

Forest Service Planning Rule Science Panel:

Landscape Level Planning Using current science to plan, manage and measure at the landscape scale

Water and Climate Change at the Landscape Level

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Presentation Objectives

- Discuss how the Forest Service can use current science to plan, manage, and measure the effects of climate change on water at the landscape level across multiple ownerships.
- Discuss ways this information can be incorporated into a clear, effective, efficient planning rule.



Measuring, Monitor and Planning for Climate Change Impacts on Water Availability at the Landscape Level

Consideration 1. If we only focus on climate change controls on water resources, the forest plan will fail

Consideration 2. If we consider water as a stand alone ecosystem service, the forest plan will fail

Fortunately, the Forest Service already has tools to address these issues

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Considerations for a Successful Forest Plan

- Include factors other than climate that control water availability at the landscape scale
 - Population change
 - Change in seasonal timing of precipitation
 - Vegetation change
 - Other sector water demand
- Consider which other factors water management will impact at the landscape scale
 - Forest growth and carbon sequestration
 - Biodiversity



Fortunately, the Forest Service already has developed tools to address these issues

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Examples of Consideration 1. If we only focus on climate change controls on water availability, the forest plan will fail

Using the Water Supply Stress Index (WaSSI)

a landscape scale model for assessing multiple stress impacts on water availability developed by FS Hydrologist Dr. Ge Sun et al.

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Ecosystem vs. Human Water Use

Eastern US % Water Use



- People
- Ecosystems

Western US % Water Use



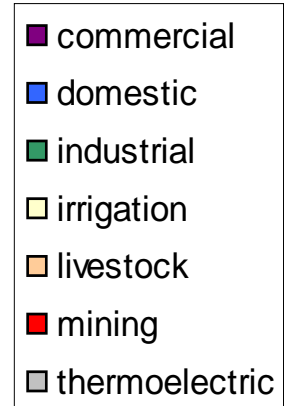
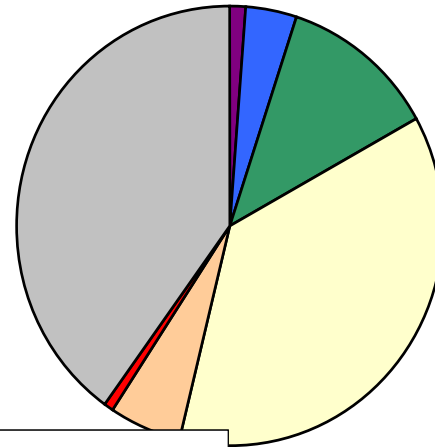
- People
- Ecosystems

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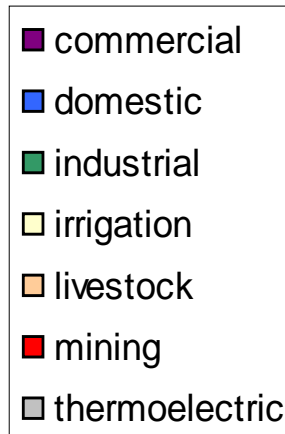
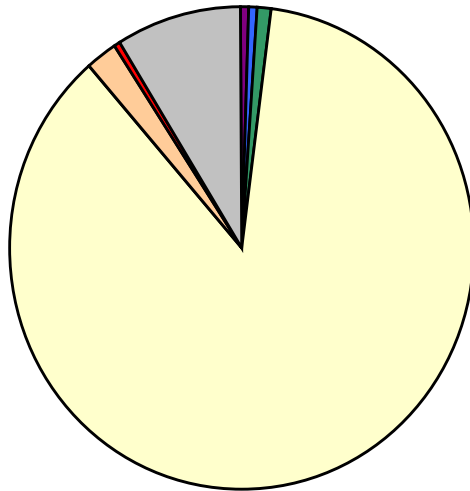


Water Withdrawal by Region

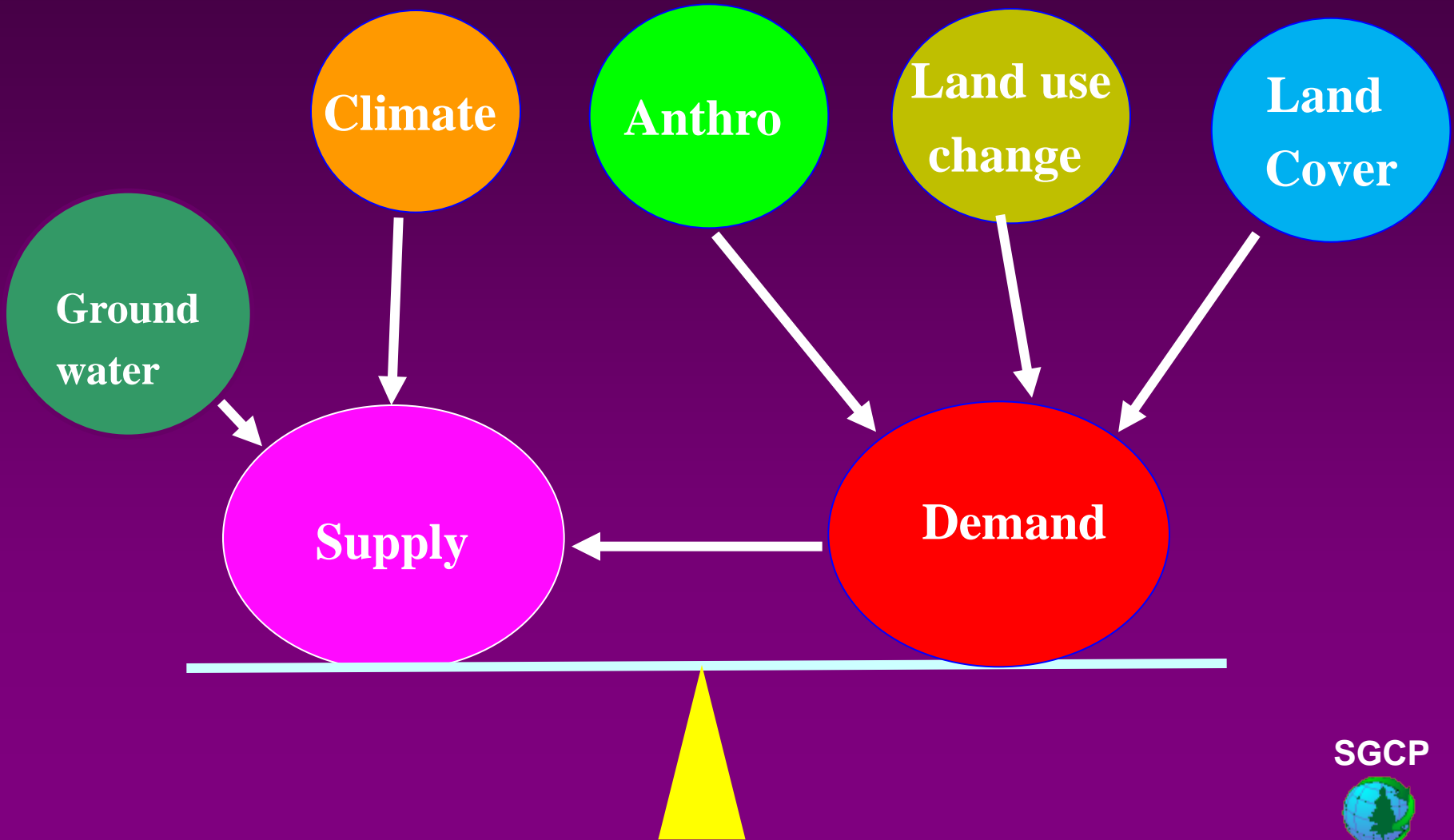
Eastern Relative Water Withdrawal



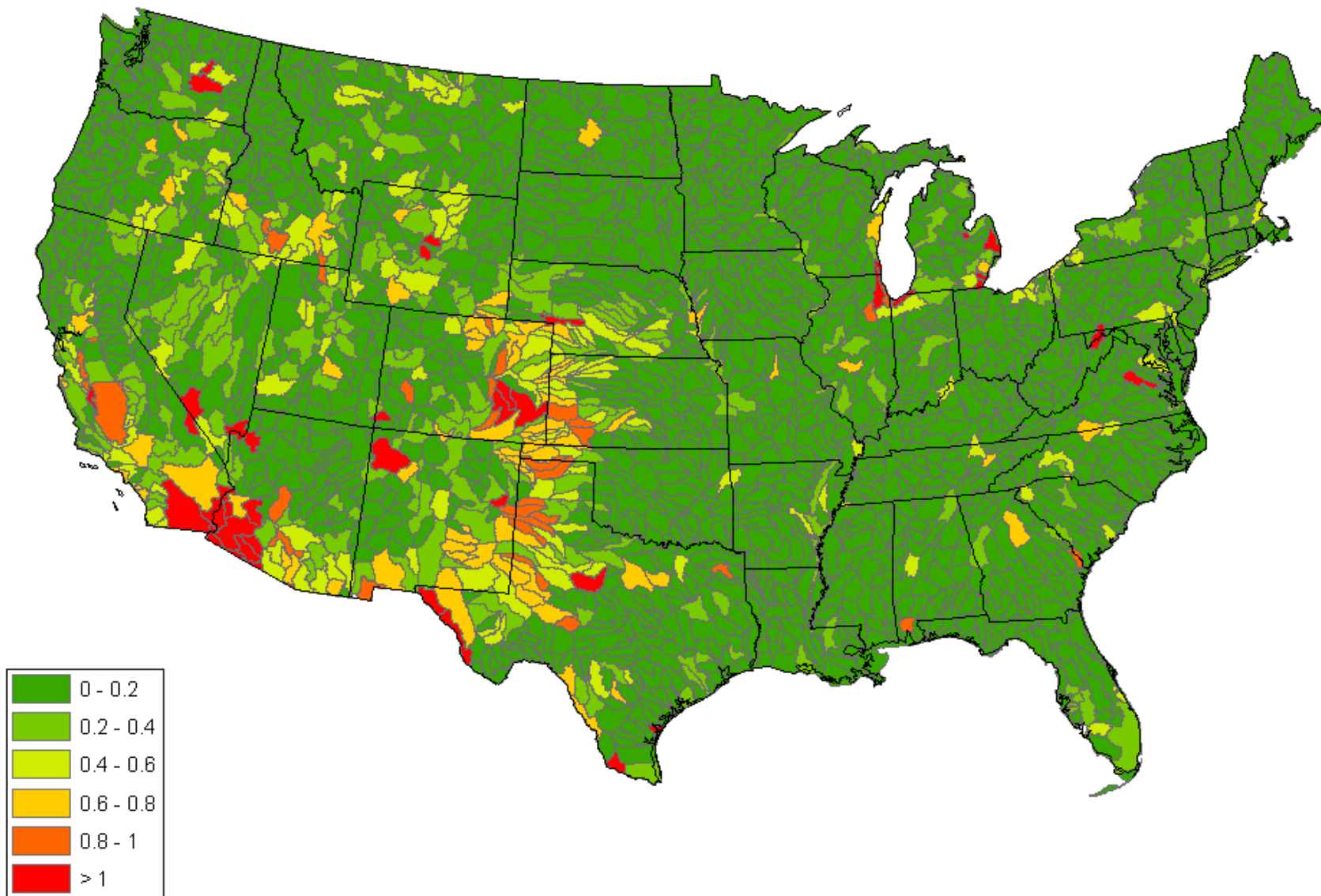
Western Relative Water Withdrawal



Conceptual Design of WaSSI

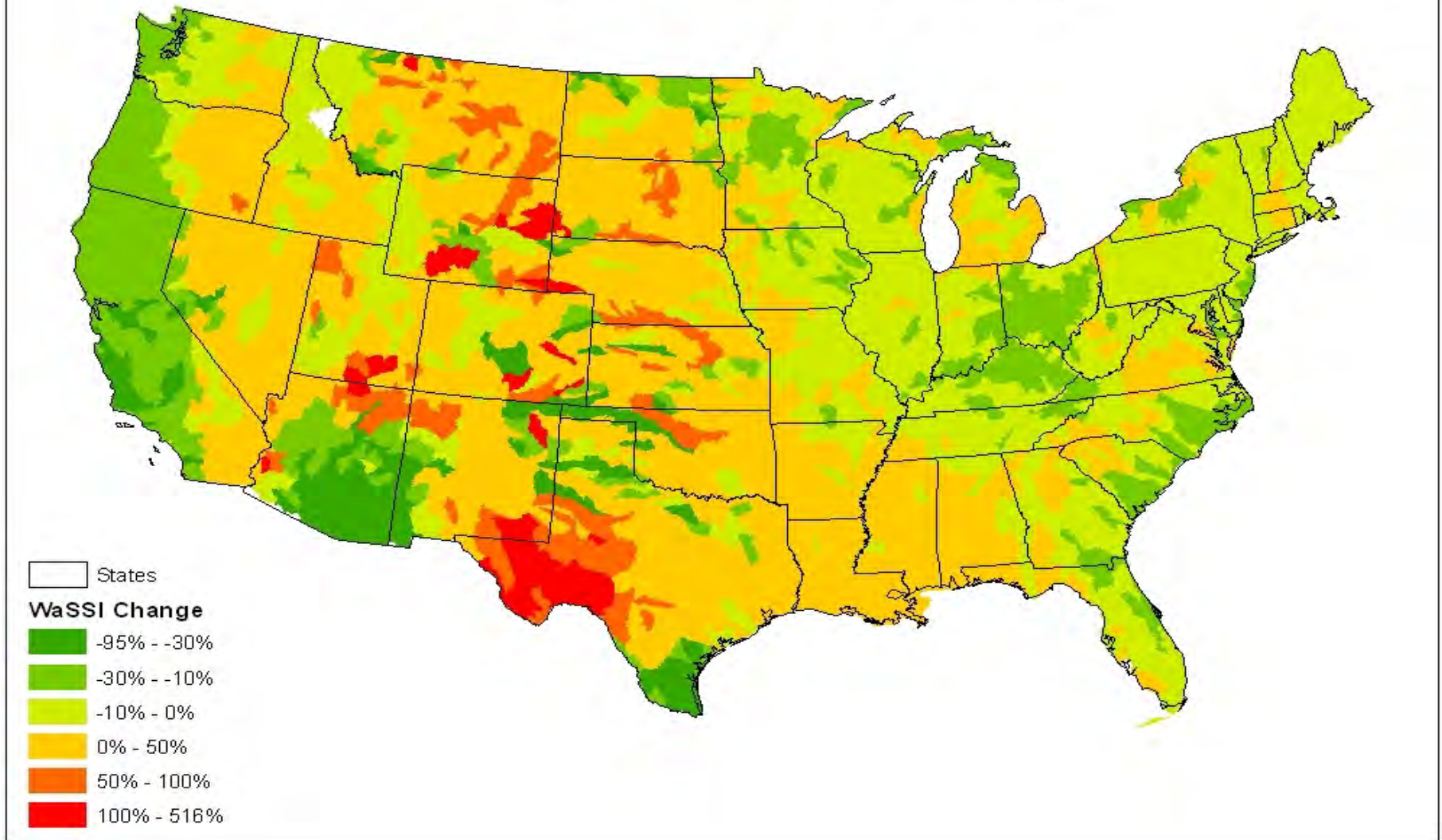


Average Annual WaSSI (1973-1993)



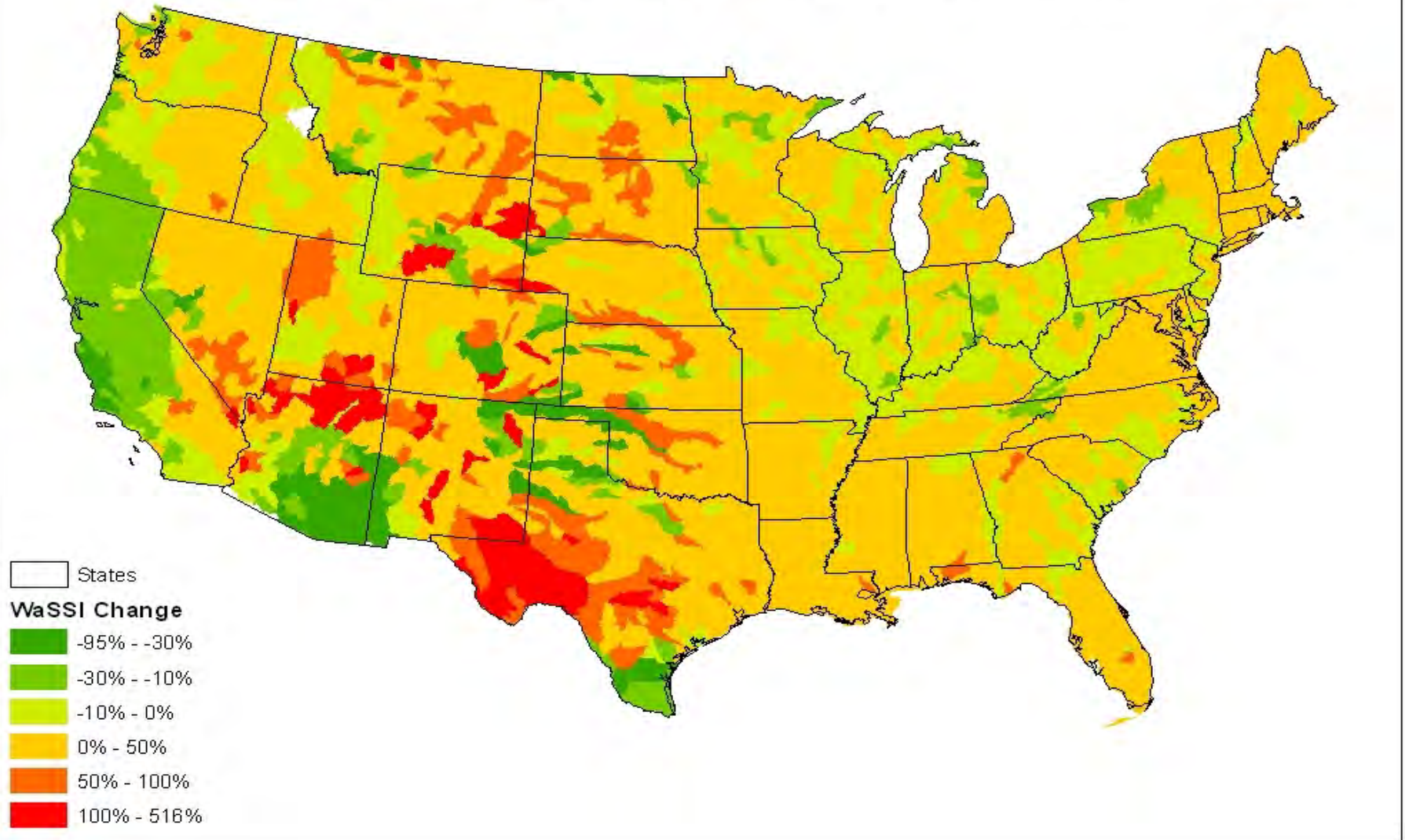
Climate Change Impacts on Water Supply

Impacts of Climate Change (Hadley 2)



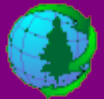
Climate and Population Change Impacts on Water

Impacts of Climate Change (Hadley 2) and Population Growth

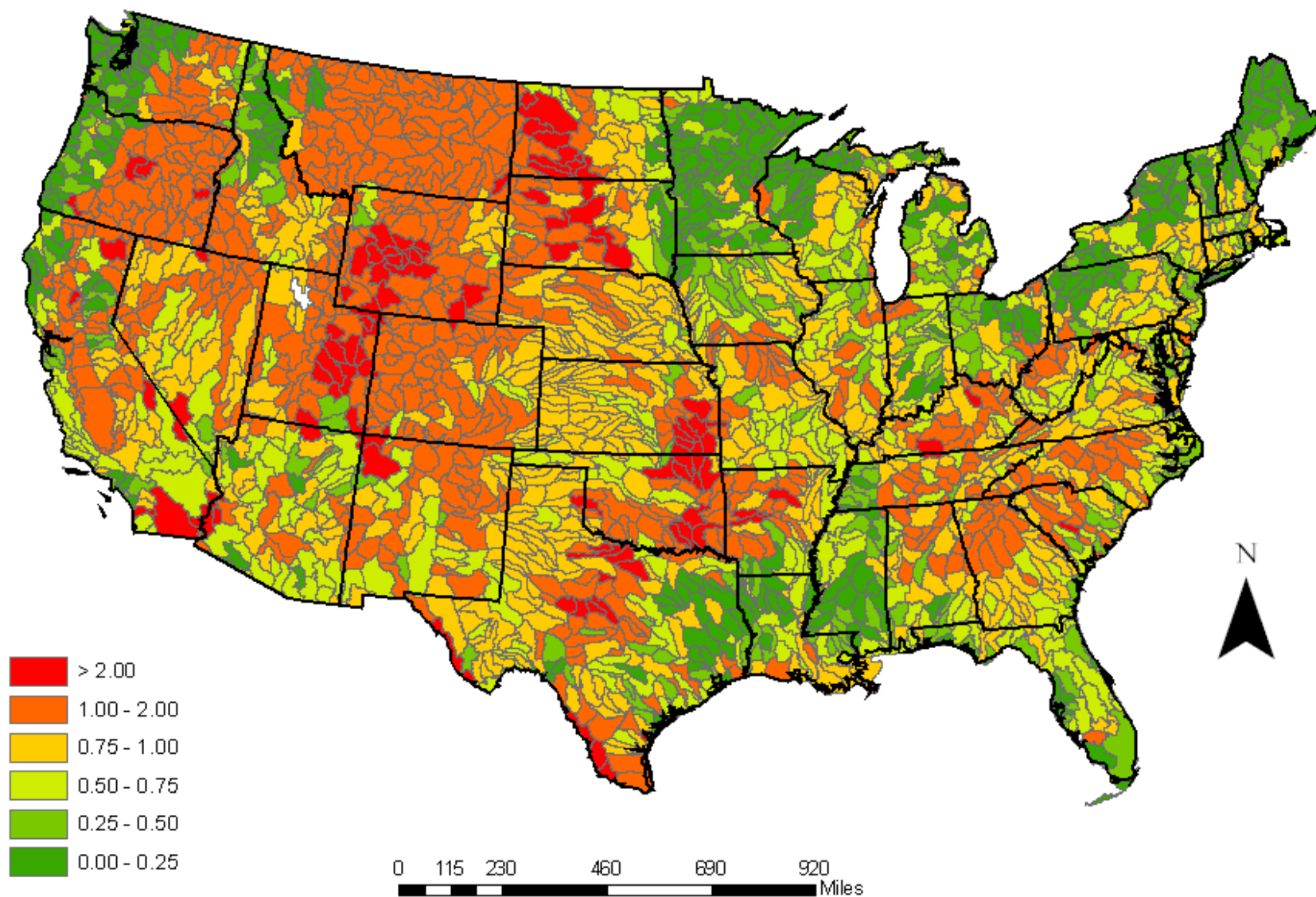


Climate Change and Groundwater Loss

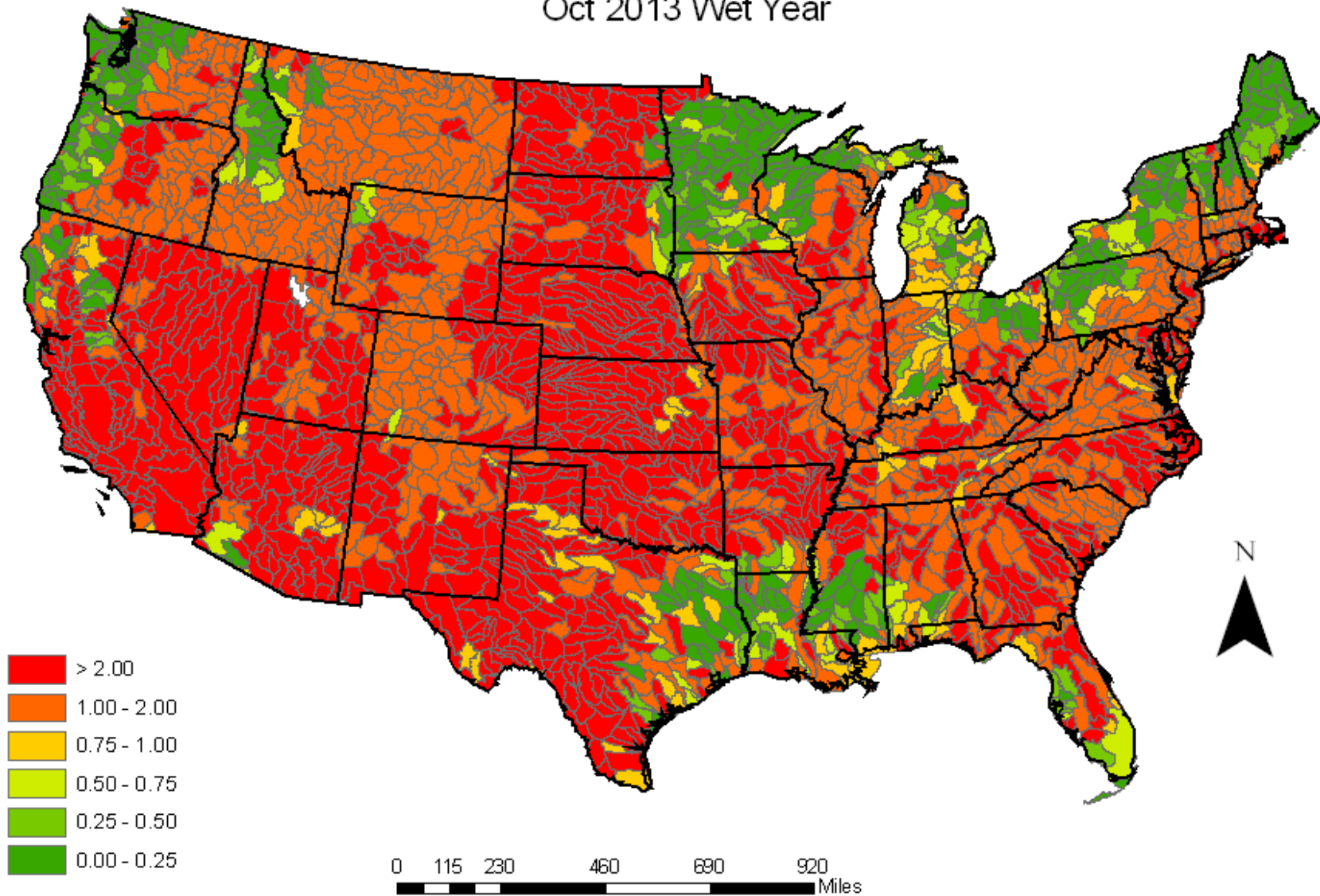
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Water Supply Stress Index Baseline Oct 2013 Wet Year



Water Supply Stress Index
No Groundwater
Oct 2013 Wet Year



Landuse and climate change interactions

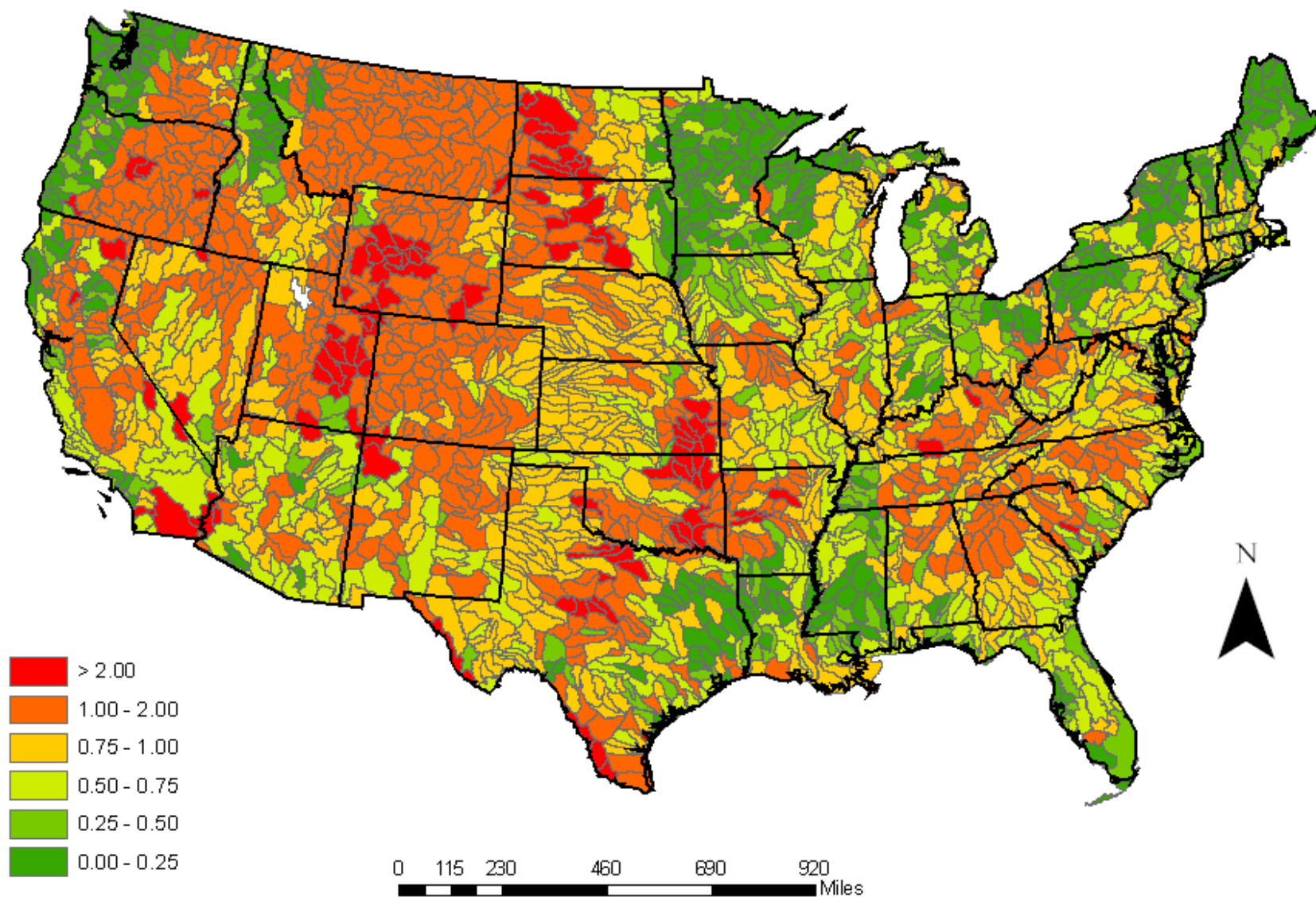


Irrigation

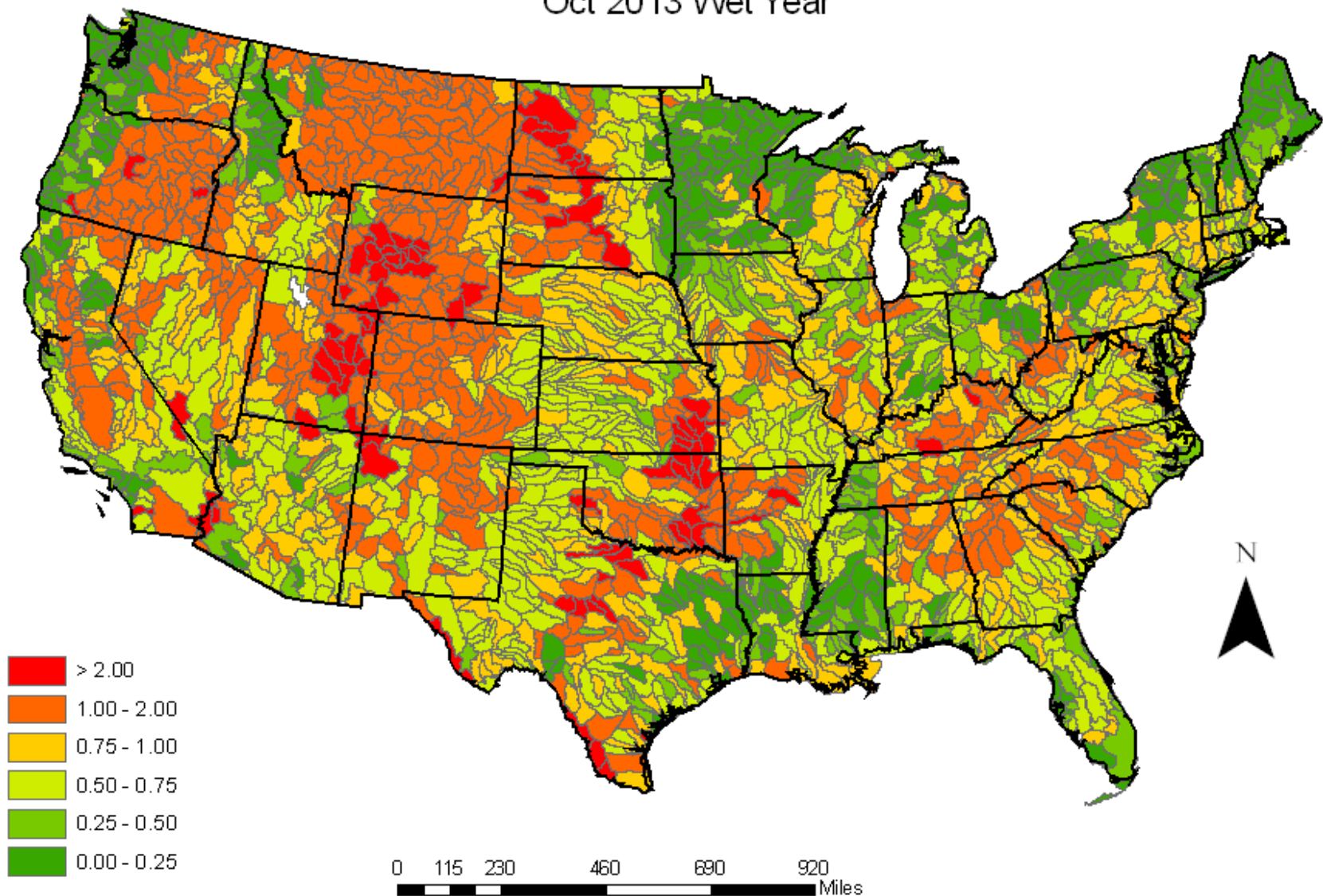
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Water Supply Stress Index Baseline Oct 2013 Wet Year



Water Supply Stress Index
Reduced Irrigation 20%
Oct 2013 Wet Year

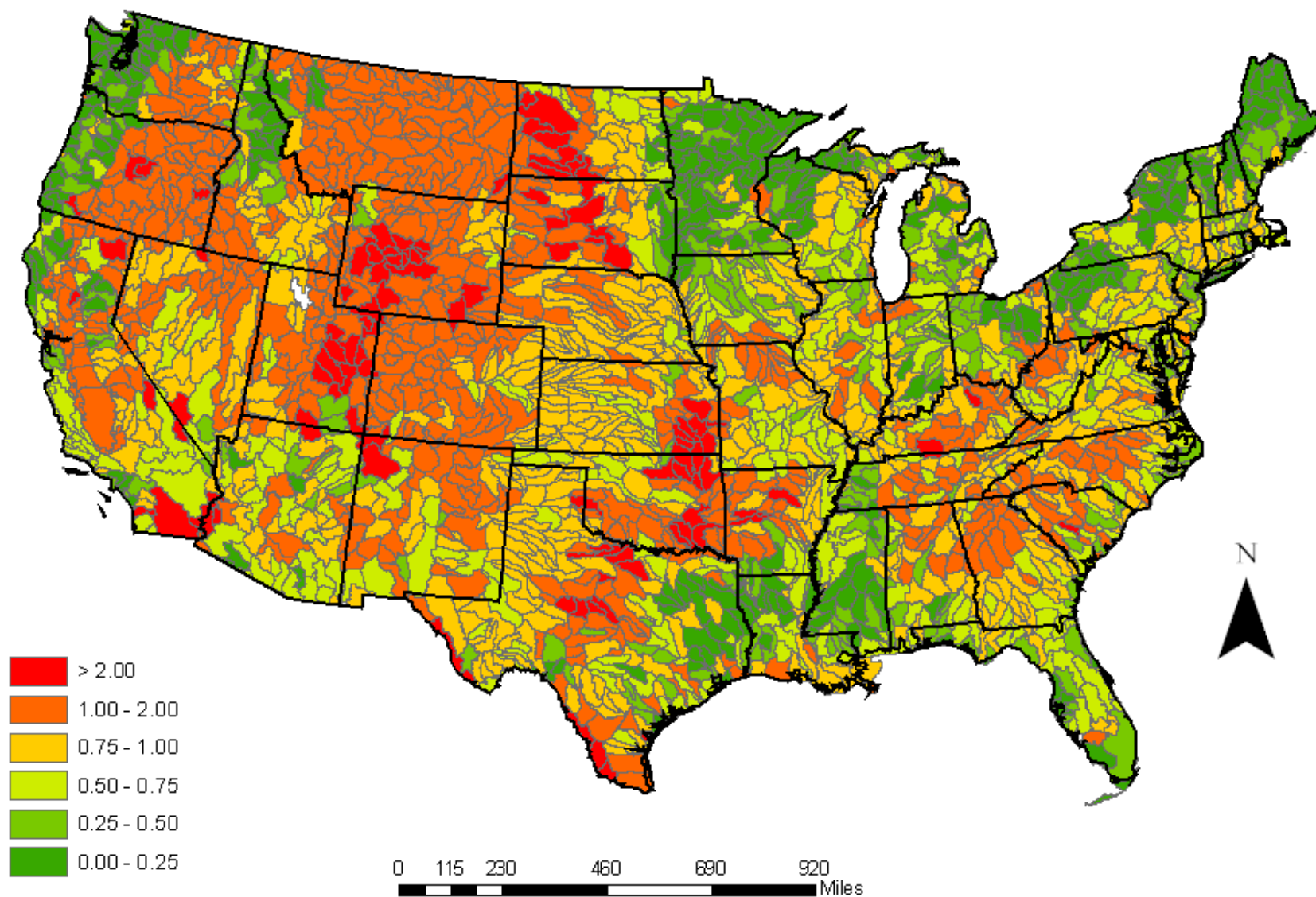


Deforestation

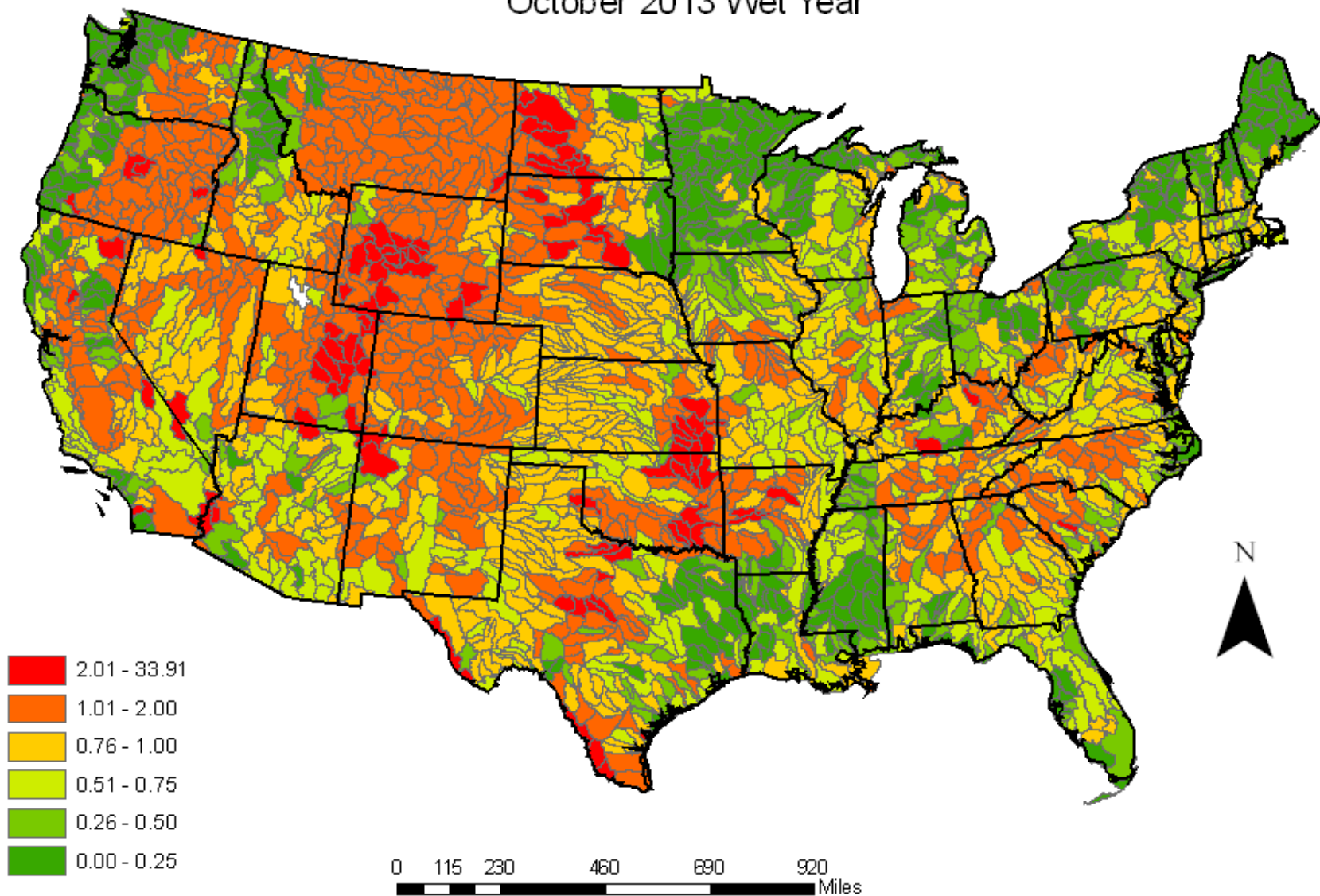
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Water Supply Stress Index Baseline Oct 2013 Wet Year

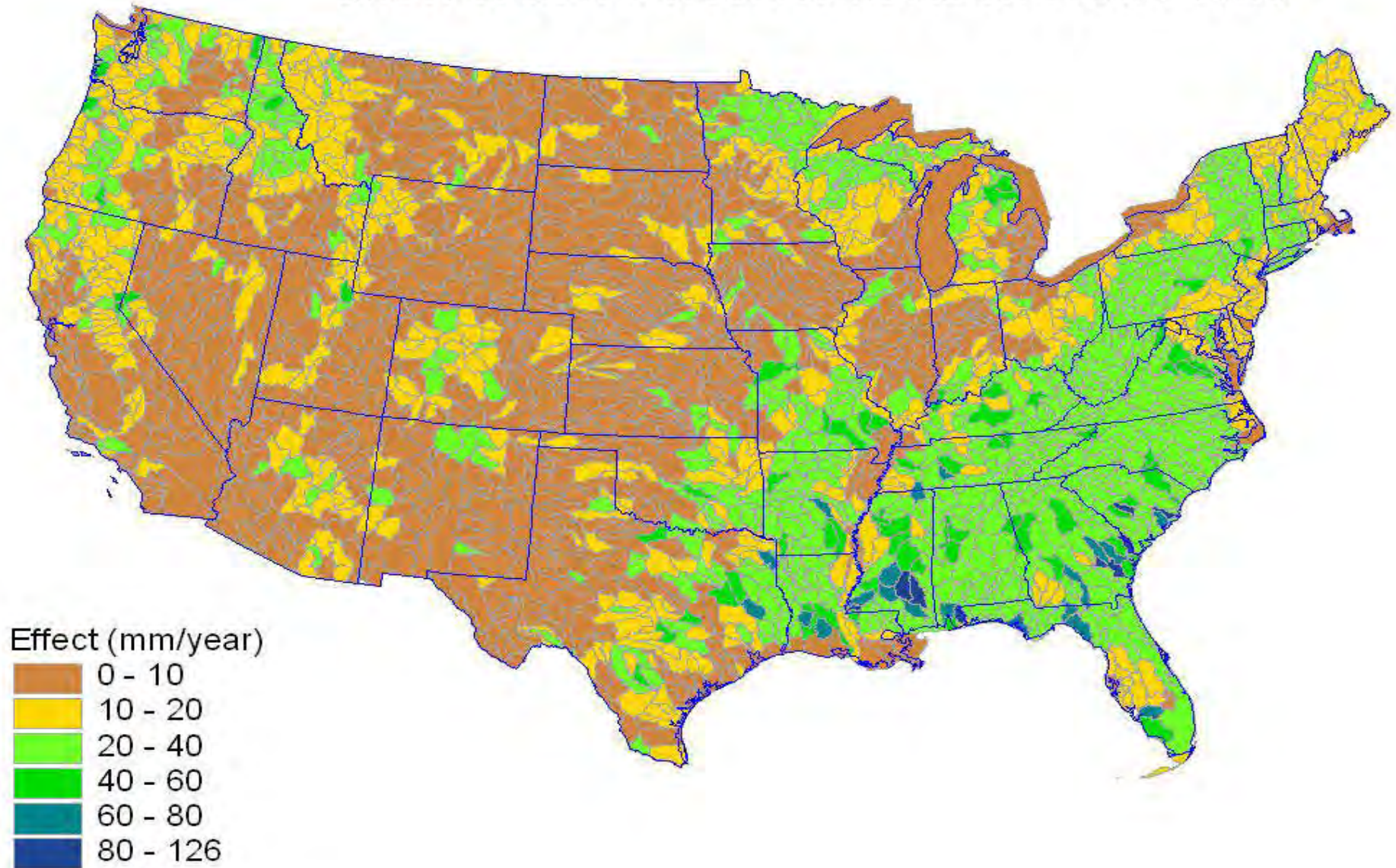


Water Supply Stress Index
Reduced Forest 20%
October 2013 Wet Year



Forest Management Impacts

Effect of 20% Forest Removal on Water Yield

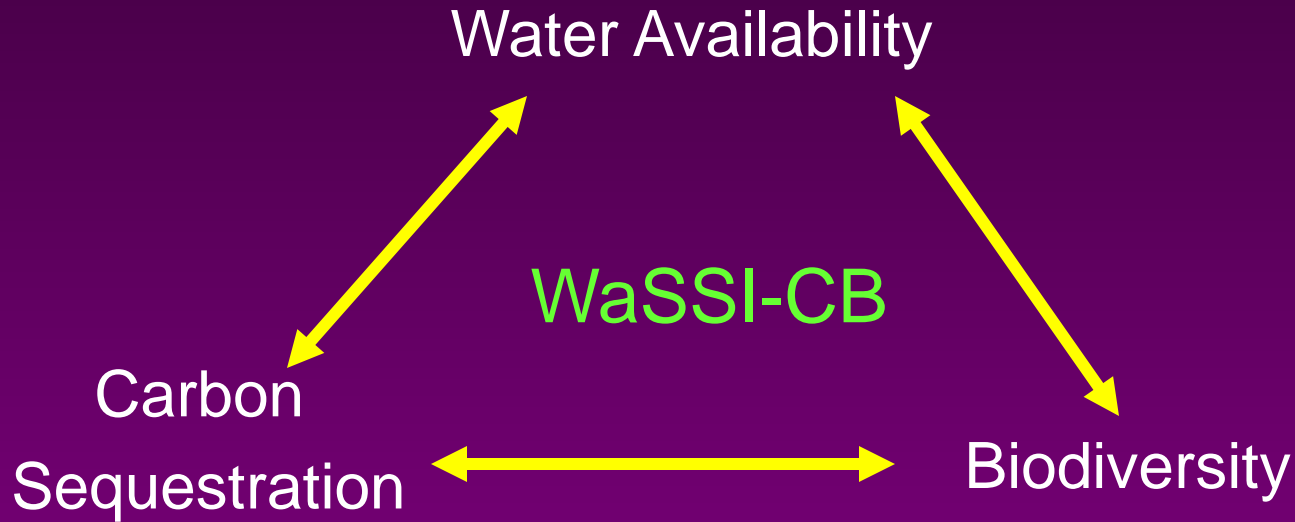


Examples of Consideration 2. If we consider water as a stand alone ecosystem service, the forest plan will fail

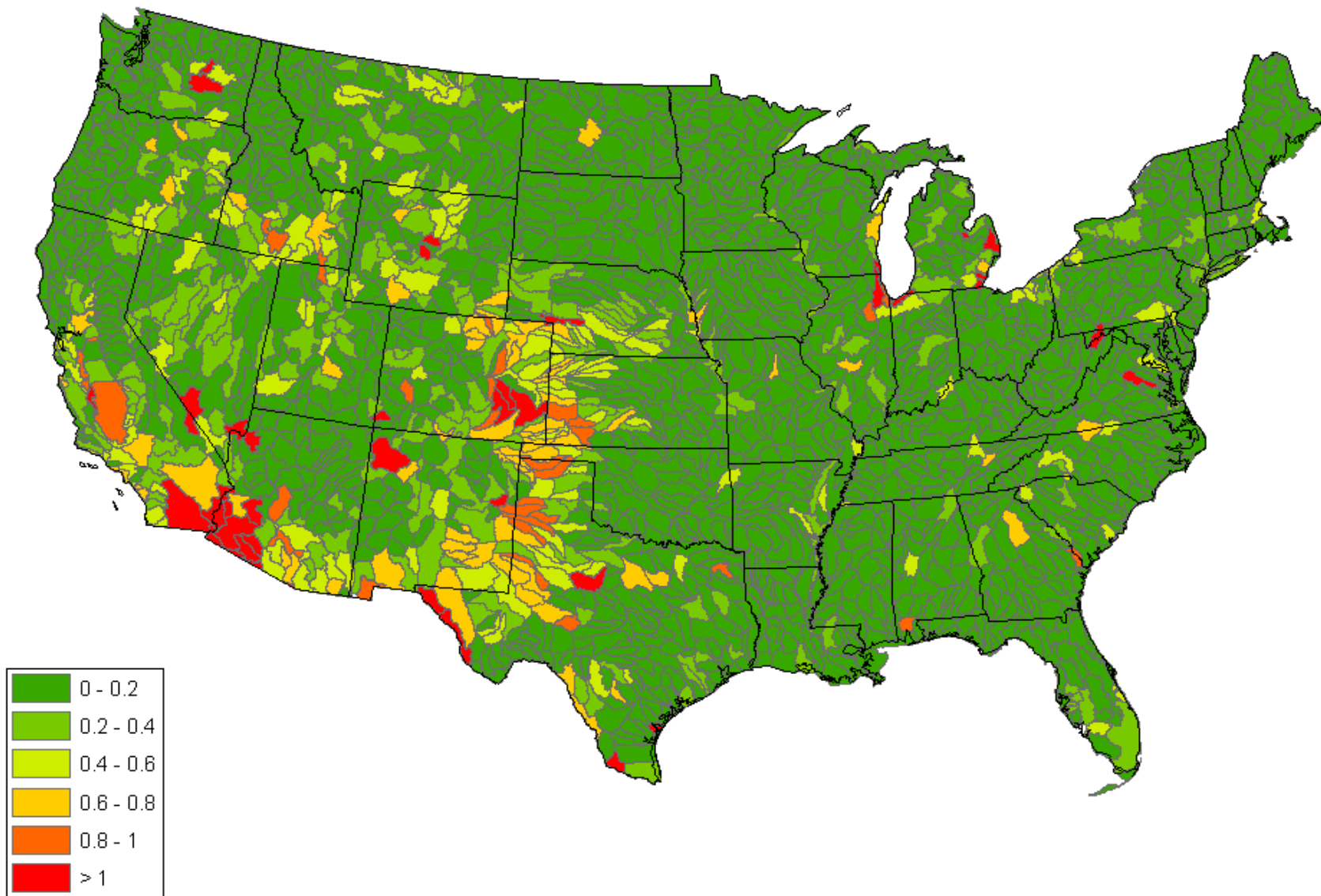
Water Trade-offs



Relationships Between Ecosystem Services

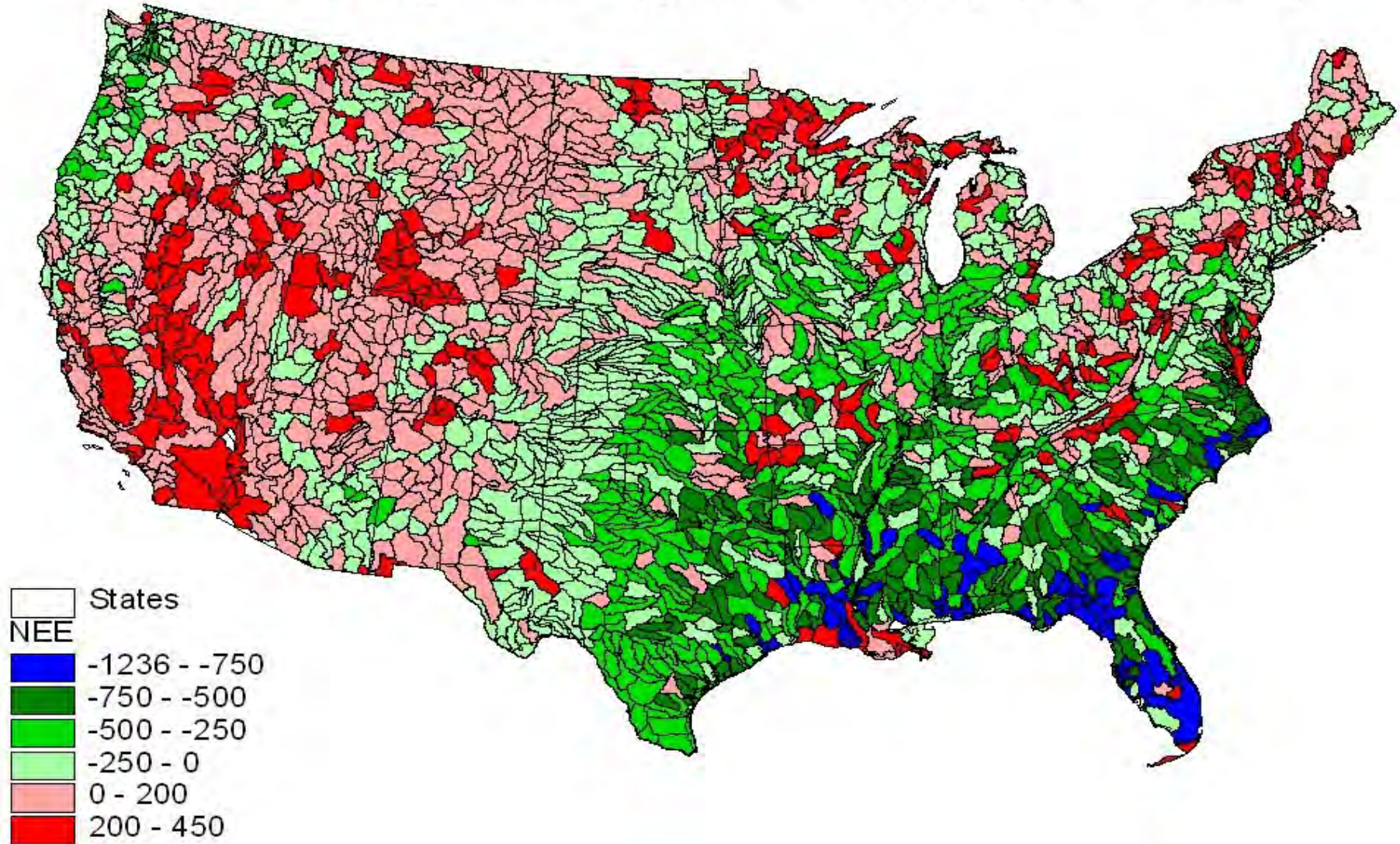


Average Annual WaSSI (1973-1993)



Trade-offs between Water and Carbon Sequestration

Average NEE (g CO₂/m²/yr.) (1974-1993)



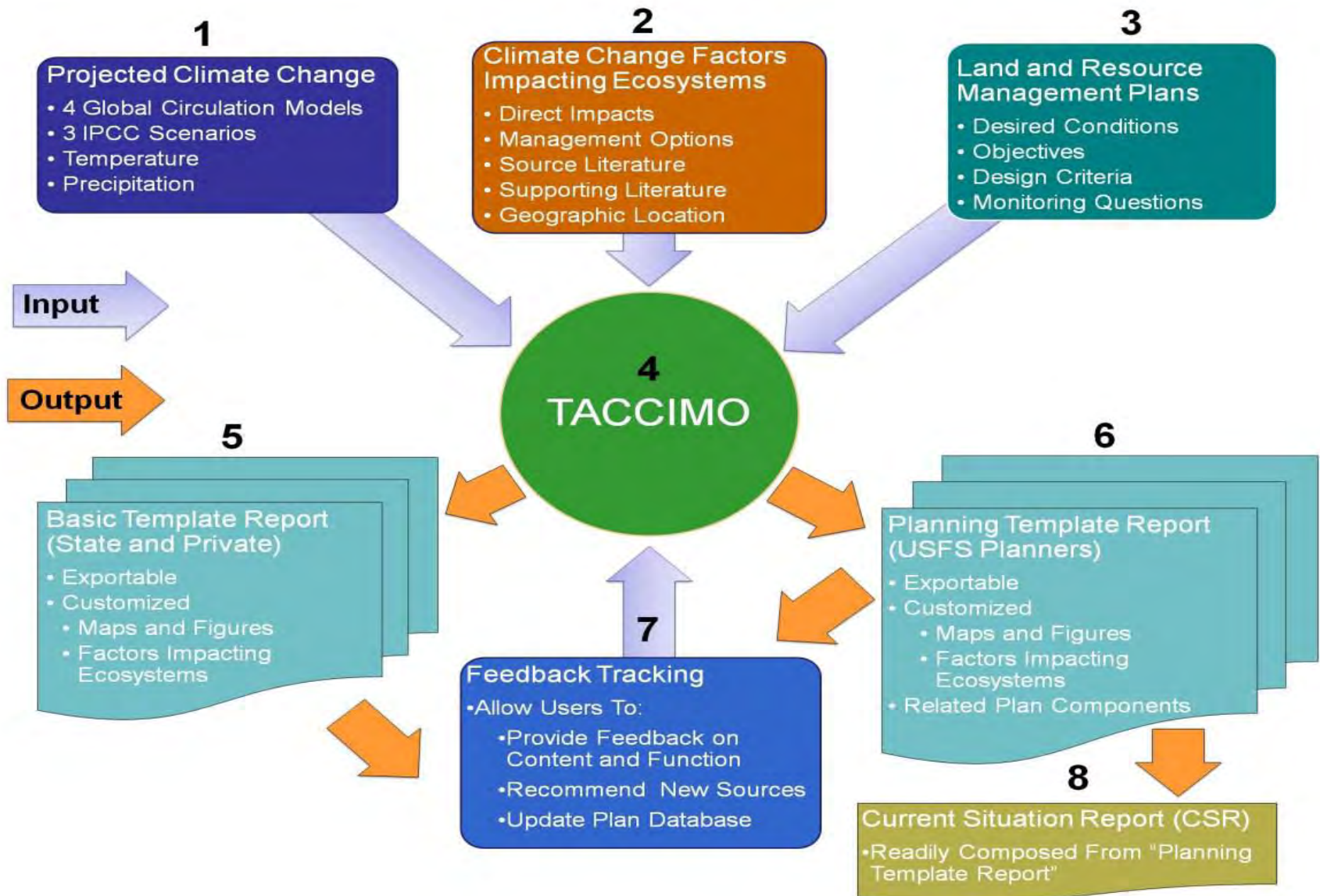
Integrate Model Projections into Forest Planning



Template for Assessment of Climate Change
Impacts and Management Options



TaCCIMO Overview



Take Home Points

A successful Planning Rule will

- consider multiple stress impacts
- consider (conflicting) interactions between ecosystem services

Forest Service tools exist to address these issues such as

- WaSSI-CB predict future conditions
- TACCIMO convey that information to land managers

These types of tools will assist in providing an informed Baseline from which to make future management decisions

