

KATY BARLOW
THE NATURE
CONSERVANCY

Climate Resiliency Science, Strategies, and Planning

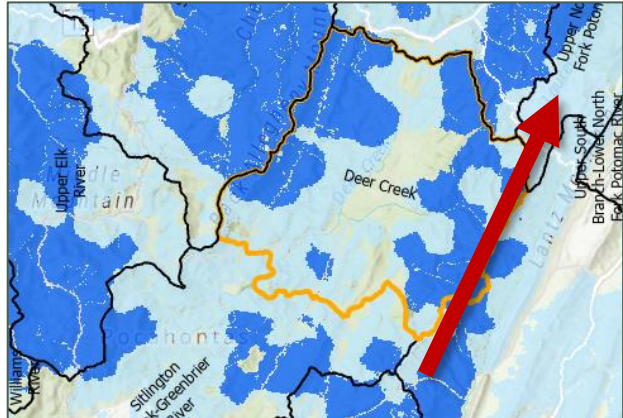
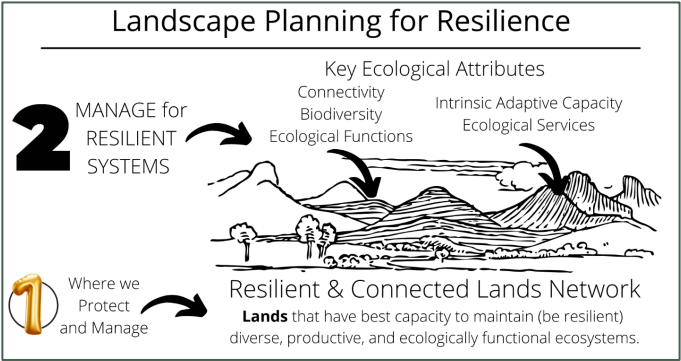
The Nature
Conservancy 
Protecting nature. Preserving life.

OBJECTIVES

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

Climate Resiliency Science, Strategies, and Planning

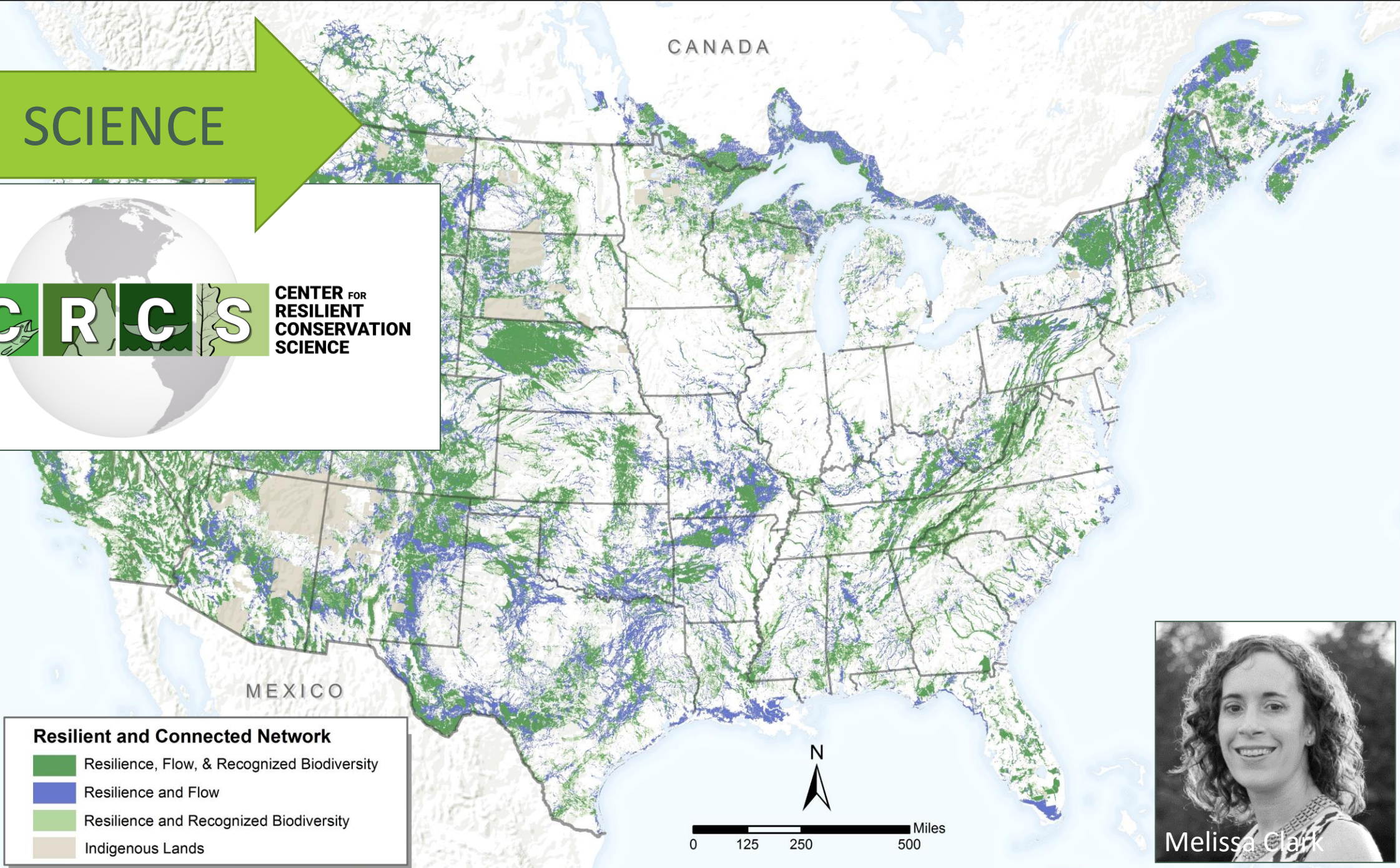
Climate Resilience





SCIENCE



CENTER FOR
RESILIENT
CONSERVATION
SCIENCE



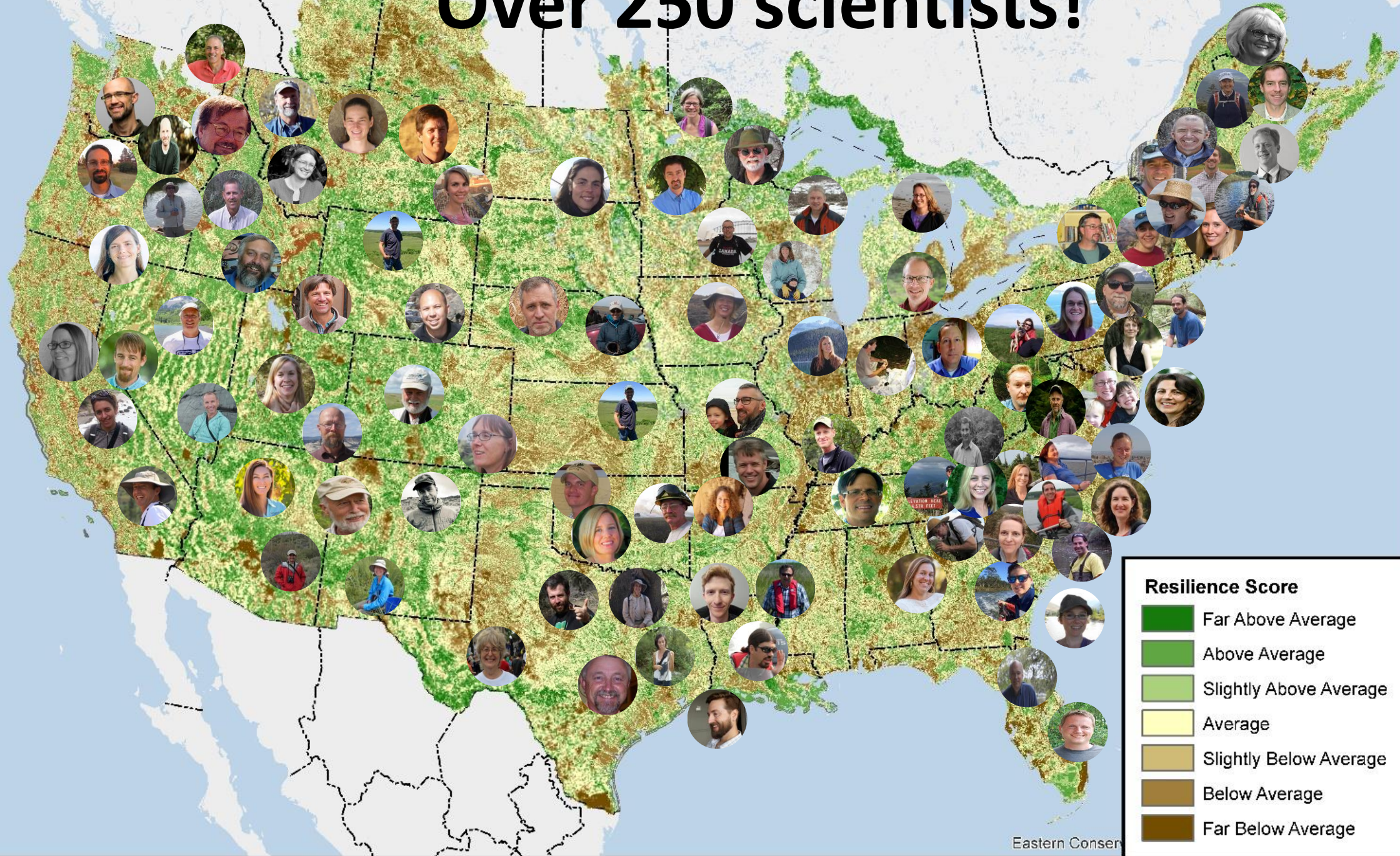
Resilient and Connected Network

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

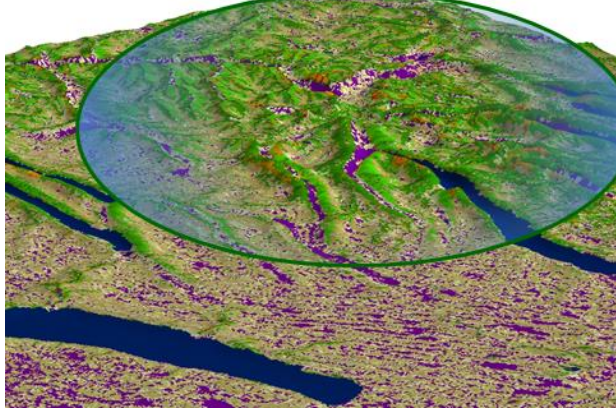


Melissa Clark

Over 250 scientists!

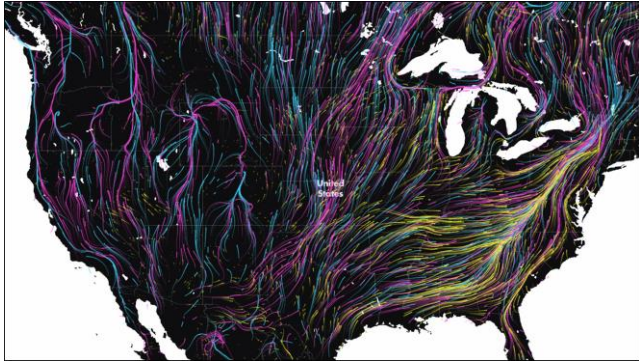


Three Ingredients



Resilient Land

Land with many *connected* microclimates representing all physical environments



Permeable Landscape

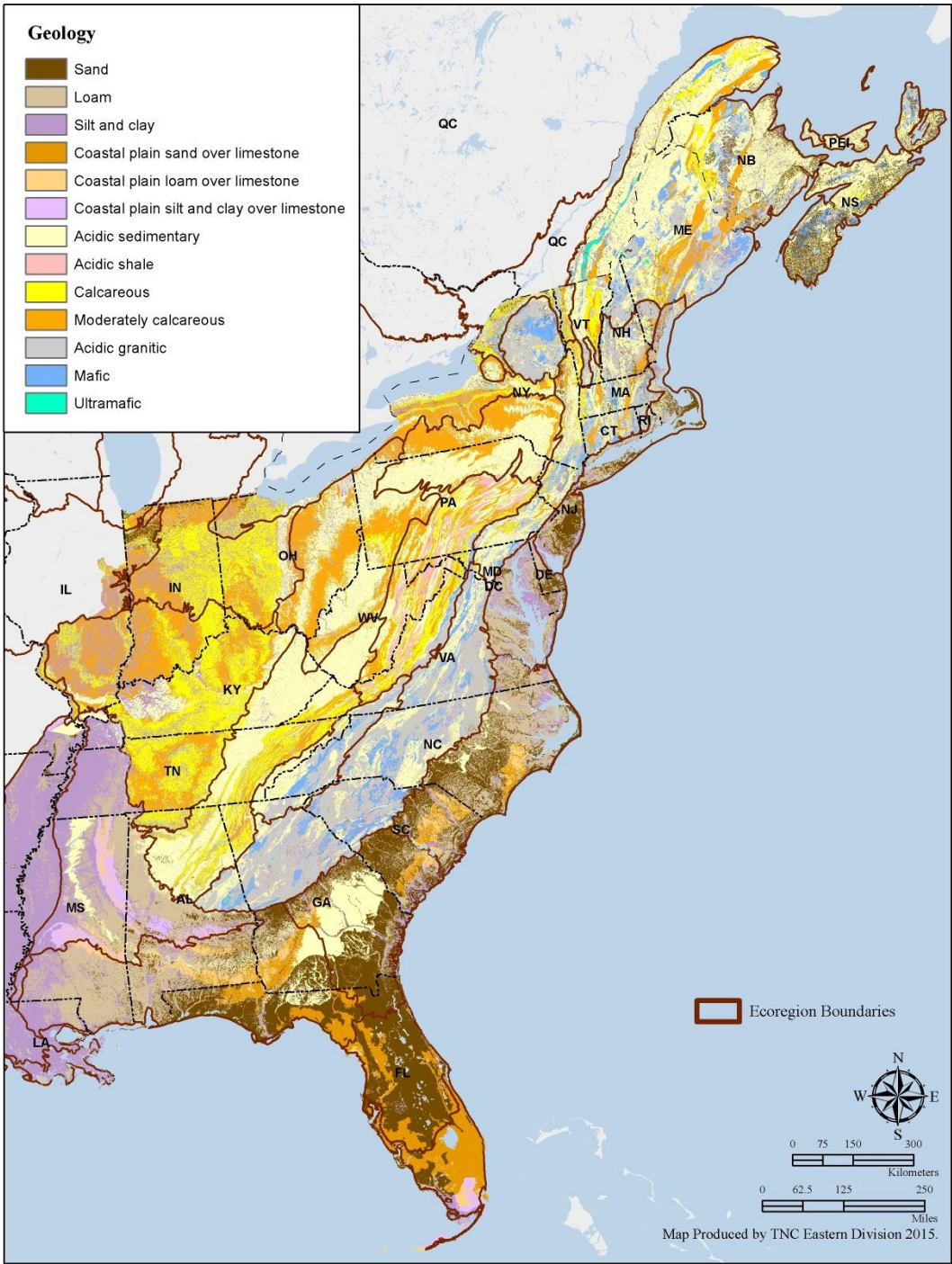
A *connected* landscape that allows movement and facilitates range shifts



Resilient Systems & Species

Intact habitats, unique communities and rare species populations

Conserving Nature's Stage



Representative Land

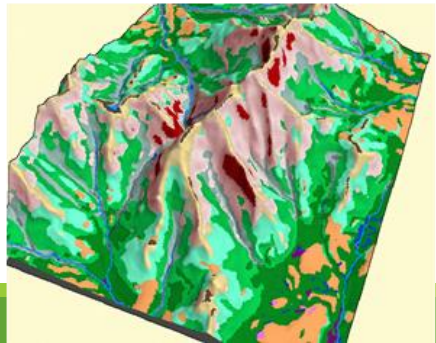
Biological diversity is highly correlated with **Land Properties** (Geology, Soil, Elevation, Topography, Hydrology)

Many Microclimates

Create climate options

Locally Connected

Allows species to move

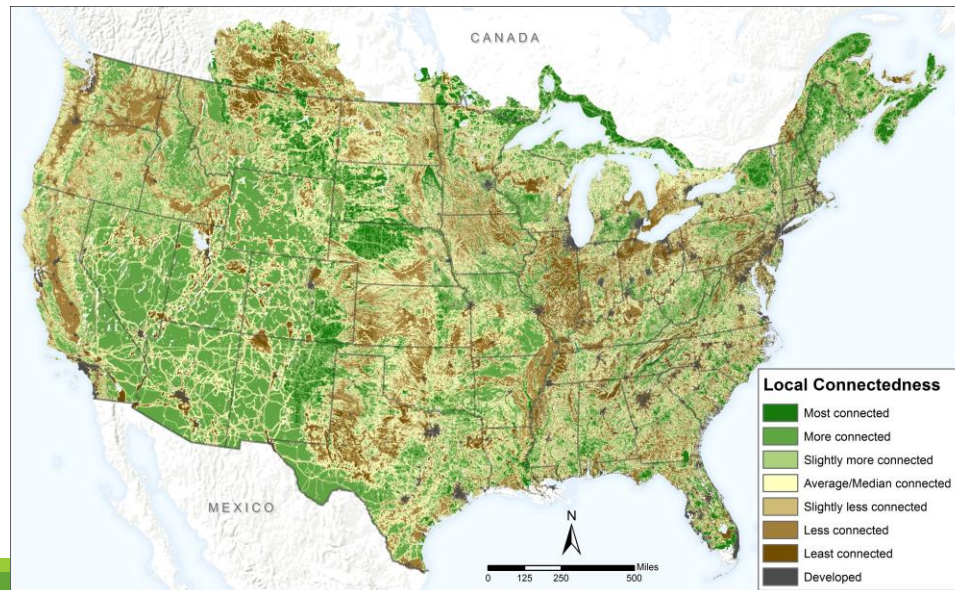


Resilient Land

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



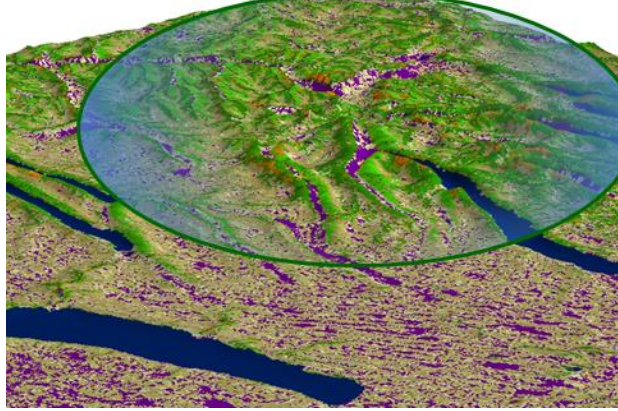
Landscape Diversity



Local Connectedness

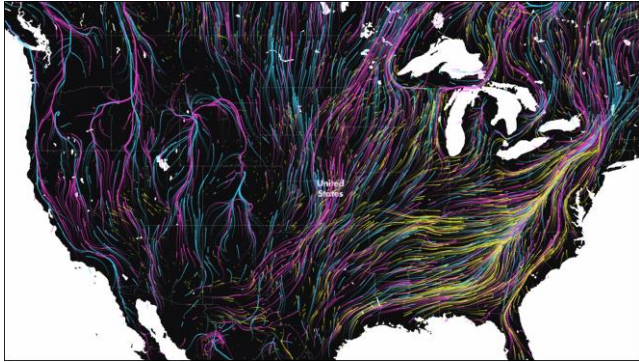


Three Ingredients



Resilient Land

Land with many *connected* microclimates representing all physical environments



Permeable Landscape

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

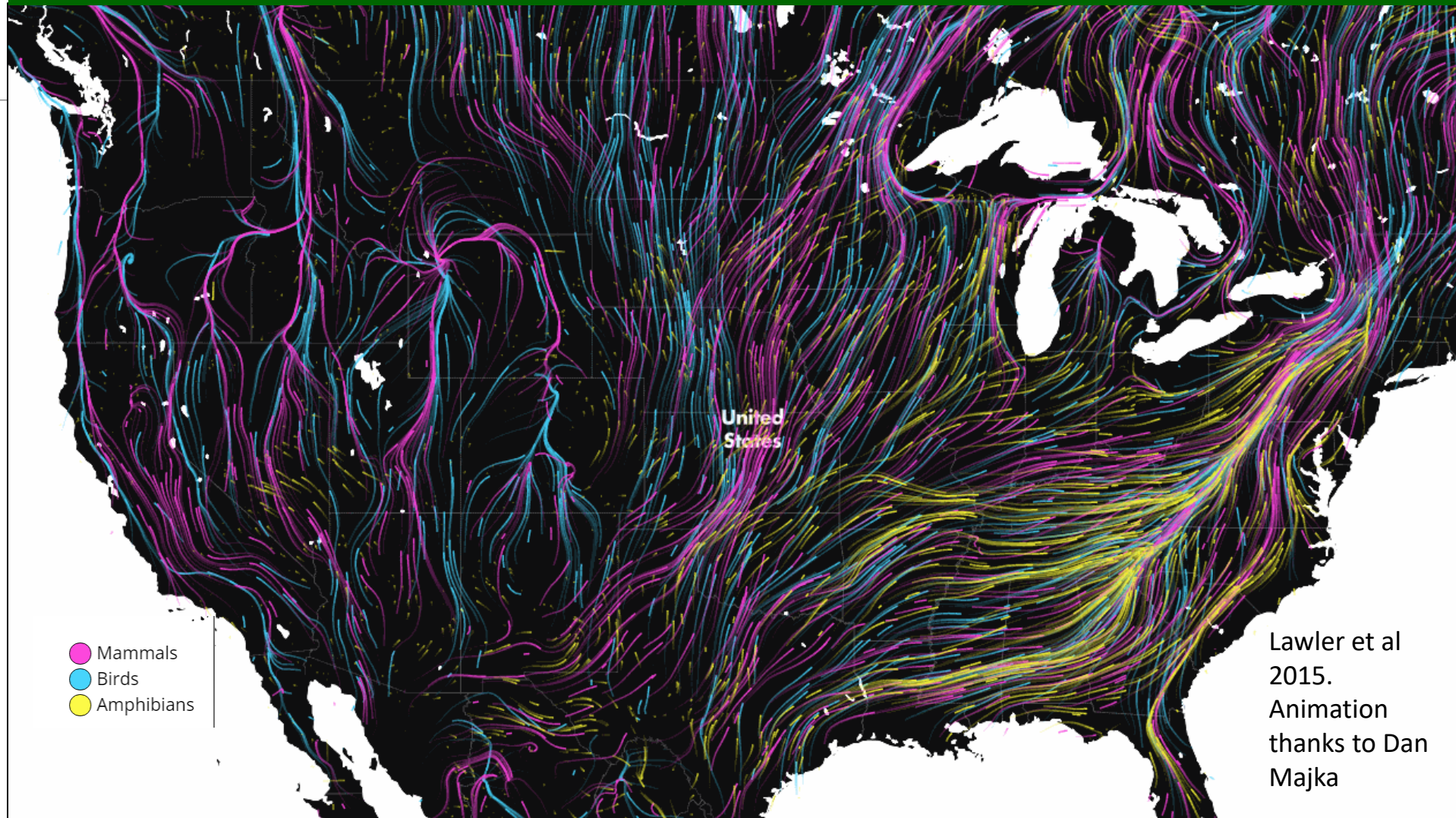


Resilient Systems & Species

Intact habitats, unique communities and rare species populations

Climate Flow

The Gradual Movement of Populations in Response to Climate Change

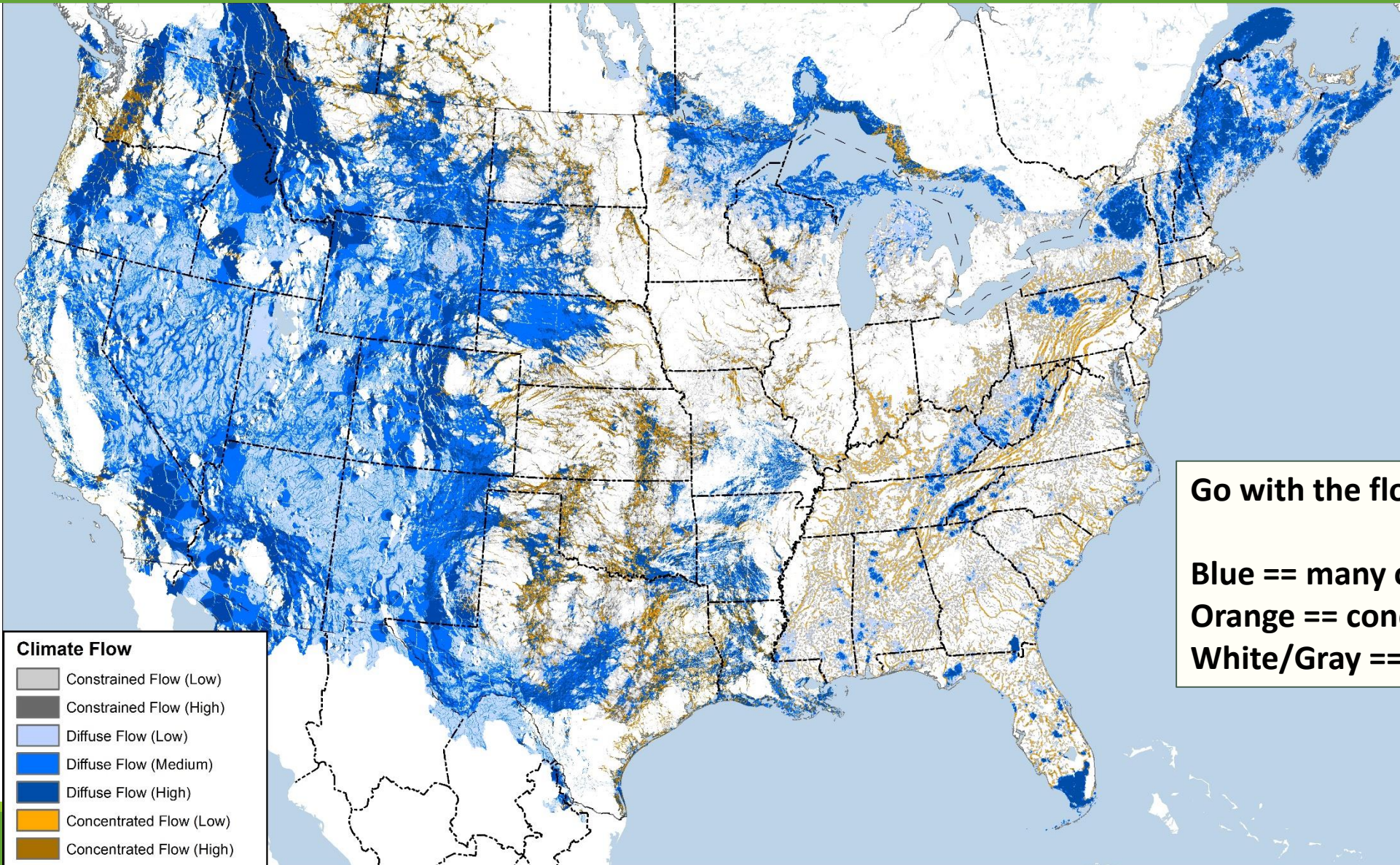


The gradual movement of populations across the landscape in response to climate change

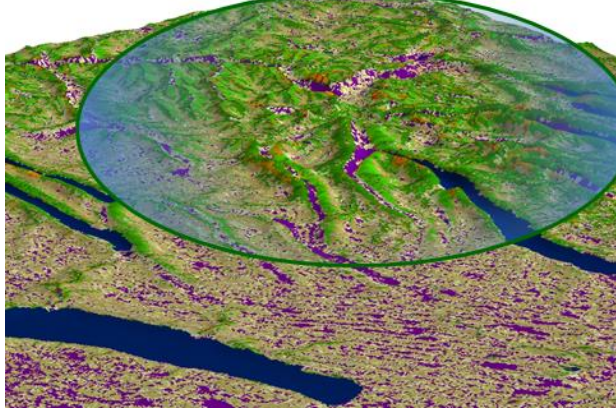
Current Rates: 11 mile per decade North 36 feet per decade Upslope

Climate Flow

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

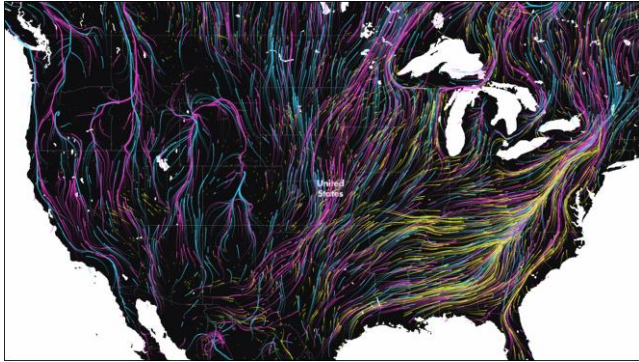


Three Ingredients



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

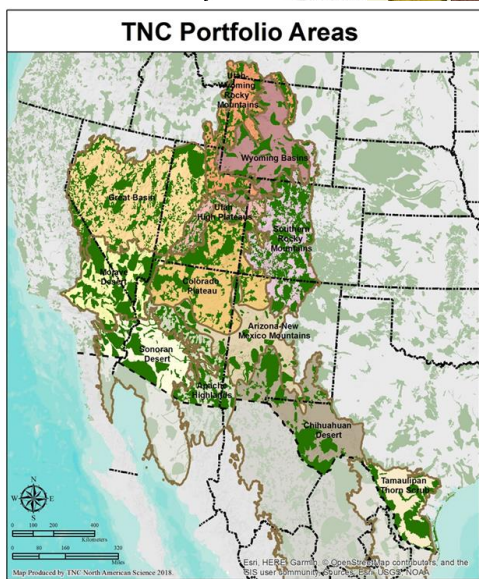
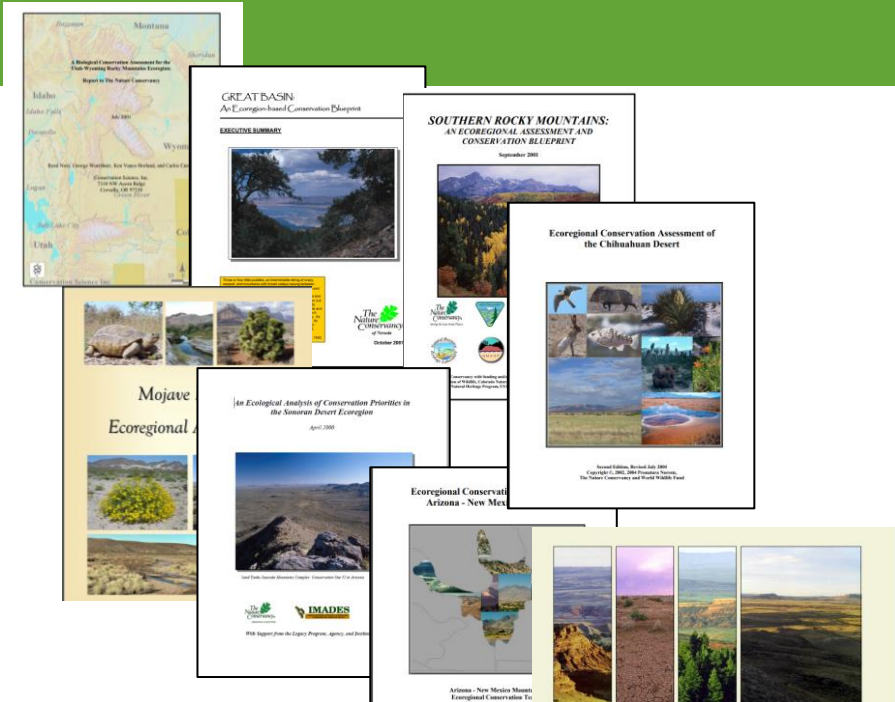
Intact habitats, unique communities and rare species populations



Biodiversity

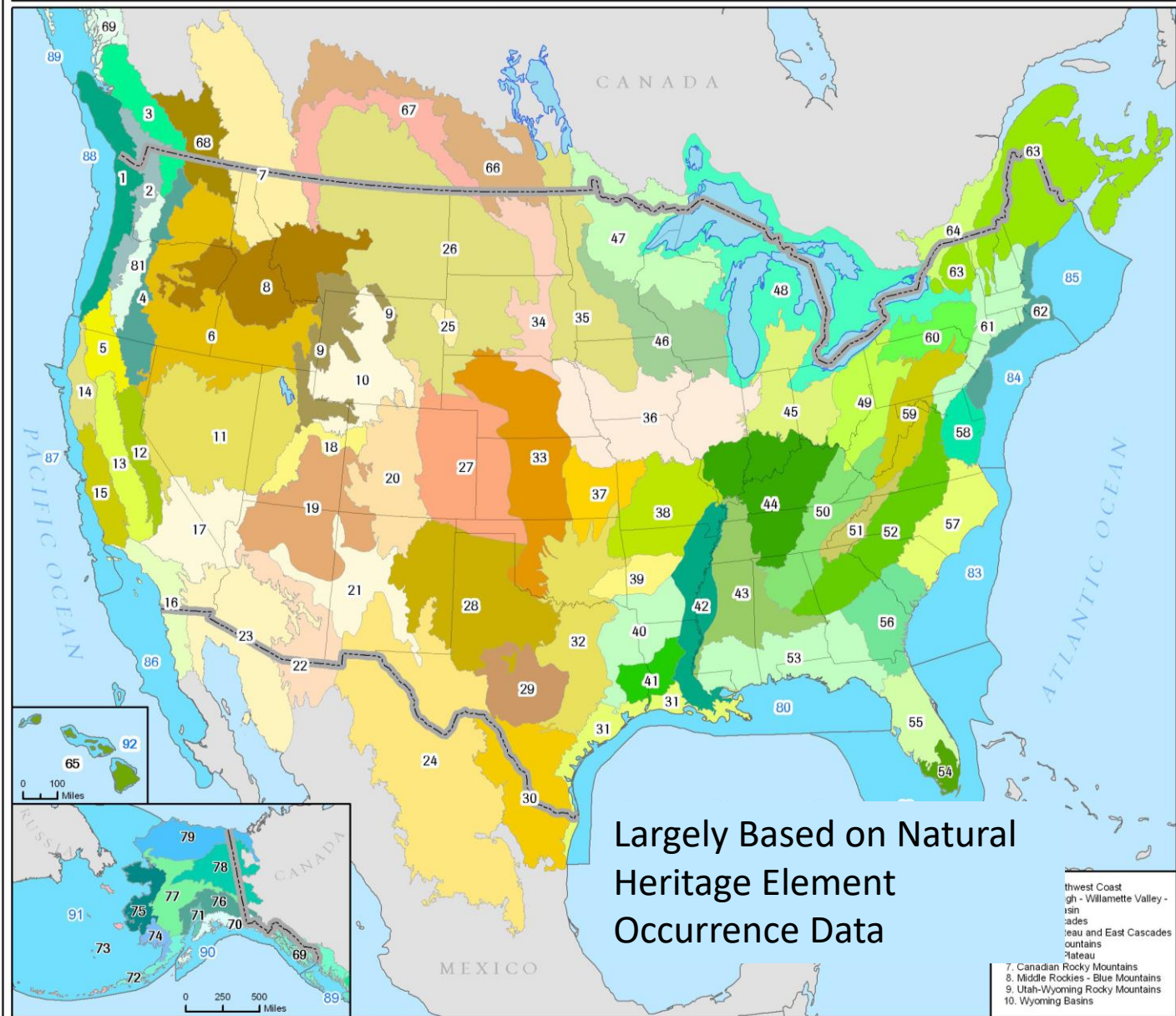
Intact Habitats
Rare Species Populations
Unique Communities

Biodiversity Assessments



The Wyoming Basins Ecoregional Plan

Terrestrial and Marine Ecoregions of the United States

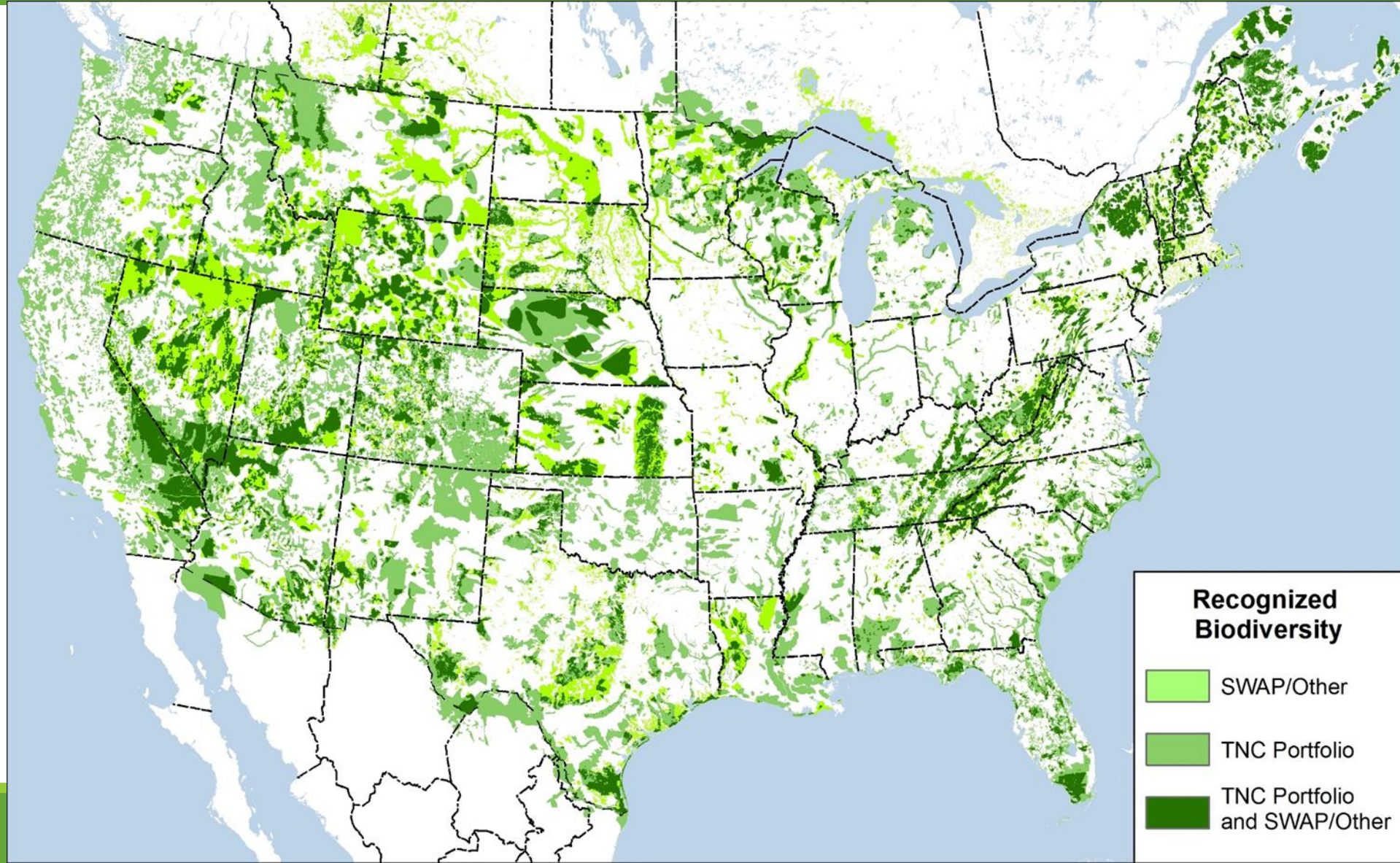


Largely Based on Natural Heritage Element Occurrence Data

- 1. West Coast
- 2. Oregon Coast Range
- 3. Willamette Valley
- 4. Klamath
- 5. Siskiyou
- 6. Coast Range and East Cascades
- 7. Cascade Mountains
- 8. Cascade Plateau
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- 92. Cascade

Biodiversity

(TNC Ecoregional Plans, SWAPs, NHP)

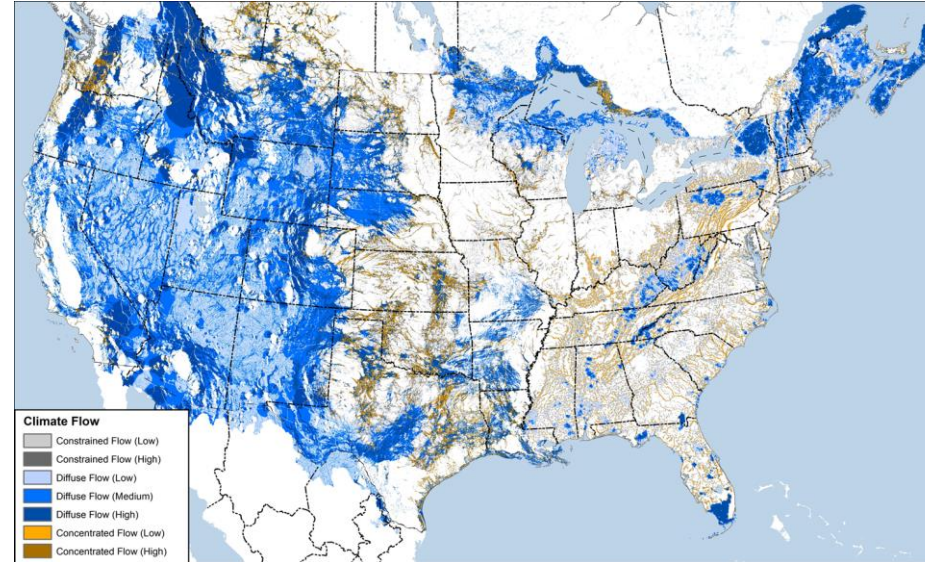


Resilient and Connected Network

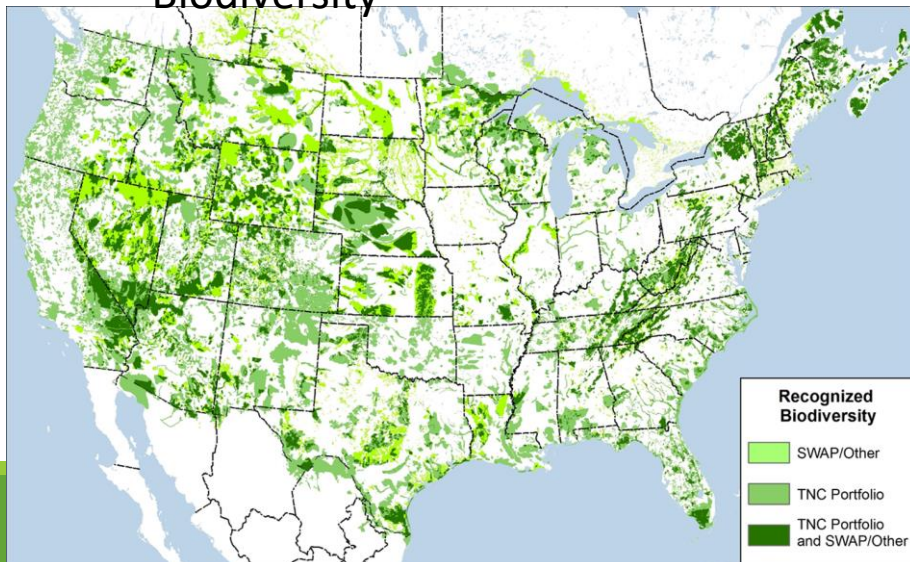
Site Resilience



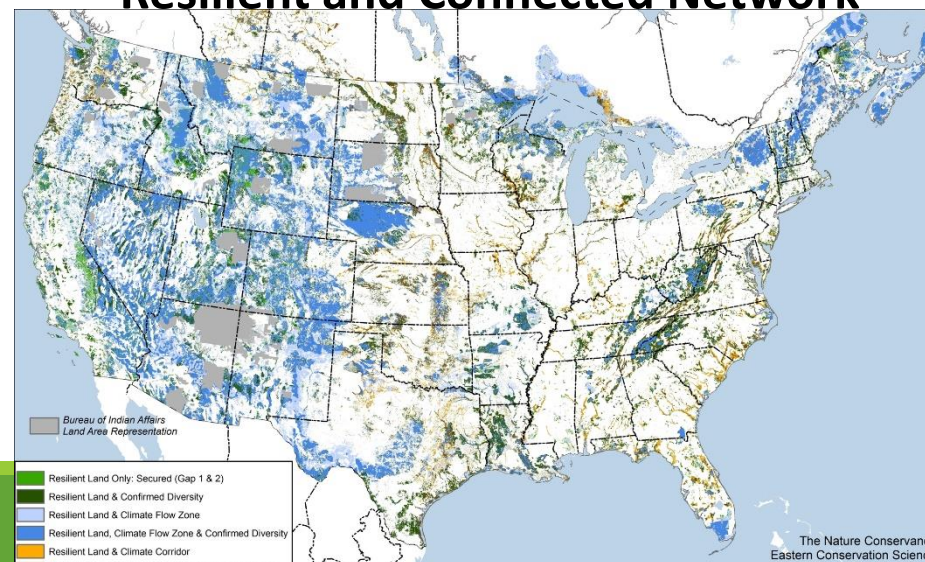
Climate Flow



Biodiversity



Resilient and Connected Network



Access the Data

<http://crs.tnc.org>

<http://nature.org/climateresilience>

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

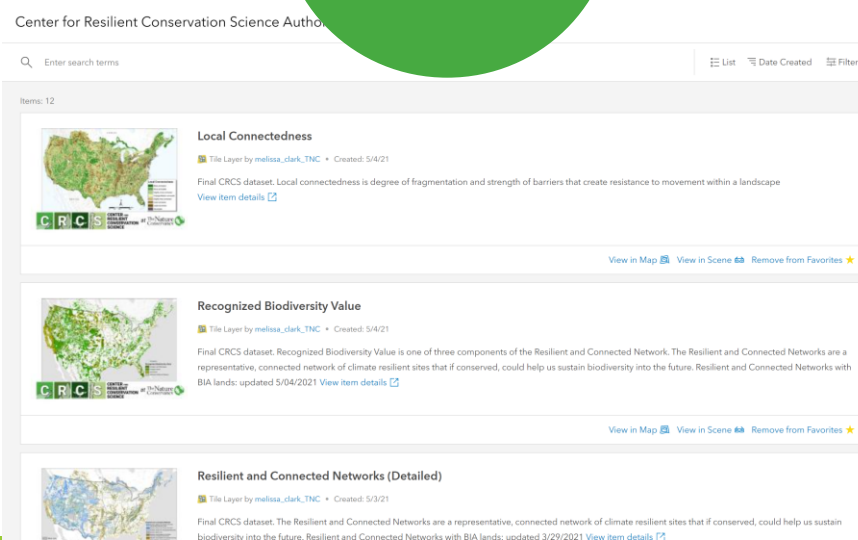
--Easiest--

Resilient Land Mapping Tool



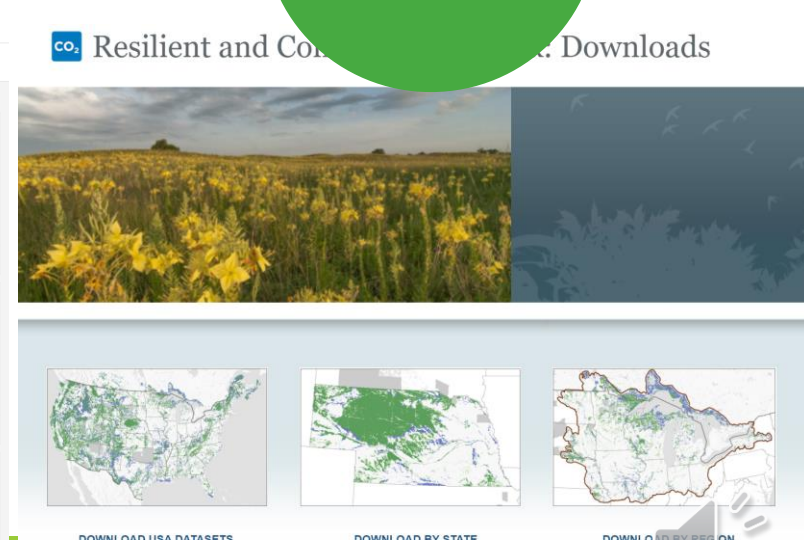
--Intermediate--

ArcGIS Online
Authoritative
data

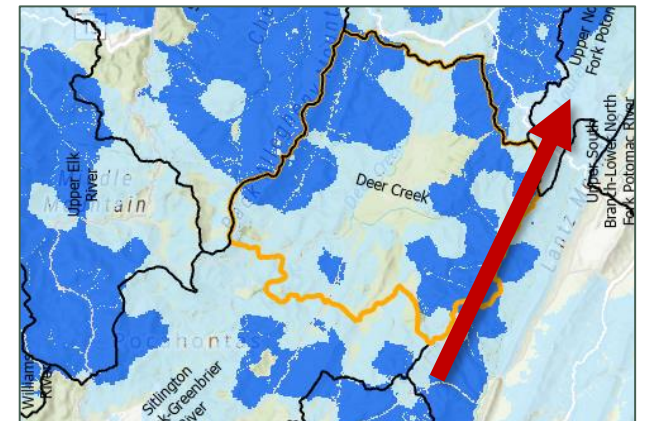
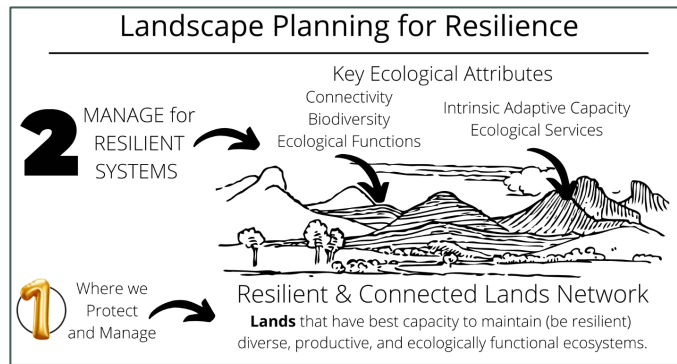


--Advanced--

Download the
Data



Climate Resilience



Landscape Planning for Resilience

2

MANAGE for
RESILIENT
SYSTEMS

Key Ecological Attributes

Connectivity

Biodiversity

Ecological Functions

Intrinsic Adaptive Capacity

Ecological Services



1

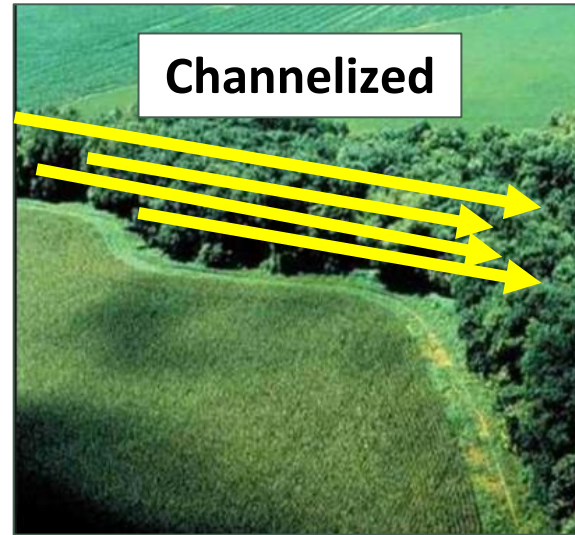
Where we
Protect
and Manage

Resilient & Connected Lands Network

Lands that have best capacity to maintain (be resilient) diverse, productive, and ecologically functional ecosystems.

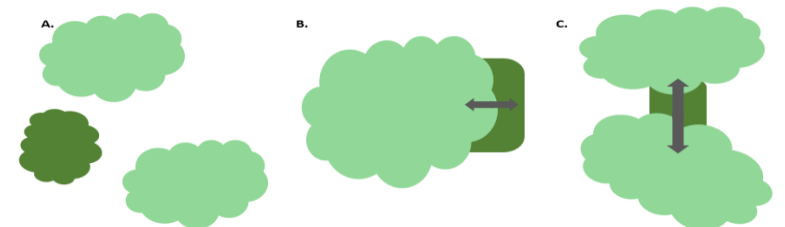
STRATEGIES

Connectivity

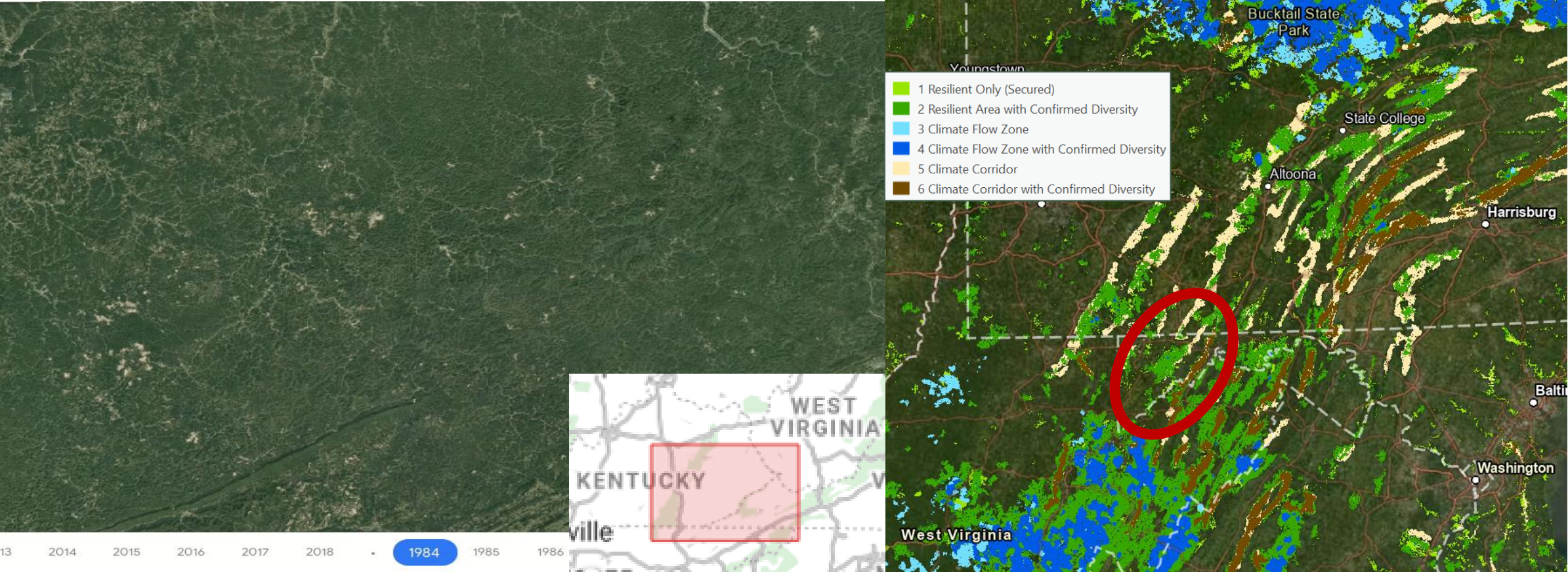


WHY? Connectivity enables species movement for maintaining ecosystem functions and gene flow for maintaining biodiversity

Management Options

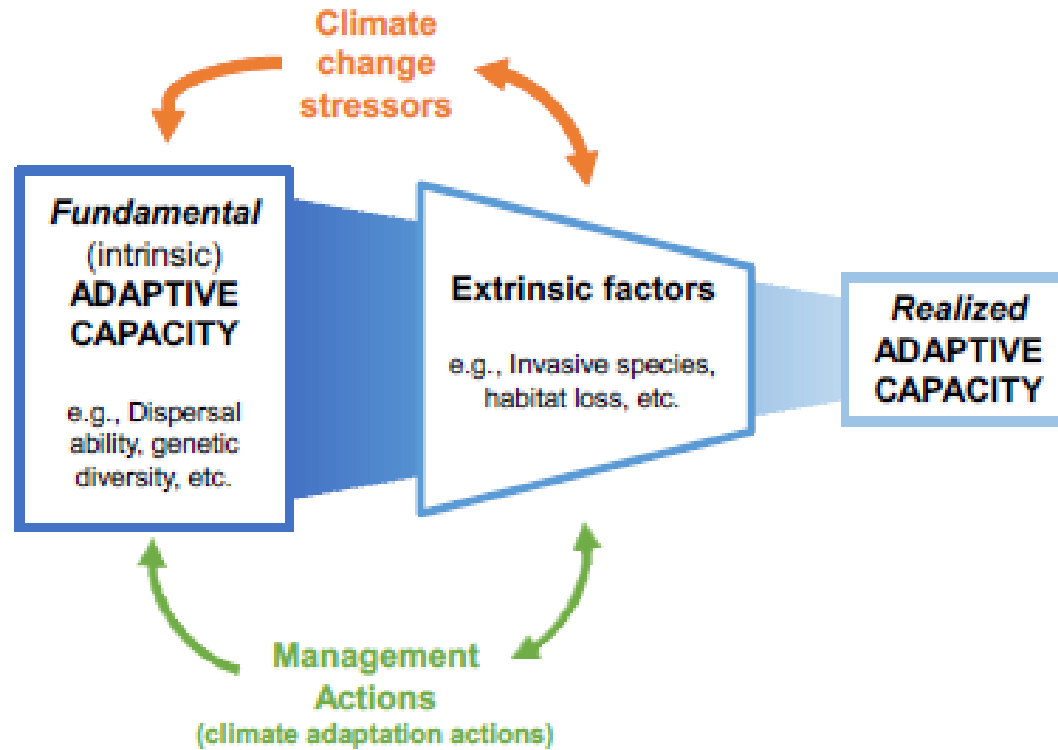


Connectivity



Adaptative Capacity

Adapted from Beaver et al 2016



forksofcheat



Photo Frank Slider

Adaptative Capacity

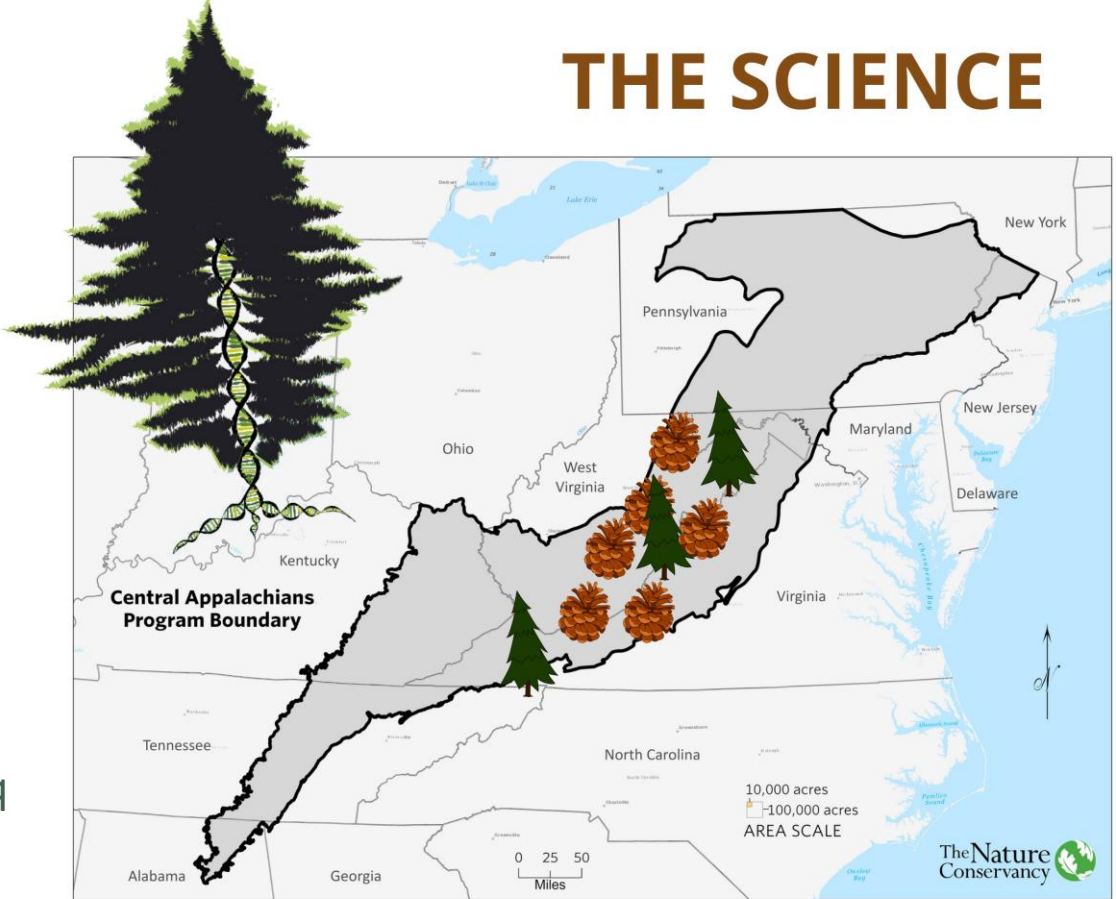
Optimal Sources

- 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

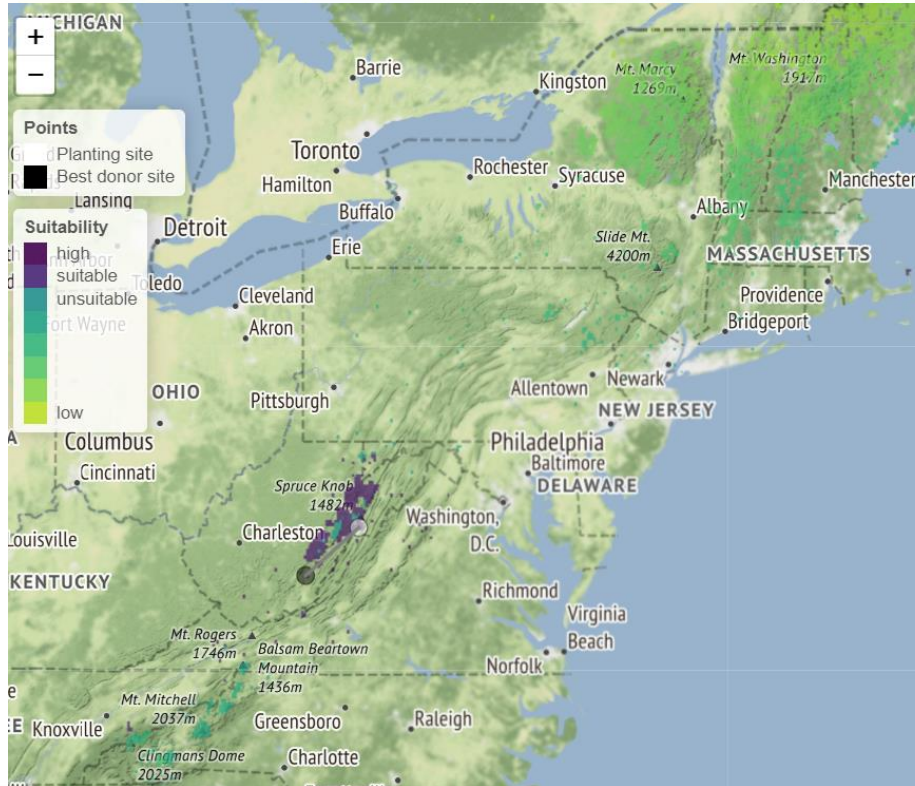


Where are you going to plant?

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.



Dr. Susanne Lachmuth

Optimal Sources

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

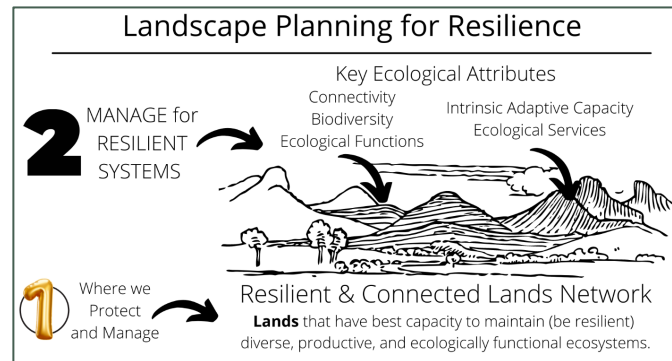


Climate Resilience

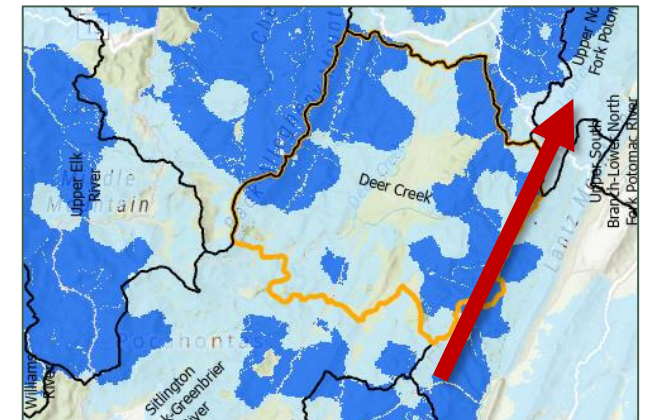
SCIENCE



STRATEGIES

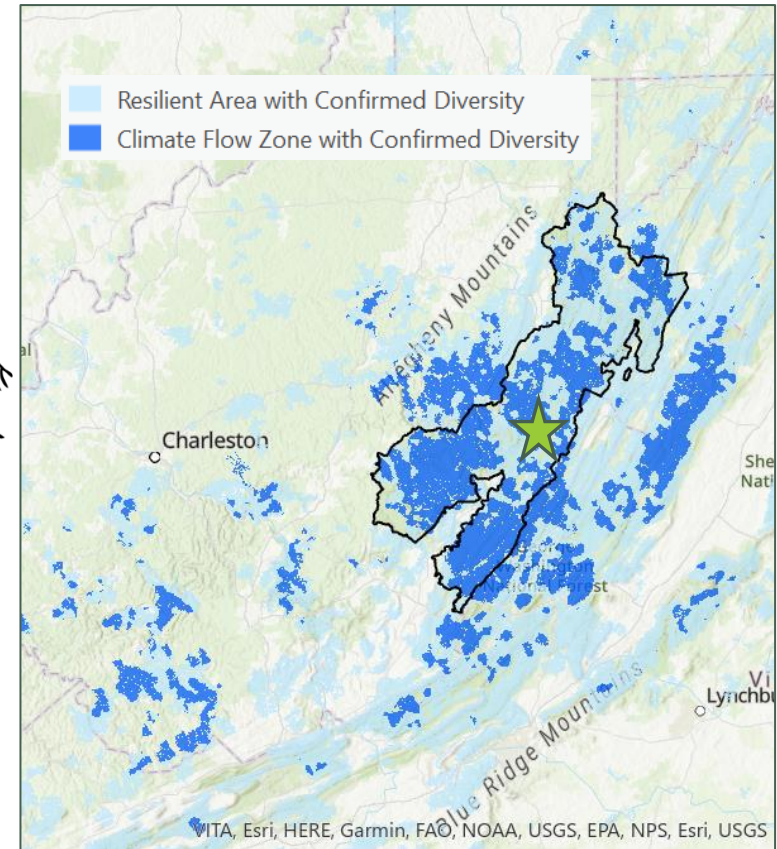
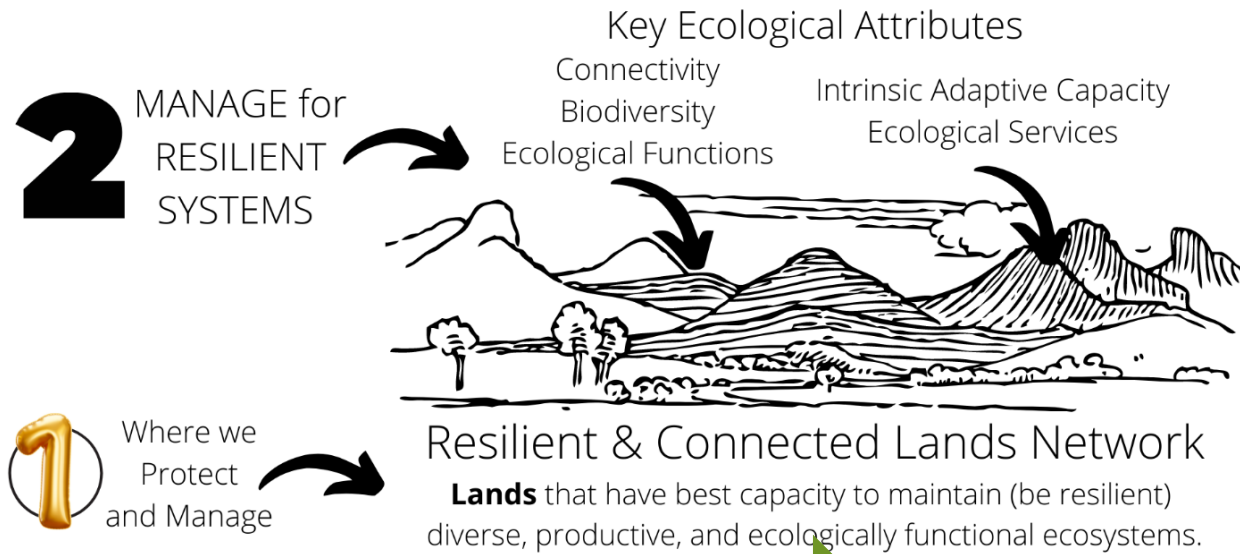


PLANNING



Planning - Deer Creek example

Landscape Planning for Resilience



1. Where?

Planning

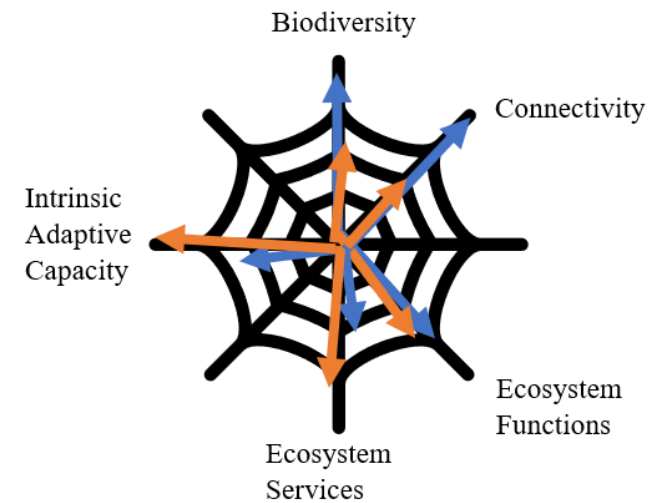
3. Strategies & Tactics

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

Restore Processes (i.e., decompact soil)

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

4. Overlap & Tradeoffs

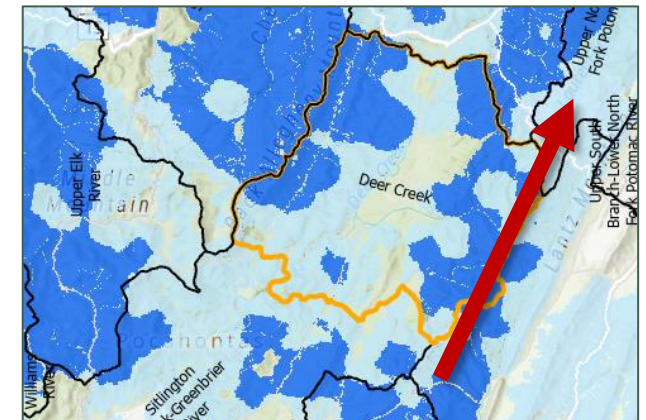
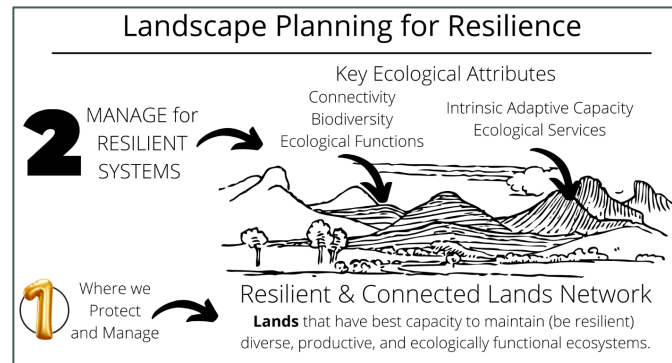


Climate Resilience

SCIENCE

STRATEGIES

PLANNING



Questions, Comments, Feedback

Katy Barlow

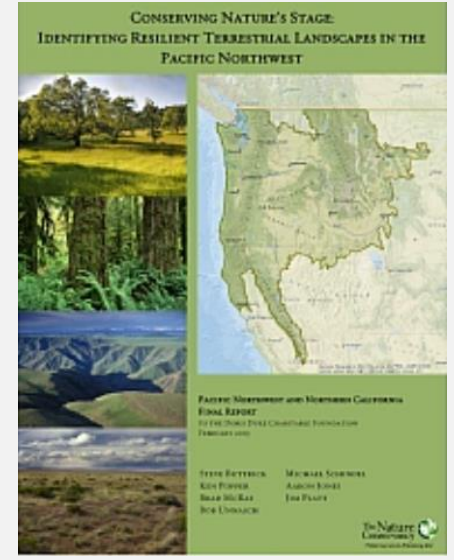
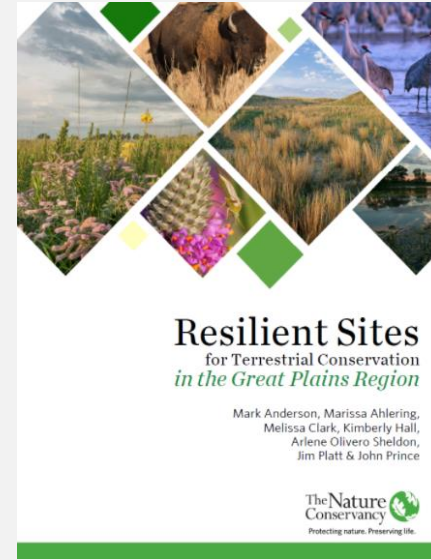
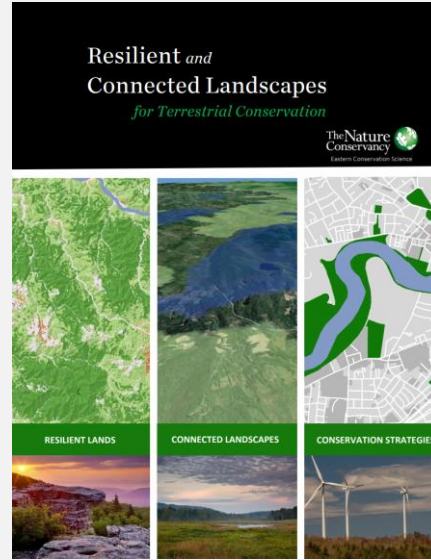
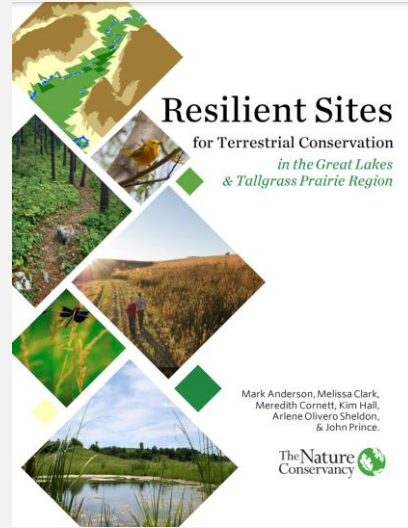
TNC Central Appalachians Program

kathryn.barlow@tnc.org

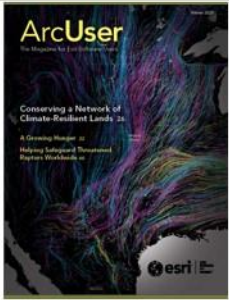
References and Resources

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



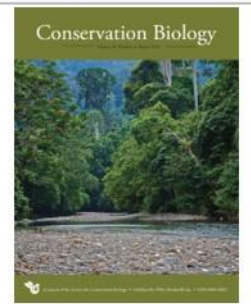
Natural Highways and Neighborhoods: Conserving a Network of Climate-Resilient Lands

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>