

Climate Change Watershed Vulnerability Assessment Pilot

Grand Mesa, Uncompahgre and Gunnison
National Forests
Rocky Mountain Region



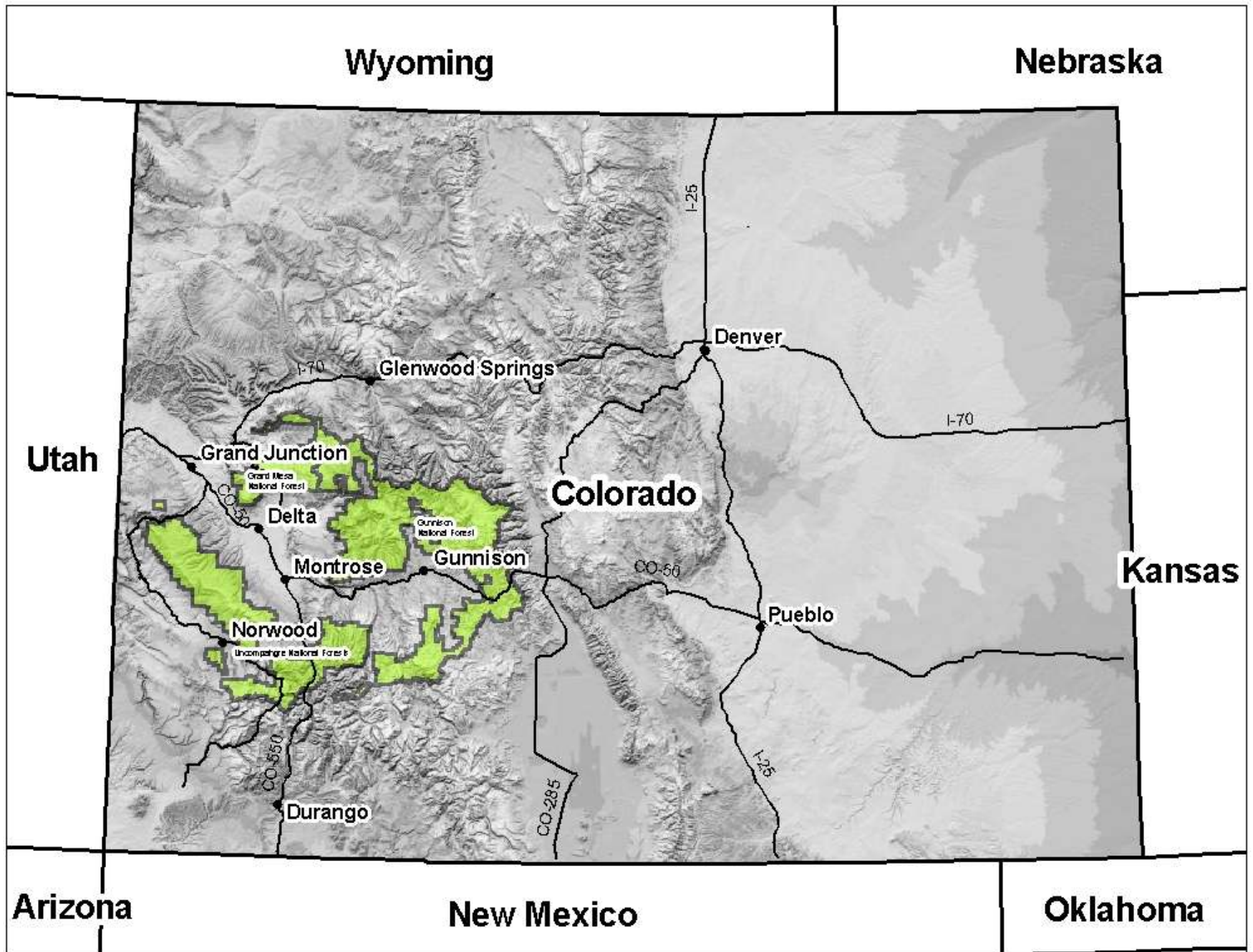
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Steven Jay, Hydro. Tech.

May 26, 2011

Objective

- Identify the **Relative Vulnerability** of watersheds to risks posed by climate change.

Focus on aquatic resources



Wyoming

Nebraska

Utah

Colorado

Kansas

Arizona

New Mexico

Oklahoma

The GMUG NF:

- **3.2 million acres**
- **Elevations 6,000 to 14,000 +**
- **Wide diversity of habitat**

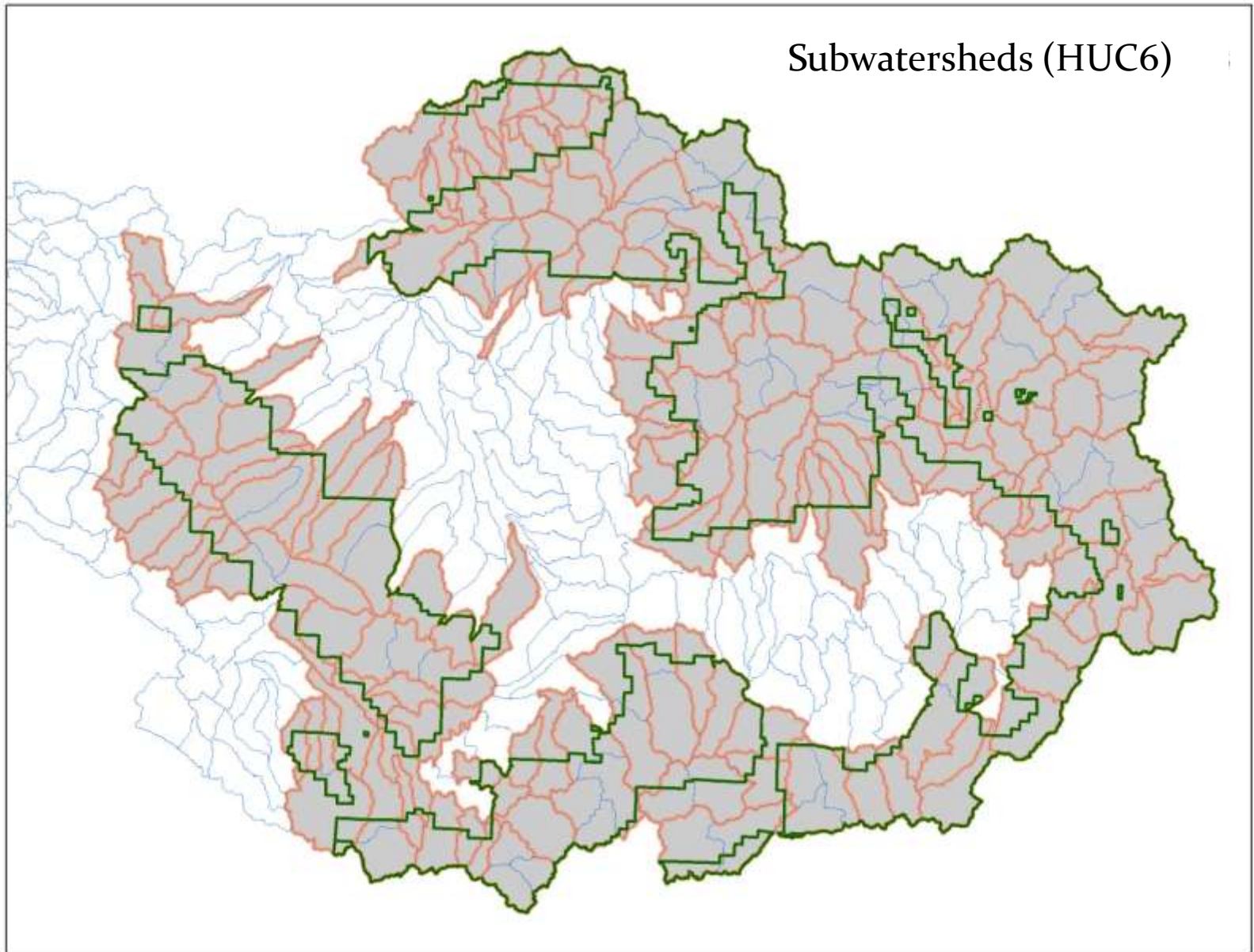


The GMUG NF:

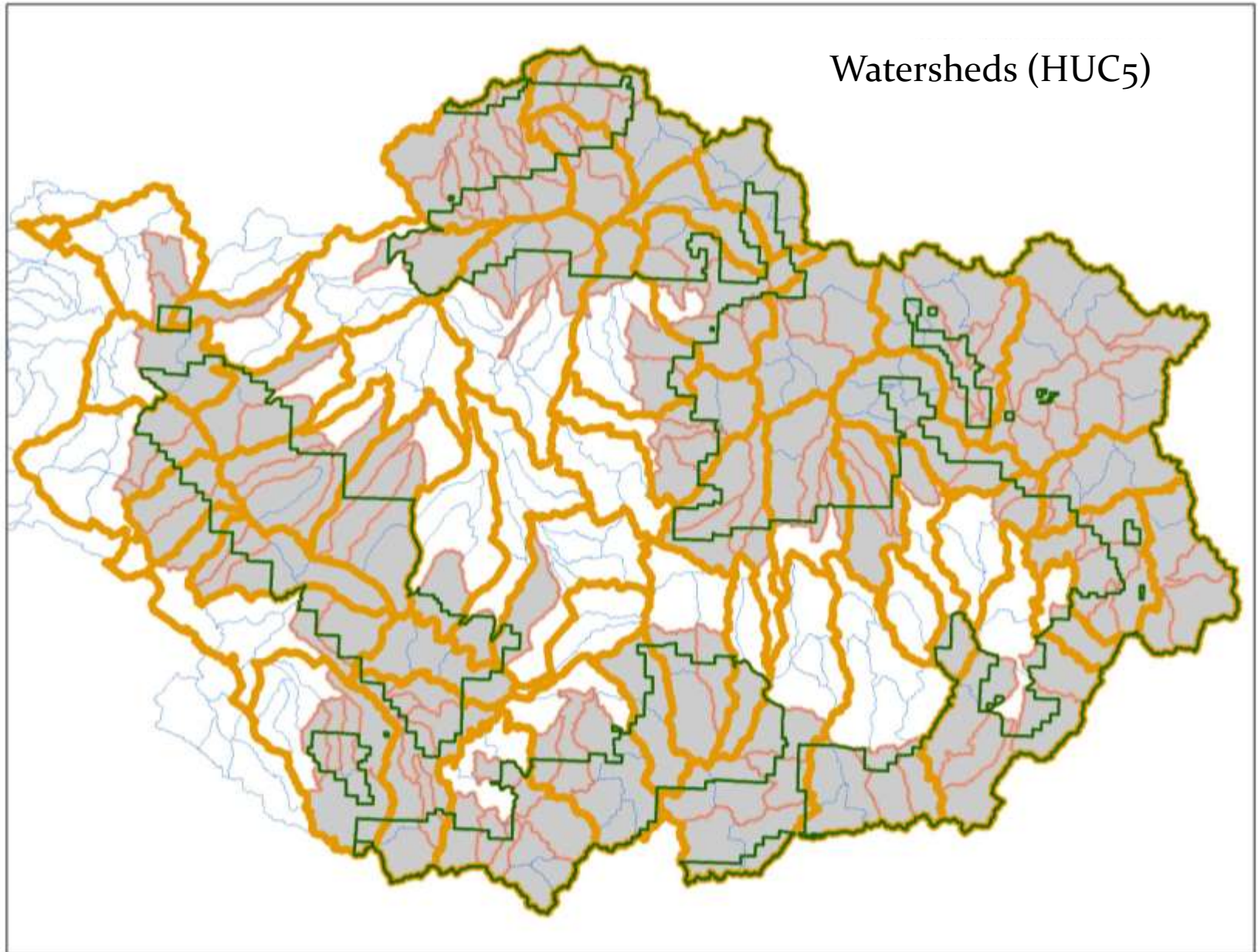
- **3.2 million acres**
- **Elevations 6,000 to 14,000 +**
- **Wide diversity of habitat**
- **2.9 million acre-feet annually**
- **3,500 miles of streams**
- **1.7 million acre-feet storage**



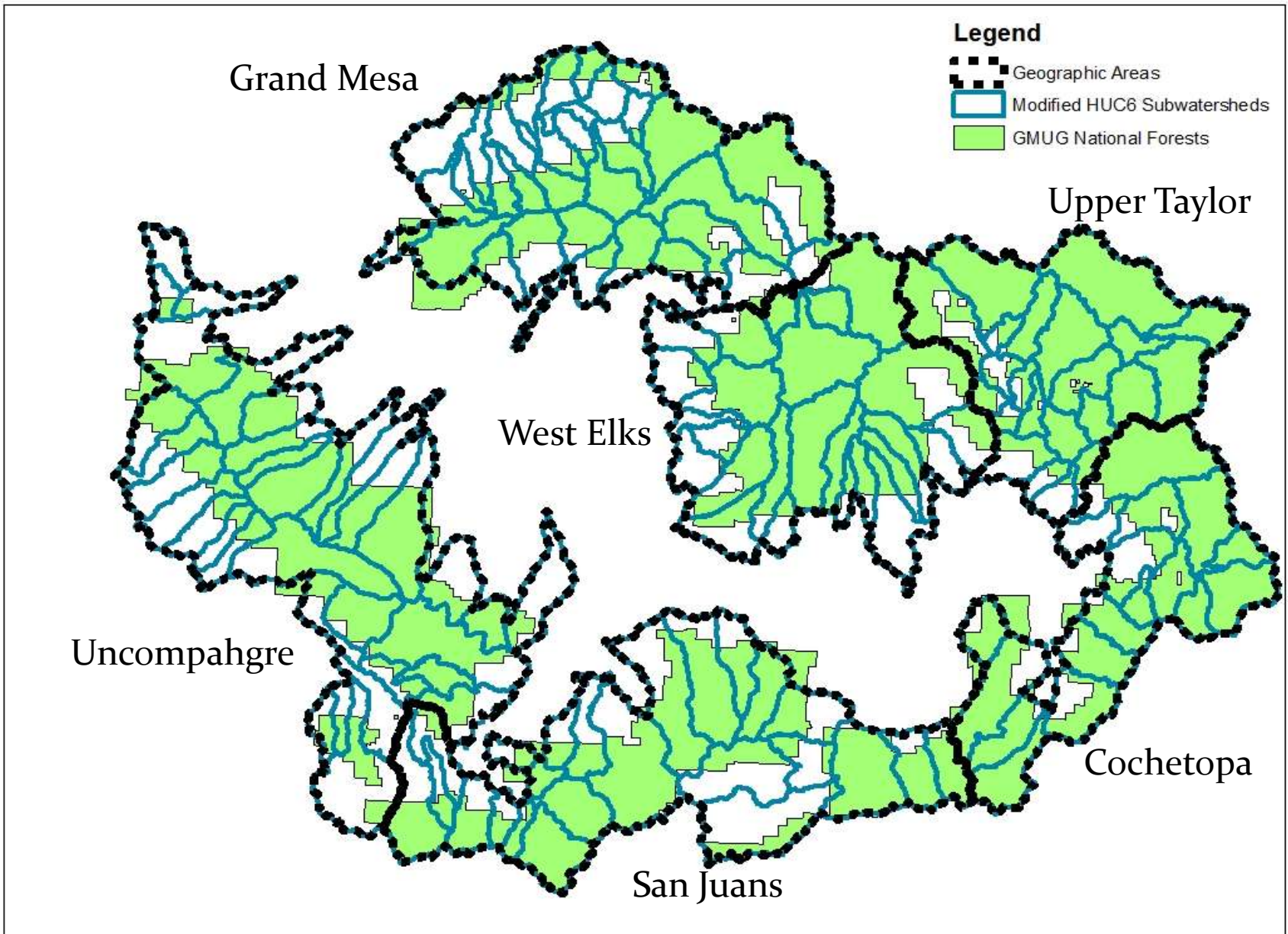
Scales of Assessment



Scales of Assessment

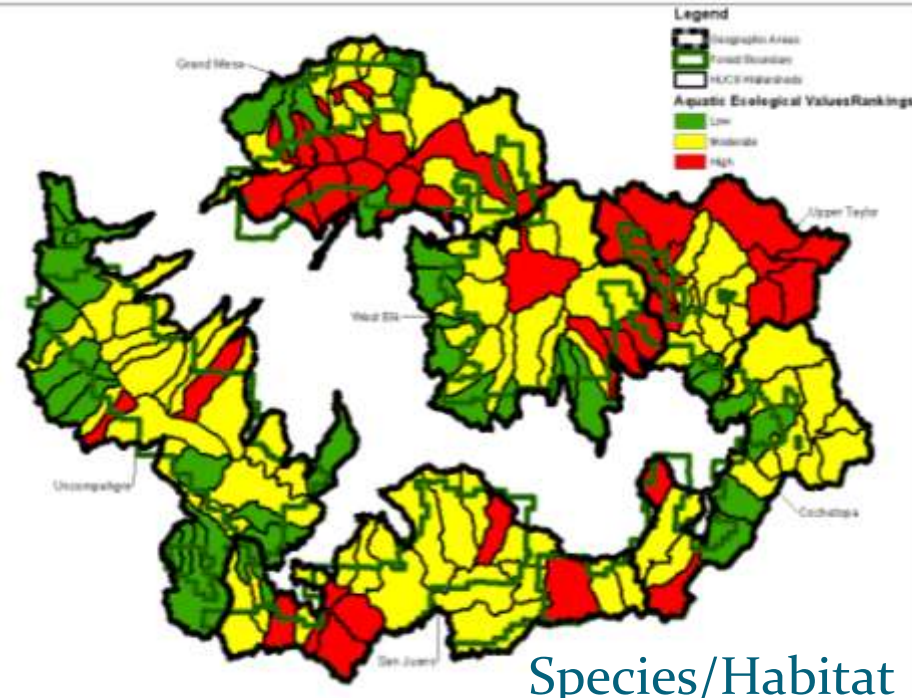
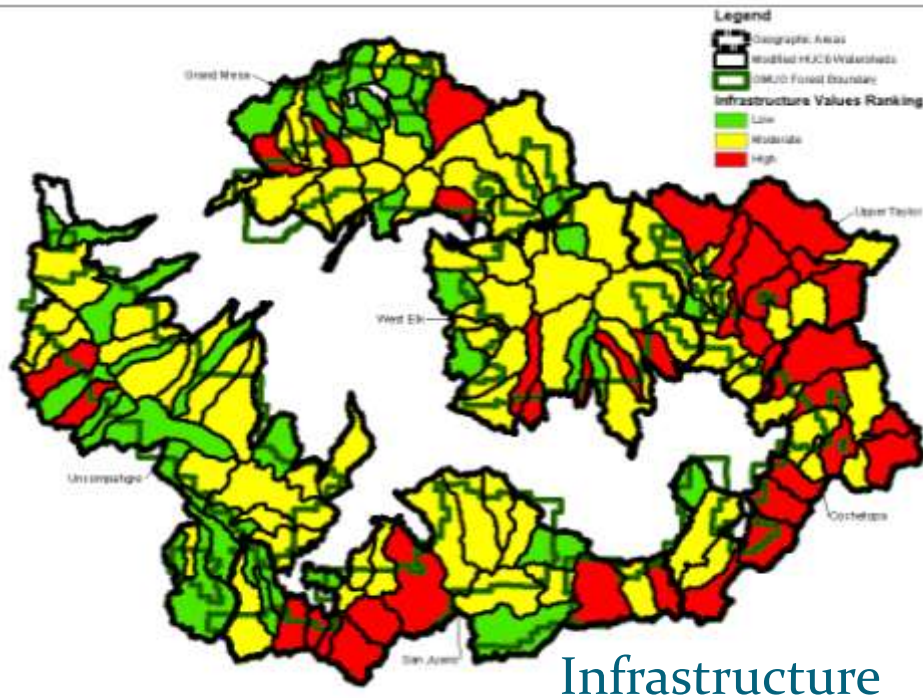
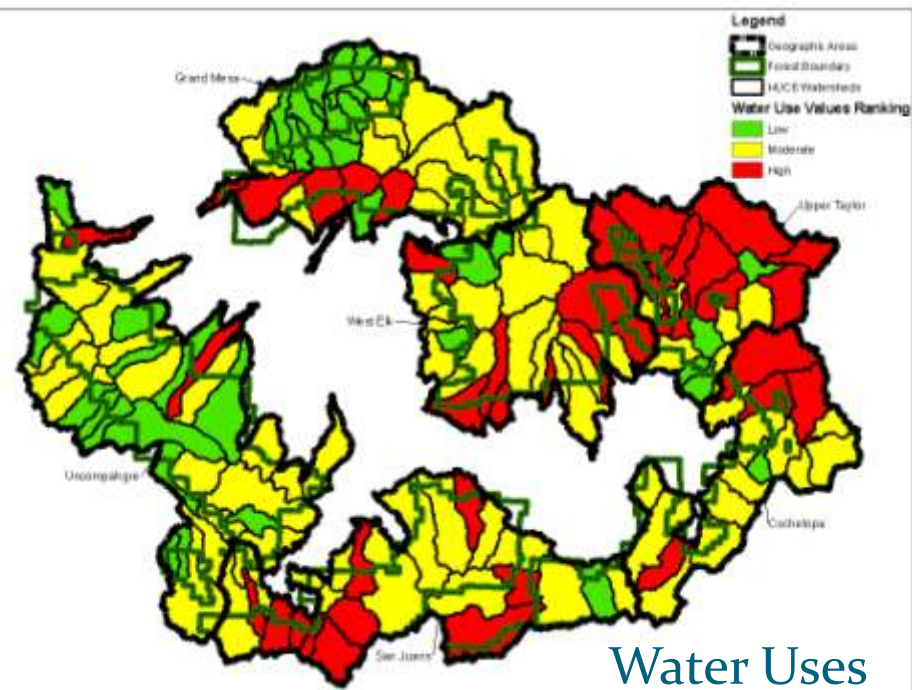


Scales of Assessment



Aquatic Values

- Water Uses
- Infrastructure
- Species & Habitats



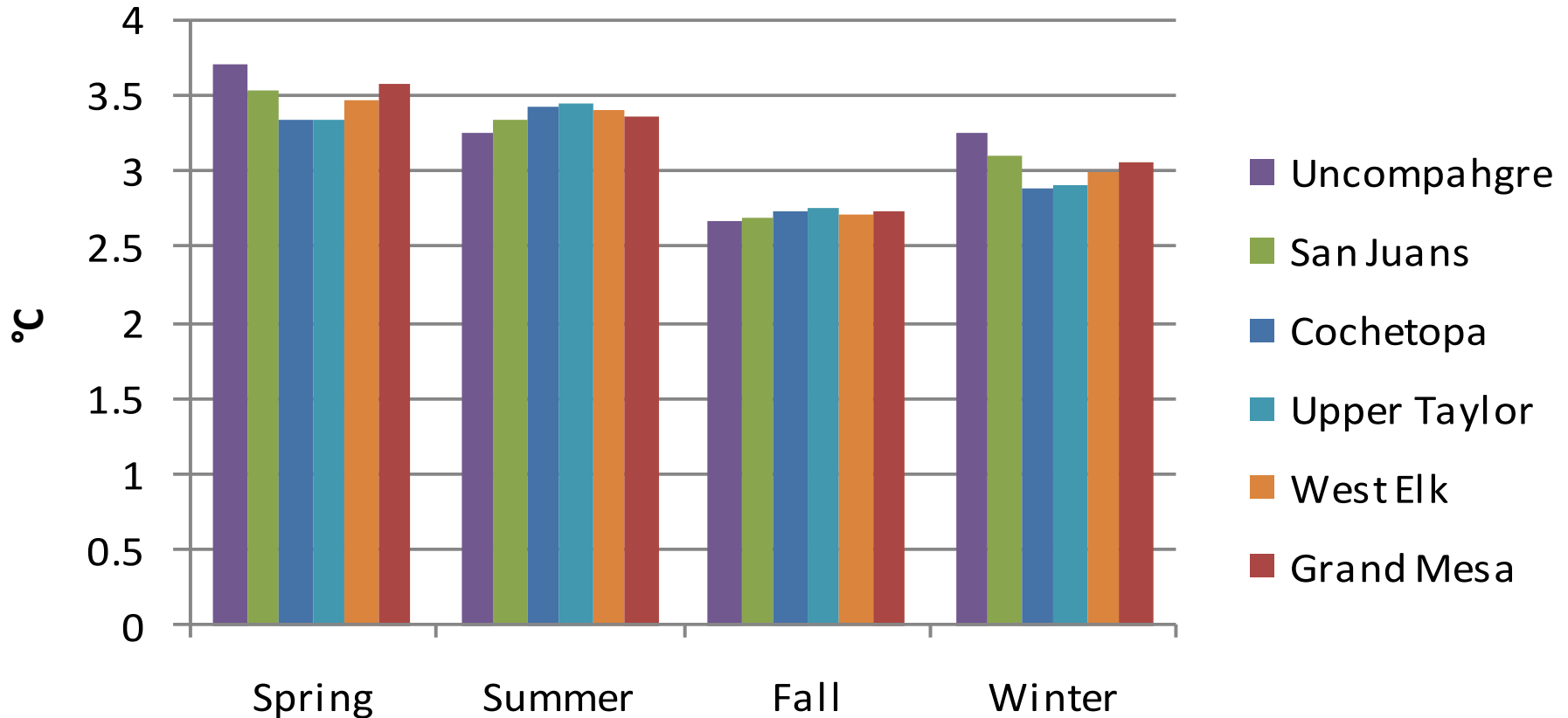
Exposure

Element	Past 30 years	Predicted by 2040-2060															
Temperature	Increase of 2° F	Increase of 3.6 – 5.4° F															
Precipitation	No clear trend	<table border="1"> <tr> <td><u>Annual</u></td> <td>~0 %</td> <td>-10%</td> </tr> <tr> <td>Winter</td> <td>+15%</td> <td>~0%</td> </tr> <tr> <td>Spring</td> <td>-12%</td> <td>-15%</td> </tr> <tr> <td>Summer</td> <td>-15%</td> <td>-20%</td> </tr> <tr> <td>Fall</td> <td>+4%</td> <td>-10%</td> </tr> </table>	<u>Annual</u>	~0 %	-10%	Winter	+15%	~0%	Spring	-12%	-15%	Summer	-15%	-20%	Fall	+4%	-10%
<u>Annual</u>	~0 %	-10%															
Winter	+15%	~0%															
Spring	-12%	-15%															
Summer	-15%	-20%															
Fall	+4%	-10%															
Runoff	2 weeks earlier	2 to 4 weeks earlier															
Extreme Events	Variable	More Frequent, More Intense															

Exposure- Temperature

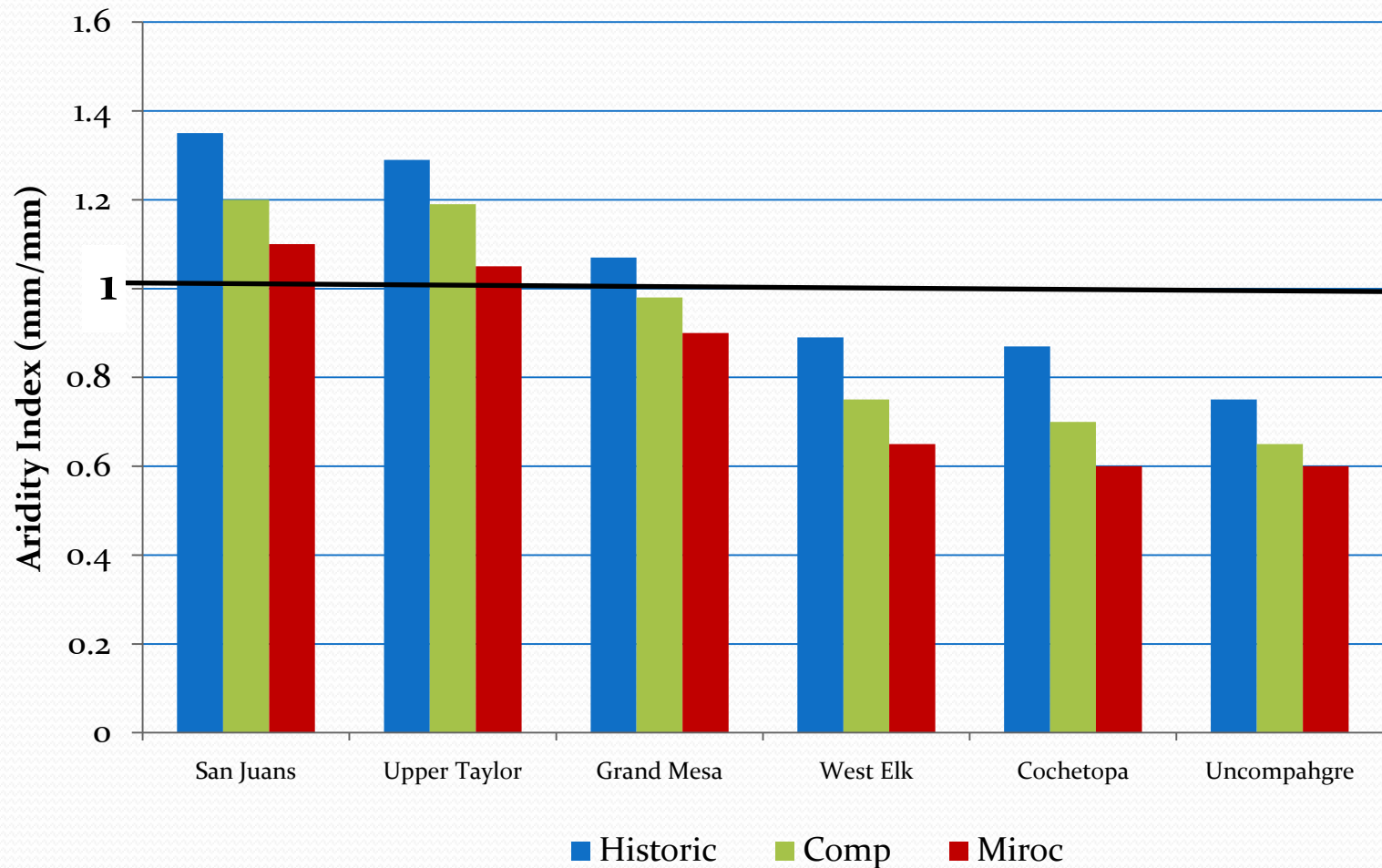
Seasonal Minimum Temperature Increase

Seasonal Increase in Minimum Average Temperature
by Geographic Area

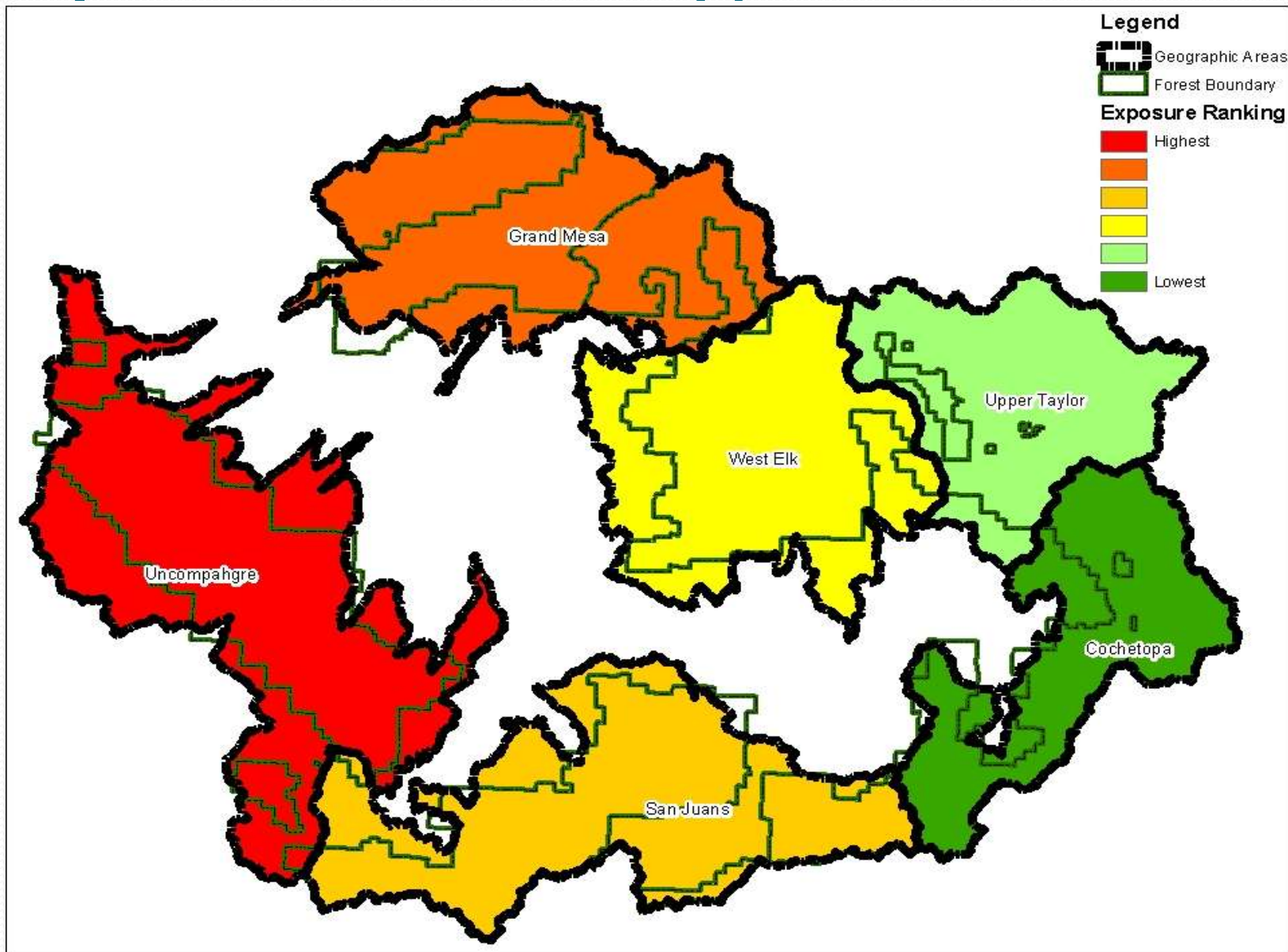


Exposure - Aridity Index

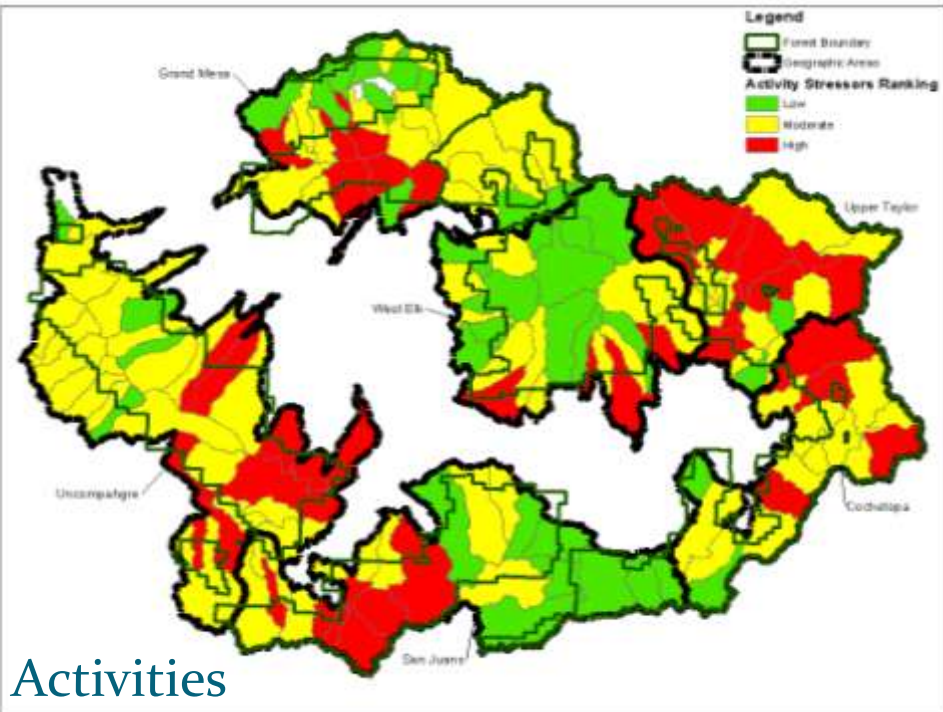
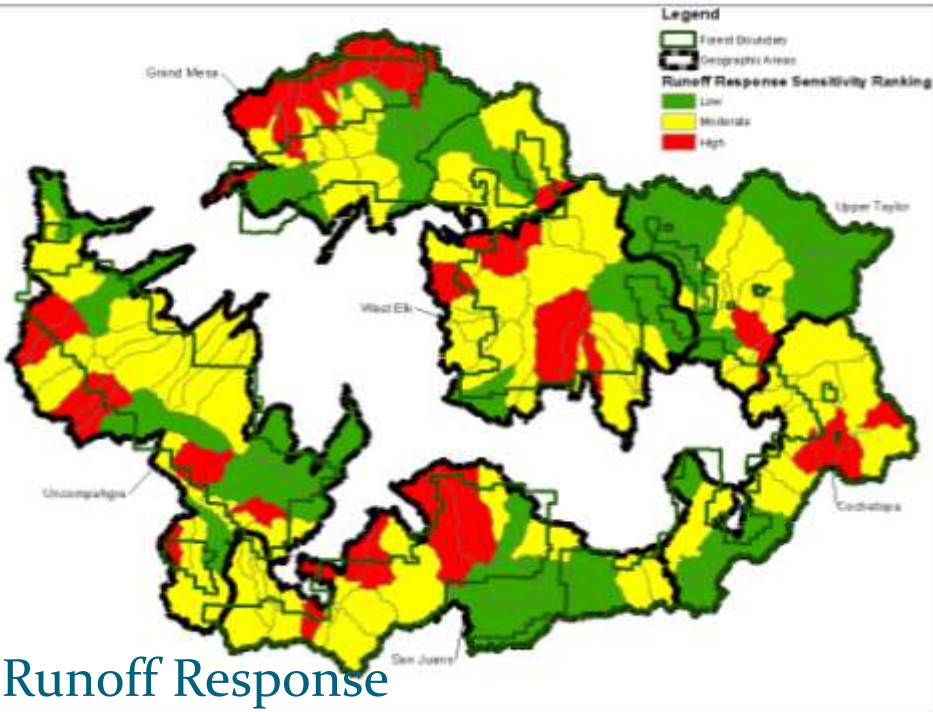
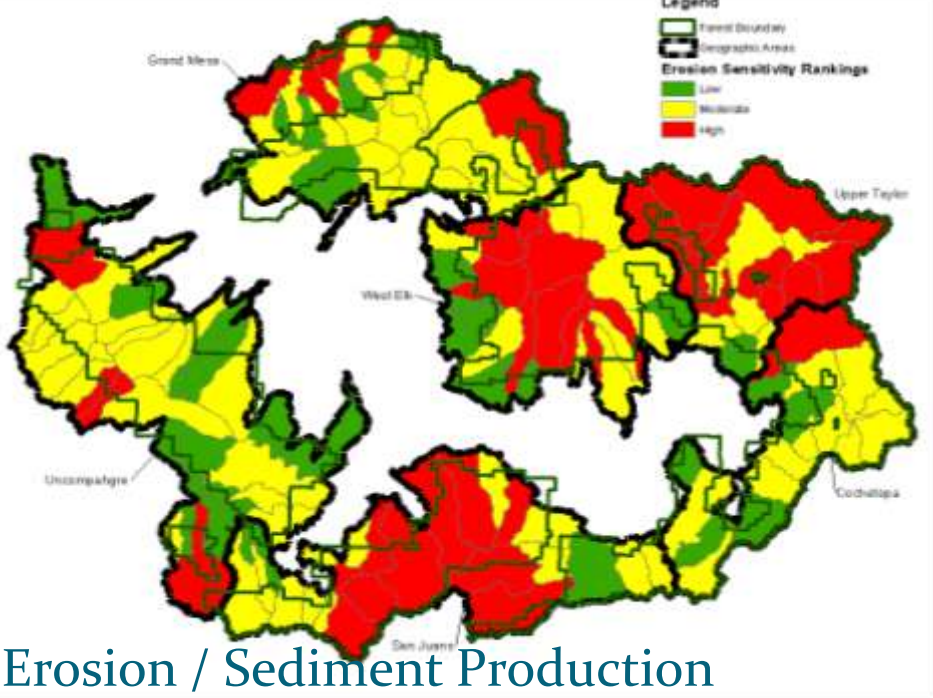
Aridity Index = Precipitation / Potential Evapotranspiration



Exposure ranking



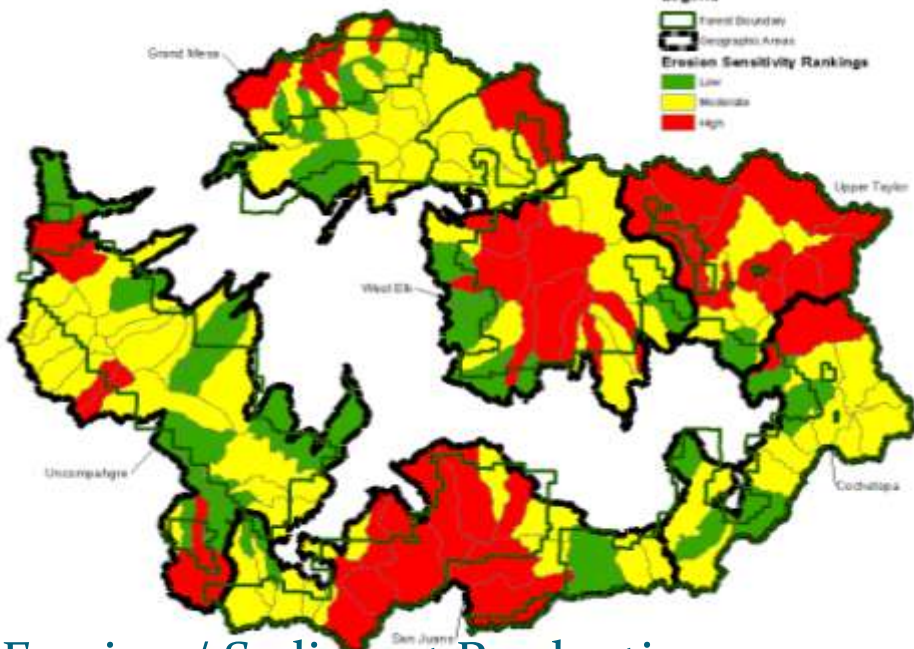
Watershed Risk - Sensitivity & Stressors



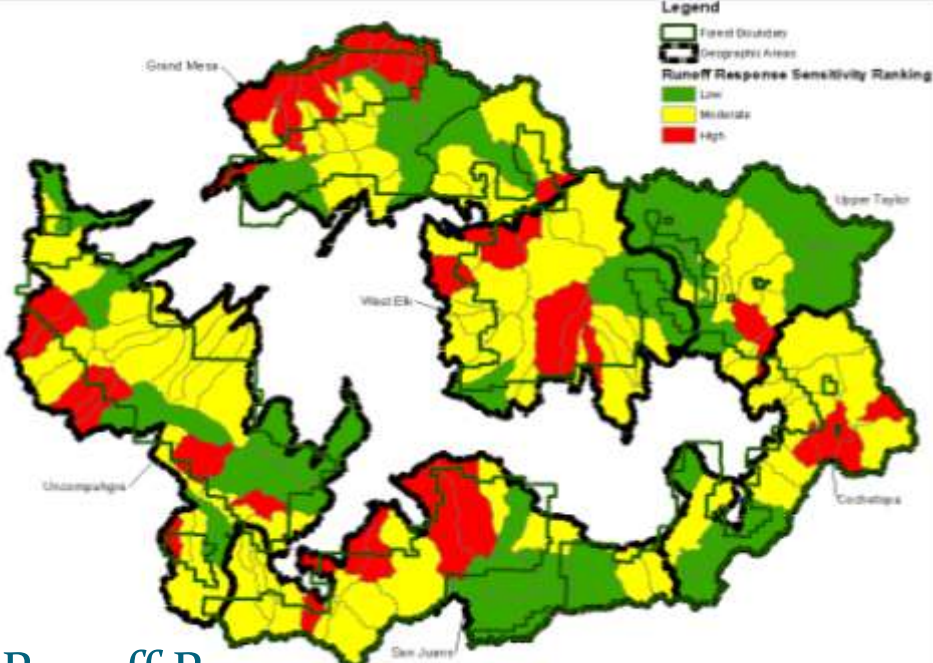
Stressors (Land Uses/Management)

- Stream Miles Below Diversions
- Stream Miles Below Reservoirs
- Stream Miles Inundated by Reservoirs
- Motorized Route Density in Watershed and in Riparian/Floodplain
- Motorized Route Stream Crossings
- Past Vegetation Treatments (included Wildland fire)
- Past Mining Activities
- Areas of High Recreational Use
- Private Inholdings

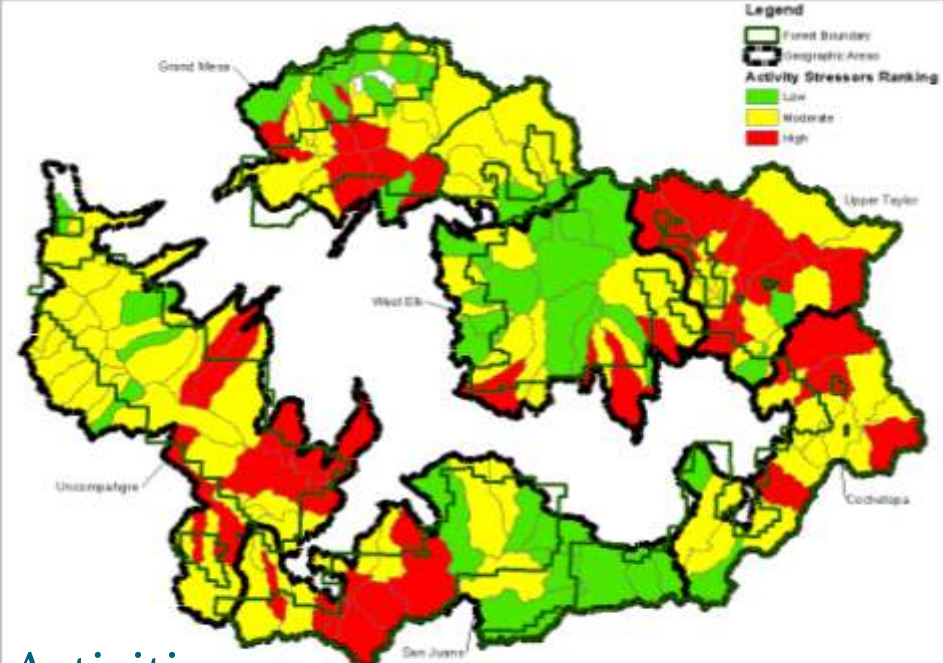
Watershed Risk - Sensitivity & Stressors



Erosion / Sediment Production

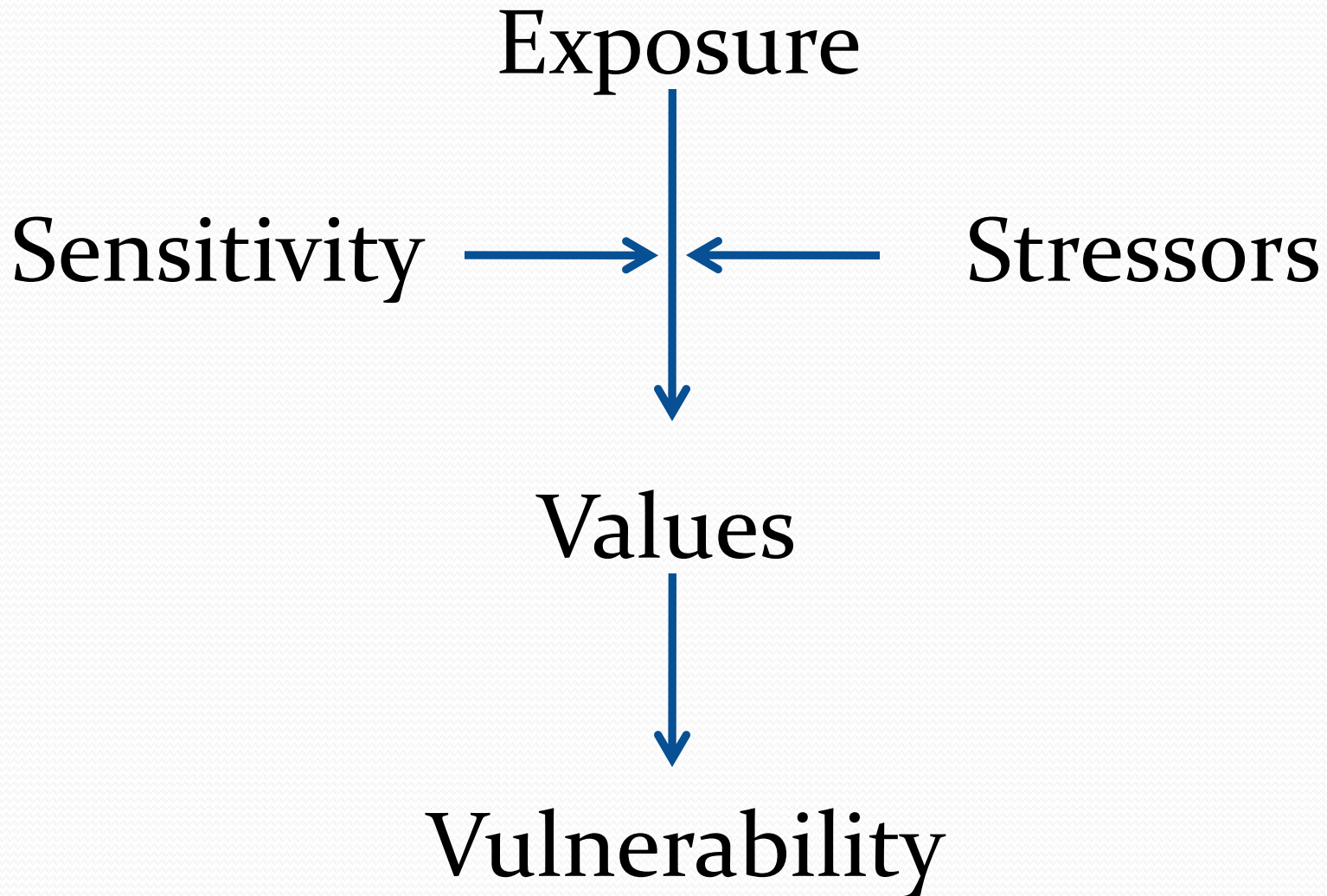


Runoff Response



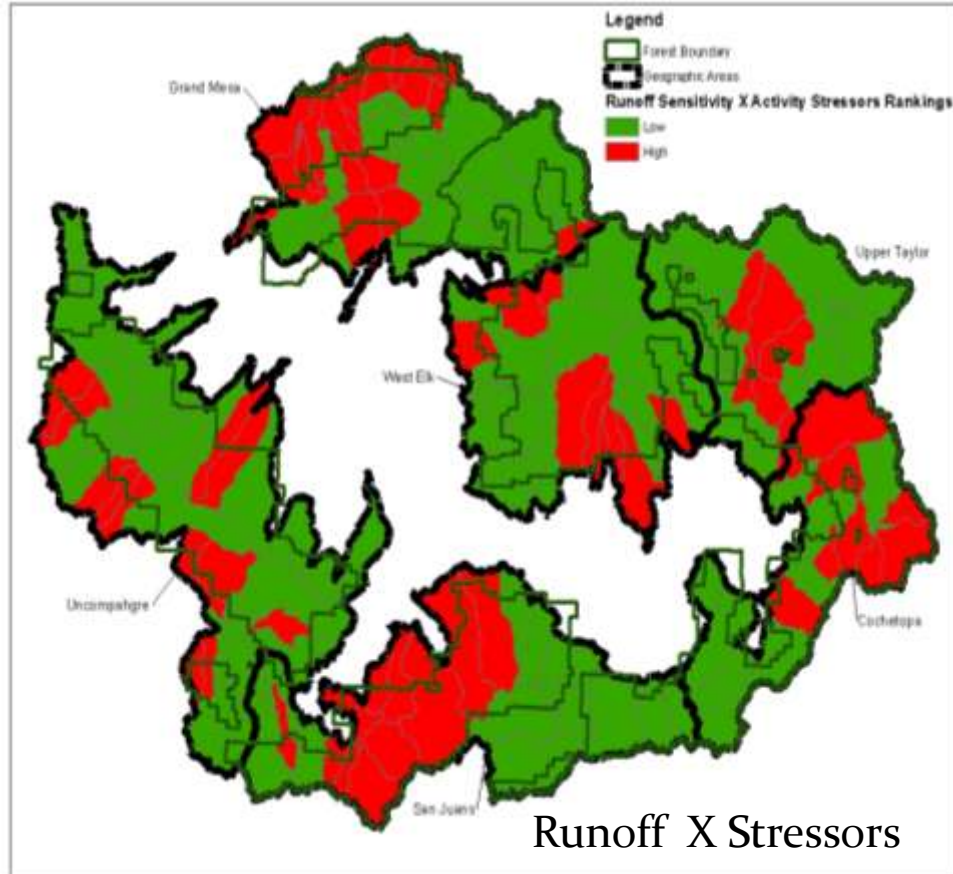
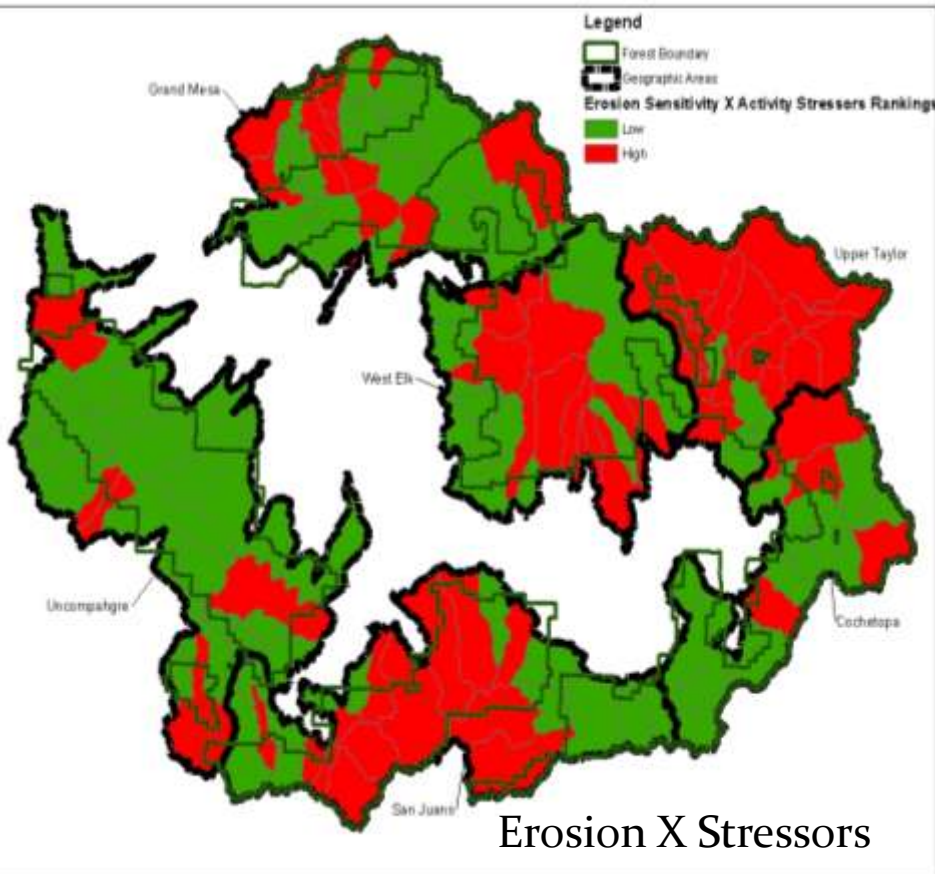
Activities

Process



Watershed Risk – Ranking Matrix

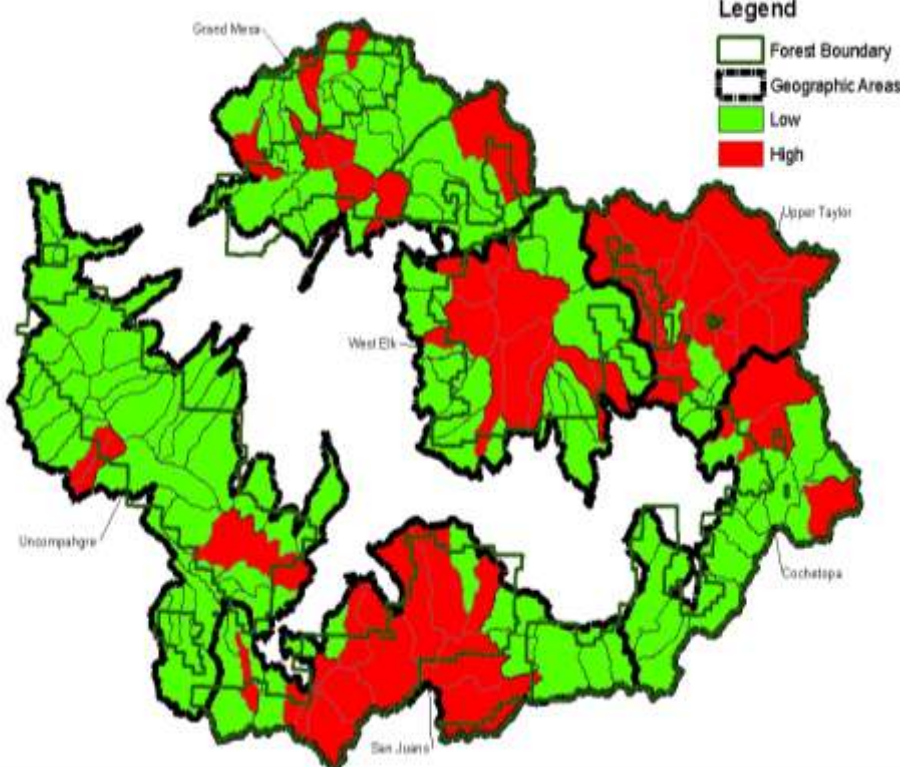
		Stressors			
		Low	Moderate	High	
Sensitivity	Low	Low	Low	Low	Low
	Moderate	Low	Low	High	
	High	High	High	High	High



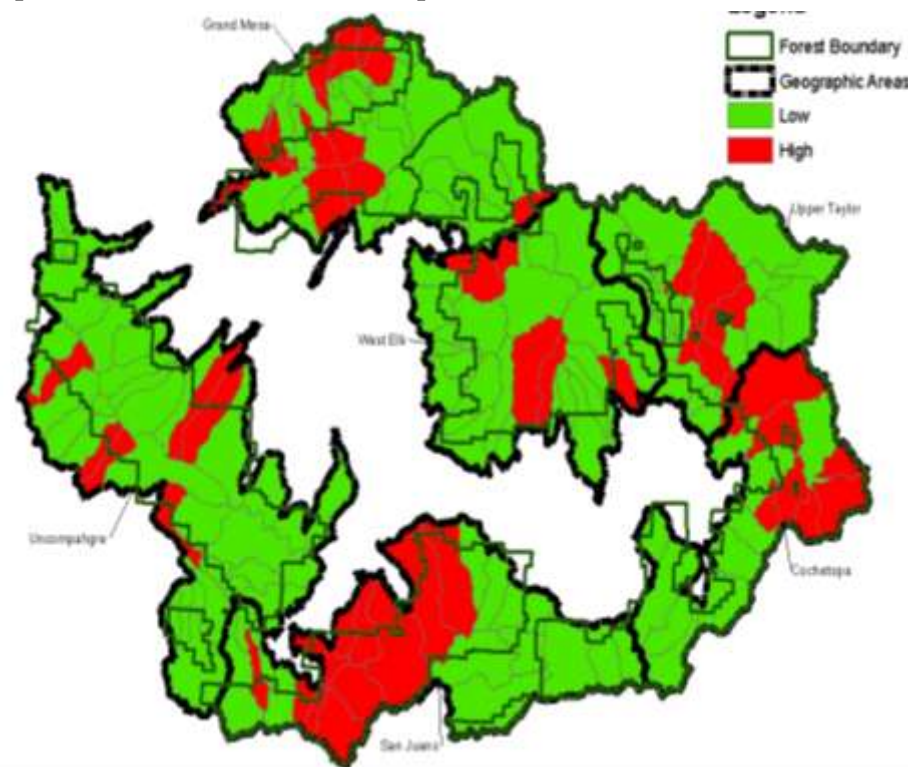
Aquatic Values X Watershed Risk - Ranking

		Sensitivity X Stressors	
		Low	High
Value	Low	Low	Low
	Moderate	Low	High
	High	Low	High

Species/Habitats X Erosion X Stressors

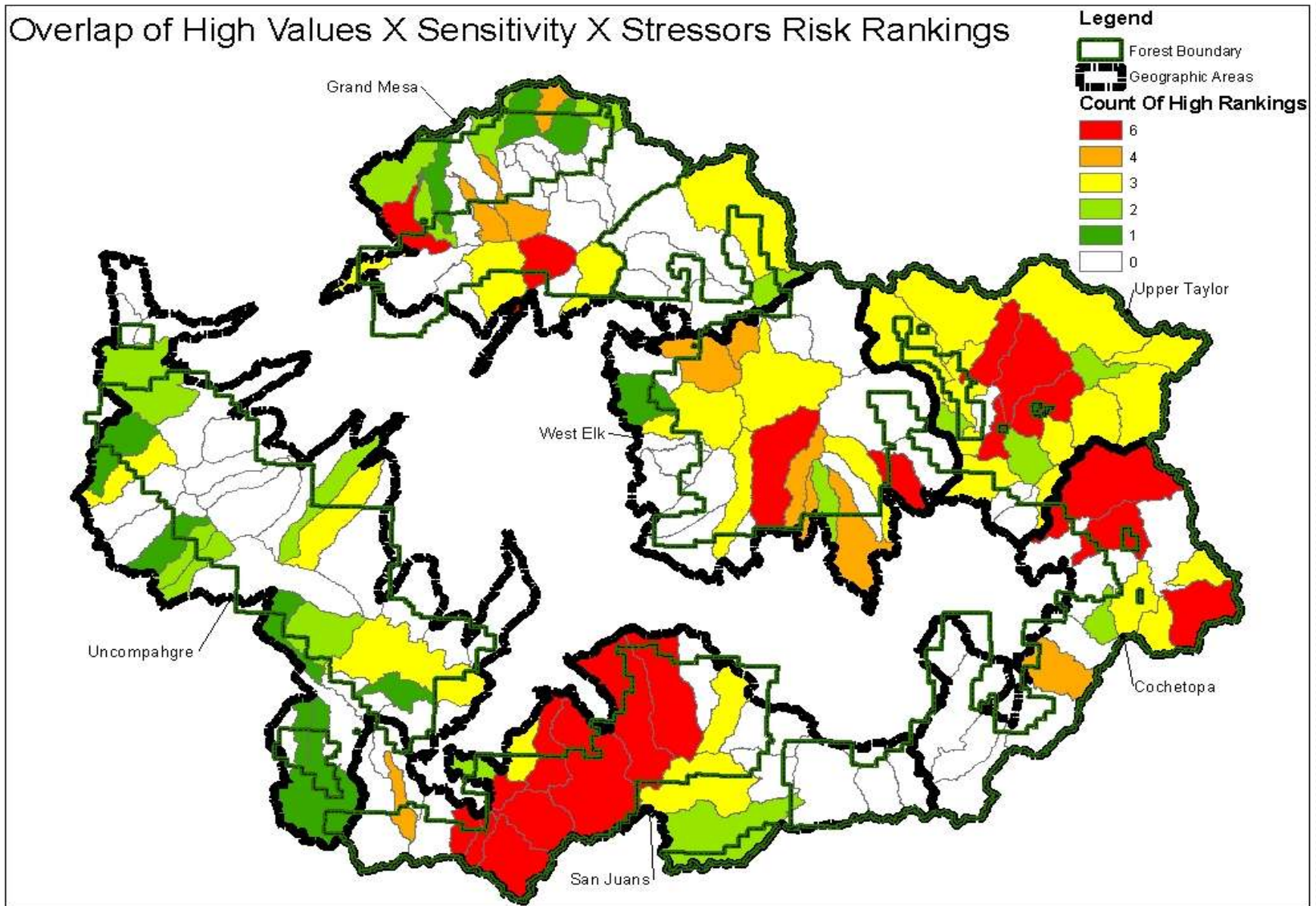


Species/Habitats X Runoff Response X Stressors



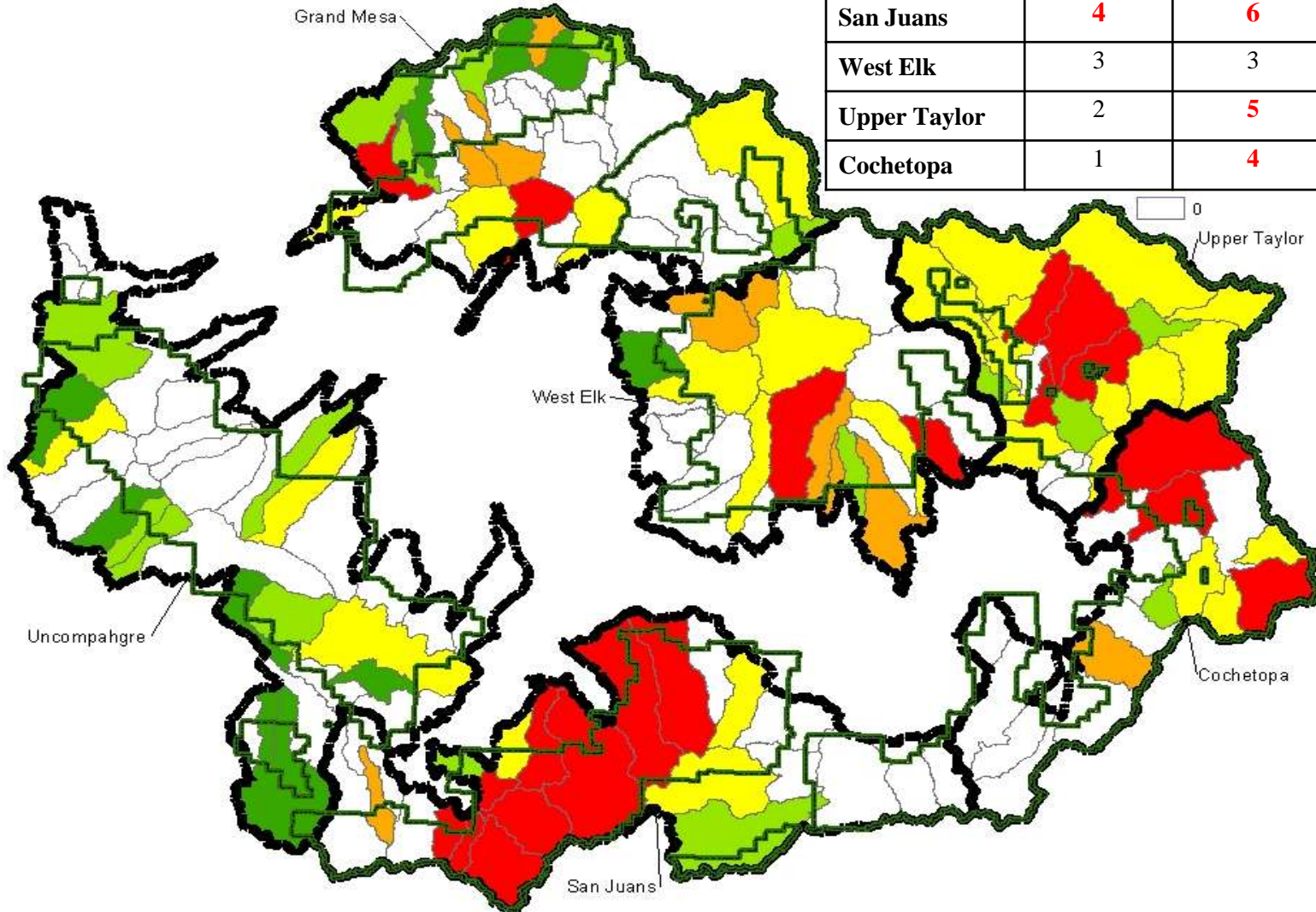
Vulnerability

Overlap of High Values X Sensitivity X Stressors Risk Rankings



Vulnerability

Overlap of High Values X Sensitivity X Stressors R



Geographic Areas	Exposure Ranking	Value Risk Ranking	Adjusted Vulnerability Ranking
Uncompahgre	6	1	3
Grand Mesa	5	2	4
San Juans	4	6	6
West Elk	3	3	2
Upper Taylor	2	5	5
Cochetopa	1	4	1

Applications

- **Monitoring and Inventory to fill data gaps**
 - Culvert inventory - are pipes the right size?
 - Stream temperature - what is it now, how does it change?
 - Actual climate changes – same as predicted?
- **Design Projects to Improve Resilience/Adaptation**
 - Prioritize route decommissioning in subwatersheds with high road/trail densities in riparian habitats.
 - Improve riparian/wetland habitat conditions.
 - Identify areas suitable for water storage developments.
- **Future Assessments – Terrestrial Resources**
- **Link to Watershed Condition Framework**
 - Prioritize Watersheds
 - Incorporate Condition Attributes into Vulnerability
- **Climate Change Scorecard ✓**

