



# The Energy-Water Nexus: Balancing Electricity and Water

**David Hunter**

Sr. Government Representative

Environment, Industry, and International Affairs

**Meeting of the Climate Change and Water Resources Workgroup of  
the Advisory Committee on Water Information**

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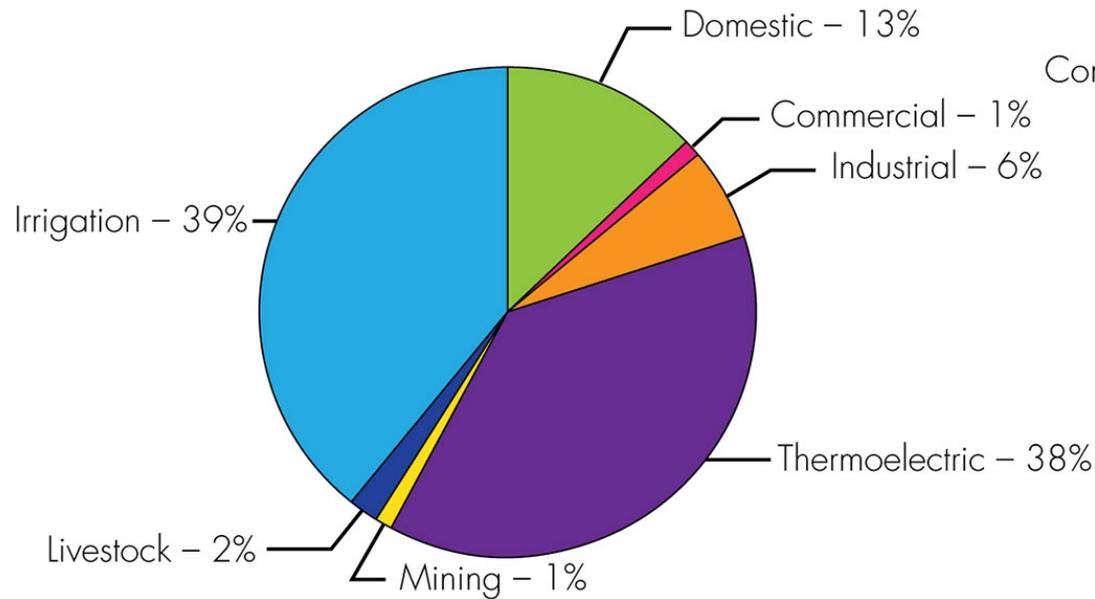
# About EPRI

- Founded in 1972 as an independent, non-profit center for public interest energy and environmental research
- 450+ participants in more than 30 countries
- EPRI members generate approximately 90% of the electricity in the United States

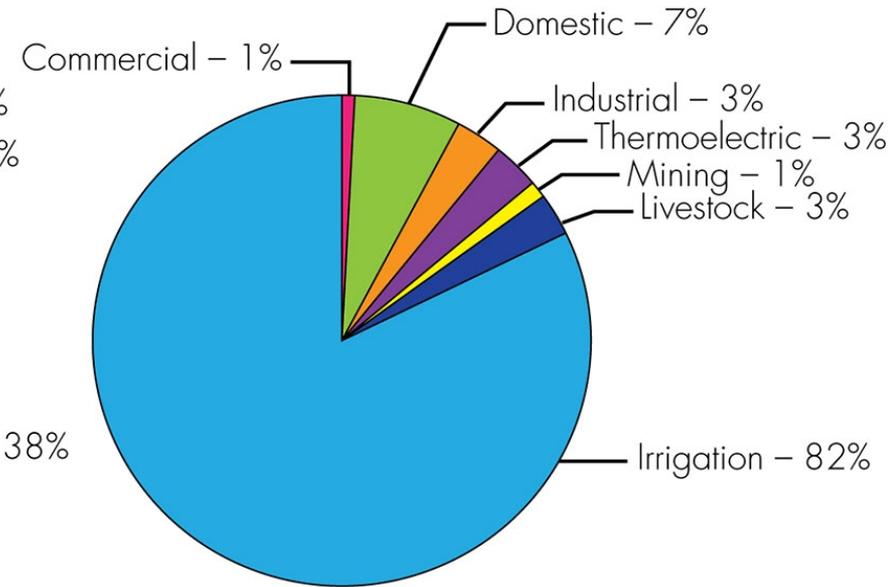


# Freshwater Withdrawal and Consumption

## Freshwater Withdrawal by Type (USGS)

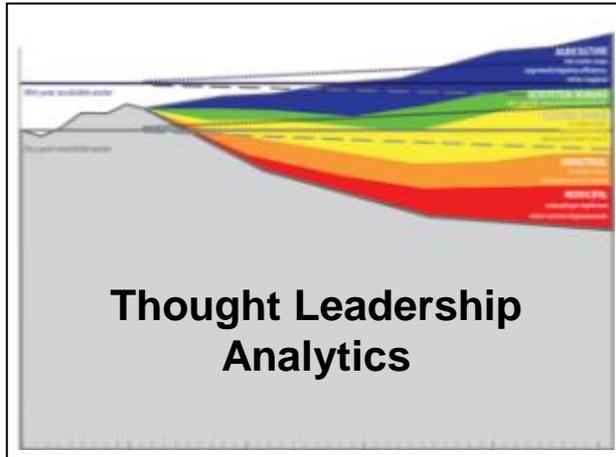


## Freshwater Consumption (USGS)



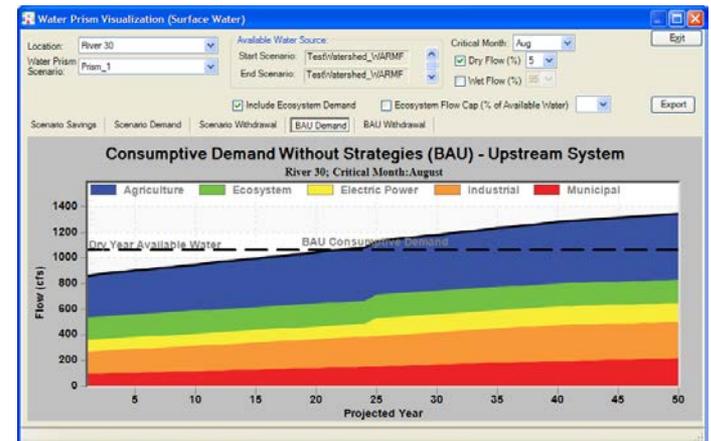
Sources: EPRI, USGS

# EPRI Research – Water Management and Water Conservation



# Water Prism: EPRI tool for supporting watershed-scale decisions

- Computes system water balance on regional scale
- Projects consumptive and withdrawal demands for 40- to 50-year horizon
- Explores water saving strategies through scenarios
- Complements other hydrological and short term forecasting models

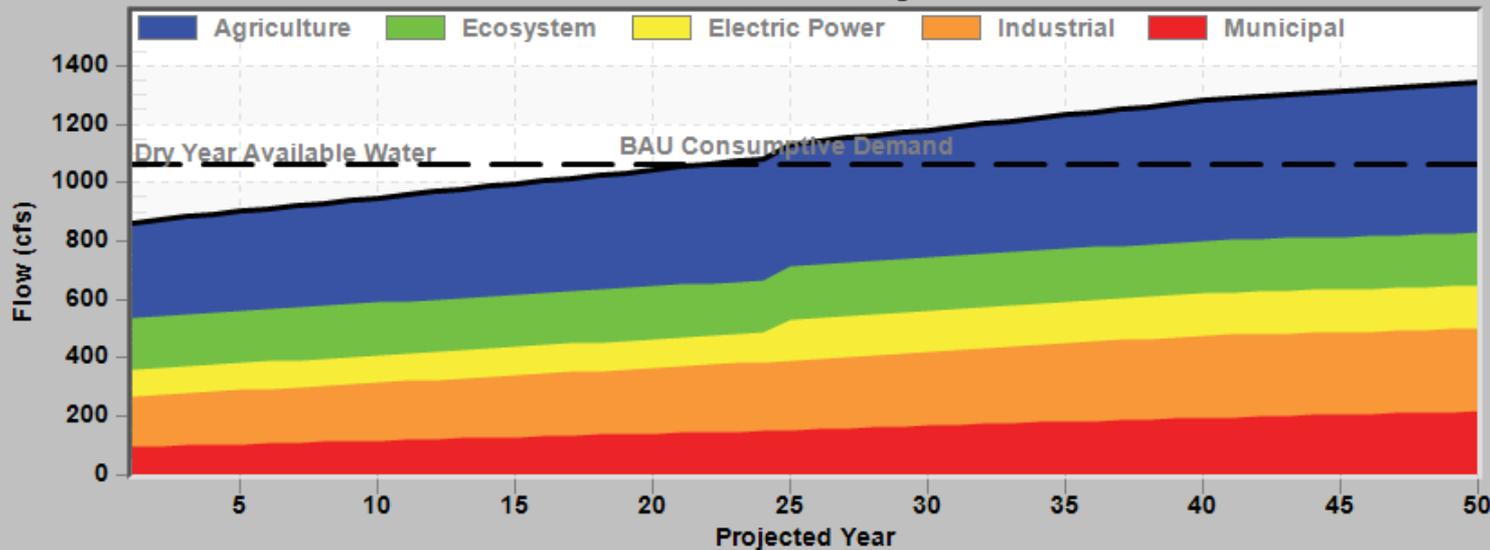


# Demonstration: Water Prism Applied to Hypothetical Watershed



Consumptive Demand Without Strategies (BAU) - Upstream System

River 30; Critical Month: August



Hypothetical example shows consumptive demand exceeding available water under dry year conditions within 20 to 25 years

# Build Water Prism Scenarios to address shortages

The screenshot shows the WaterPrismDSS (ver 1.4.1.0) - TestWatershed2 application. The main window displays a map of a watershed with various icons representing different water use entities. A 'Scenario Builder' dialog box is open, showing a table of available Prism Scenario(s) and an implementation schedule table.

**Scenario Builder - Available Prism Scenario(s):**

Scenario ID	Description	Created Time
Prism_1		
Prism_2	No Biomass plant, significant muni conservation	

**Implementation Schedule:**

Year	Type	Value	Notes
25	% Reduction	75	

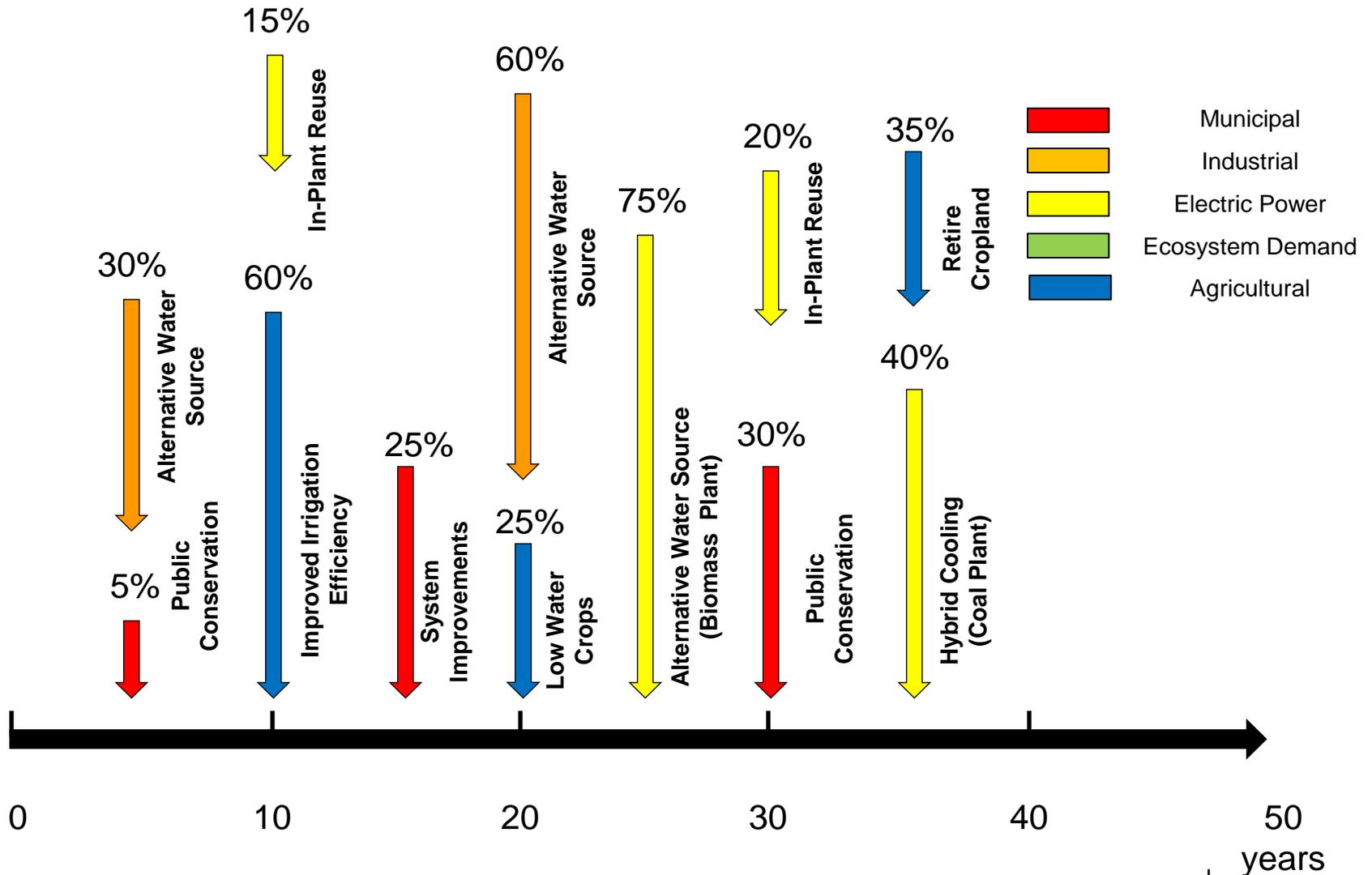
**Map Legend:**

- Water Use Entities
  - Municipal
  - Industrial
  - Power Plant
  - Ecosystem Demand
  - Agriculture
- USGS Gages
  - USGS Gages
- Surface Hydrology
  - Rivers
  - Lakes/Reservoirs
- Basin Properties
  - Land Uses
  - Hydrologic Soil Group
- Prism Watershed Layers
  - Aquifers
  - Fine Grained Unconsolidated

**Year 25: alternative water source for new biomass plant**

**Year 35: convert once-through coal plant to hybrid cooling**

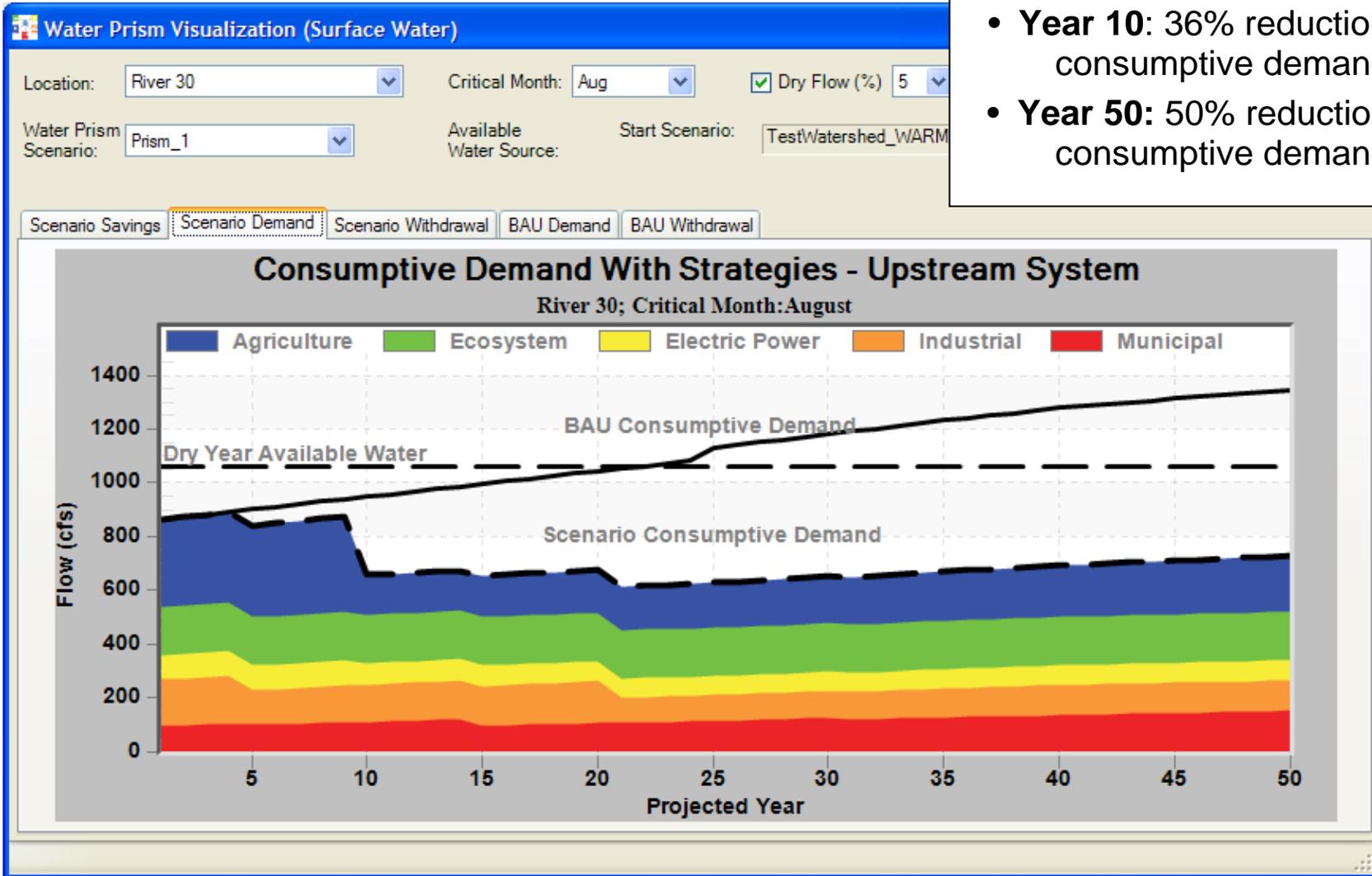
# Schematic of a Water Prism Strategy Timeline (Percent Reduction in Water Use)



# Reduced Demand Risk

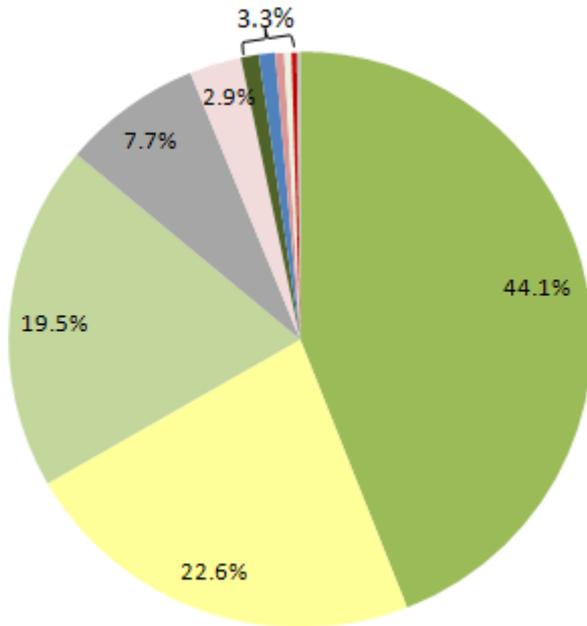
## Potential Benefits of Water Prism Strategy Implementation

- **Year 10:** 36% reduction in consumptive demand
- **Year 50:** 50% reduction in consumptive demand

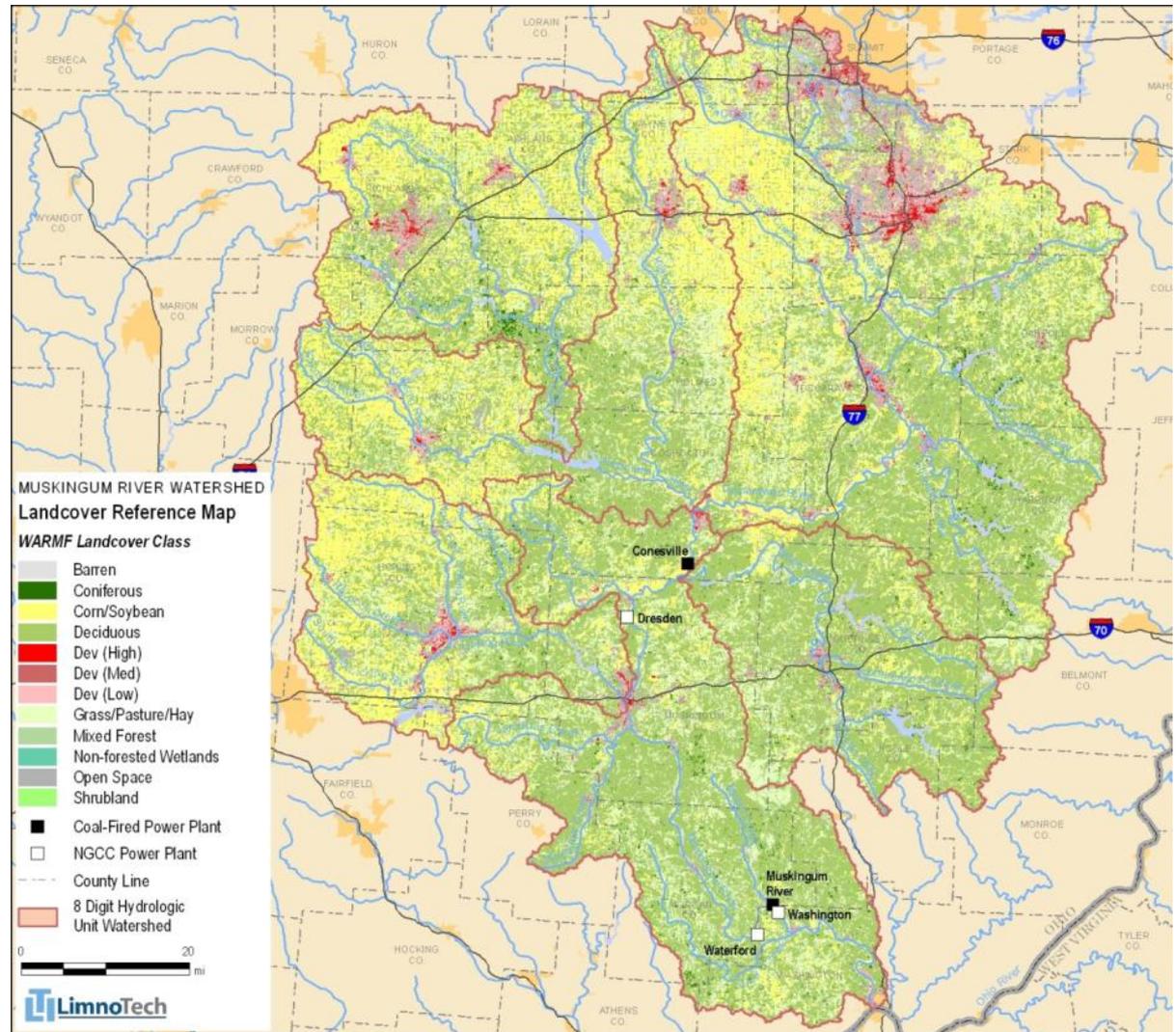




# Land Use / Land Cover (2006 NLCD)



- Deciduous
- Corn/Soybean
- Grass/Pasture/Hay
- Open Space
- Dev (Low)
- Coniferous
- Dev (Med)
- Non-forested Wetland
- Dev (High)
- Barren
- Shrubland
- Mixed Forest



# Principal Aquifers

## 4 Principal Aquifers

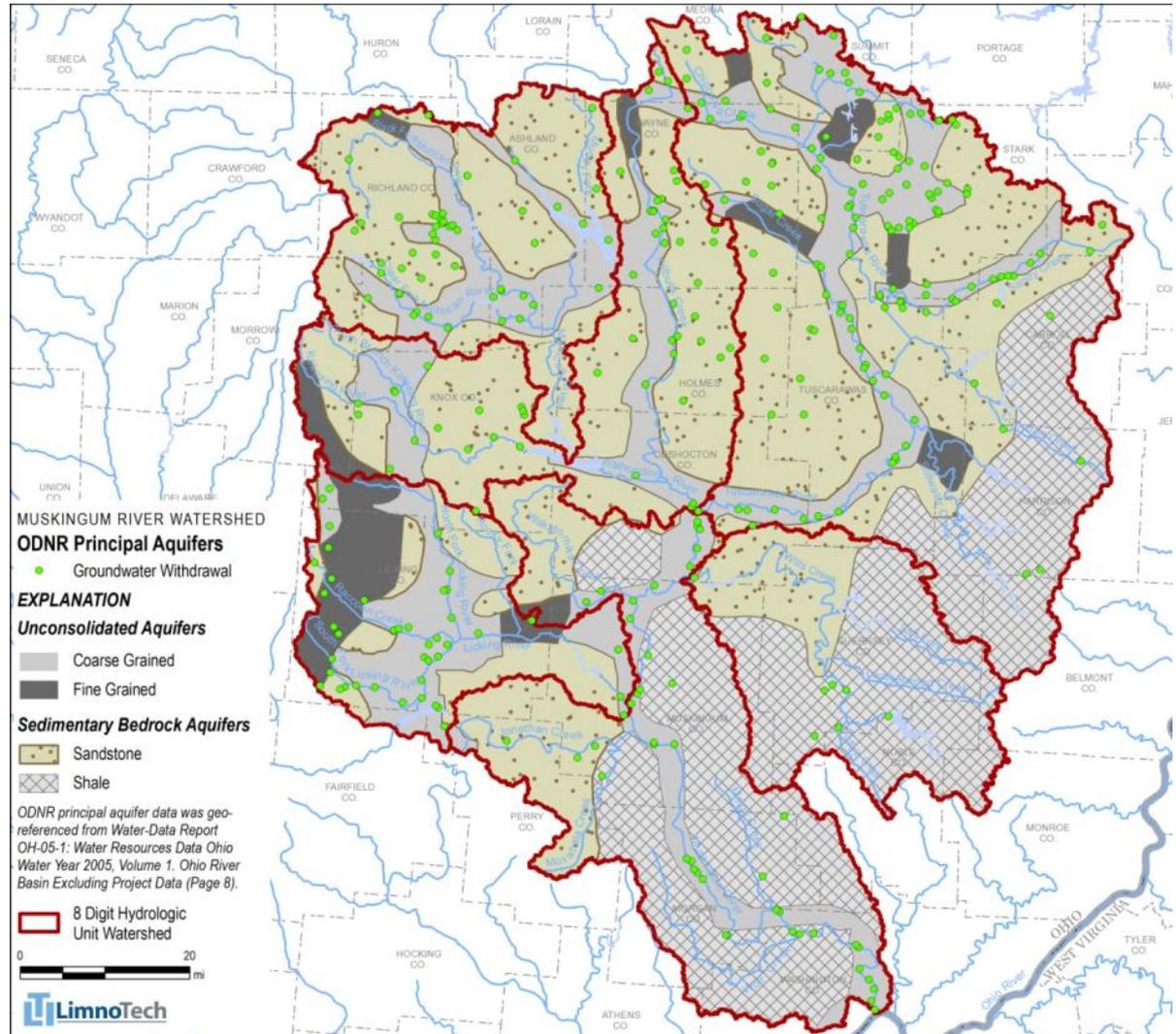
- 389 to 3741 mi<sup>2</sup>

## Unconsolidated

- Shallow, follows river valleys, high porosity, high yield

## Bedrock

- Deeper, low porosity, low yield





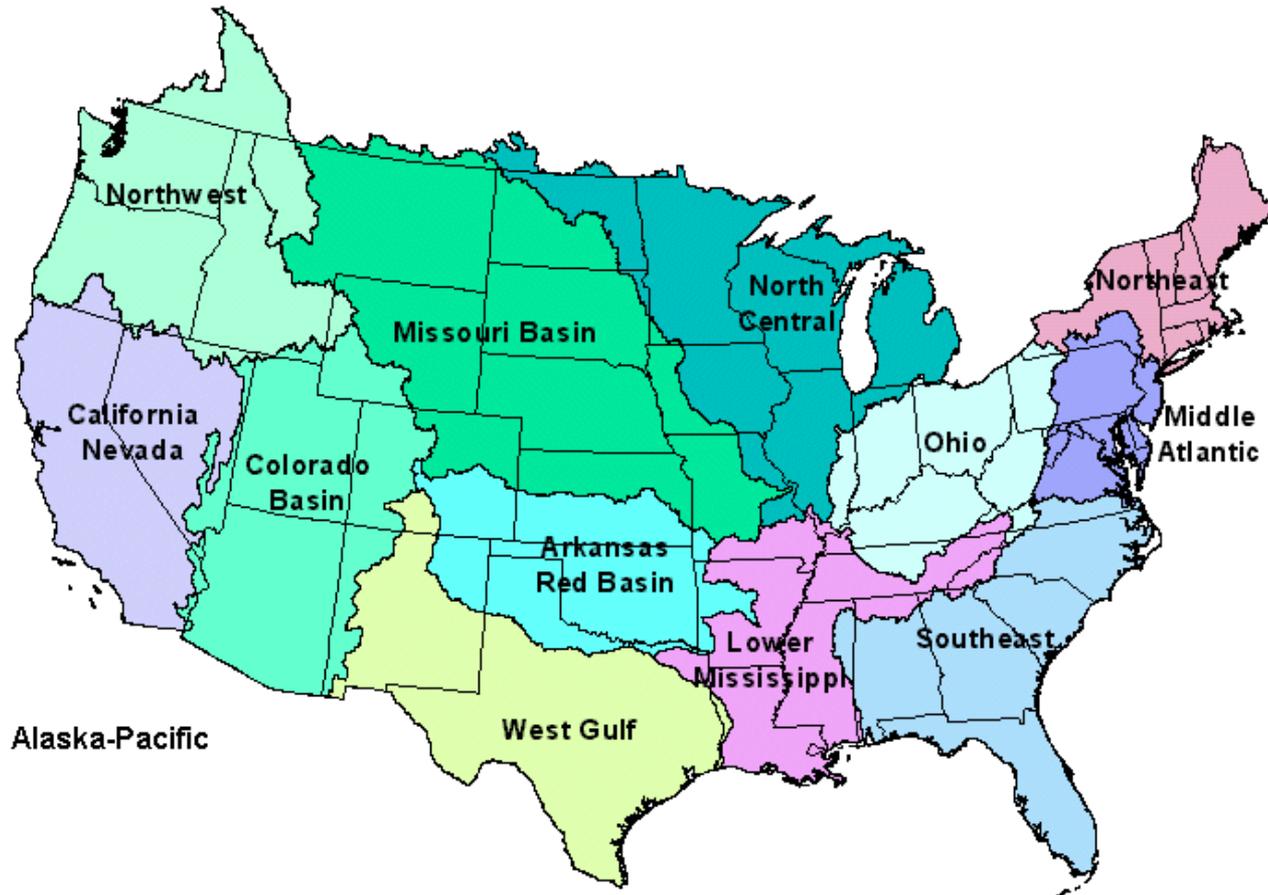
# Observations of Muskingum River Basin

- Surface water system is generally “gaining” water from the groundwater system
- Isolated areas with potential water risk during summer months of dry years
- Most of watershed at relatively low risk for consumptive and withdrawal demands in both groundwater and surface water systems



**Water Prism showed generally low water risk and impacts of retirement of once-through units**

# Next step: Nationwide assessment?



**Water Prism could inform decision making on a nationwide scale**



# *Together...Shaping the Future of Electricity*

**David Hunter, Ph.D.**  
Sr. Gov't Representative  
Environment, Industry, and International Affairs  
**Electric Power Research Institute**  
2000 L ST NW Suite 805  
Washington, DC 20036

202-293-7514  
[dhunter@epri.com](mailto:dhunter@epri.com)