Green Infrastructure Planning for Sustainability and Resiliency

Linking Lands and Communities
in the Land-of-Sky Region

SAMAB Conference - November 18, 2010

www.linkinglands.org

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Land-of-Sky Regional Council

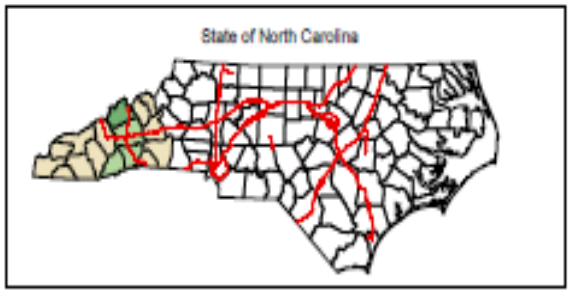
Outline

- Intro to region
- Growth and climate change challenges
- Linking Lands and Communities project
- Designing resiliency into the Regional Network
- Planning for climate change using the LLC framework – next steps

Land-of-Sky Regional Council

- Multi-county, local government planning and development organization (Council of Governments)
- Council board is made up of chief elected officials from member governments, economic development representatives and others
- Council's mission: *to work with local governments, the Region's leadership and state and federal agencies to foster desirable social, economic, cultural and ecological conditions in Buncombe, Henderson, Madison and Transylvania Counties.*
- For more information, see www.landofsky.org

Western NC and the Land-of-Sky Region

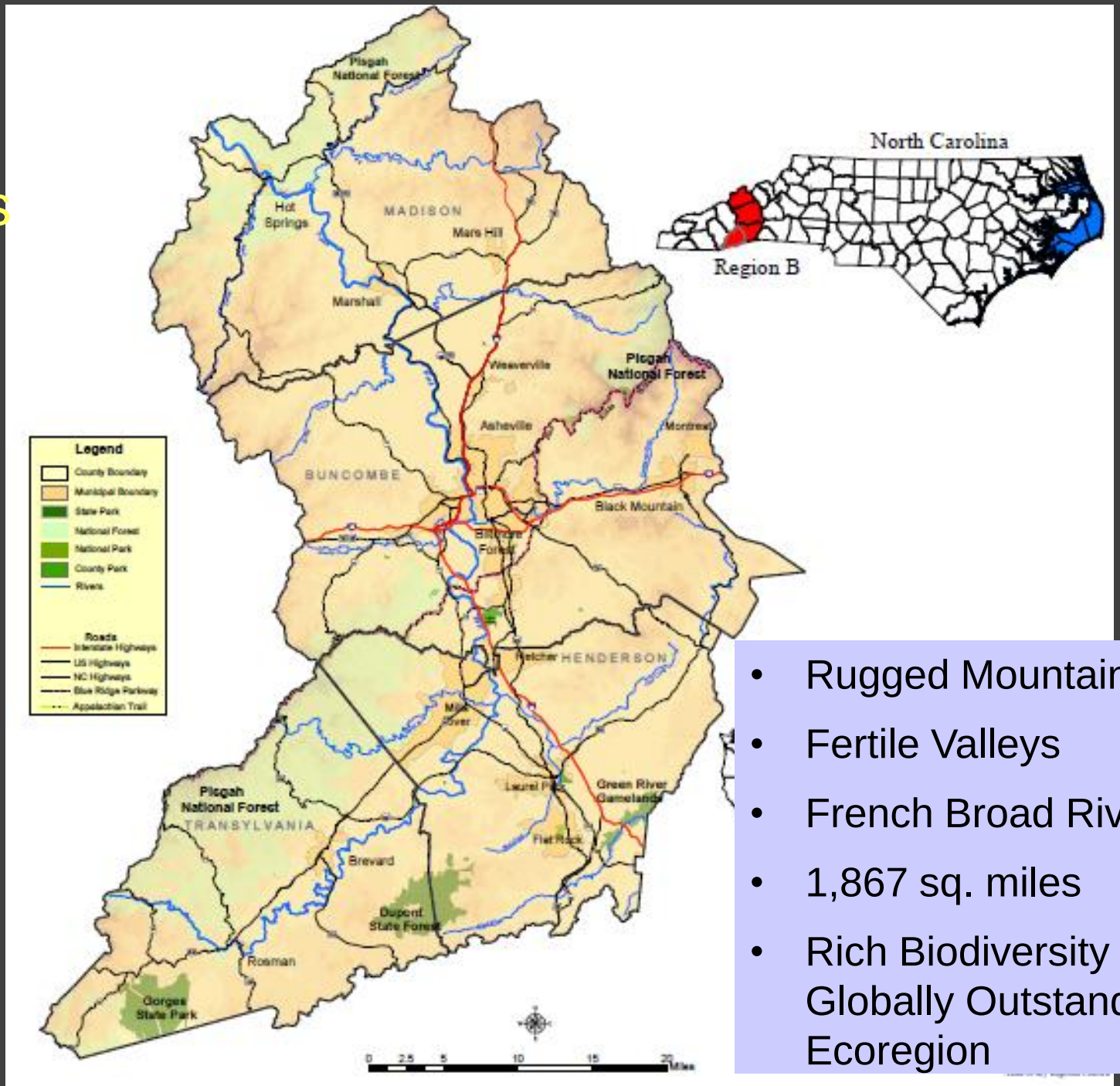


Interstates
Primary Rivers
Madison County
Region B
Western North Carolina

MITCHELL
YANCEY
MADISON
MCDOWELL
BUNCOMBE
HAYWOOD
SWAIN
GRAHAM
JACKSON
RUTHERFORD
HENDERSON
POLK
TRANSYLVANIA
CHEROKEE
MACON
CLAY

This map was produced by Madison County GIS, Assessor's, Land Records, & Planning Departments.

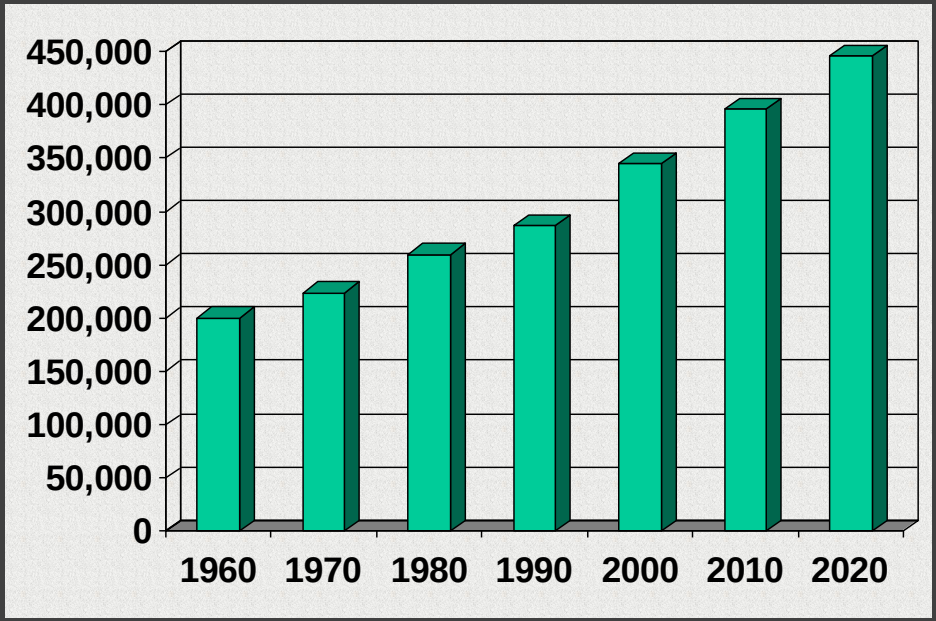
Natural History & Resources



- Rugged Mountains
- Fertile Valleys
- French Broad River
- 1,867 sq. miles
- Rich Biodiversity – Globally Outstanding Ecoregion

Challenges Facing Our Region

Steady population growth;
Spread-out pattern of growth



Development on mountain ridges and steep slopes is breaking up large parcels of mostly forested land, resulting in habitat loss, loss of scenic quality, water quality issues,…

Need to preserve rich biodiversity

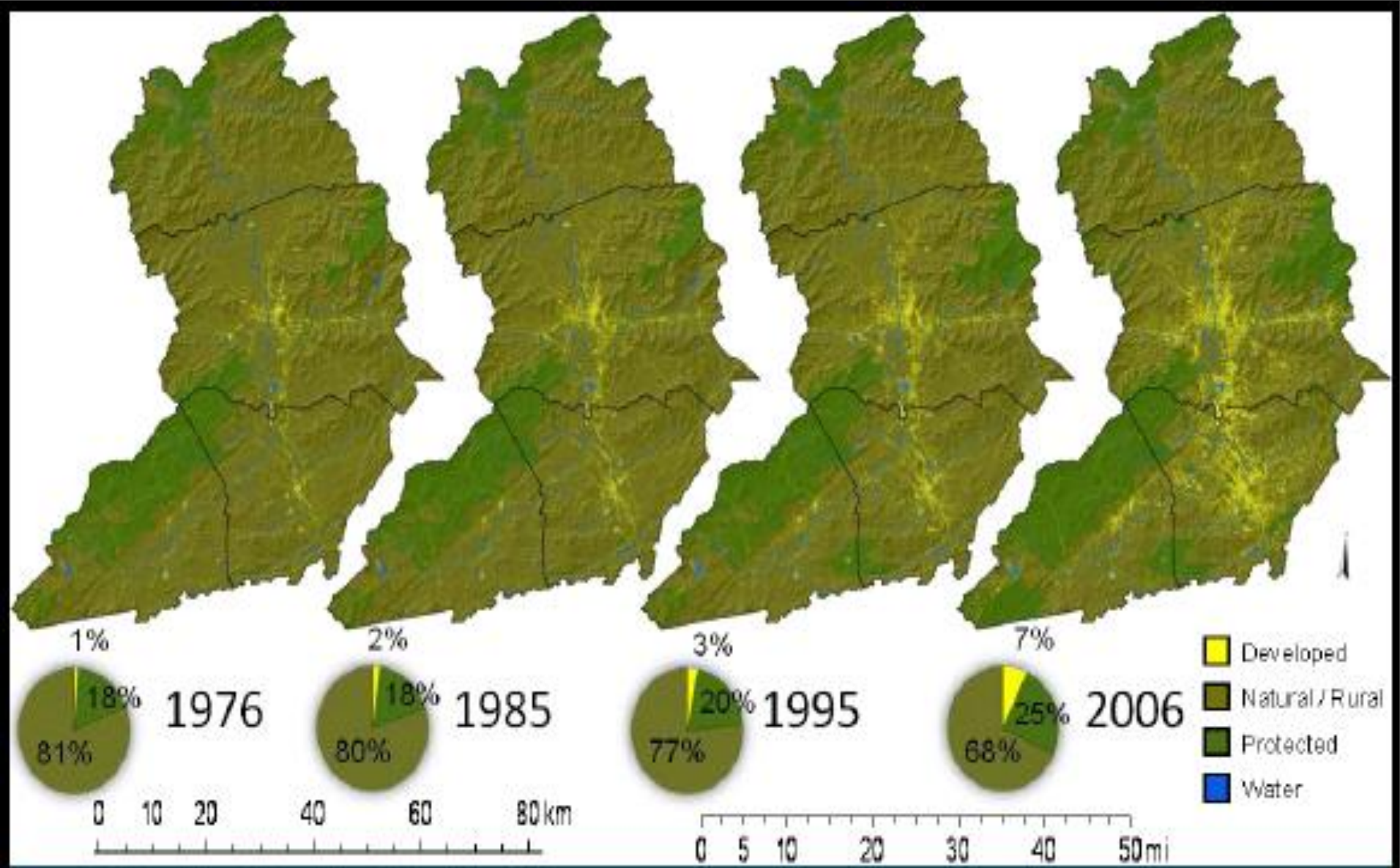
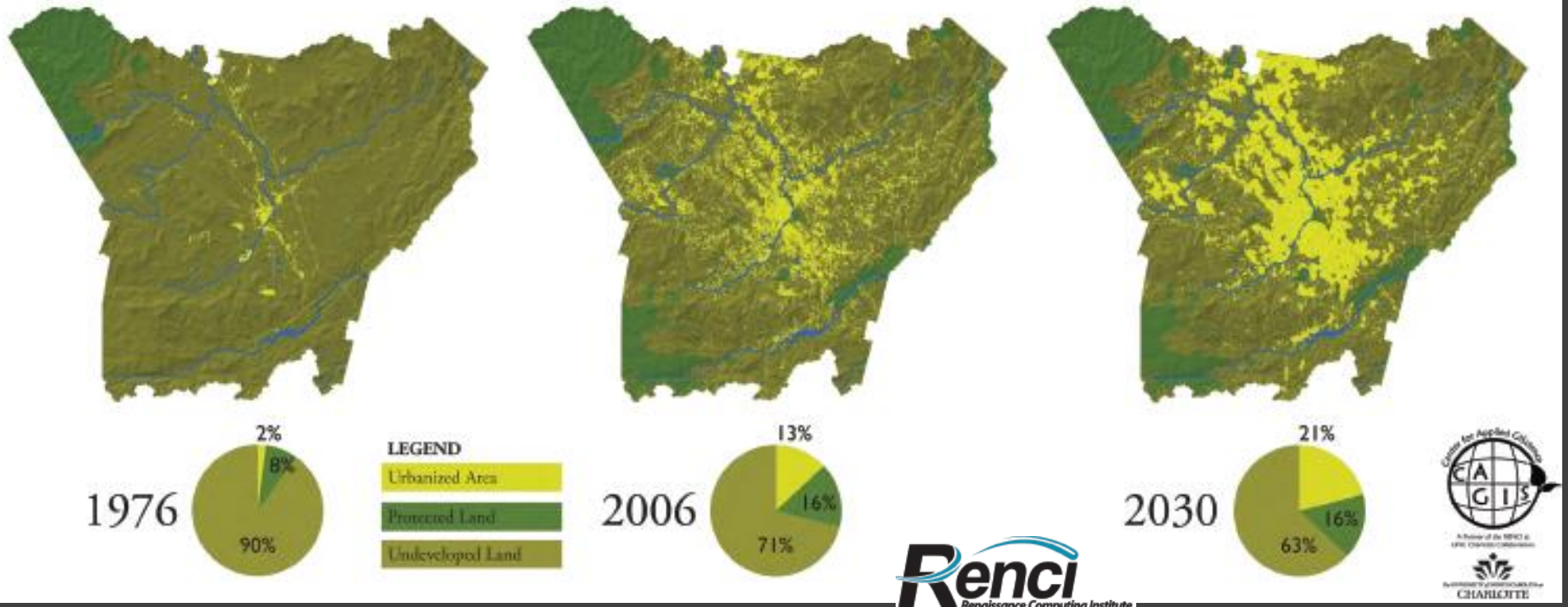


Figure 3 : Historical development patterns mapped via analysis of Landsat satellite imagery for years 1976, 1985, 1995 and 2006.

"Mapping historical development patterns and forecasting urban growth in Western North Carolina, 1976-2030." The Center for Applied GIScience at UNC Charlotte, 2009.

How The Urban Growth Model Works

Henderson County



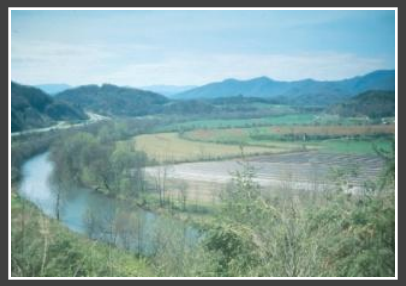
Satellite imagery from 1976, 1985, 1995 and 2006 used to track the advance of impervious surfaces, a key indicator of development.

Projections of development potential were constructed from statistical models using variables that help predict growth patterns: distance to roads, interchanges and urban areas; the attraction of employment centers; slope; and “pressure” from previously developed areas.

Challenges Facing our Region

- Loss of Farmland and Farming
  - *Approx. 16% of land is farmland; 86,000 acres lost between 1987 and 2007*
  - *Fragmentation into smaller parcels;*
  - *Loss of rural lifestyle and character.*
- Agriculture key to local economy and to region's resiliency

Climate Change – Expected Impacts



Water
- Flooding
- Drought
- Decreased availability

Agriculture
- Changes in crops and growing seasons
- Changes in tree species
- More loss due to fire

Humans, Communities
- Stress due to increased air and water temps
- Sever weather events
- Degraded ecosystem services

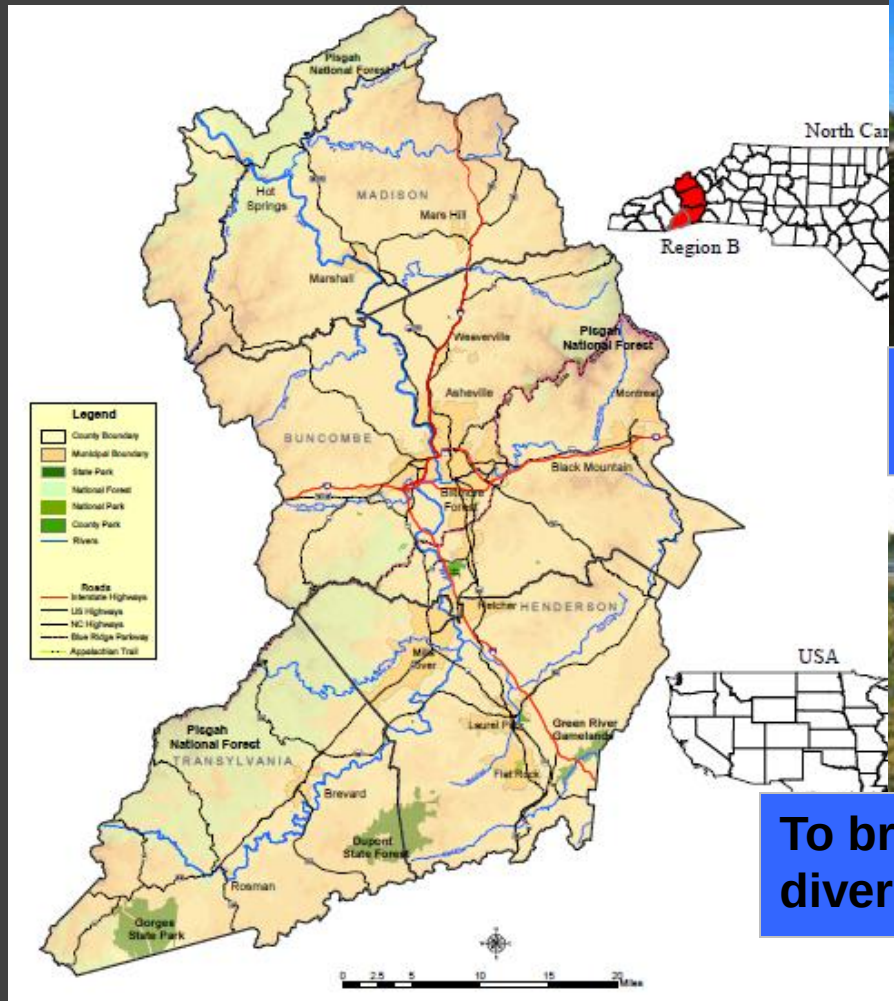
Wildlife Habitat & Biodiversity
- Changes in sizes and locations of habitat
- Species adaptation, migration or extinction

The Challenges of Growing Communities

Communities need tools to make <u>strategic</u> and <u>informed</u> land use decisions

Where to encourage development?

Where to construct roads & utilities?



Which lands to conserve?

To bring together divergent interests!

Linking Lands and Communities – *Goals*

- *Identify where the most valuable natural resources are located and how they might be interconnected;*
- *Bring together a diverse group of organizations and individuals to explore common values and identify opportunities to work together to maintain our valued resources;*
- *Provide a set of tools and resources to help local governments and communities make more informed land use and development decisions.*

Project Partners

Appalachian Sustainable Agriculture Project (ASAP)
Appalachian Trail Conservancy
Friends of DuPont State Forest
NC Wildlife Federation
Open Space Institute
RiverLink
Southern Appalachian Forest Coalition
Southern Environmental Law Center
Sustainable Big Ivy
WNC Green Building Council
Western North Carolina Alliance

Asheville Convention and Visitors Bureau
The Biltmore Estate
Mountain Council for Accountable Development
Self Help Credit Union/Self Help Ventures Fund
Sustainability Strategies, LLC

Buncombe County
Buncombe County Greenways and Trails Commission
Buncombe County Soil & Water Conservation District
City of Asheville
City of Hendersonville
Transylvania County

Blue Ridge Forever
Carolina Mountain Land Conservancy
Southern Appalachian Highlands Conservancy

Blue Ridge National Heritage Area
Blue Ridge Parkway

Natural Resources Conservation Service
U.S.D.A. Forest Service Southern Research Station
U.S. Fish & Wildlife Service

NC Cooperative Extension – County Offices
NC Department of Agriculture
NC Department of Environment and Natural Resources
NC Division of Community Assistance
NC Division of Forest Resources
NC Farm Bureau
NCSU Mountain Horticultural Crops Research & Ext Center
NC Wildlife Resources Commission

Mars Hill College
RENCI @ UNC Asheville
UNC Asheville
Warren Wilson College

Project Funding
$$

The Community Foundation of Western North Carolina

Blue Ridge National Heritage Area

Federal Highway Administration

RENCI at UNC Asheville

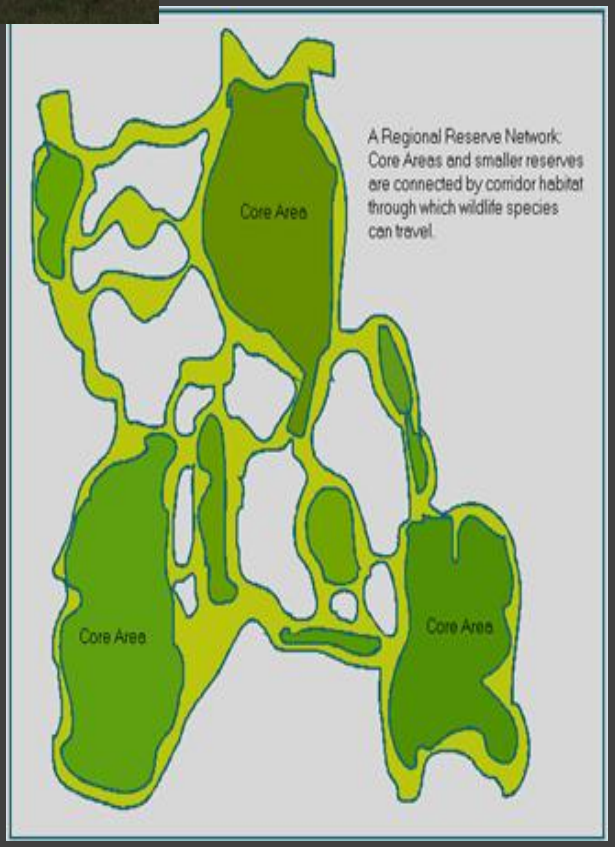
Z. Smith Reynolds Foundation

Lyndhurst Foundation

Wildlife Conservation Society

Why a Regional Network Approach?

- Nature functions as a system that does not match or respect jurisdictional boundaries
- Healthy natural systems provide valuable goods and services for the health and well-being our communities



Benefits that people obtain from healthy natural systems

- Clean water and air
- Food
- Timber
- Pollination of crops and other vegetation
- Flood and drought mitigation
- Soil formation and maintenance
- Recreation and aesthetic and spiritual benefits

Economic Benefits - Ecosystem Services

- Storm water management
  - ✓ Lands preserved for flood storage have an 8:1 dollar savings over manmade flood control structures

- Supplying drinking water
  - ✓ 105 of world's biggest cities rely on protected forests for drinking water (e.g. NYC - $1.5 billion to protect watershed vs. $6-8 billion) .

HOW we are developing the network

- *Using a community- and science-based approach*

- *Green Infrastructure planning:*
  - *Is a nationally recognized collaborative method for land use planning, and*
  - *designed to meet the needs of ALL stakeholders.*
  - *is not an advocacy tool designed to favor a specific point of view*

- *Focus is on interconnectivity and the importance of having a network*

Green Infrastructure is our region's Natural Life Support System –

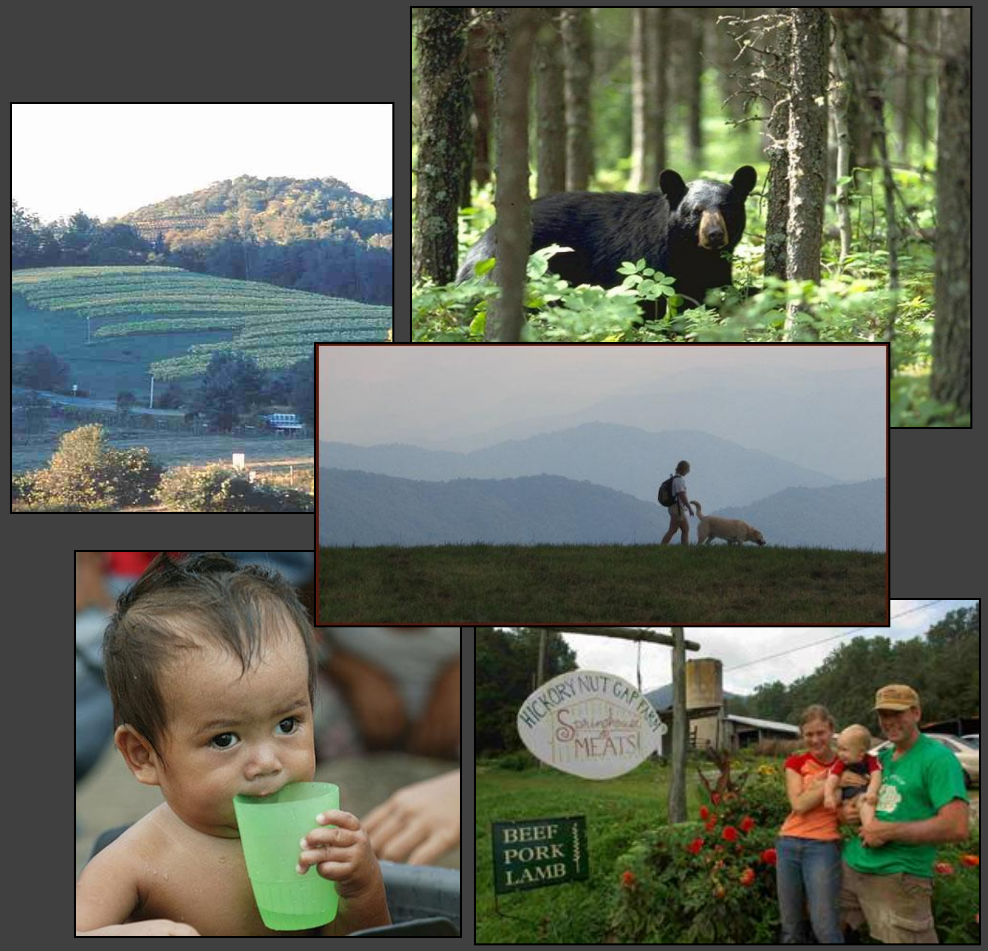
an interconnected network of land and water that contributes to the health, economic well being & quality of life for communities & people.

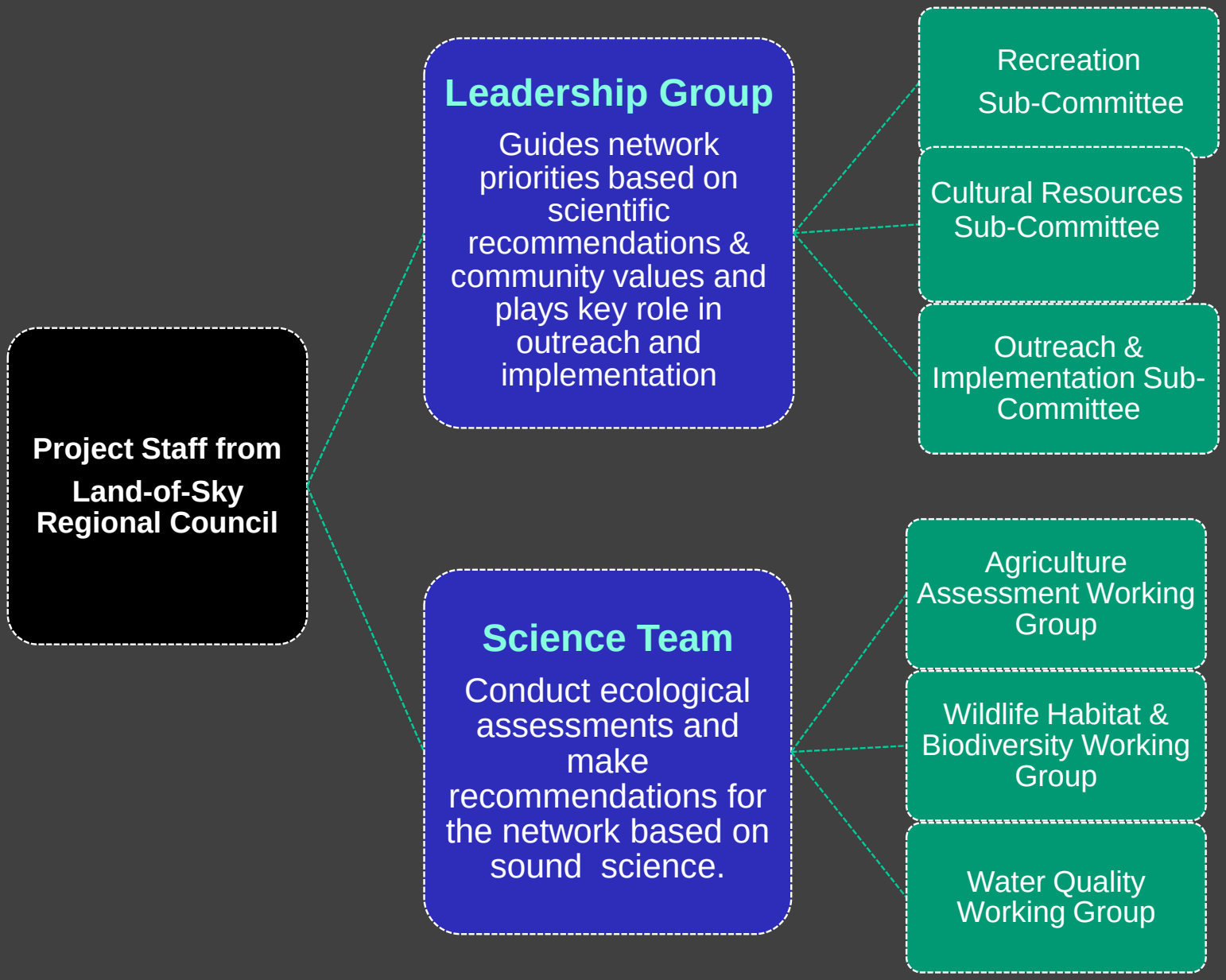
- A Green Infrastructure Network may include:
  - *Natural areas*
  - *Public and private conservation lands*
  - *Farmlands and lands managed for forestry*
  - *Outdoor recreation areas and trails*
  - *Cultural resources and sites*

- Green Infrastructure networks exist at various scales (parcel, community, regional)

What are the most valuable resources in the region?

- Water and water quality
- Farming and forestry
- Cultural heritage
- Scenic views
- Recreation
- Wildlife habitat and biodiversity




Project Staff from Land-of-Sky Regional Council
Leadership Group
Guides network priorities based on scientific recommendations & community values and plays key role in outreach and implementation
Recreation Sub-Committee
Cultural Resources Sub-Committee
Outreach & Implementation Sub-Committee
Science Team
Conduct ecological assessments and make recommendations for the network based on sound science.
Agriculture Assessment Working Group
Wildlife Habitat & Biodiversity Working Group
Water Quality Working Group

Resource Assessments

Water Quality

Which lands are valuable for their contribution to water quality?

Agriculture

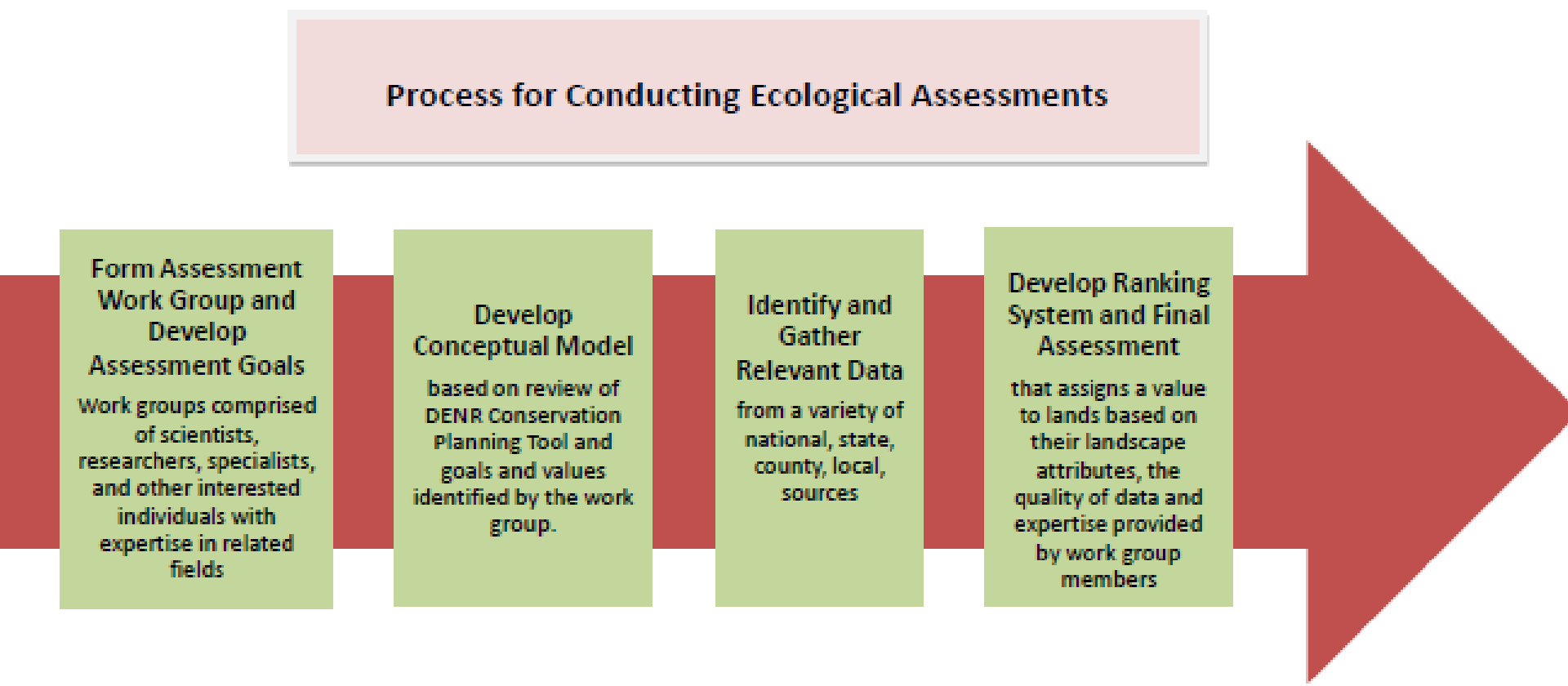
Which lands are valuable for farming and forestry?

Wildlife Habitat & Biodiversity

Which lands are valuable for wildlife habitat and supporting & maintaining biodiversity?

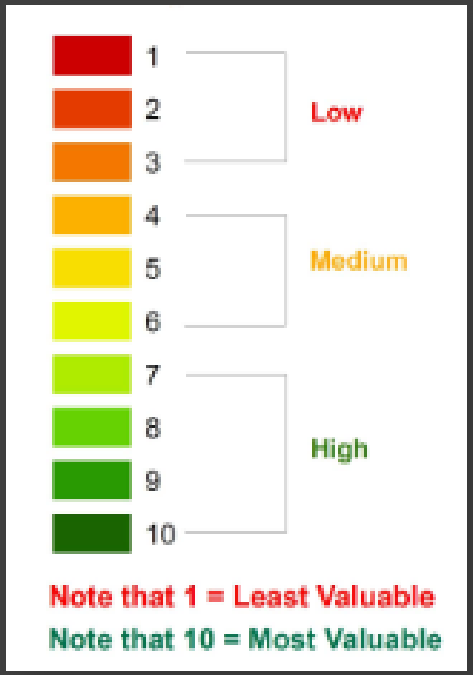
The Green Infrastructure Network is developed by using the highest priority lands identified in these assessments

For each assessment:



Assessment Approach/Standards

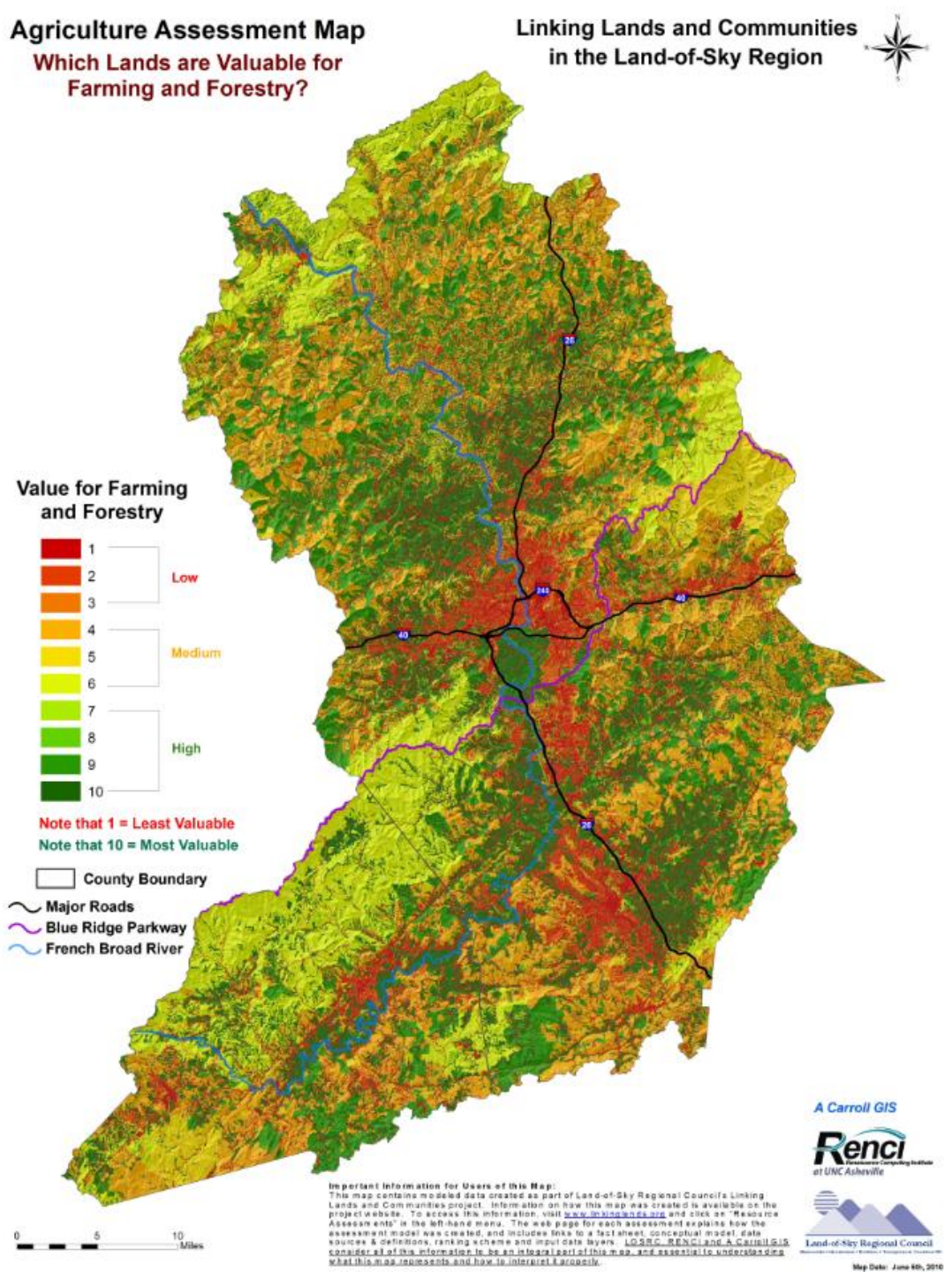
- Assessments and ranking criteria developed by each working group
- Raster based modeling (30-meter pixels)
- Ordinal ranking scale of 1 -10
- Use the most current and accurate data available
- Data incorporated must be region-wide



Primary Indicators of High Value Lands:

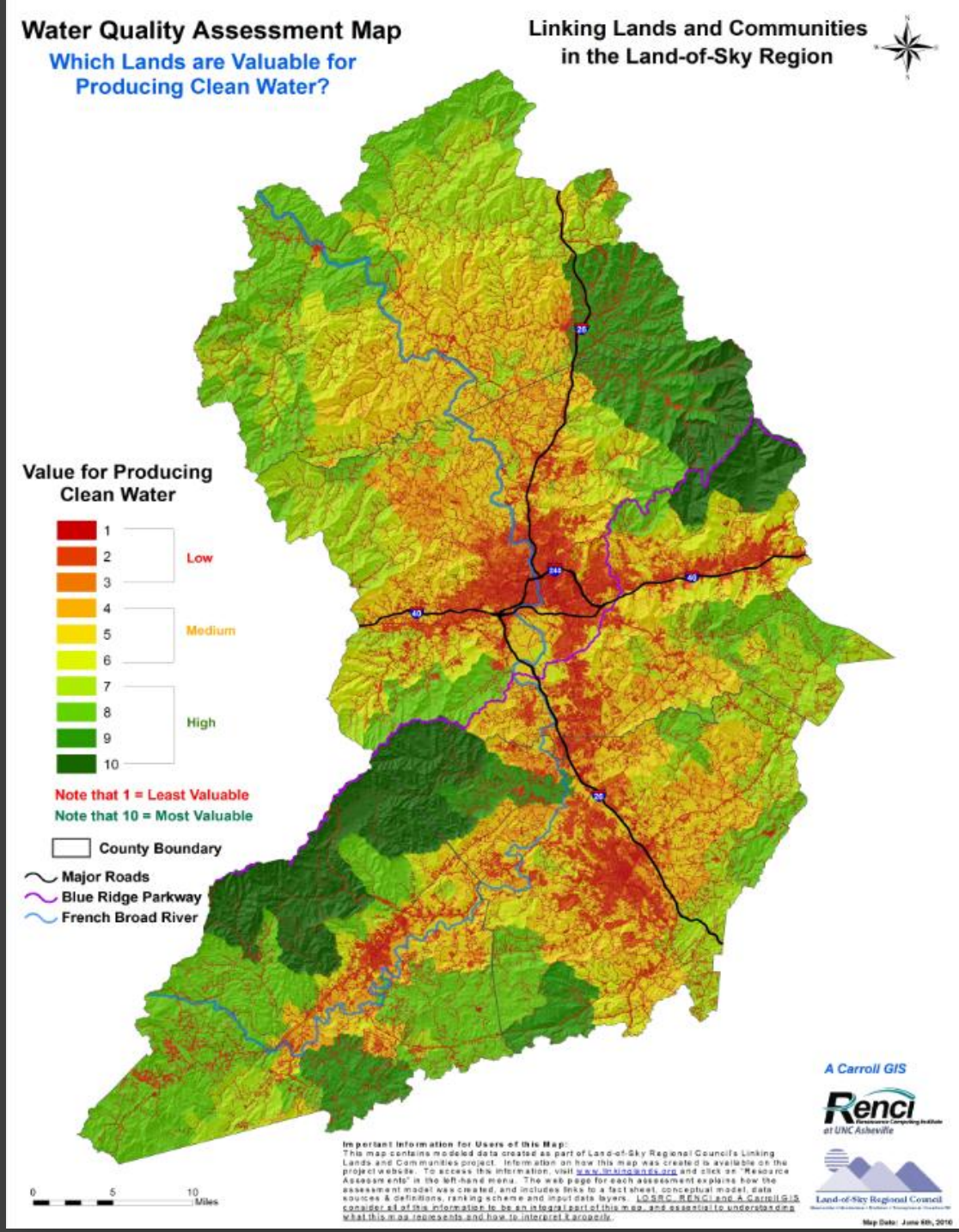
- *Presence of an existing farm/forest operation*
- *Land Cover – Vegetation Type*
- *Most productive soils*

Highest Ranking Lands (10) have productive soils AND have forest or cropland vegetation



Primary Indicators of High Value Lands:

- *Sub-watersheds that:*
  - *are primarily forested*
  - *have some level of protection*
  - *contains a water supply watershed*
  - *contain a stream rated good or excellent by DWQ*



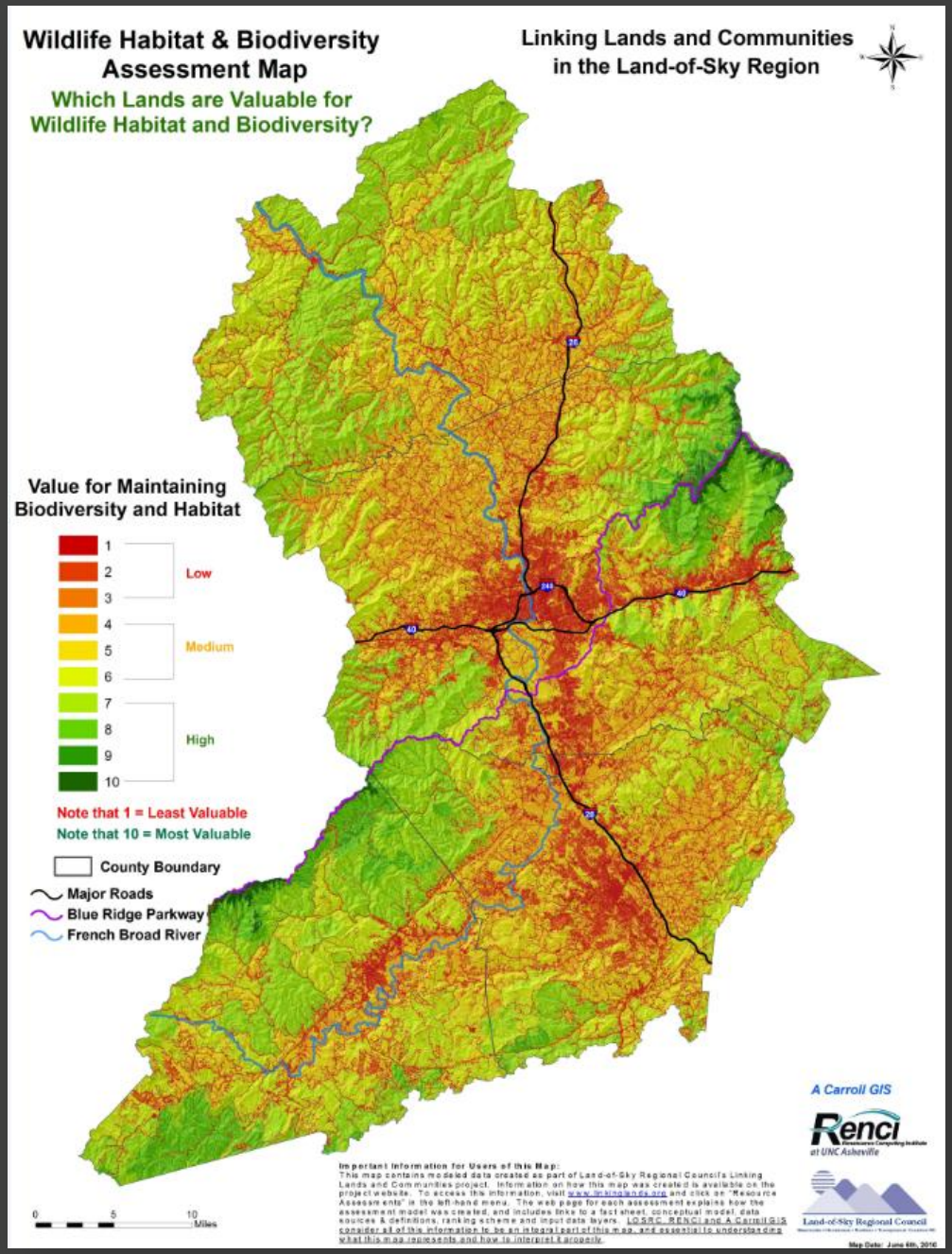
The WHB Assessment identifies lands that:

1.Provide large blocks of natural habitat

2.Support high levels of biodiversity

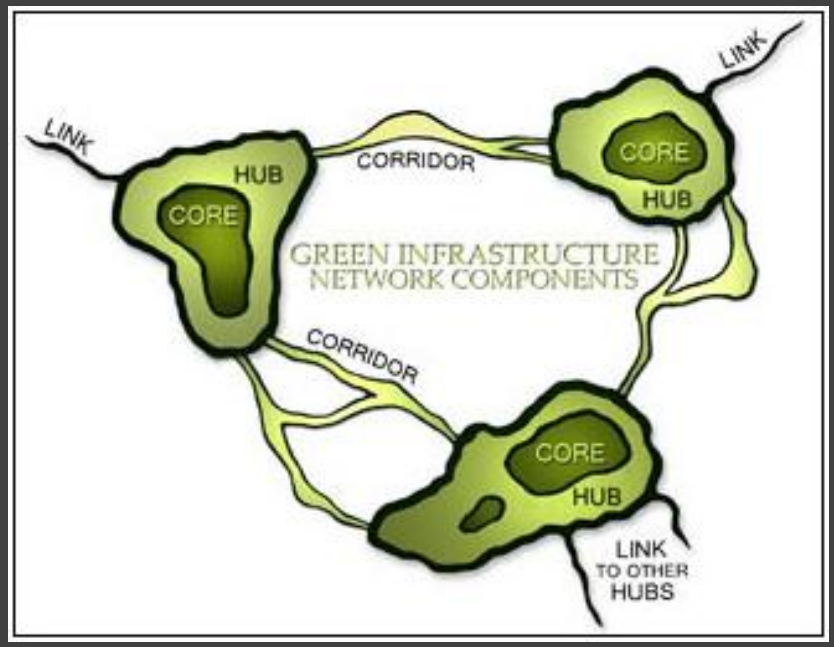
3.Support priority ecological systems as identified in the NC State Wildlife Action Plan developed by the Wildlife Resources Commission

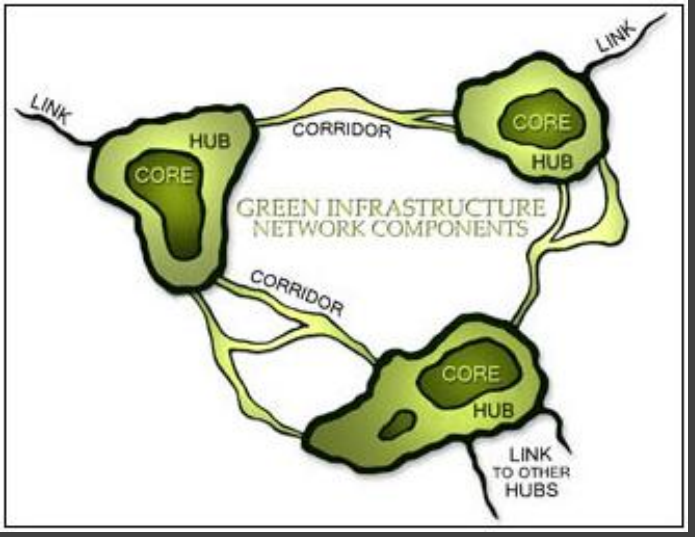
4.Provide associated ecosystem services and functions to local communities.



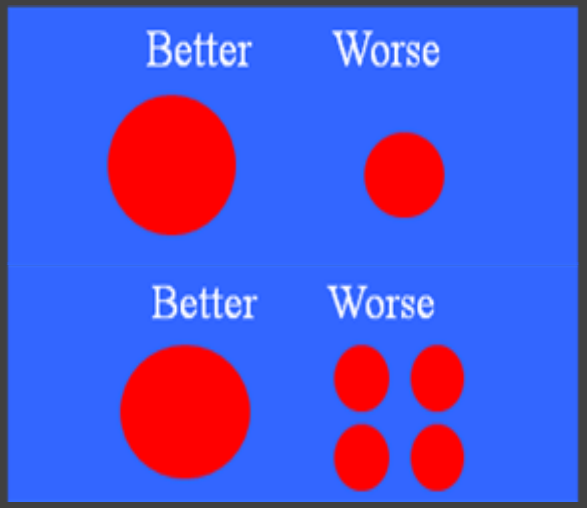
Identifying Resource “Hubs”

- Highest ranking lands (ranks 7-10)
- Minimum size criteria >= 100 acres
- Combined with public and protected lands

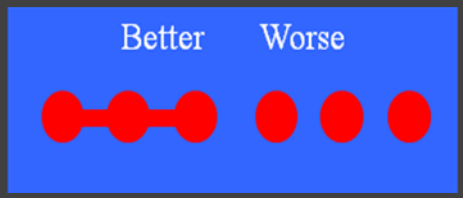




Network Design driven by Landscape Ecology Principles

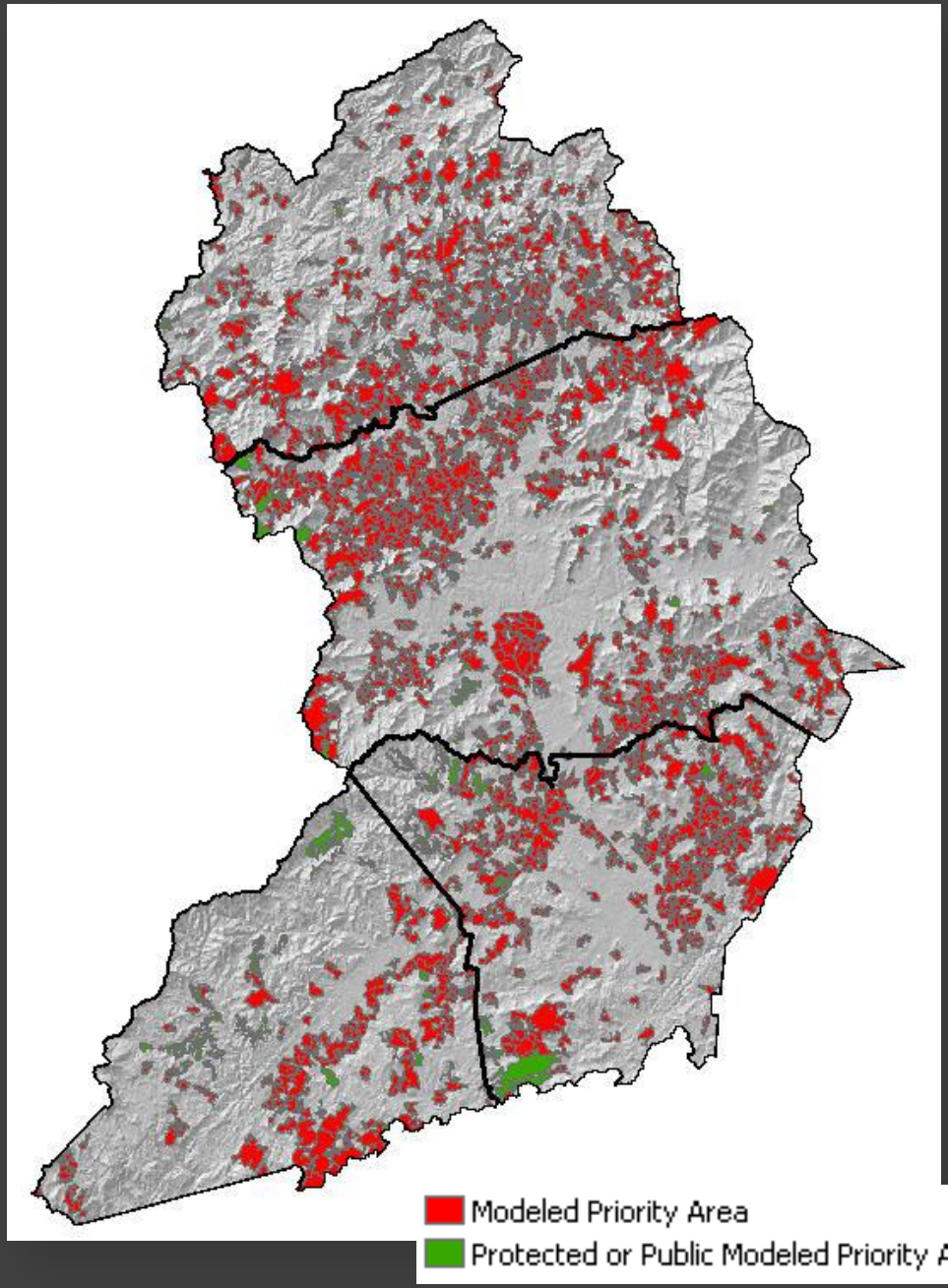


- larger hubs are better than smaller hubs;
- one large hub is better than multiple smaller hubs with the same total area;
- more compact hubs are better than less compact hubs;
- connected hubs are better than isolated hubs.



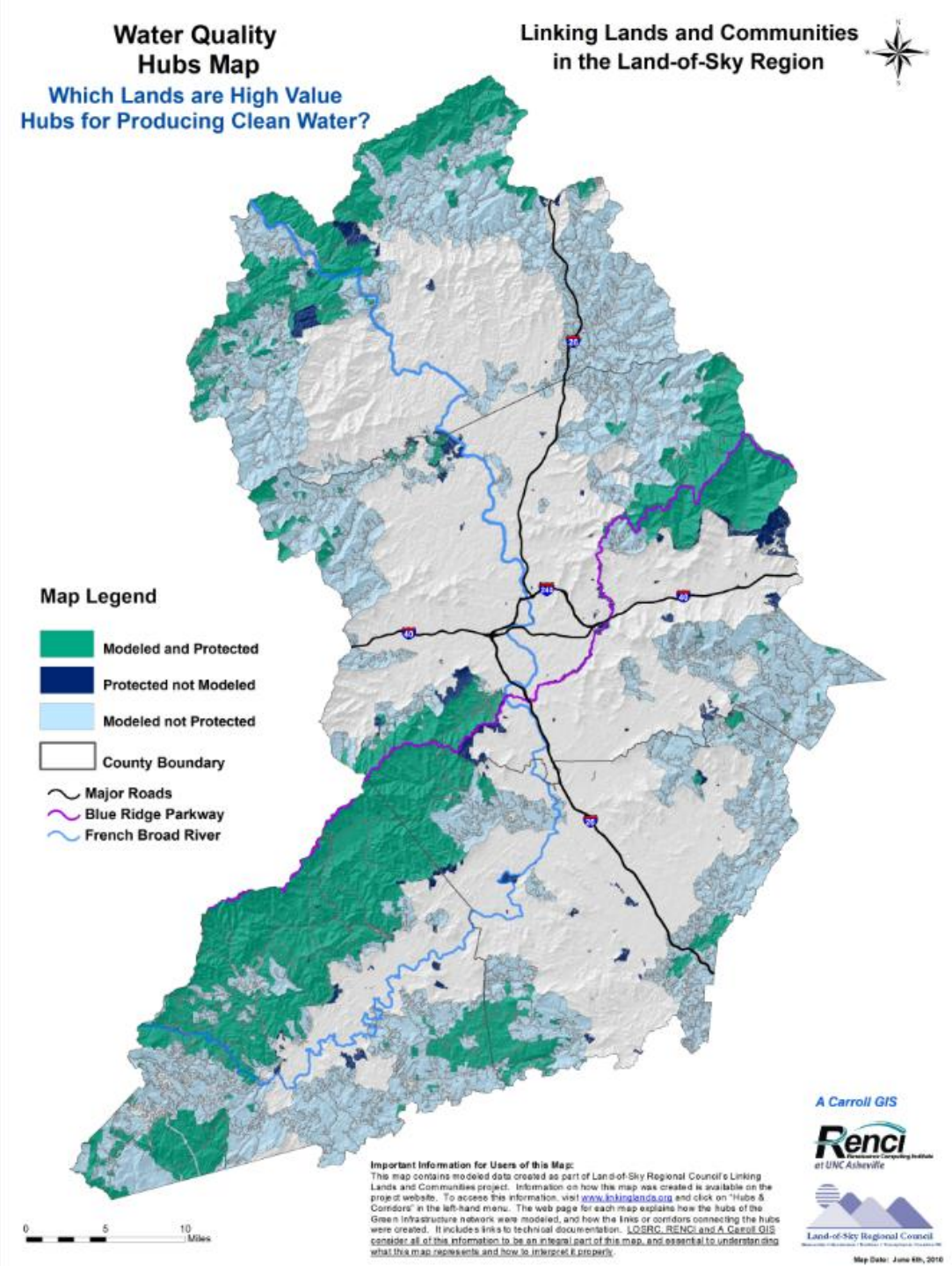
Contribution to Green Infrastructure Network:

Agricultural Resource Hubs



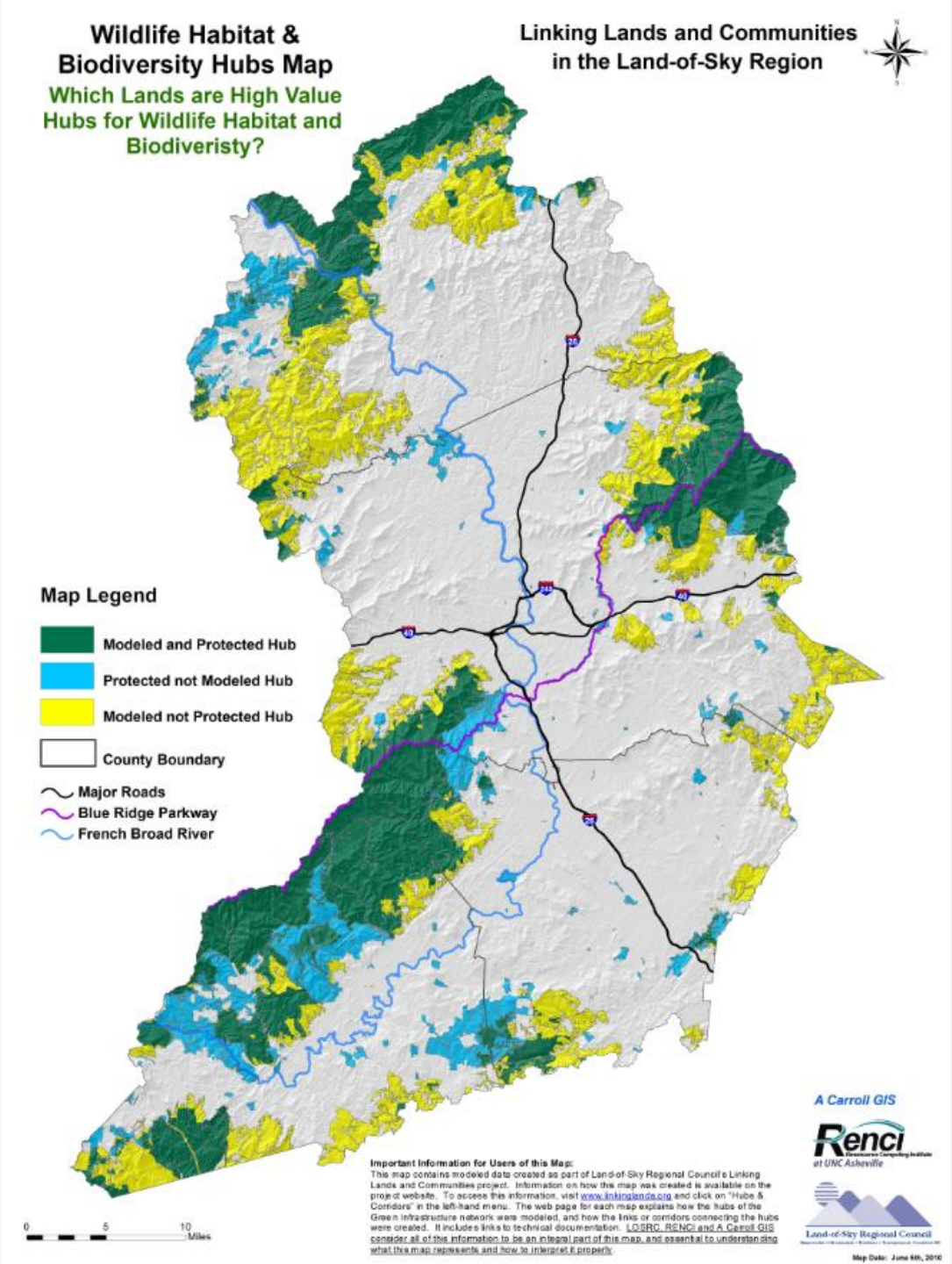
Contribution to Green Infrastructure Network:

Water Quality Hubs



Contribution to Green Infrastructure Network:

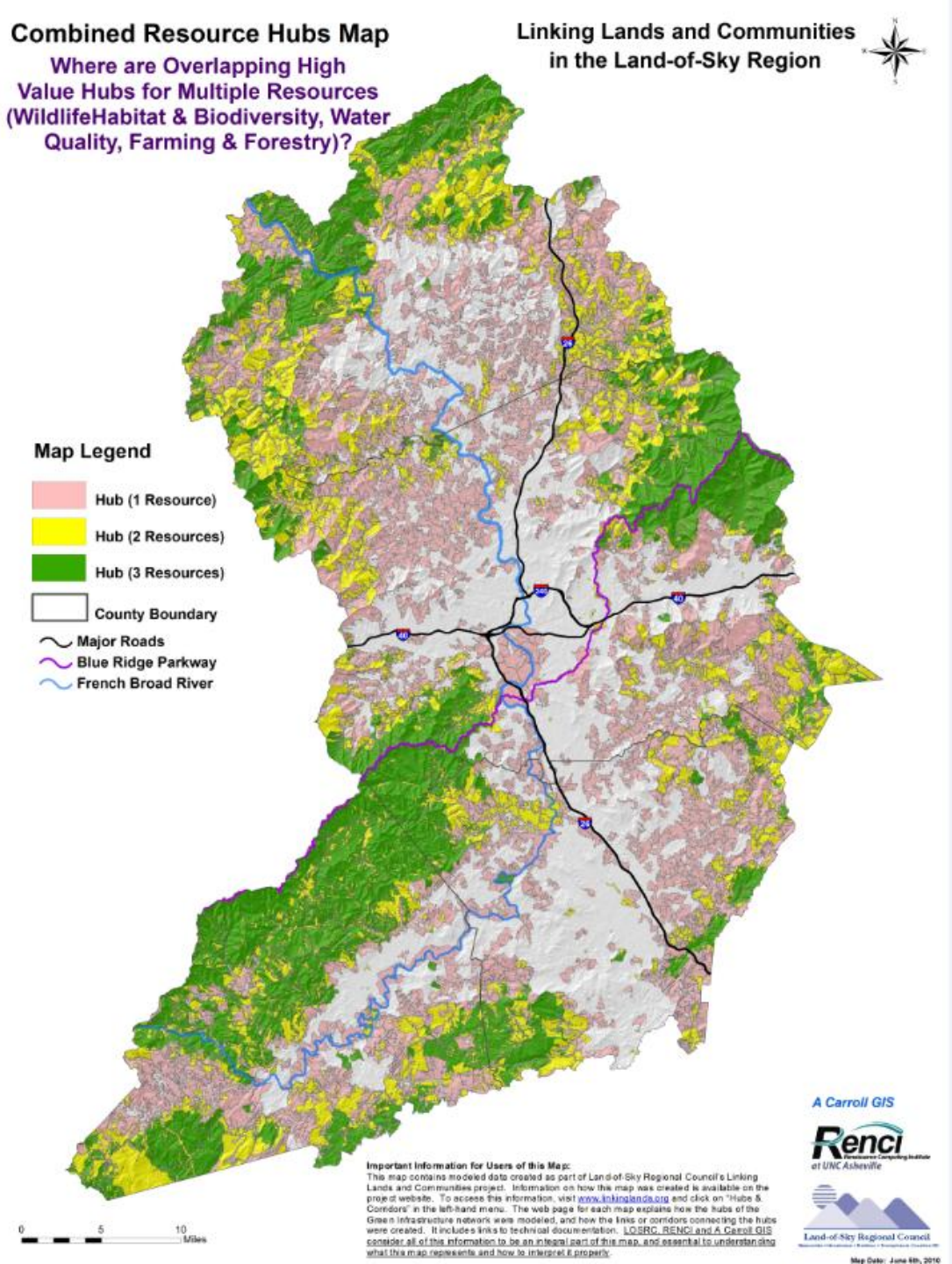
Wildlife Habitat and Biodiversity Hubs and Corridors



Combined Resource Hubs

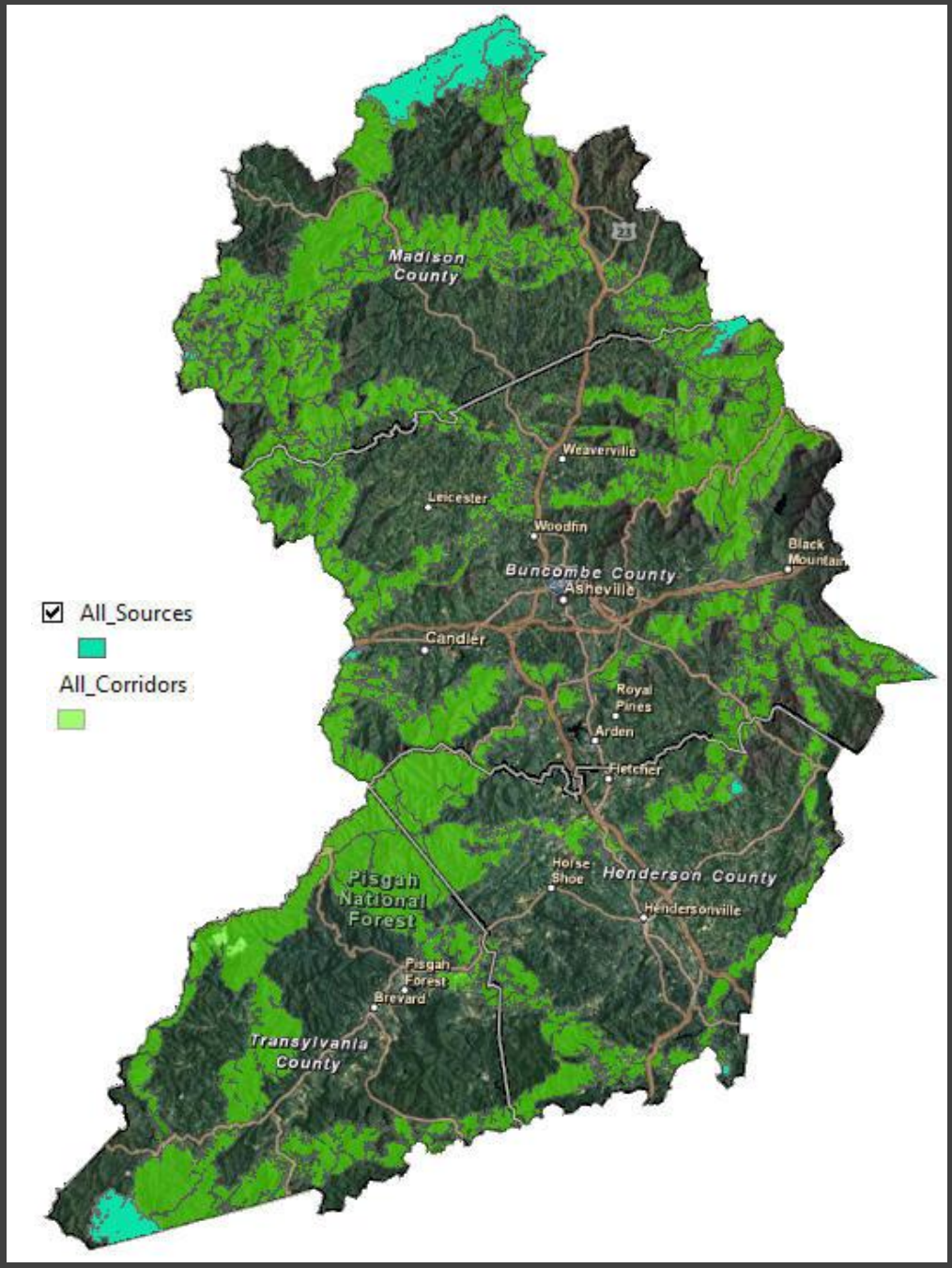
Lands with multiple resource values

Combined highest ranking lands (7-10) from each assessment



Wildlife Habitat & Biodiversity Corridors

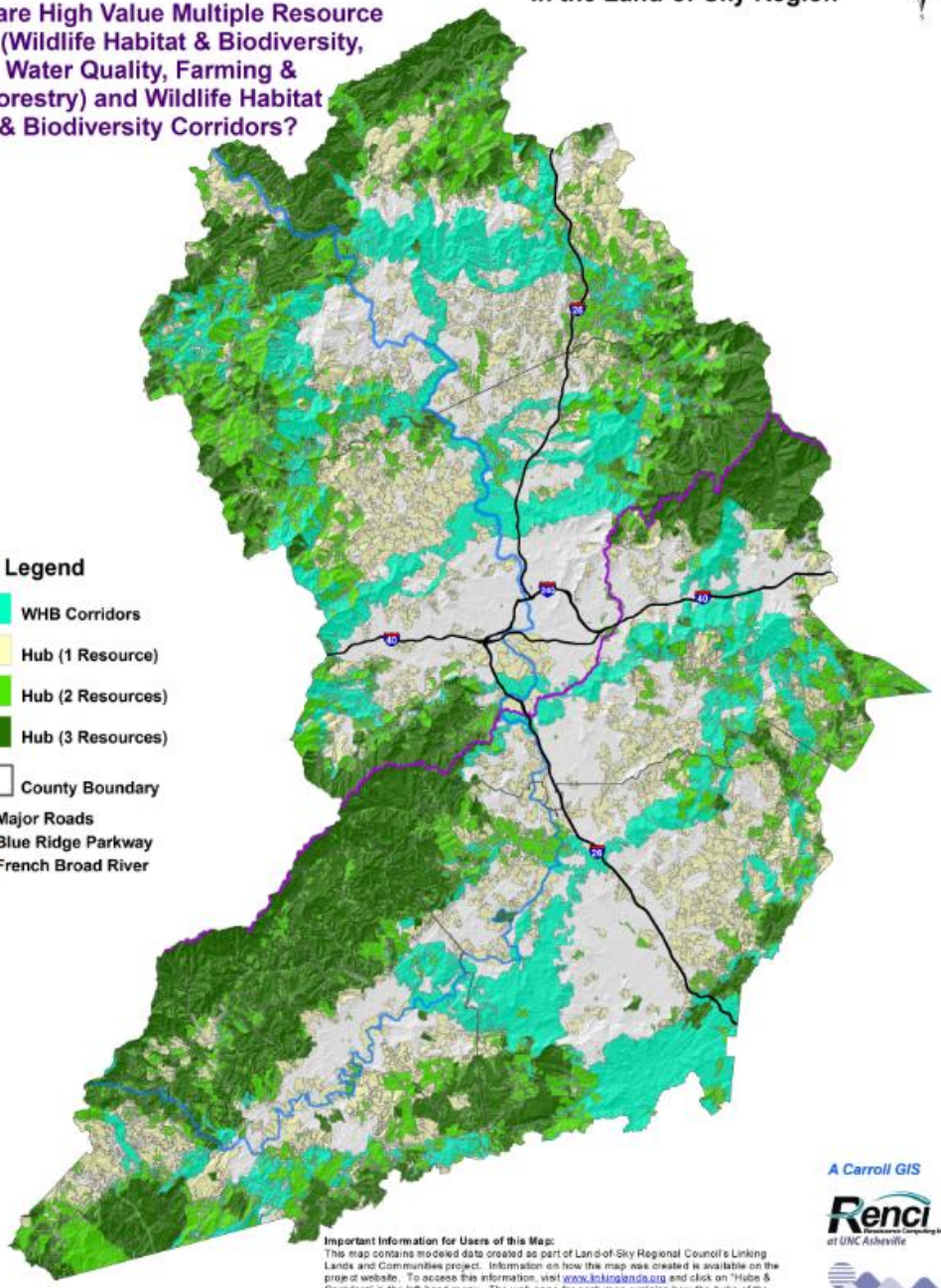
- 12 “sources” chosen from hubs along perimeter
- Corridors contains lands of high ecological value – *provide areas for plant and animal species to move as climate changes*



Green Infrastructure Network (Combined Resource Hubs)

Where are High Value Multiple Resource Hubs (Wildlife Habitat & Biodiversity, Water Quality, Farming & Forestry) and Wildlife Habitat & Biodiversity Corridors?

Linking Lands and Communities in the Land-of-Sky Region



Important Information for Users of this Map:
This map contains modeled data created as part of Land-of-Sky Regional Council's Linking Lands and Communities project. Information on how this map was created is available on the project website. To access this information, visit www.linkinglands.org and click on "Hubs & Corridors" in the left-hand menu. The web page for each map explains how the hubs of the Green Infrastructure network were modeled, and how the links or corridors connecting the hubs were created. It includes links to technical documentation. LOSRC, RENCI and A Carroll GIS consider all of this information to be an integral part of this map, and essential to understanding what this map represents and how to interpret it properly.

A Carroll GIS

Renci at UNC Asheville

Land-of-Sky Regional Council

Map Date: June 17th, 2010

Hub and Corridor Evaluation: *Habitat Suites*

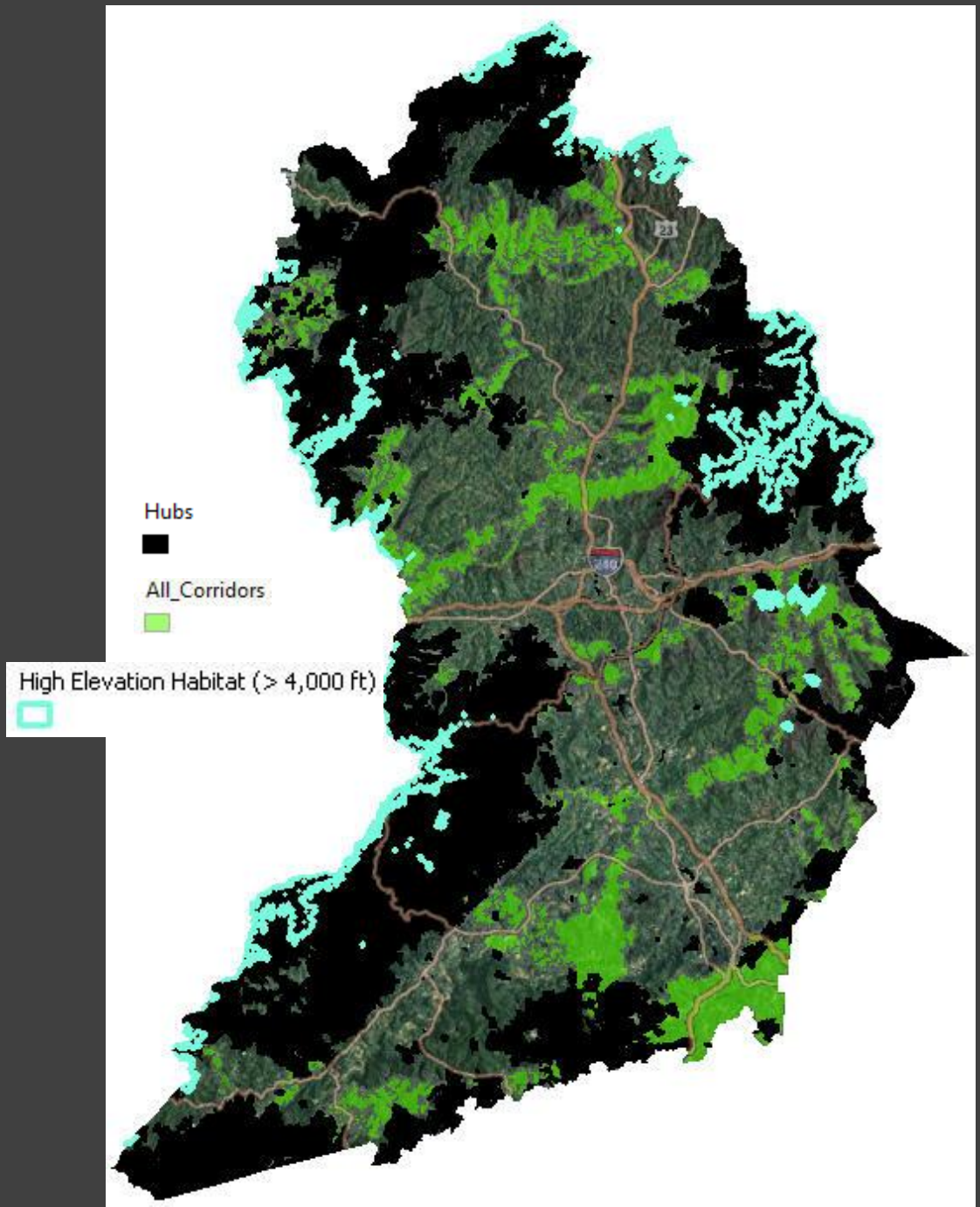
- Hubs and proposed corridors contain:

  - 91% of all natural habitat above 4,000 ft

  - 74% of all forested riparian habitat

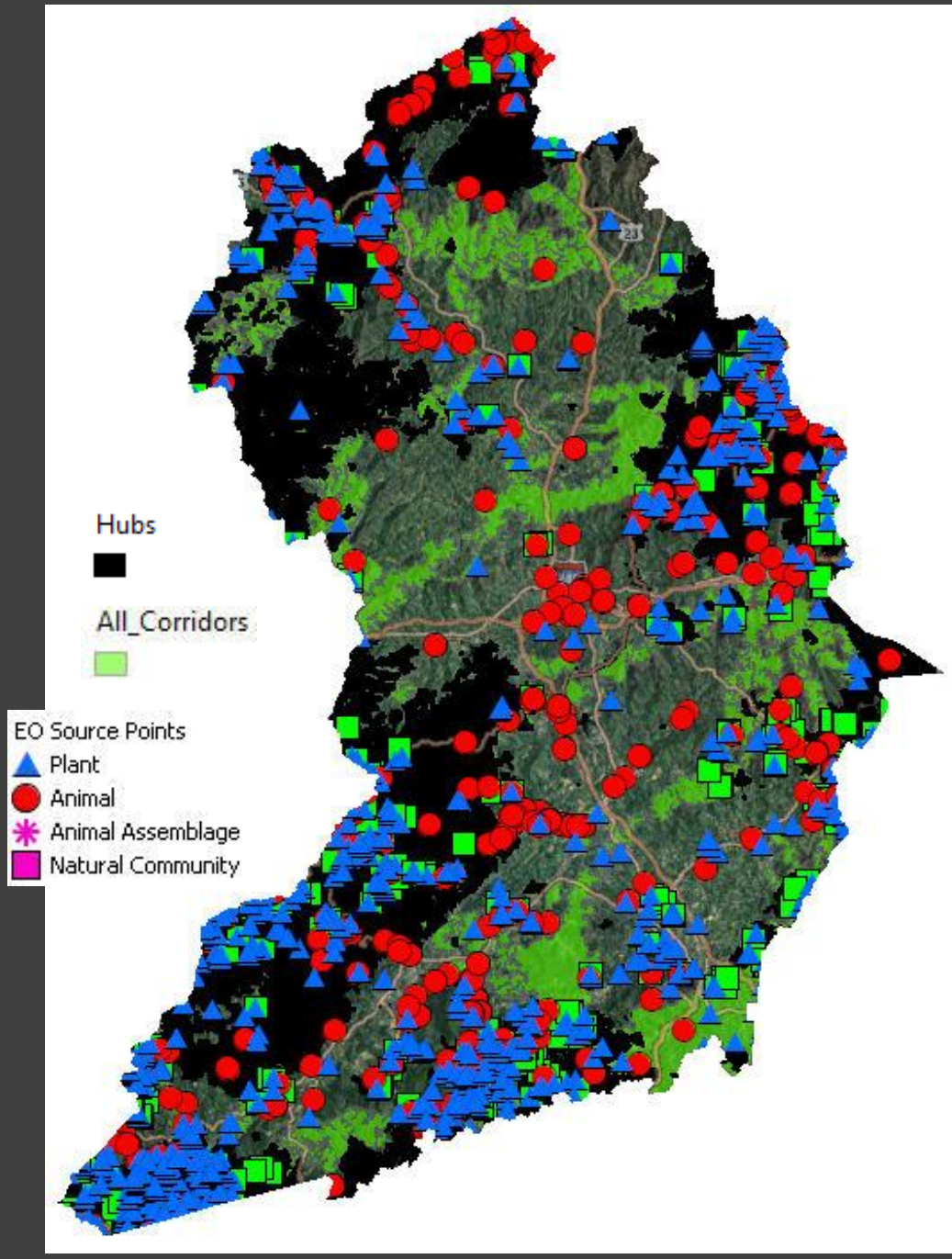
  - 70% of all natural habitat below 4,000 ft

  -25% of all agricultural and open space



Hub and Corridor Evaluation: *Natural Heritage Data*

- 74% of EO source points captured in WHBD hubs and corridors
- Fragmented or isolated populations represent remaining 26% of source points



Implementation / “Action”

- Series of actions that bring the GI network into reality on the ground and manage it in sustainable ways
  - Resource planning;
  - Conservation;
  - Restoration;
  - Development; and
  - Management

- Management practices key to implementation

Variety of Implementers

- Local Governments
- State and Federal Agencies
- Land Owners
- Developers
- Land Trusts
- Environmental and other Non-profits

HENDERSON COUNTY, N.C. FOUNDED 1838

THE CITY OF HENDERSONVILLE · N.C. 1847

NCDOT NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

CMLC CAROLINA MOUNTAIN LAND CONSERVANCY
Saving the places you love

Variety of actions – examples:

- A **county** uses the tools in its Comprehensive Plan update and/or its Development Review process
- **Developer** uses the tools to ID best orientation and layout for a planned subdivision
- **NCDOT** and **MPO** use the tools to mitigate negative impacts of intersection improvements upon wildlife crossings
- **NCDOT** and **MPO** use the tools to help identify best new alignment for a road
- **NC Wildlife Federation** works with a **developer** to facilitate a Wildlife-Friendly Development Certification
- A **greenways commission** uses the tools to plan a regional greenway
- A **land trust** uses the tools to prioritize key agricultural lands for protection
- The **USFS** uses the tools to make resource management decisions
- The **NCWRC** uses the tools to prioritize land management practices for a newly-acquired gamelands tract
- A **developer** uses the tools to gain regional credit for LEED certification of his/her project

Implementation Resources

Linking Lands and Communities Data, Maps, Information

State Government Resources

One NorthCarolina Naturally

NC Wildlife Resources Commission

NC Div. of Community Assistance

nc ONE map

County Planning and Permitting Offices

Local, Regional and Statewide Land Trusts

Studies, Toolkits, Best Management Practices

Quality Growth Toolbox

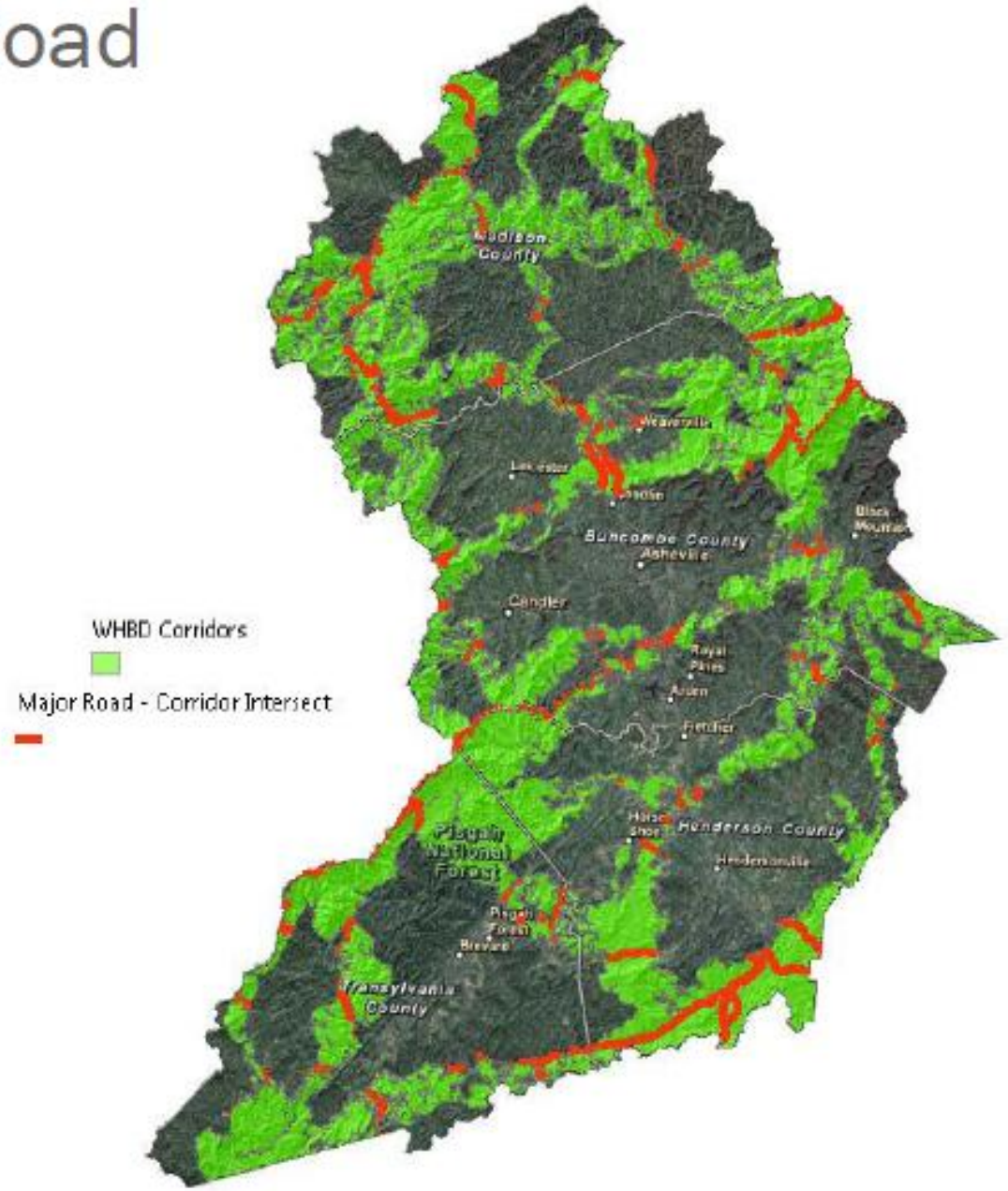
Mountain Landscapes Initiative

GREEN GROWTH
Conservation, Prosperity, Community

For Transportation Planning and Mitigation

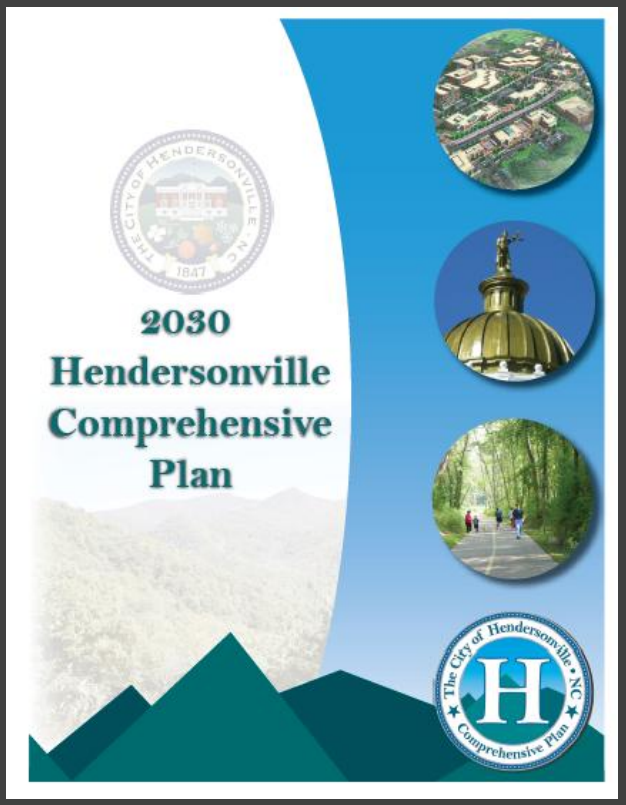
Identifying Major Road Crossings

- Use intersect tool to ID major roads
- Culverts and bridges offer some movement
- Others represent barriers for connectivity among certain species

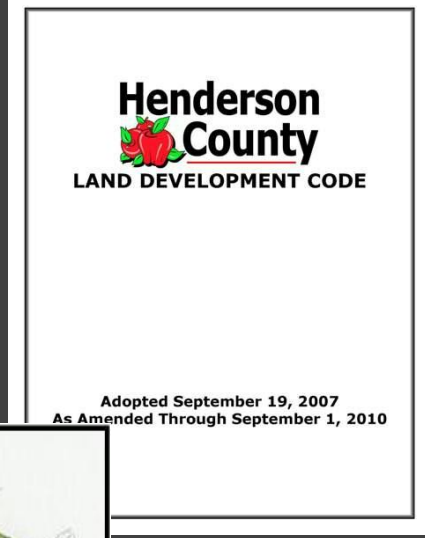


To Support City/County Planning

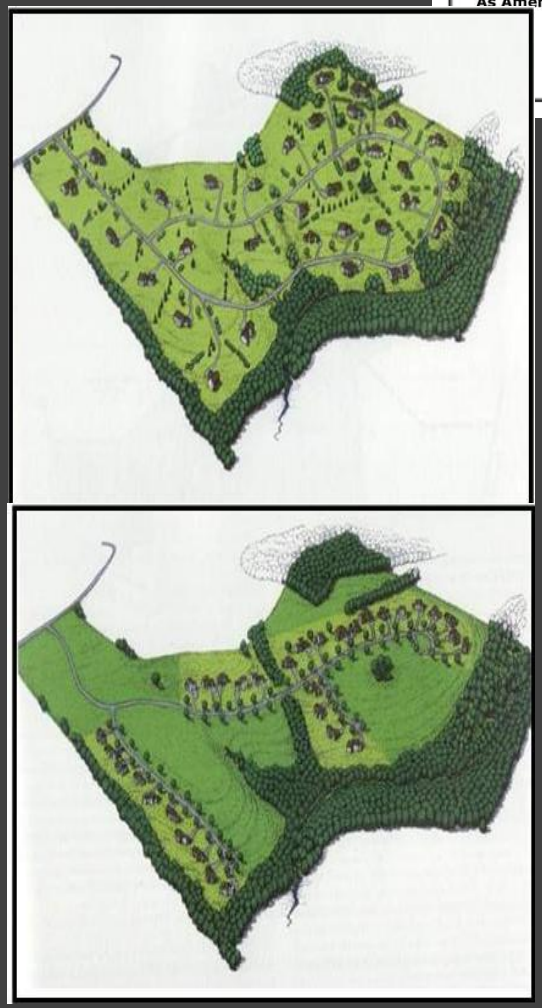
- Additional data, maps and tools to enhance current data and planning tools
- Provides additional information for planning for conservation, recreation and development



Structuring zoning and development ordinances to **conserve priority habitats alongside development**



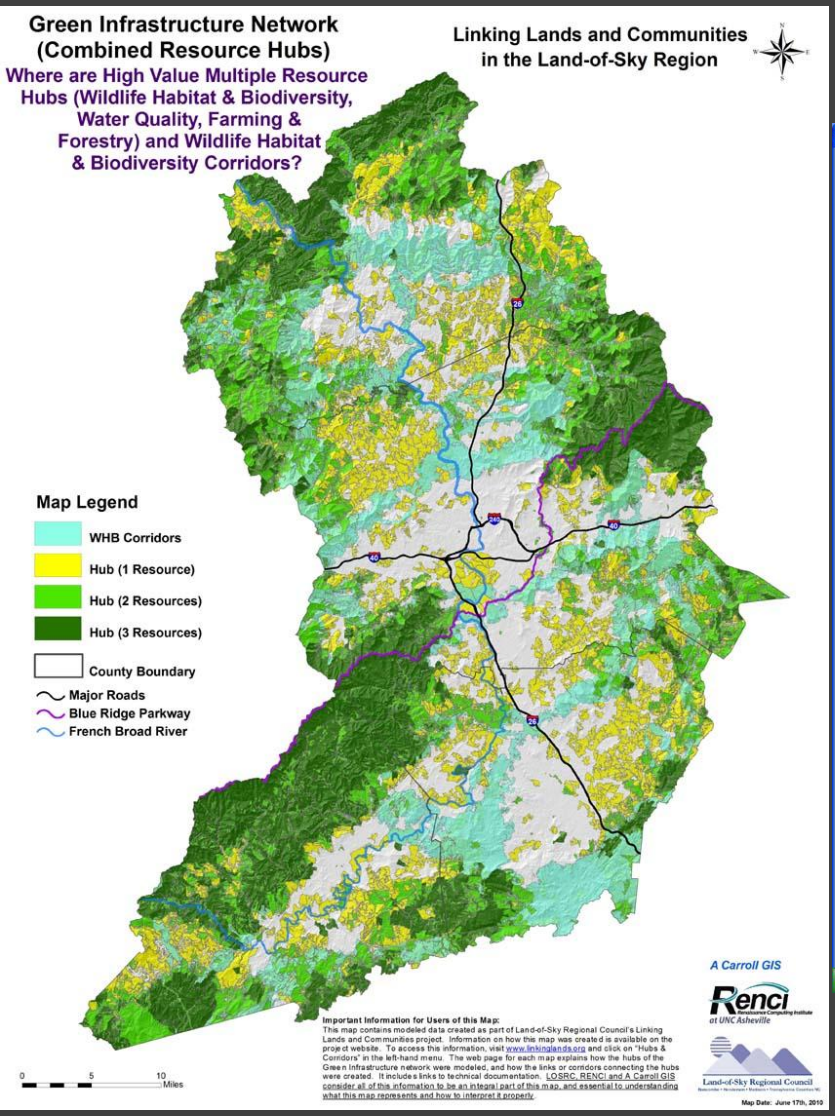
- Minimum 25% of site must be in permanent conservation
  - *Priority on floodplains, stream buffers and slopes >30%*
- Density bonus – for greater open space OR agricultural preservation
- Must submit management plan

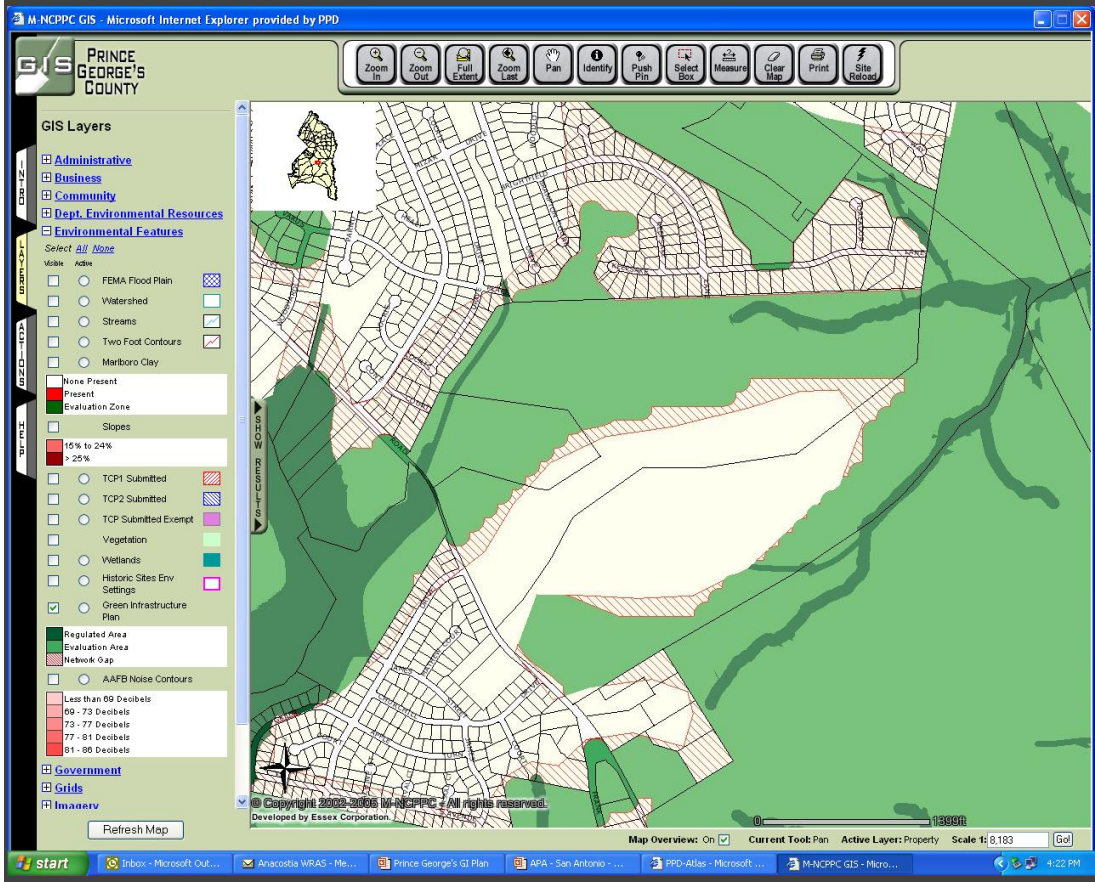


Development Review & Site Design

- Using the GI network, LLC assessments and other conservation data to review development proposals
- Applying wildlife-friendly development principles to site design

Development Review & Site Design





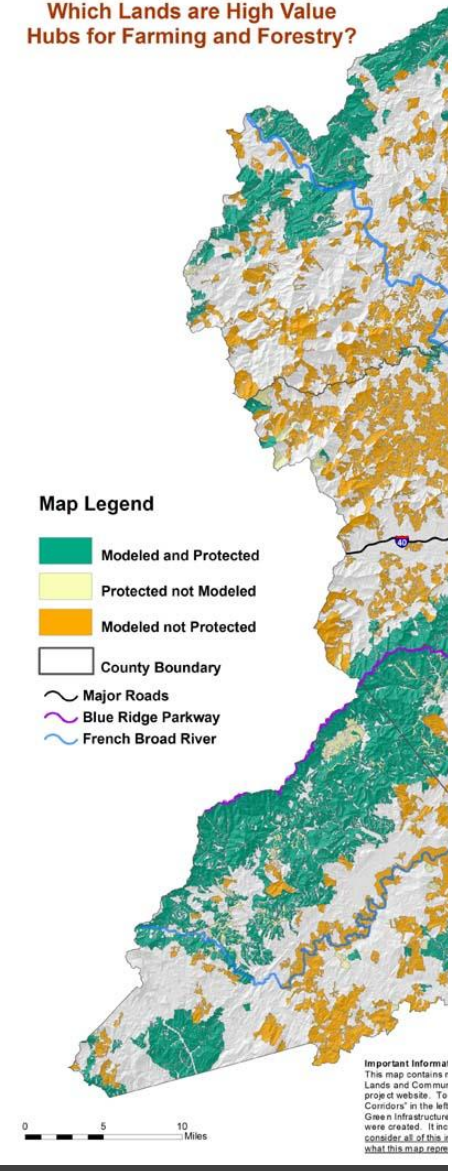
Land Trust Example

Use the tools to prioritize lands for agricultural preservation:

- Look at the Agricultural Hubs map
- Look at the GI network map
- Look at the various layers included in the Agricultural Assessment; then seek out other data and resources

Agricultural Hubs Map

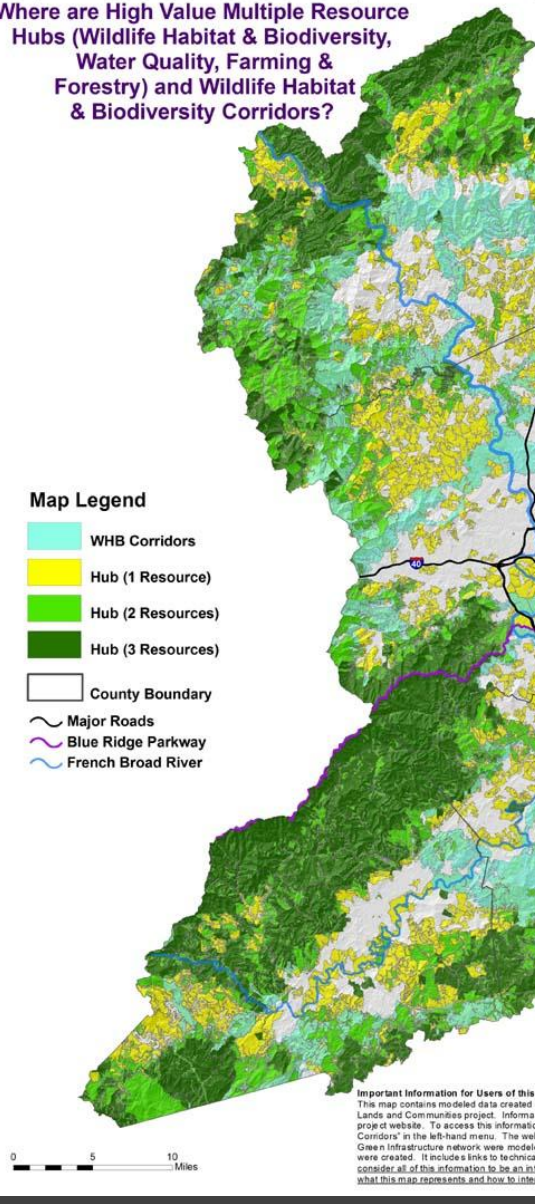
Which Lands are High Value Hubs for Farming and Forestry?



Linking Lands and Communities in the Land-of-Sky Region

Green Infrastructure Network (Combined Resource Hubs)

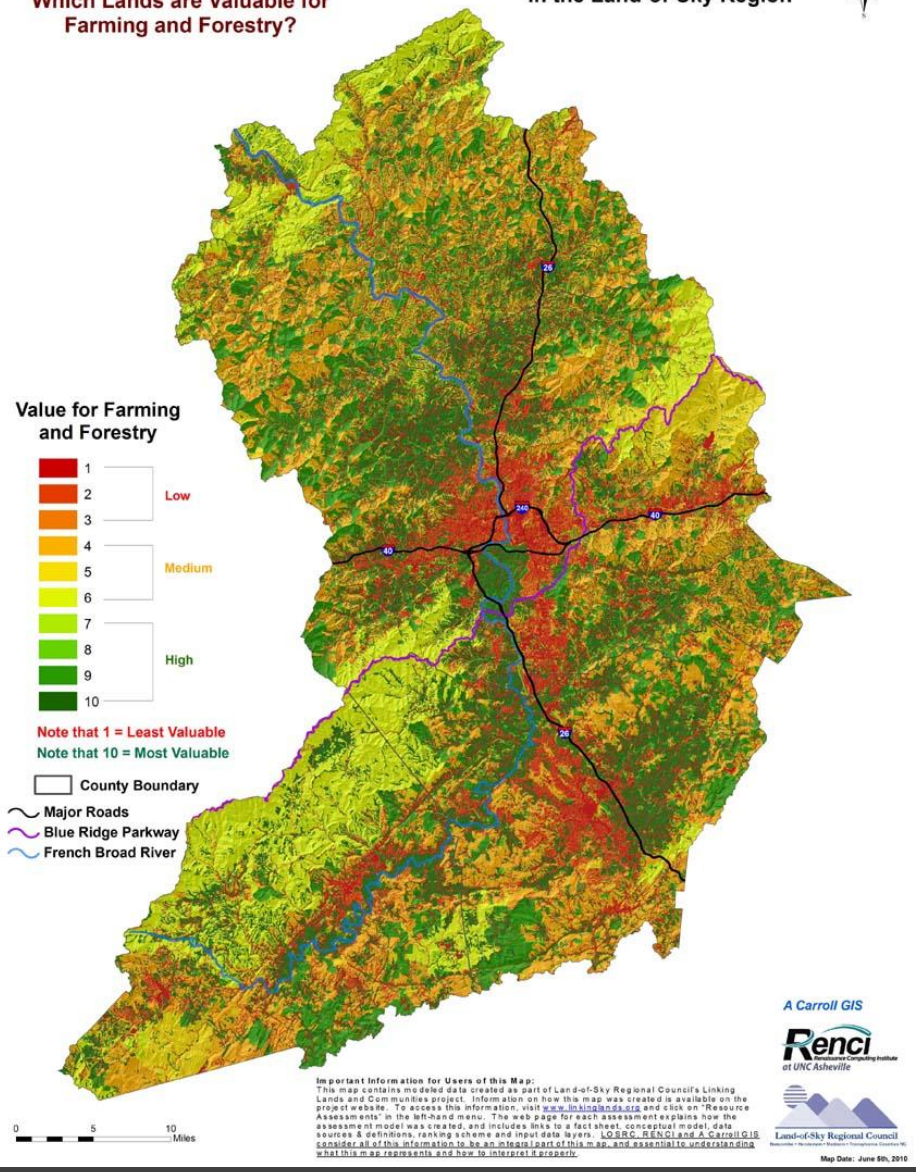
Where are High Value Multiple Resource Hubs (Wildlife Habitat & Biodiversity, Water Quality, Farming & Forestry) and Wildlife Habitat & Biodiversity Corridors?



Linking Lands and Communities in the Land-of-Sky Region

Agriculture Assessment Map

Which Lands are Valuable for Farming and Forestry?



Linking Lands and Communities in the Land-of-Sky Region

Important Information for Users of this Map:
This map contains modeled data created as part of Land-of-Sky Regional Council's Linking Lands and Communities project. Information on how this map was created is available on the project website. To access this information, visit www.linkinglands.org and click on "Resource Assessments" in the left-hand menu. The web page for each assessment explains how the assessment model was created, and includes links to a fact sheet, conceptual model, data sources & definitions, ranking scheme and input data layers. LOSRC, RENCI and A Carroll GIS consider all of this information to be an integral part of this map, and essential to understanding what this map represents and how to interpret it properly.

A Carroll GIS

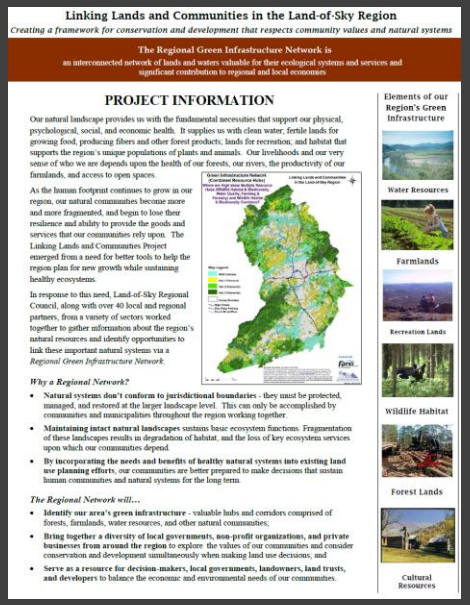
Renci Renaissance Computing Institute at UNC Asheville

Land-of-Sky Regional Council

Map Date: June 9th, 2010

Communication & Outreach

- Provide informational materials and promote use of products – maps, documentation, website, “fact sheets”
- Presentations to a variety of groups
- Training workshops



Linking Lands and Communities in the Land-of-Sky Region

Creating a framework for conservation and development that respects community values and natural systems

The Regional Green Infrastructure Network is
an interconnected network of lands and waters valuable for their ecological systems and services and significant contribution to regional and local economies

PROJECT INFORMATION

Our natural landscape provides us with the fundamental necessities that support our physical, psychological, social, and economic health. It supplies us with clean water, fertile lands for growing food, producing fibers and other forest products, lands for recreation, and habitat that supports the region’s unique populations of plants and animals. Our livelihoods and our very sense of who we are depends upon the health of our forests, our rivers, the productivity of our farmlands, and access to open spaces.

As the human footprint continues to grow in our region, our natural communities become more and more fragmented, and begin to lose their resilience and ability to provide the goods and services that our communities rely upon. The Linking Lands and Communities Project emerged from a need for better tools to help the region plan for new growth while sustaining healthy ecosystems.

In response to this need, Land-of-Sky Regional Council, along with over 40 local and regional partners, from a variety of sectors worked together to gather information about the region’s natural resources and identify opportunities to link these important natural systems via a *Regional Green Infrastructure Network*.

Why a Regional Network?

- **Natural systems don’t conform to jurisdictional boundaries** - they must be protected, managed, and restored at the larger landscape level. This can only be accomplished by communities and municipalities throughout the region working together.
- **Maintaining intact natural landscapes** sustains basic ecosystem functions. Fragmentation of these landscapes results in degradation of habitat, and the loss of key ecosystem services upon which our communities depend.
- **By incorporating the needs and benefits of healthy natural systems into existing land use planning efforts**, our communities are better prepared to make decisions that sustain human communities and natural systems for the long term.

The Regional Network will…

- **Identify our area’s green infrastructure** - valuable hubs and corridors comprised of forests, farmlands, water resources, and other natural communities;
- **Bring together a diversity of local governments, non-profit organizations, and private businesses from around the region** to explore the values of our communities and consider conservation and development simultaneously when making land use decisions; and
- **Serve as a resource for decision-makers, local governments, landowners, land trusts, and developers** to balance the economic and environmental needs of our communities.

Elements of our Region’s Green Infrastructure

Water Resources

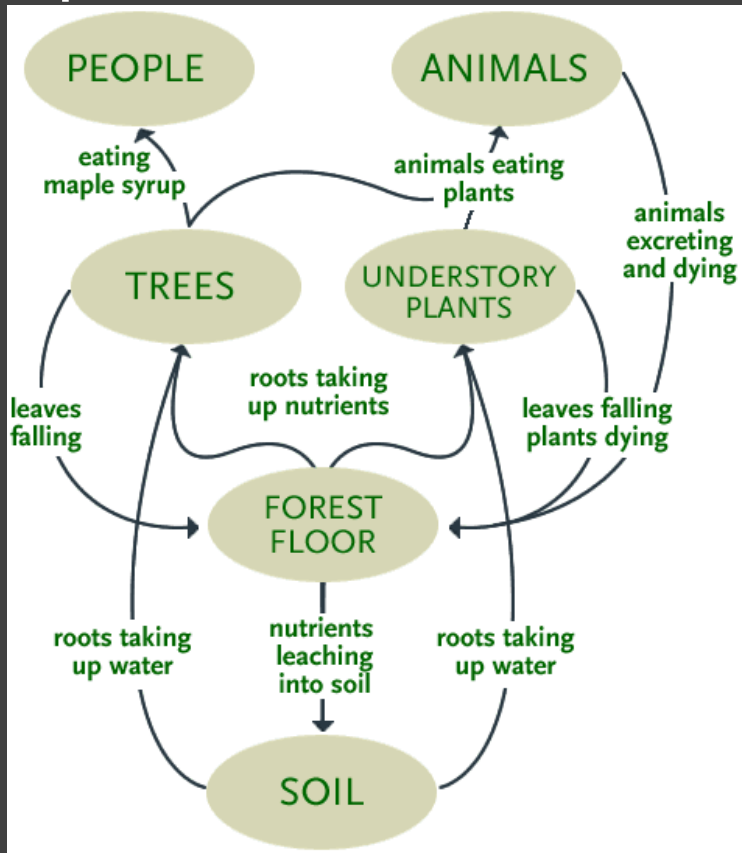
Farmlands

Recreation Lands

Wildlife Habitat

Forest Lands

Cultural Resources



Next steps

- Share project and process with other regions
- Update data as new data are available
- Design various development scenarios and compare development needs to natural resource priorities and needs
- Design regional climate change scenarios and examine impacts
- ID a set of best practices that increase resilience of resources, ecosystems

Questions? Discussion…

Project website: www.linkinglands.org

Land-of-Sky website: www.landofsky.org