Frost and Freeze Data and Impacts to the Agriculture, Construction and Transportation Industry

Decision Support Tools, etc.

Jim Fox

Director, UNC Asheville's NEMAC

March 21, 2013

UNC ASHEVILLE NEMAC
National Environmental Modeling and Analysis Center

Cooperative Institute for Climate and Satellites
cics.nc

National Oceanic and Atmospheric Administration
NOAA
U.S. Department of Commerce

UNC Asheville's NEMAC
National Environmental Modeling and Analysis Center

- **Applied Research** and technology development of environmental and climate data sets
  - Data and GIS
  - Visualization
  - Decision Making
- **Decision Support tools** for Flood Mitigation, Emergency Response, Forest Health, Water Resource Issues, Planning, Vulnerability and Resilience
- **Collaboration** among government, academia and private enterprise
- Active **Undergraduate Research**

Climate Literacy Education and Research (CLEaR)

Eastern Forests Environmental Threat Assessment Center (EFETAC)

Renaissance Computing Institute State of North Carolina

Local and State Government

Land-of-Sky Regional Council

Mountain Resources Commission

Companies

ELUMENATI™ IMMERSIVE PROJECTION DESIGN

Brown AND Caldwell

LandDesign

ERC BROADBAND

Others

Southeast Natural Resource Leaders Group

NRCS Natural Resources Conservation Service

US Army Corps of Engineers

USGS science for a changing world

UNC CHARLOTTE

Overview

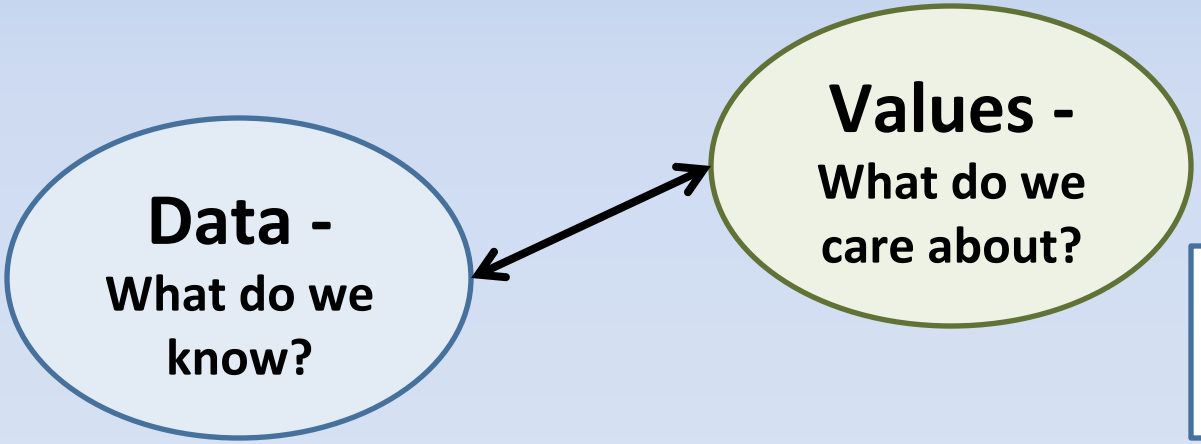
- Baseline changes in climate increases risk of weather impact
  - Late Frost impact on plants after early onset to growing season
  - Change of growing season length impact on natural system
  - Freeze and thaw impacts on mobility and design
- Non-climate issues add to sensitivity
  - Agriculture practice changes, Forest invasives and pests
  - Population and demographic changes, Economic Issues
  - Transportation planning and design
- Group Decision Making is a process that needs to be actively supported with appropriate technologies and toolsets
- Collaboration is key – the three sectors of government, academia and industry must work together to meet this challenge

Decision Making Building Blocks

Data -
What do we know?

- Housing
- Transportation
- Energy
- Jobs/Economic Dev.
- Natural and Cultural Resources
- Land Use
- Health

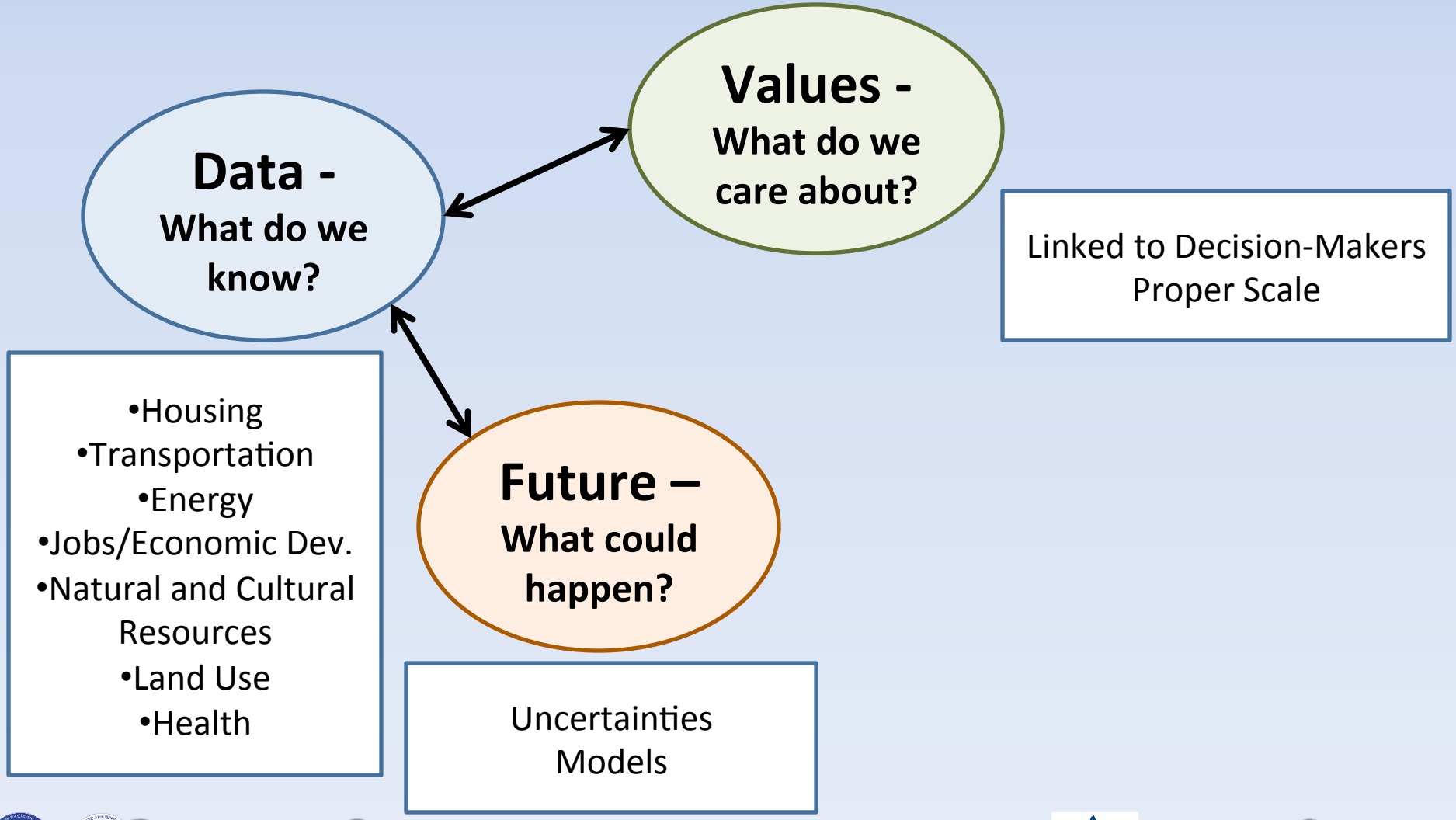
Decision Making Building Blocks



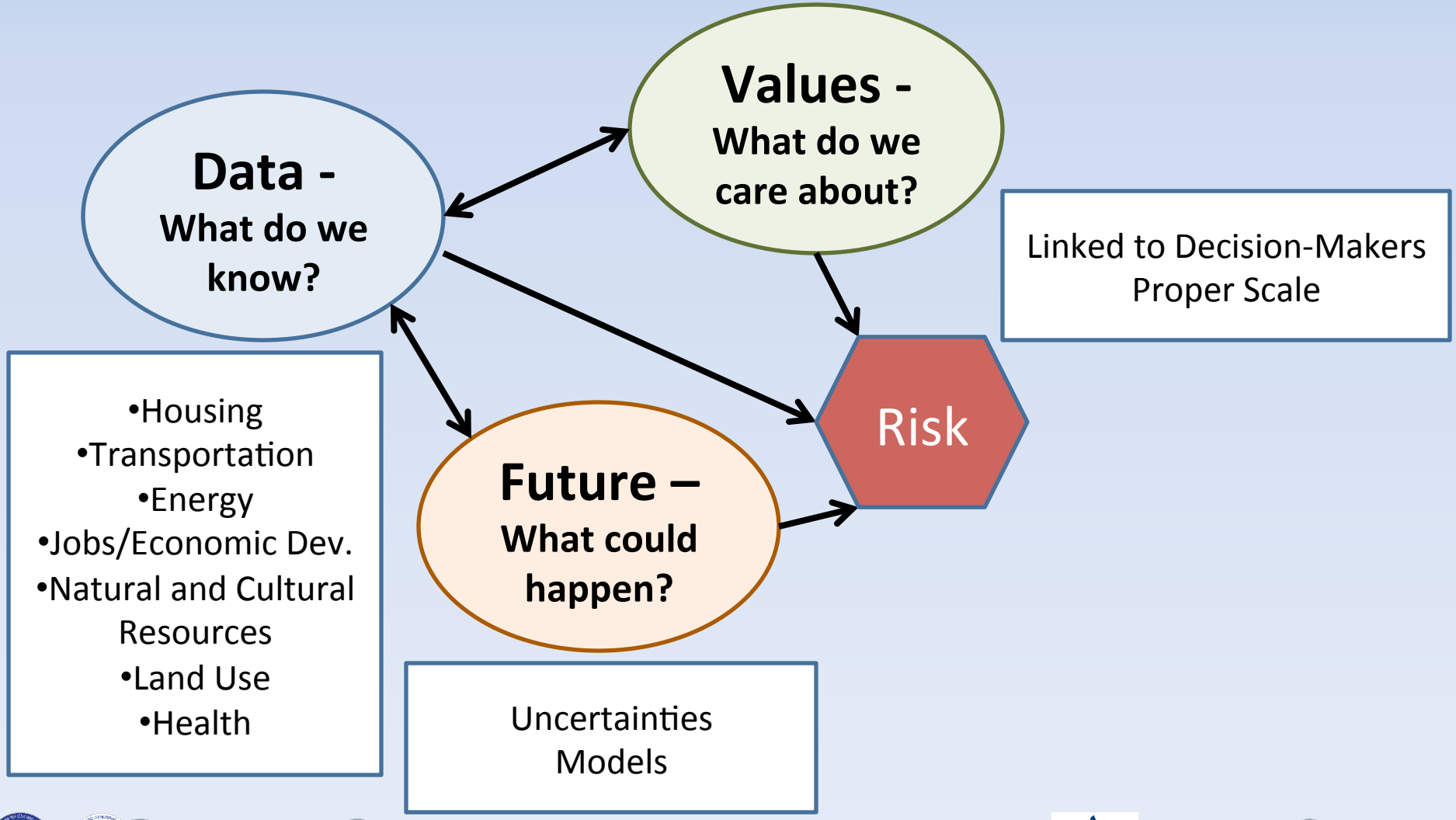
Linked to Decision-Makers
Proper Scale

- Housing
- Transportation
- Energy
- Jobs/Economic Dev.
- Natural and Cultural Resources
- Land Use
- Health

Decision Making Building Blocks



Decision Making Building Blocks



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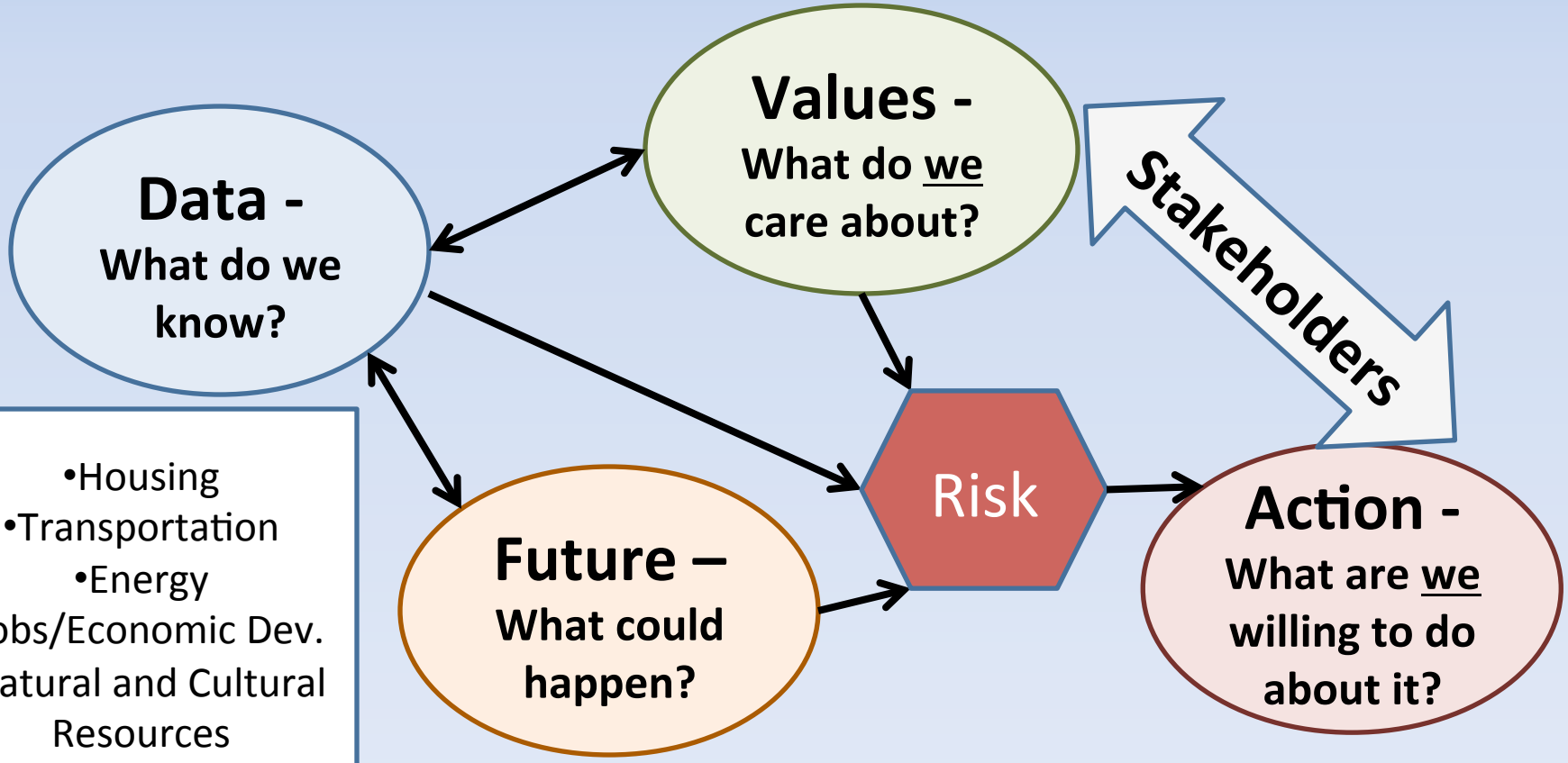
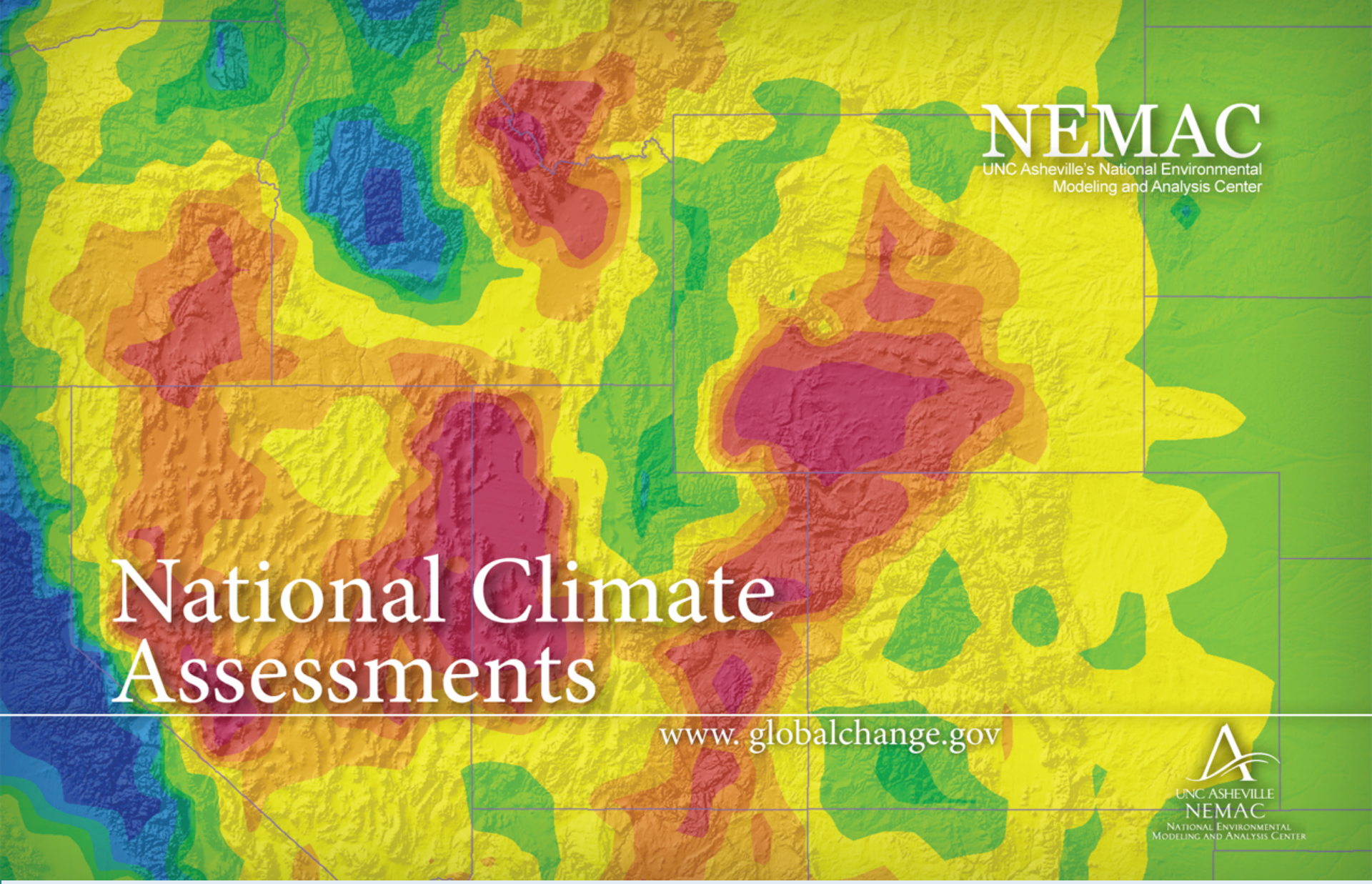




Decision Portals, GIS Viewers, Facilitation in support of the NCA

National Climate Assessment

- **Decision**: Integrated solutions that consider factors including economic development, transportation, agriculture, etc.
- **Scale**: National, Regional and Local
- **Use of Climate Data**: Climate impacts on key issues and sectors

Design of Database to Support Assessment

Scale
National
Regional - SE
State
State Region
River Basin

Sector (with subsectors)
Transportation
Natural Environments
Water Resources
Coastal Resources
Marine Resources
Land Resources
Agriculture and Forestry
Energy Production and Use
Human Social Systems
Human Health & Welfare
Air Quality

Climate Condition
Low Temp days/nights
High Temp days/night
Cold spells (cold snaps)
Warm spells (heat waves)
Cool seasons/warm seasons
Heavy precipitation events
Rare precipitation events
Drought
Tropical cyclones
Extreme extra-tropical storms
Small scale severe weather
Sea level rise

Example of Multi-Scale Approach

Multiple Scales

National
- Maps for NOAA and USDA Forest Service

North Carolina
- State Climate Plan
- RENCI maps

Multi-County
- Regional Planning
- Transportation

Local
- River District
- Downtown Asheville
- Biltmore Village
- Swannanoa Watershed

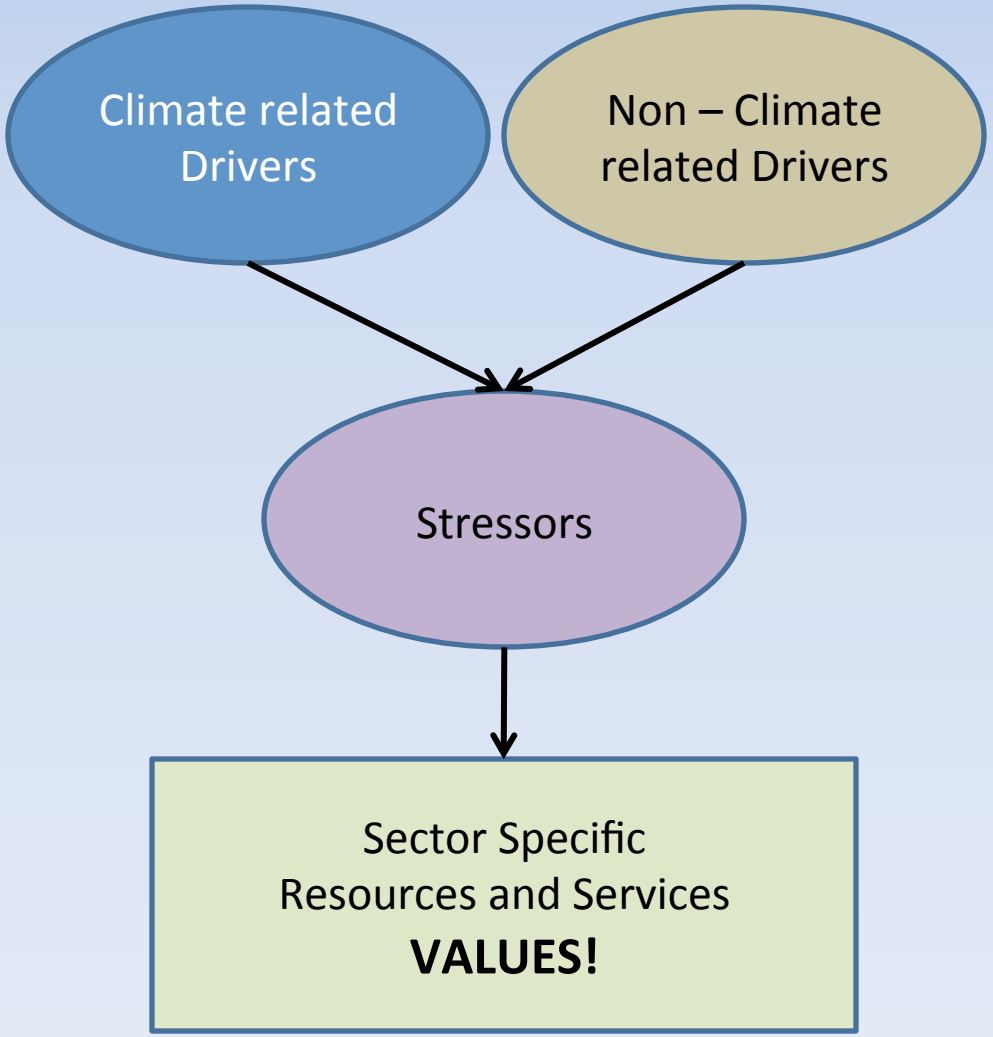
Southeast
- Southern Group of State Foresters
- SENRLG

Western NC
- Vitality Index
- Future Build-out Study

City/County
- GIS Websites
- Multi-Hazard Risk Tool
- Steep Slope Tool

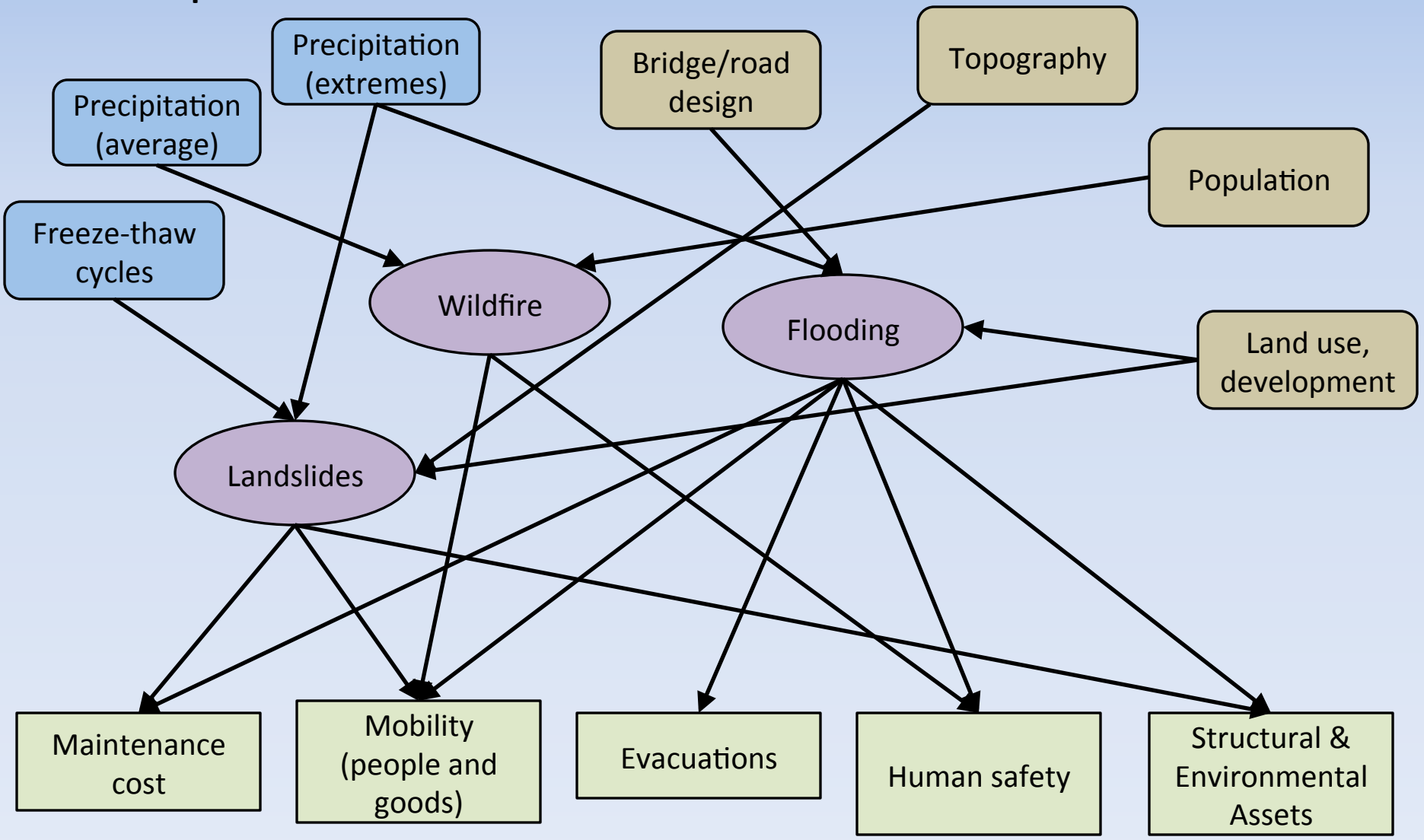
Assessments Lead to Decisions

- Communities will **not** make decisions based on climate alone
- Driven by **values**, not data
- Must engage with decision makers from the beginning

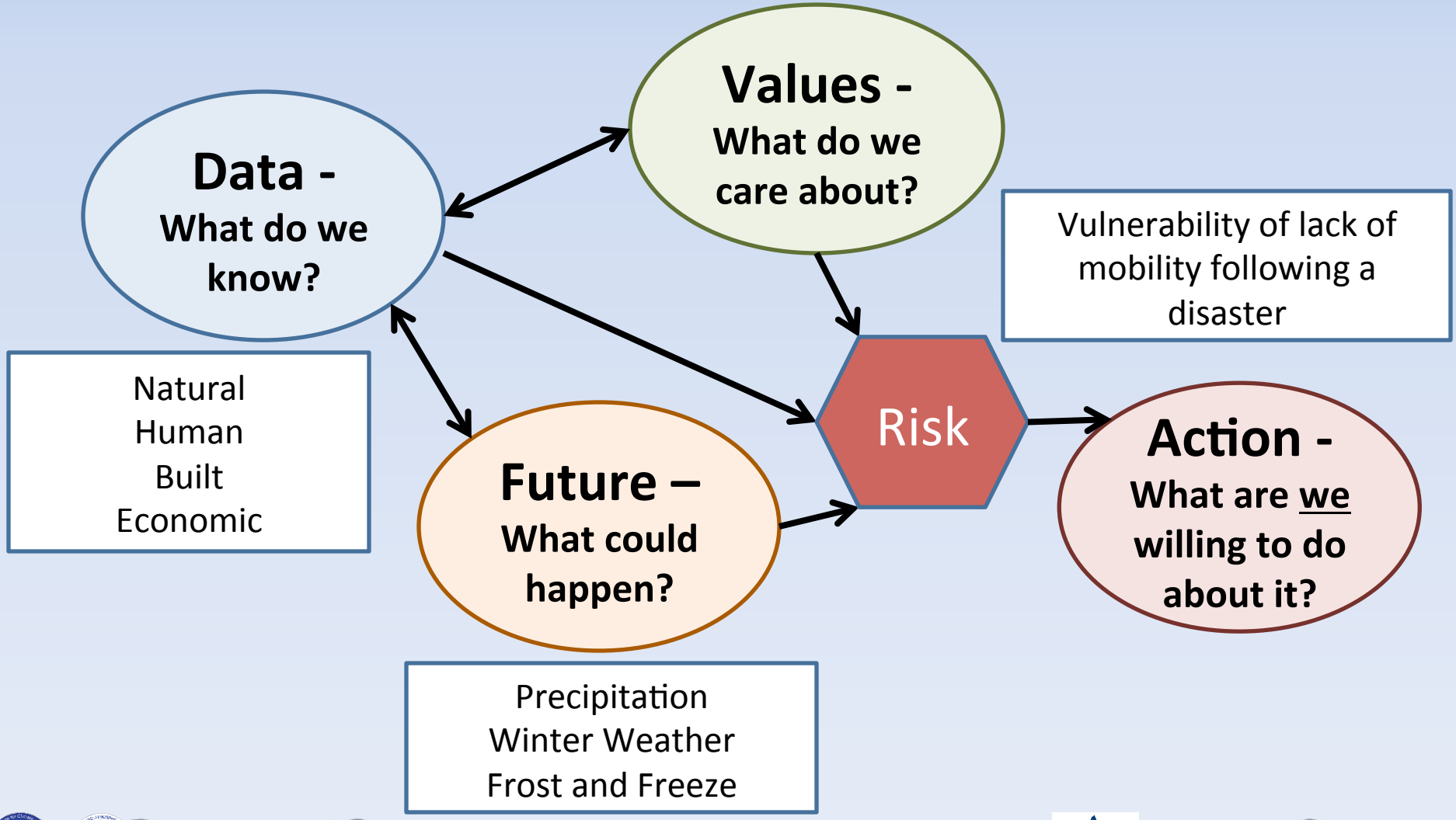


Scale: **(Regional)** Land of Sky Regional Council of Governments
Sector: **Transportation**

Conceptual Model

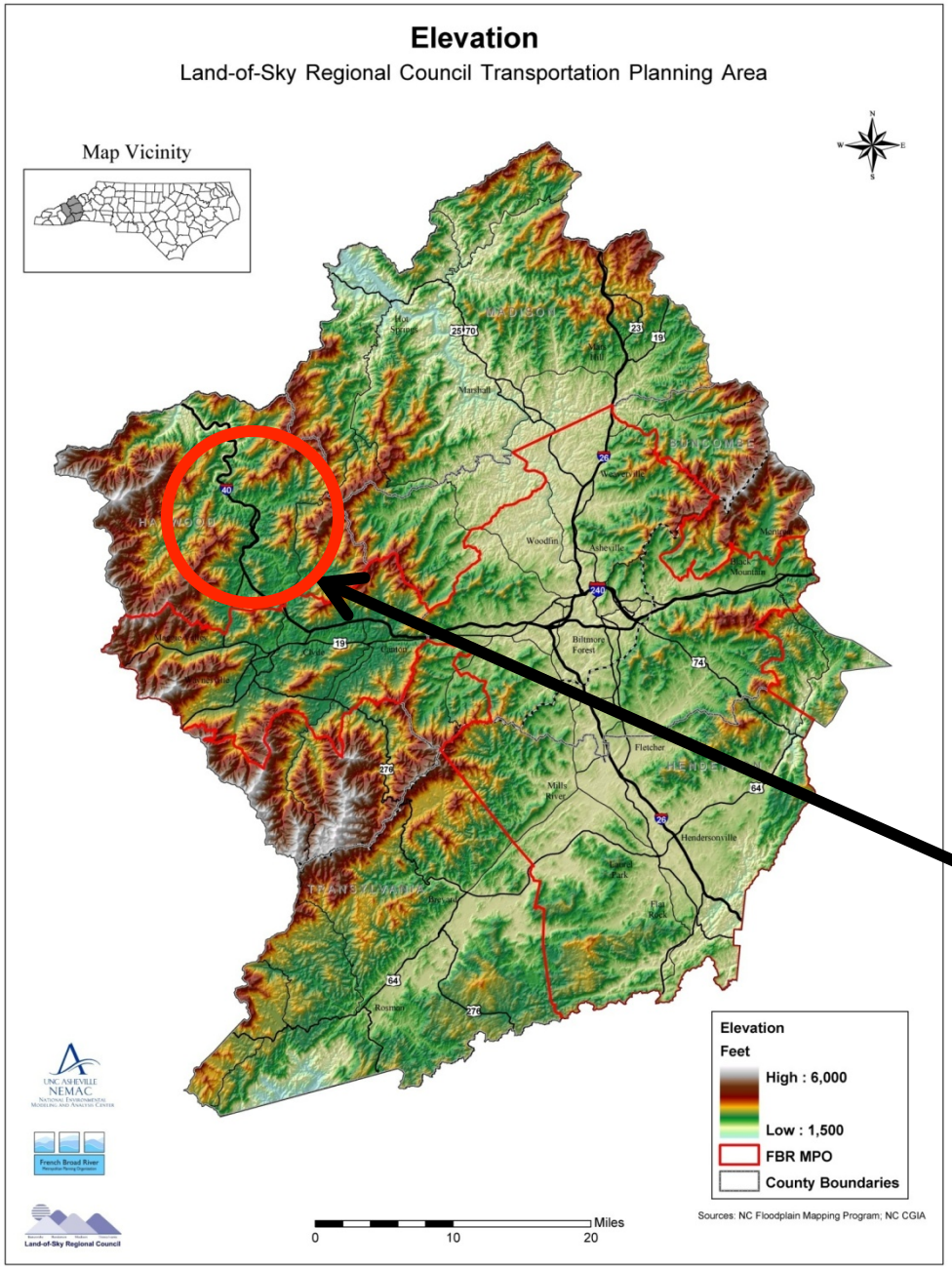


Western North Carolina Transportation Planning



I-40 Landslide in 2010

- **Vulnerability** is related to mobility in the transportation sector
- Freeze following a major rain initiated the landslide
- $200 Million Impact



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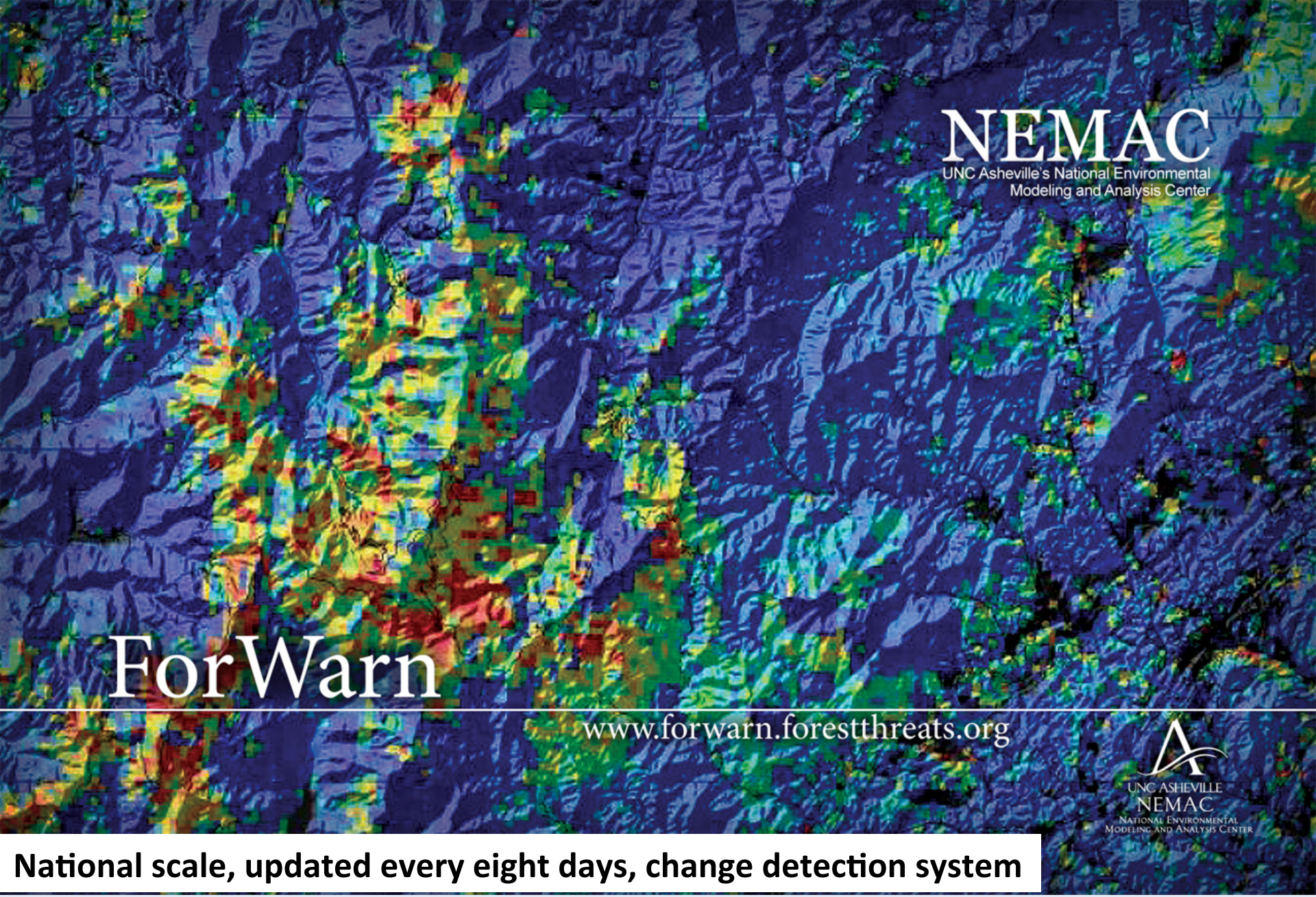


National scale, updated every eight days, change detection system

CONTACT US

Search

ForWarn

Satellite-Based Change Recognition and Tracking

USGS OAK RIDGE National Laboratory

Home | Overview | News | Highlights | Data | Support

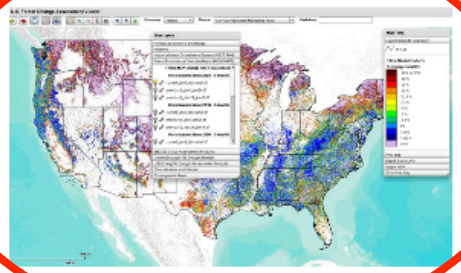
Heavy snowpack in the Northwest

A strong La Niña in the tropical east Pacific contributed to an unusually heavy snowpack in the Pacific Northwest during the 2010-11 winter. As seen in this 32-day time sequence for western Washington and Oregon, spring greenup conditions were...

read more »

What is ForWarn?

ForWarn is a satellite-based forest disturbance monitoring system for the conterminous United States. It delivers new forest change products every eight days and provides tools for attributing abnormalities to insects, disease, wildfire, storms, human development or unusual weather. Archived data provide disturbance tracking across all lands since 2000. Interactive maps are accessible via the Forest Change Assessment Viewer. Read more about ForWarn here.



Recent News

Official ForWarn News Release Now Available

03/21/2012 - 09:25 The official news release from the USDA Forest Service and NASA announcing *ForWarn* is now available for download!

USDA FS AND NASA JOINT PRESS RELEASE_03 15 12.DOC

Introducing the Pest Proximity Database

12/17/2012 - 10:40 The new Pest Proximity Database, now built into the Forest Change Assessment Viewer, helps determine which insects and disease agents are most likely to have been responsible for new forest...

more news »

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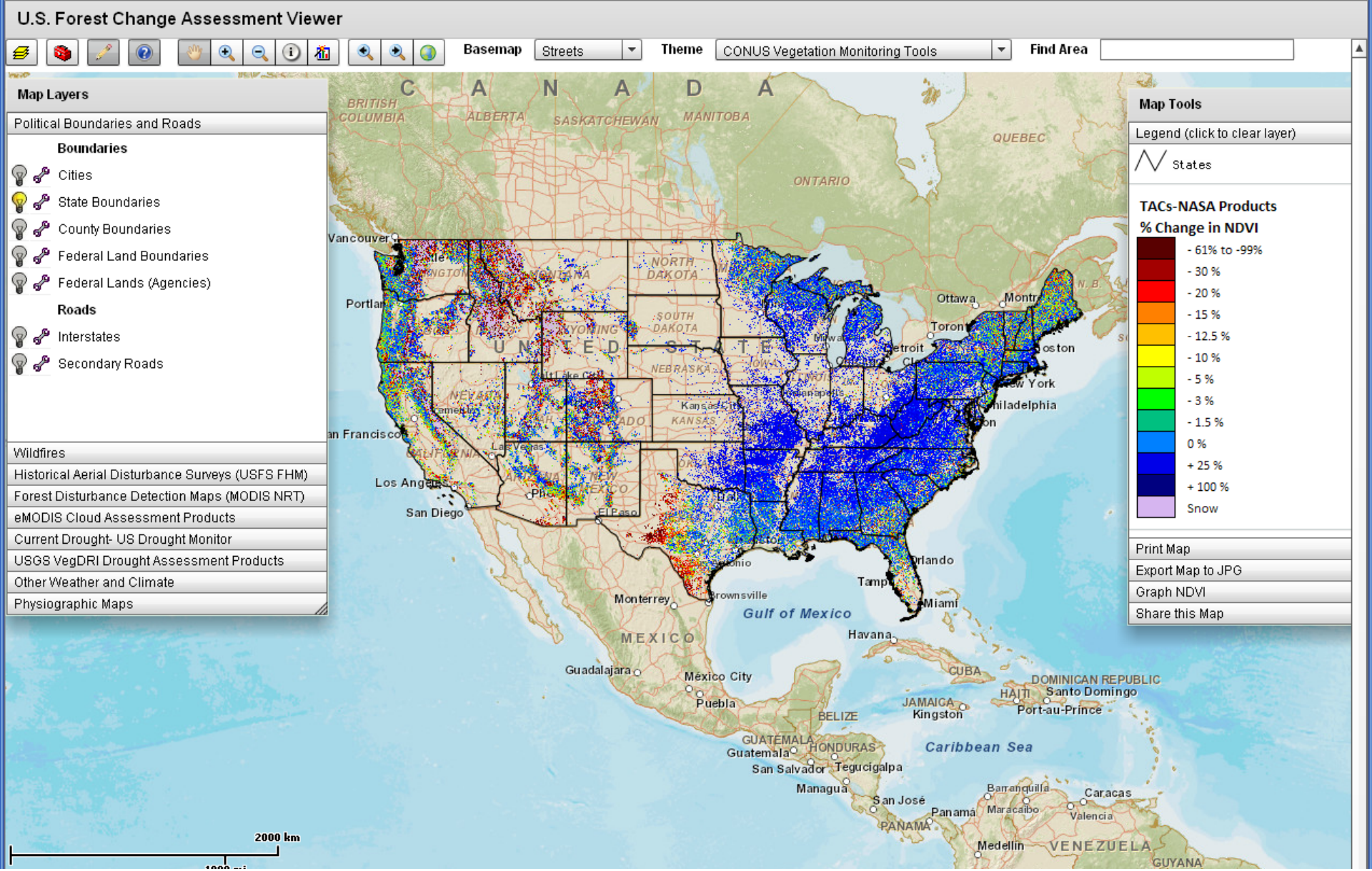
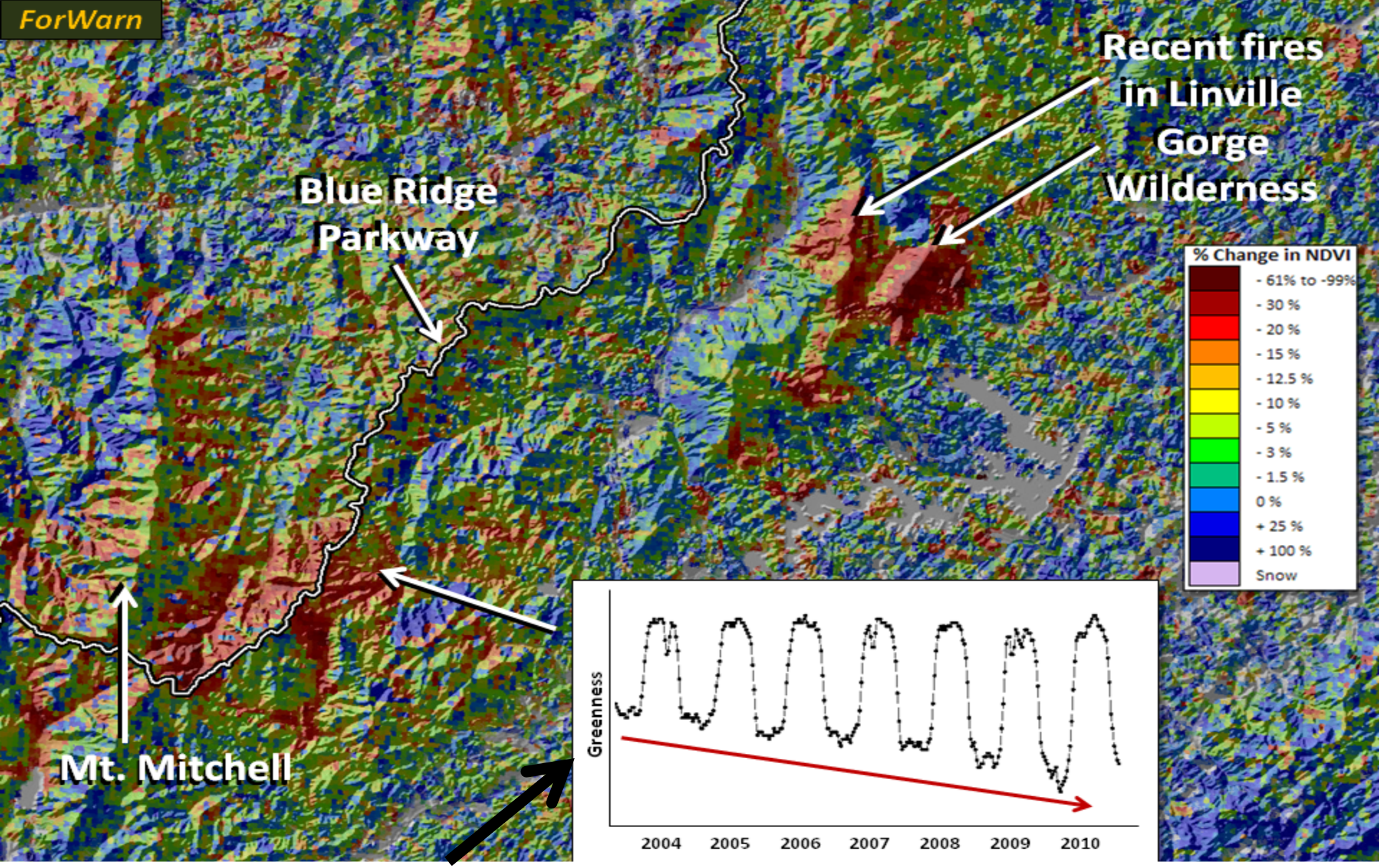
Website for Visualization and Story Telling – Forest Health is Value Driver



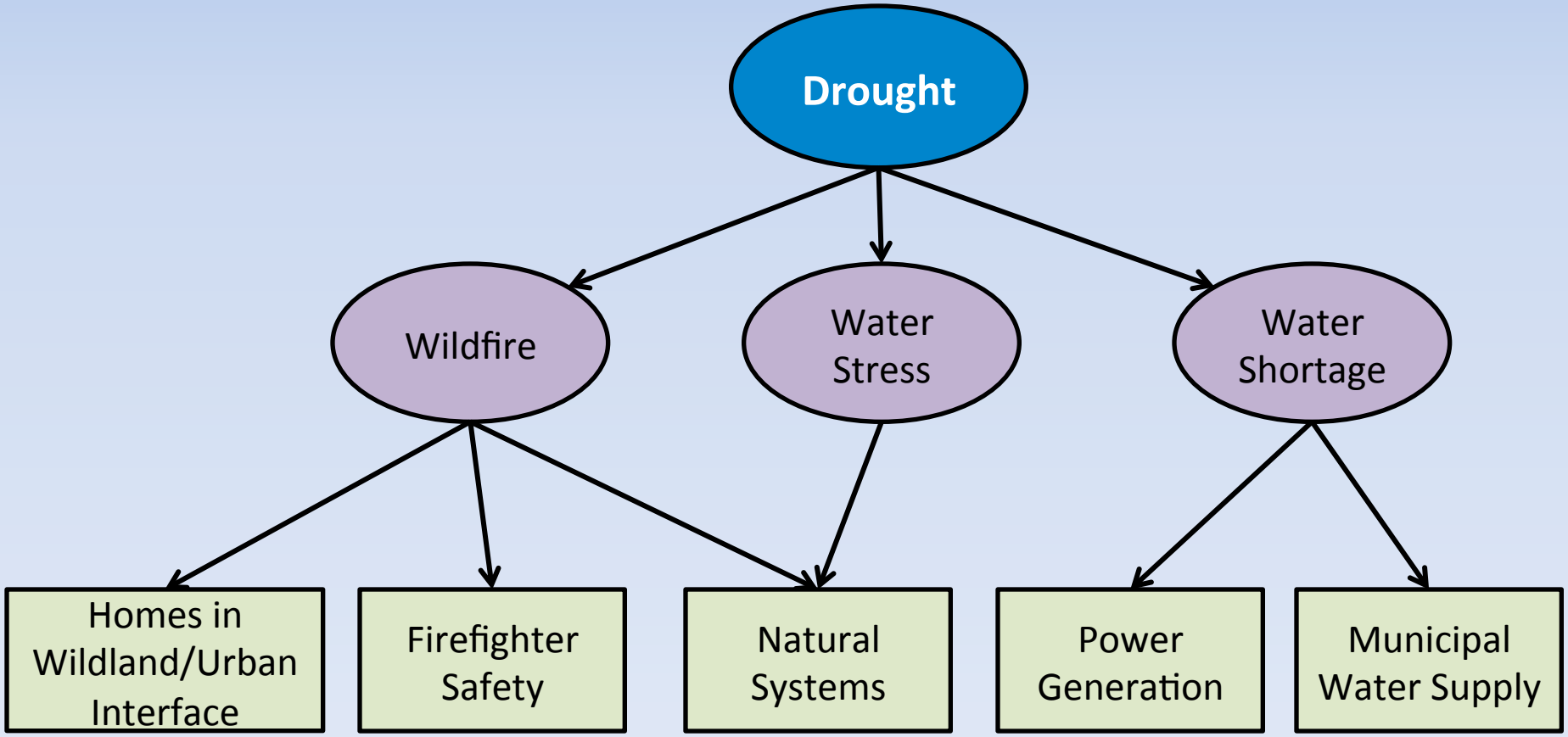
GIS Viewer for scalability and determining cause and effect



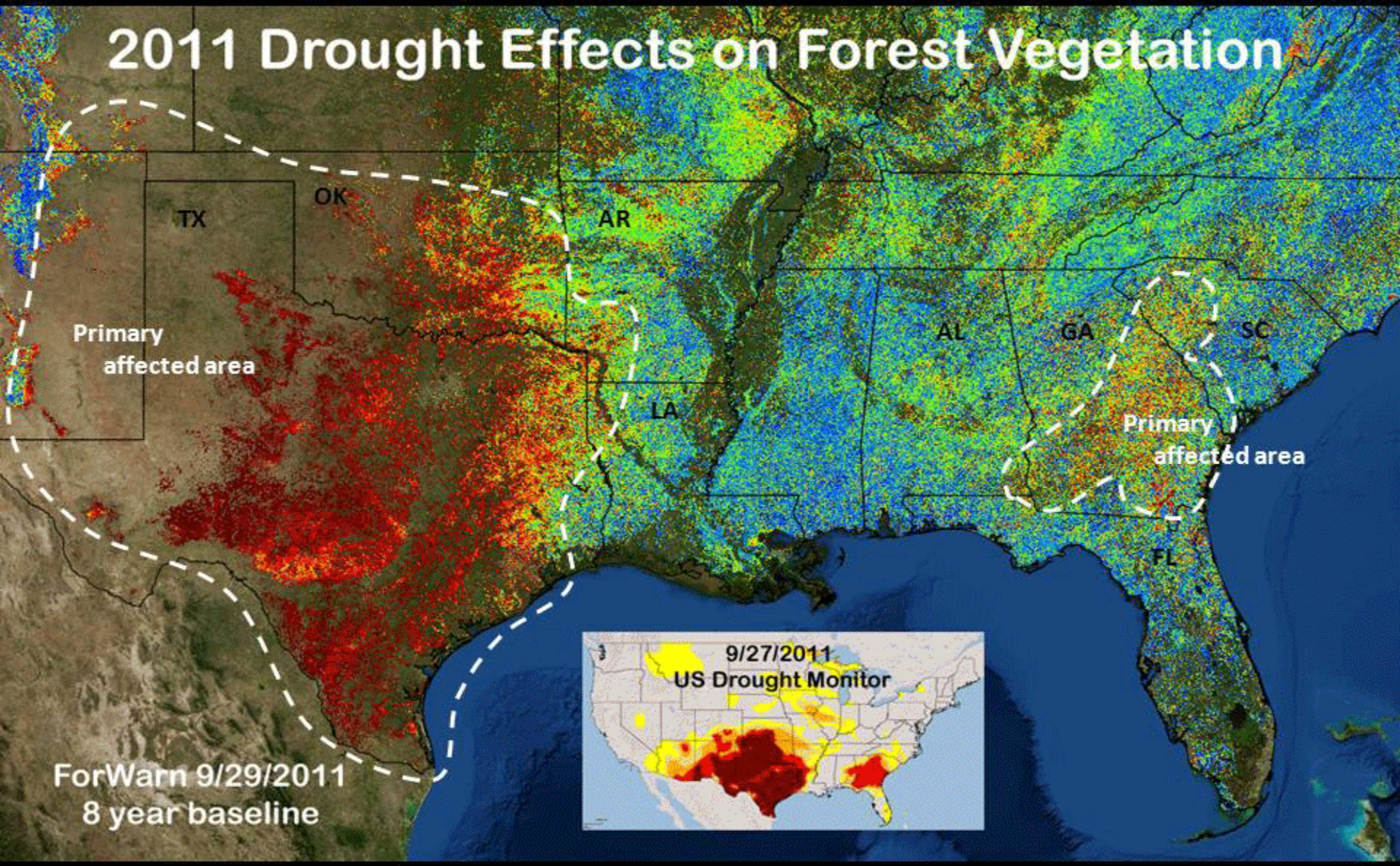
Multigraph tool (imbedded in GIS Viewer) allows users to see in the temporal dimension

Red pixels on map shows a deviation from the 10-year normal

Climate Assessment
Conceptual Model of Linked Relationships

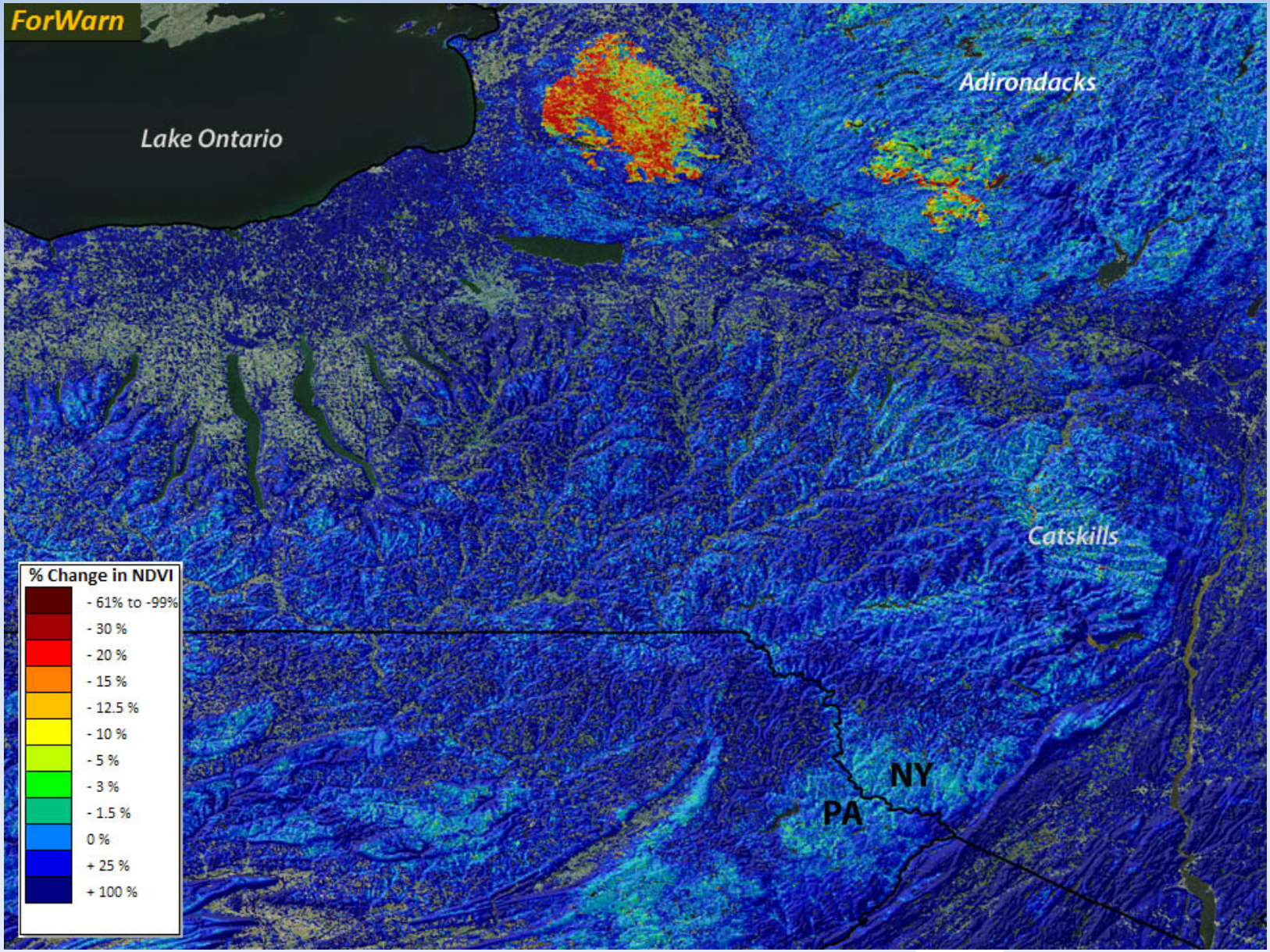


Assessments **lead to** decisions (and actions!): Focus on resources and values lets the customer understand why climate matters.

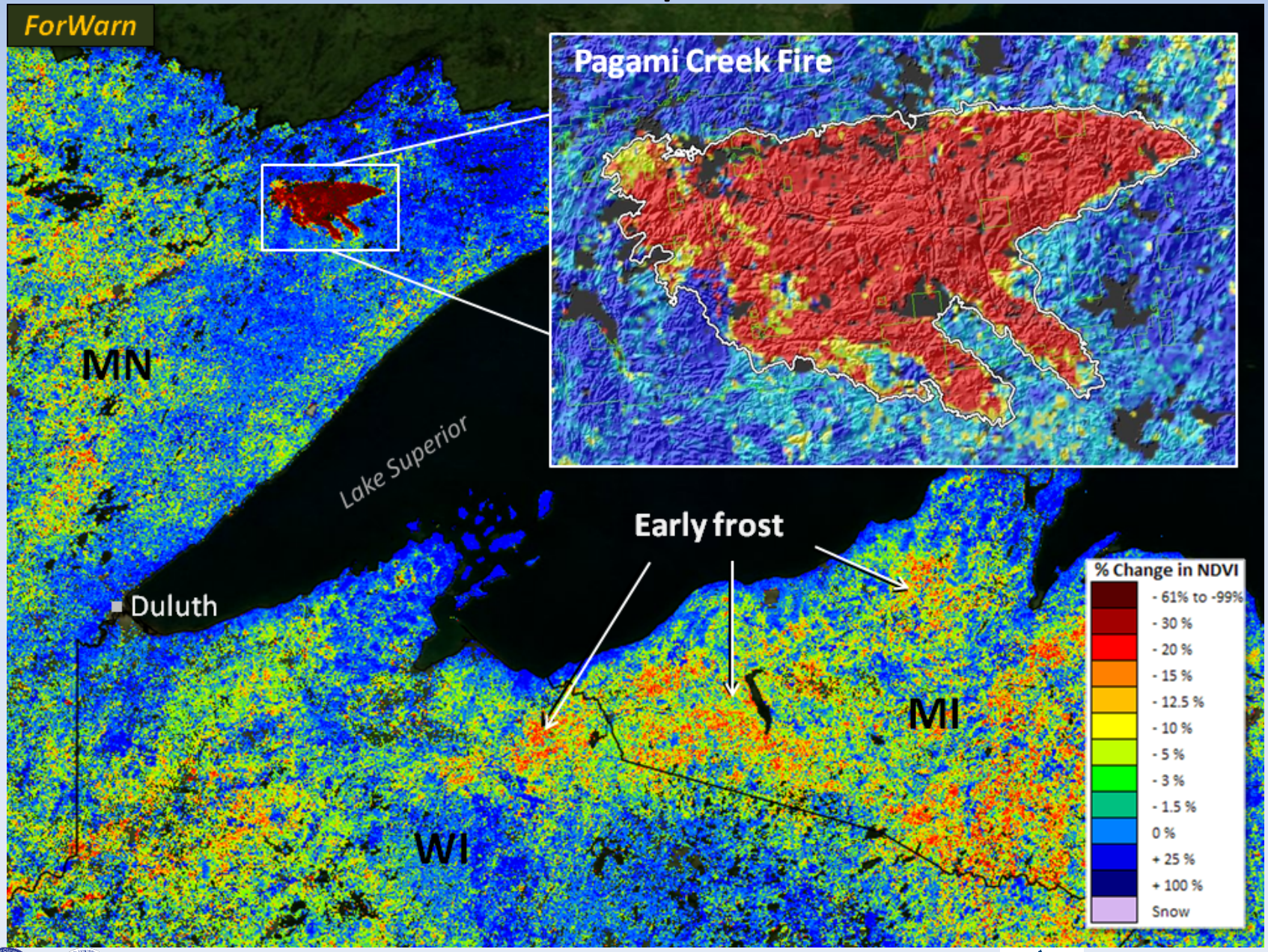


Storytelling on the web to support the GIS Viewer

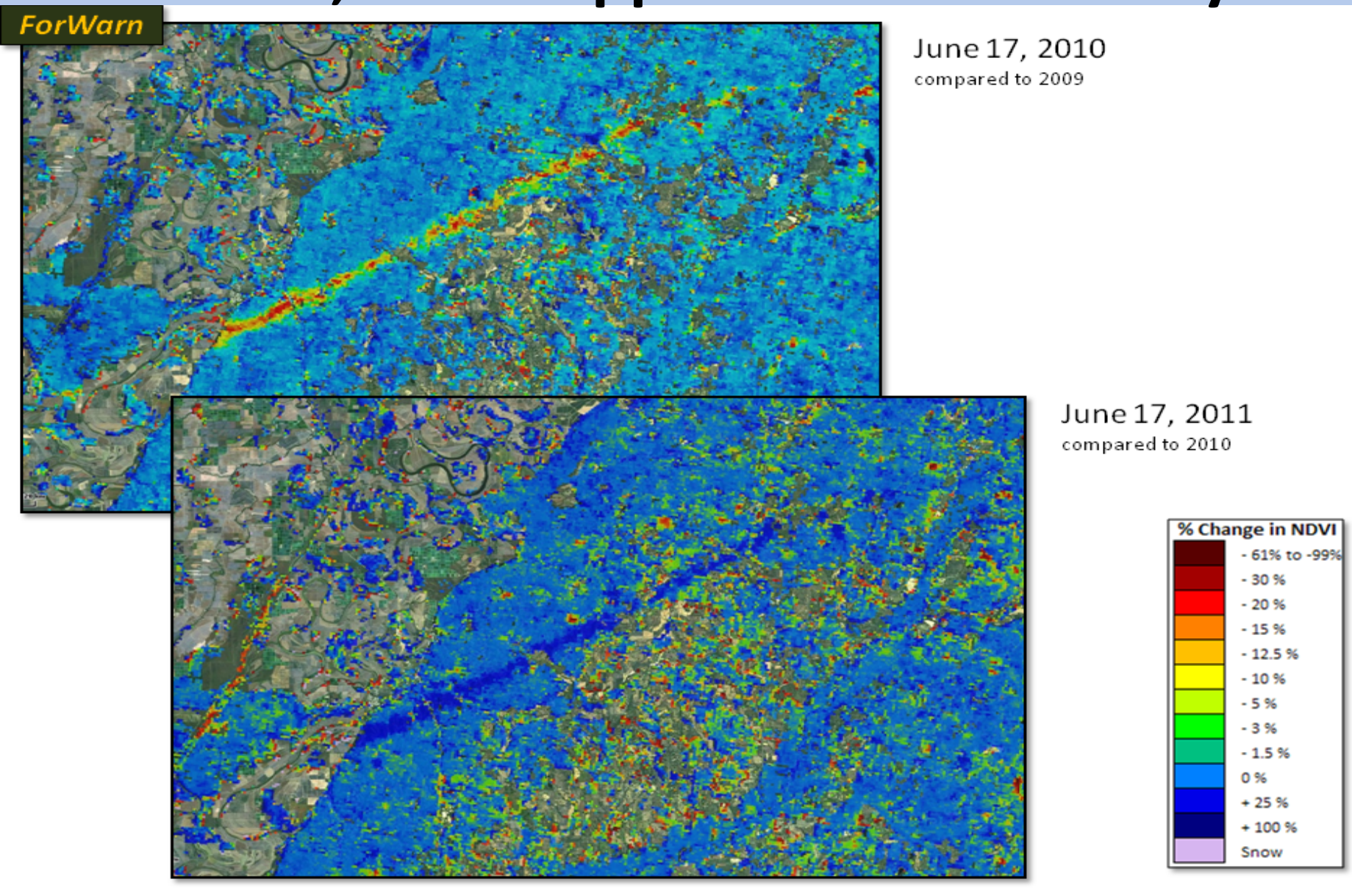
Lake-effect snow delays 2010 spring



Fire and Frost Impact – Fall of 2011

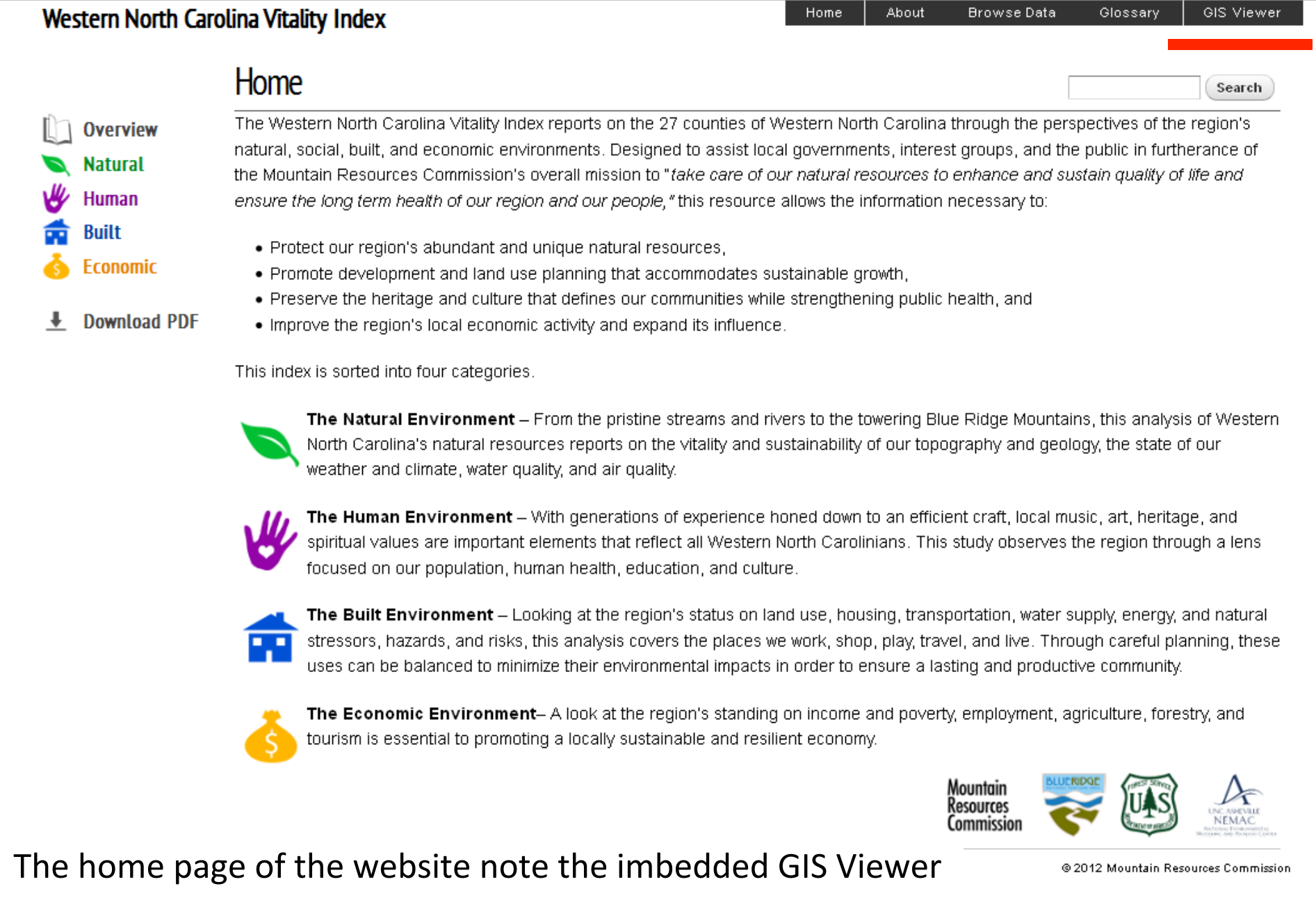


Yazoo, Mississippi Tornado Recovery

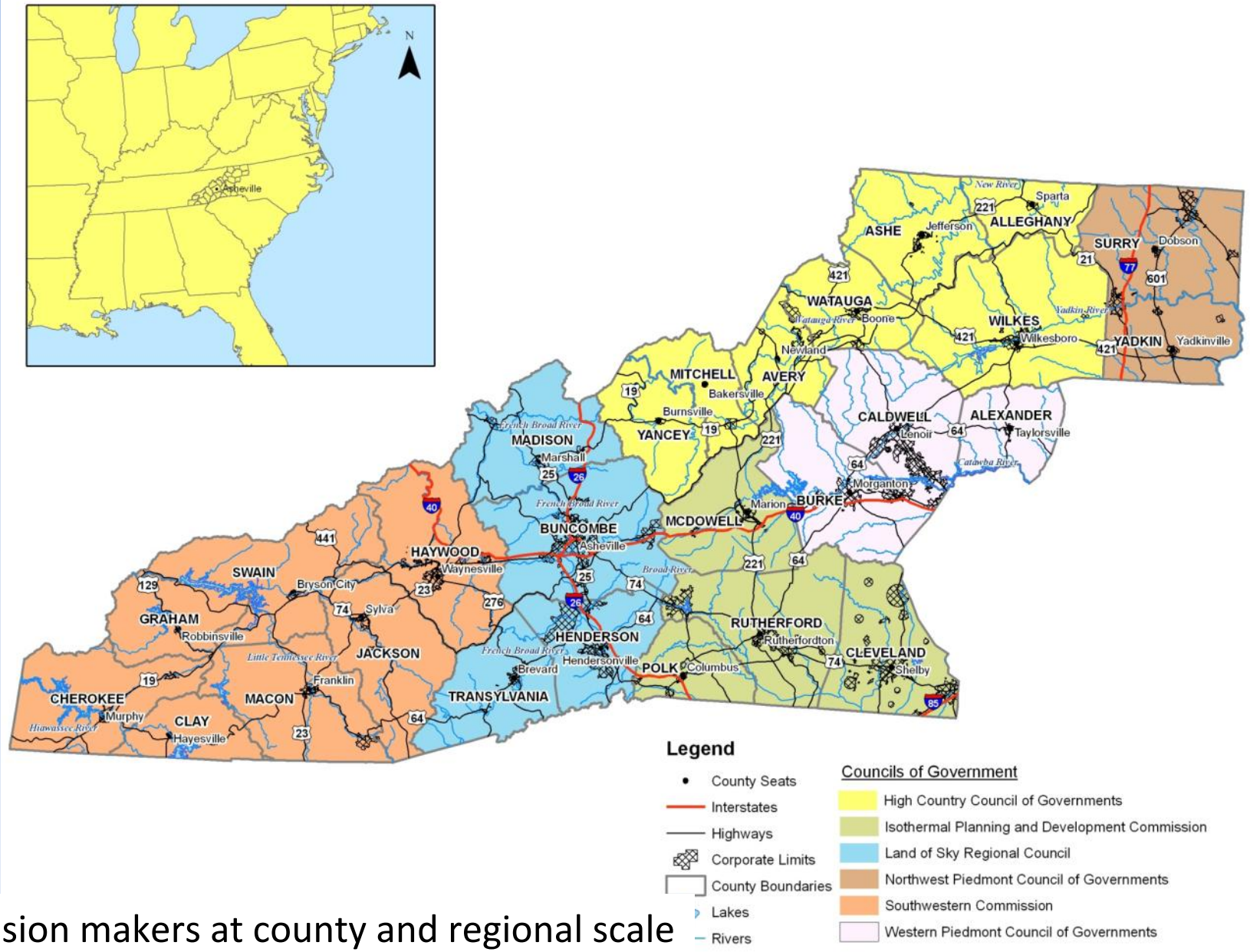


North Carolina Mountain Resources Commission
Vitality Index
www.wncvitalityindex.org

County Decision Makers needed some help – we provided an online tool with 160 metrics

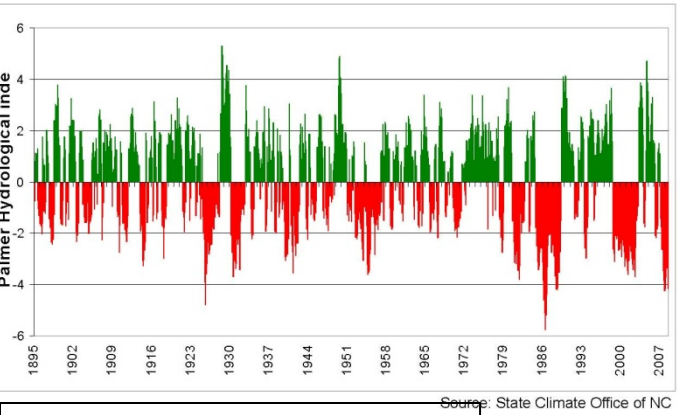


The home page of the website note the imbedded GIS Viewer



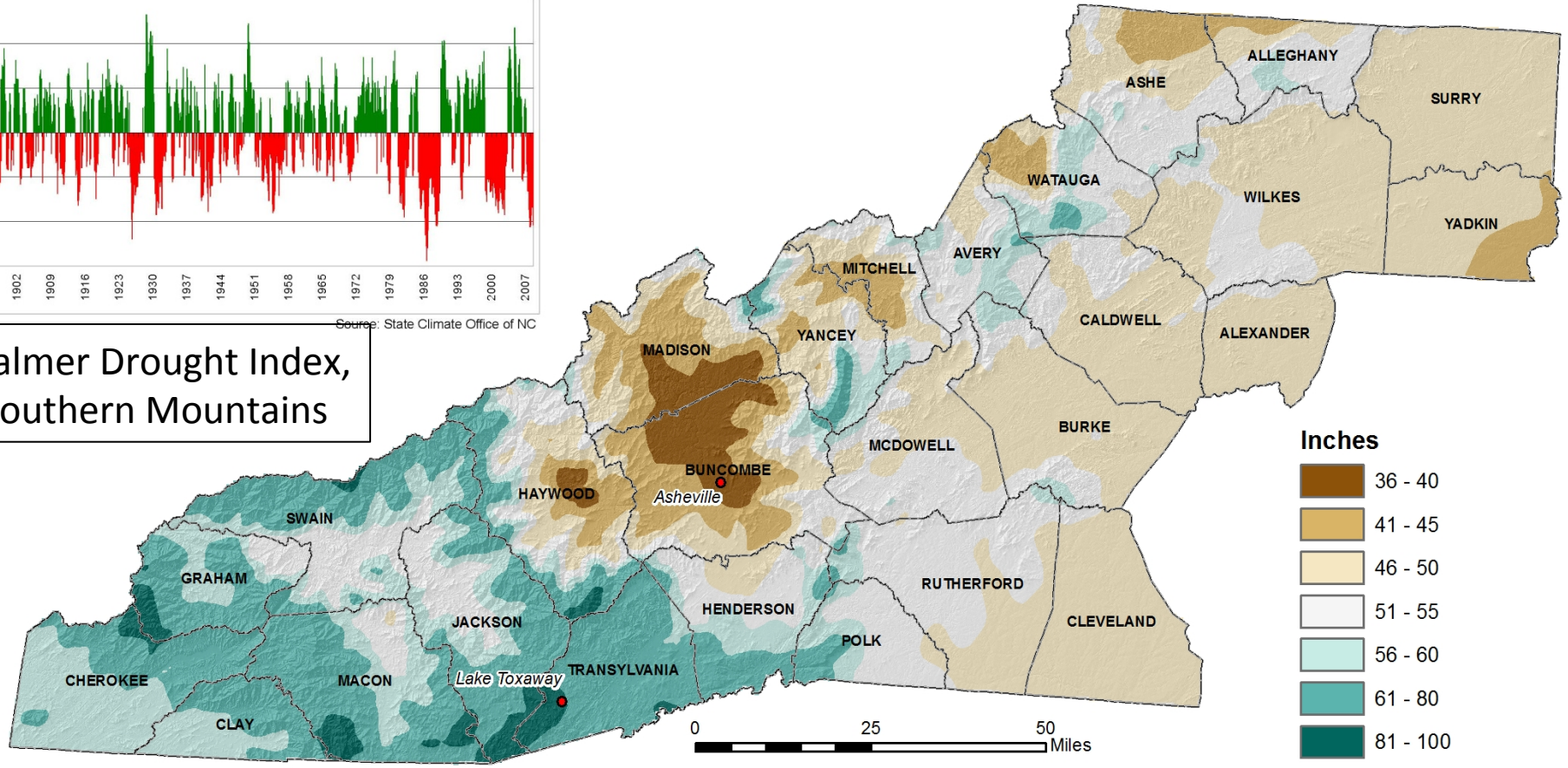
Decision makers at county and regional scale

Average Annual Precipitation (1981 - 2010)

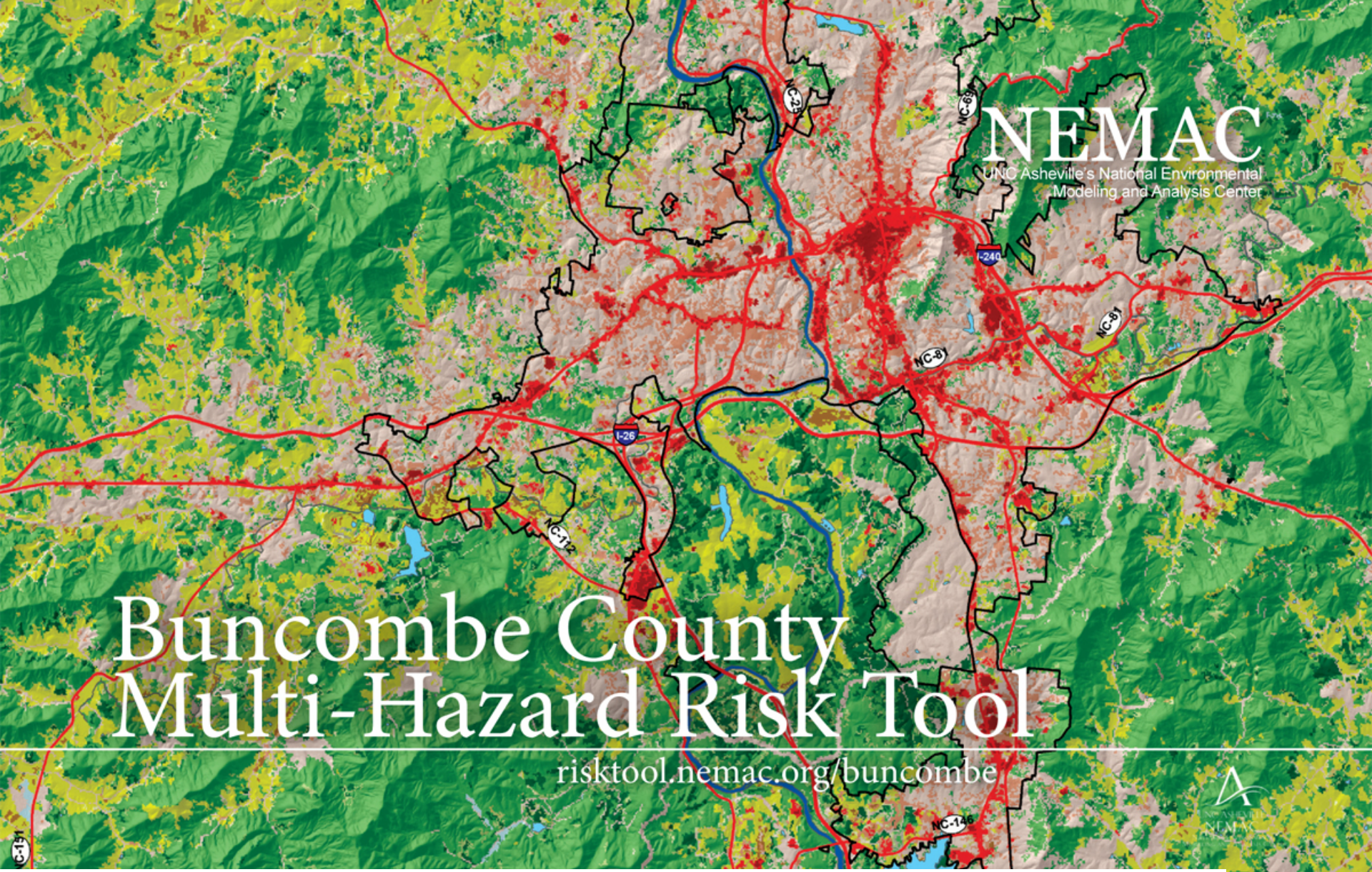


Source: State Climate Office of NC

Palmer Drought Index, Southern Mountains



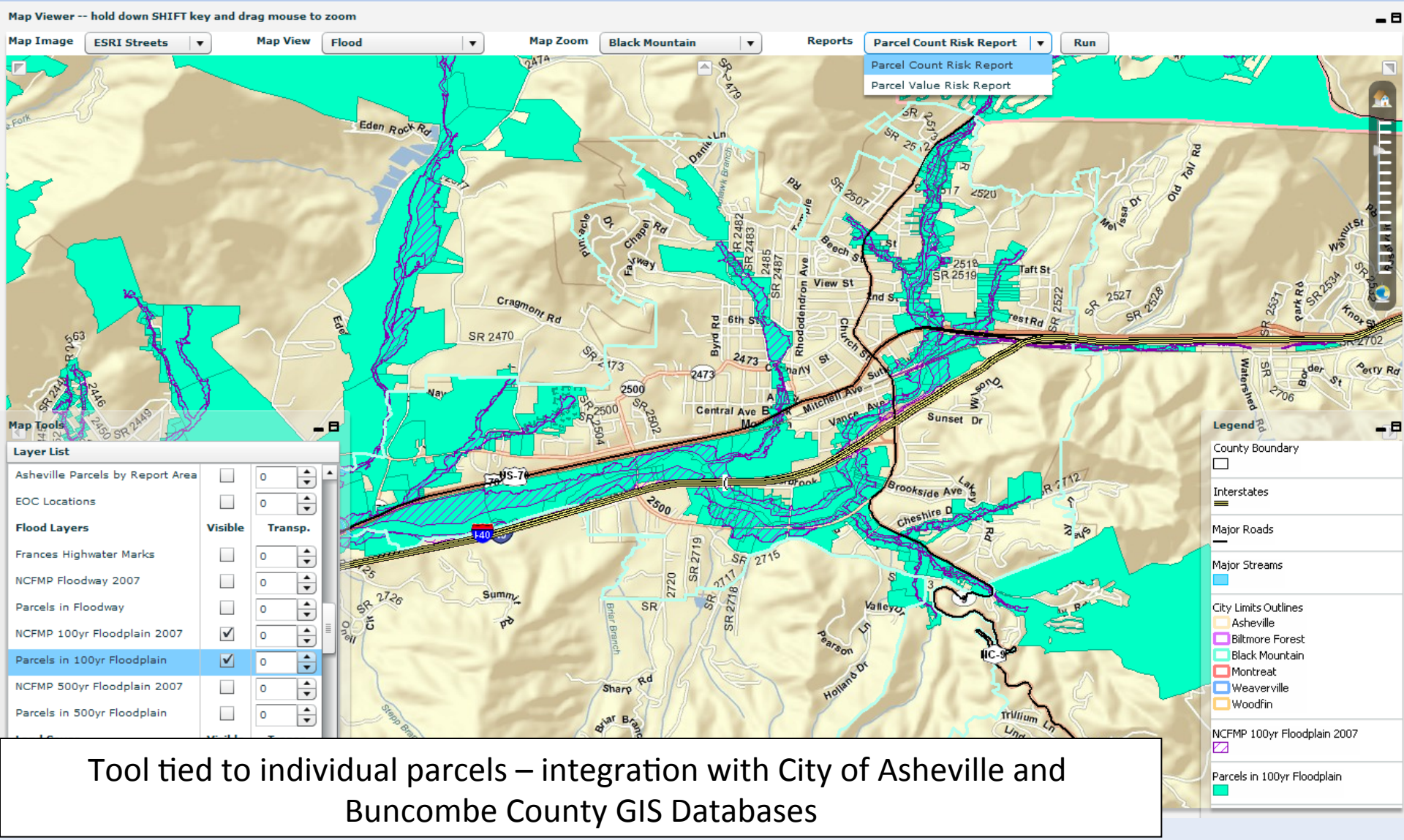
Regionally specific products aided by storytelling turns a map into a tool



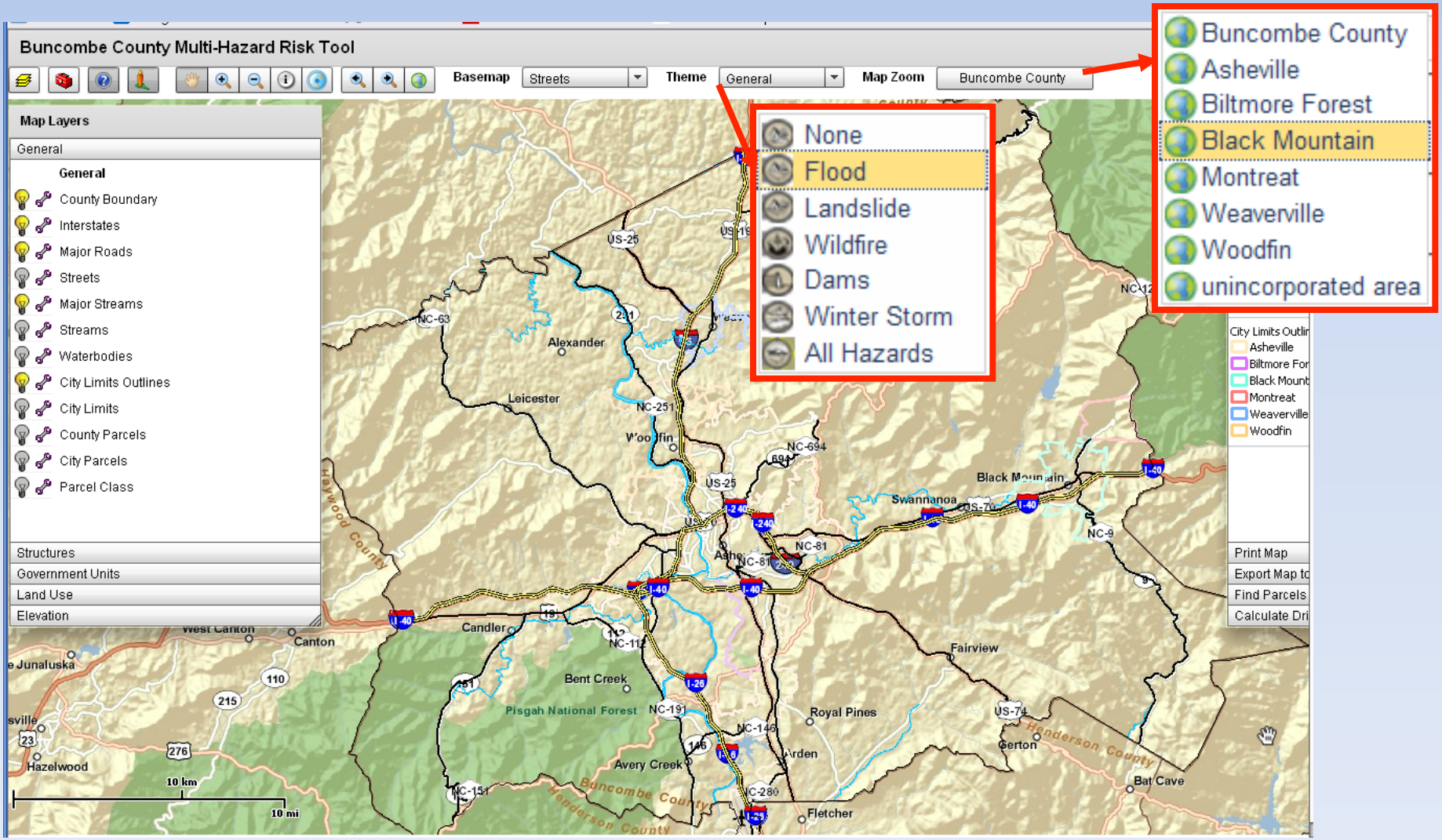
Emergency Managers needed an integrated decision tool for FEMA reporting

Multi-Hazard Risk Tool

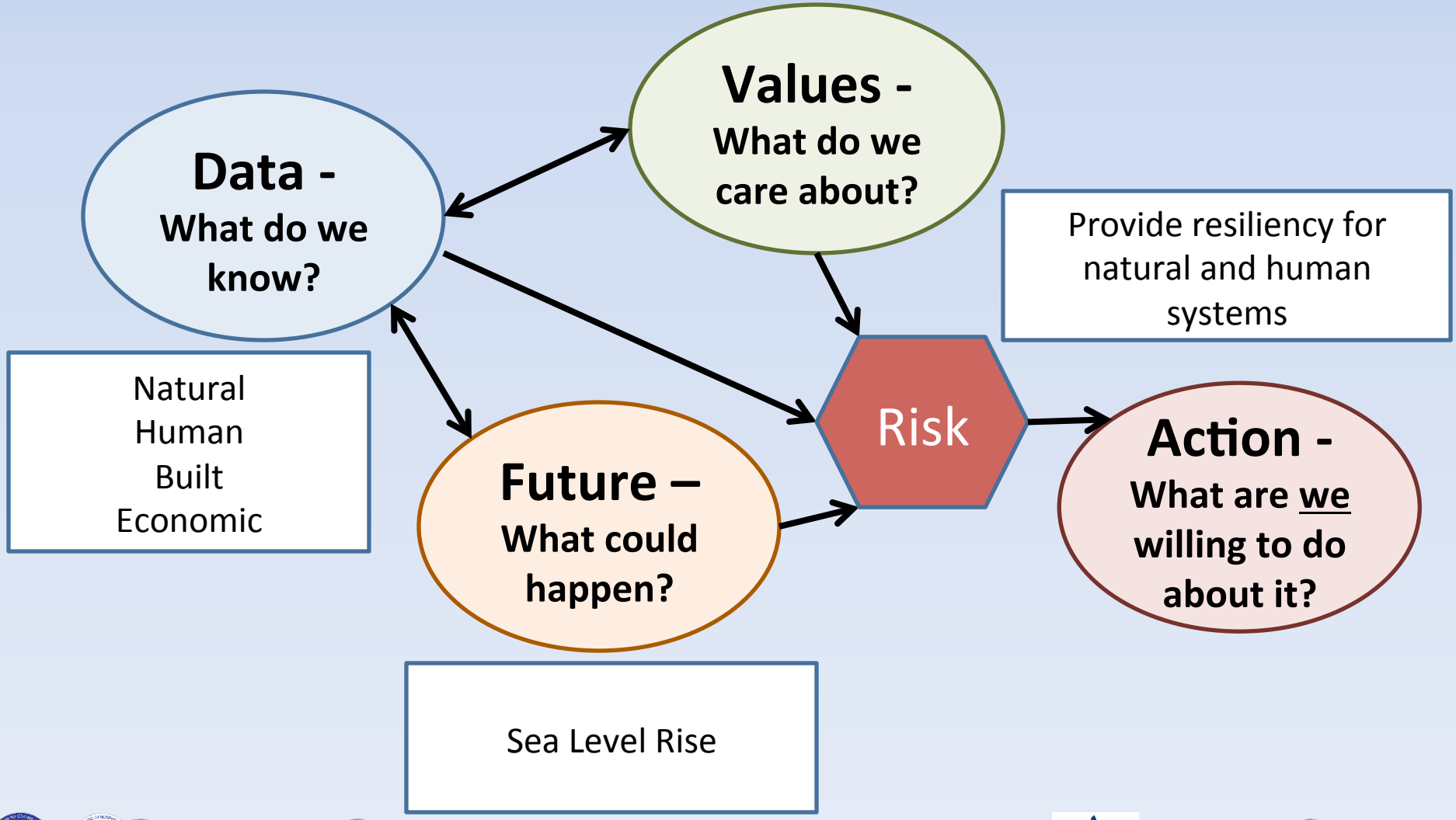
- **Purpose of study**: Tool for Emergency Managers that integrates
- **Decision**: How to plan for multiple risks including flooding, wildfire, landslides, winter storms, dam failure, etc.
- **Scale**: Buncombe County
- **Use of Climate Data**: Drought, flooding, precipitation, winter storm occurrence



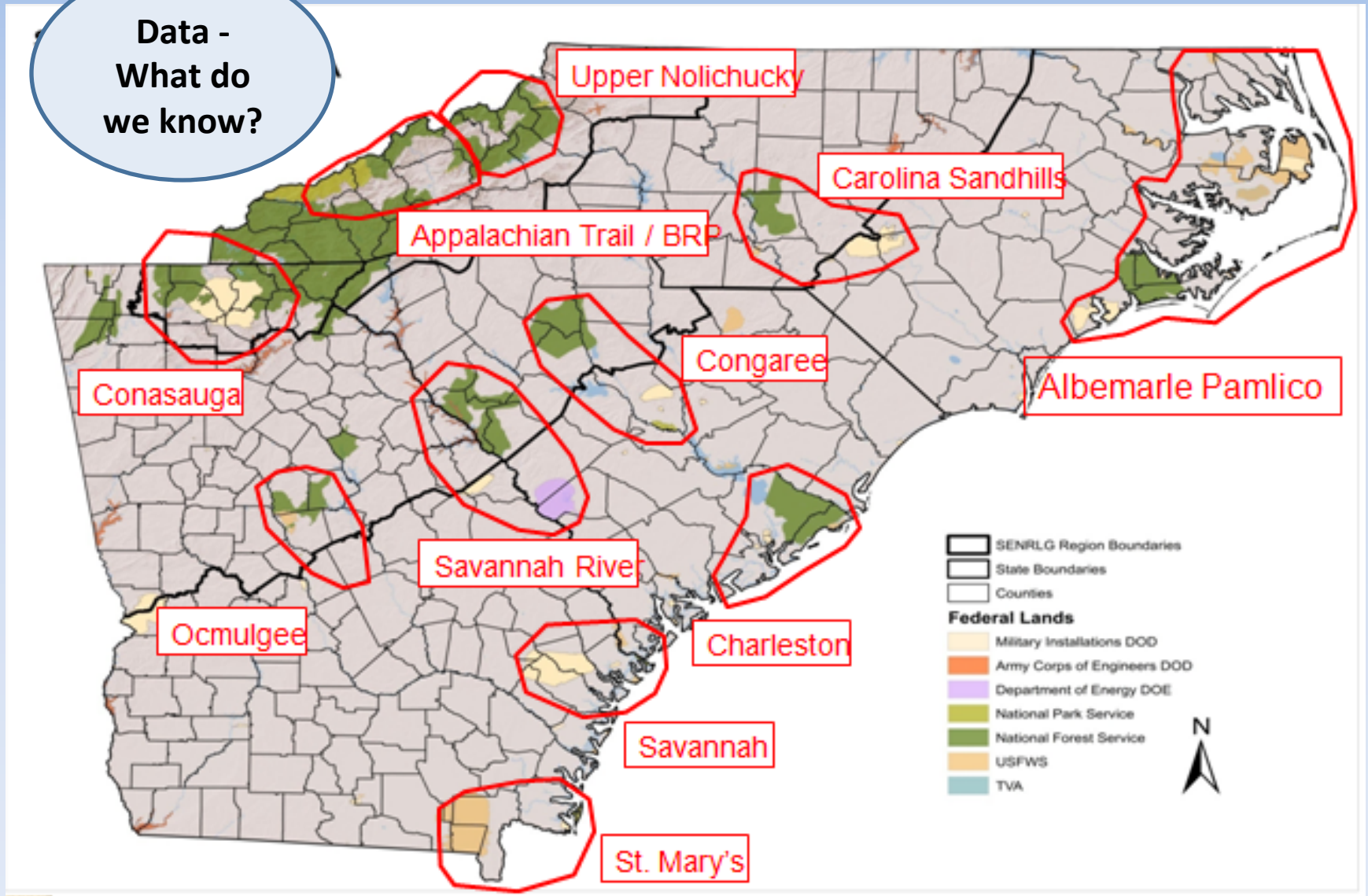
Tool tied to individual parcels – integration with City of Asheville and Buncombe County GIS Databases


Buncombe County Multi-Hazard Risk Tool
Basemap
Streets
Theme
General
Map Zoom
Buncombe County
Map Layers
General
General
County Boundary
Interstates
Major Roads
Streets
Major Streams
Streams
Waterbodies
City Limits Outlines
City Limits
County Parcels
City Parcels
Parcel Class
Structures
Government Units
Land Use
Elevation
None
Flood
Landslide
Wildfire
Dams
Winter Storm
All Hazards
Buncombe County
Asheville
Biltmore Forest
Black Mountain
Montreat
Weaverville
Woodfin
unincorporated area
City Limits Outlin
Asheville
Biltmore For
Black Mount
Montreat
Weaverville
Woodfin
Print Map
Export Map to
Find Parcels
Calculate Dri
Alexander
Leicester
Woodfin
Swannanoa
Black Mountain
Asheville
Candler
Canton
West Canton
Junaluska
Bent Creek
Pisgah National Forest
Fairview
Royal Pines
Arden
Avery Creek
Hazelwood
Gerton
Bat Cave
Fletcher
Haywood County
Buncombe County
Henderson County
10 km
10 mi

Albemarle Pamlico Sea Level Rise

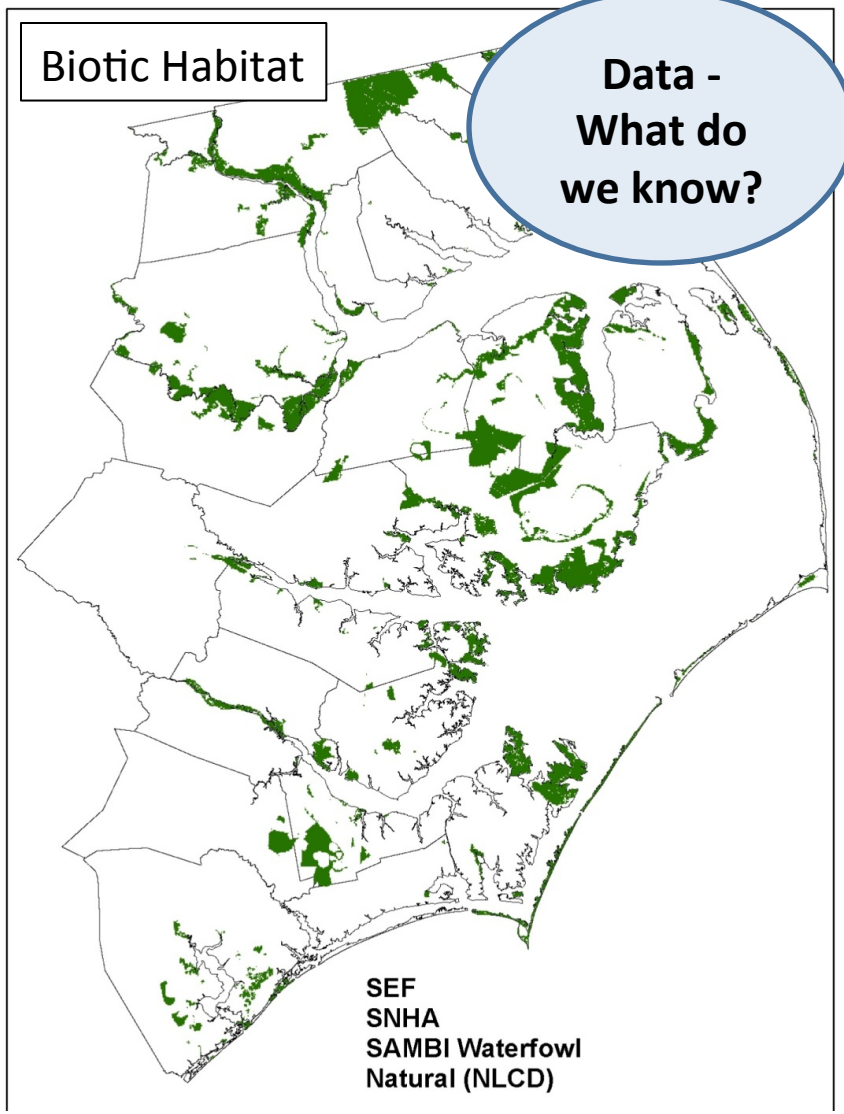


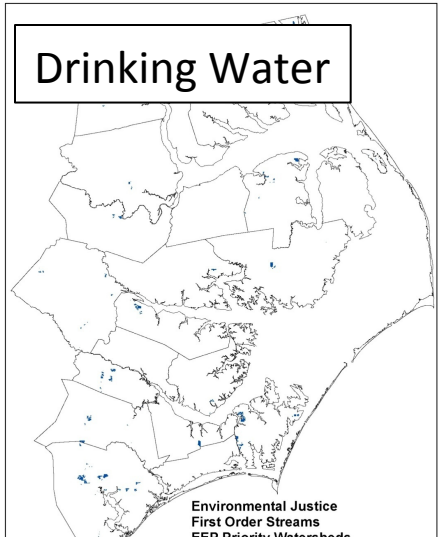
Data - What do we know?

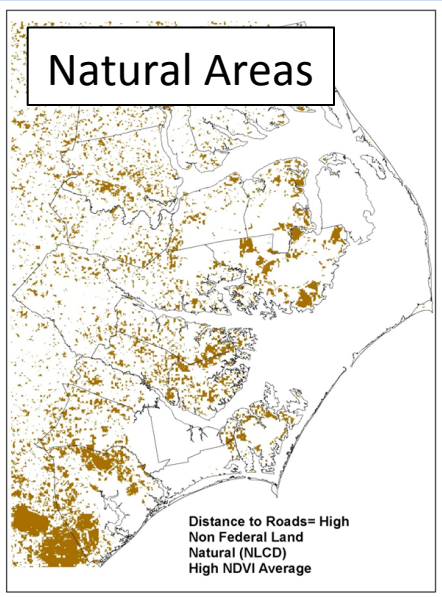


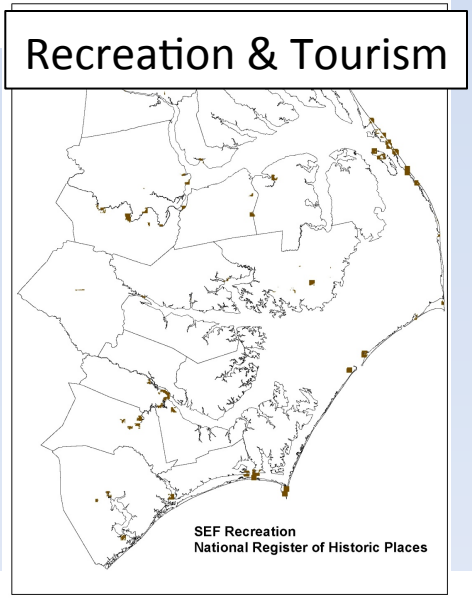
During the first phase of the study, areas that will be impacted by climate change were identified

Maps are important, but facilitation leads to decision making in group settings







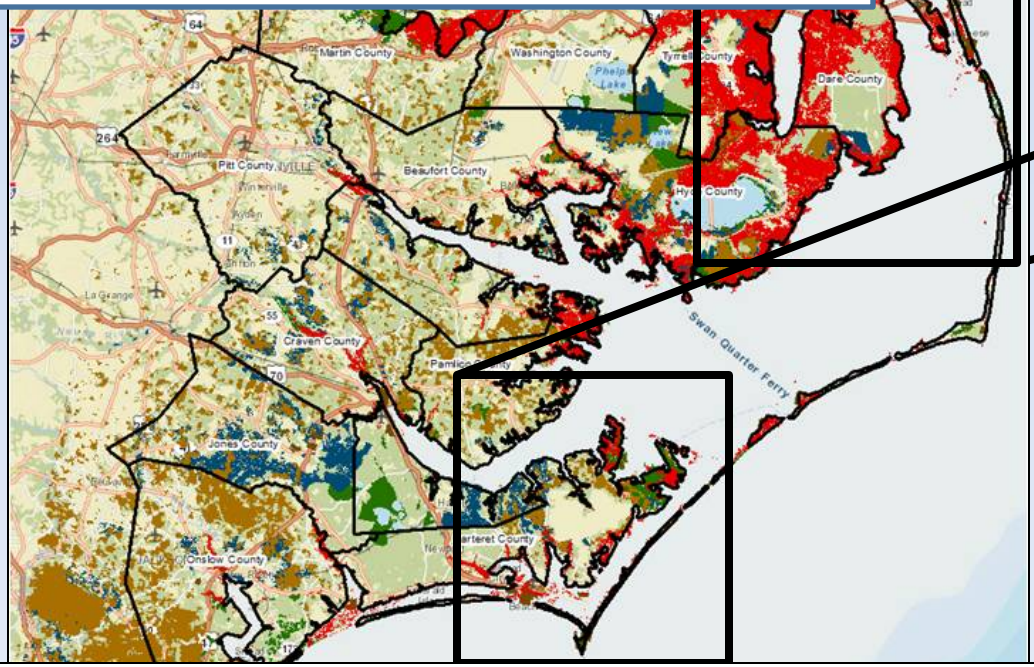


During the second phase, key value drivers for the 12 Federal Agencies were mapped: 1) Biotic Habitat, 2) Natural Areas, 3) Drinking Water, and 4) Recreation & Tourism

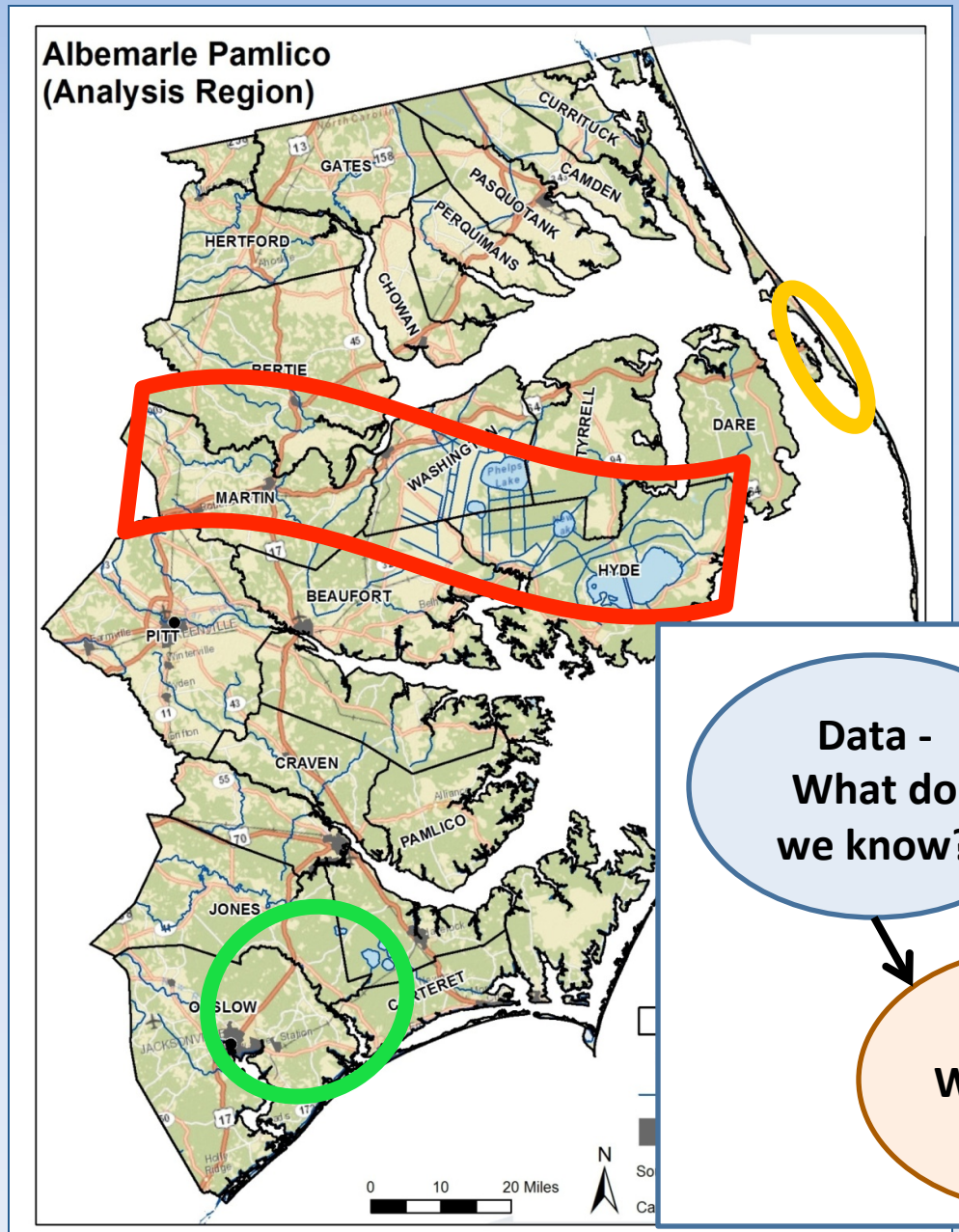
Data - What do we know?

Values - What do we care about?

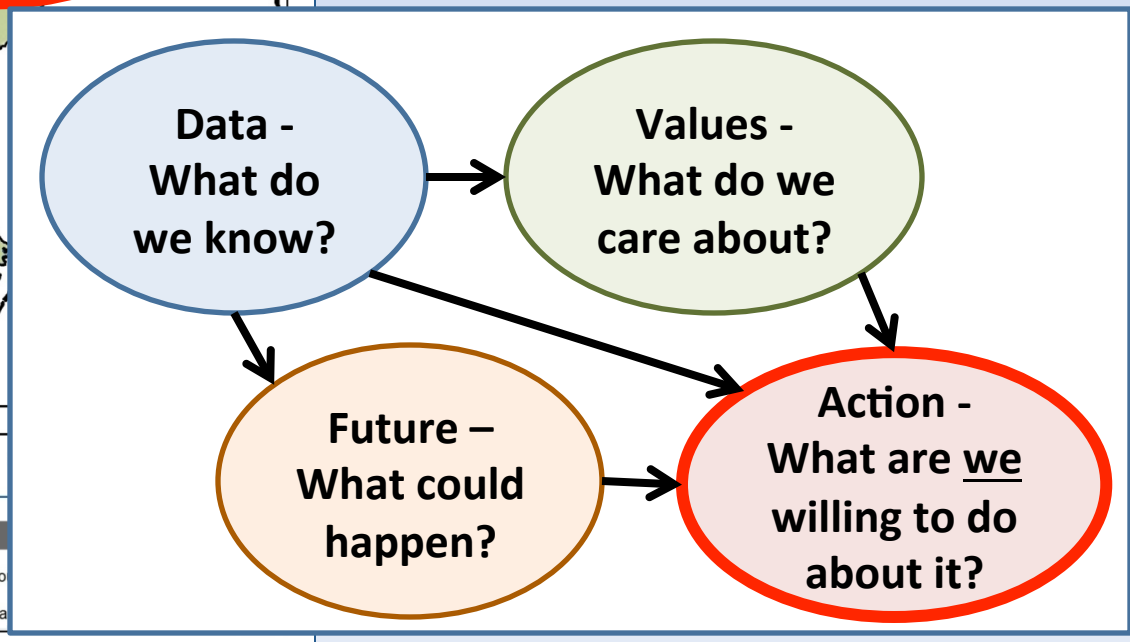
Future – What could happen?



Combined Stories with Sea Level Rise Scenarios



Three Prioritized Areas for **Action** – areas where the agencies are more likely to match local dollars to build resilience.



Summary

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  - Freeze and thaw impacts on mobility and design
- Non-climate issues add to sensitivity
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  - Population and demographic changes, Economic Issues
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Questions?

Jim Fox
jfox@unca.edu