

# The Kittatinny Ridge Corridor as a Conservation Priority

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## Large Landscape Conservation Initiatives



Presented to  
The Kittatinny Ridge Coalition  
November 3 , 2016

Ginny Kreitler

# Today's presentation

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- Review three initiatives which are identifying the Kittatinny Ridge corridor as a conservation priority
- Provide a snapshot of each initiative's priorities and status of their work
- Introduce the new climate planning approaches which cause the Kittatinny to be prioritized within large landscapes

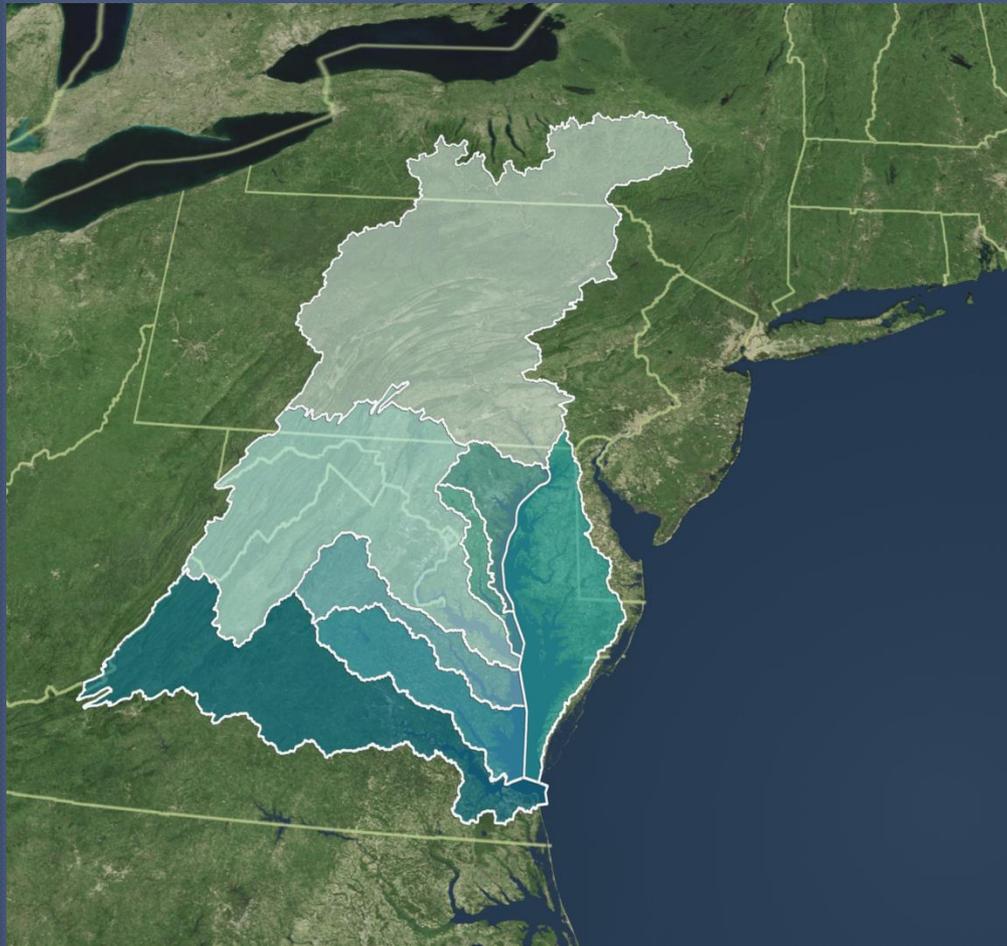
# Why large landscape collaborations?

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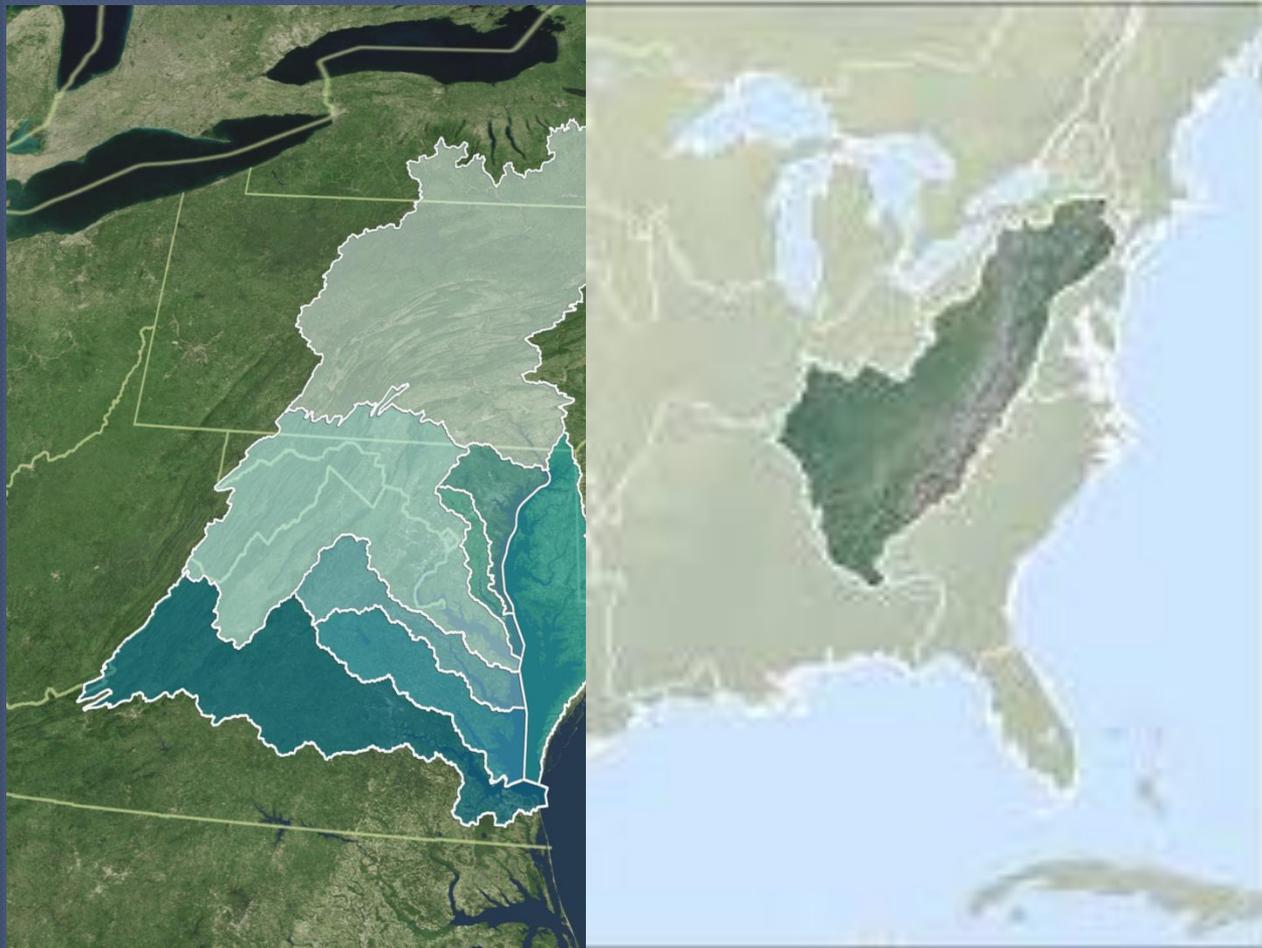
- Scale up conservation results
- Foster increased alignment and synergy among multiple entities so as to better address large conservation challenges
- Some conservation challenges are too great for any one agency or organization
- If cooperative action is to occur, there will need to be mutually agreed upon priorities

# Chesapeake Conservation Partners geography

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# Appalachian Landscape Conservation Cooperative Geography



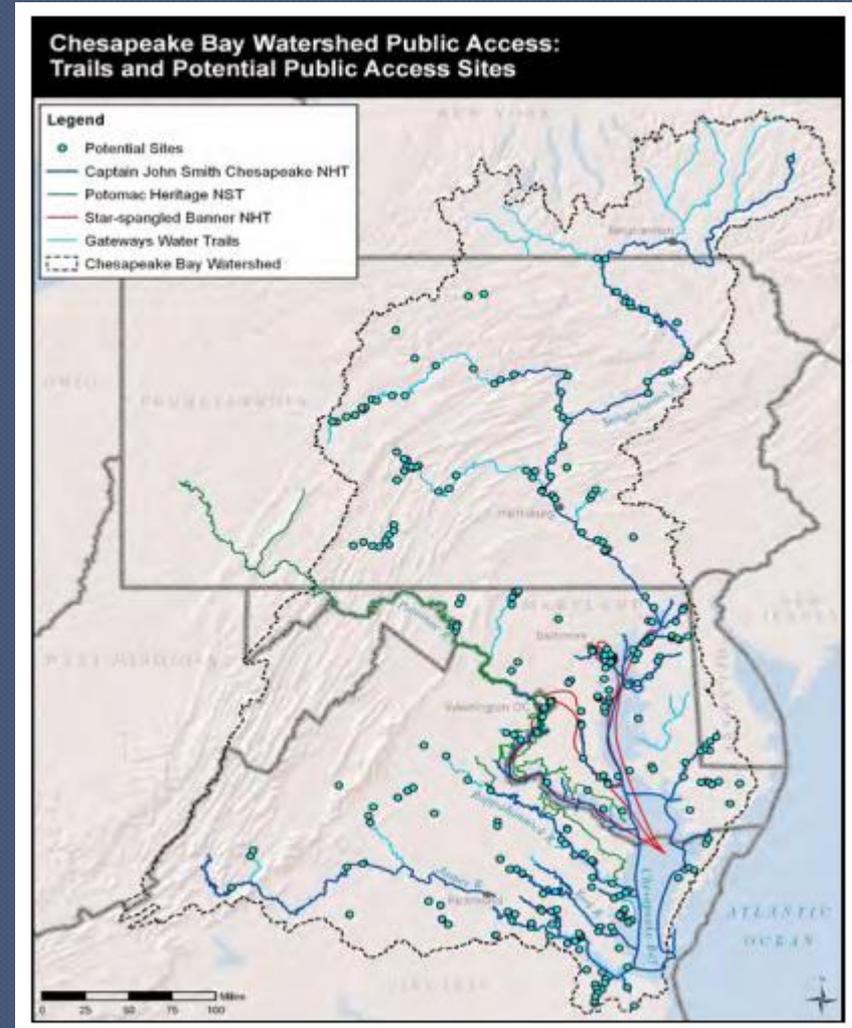
# North Atlantic Landscape Conservation Cooperative Geography





# The Chesapeake Conservation Partnership

**Mission:**  
Foster collaborative action to conserve culturally and ecologically important landscapes to benefit people, economies, and nature throughout the watershed



# Partners in the Chesapeake Conservation Partnership



# Work of the CCP

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- Public access
- Habitat protection
  - Conservation designs at level of the entire watershed and smaller scales
- Landscape Chesapeake
  - Portal to regional information
- Land conservation
  - LWCF \$ [Rivers of the Chesapeake]
- Working lands strategy implementation
- Indigenous cultural landscapes

# Priority areas

Iconic landscapes important for their natural, historic, recreational, or aesthetic values

Kittatinny plus  
19 others

## Legend

1. Pennsylvania Wilds Conservation Landscape Initiative (CLI)
2. Potomac Forest and Waters Conservation Landscape Initiative
3. Laurel Highlands Conservation Landscape Initiative
4. South Mountain Partnership (CLI)
5. Susquehanna Gateway Heritage Region
6. Lower Susquehanna Conservation Landscape Initiative
7. Allegheny Ridge Heritage Area
8. Journey Through Hallowed Ground National Heritage Area and Scenic Byway
9. Shenandoah Battlegrounds National Historic District
10. Cacapon and Loet Rivers Watershed (Cacapon & Loet Rivers Land Trust)
11. Otsego Lake (Otsego Land Trust)
12. Eastern Shore, Maryland (Eastern Shore Land Conservancy)
13. Backwater Nerisoke Corridor
14. Lower Potomac River Corridor
15. Tidal Rappahannock River Corridor
16. Lower James and Chickohominy Rivers Corridor
17. Lower Susquehanna Corridor
18. Kittatinny Conservation Corridor
19. Frontline the James
20. Christian the Susquehanna

## Working Definition: Defining Conservation Focal Areas

- a. Are fairly large and iconic in their own right.
  1. They are typically large enough to be multi-jurisdictional, at least at the county level.
  2. They are recognizable and known as a landscape unit.
  3. They reflect multiple values (natural, cultural, recreational).
- b. Are the result of historic collaboration or cooperation efforts.
  1. They may be developed or formally recognized by state or local government.
  2. There is already ongoing or recent partnership engaged in conservation and related activities.
- c. Include existing and/or protected lands where possible.

0 15 30 60 90 120 Miles



Source: Pennsylvania Department of Environmental Protection

# Priority area selection process

- In selecting priority areas the partners wished to focus resources in high value areas where there was a likelihood of achieving results in a ‘reasonable period of time’
  - Existing partners and capacity to achieve results were part of the selection process



# Land conservation

## Goals:

- Preserve an additional 2M acres by 2025
- Grow conservation funding for the region

Impact: new Federal Appropriations (nearly \$11M in 2016)

**Table 1. Chesapeake Projects in Appropriations Act, 2016**

<b>Agency</b>	<b>Acres</b>	<b>Dollars (in thousands)</b>
BLM -Nanjemoy Natural Resource Management Area (MD)	42	191
BLM - Meadowood Special Recreation Management Area (VA)	407	2,400
USFWS - Blackwater National Wildlife Refuge (MD)	392	1,511
USFWS - Rappahannock River National Wildlife Refuge (VA)	160	1,600
USFS - George Washington-Jefferson NF (VA/WV)	958	1,990
NPS - Captain John Smith Chesapeake National Historic Trail (DC/DE/MD/VA)	175	2,237
Piscataway Park (MD)	1	571
Gettysburg National Military Park (PA)	18	285
<b>TOTAL</b>	<b>2,152</b>	<b>10,785</b>

# Landscape Chesapeake



Home » Focus and Plan » Priority Places » LandScope Chesapeake » LandScope Chesapeake Home

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## LandScope Chesapeake Home

Conservation Summary

Conservation Priorities

Featured Places

Protected Areas

Conservation Partners

Chesapeake Bay States

LandScope Chesapeake is the Authoritative Source for Conservation Maps in the Watershed

Go to the Map >>

Conservation Needs Maps

Tell us how you use LandScope

Take a short survey help make LandScope the best conservation tool that it can be

From our Content Partner



Locator Map

GO TO THE MAP



# Kittatinny Ridge on Landscape

www.landscape.org/chesapeake/featured\_places/Kittatinny\_Conservation\_Corridor/



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LandScope Chesapeake Home

Conservation Summary

Conservation Priorities

» Featured Places

Lower Susquehanna

Journey Through Hallowed Ground

Star-Spangled Banner Trail

Captain John Smith Chesapeake National Historic Trail

Cacapon River Watershed

Protected Areas

Conservation Partners

Chesapeake Bay States

## Kittatinny Ridge Conservation Corridor

The Kittatinny Ridge is one of Pennsylvania's largest Important Bird Areas and the site of a world-famous autumn raptor migration. Audubon Pennsylvania and many partner organizations have been working for years to conserve this critical landscape. A recent report details the current status of the ridge based on a series of measurements indicating some of the area's great successes and largest remaining challenges. Click [here](#) for the report.



© Brian Byrnes

The Kittatinny Ridge Project, led by Audubon Pennsylvania, is a collaborative effort of local, regional, and state organizations and agencies to focus public attention on the importance of the 185-mile long forested Ridge through Pennsylvania; and to promote conservation activities to protect the Ridge from further habitat loss, fragmentation, and inappropriate land use.

The Kittatinny Ridge (also known as Blue Mountain) is a long mountain ridge that winds 185 miles through eastern and central Pennsylvania, to the Maryland line. The Ridge is a globally-significant fall migration flyway used annually by tens of thousands of raptors and vultures and millions of songbirds, and has been designated by Audubon Pennsylvania, as the largest of the state's "Important Bird Areas." The many rock outcroppings along the ridge also make it an excellent

Kittatinny Ridge Conservation Corridor



No related items

Locator Map

GO TO THE MAP



LandScope Chesapeake Home

Conservation Summary

Conservation Priorities

Featured Places

Protected Areas

Conservation Partners

Chesapeake Bay States

## Chesapeake Bay States

The Chesapeake Bay watershed and its vast network of streams, creeks and rivers cover parts of six states. Learn more about state-by-state efforts to protect the shared natural heritage of its 64,000 square miles for the benefit of the 17 million inhabitants of the region.



© Stanke Jett | National Park Service

### States in the Chesapeake Bay Watershed



© Jack Looney

#### LandScope Virginia

From its river, bay and sea shores in the east to the Appalachian highlands in the west, Virginia harbors a wealth of natural and cultural riches.

[Read More](#)



© Nicholas Tonelli

#### LandScope Pennsylvania

Pennsylvania, which means "Penn's Woods," is still 60% forested, and located at an ecological crossroads, meaning that it plays an important role in conserving many diverse species and habitats.

[Read More](#)



© Chesapeake Bay Program

#### LandScope Maryland

Maryland's concurrence of northern and southern species and habitats creates an amazing breadth of ecological diversity within the ninth-smallest state in the nation.

[Read More](#)



© Christopher Schuenbohm

#### LandScope New York

New York's varied, wide-reaching terrestrial and myriad freshwater and coastal ecosystems are home to an incredible array of life.

[Read More](#)



© Delaware State Parks

#### LandScope Delaware

The First State offers a unique setting for conservation with its two major—and very distinct—watersheds: the Chesapeake Bay to the west and the Delaware River to the east.

[Read More](#)

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LandScope Chesapeake Home

Conservation Summary

Conservation Priorities

Wildlife and Habitat Conservation

Working Lands and Waters

Recreation

Historical and Cultural Lands

Clean Water

Featured Places

Protected Areas

Conservation Partners

Chesapeake Bay States

## Conservation Values for Chesapeake Priorities



© Chesapeake Bay Program

### Wildlife and Habitat Conservation Priorities in the Chesapeake

Conserving intact natural landscapes obviously yields basic benefits to the plants and animals that depend on them, but human communities gain considerably from such transactions as well. These data identify biologically significant areas of the Chesapeake and chart out possible protection and connection scenarios.

[Read More](#)



© Chesapeake Bay Program

### Working Lands and Waters Priorities in the Chesapeake

Even the densest, most technologically advanced cities depend on rural communities' capacity to cultivate and harvest food, fiber, and fuel. Farmers, foresters, and fishermen (among others) depend on prime lands and waters to provide them with jobs and income. These maps highlight which productive landscapes should stay in production.

[Read More](#)



© Spielmann | National Park Service

### Recreational Priorities

From urban pocket parks to distant untrammeled wilderness, getting active outdoors restores and recharges us. With the Chesapeake Bay Executive Order's goal of adding 300 new public access sites within the watershed by 2025, these data track emerging ideas on the future of hiking, hunting, fishing, boating, and other recreational activities in the region.

[Read More](#)



© Bill Haley | National Park Service

### Historical and Cultural Priorities in the Chesapeake

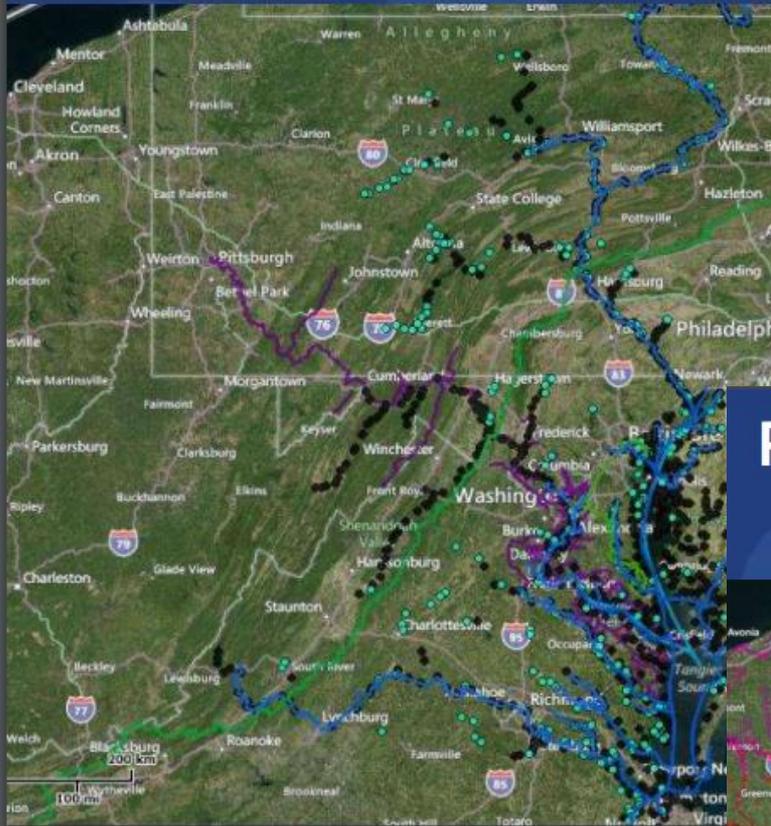
Human history grows from its native soils; its roots can run deep in connection with notable lives, long association, or the shock of individual events. Just as with any other conservation value, though, we need to know how and where these spiritual and cultural links to the land exist to protect them for future generations.

[Read More](#)



### Clean Water Priorities for the Chesapeake

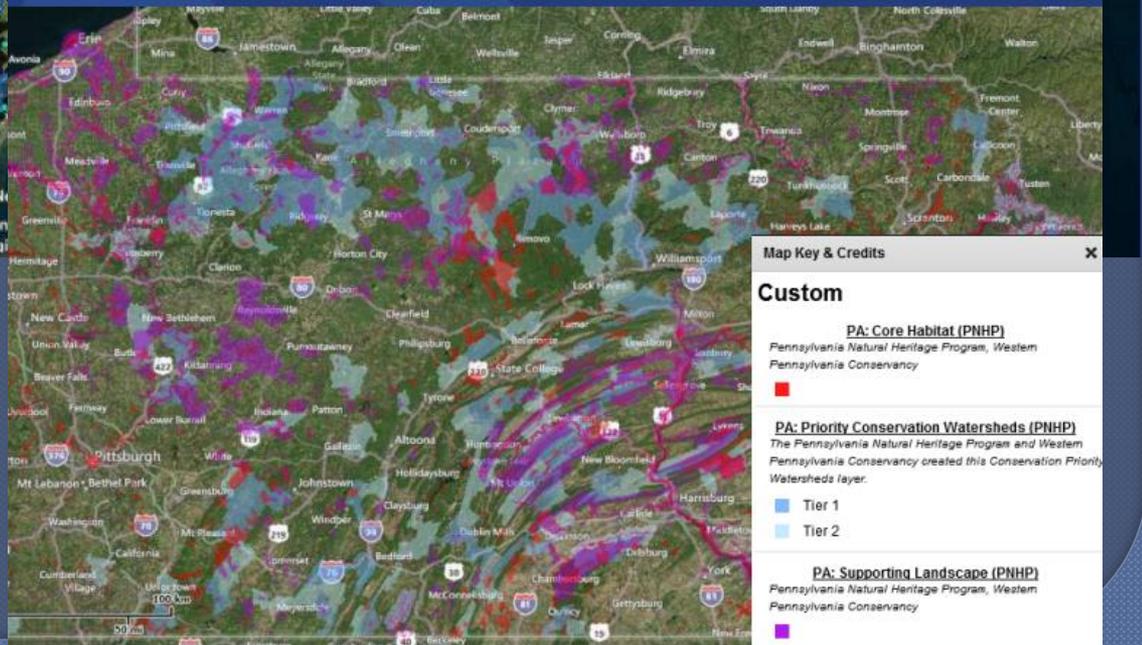
# Regional Recreation Resources



## Important Bird Areas



## Pennsylvania: Priority Habitats and Watersheds



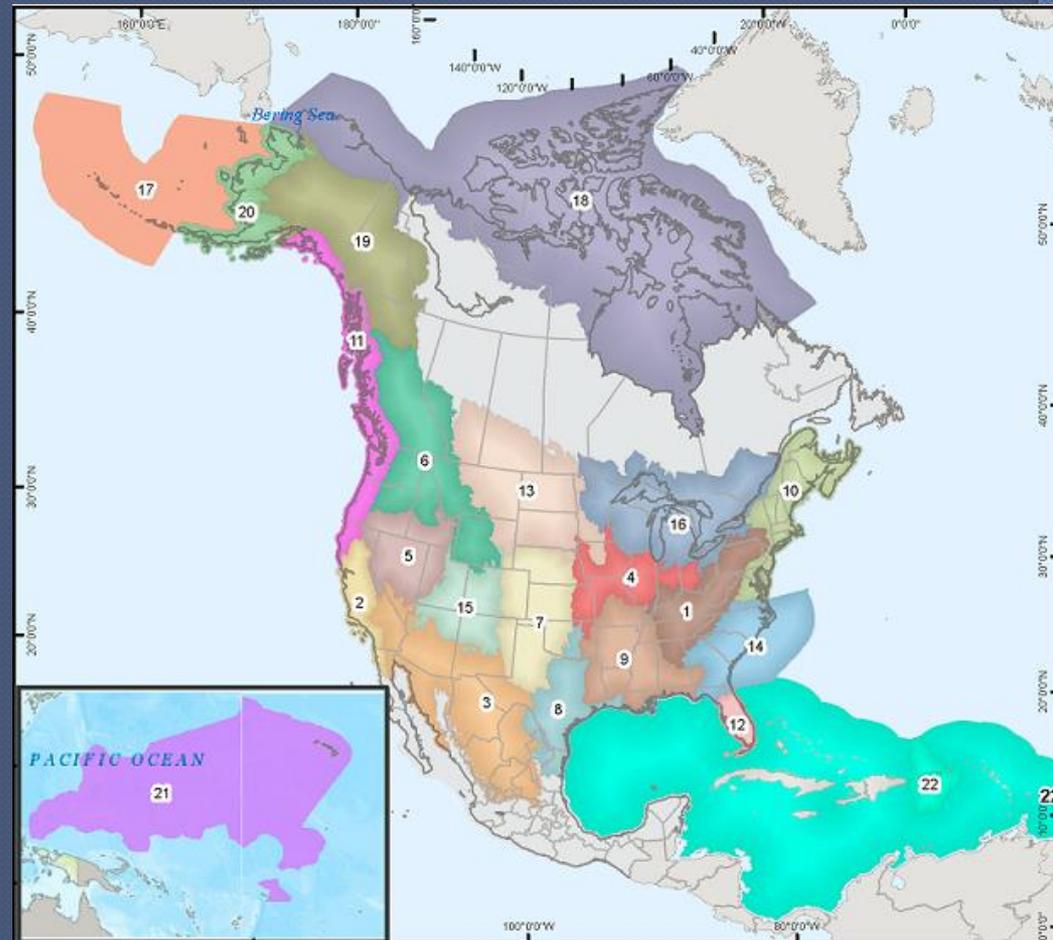


# Landscape Conservation Cooperatives

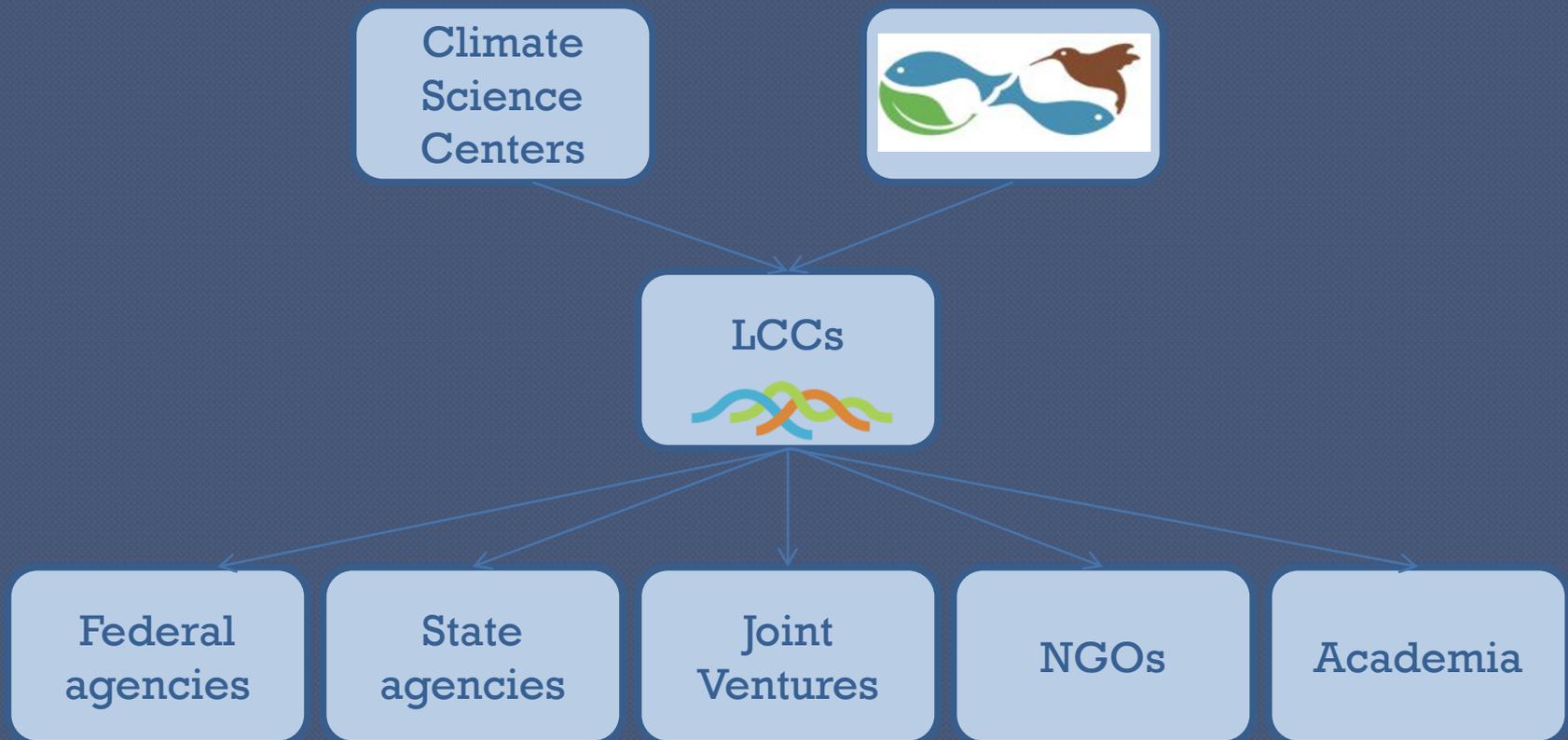
# The Landscape Conservation Cooperatives

Established in 2010

- Acting to address large-scale and long-term conservation issues
- Span geographic and institutional boundaries
- Increase collective science and management capacity



# Role of the LCCs



# LANDSCAPE CONSERVATION DESIGN

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A core activity of the LCCs today

- Important to achieving the goals of the LCC network
- LCDs being completed across the country

What is a Landscape Conservation Design?

- A goal-driven planning process and a set of integrated products
- A conservation blueprint for the protection of biodiversity

# Why do landscape conservation design?

## *Why a regional conservation design?*



NATIONAL *fish, wildlife & plants*  
CLIMATE ADAPTATION STRATEGY

### **Goal 1. Conserve habitat to support healthy fish, wildlife, and plant populations and ecosystem functions in a changing climate**

Strategy 1.1. Identify areas for an ecologically-connected network of terrestrial, freshwater, coastal and marine conservation areas that are likely to be resilient to climate change and to support a broad range of fish, wildlife and plants under changed conditions.

# APPALACHIAN

LANDSCAPE CONSERVATION COOPERATIVE



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## Appalachian LCC Partners

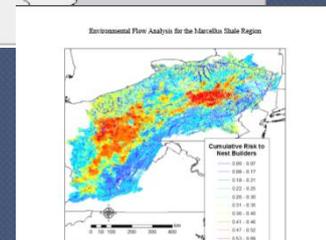
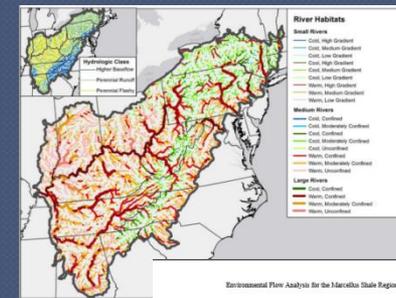
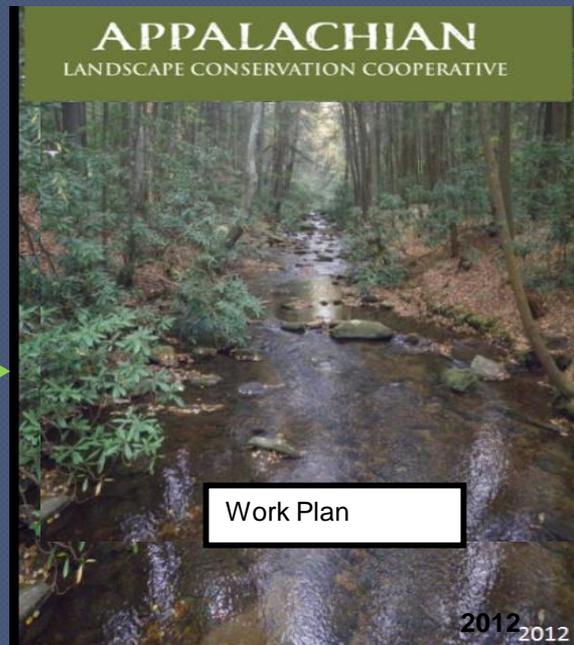
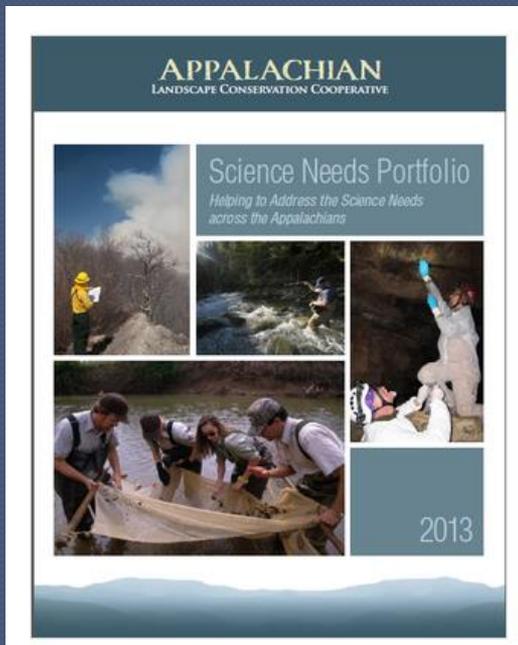
The partners set the strategic priorities and shape the work plan

About to develop work plan for next 5 years

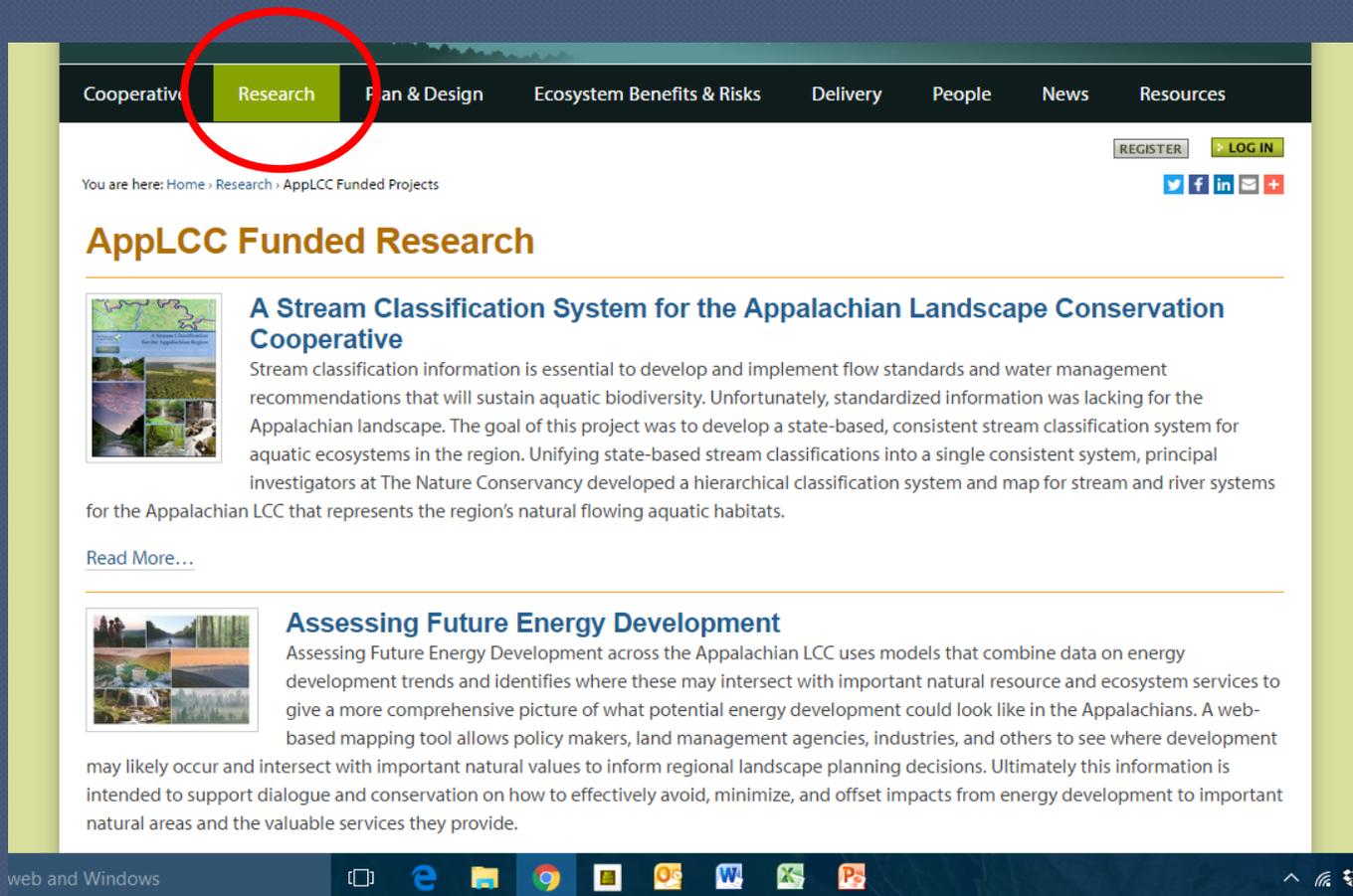


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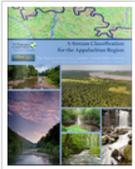
## Projects



The screenshot shows the website's navigation bar with the following items: Cooperative, **Research** (circled in red), Plan & Design, Ecosystem Benefits & Risks, Delivery, People, News, and Resources. To the right of the navigation bar are buttons for REGISTER and LOG IN, and a row of social media icons for Twitter, Facebook, LinkedIn, Email, and a plus sign for more options.

You are here: [Home](#) > [Research](#) > [AppLCC Funded Projects](#)

### AppLCC Funded Research



#### A Stream Classification System for the Appalachian Landscape Conservation Cooperative

Stream classification information is essential to develop and implement flow standards and water management recommendations that will sustain aquatic biodiversity. Unfortunately, standardized information was lacking for the Appalachian landscape. The goal of this project was to develop a state-based, consistent stream classification system for aquatic ecosystems in the region. Unifying state-based stream classifications into a single consistent system, principal investigators at The Nature Conservancy developed a hierarchical classification system and map for stream and river systems for the Appalachian LCC that represents the region's natural flowing aquatic habitats.

[Read More...](#)



#### Assessing Future Energy Development

Assessing Future Energy Development across the Appalachian LCC uses models that combine data on energy development trends and identifies where these may intersect with important natural resource and ecosystem services to give a more comprehensive picture of what potential energy development could look like in the Appalachians. A web-based mapping tool allows policy makers, land management agencies, industries, and others to see where development may likely occur and intersect with important natural values to inform regional landscape planning decisions. Ultimately this information is intended to support dialogue and conservation on how to effectively avoid, minimize, and offset impacts from energy development to important natural areas and the valuable services they provide.

web and Windows

## LANDSCAPE CONSERVATION DESIGN

A conservation blueprint for the protection of biodiversity

Grounded in resource management goals

- Expert input established goals
- Species data selected to represent systems

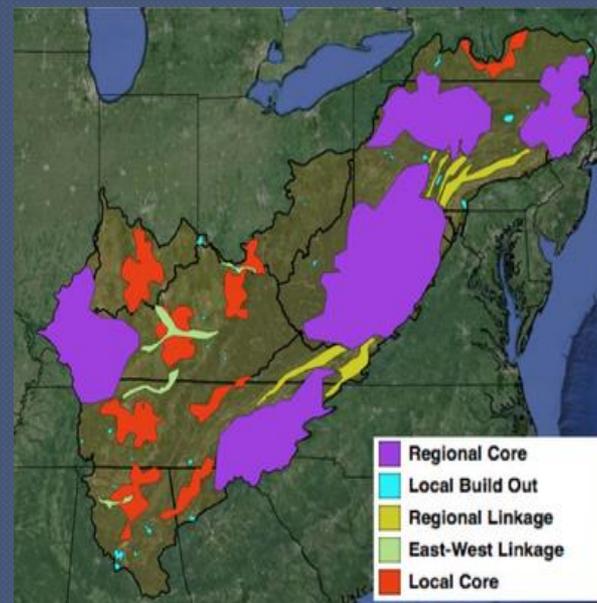


# LANDSCAPE CONSERVATION DESIGN

Phased project

Phase I (2015) emphasized landscape areas that have internal integrity; connectivity

Phase II emphasized aquatic integrity and connectivity



# APPALACHIAN

LANDSCAPE CONSERVATION COOPERATIVE

- Phase I design gave emphasis to:
  - Forests: unfragmented forest; high elevation forest; mature lowland forest
  - Early successional habitat
  - Streams: High elevation, low elevation
  - Cave/karst habitats
  - Forested wetlands
  - Climate resiliency
  - Connectivity

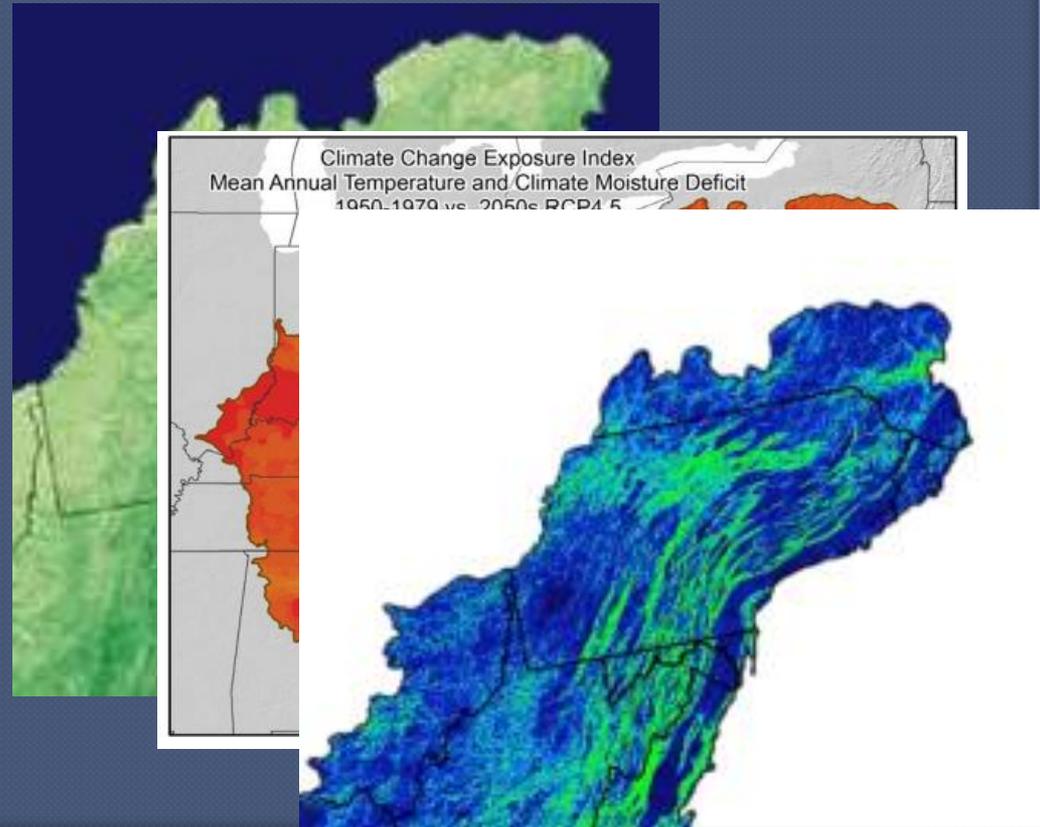


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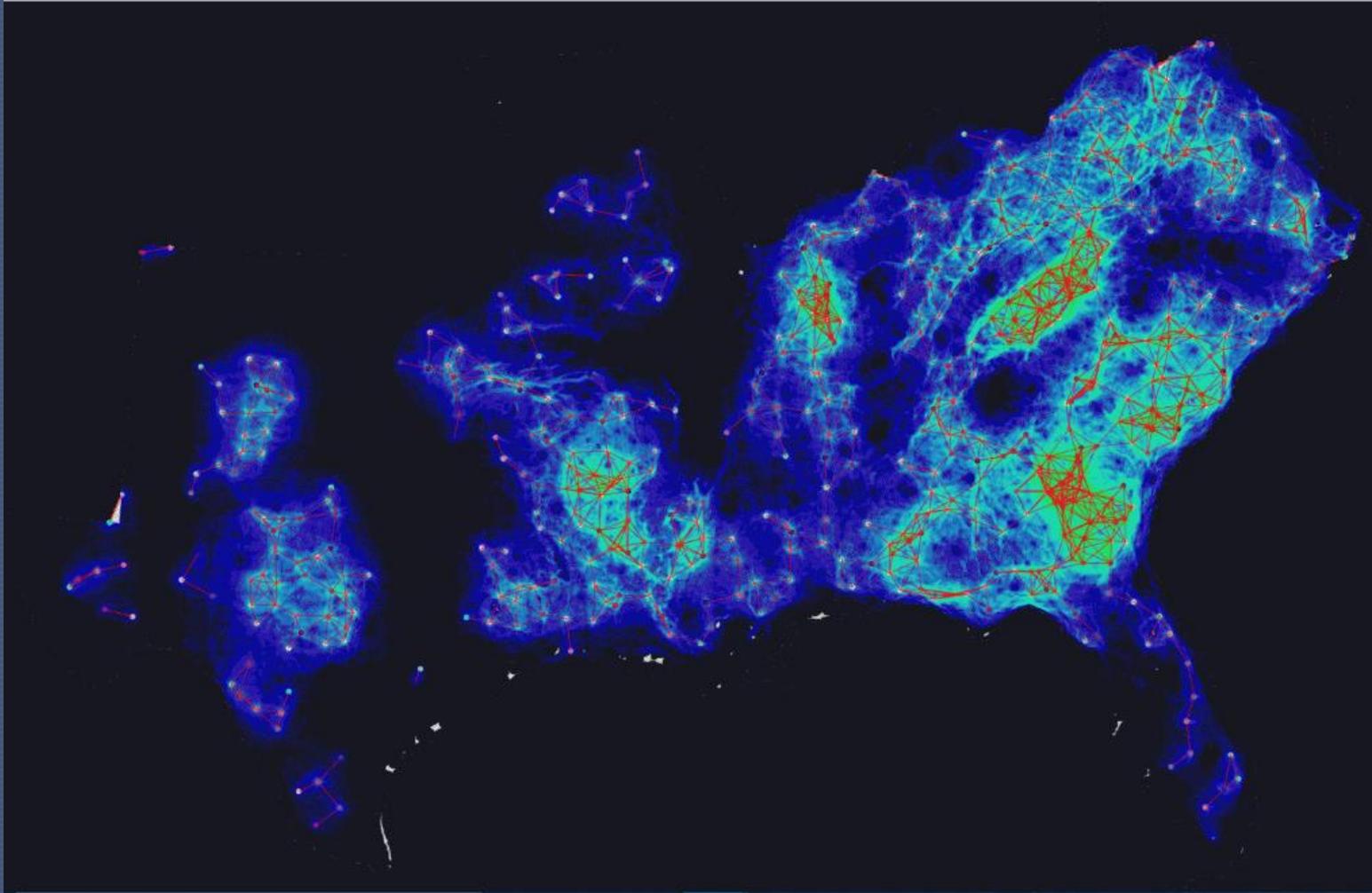
LANDSCAPE CONSERVATION COOPERATIVE

While the resource abundance and climate data give some emphasis to the Kittatinny corridor it is the connectivity analysis that brings the region to the fore

Resource richness  
Climate exposure  
Connectivity



# Connectivity mapping



# LCD work in progress: aquatic systems

New analysis in 2<sup>nd</sup> phase of this project focuses on aquatic habitat condition looking at:

- aquatic resource integrity
- and connectivity

Analytical tools that assess conditions on a catchment basis

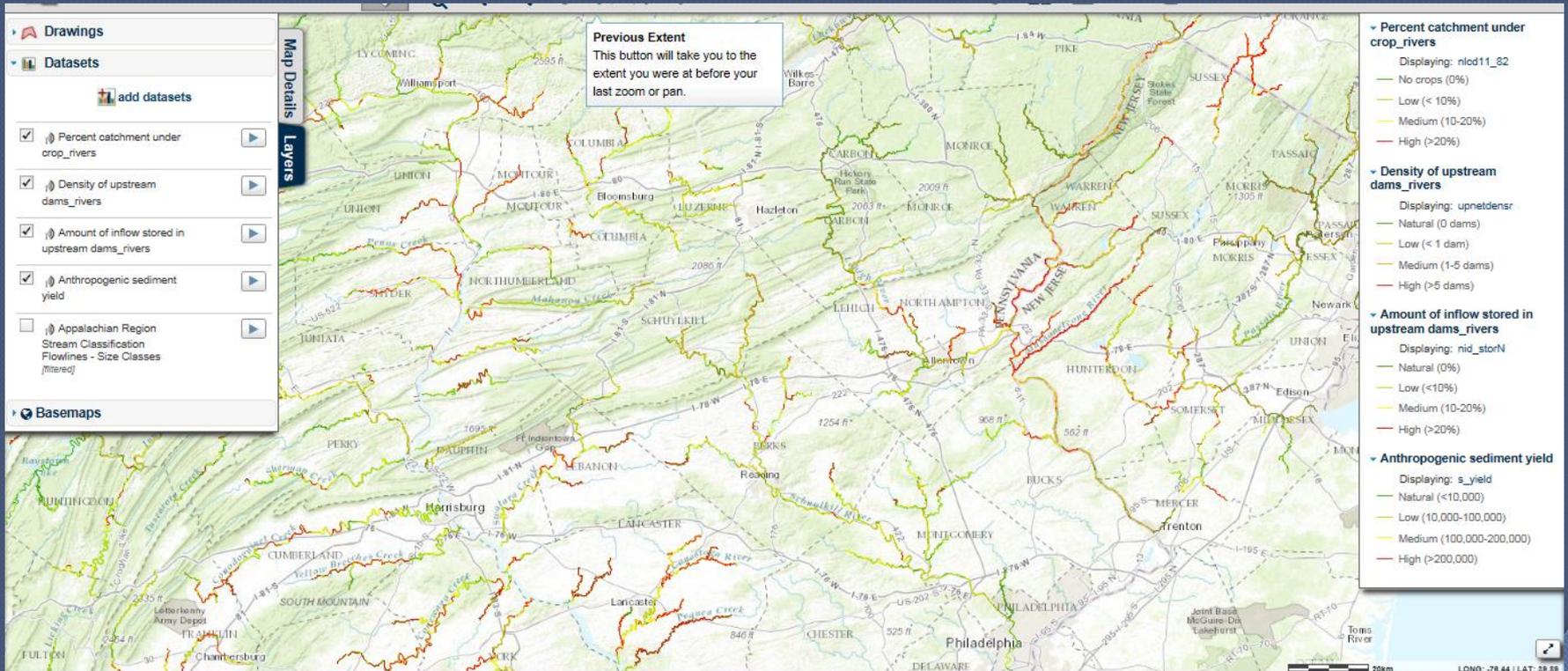


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## Integrity scoring on multiple metrics (interim result)

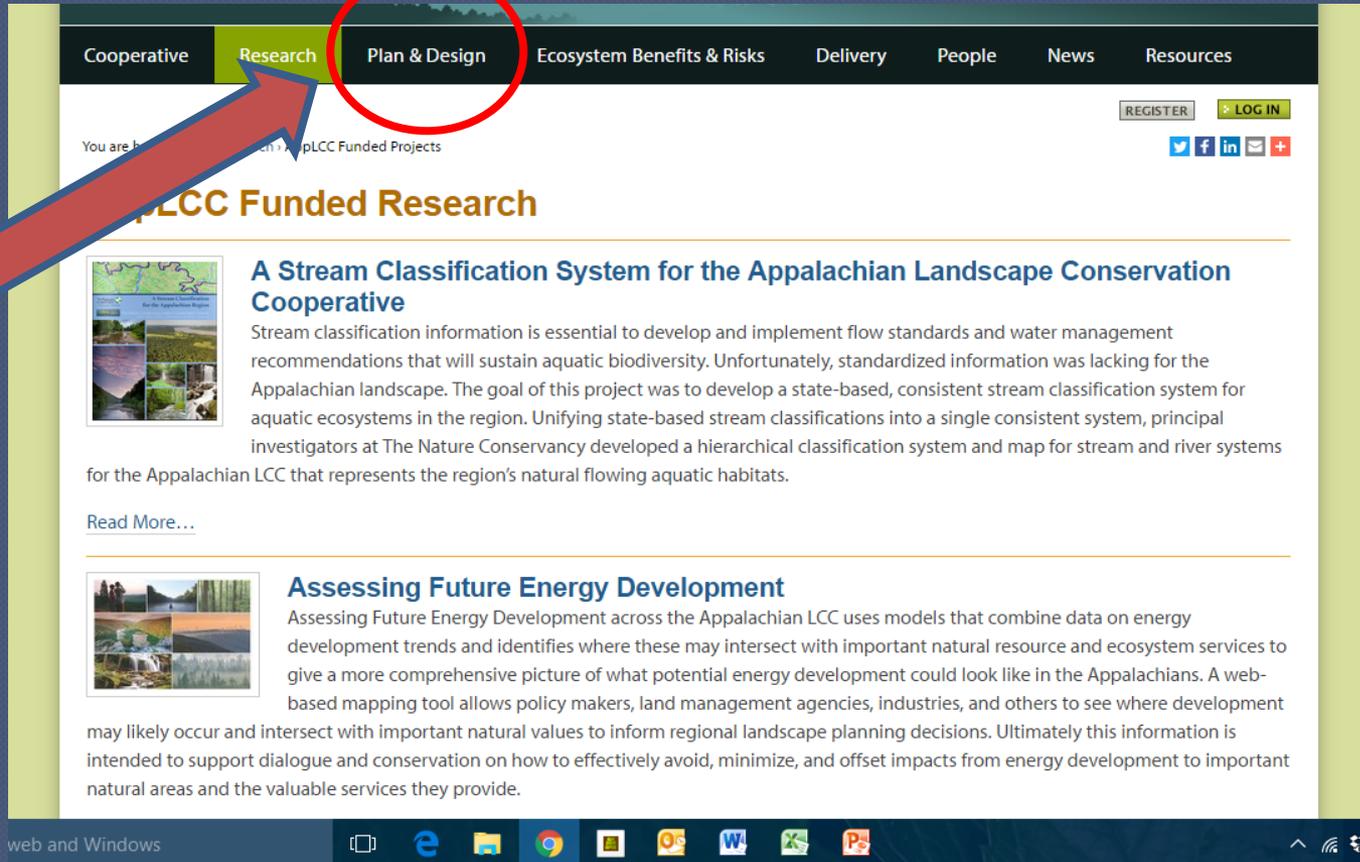
- Anthropogenic sediment load, Density of dams, inflow volume stored in upstream dams and rivers



# APPALACHIAN

LANDSCAPE CONSERVATION COOPERATIVE

## On-line information on LCC website



The screenshot displays the website's navigation menu with the following items: Cooperative, Research, Plan & Design, Ecosystem Benefits & Risks, Delivery, People, News, and Resources. The 'Research' item is circled in red, and a red arrow points from it to the 'LCC Funded Research' section below. The page content includes a 'REGISTER' and 'LOG IN' button, social media icons for Twitter, Facebook, LinkedIn, and Email, and two featured articles:

### LCC Funded Research

**A Stream Classification System for the Appalachian Landscape Conservation Cooperative**  
Stream classification information is essential to develop and implement flow standards and water management recommendations that will sustain aquatic biodiversity. Unfortunately, standardized information was lacking for the Appalachian landscape. The goal of this project was to develop a state-based, consistent stream classification system for aquatic ecosystems in the region. Unifying state-based stream classifications into a single consistent system, principal investigators at The Nature Conservancy developed a hierarchical classification system and map for stream and river systems for the Appalachian LCC that represents the region's natural flowing aquatic habitats.  
[Read More...](#)

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web and Windows

# GIS data layers on Databasin, in the Appalachian LCC gallery

The screenshot displays the web interface for the Appalachian LCC Conservation Planning Atlas (CPA). The browser address bar shows the URL <https://applcc.databasin.org>. The page features a navigation menu with four main sections: **Get Started**, **Explore**, **Create**, and **My Workspace**. The **Explore** section is currently active, displaying a central text block and a large image of a forest stream. The text block reads: "The Appalachian LCC Conservation Planning Atlas (CPA) is a platform for data discovery, sharing and collaboration for stakeholders throughout the Appalachian LCC region. With the CPA you can search for spatial datasets, visualize LCC-supported projects, and learn more about conservation science and design in the region." To the left of this text are four teal buttons with icons: "What is the Conservation Planning Atlas?", "What is the Appalachian LCC?", "What can I do?", and "How do I start exploring?". Below the main content is a green banner with the text "Get started quickly with the Appalachian LCC CPA" and a "Start Tour" button. The page is flanked by two topographic maps. The Windows taskbar at the bottom shows the time as 7:26 AM on 10/30/2016.

Appalachian LCC CPA

https://applcc.databasin.org

Sign Up Sign In Support

## APPALACHIAN

LANDSCAPE CONSERVATION COOPERATIVE  
Conservation Planning Atlas

Search by keyword or location

powered by DATA BASIN

Get Started Explore Create My Workspace

What is the Conservation Planning Atlas?

What is the Appalachian LCC?

What can I do?

How do I start exploring?

The Appalachian LCC Conservation Planning Atlas (CPA) is a platform for data discovery, sharing and collaboration for stakeholders throughout the Appalachian LCC region. With the CPA you can search for spatial datasets, visualize LCC-supported projects, and learn more about conservation science and design in the region.

Get started quickly with the Appalachian LCC CPA [Start Tour](#)

Ecosystem Benefits and Risks Regional Datasets Appalachian LCC Boundary

7:26 AM 10/30/2016

**North  
Atlantic**  **LCC**



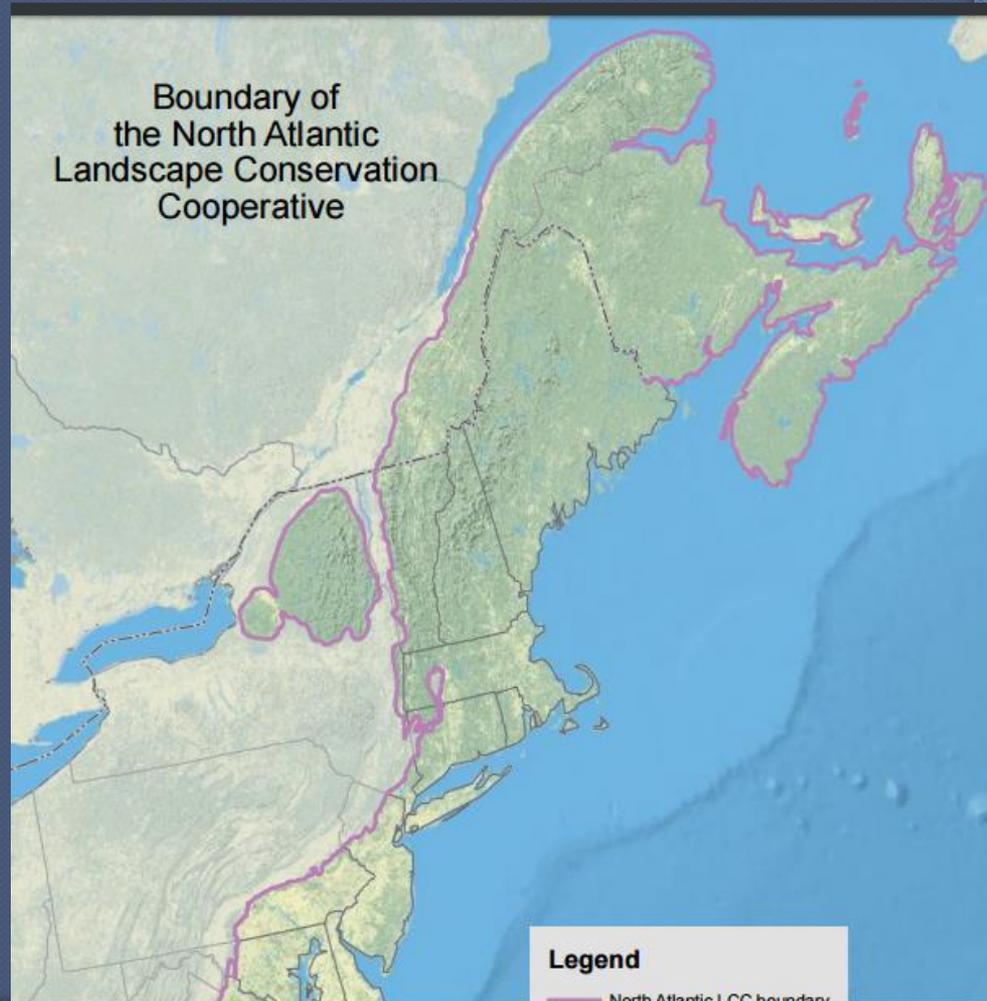
North Atlantic Landscape  
Conservation Cooperative



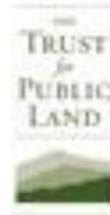
## NALCC boundaries

Boundaries are to the east and north of the Kittatinny

But much of NALCC's science is for all of Pennsylvania



# Partners in the North Atlantic LCC



# Partners in the Northeast Association of Fish & Wildlife Agencies



# Products & tools available through NALCC website

The screenshot shows a web browser window displaying the 'Projects' page of the North Atlantic Landscape Conservation Cooperative. The browser's address bar shows the URL 'northatlanticlcc.org/projects'. The website's header includes the organization's name and a search bar. A navigation menu at the top features several tabs: 'Home', 'Who We Are', 'Teams', 'Resource', 'Projects', 'Products', 'Spatial Data', and 'News & Events'. The 'Projects' tab is highlighted with a red circle. Below the navigation menu, there are links for 'Companion Sites', 'REGISTER', and 'LOG IN', along with social media icons for Twitter, Facebook, LinkedIn, and Email. The main content area is titled 'Projects' and contains a paragraph describing conservation science projects. A 'Search Projects' section is located on the left, with a search box and a 'submit' button. On the right, a 'FEATURED PROJECTS' section highlights 'Forecasting Changes in Aquatic Systems and Resilience of Brook Trout', accompanied by a map titled 'SHEDS: Interactive Catchment Explorer'.

Projects — North Atlantic

northatlanticlcc.org/projects

North Atlantic Landscape Conservation Cooperative

Search Site Search  
only in current section

Home Who We Are Teams Resource **Projects** Products Spatial Data News & Events

Companion Sites REGISTER LOG IN

You are here: Home / Projects

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## Projects

This area describes conservation science projects sponsored by the North Atlantic LCC, and other regional partners, that contribute regional-scale scientific information to aid decision makers who are working to sustain natural and cultural resources, including fish and wildlife populations.

### Search Projects

Search by typing in keywords or by selecting terms below

submit

### FEATURED PROJECTS

#### Forecasting Changes in Aquatic Systems and Resilience of Brook Trout

The objective of this project is to develop tools to assist managers in protecting and restoring streams for brook trout and other aquatic resources in the face of threats such as climate change and development. The project includes developing stream temperature, stream flow, and brook trout occurrence models for headwaters of the Northeast, including projections of the potential effects of

# Data layers available through Databasin

The screenshot shows a web browser window displaying the North Atlantic LCC CPA website. The browser's address bar shows the URL `nalcc.databasin.org`. The website header includes the title "North Atlantic Landscape Conservation Cooperative Conservation Planning Atlas" and a search bar. Below the header is a navigation menu with four tabs: "Get Started", "Browse", "Create", and "My Workspace". The main content area features a large image of a red flower and a text block that reads: "The North Atlantic LCC Conservation Planning Atlas is a platform for easy access to high-quality geospatial datasets, maps and information to facilitate partner-driven conservation." Below this text is a "Learn more" link. At the bottom of the main content area, there is a "Take a Tour" button. The Windows task bar at the bottom of the screen shows the time as 1:11 PM on 10/28/2016 and includes icons for various applications and system settings.

North Atlantic LCC CPA

nalcc.databasin.org

Sign Up Sign In Support

Search by keyword or location

powered by DATA BASIN

Get Started Browse Create My Workspace

What is the North Atlantic LCC Conservation Planning Atlas (CPA)?

What is the North Atlantic LCC?

What can I do?

How do I start exploring?

The North Atlantic LCC Conservation Planning Atlas is a platform for easy access to high-quality geospatial datasets, maps and information to facilitate partner-driven conservation.

Learn more

Get started quickly with the North Atlantic LCC Conservation Planning Atlas [Take a Tour](#)

North Atlantic LCC Galleries... Recommended Items Northeast Terrestrial Habitat and Secured Lands Map

Ask me anything

1:11 PM 10/28/2016

# NALCC Landscape Conservation Design = 'RCOA'

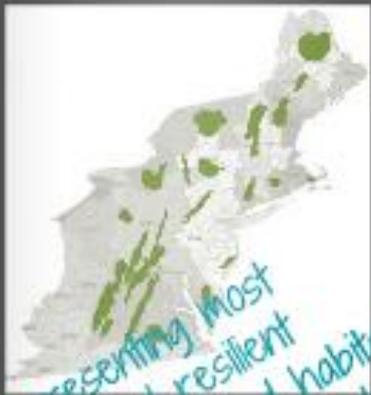
## Vision

Engage the collective wisdom and common interest of partners

To identify and map a **connected** network of **resilient**  
and **ecologically intact** habitats that will support  
**biodiversity** under changing conditions

# Major components of NALCC RCOA

## CORE AREAS



Representing most intact and resilient ecosystems and habitats for fish, wildlife and plants in the region

## RSGCN HABITATS



Important habitats for rare and threatened RSGCN

## RESTORATIO



Prioritization to focus habitat restoration and management efforts

## CONNECTIVITY

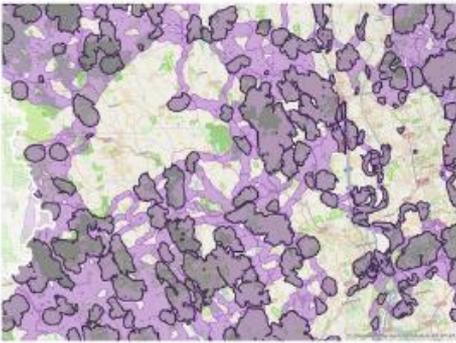


Ensures all wildlife have opportunity to find good habitat

# Some of the newest work is in connectivity analysis

## Connectivity analysis

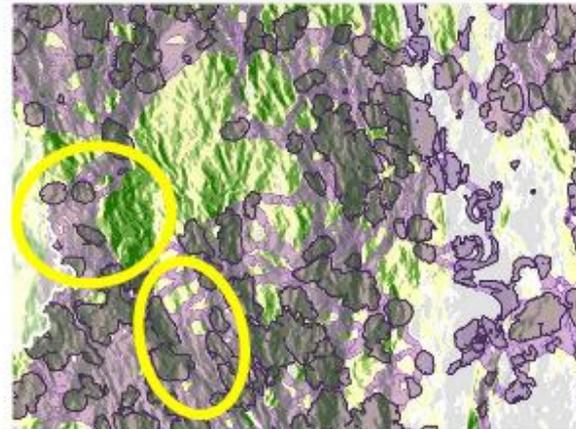
Node to node corridors



Global wall to wall permeability



Node to node corridors versus global wall to wall permeability

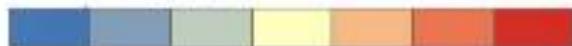


*Logical regional flow bypassed*

# Connectivity analysis

Regional pinch points bottlenecks for species flow

## Anthropogenic Resistance Flow



Barrier      Diffuse Flow      Concentrated Flow (bottlenecks)

 Area of Concentrated Flow

 Example Pinch Point Locations

*Highlights irreplaceable locations important in connecting large natural areas*



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# The Nature Conservancy's Climate Analyses



# The importance of TNC's climate change work

- Seminal work now being reflected in landscape-scale planning endeavors

**Conserving the Stage**  
Create reserves for refugia not museums of the past.

Soakwater Sandstone Granite  
Crown Sand Limestone Pinalo Diggins  
Maricopa Mountains Mogon Valley Cactusland Crown Sand

**Resilient and Connected Landscapes for Terrestrial Conservation**

Resilient Landscapes Connected Landscapes Landscape Resilience

**Conserving Nature's Stage**  
Conserve examples of different physical environments

**Climate Resilient Sites**  
Focus conservation on natural climate strengths

**Permeable Landscapes**  
Maintain and landscape that allows movement and facilitated range shifts

© 2010 Duke University Foundation and The Nature Conservancy. Landscapes Resilient to Climate Change

# Climate adaptation planning for landscapes

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## Core premise:

Species ranges will shift in response to climate change

- Northward
- Upslope

## Management Strategy

Landscape conservation should protect features of natural landscapes that enable species to settle in new locations where they can thrive

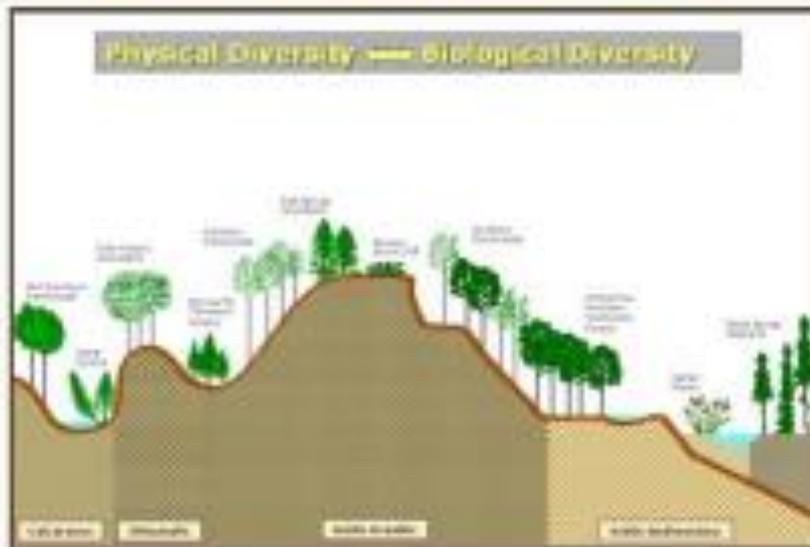
# Elements that tend to emphasize Kittatinny Ridge

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- **Climate resilient sites**
  - Defined based on physical attributes
  - Geophysical variation that yields richness of microclimates (diverse elevation, bedrock, soil)
- **Climate landscape network: permeable landscape of climate resilient sites**
  - Similar to, but distinct from, connectivity as identified through cores and connectors
  - More complete consideration of the hardness of barriers, the connectedness of natural cover, and the arrangement of land uses

# Climate resilient site vs. permeable climate network

Climate resilient sites have physical attributes that support microclimate diversity



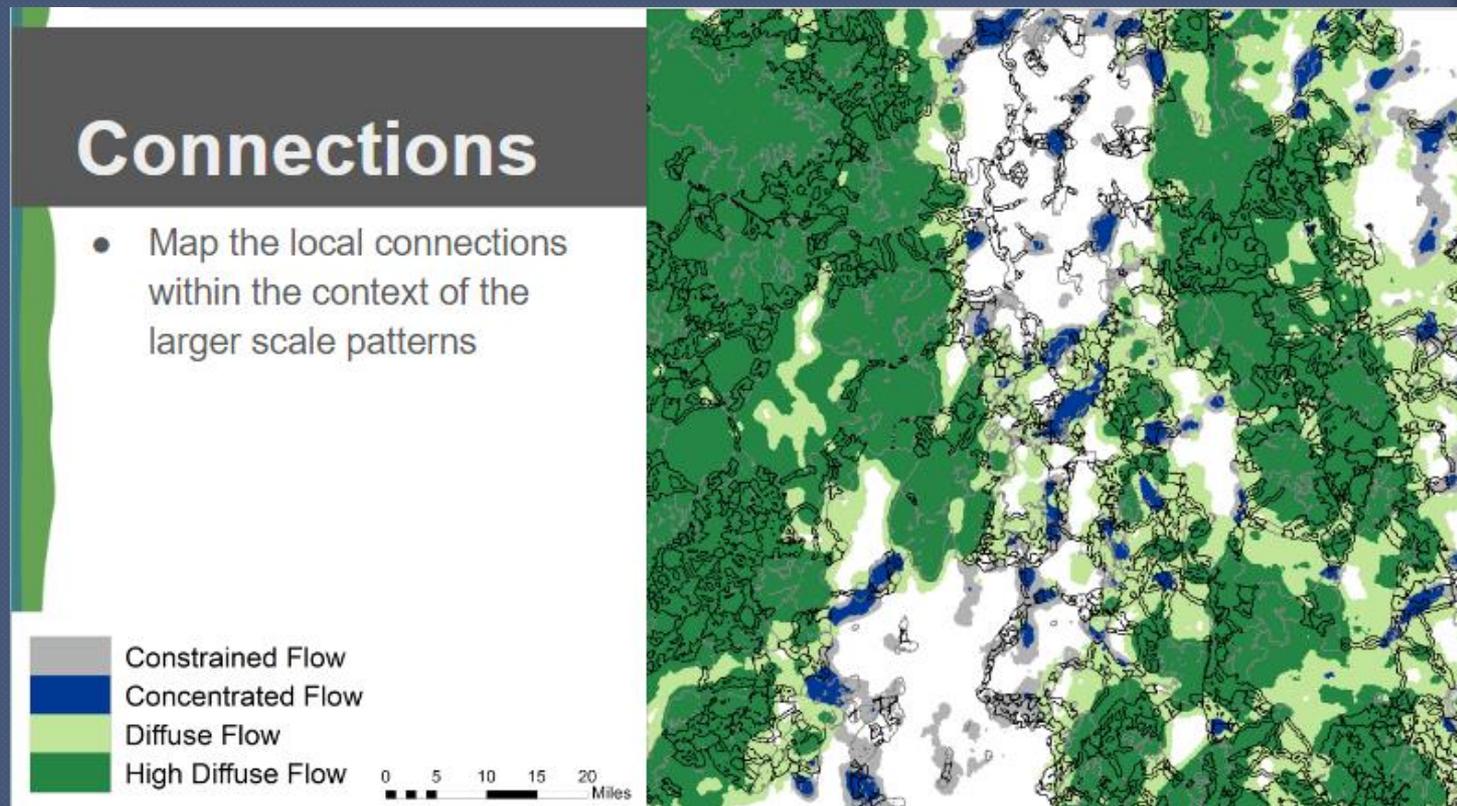
**GEOPHYSICAL SETTINGS**  
are unique combinations of  
geology, elevation, and landforms.



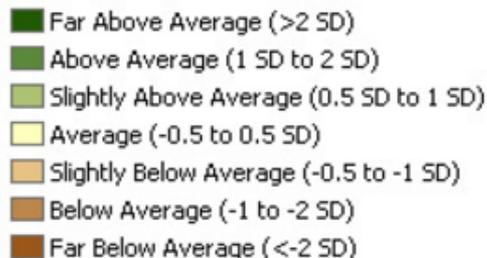
**COMPLEX LANDSCAPES**  
create "micro-climates" that buffer  
change by providing species with  
a variety of local climates.

# Climate resilient site vs. permeable climate network

Landscape permeability: properties of large regions that are conducive to long-term movements of many species between climate refugia

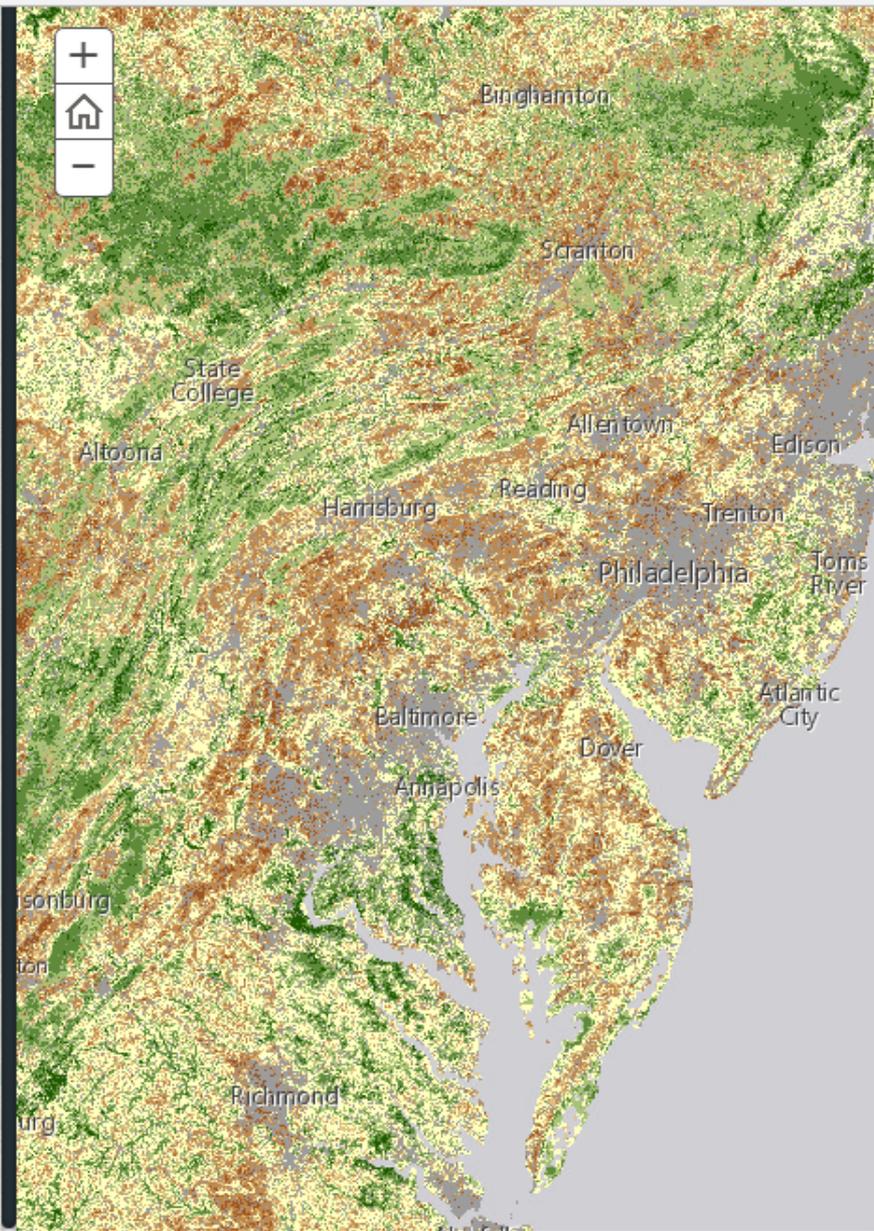


## RESILIENT SITES



Resilient sites are sites that continue to support biological diversity, productivity and ecological function even as they change in response to climate change. Resilient sites buffer their resident species from the direct effect of climate change by providing temperature and moisture options in the form of connected microclimates that can differ as much as 10-15 degrees C. Sites with high microclimate diversity allow plants and animals to persist locally even as the regional climate appears unsuitable, thus slowing down the rate of change. Recently a team of 60 scientists, led by The Nature Conservancy, have identified and mapped the places where site resilience is the highest for each of 61 different environments in Eastern North America. Thanks to the land's diverse topography, bedrock, and soil, these climate-resilient sites are more likely to sustain native plants, animals, and natural processes into the future.

To map site resilience across Eastern North America, scientists first grouped the land into distinct geophysical settings and then analyzed every acre for two characteristics



## CONFIRMED BIODIVERSITY



### RESILIENT

Areas of above average resilience, but do not fall into any of the prioritization categories.



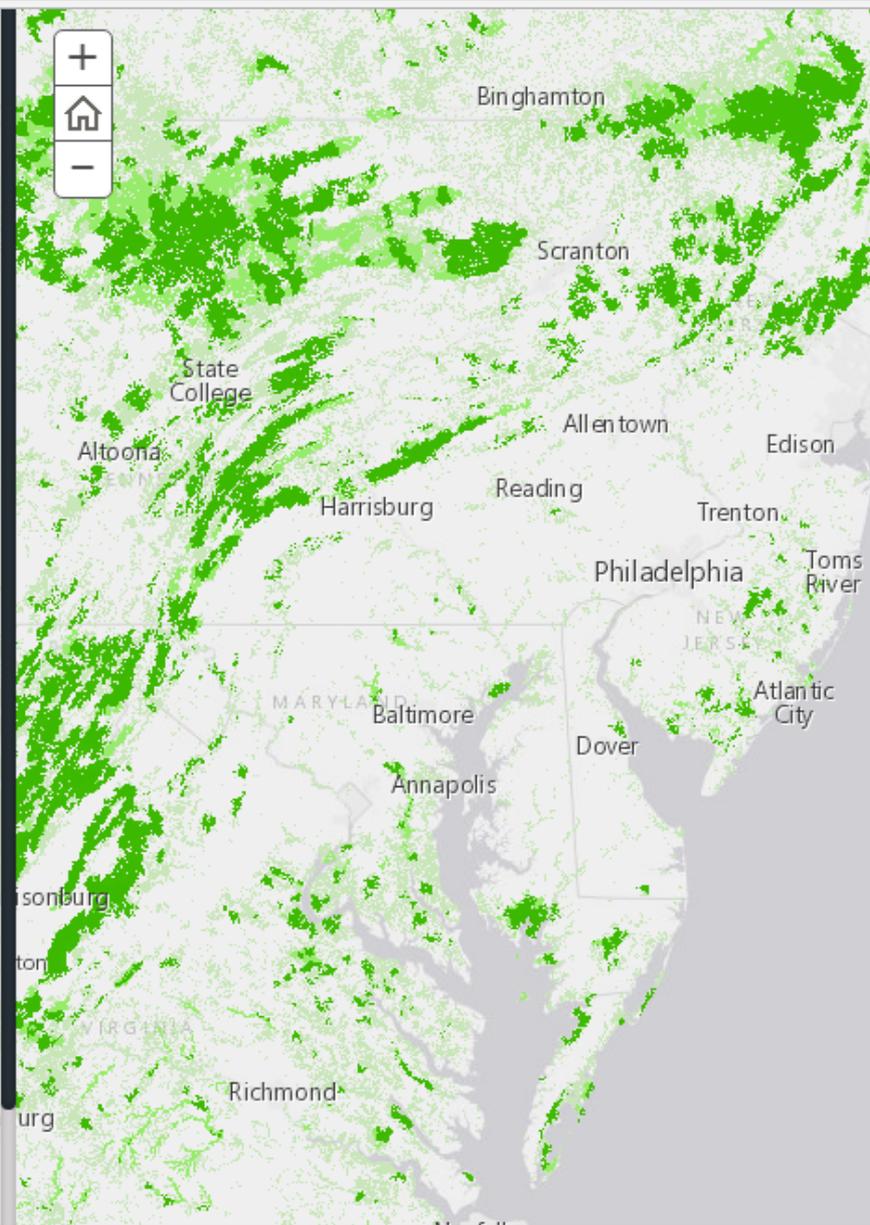
### RESILIENT & HIGH DIVERSITY

Resilient areas that have confirmed rare species and natural communities, or are large resilient examples of each geophysical setting.

Biological diversity refers to the 28,000 types of plants and animals that characterize the Eastern US and provide the functions and services on which life depends. The distribution of species in the region has a well-developed spatial structure that is closely associated with the distribution of physical characteristics such as bedrock, soils, landforms, latitude and elevation zones. For example, species that thrive and reproduce in low elevation coastal sands are very different from those that thrive in high elevation granite mountains.

To map important areas of representative and unique biological diversity we identified three types of features across the region:

The largest resilient areas of each geophysical setting which collectively encompasses the full spectrum of relatively distinct species habitats (e.g. low elevation limestone, high elevation granite, 61 in all). The acreage identified for each setting was determined by the current level of protection, with more acreage for the least protected settings.



## REGIONAL FLOW



**Diffuse flow** occurs in intact natural areas where high amounts of flow can spread-out and expand in many directions. These areas correspond to the least fragmented parts of the region.



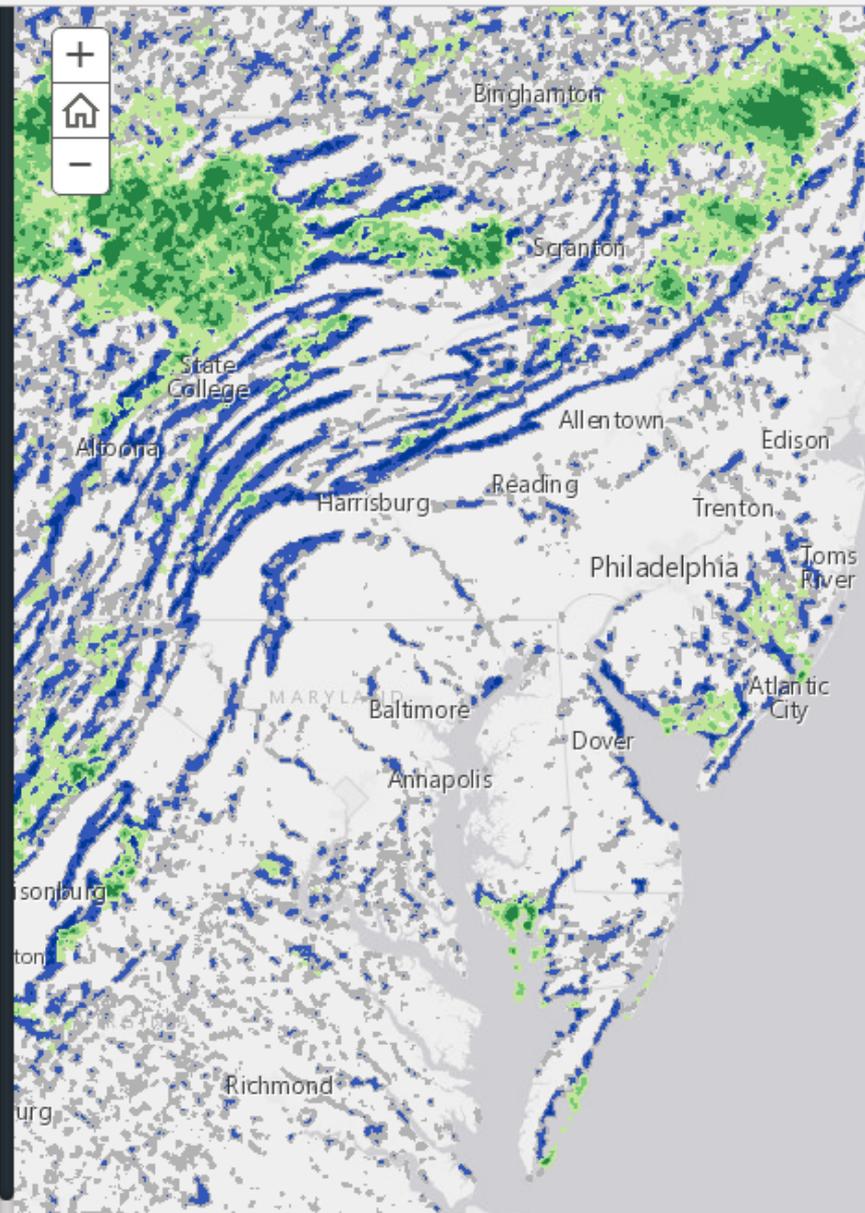
**Concentrated flow** occurs where high amounts of directional flow become concentrated in relatively small channels or pinch points. Concentrated flow areas often correspond to unbroken natural ridgelines (terrestrial corridors) or relatively intact riparian and floodplain areas (riparian climate corridors) embedded in a matrix of development and agriculture. Concentrated flow may connect areas of high diffuse flow or high biodiversity.



**Blocked or Constrained flow** occurs where directional flow hits a hard barrier or encounters strong resistance that dampens and decreases the overall amount of movement through an area. Diversions caused by blocked flow may result in corresponding areas of concentrated flow.

Flow refers to the gradual movement of plant and animal populations in response to changes in the climate. Population range shifts were common and widespread in past episodes of climate change and have already been detected for hundreds of plant and animal populations in response to current climate change. Climatic driven flows are often directional, for example current populations are moving upslope and northward into cooler climate zones, or downslope into a moist shady riparian area. Unlike the past, today's dispersing species must navigate through to a wealth of barriers such as busy roads, impassable dams, and extensive development, in order to reach suitable new habitat, and in many places species movements are blocked or rerouted.

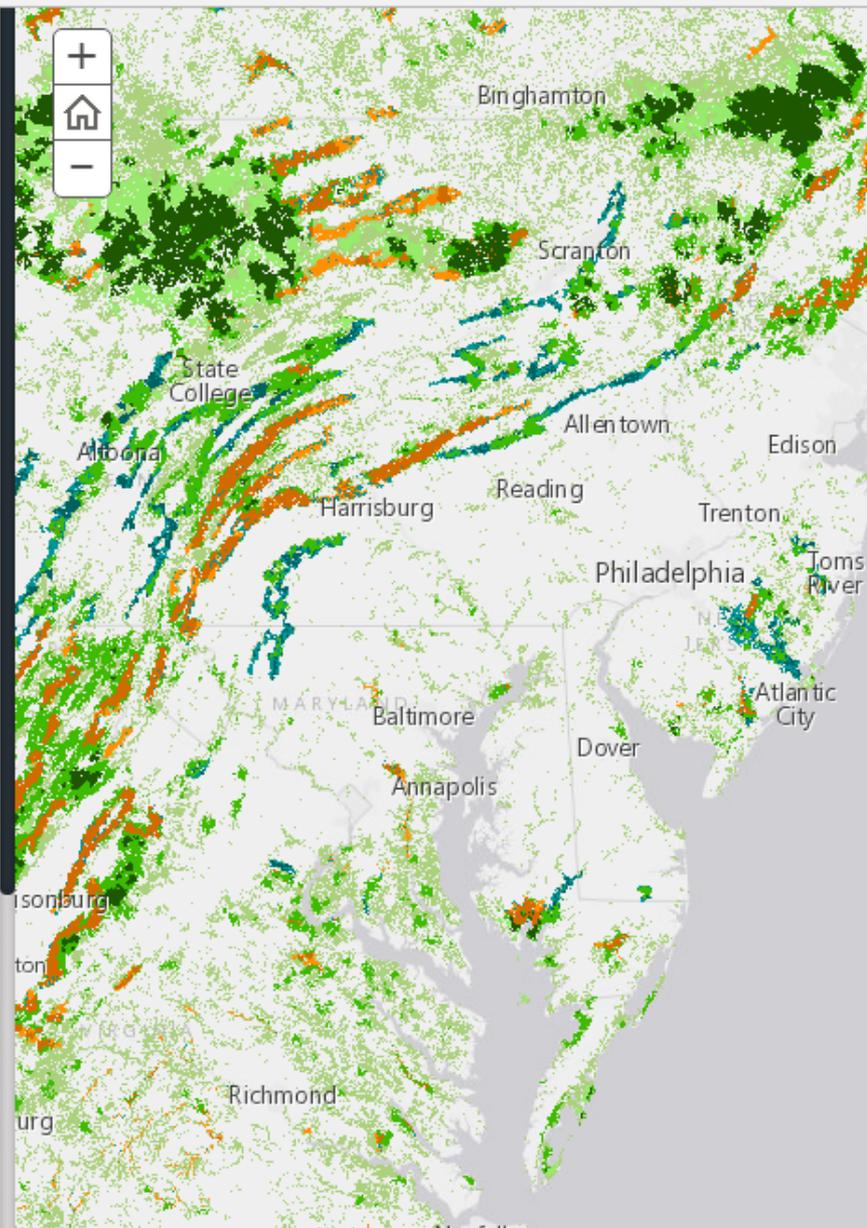
Flow patterns have a distinct regional structure because barriers work in aggregate to slow, obstruct, redirect, or funnel moving populations. Like water, a steady current of dispersing species may flow around obstructions, spread-out in intact areas, or become concentrated in channels. Mapping the region's natural flow patterns and



## RESILIENT AND CONNECTED LANDSCAPES

<b>RESILIENT</b>	<p>Areas of above average resilience, but do not fall into any of the prioritization categories.</p>
<b>RESILIENT &amp; DIFFUSE FLOW</b>	<p>Resilient areas of high or medium diffuse flow. Diffuse flow areas are extremely intact and consequently facilitate high levels of dispersed flow.</p>
<b>RESILIENT &amp; HIGH DIVERSITY</b>	<p>Resilient areas that have confirmed rare species and natural communities, or are large resilient examples of each geophysical setting.</p>
<b>RESILIENT &amp; DIVERSITY &amp; FLOW</b>	<p>Resilient areas that are high in diversity and have high or medium diffuse flow</p>
<b>Linkage within Resilient Land</b>	<p>Resilient areas that are either pinch points of concentrated regional flow or are in a Riparian Climate Corridors.</p>
<b>Linkage between Resilient Land</b>	<p>Areas that connect areas of prioritized resilience that are either pinch points of concentrated regional flow or Riparian Climate Corridors.</p>

The goal of this section was to identify a network of resilient sites and linkages – a “braided through line” - that if adequately managed or conserved would sustain the diversity of the region under a dynamically changing climate. The assessment also provides an information-base and framework for identifying areas that provide natural benefits for people such as carbon storage or clean water supplies while also supplying



# For More information

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## Chesapeake Conservation Partnership

- [chesapeakeconservation.org](http://chesapeakeconservation.org)

## Landscape Chesapeake

- <http://www.landscape.org/chesapeake>

## Appalachian LCC

- [applcc.org](http://applcc.org)

## North Atlantic LCC

- [northatlanticlcc.org](http://northatlanticlcc.org)

## Databasin

- [databasin.org](http://databasin.org)

## TNC's climate adaptation work

- Go to TNC's Conservation Gateway and click on Permeability or Resilient Land