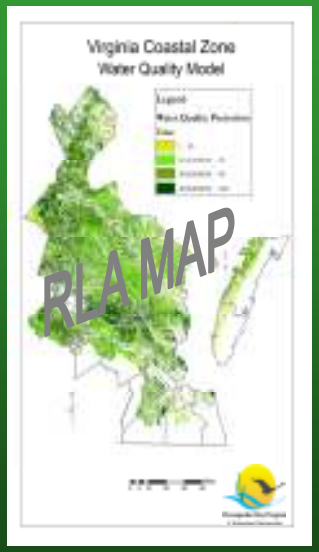


Vulnerability

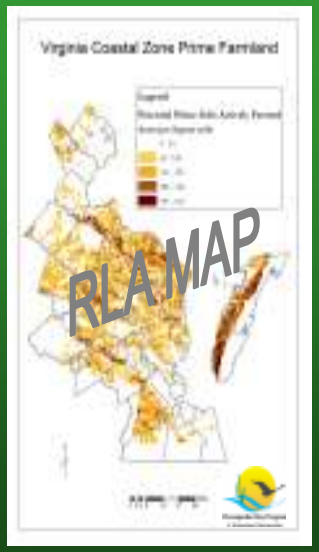
Forest Economics

Recreation

Water Quality



Agricultural



Cultural Assets

Objective: The objective of the cultural assets model is to identify the relative cultural value of lands as defined by the model input parameters.

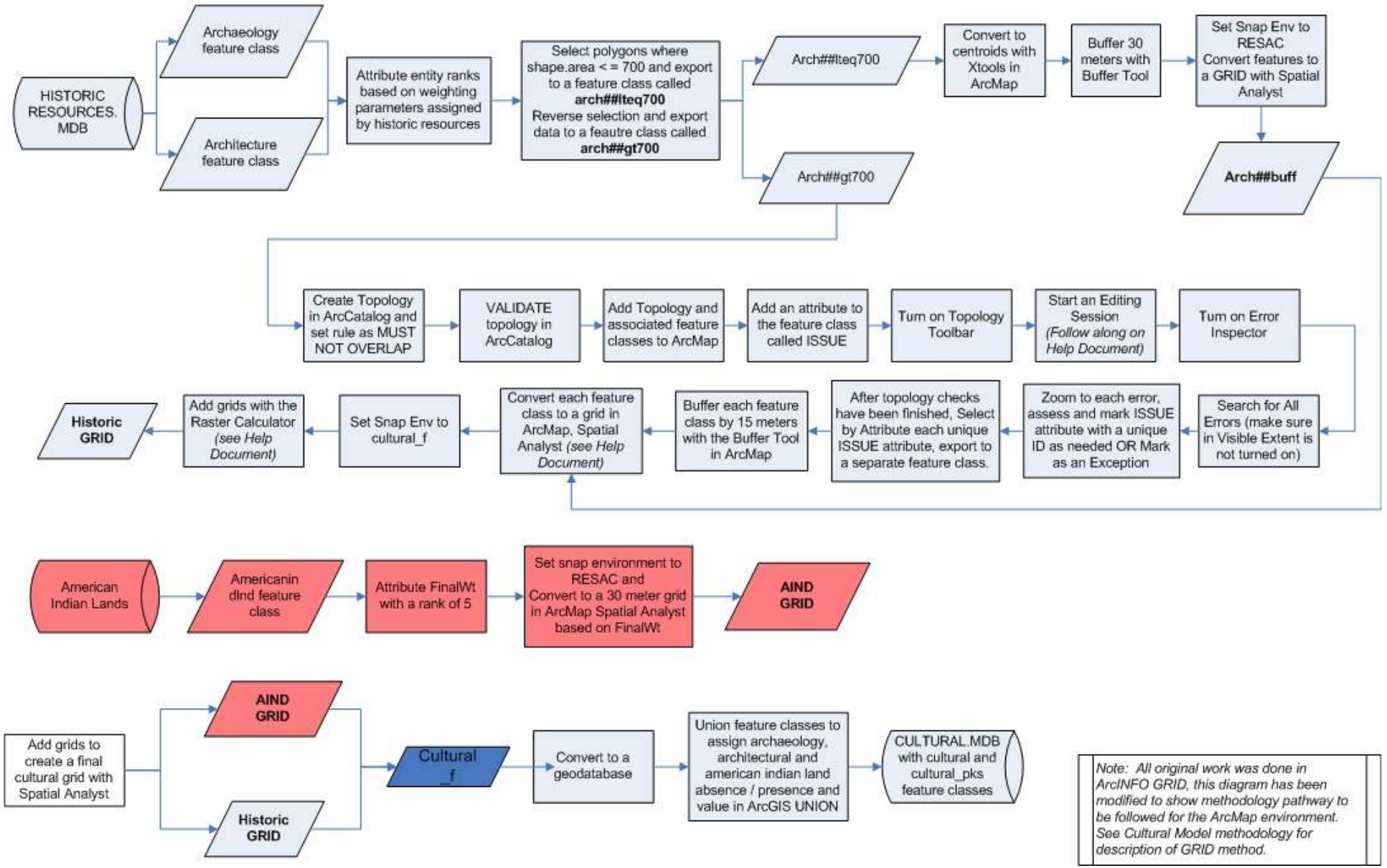
Partner: Virginia Department of Historic Resources

Data Layers

- Archaeological Sites & Architectural Sites
  1. National Historic Districts
  2. National Historic Landmarks
  3. National Historic Register Sites
  4. State Inventoried Sites (Eligible for possible National Register and Easements)
- American Indian Areas

Status: Completed March 2006; data, metadata and technical report available upon request.

Cultural Model Methodology



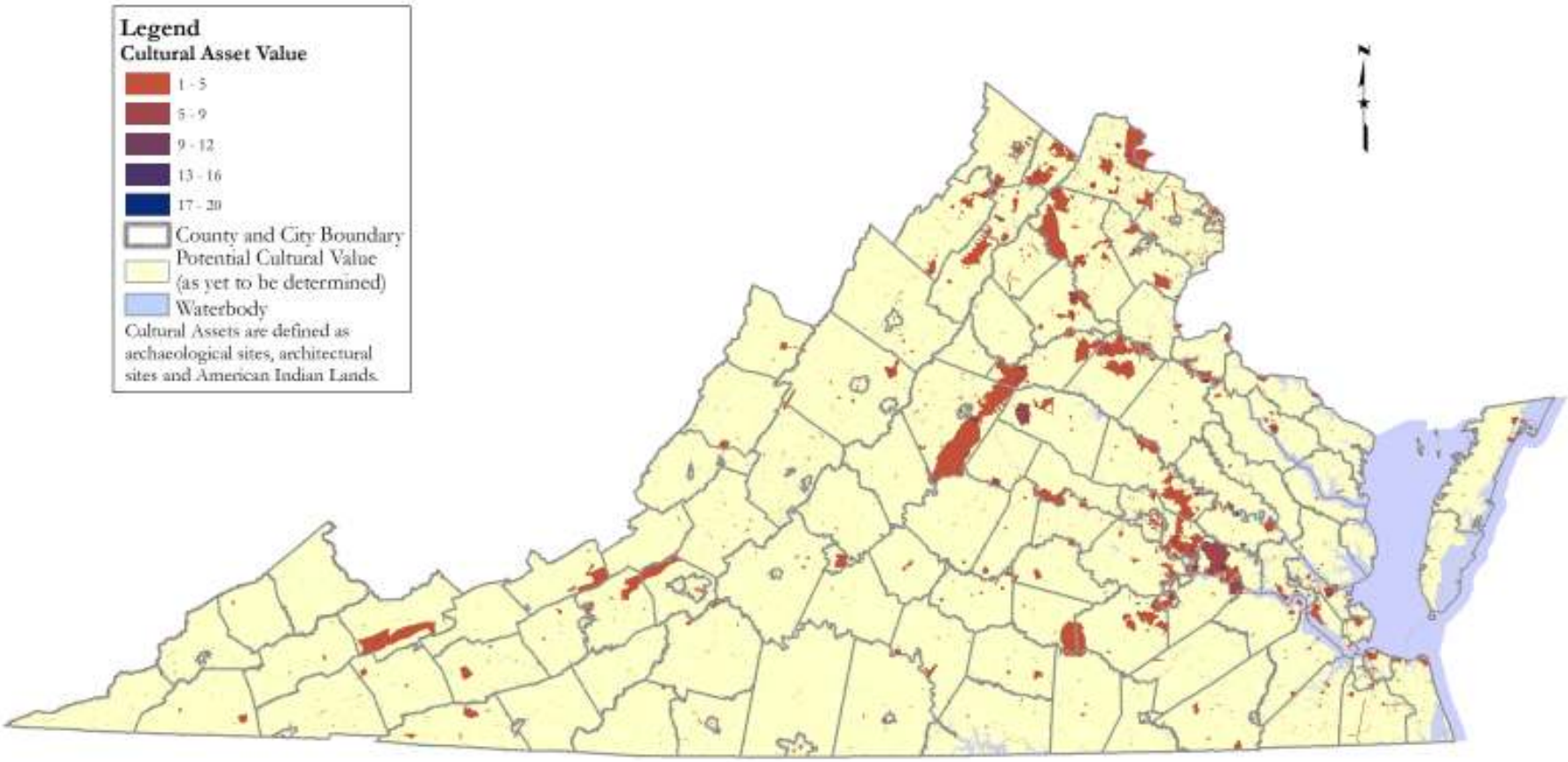
Note: All original work was done in ArcINFO GRID, this diagram has been modified to show methodology pathway to be followed for the ArcMap environment. See Cultural Model methodology for description of GRID method.

DEPARTMENT OF CONSERVATION AND RECREATION

Virginia Conservation Lands Needs Assessment

Virginia Cultural Asset Model

March 2006

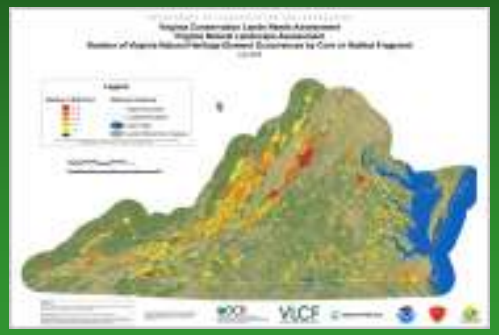


DCR DHR VLCF Virginia Coastal Zone

For more information about the VCLNA and the Cultural Assets Model, visit DCR's website: http:/www.dcr.state.va.us/dnh

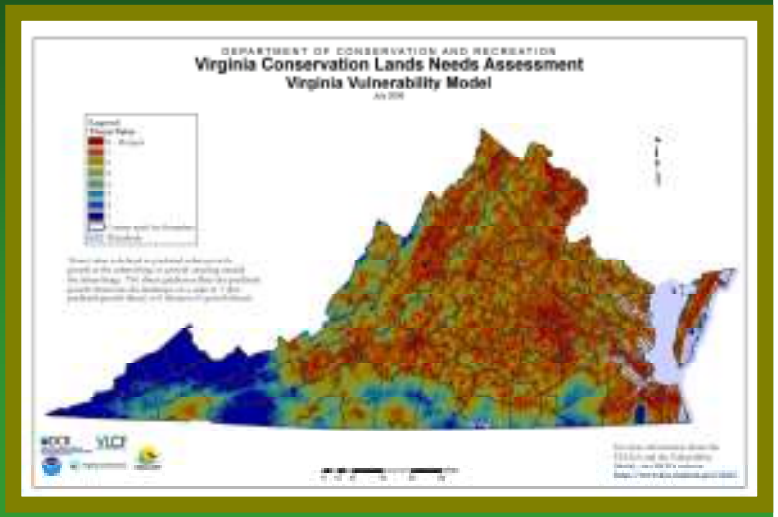
VCLNA Models

Ecological (VANLA)



Cultural

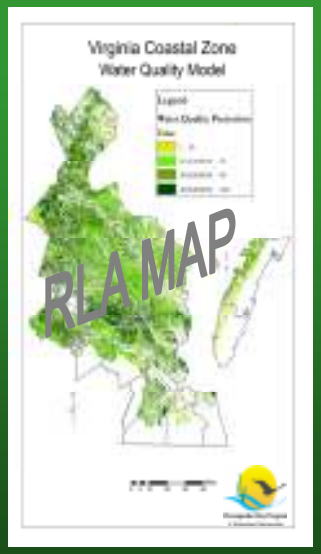
Vulnerability



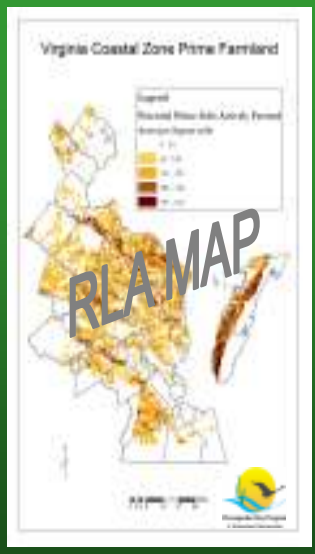
Forest Economics

Recreation

Water Quality



Agricultural



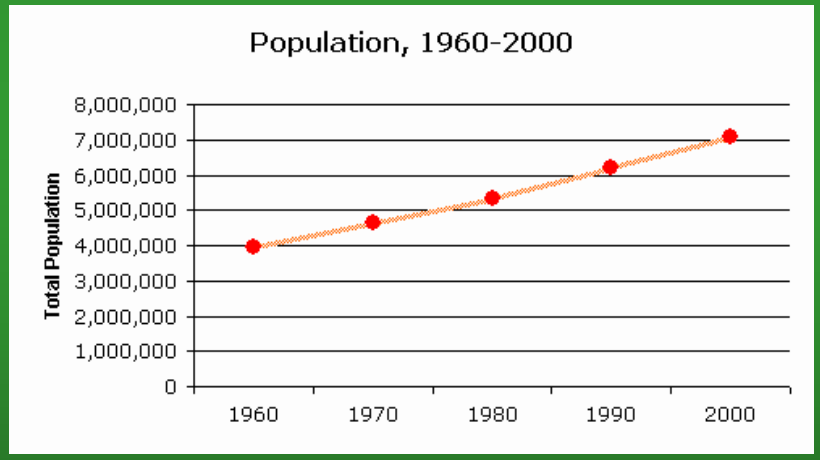
Vulnerability Model

Objective: To develop a growth prediction model to provide a landscape view of growth trends in Virginia. Developed an Urban Growth Prediction Model, a Suburban Growth Prediction Model (called Urban Fringe Growth), a Rural Growth Prediction Model (called Growth Outside the Urban Fringe), and a composite model.

Partner: Virginia Commonwealth University

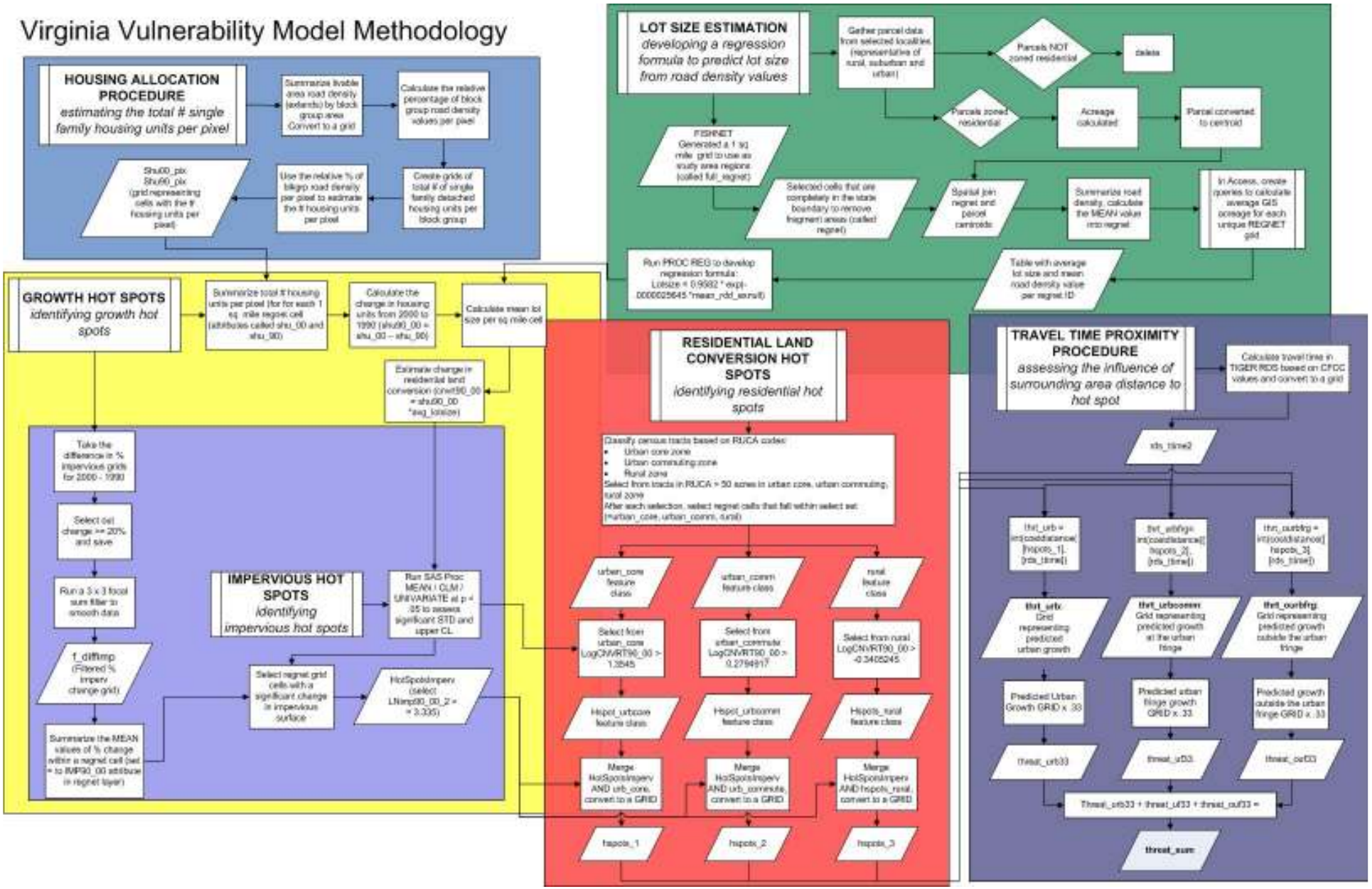
Data Layers:

- Land Use
- Slope
- 1990 Census Block Group data
- 2000 Census Block Group data
- 1990 Impervious Surface data
- 2000 Impervious Surface data
- Road Density
- Parcel data
- Rural-Urban Commuting Area Codes (RUCA)

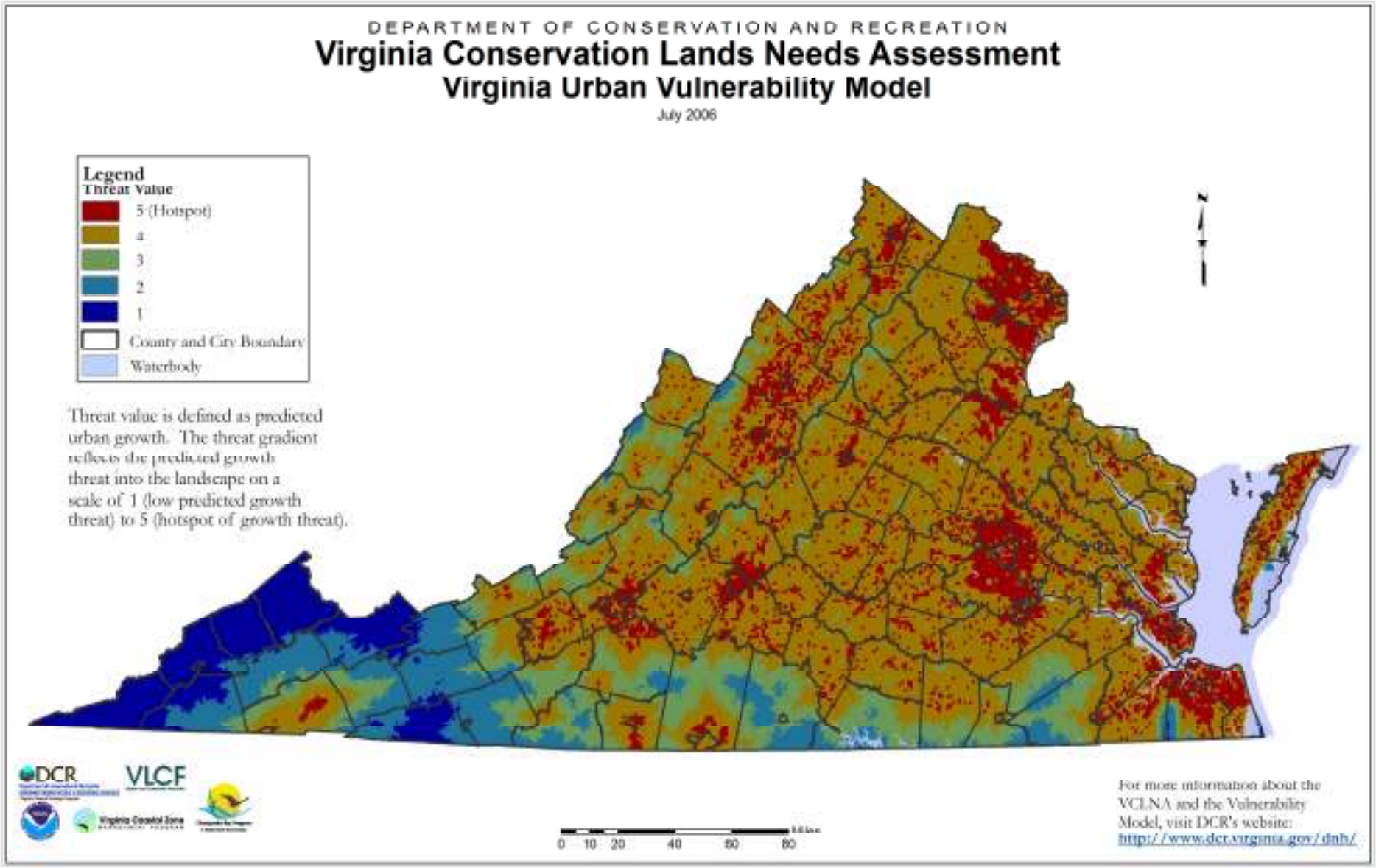


Status: Completed July 2006, all 4 models available upon request including data, metadata and technical report.

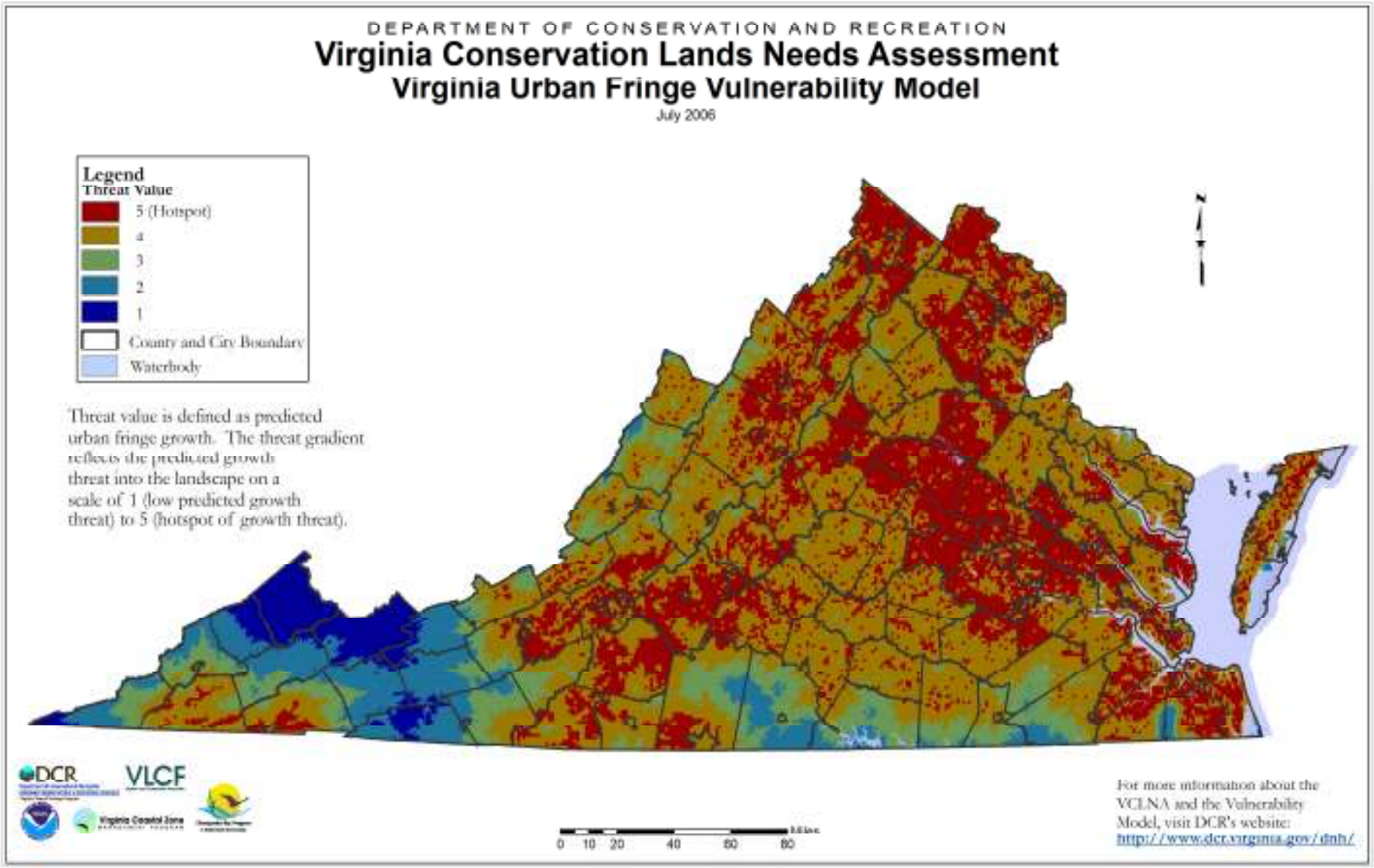
Virginia Vulnerability Model Methodology



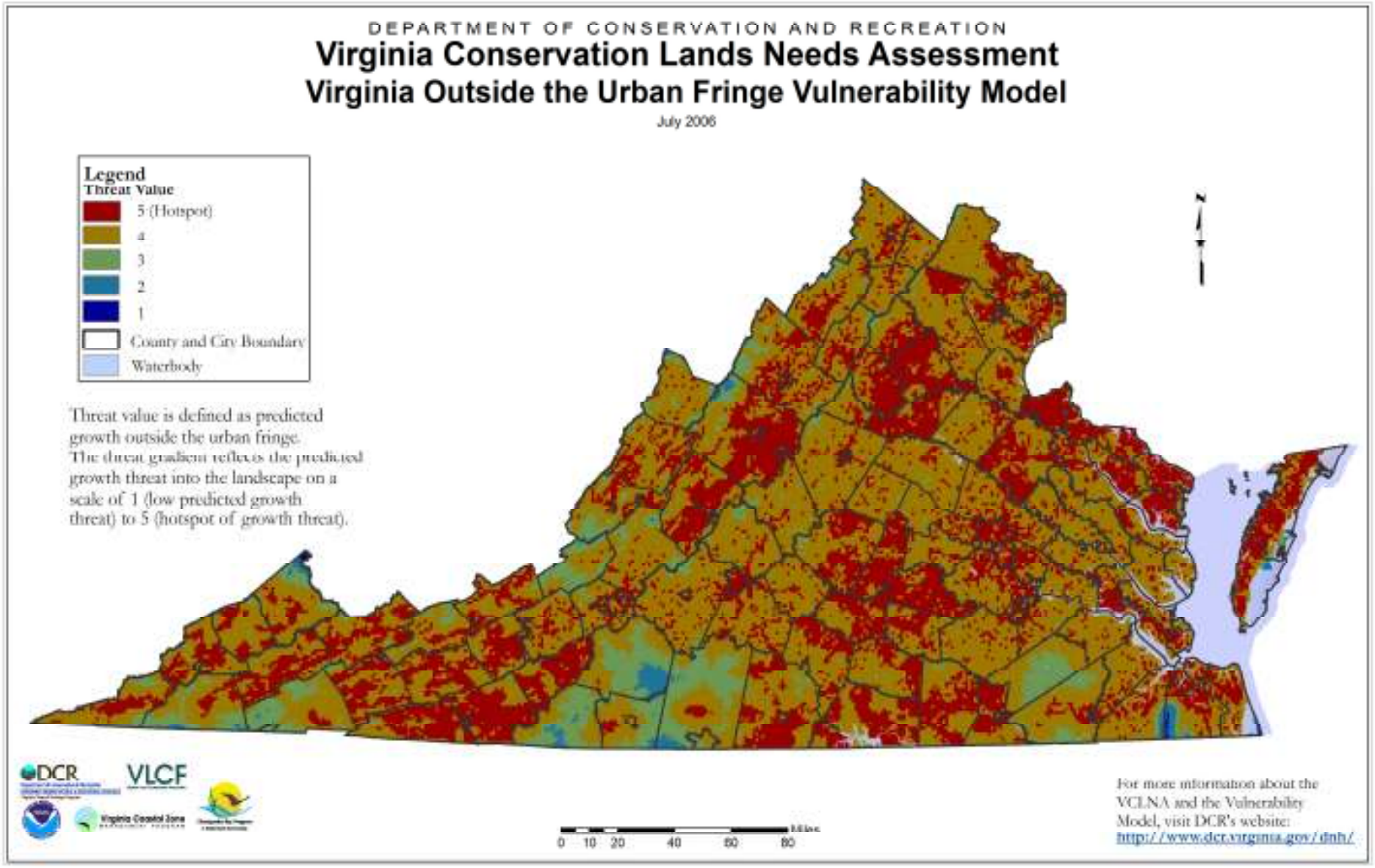
Urban Vulnerability Model showing Predicted Urban Growth



Urban Fringe Vulnerability Model showing Predicted Suburban Growth



Growth Outside the Urban Fringe Vulnerability Model showing Predicted Rural Growth

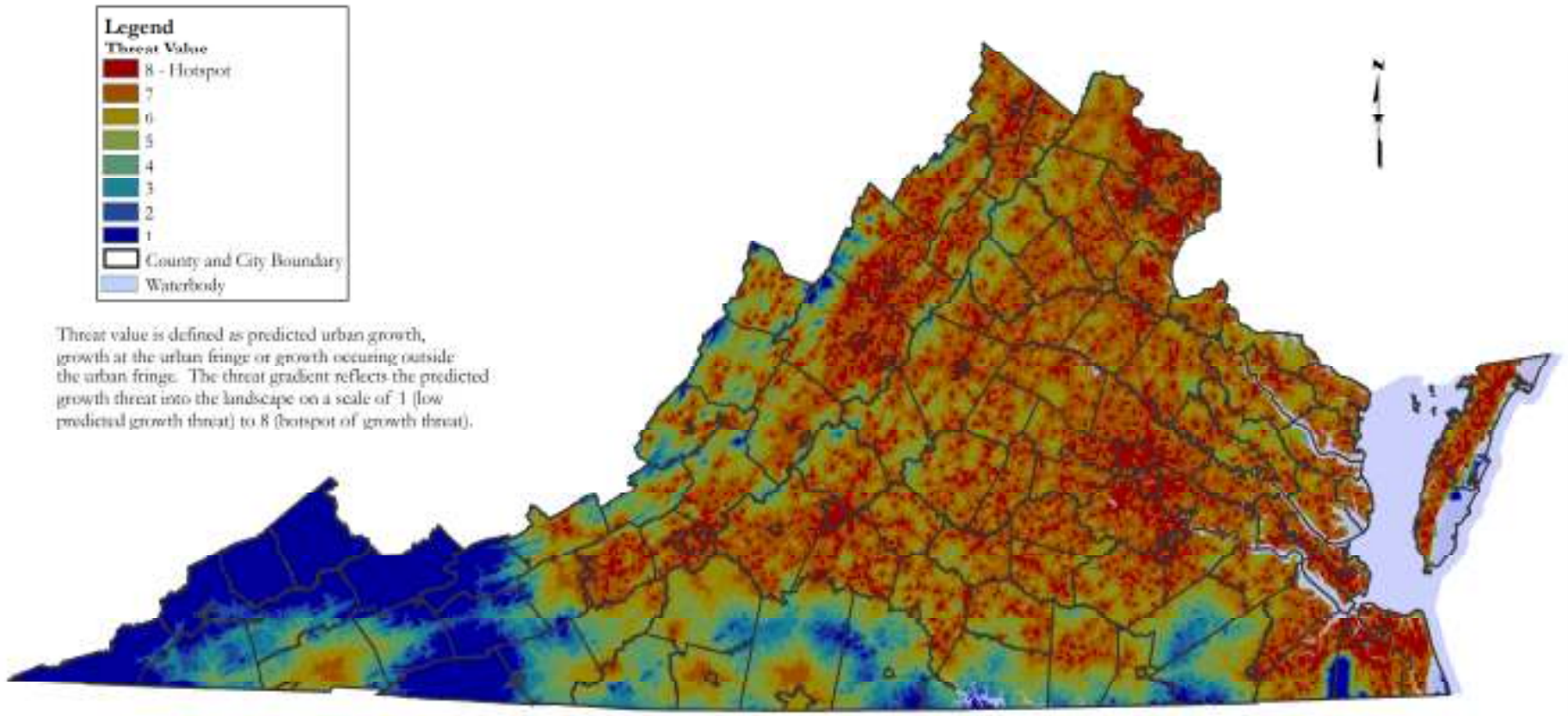


DEPARTMENT OF CONSERVATION AND RECREATION

Virginia Conservation Lands Needs Assessment

Virginia Vulnerability Model

July 2006



DCR VLCF Virginia Coastal Zone

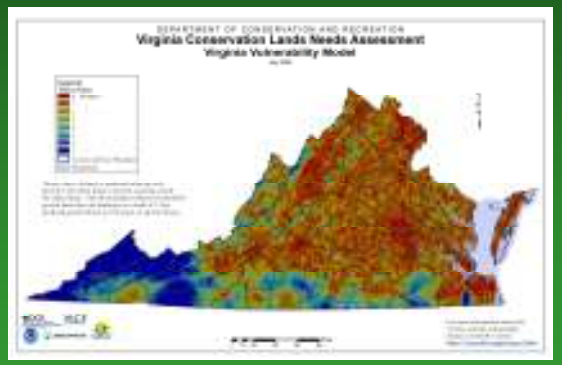
For more information about the VCLNA and the Vulnerability Model, visit DCR's website: http://www.dcr.virginia.gov/dnh/

VCLNA Models

Ecological (VANLA)

Cultural

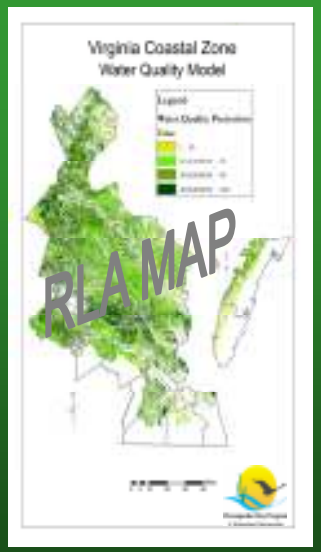
Vulnerability



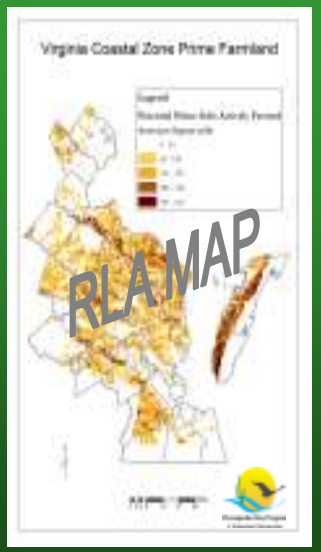
Forest Economics

Recreation

Water Quality



Agricultural



Forest Economics

Objective: To map the relative value of forest lands with economic value.

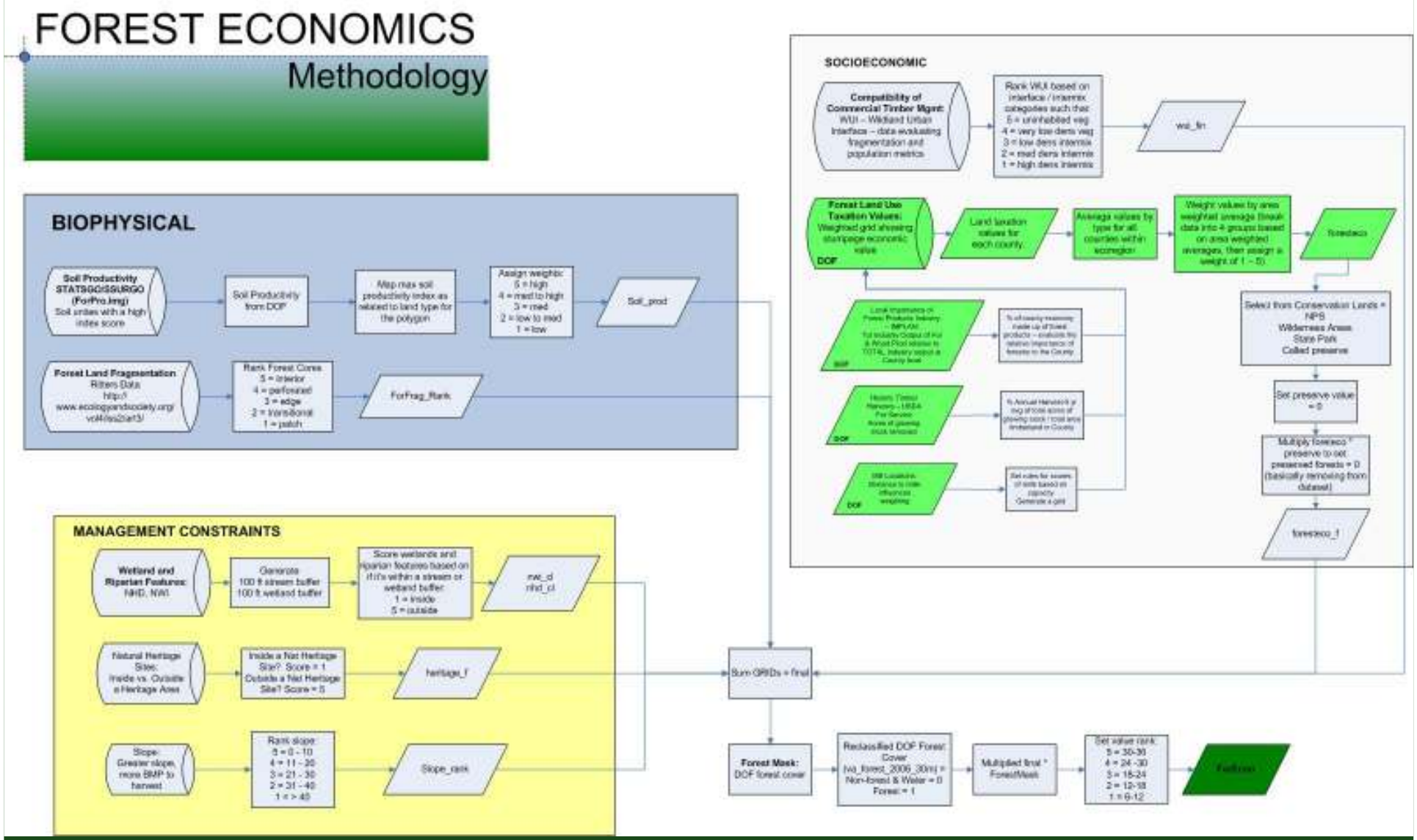
Partner: VA Dept of Forestry

Data Layers

- Soil Productivity
- Forest Land Fragmentation
- Riparian and Wetland features
- Steep Slopes - NHD
- Rare, T and E Species
- Census Data – Geography Network / US Gov't
- Forest Land Use Taxation Values (economic data)
  - Stumpage value
  - Forest productivity values

Status: Completion May 2007; data, metadata and technical report available upon request.

Forest Economic Model Working Methodology

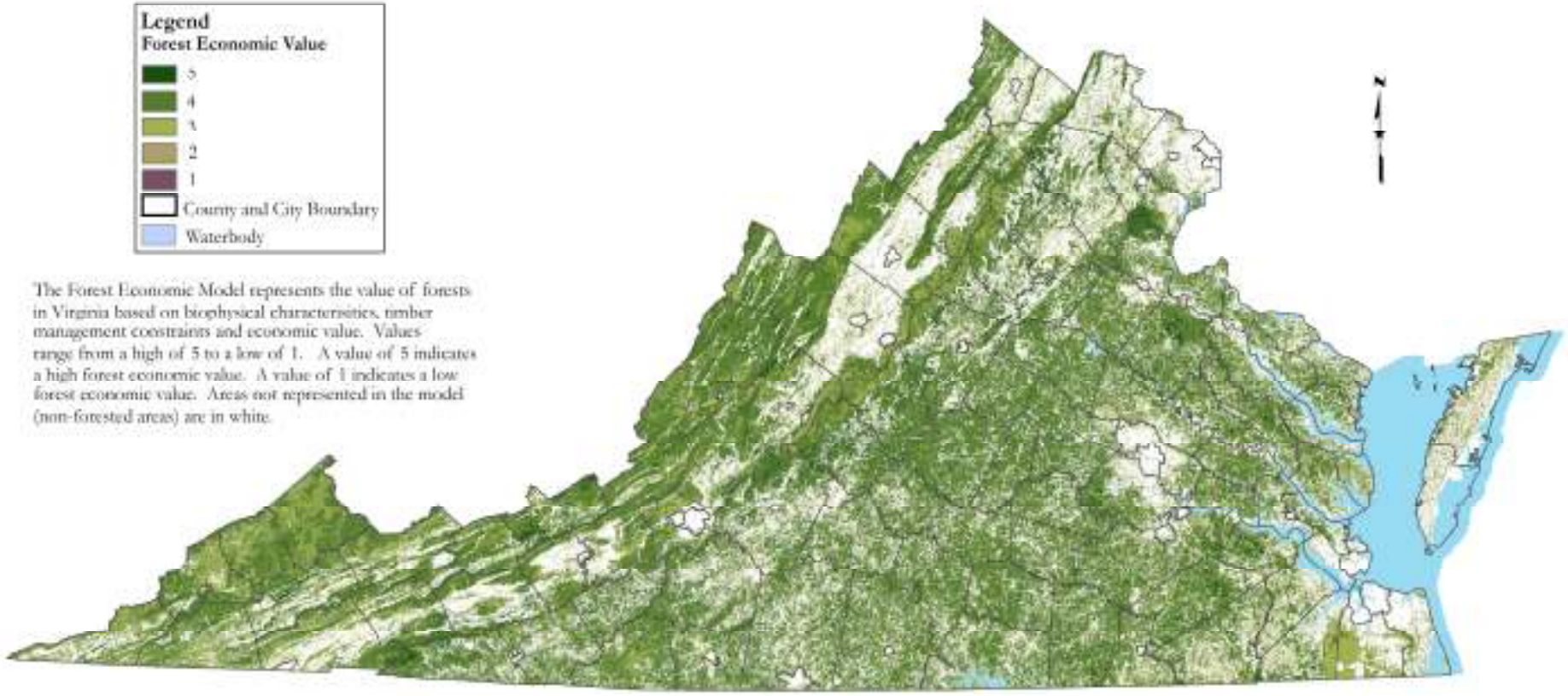


DEPARTMENT OF CONSERVATION AND RECREATION

Virginia Conservation Lands Needs Assessment

Virginia Forest Economic Model

April 2007



The Forest Economic Model represents the value of forests in Virginia based on biophysical characteristics, timber management constraints and economic value. Values range from a high of 5 to a low of 1. A value of 5 indicates a high forest economic value. A value of 1 indicates a low forest economic value. Areas not represented in the model (non-forested areas) are in white.

DCR VLCF Virginia Coastal Zone

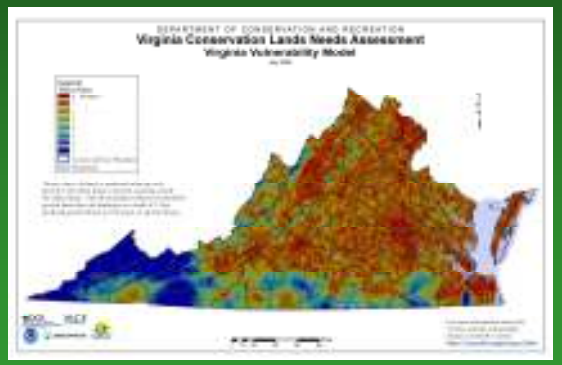
For more information about the VCLNA and the Forest Economic Model, visit DCR's website:
http://www.dcr.virginia.gov/natural_heritage/vclna.shtml

VCLNA Models

Ecological (VANLA)

Cultural

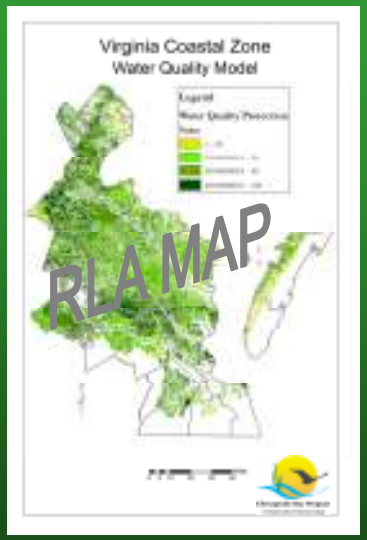
Vulnerability



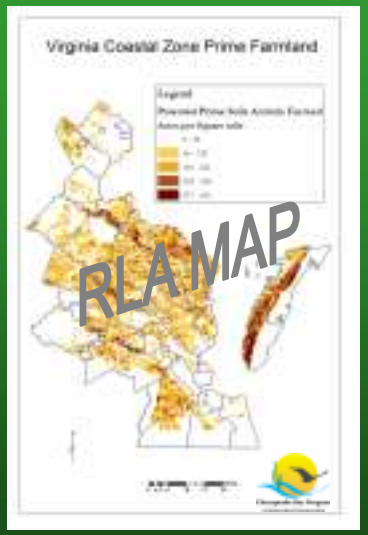
Forest Economics

Recreation

Water Quality



Agricultural



Recreation Model

Objective: To map the relative recreation value of lands in Virginia based on input model parameters.

Partners:
VA Dept of Game and Inland Fisheries
DCR Division of Planning and Recreation Resources

Data Layers:
- Access points
- Trails
  - Blueways
  - Greenways
  - Birding Trails
- Parks
  - Federal
  - State
  - Local
- Department of Game and Inland Fisheries Hunting and Fishing Data
- Beaches - VIMS

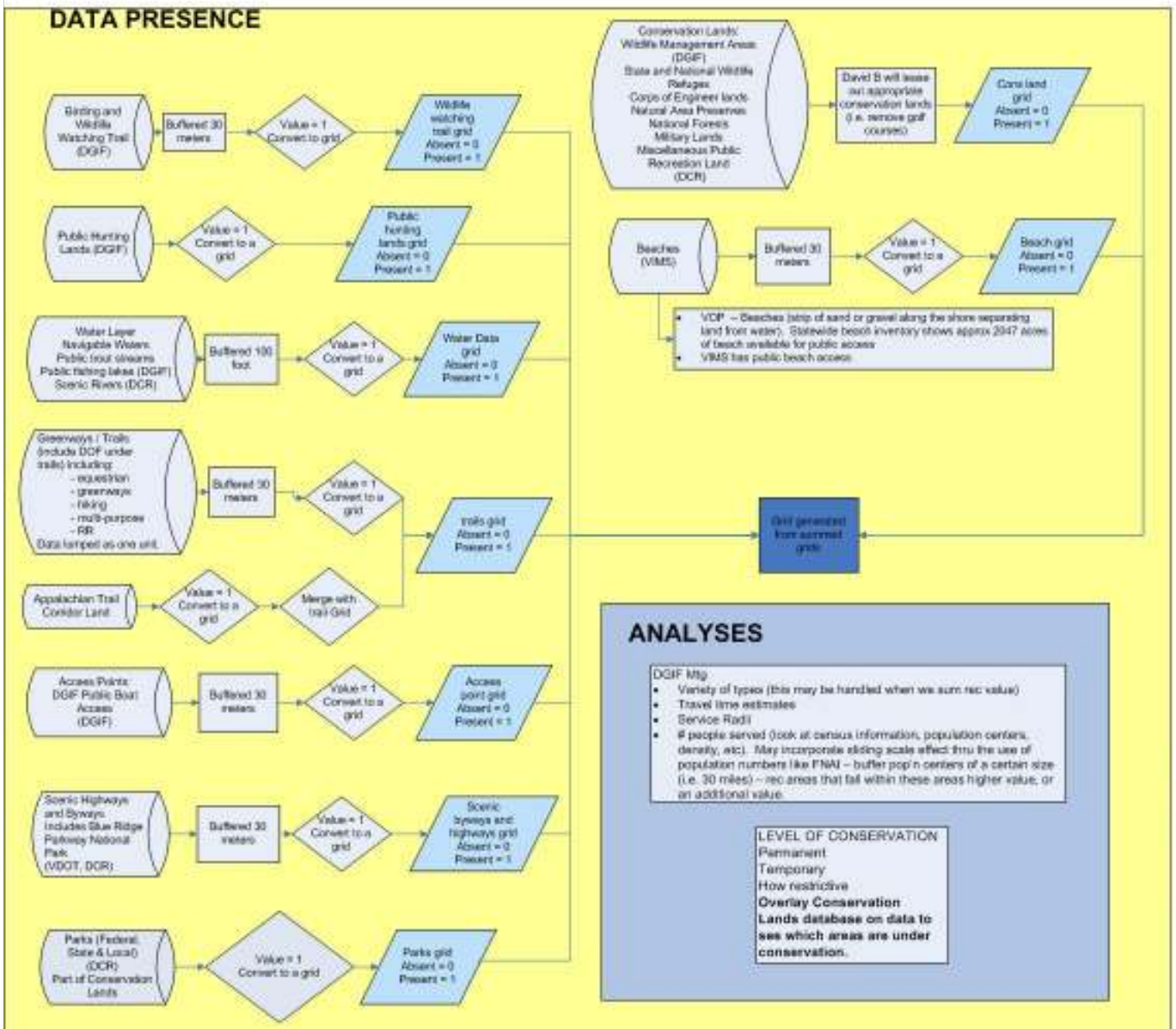
- Analyses
  - Service Radii
  - Travel Time

Status: Completion April 2007; data, metadata and technical report available upon request.

RECREATION MODEL

April 18, 2007

DATA PRESENCE



ANALYSES

DGIF Mtg

- Variety of types (this may be handled when we sum rec value)
- Travel time estimates
- Service Radii
- # people served (look at census information, population centers, density, etc). May incorporate sliding scale effect thru the use of population numbers like FNAI – buffer pop'n centers of a certain size (i.e. 30 miles) – rec areas that fall within these areas higher value, or an additional value.

LEVEL OF CONSERVATION
Permanent
Temporary
How restrictive
Overlay Conservation Lands database on data to see which areas are under conservation.

Landowner permit needed = restrictive not public access
BUT something like Danville requiring a permit to fish the trout stream, not restrictive in the same sense, public access – more inventory driven and allow all as long as permit in hand.

PARTNERS
VDGIF
DCR Div of Planning and Recreation

CONSIDERATIONS

- GIAW – brought up the sliding scale idea, recreation value is different depending on resolution. For a city, the value of a green space may be considerably more significant than in a rural area – how do we incorporate sliding scales in the recreation model? Is it possible →
- May incorporate sliding scale effect thru the use of population numbers like FNAI – buffer pop'n centers of a certain size (i.e. 30 miles) – rec areas that fall within these areas higher value, or an additional value.
- Inclusion of data that is recreational based (just because land may have ecological value, it doesn't necessarily qualify in the rec model, has to have recreation value)

NOTES

Recreation is the employment of time in a non-profitable way, in many ways also a therapeutic refreshment of one's body or mind.

Notes:
Bob Munson has requested we leave out potential trails.
Must be very careful of how scenic data are handled – i.e. the buffering of the lands. People may see this as "taking".

Recreation Model "Notes"
A. Water bodies are not included in this model with the following exceptions:
1. Inland Water bodies included in the DCR-DNH Conservation Lands database. These include water bodies owned/managed by the Army Corps of Engineers.
2. State owned public fishing lakes
3. Federal or State owned fish hatcheries
4. DGIF stocked/managed trout streams located within public lands
B. Scenic Byways are buffered 15 meters on either side of the centerline. (scenic_grid).
C. Trails are buffered 15m on either side of the centerline (alltrails_grid)
D. Public Boating Access Points are buffered at a 30m radius (boating_grid)

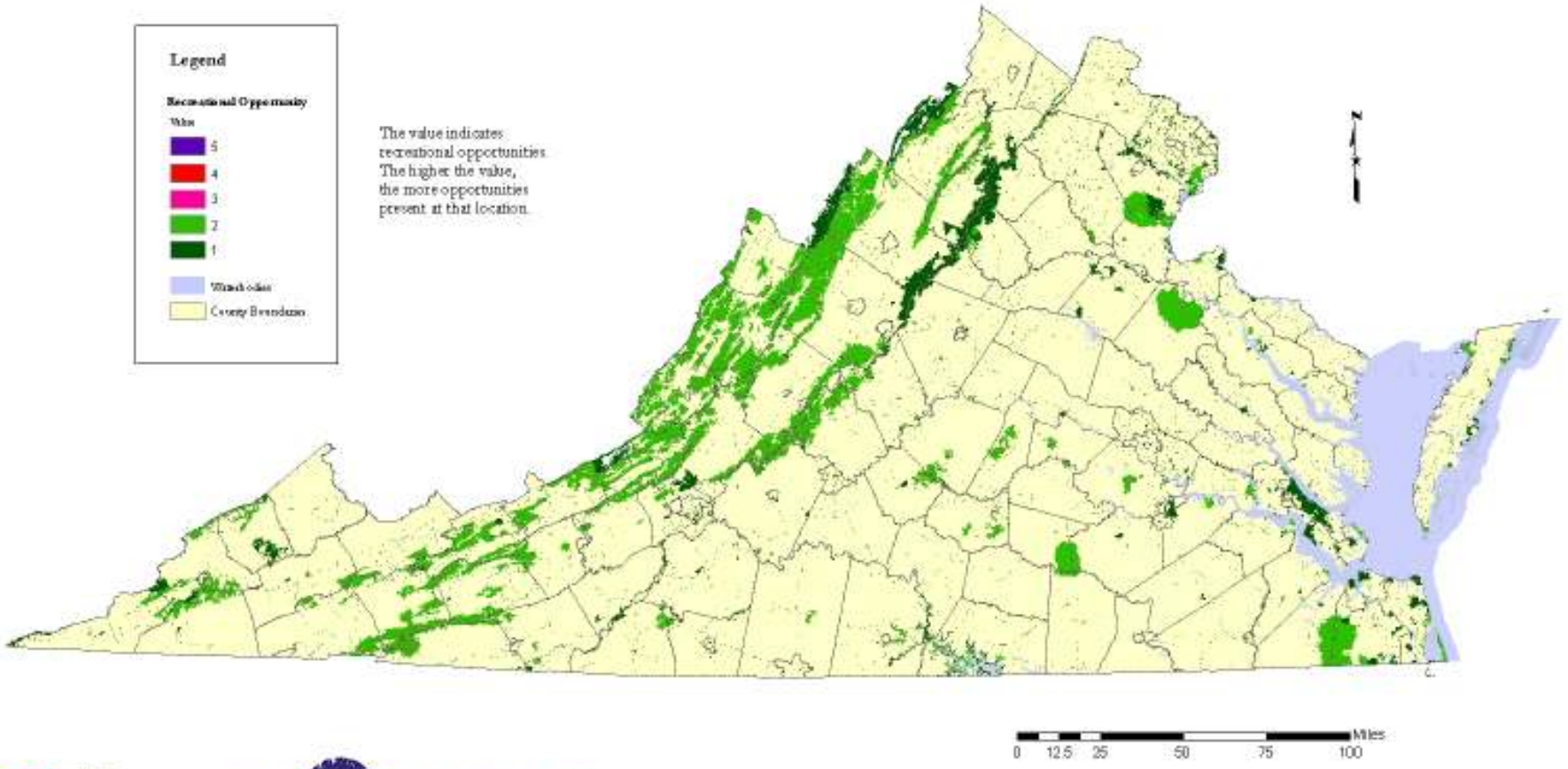
E. Trout streams are buffered 100ft on either side of center and clipped to coastlands. All other water features are buffers at 100ft.
H. Bird trails were buffered at 15 meters one either side of centerline then converted to a grid.

DEPARTMENT OF CONSERVATION AND RECREATION

Virginia Conservation Lands Needs Assessment

Virginia Recreation Model

May 2007



DCR Department of Conservation & Recreation

VLCF

Virginia Coastal Zone Management Program

For more information about the VCLNA and the Recreation Model, visit DCR's website: http://www.dcr.virginia.gov/natural_heritage/vclna.shtml

VCLNA Models

Ecological (VANLA)

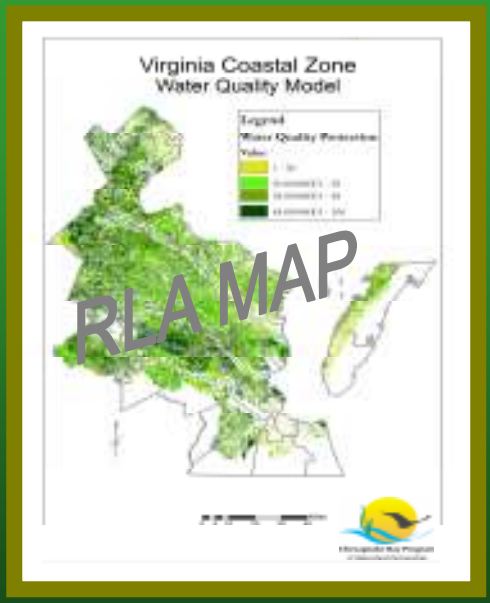
Cultural

Vulnerability

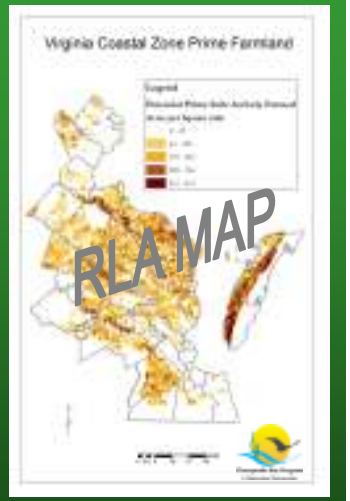
Forest Economics

Recreation

Water Quality



Agricultural



Water Quality Model

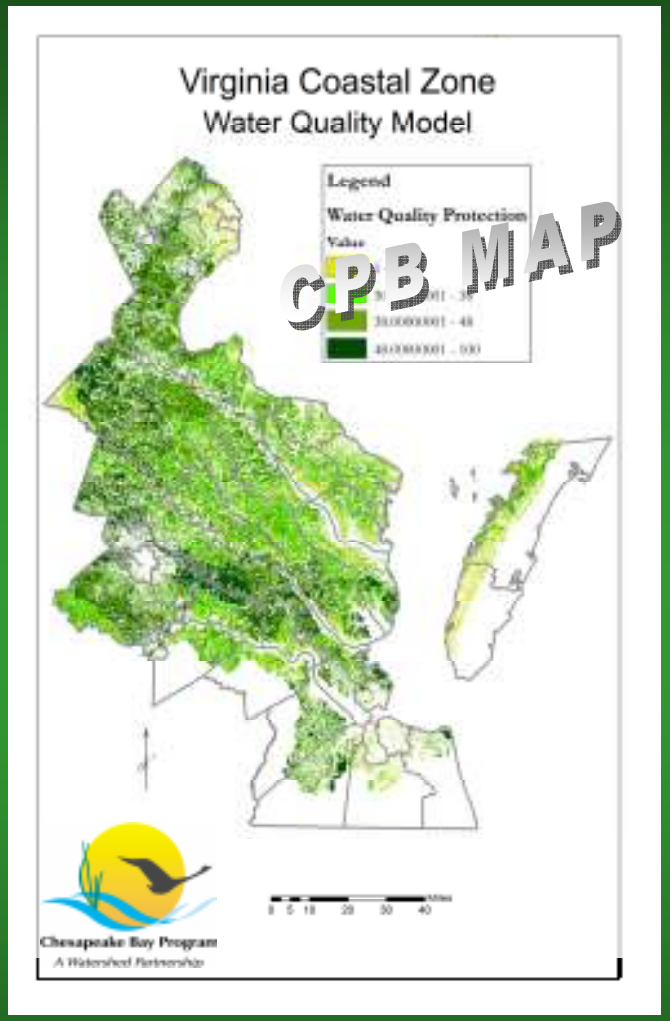
Objective: To identify the relative value of lands as they contribute to water quality and watershed integrity.

Potential Partners:

- VA Dept of Environmental Quality
- DCR – Division of Soil and Water
- VA Dept of Forestry
- Virginia Commonwealth University

Potential Data Layers:

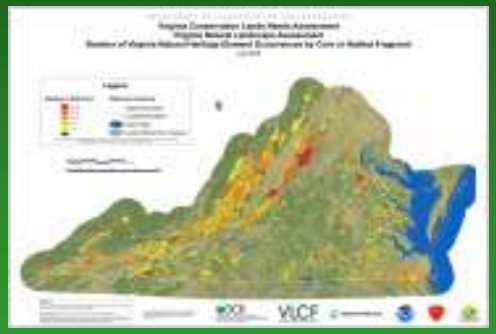
- INSTAR – VCU Center for Environmental Studies
- Proximity to Water
- Erodible Soils
- Slope
- Forest Fragmentation
- SPARROW or NPS data from Division of Soil and Water
- Stream Density (m/sq km)
- Impervious Surfaces
- Municipal Water Supplies – VA Dept Health



Status: In production, completion anticipated August 2007.

VCLNA Models

Ecological (VANLA)



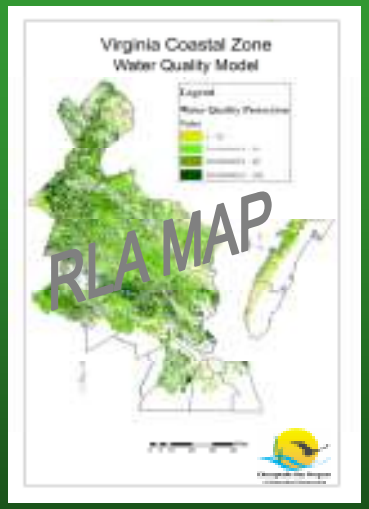
Cultural

Vulnerability

Forest Economics

Recreation

Water Quality



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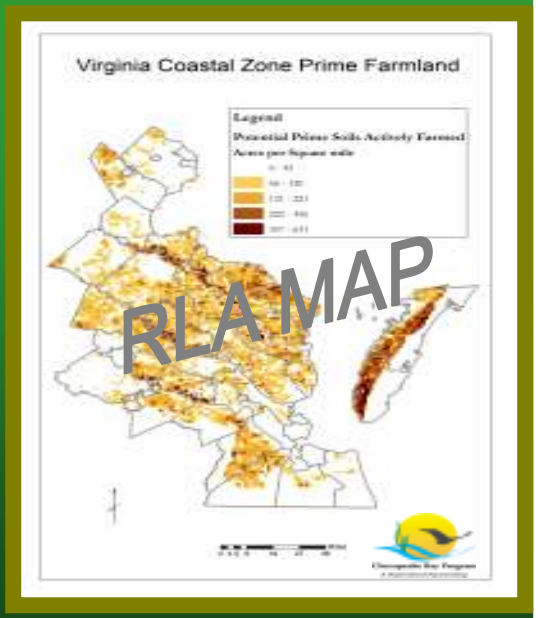


Agricultural / Prime Farmland Model

Objective: To identify the relative agricultural productivity and sustainability value of lands in Virginia.

Potential Partners:

o VA Dept of Agriculture
o American Farmland Trust
o VA Tech

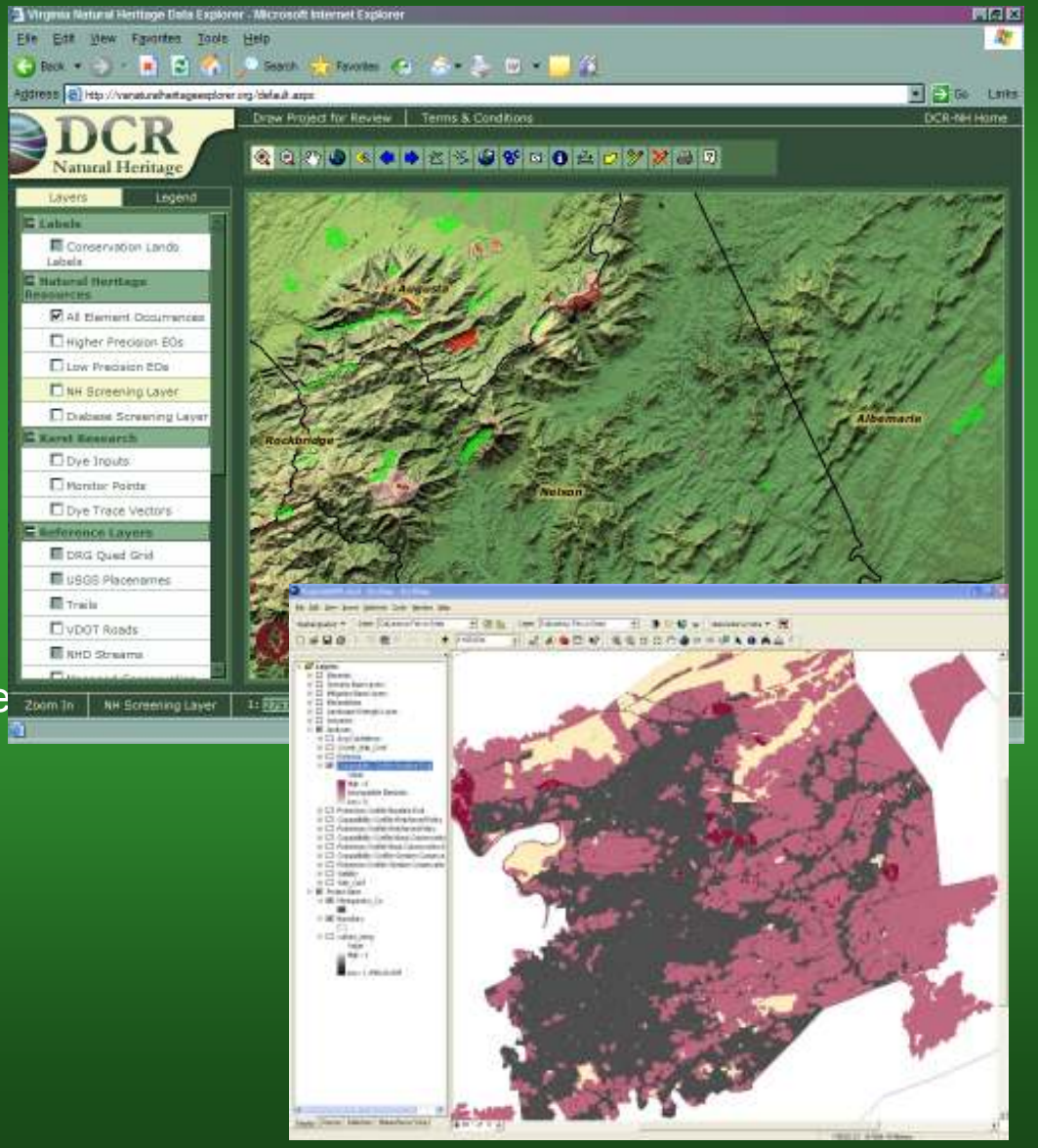
Potential Data Layers:

- Soils data
- RESAC 2000 Land Cover
- National Elevation Dataset (Slope)
- DGIF Wildlife Action Plan Derivatives
- Additional information in production

Status: In production, anticipated completion August 2007.

Implementation

- How do we effectively disseminate the information to our different end users?
- Evaluate results/findings from the Green Infrastructure Advisory Workgroup products and deliverables work session.
- Potential avenues include:
  - Natural Heritage Land Conservation Data Explorer Public Portal ArcIMS site
  - Decision Support - NatureServe VISTA
  - GIS Model data available to anyone for individual analyses
  - Bundled ArcExplorer or ArcReader packages
  - Web services
  - Hard copy maps
  - Technical reports



The Department of Conservation and Recreation acknowledges:

QUESTIONS?

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Jason Bulluck
Ph: 804/786-8377
email: jason.bulluck@dcr.virginia.gov

Visit:

http://www.dcr.virginia.gov/natural_heritage/vclna.shtml