

KATY BARLOW
THE NATURE
CONSERVANCY

Climate Resiliency Science, Strategies, and Planning



OBJECTIVES

1. CONCEPTUAL
FRAMEWORKS
WITH EXAMPLES
2. LANDSCAPE
PLANNING AND
SITE-LEVEL
MANAGEMENT

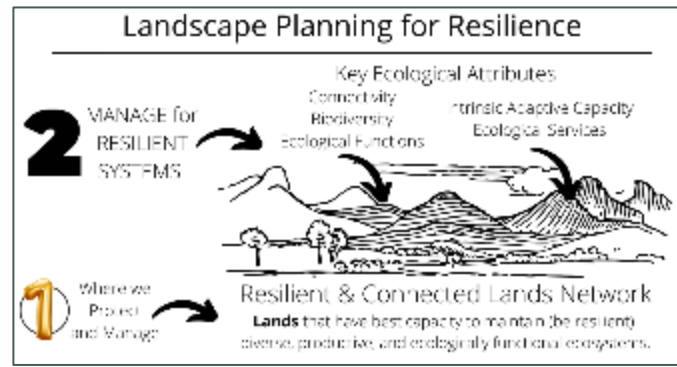
Climate Resiliency Science, Strategies, and Planning

Climate Resilience

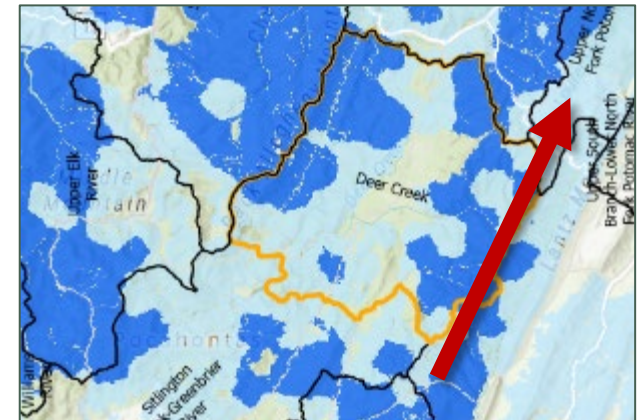
SCIENCE



STRATEGIES



PLANNING



SCIENCE

C R C S

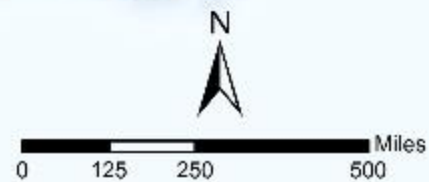
CENTER FOR
RESILIENT
CONSERVATION
SCIENCE

MEXICO

CANADA

Resilient and Connected Network

- Resilience, Flow, & Recognized Biodiversity
- Resilience and Flow
- Resilience and Recognized Biodiversity
- Indigenous Lands

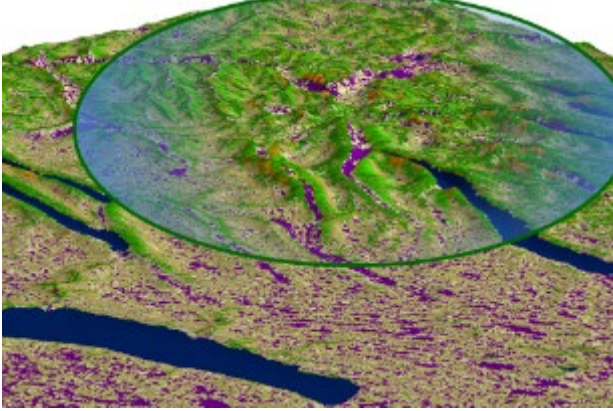


Melissa Clark

Over 250 scientists!

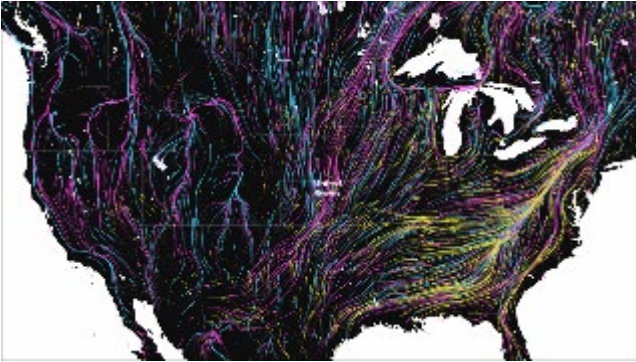


Three Ingredients



Resilient Land

Land with many *connected* microclimates representing all physical environments



Permeable Landscape

A *connected* landscape that allows movement and facilitates range shifts



Resilient Systems & Species

Intact habitats, unique communities and rare species populations

Conserving Nature's Stage

Representative Land

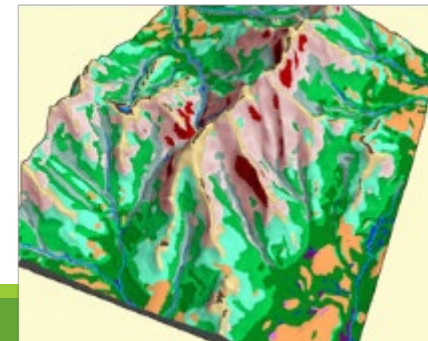
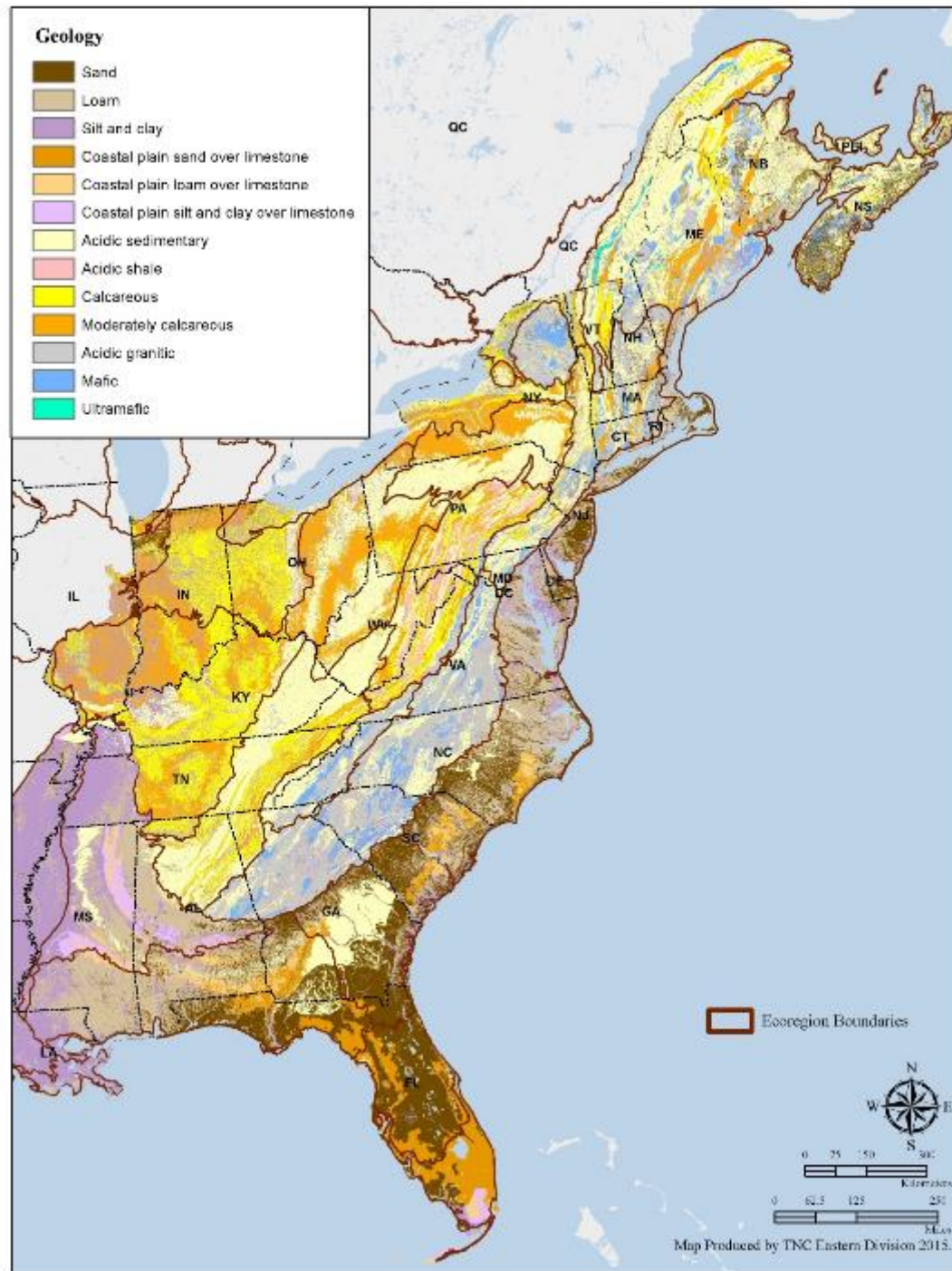
Biological diversity is highly correlated with **Land Properties** (Geology, Soil, Elevation, Topography, Hydrology)

Many Microclimates

Create climate options

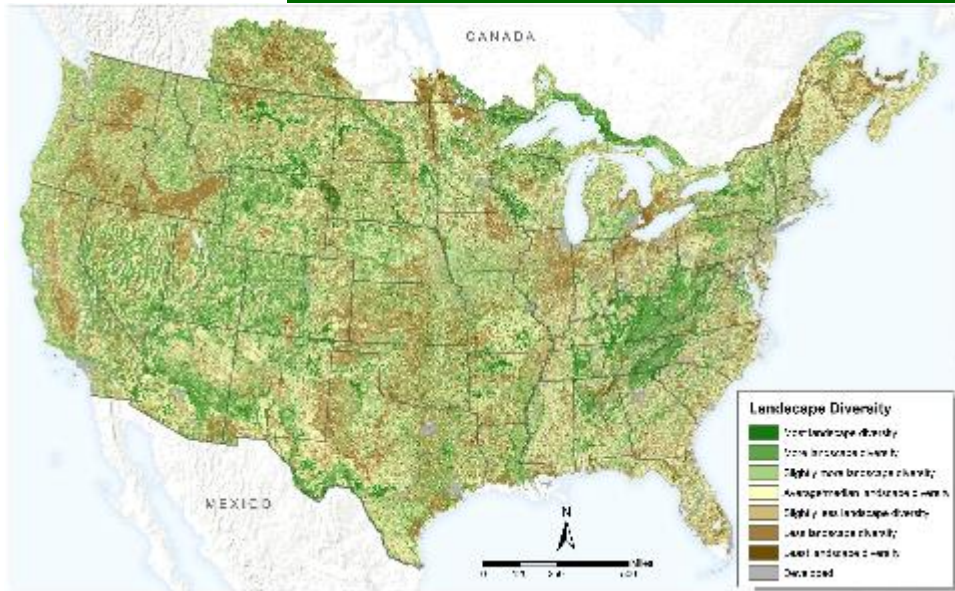
Locally Connected

Allows species to move



Resilient Land

Resilient sites = sites that continue to support biological diversity, productivity and ecological function even as they change in response to climate change.



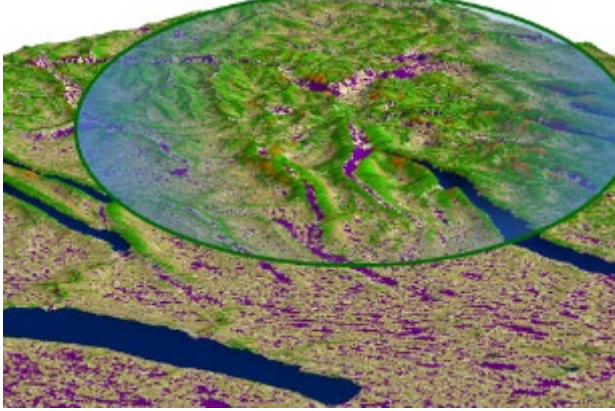
Landscape Diversity



Local Connectedness

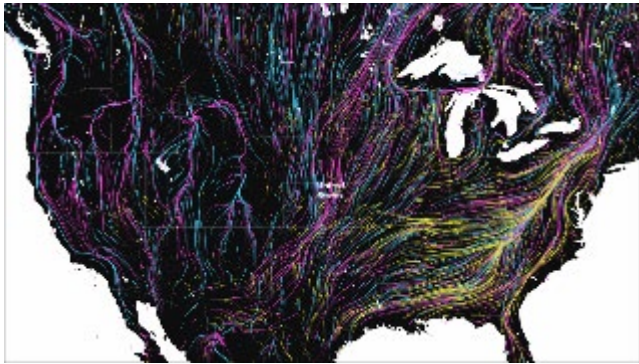


Three Ingredients



Resilient Land

Land with many *connected* microclimates representing all physical environments



Permeable Landscape

A *connected* landscape that allows movement and facilitates range shifts

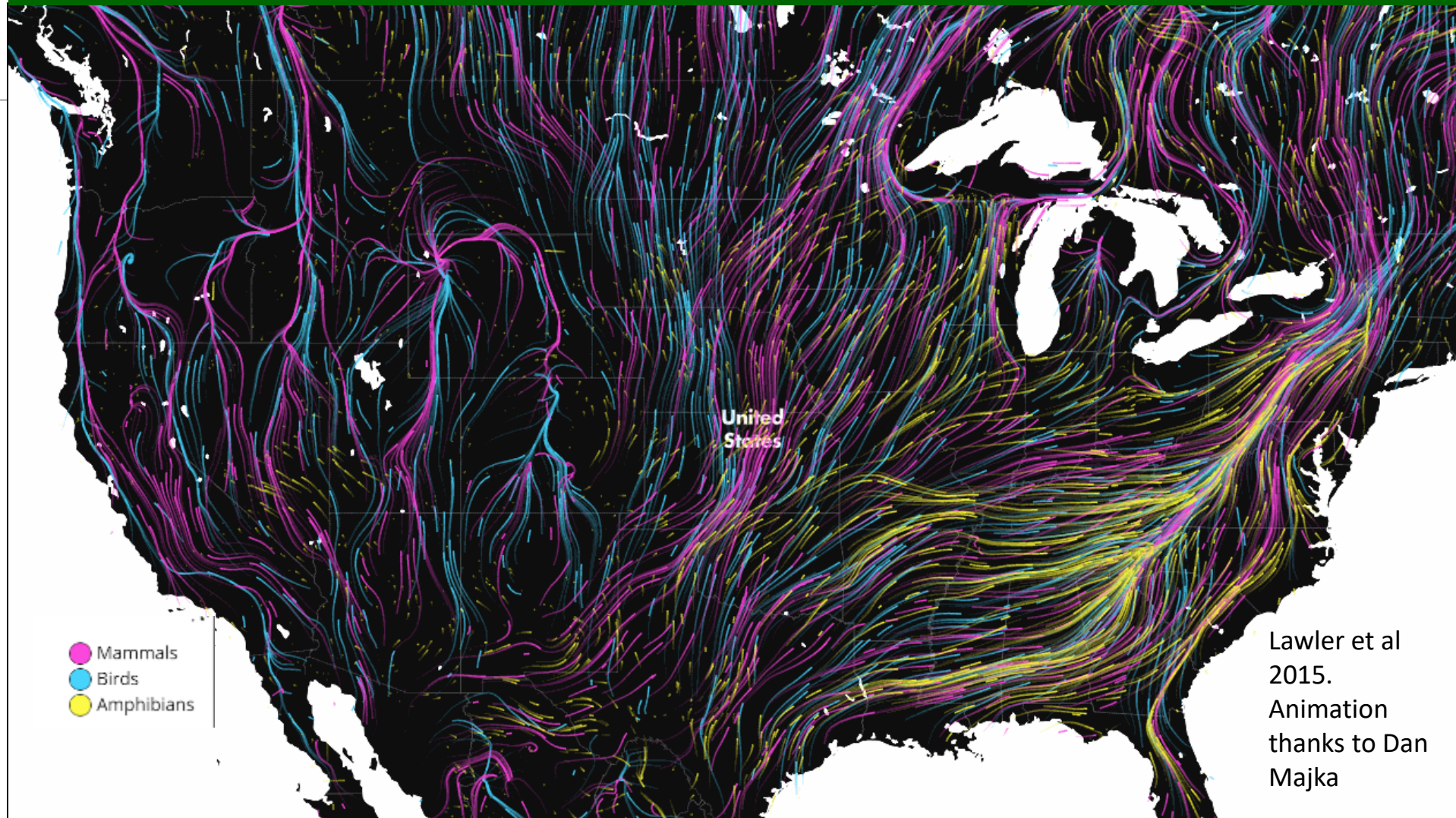


Resilient Systems & Species

Intact habitats, unique communities and rare species populations

Climate Flow

The Gradual Movement of Populations in Response to Climate Change

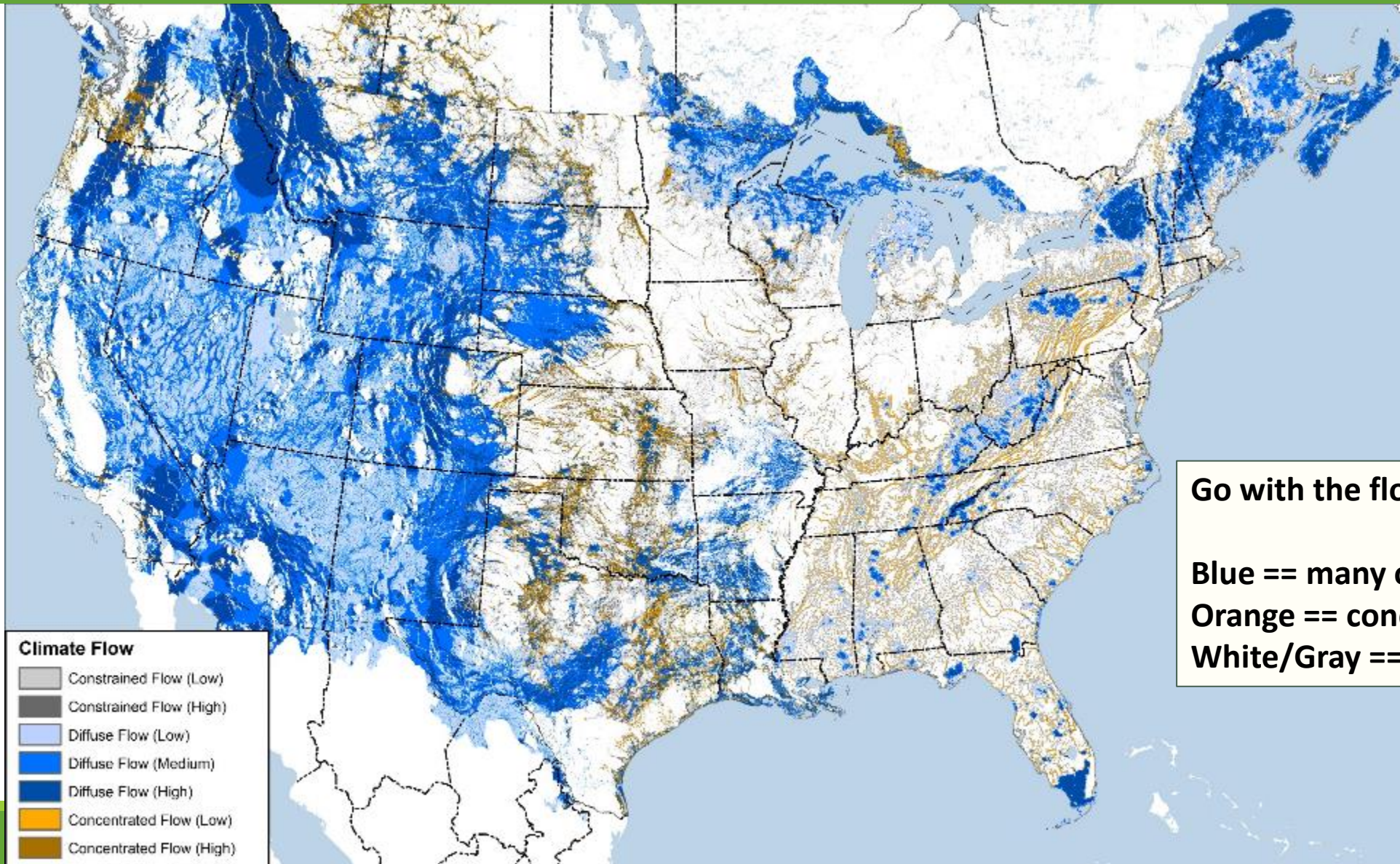


The gradual movement of populations across the landscape in response to climate change

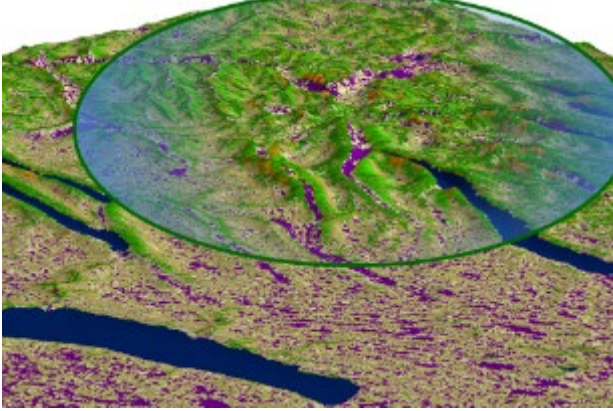
Current Rates: 11 mile per decade North 36 feet per decade Upslope

Climate Flow

The gradual movement of species populations in response to a changing climate

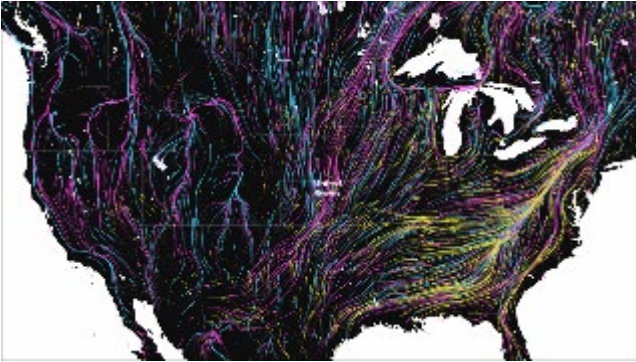


Three Ingredients



Resilient Land

Land with many *connected* microclimates representing all physical environments



Permeable Landscape

A *connected* landscape that allows movement and facilitates range shifts



Resilient Systems & Species

Intact habitats, unique communities and rare species populations



Intact Habitats
Rare Species Populations
Unique Communities

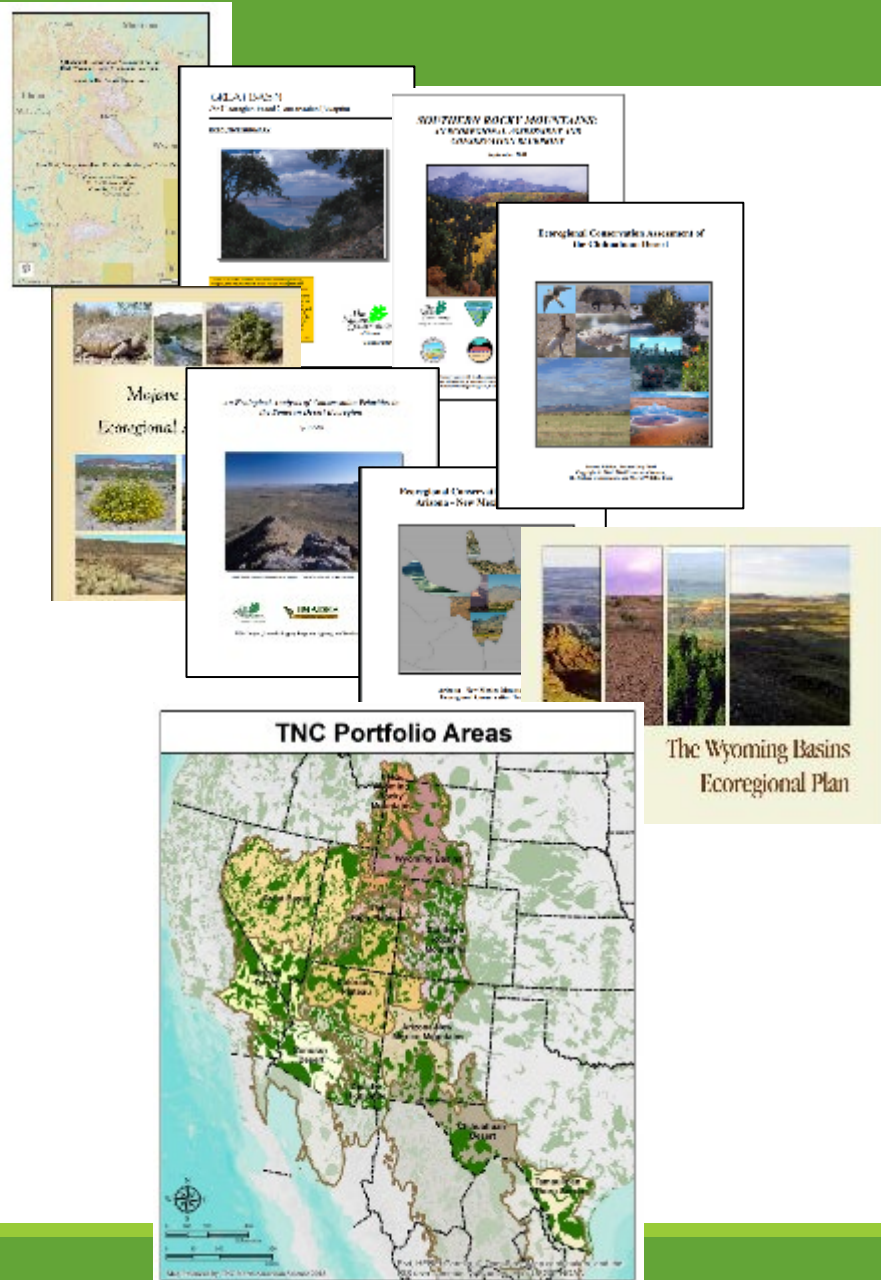


Biodiversity

Terrestrial and Marine Ecoregions of the United States

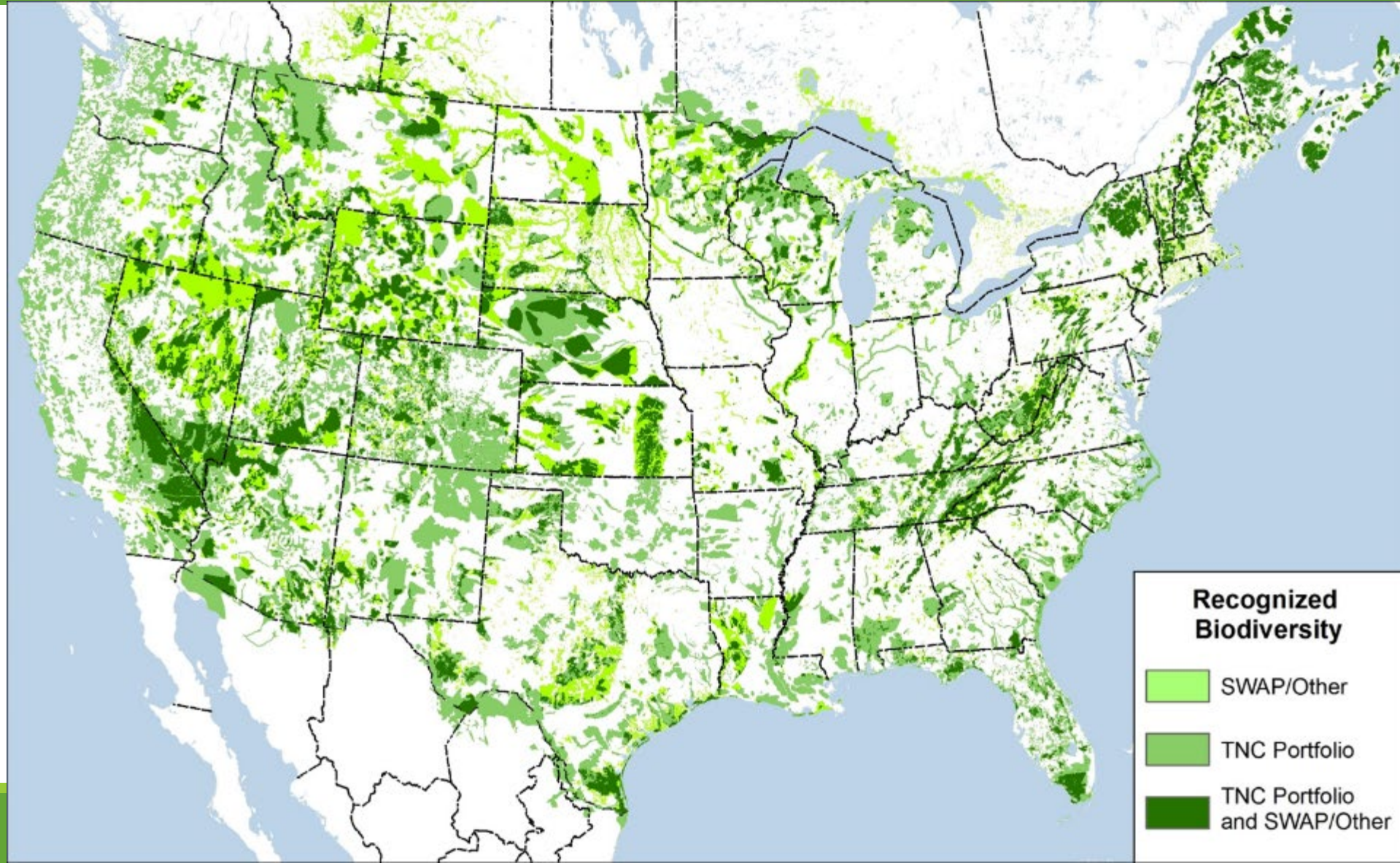
Largely Based on Natural Heritage Element Occurrence Data

87. Divided Coast
88. Columbia Valley
89. Snake River
90. East Cascades
91. Pacific Northwest
92. Canadian Rocky Mountains
93. Inland Pacific - Blue Mountains
94. Inland Pacific - Blue Mountains
95. Inland Pacific - Blue Mountains
96. Inland Pacific - Blue Mountains
97. Inland Pacific - Blue Mountains
98. Inland Pacific - Blue Mountains
99. Inland Pacific - Blue Mountains
100. Inland Pacific - Blue Mountains



Biodiversity

(TNC Ecoregional Plans, SWAPs, NHP)

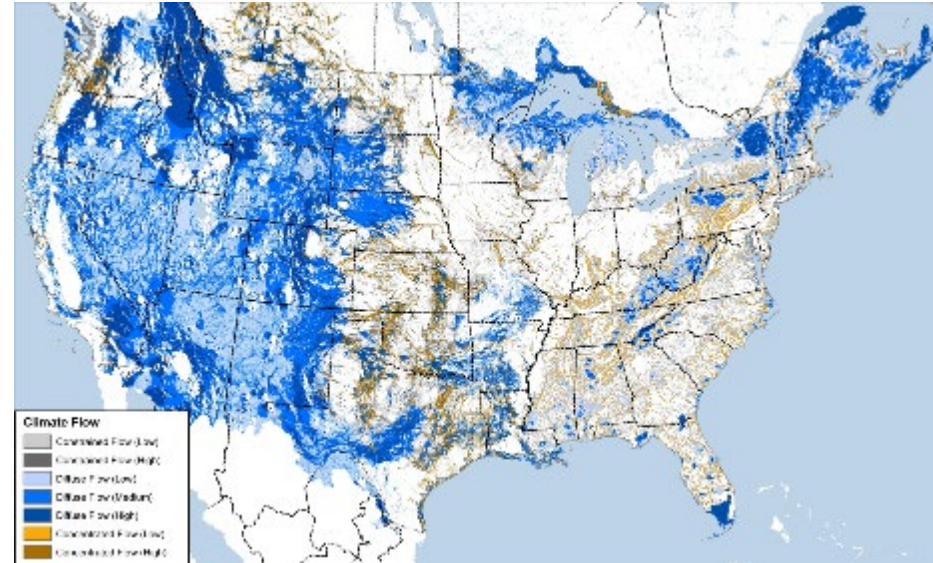


Resilient and Connected Network

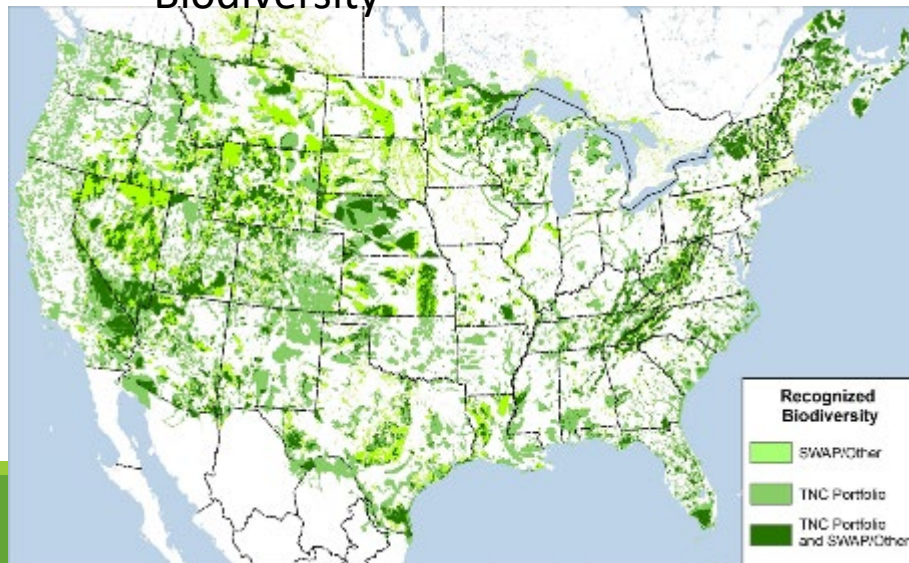
Site Resilience



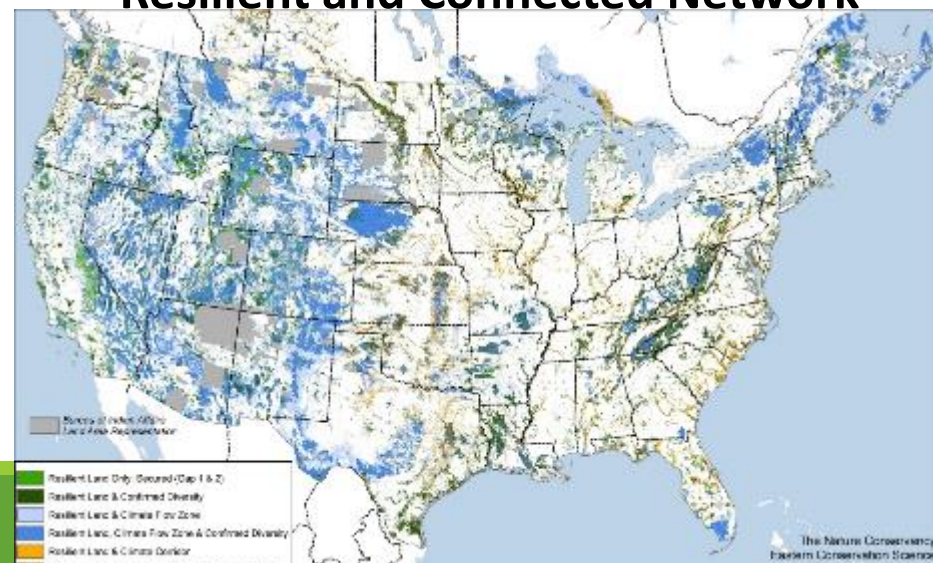
Climate Flow



Biodiversity



Resilient and Connected Network



Access the Data

<http://crcls.tnc.org>

<http://nature.org/climateresilience>

<http://maps.tnc.org/resilientland>

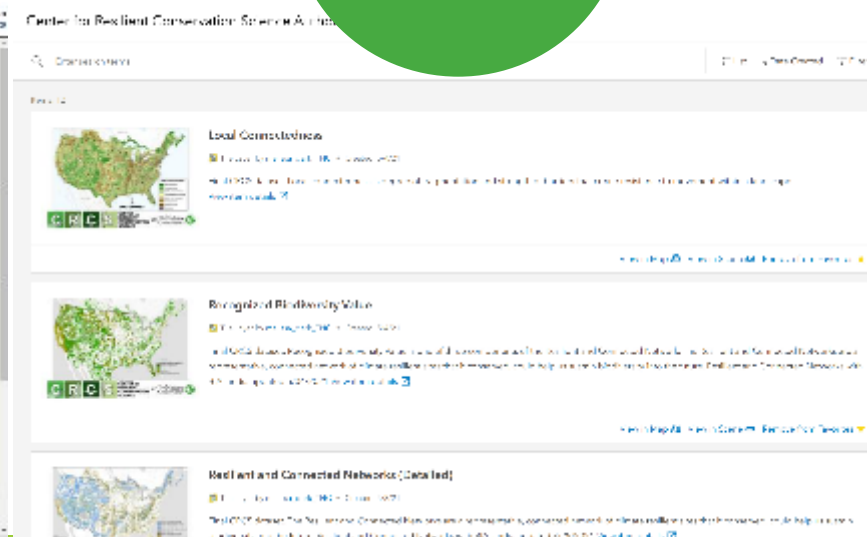
--Easiest--

Resilient Land
Mapping Tool



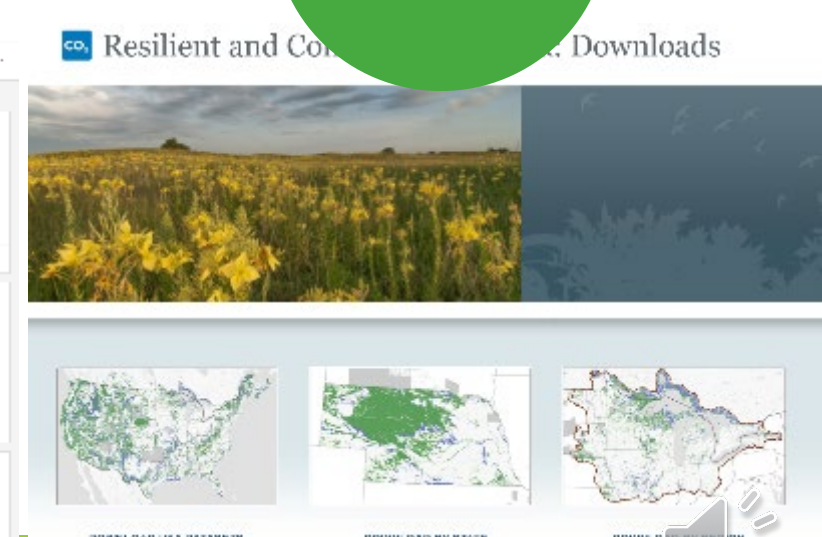
--Intermediate--

ArcGIS Online
Authoritative
data



--Advanced--

Download the
Data

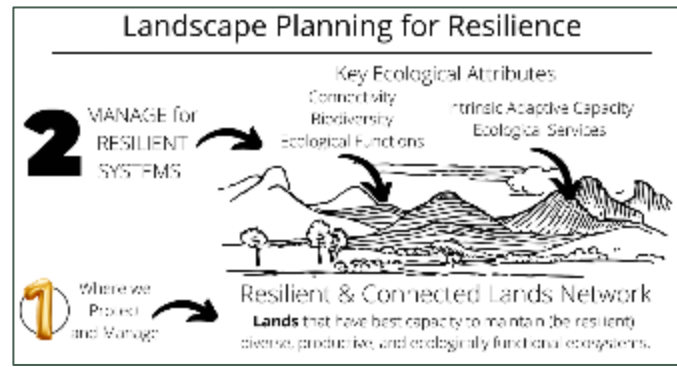


Climate Resilience

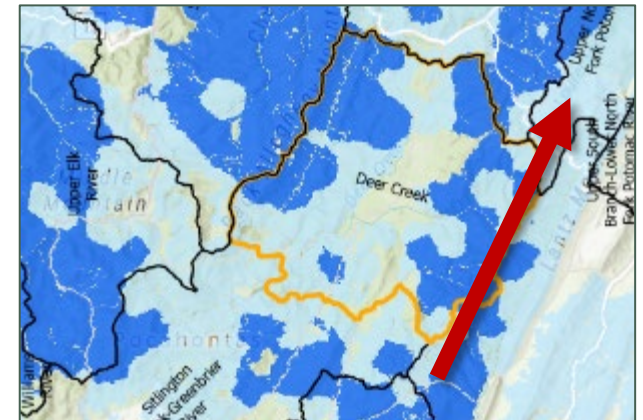
SCIENCE



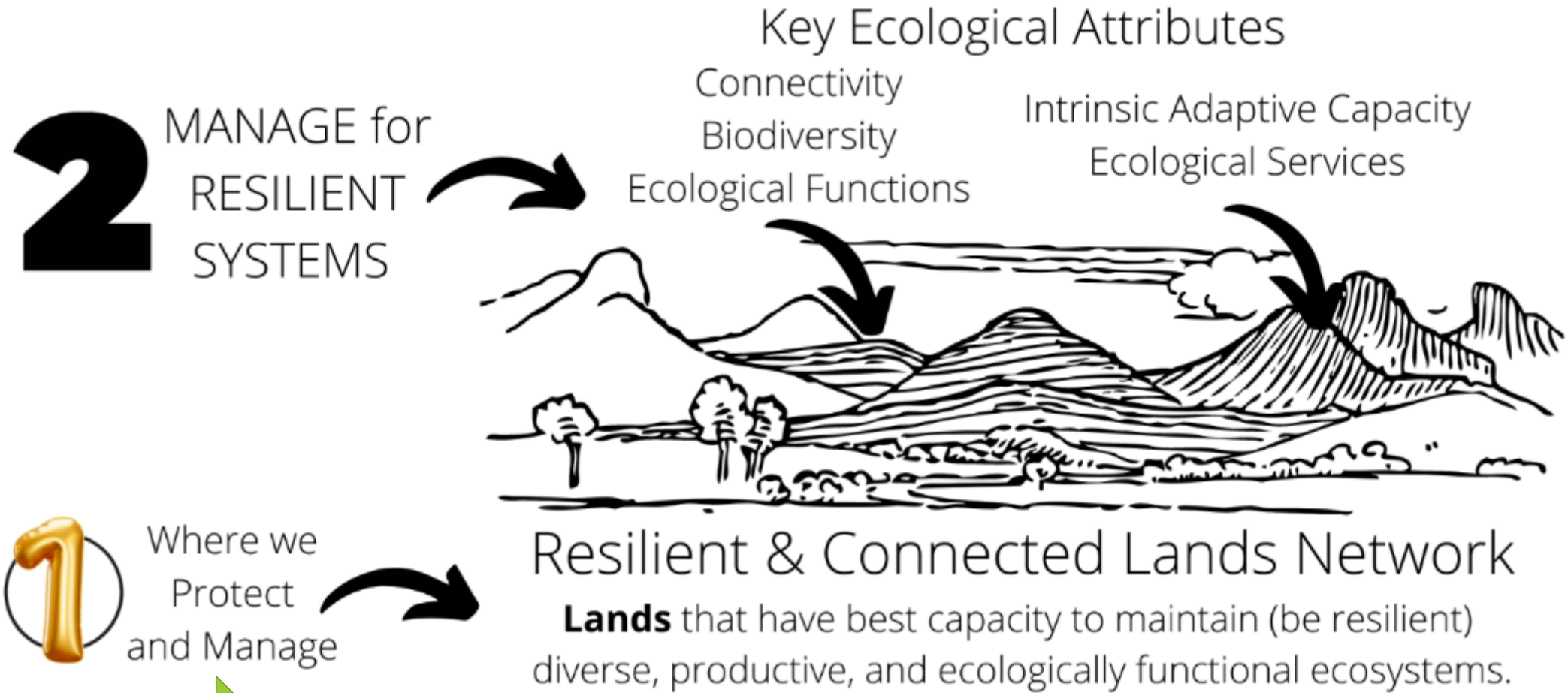
STRATEGIES



PLANNING

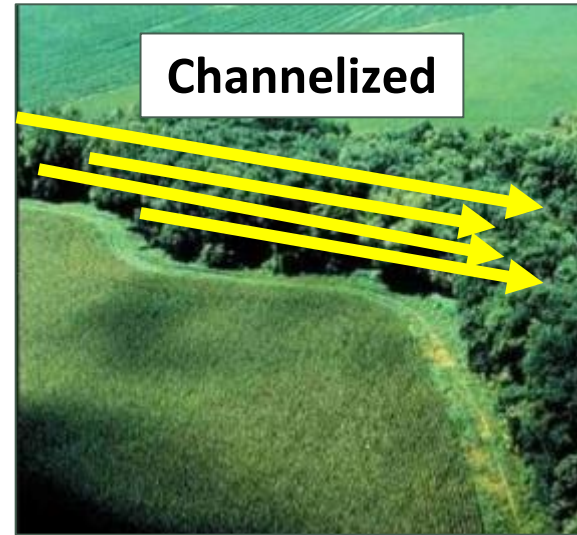


Landscape Planning for Resilience



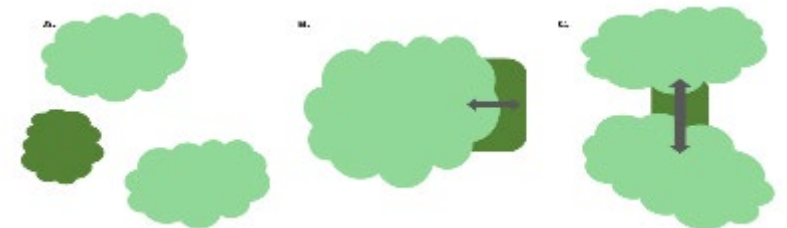
STRATEGIES

Connectivity

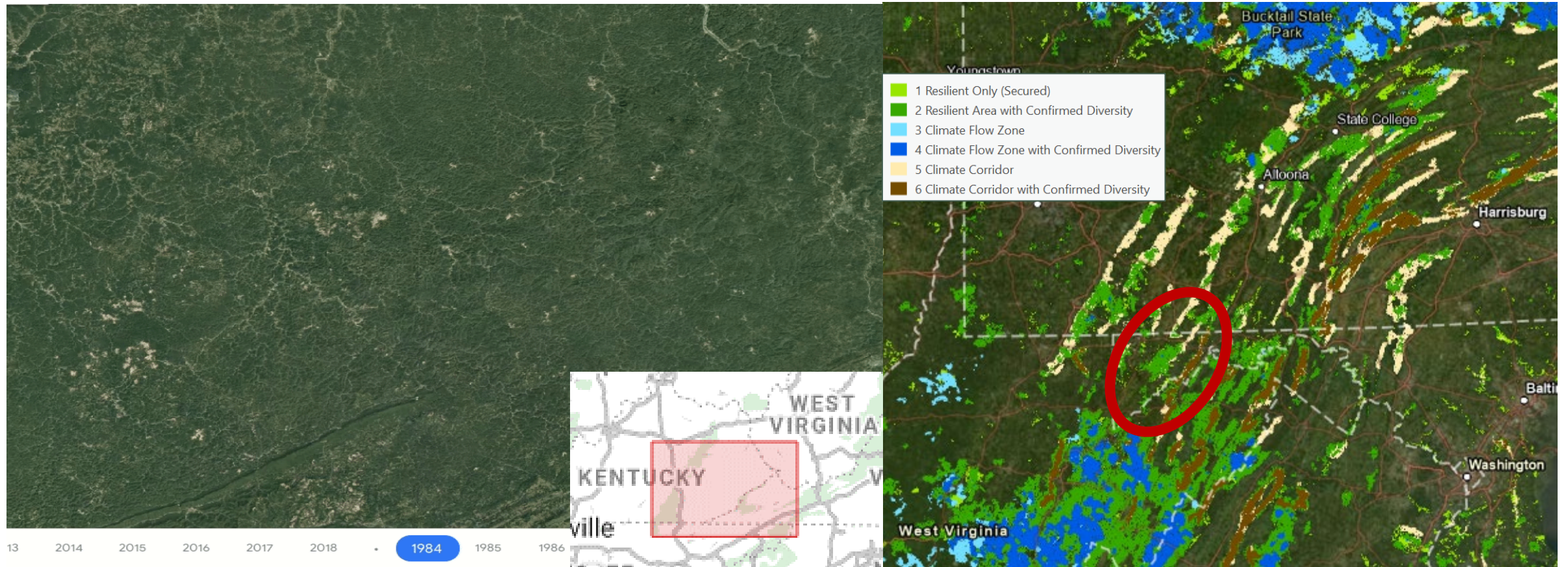


WHY? Connectivity enables species movement for maintaining ecosystem functions and gene flow for maintaining biodiversity

Management Options

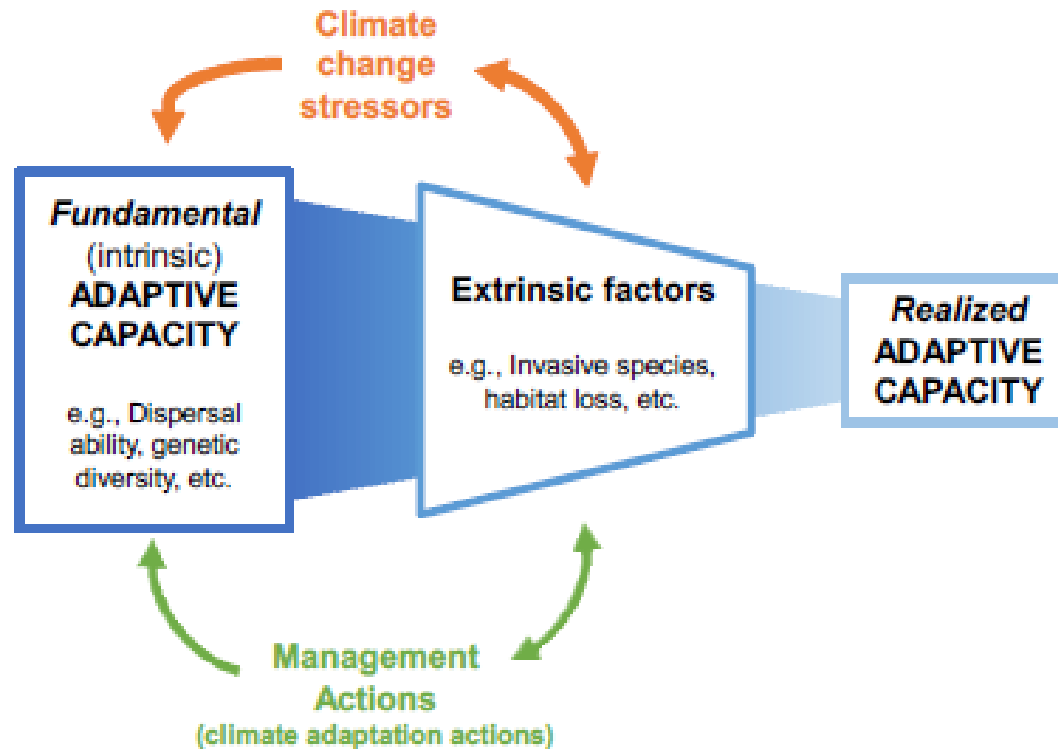


Connectivity



Adaptative Capacity

Adapted from Beaver et al 2016



forks of cheat



Photo Frank Slider

Adaptative Capacity

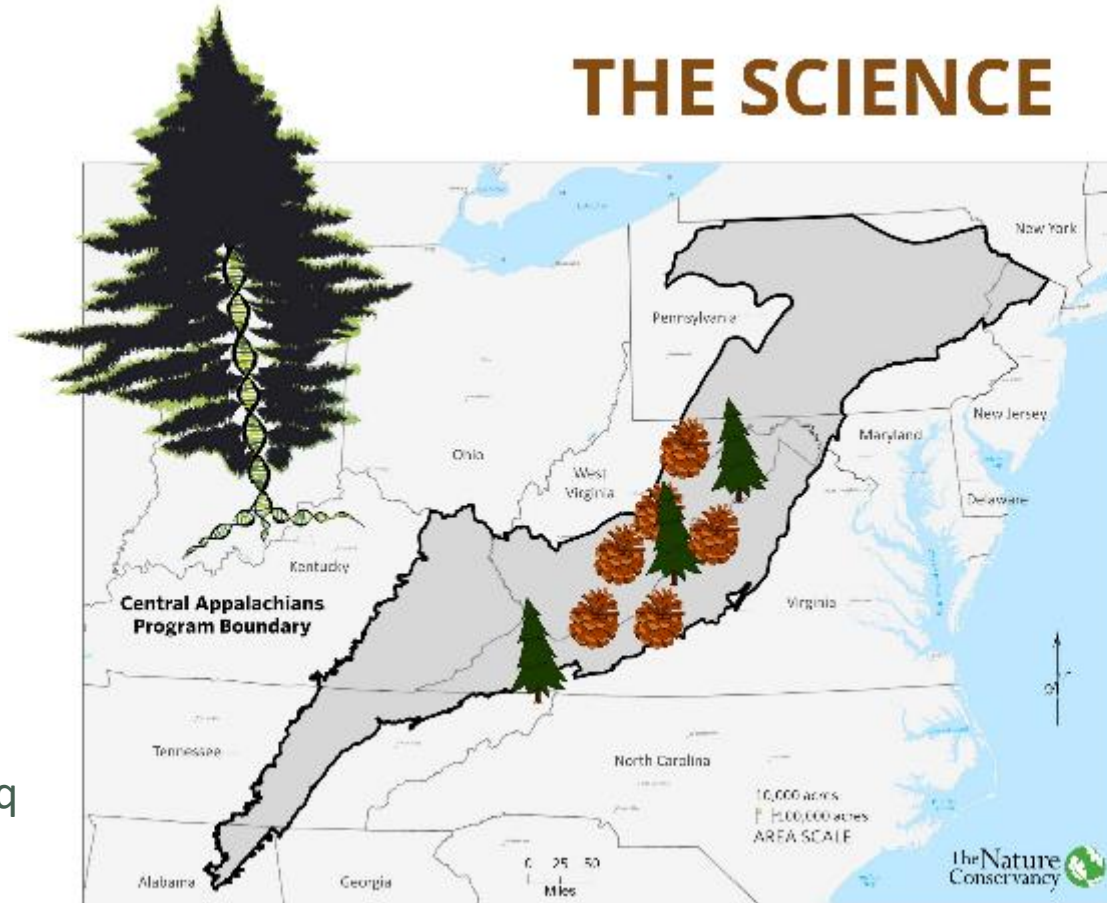
Optimal Sources

1. Maximize Genetic Diversity
2. Minimize Genetic Load
3. Optimize Local Adaptation



Dr. Thibaut Capblancq

THE SCIENCE



Source high
genetic diversity



Restoration Site

Seed Source

Intrinsic Adaptative Capacity

smartSeed: Red Spruce climate-smart seed provenancing

What future are you planting for?

Time period
2041-2070

Greenhouse gas emission level
moderate

Where are you going to plant?

Latitude
decimal degrees (e.g. 43.5)

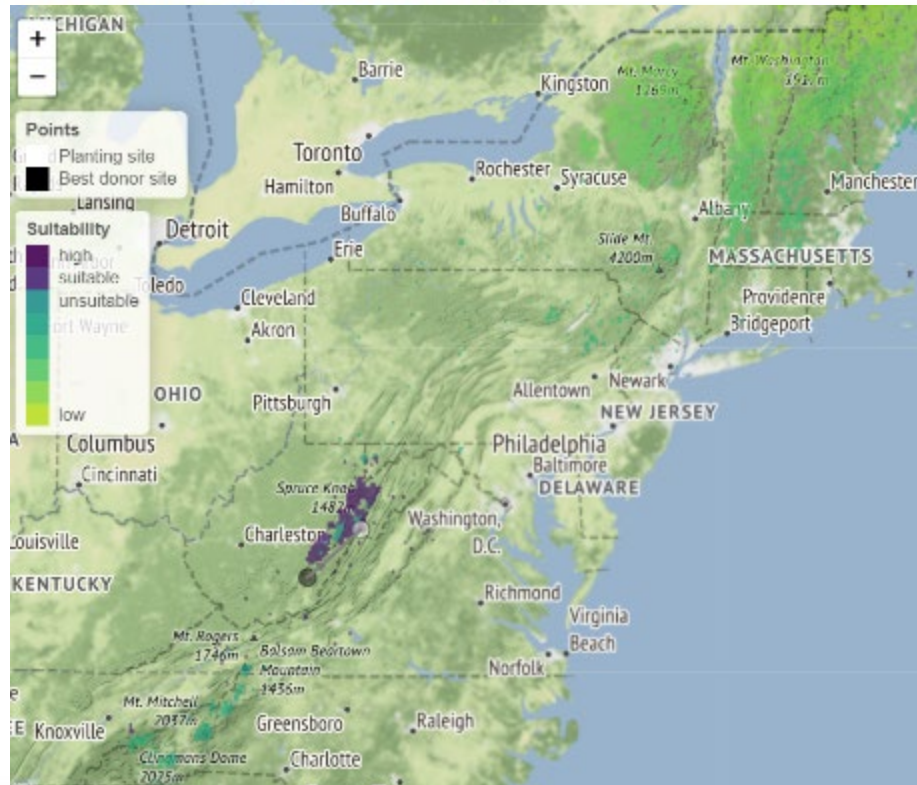
Longitude
decimal degrees (e.g. 73.0 or -73.0)

ENTER COORDINATES REFRESH MAP

This app uses genomic offsets to identify red spruce seed sources that have the best genomic adaptations to the selected planting site.

University of Maryland
CENTRE FOR ENVIRONMENTAL SCIENCE

The University of Vermont



Dr. Susanne Lachmuth

Optimal Sources

1. Maximize Genetic Diversity
2. Minimize Genetic Load
3. Optimize Local Adaptation

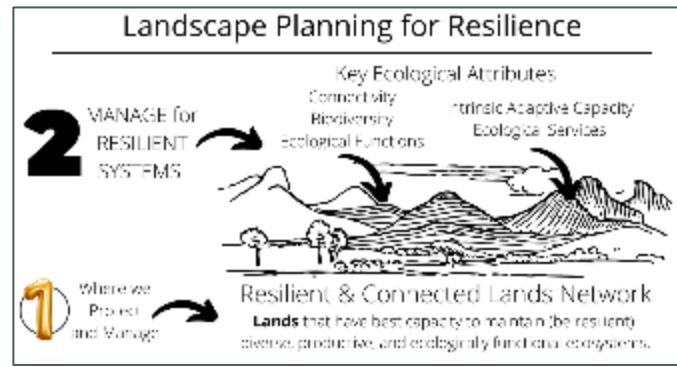


Climate Resilience

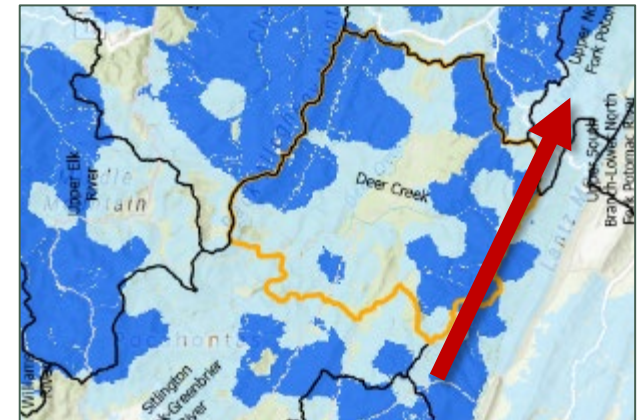
SCIENCE



STRATEGIES

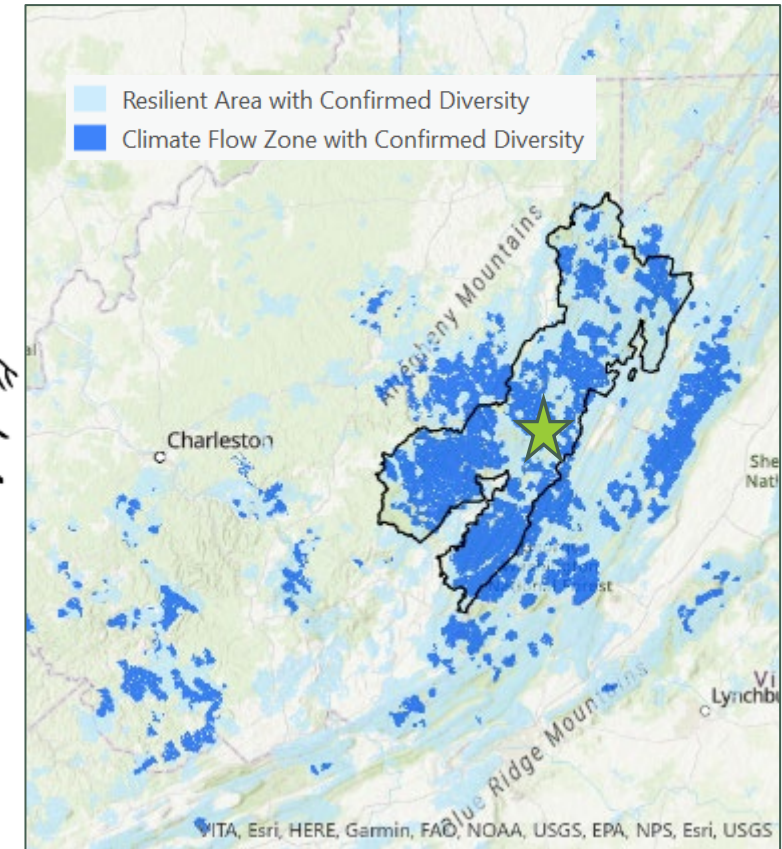
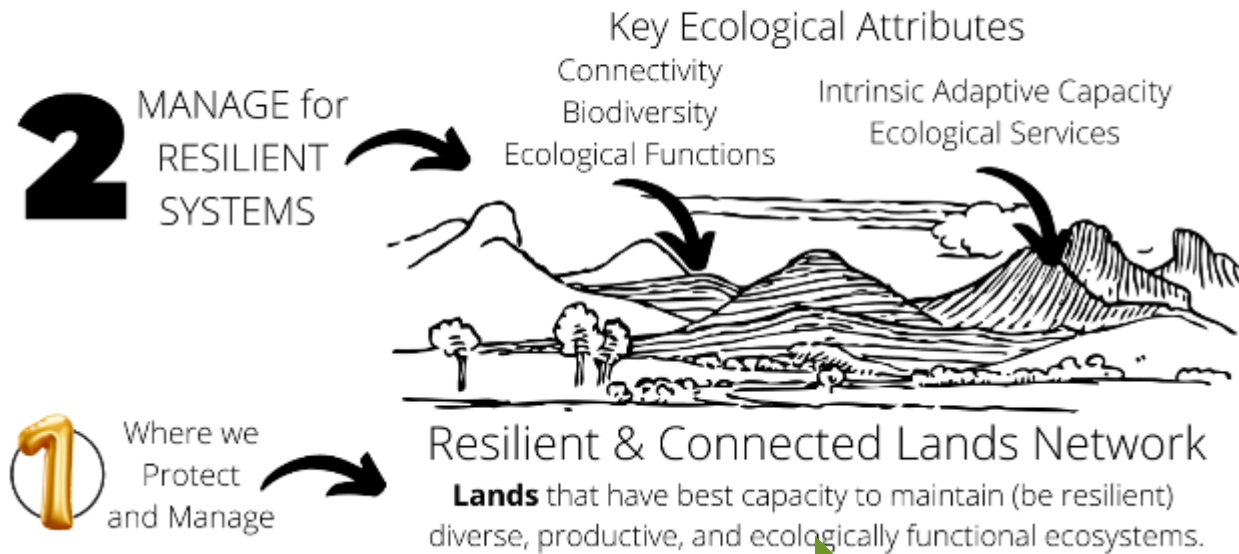


PLANNING



Planning - Deer Creek example

Landscape Planning for Resilience



1. Where?

[illegible]

Biodiversity

Upper Shavers Fork
Monongahela National Forest
Upper Green River
Deer Creek
Upper North Fork
Sittington Creek-Greenbrier River

A photograph of a forest floor with a green text box overlaid. The text box is a solid green rectangle with the words "Adaptive Capacity" in black, sans-serif font. The background shows a dense forest with many trees and a thick layer of green ferns and other vegetation on the ground. The lighting is natural, suggesting a sunny day with some shade from the trees.

Adaptive Capacity

Landscape Planning for Resilience



1

Where we
Protect
and Manage

Planning

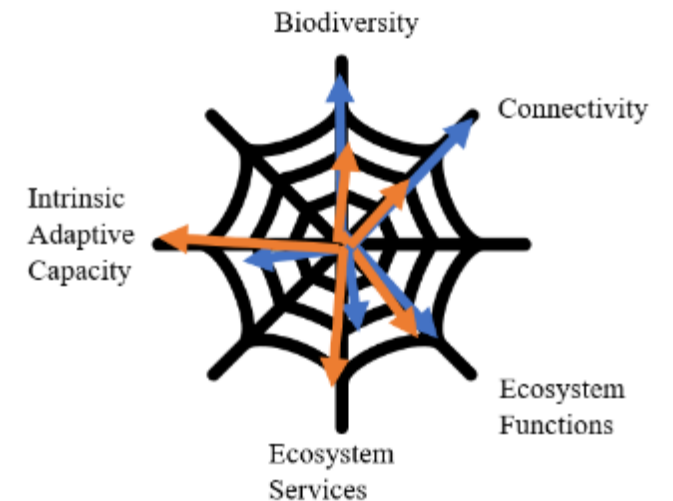
3. Strategies & Tactics

Increase Options (i.e., increase habitat connectivity)

Restore Processes (i.e., decompact soil)

Nurture Sources Renewal (i.e., Rx for regen)

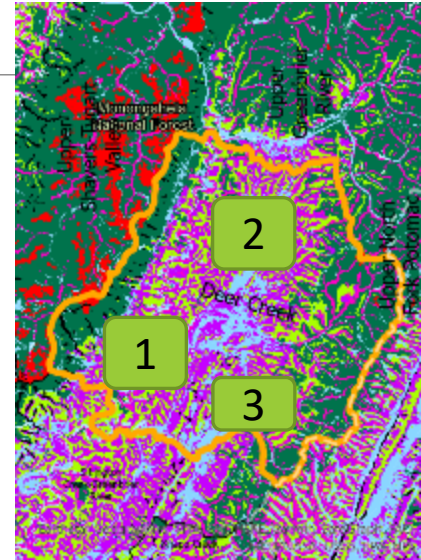
4. Overlap & Tradeoffs



Planning

5. Prioritize

6. Take Action & Adapt

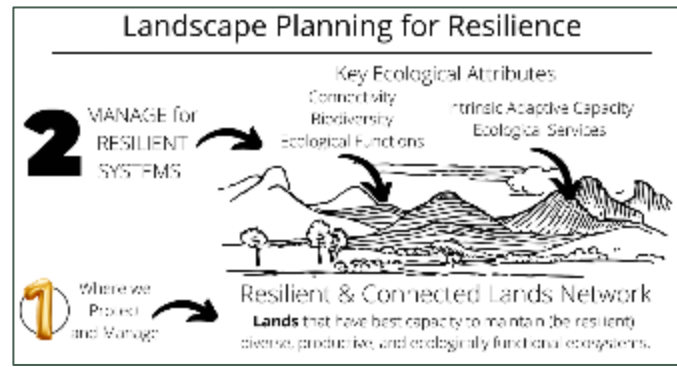


Climate Resilience

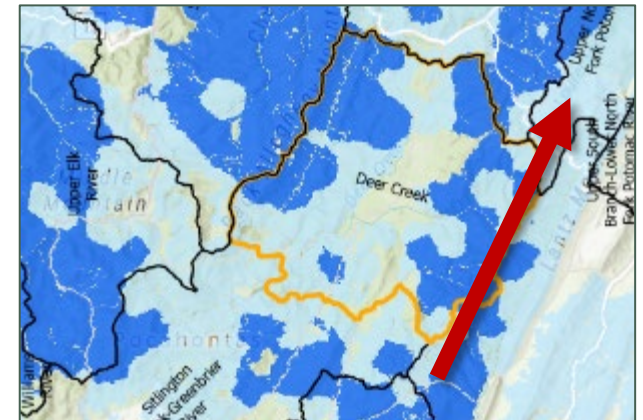
SCIENCE



STRATEGIES



PLANNING



Questions, Comments, Feedback

Katy Barlow

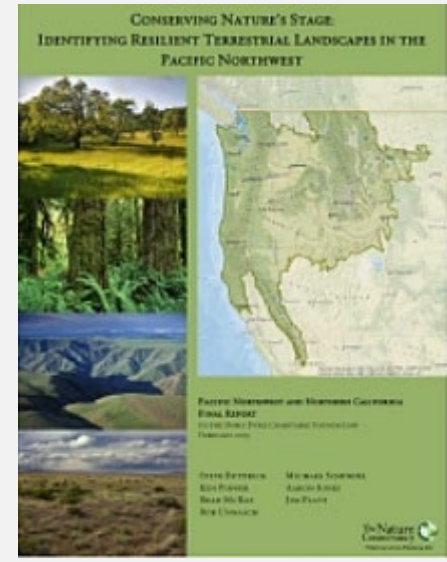
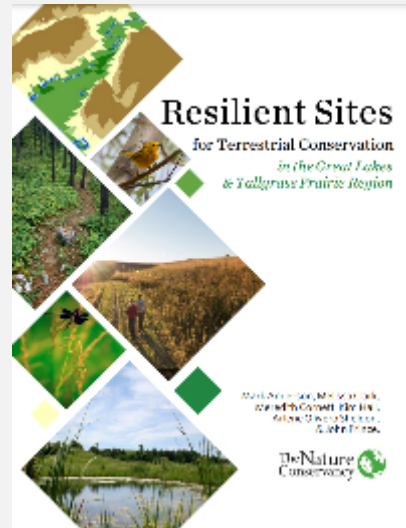
TNC Central Appalachians Program

kathryn.barlow@tnc.org

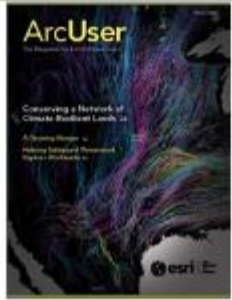
References and Resources

Learn More

REPORTS



MEDIA



Conserving a Network of
Climate Resilient Sites

ArcUser Article



Preserving not just the
most beautiful
landscapes, but the most
resilient

Boston Globe Ideas Op Ed



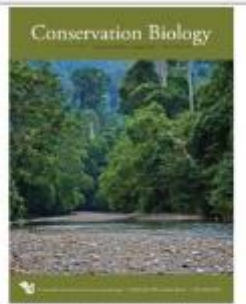
Natural Highways and
Neighborhoods:
Conserving a Network of
Climate-Resilient Lands

Nature.org Story



Road Map to Refuge

Nature Conservancy
Magazine Article



Estimating Climate
Resilience for
Conservation across
Geophysical Settings

Conservation Biology

<http://nature.org/climateresilience>