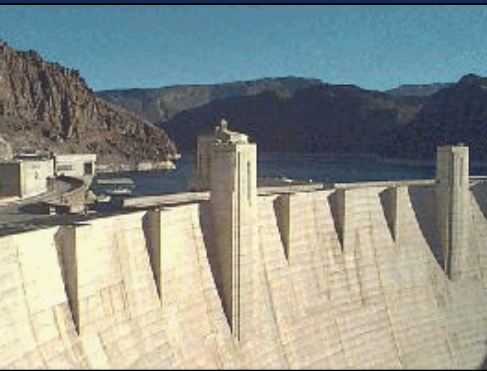


Exceptional service in the national interest



Value of Water in Energy Production

Vincent C. Tidwell

Sandia National Laboratories

*Importance of Water to the U.S. Economy
Washington, DC, September 19, 2012*

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- Mark Wigmosta
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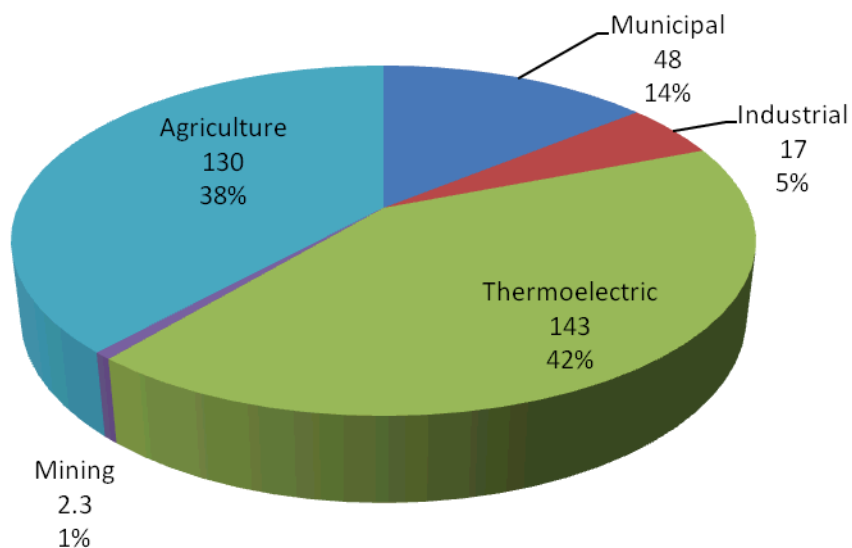
- Michael Webber
- Carey King



Water for Thermoelectric Power Generation

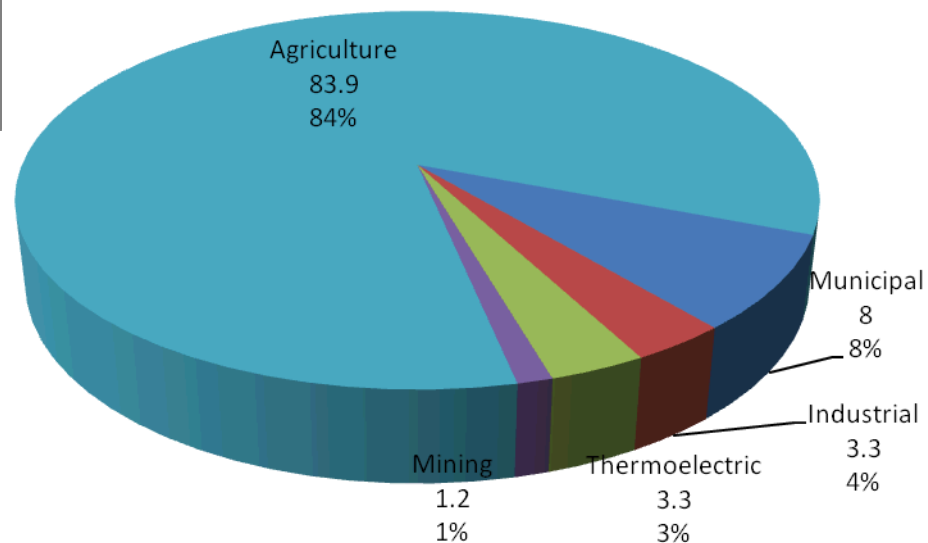
Water Withdrawal (BGD)

2005

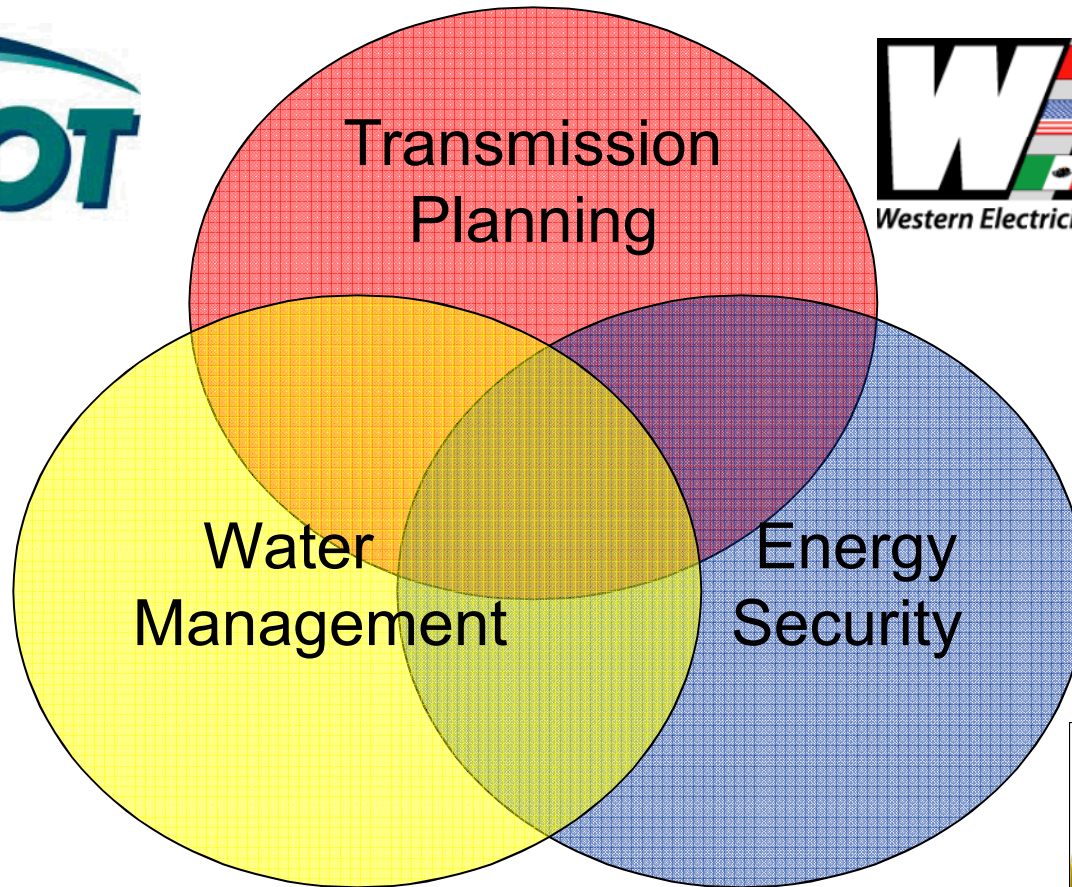


Water Consumption (BGD)

1995



Integrated Planning



**WESTERN
GOVERNORS'
ASSOCIATION**

Serving the Governors of 19 States and 3 US-Flag Pacific Islands

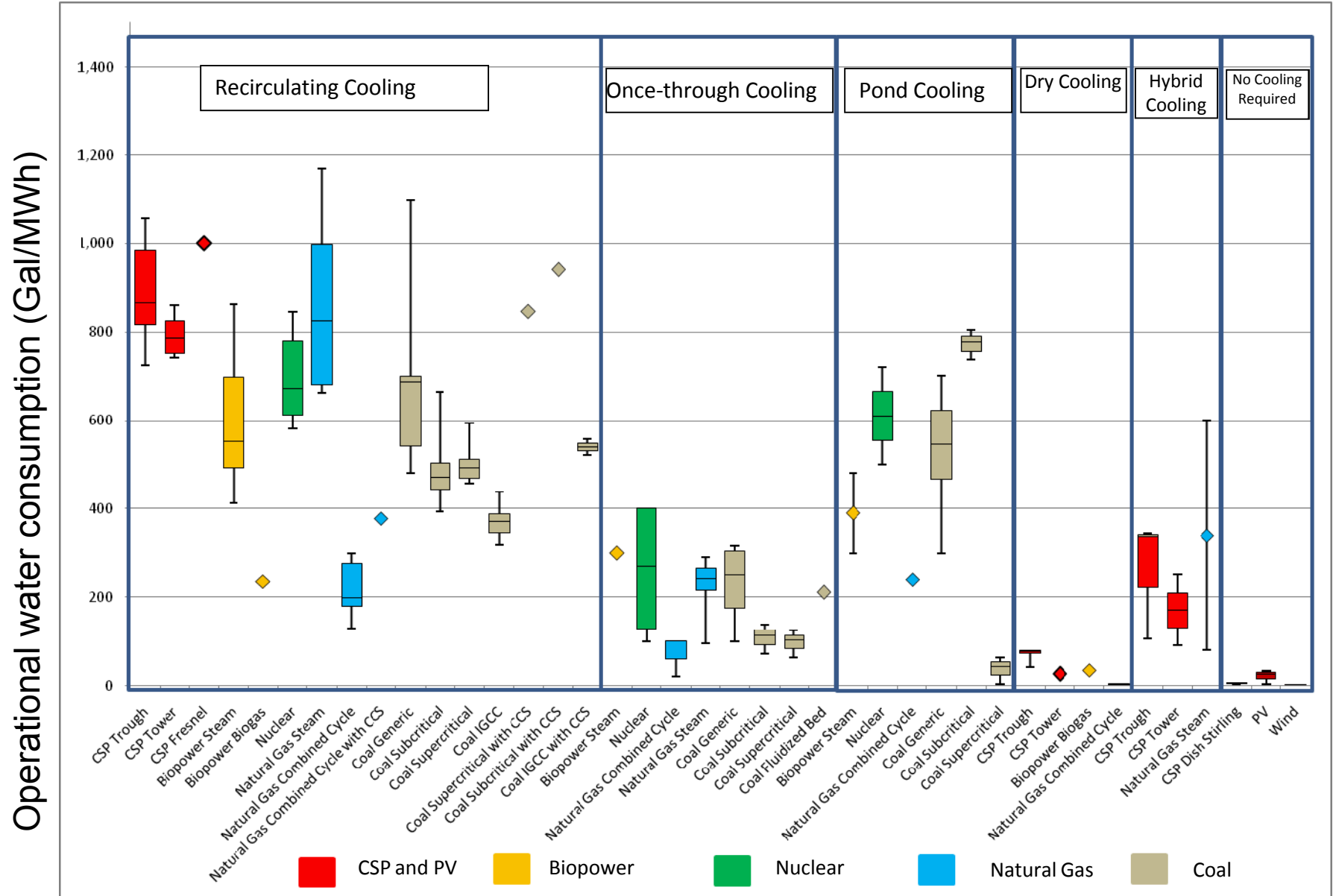


WSWC

Western States Water Council

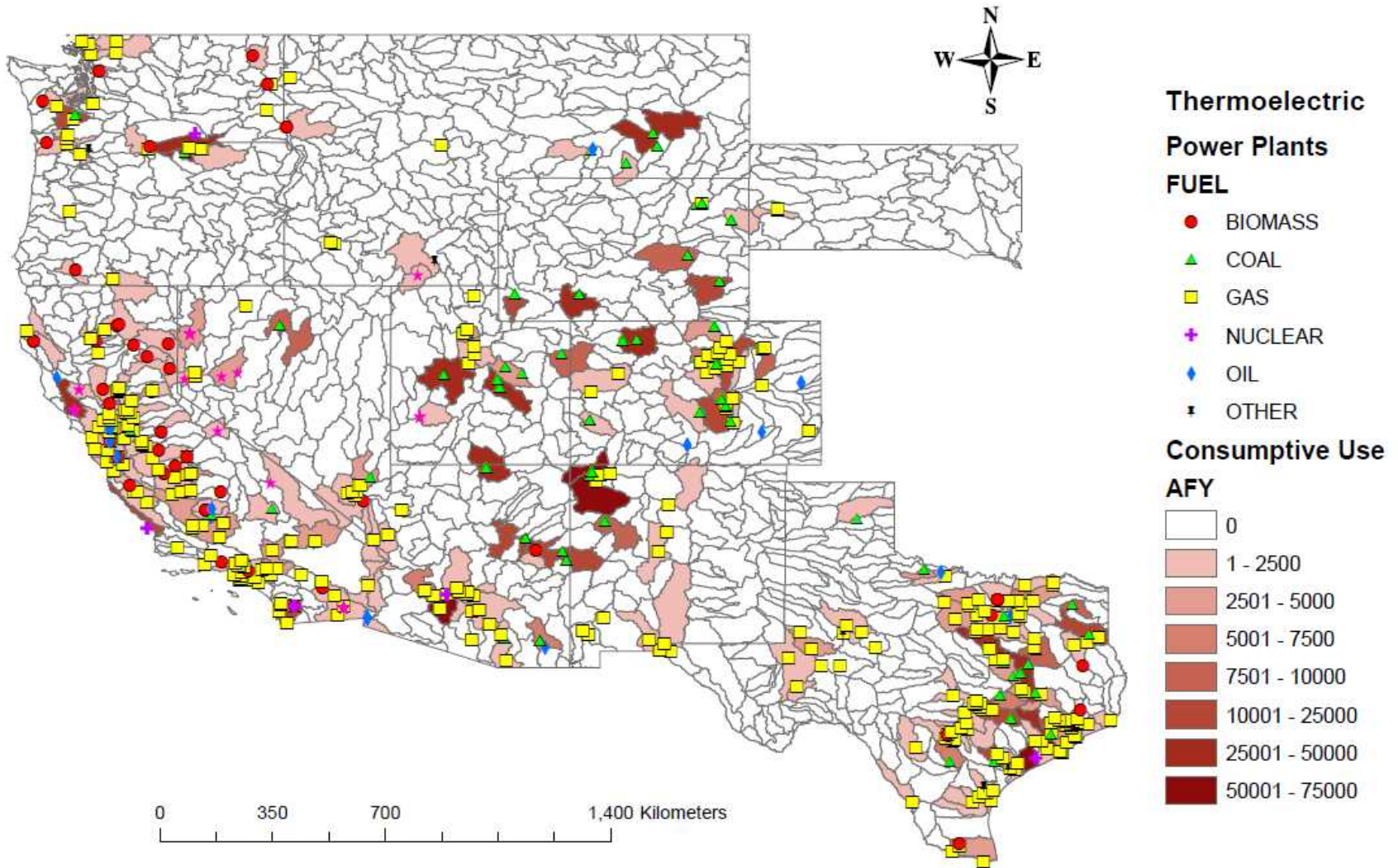


Operational water consumption factors for electricity generating technologies

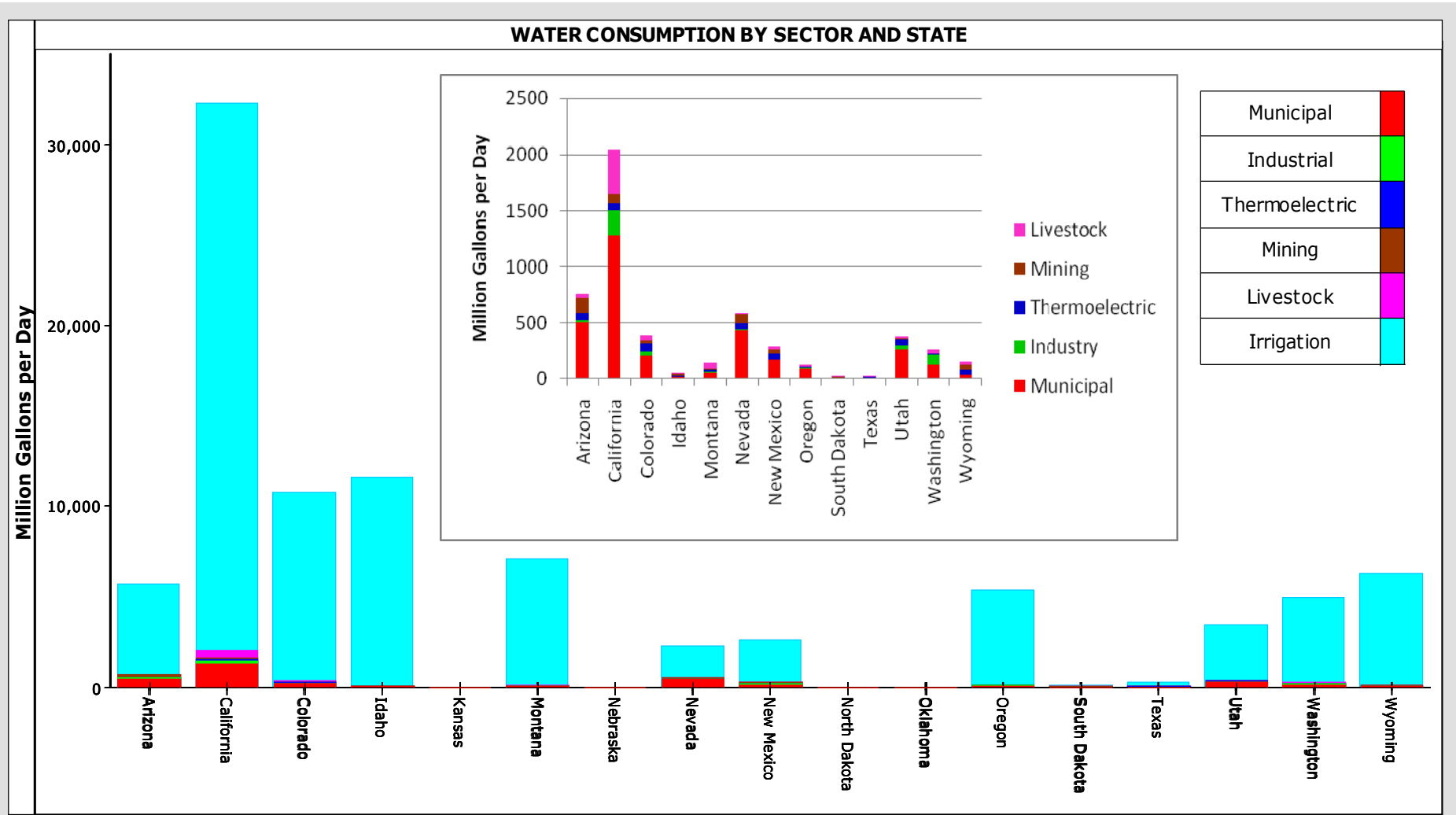


Source: Macknick *et al.* 2011

Thermoelectric Consumptive Use and Power Plants (Current)

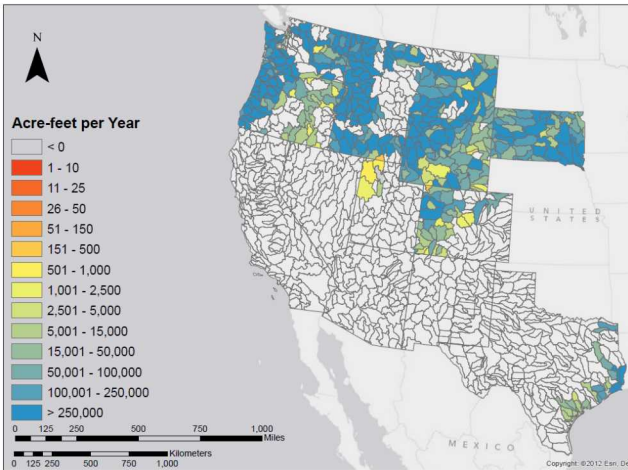


Water Consumption by State and Sector

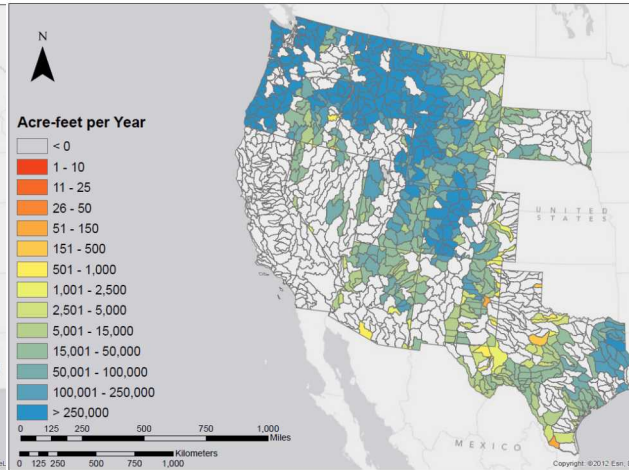


Water Availability

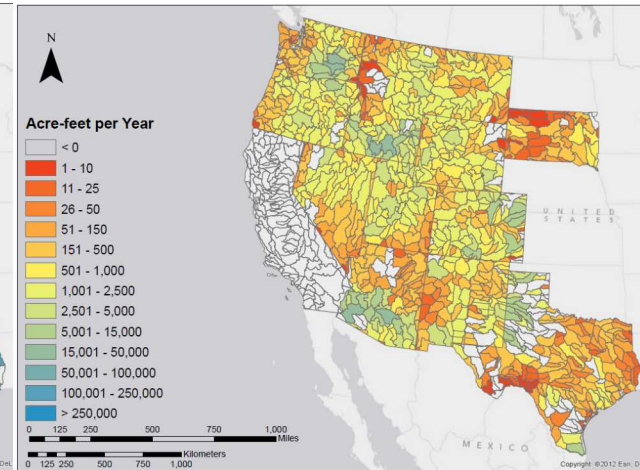
Unappropriated Surface Water Metric



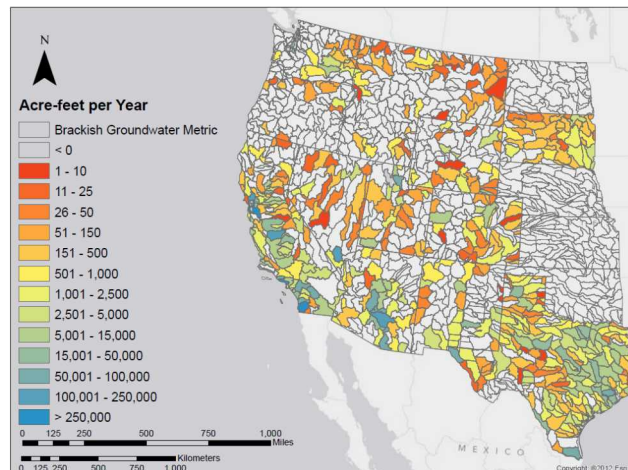
Potable Groundwater Metric



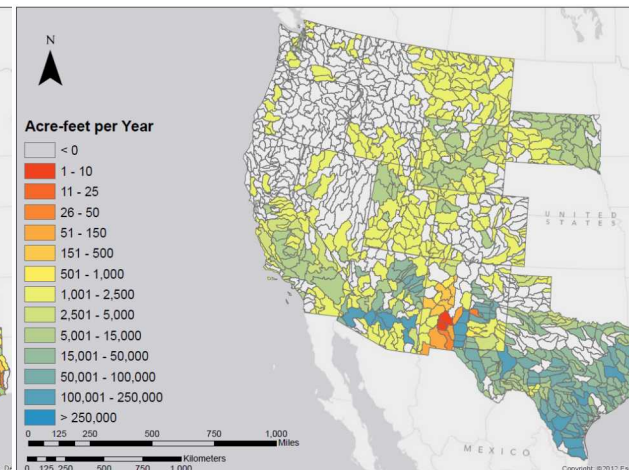
Appropriated Surface Water Metric



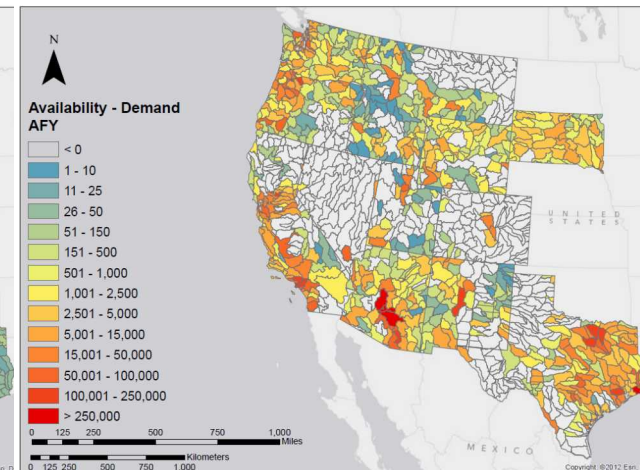
Wastewater Metric



Brackish Groundwater Metric

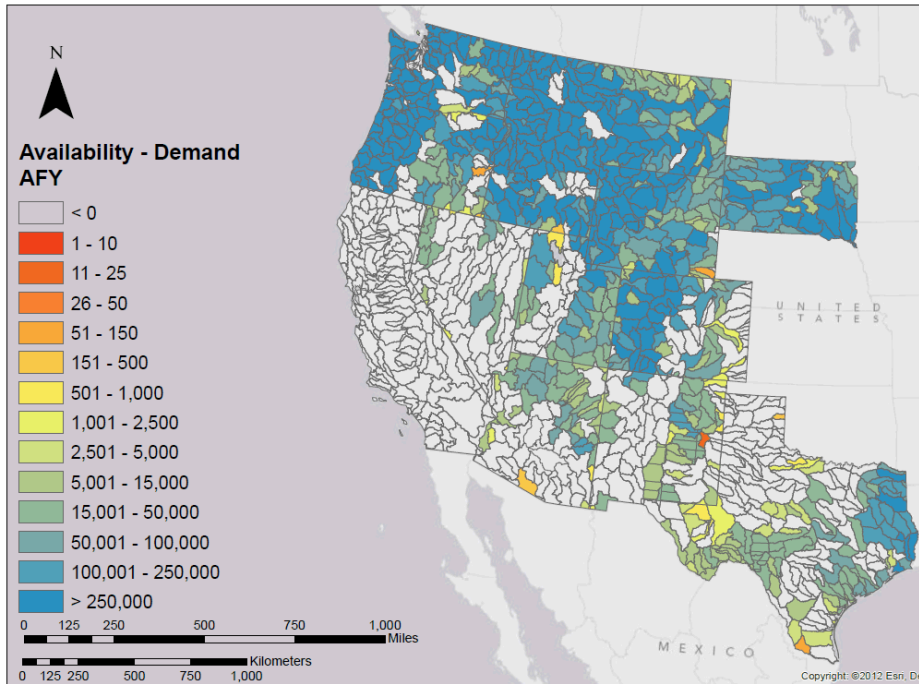


Change in Demand, Present - 2030

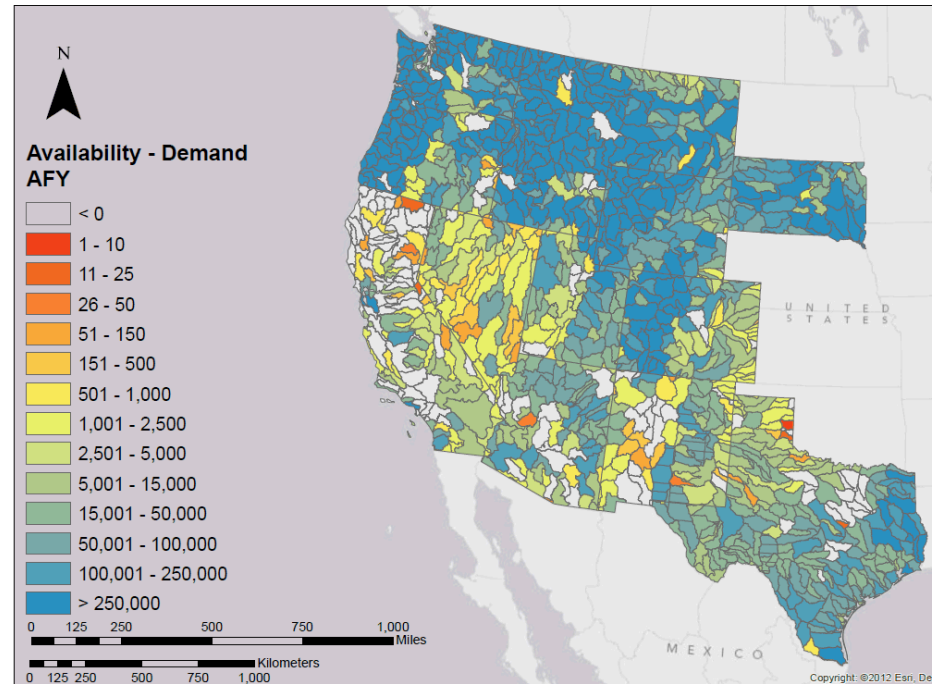


Water for Development

Unappropriated Water Sources Only
Availability - Demand, 2030

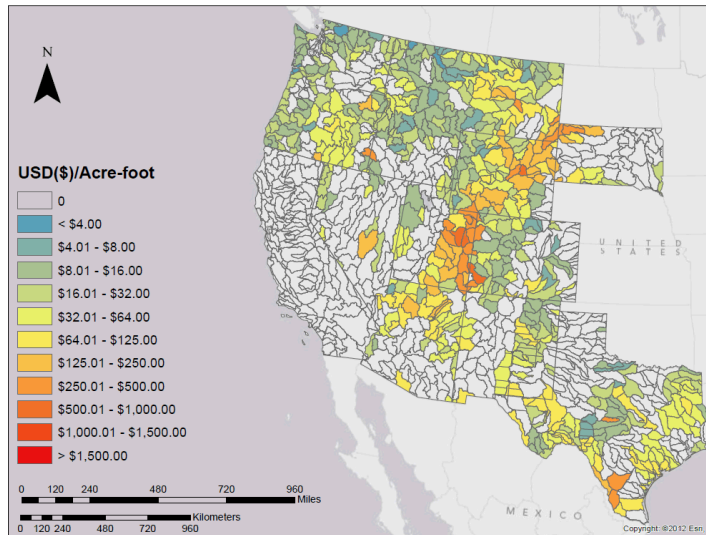


All Water Sources
Availability - Demand, 2030

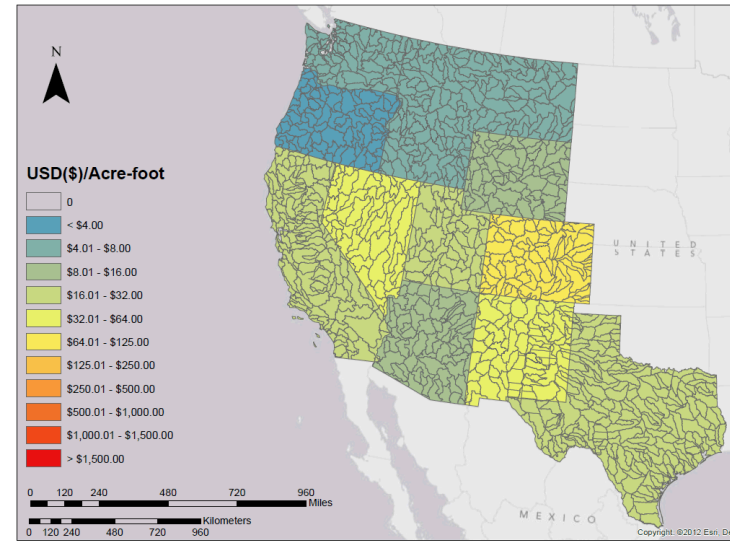


Relative Cost of Water

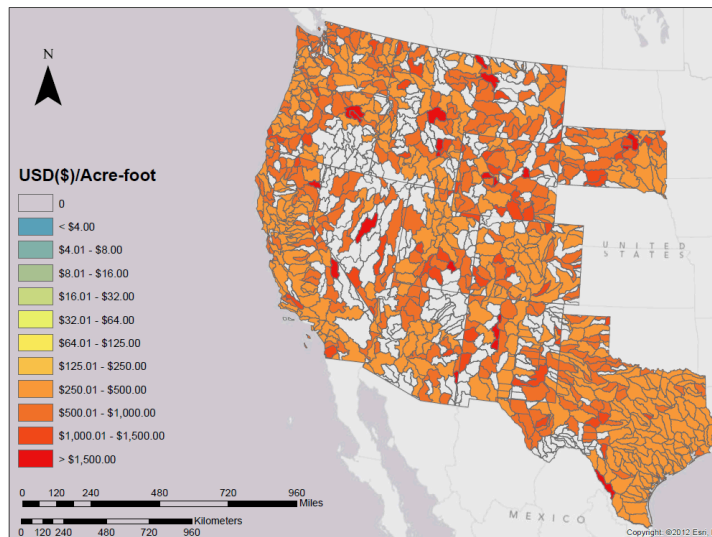
Potable Groundwater Cost



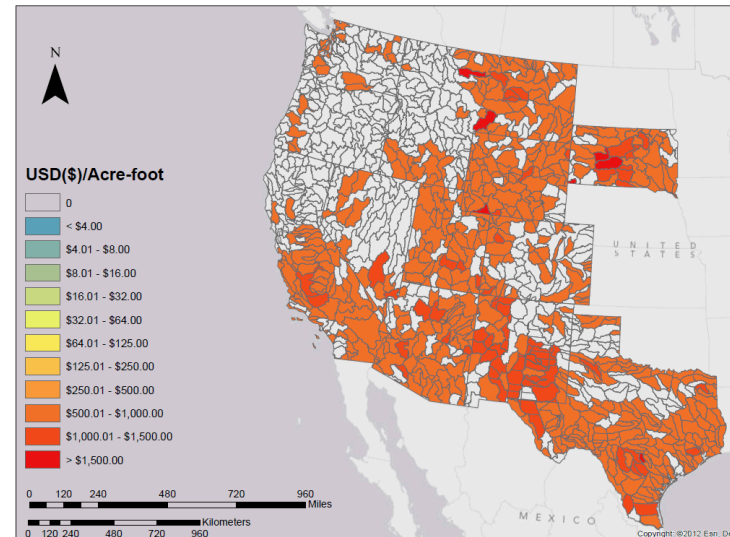
Appropriated Surface Water Cost



Wastewater Cost

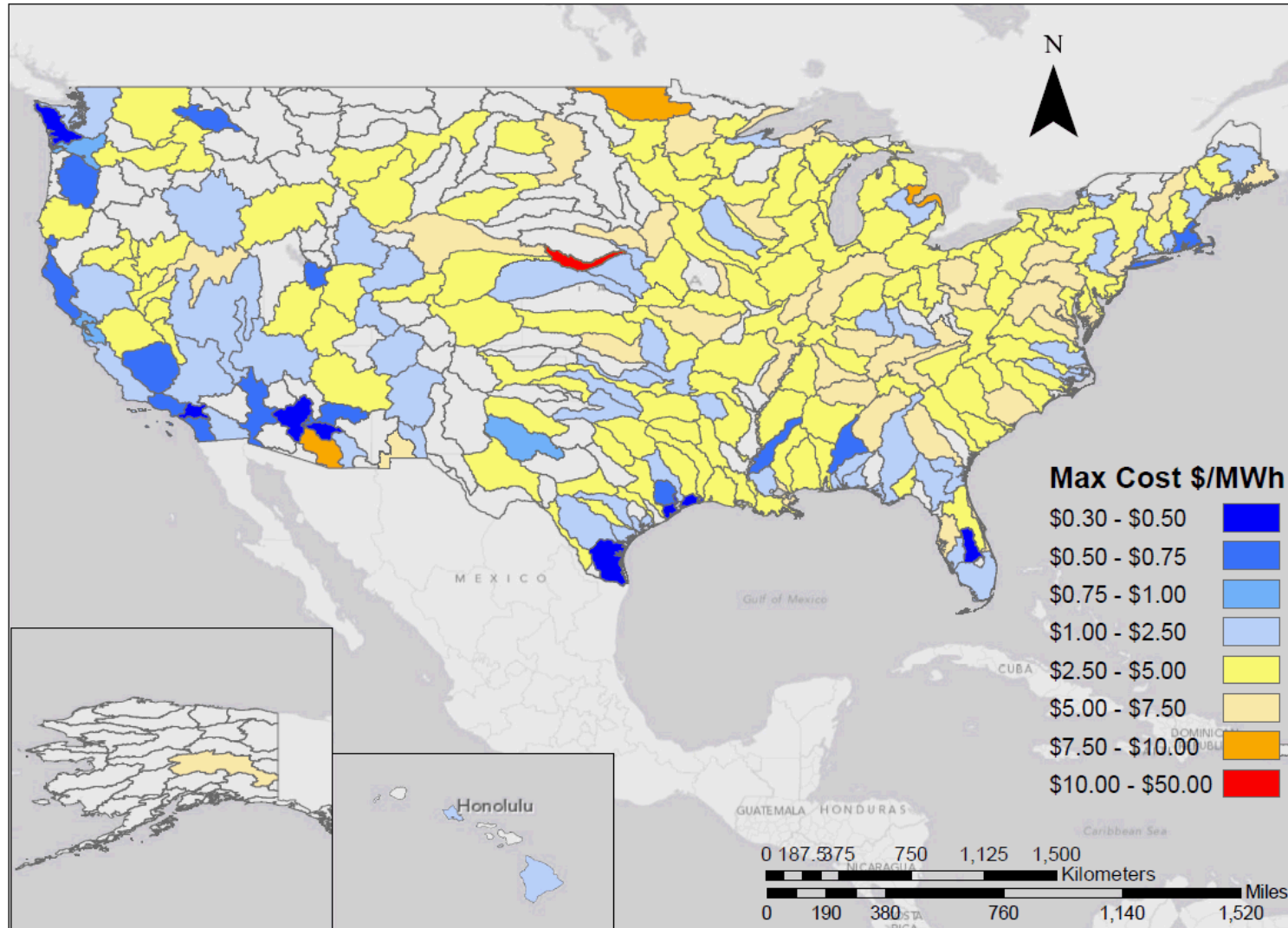


Brackish Groundwater Cost



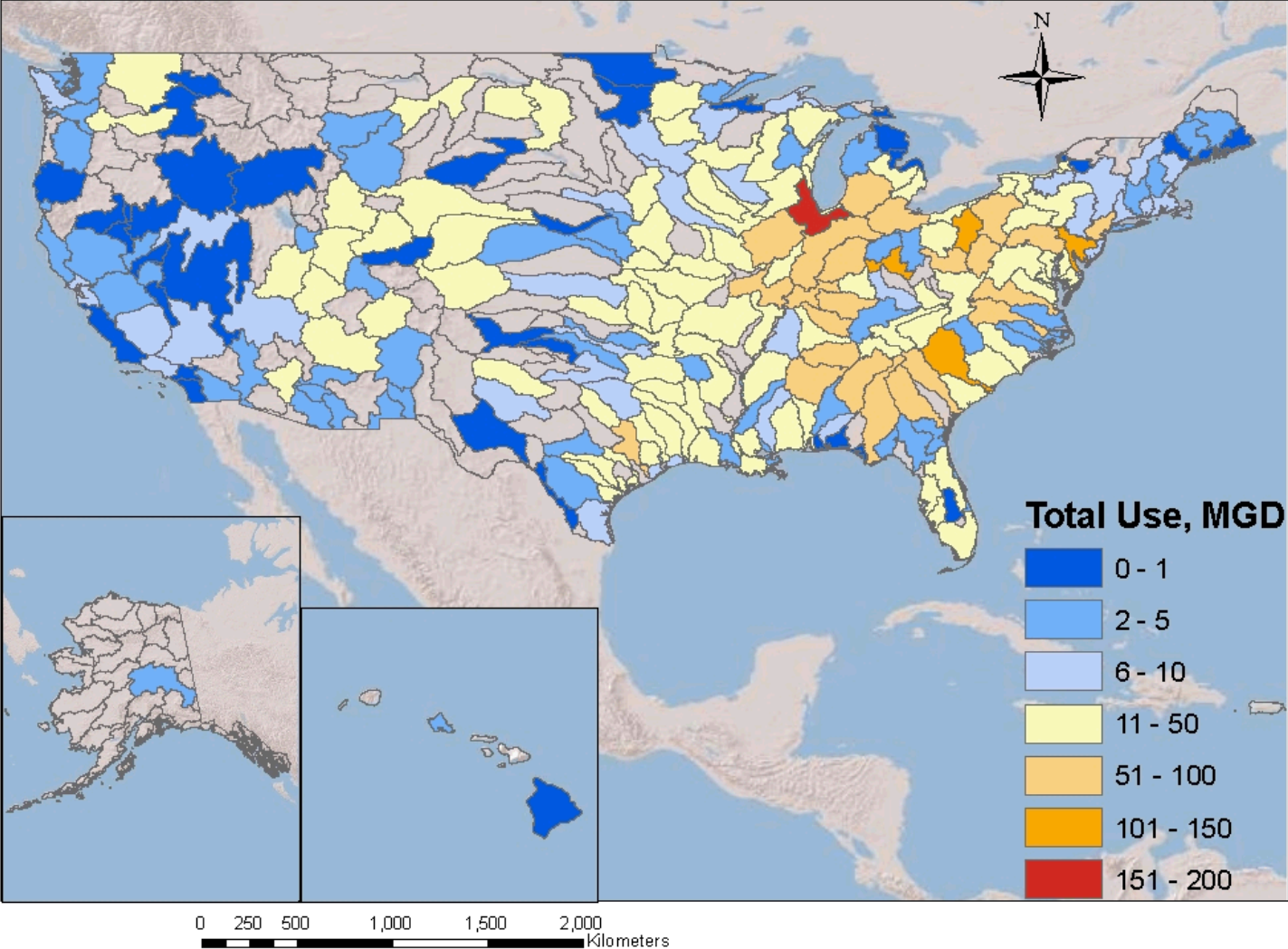
Levelized Cost of Electricity to Retrofit

Maximum Total Cost, All Technologies at 3% Discount Rate



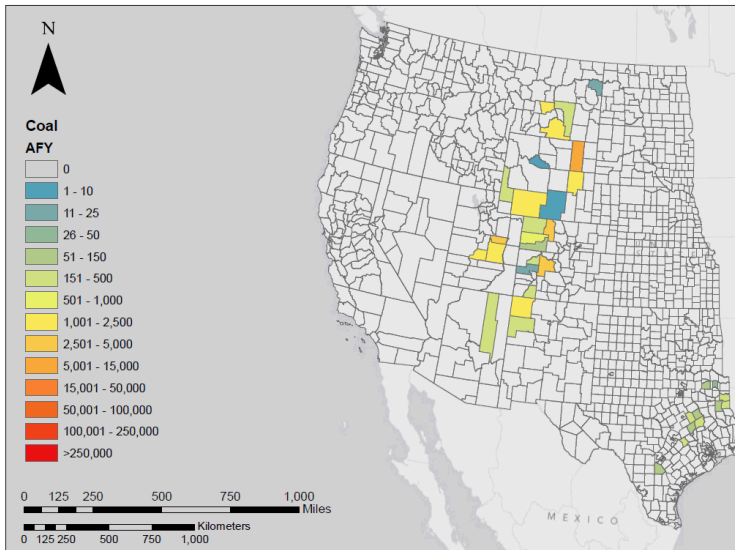
Potential Water Available from Retrofit

Powerplant Consumptive Water Use

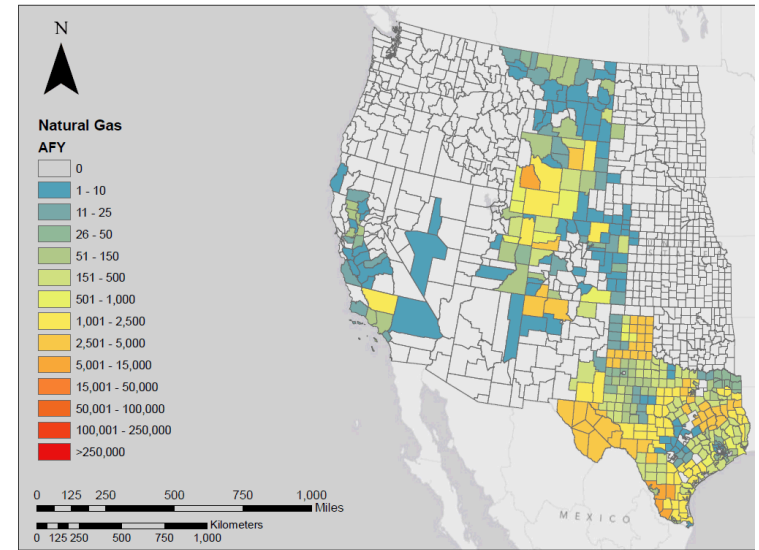


Water for Fuel Extraction

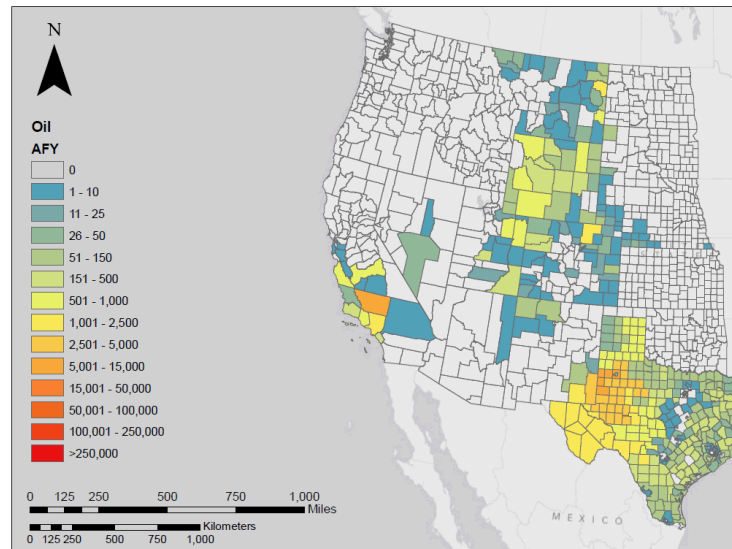
Water Use COAL

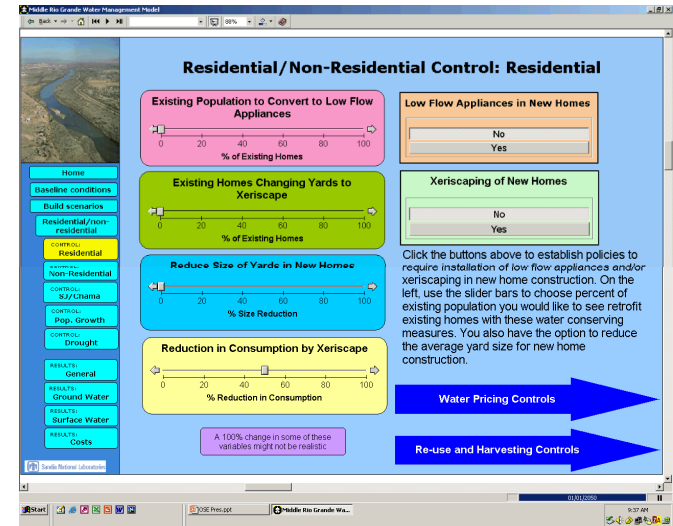
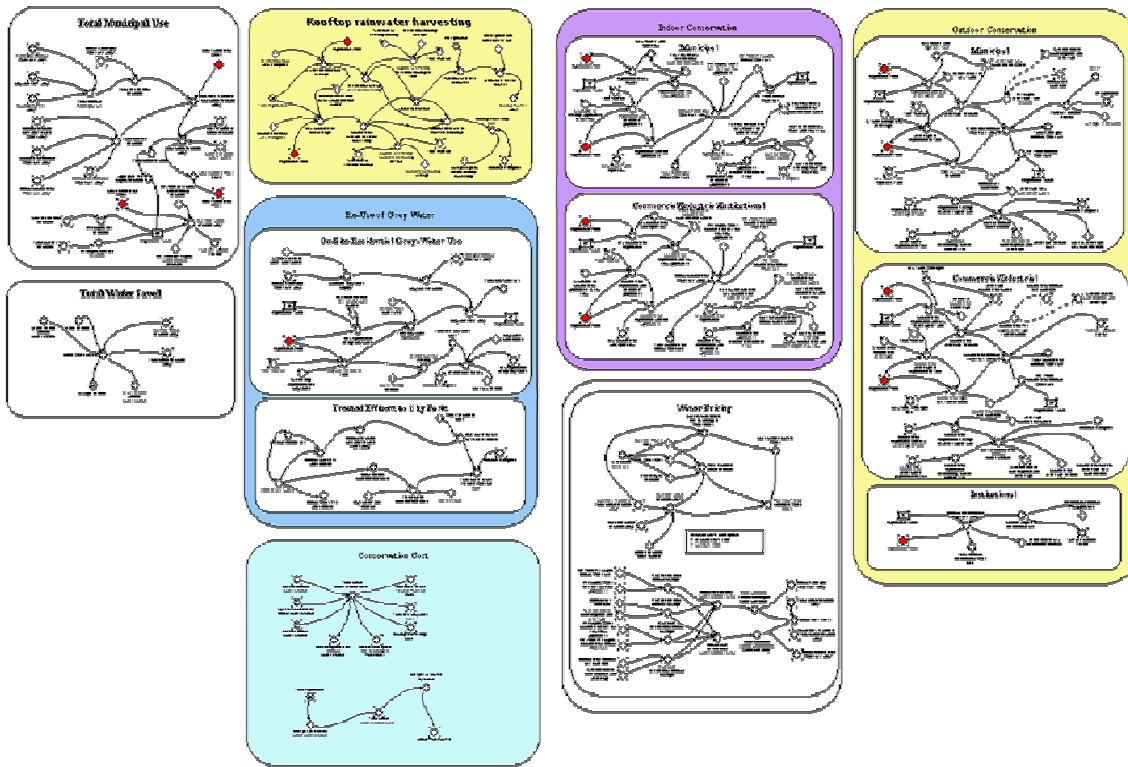


Water Use NATURAL GAS



Water Use OIL





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