Water Demand Forecasting for Southwestern Missouri

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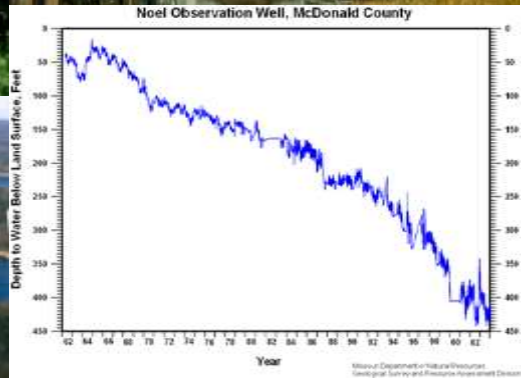
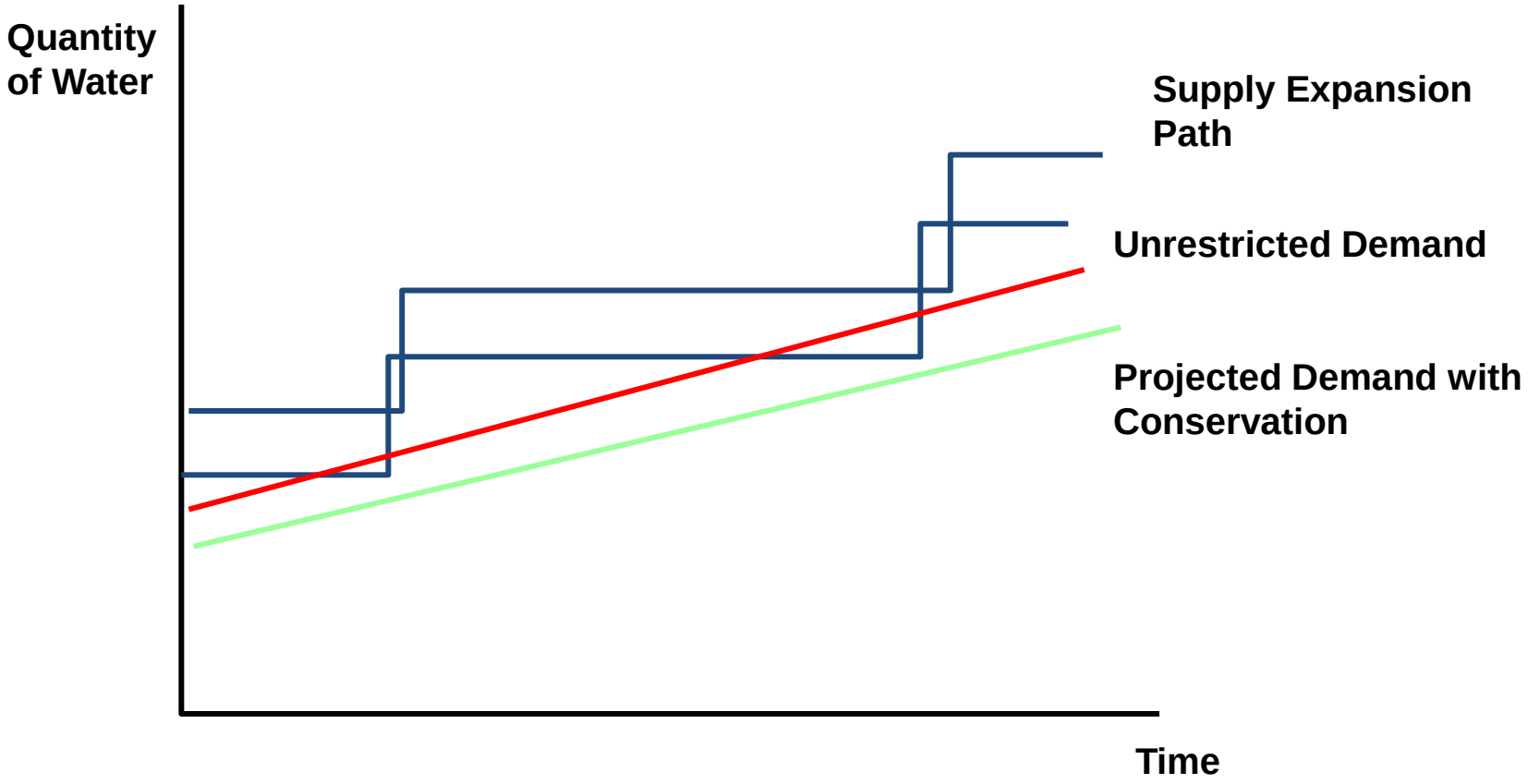
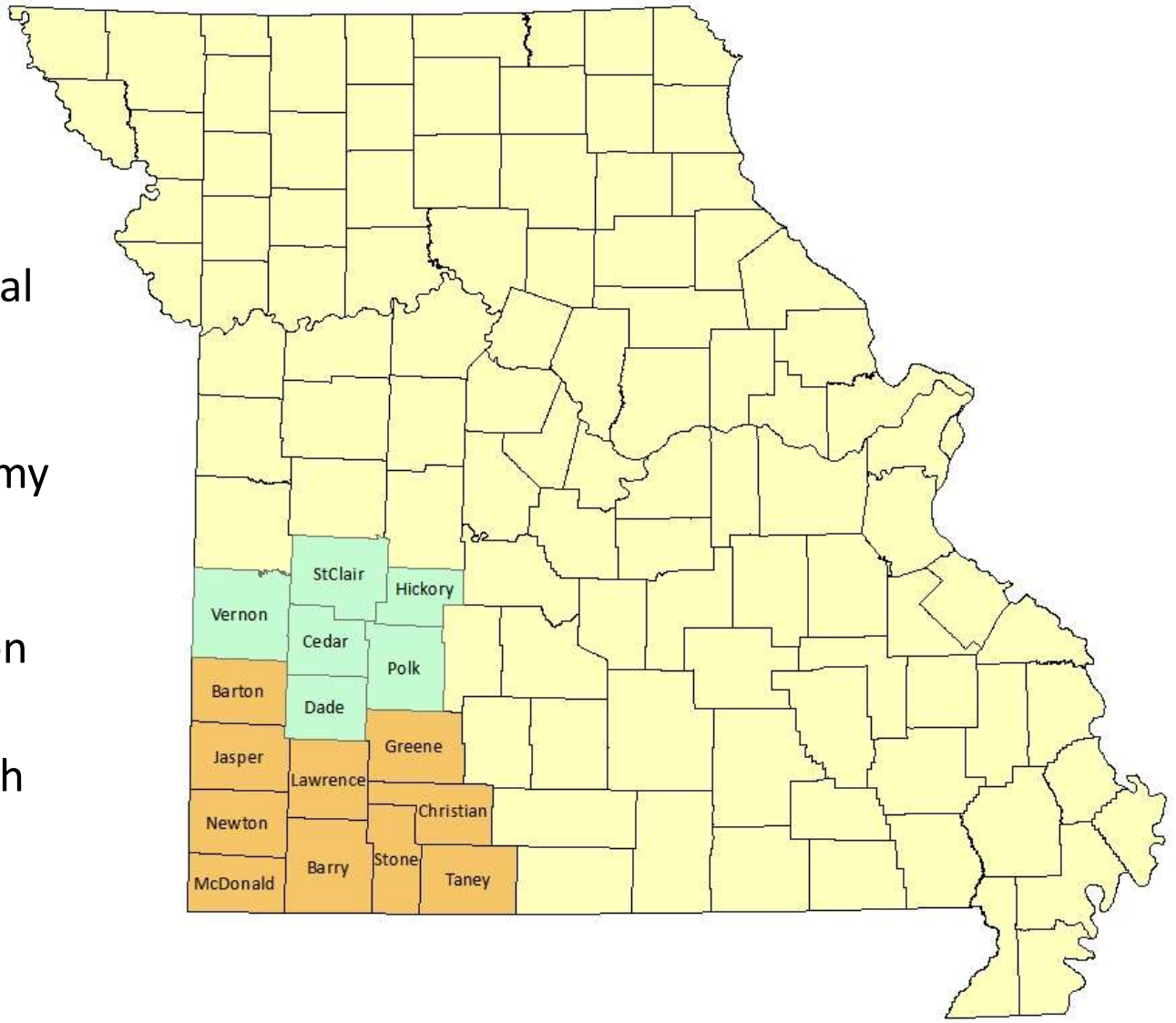


Demand-Supply Planning: The Big Picture

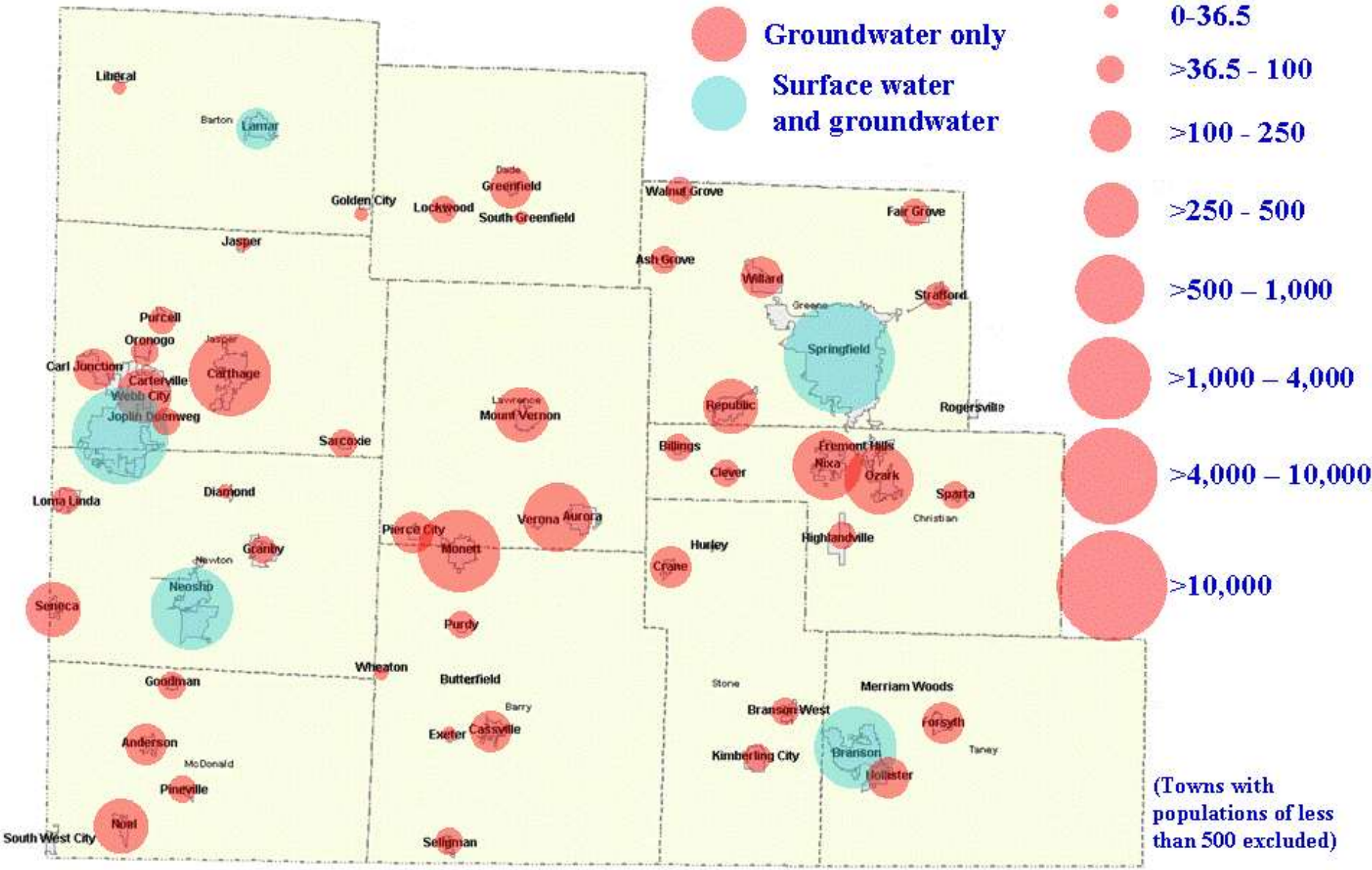


Study Area and Partners

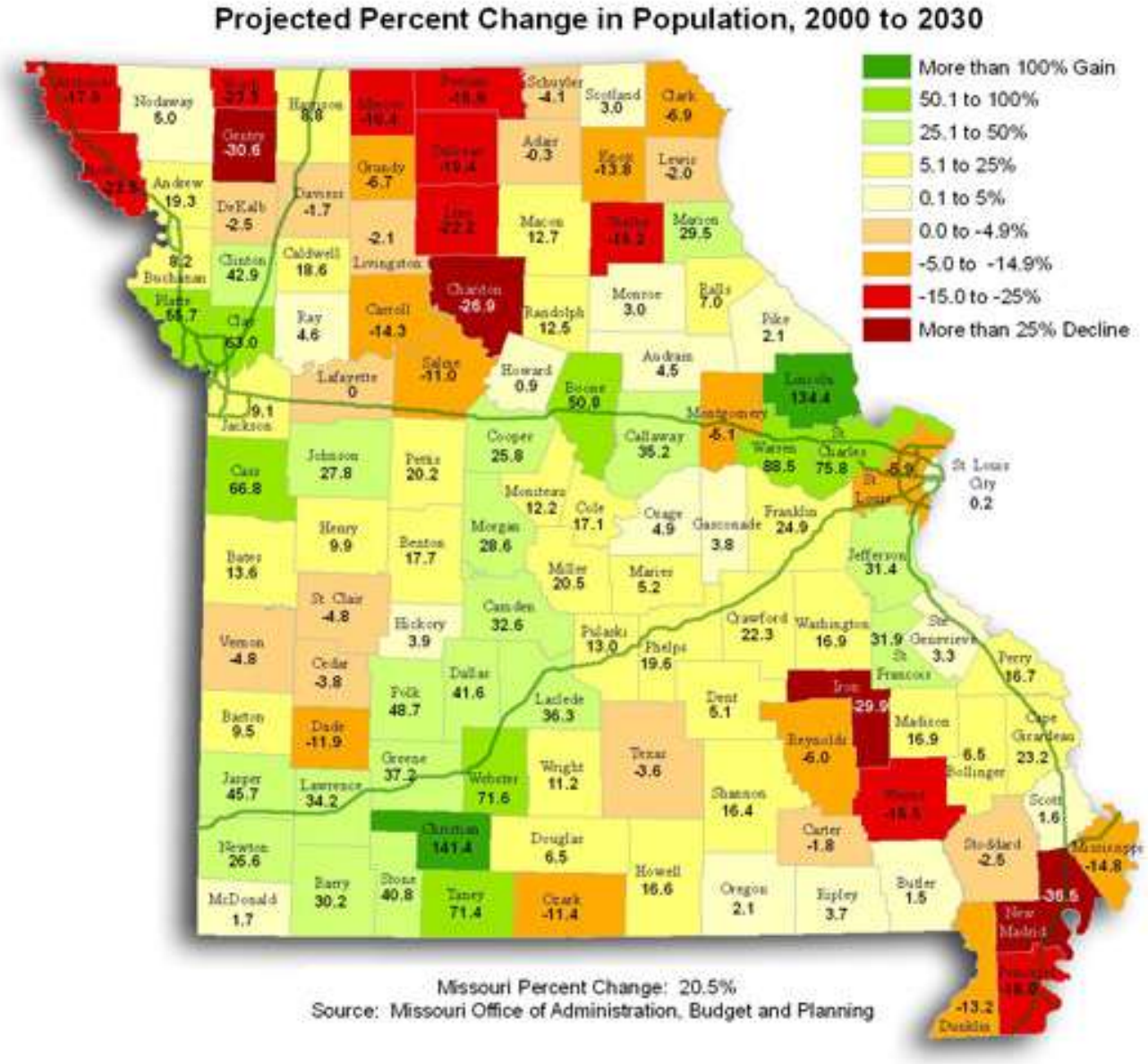
- Develop a 50-year regional water demand forecast for municipal, industrial and agricultural uses
- Partners are Little Rock and KC Districts – US Army Corps of Engineers, Missouri DNR, Tri State Water Resource Coalition and CDM
- 50/50 cost share through Planning Assistance to States
- Completed by summer 2012



Average Annual Municipal Water Use 1996 – 2008
(million gallons per year)



Population Projections



Forecast Development Process

Step 1: Data Collection

Step 2: Data Analysis

Step 3: Develop profile and water use models

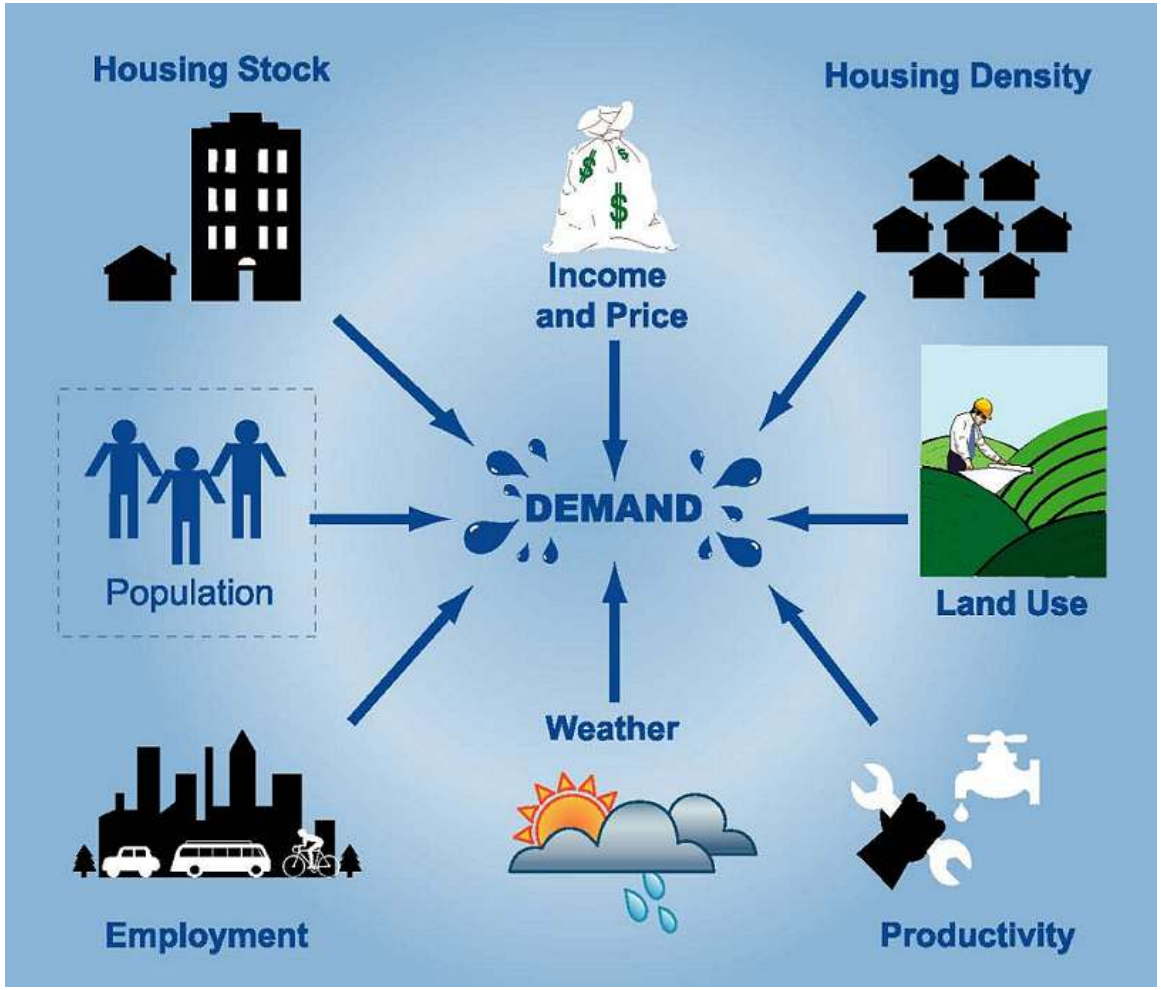
Step 4: Prepare baseline forecast

Step 5: Estimate impact of conservation on future water demands

Step 6: Evaluate sensitivity and uncertainty

Step 7: Update as new information is available

Modeling Water Use in the Real World



Real World

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Measureable Relationships

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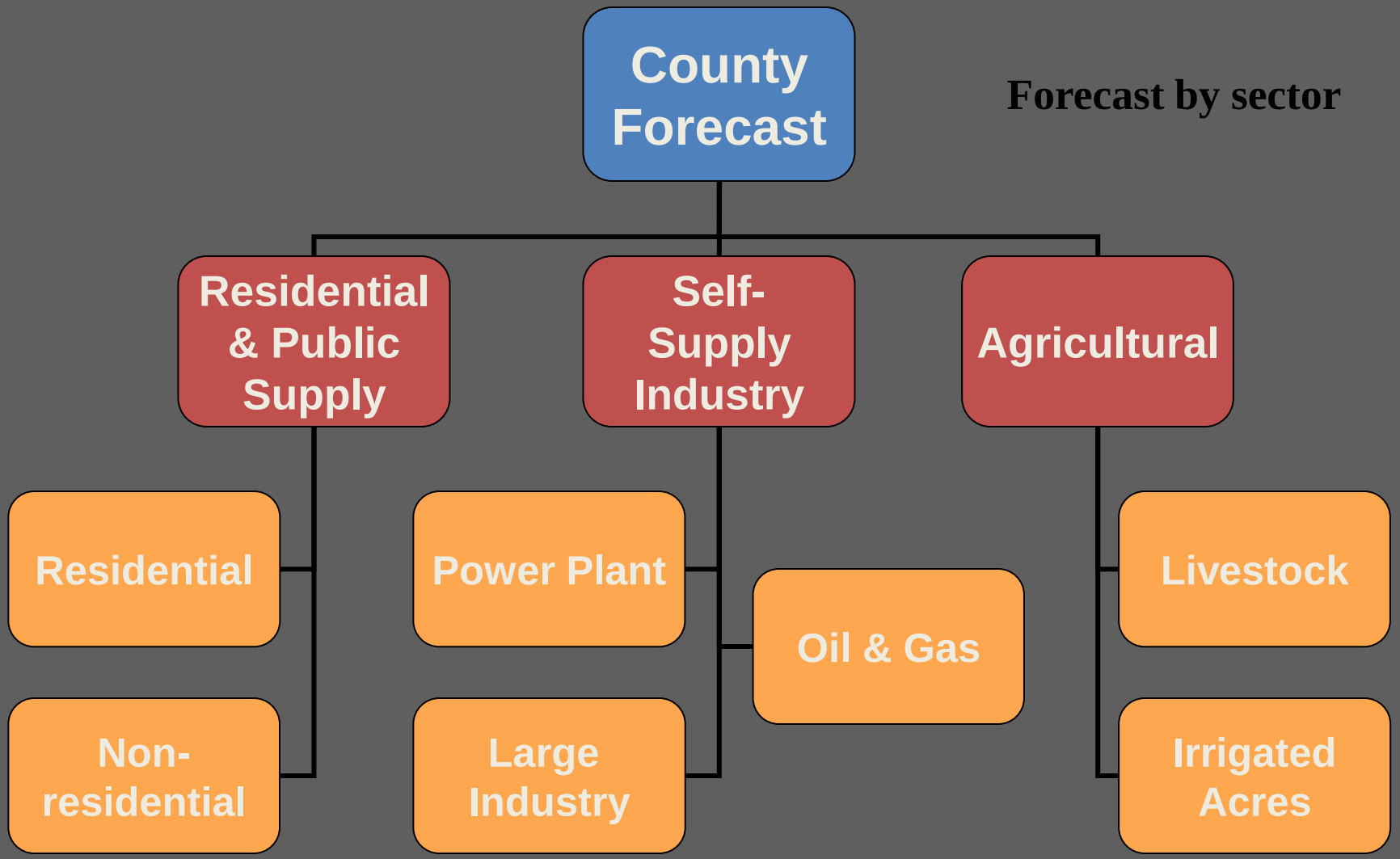
Mathematical Models of Causal Relationships

County Forecast Methodology



Demand can be disaggregated into sectors and end uses

Water Uses			
	Potable	**Raw**	**In-Stream**
Sectors	▪ Residential ▪ Commercial ▪ Industrial ▪ Irrigation ▪ *Unmetered* ▪ *Unaccounted for*	▪ Agricultural ▪ Industrial ▪ Thermopower ▪ Mining	▪ Environment ▪ Hydropower ▪ Recreation ▪ Navigation
End Uses	▪ Toilets ▪ Showers ▪ Washing Machines ▪ Faucets ▪ Landscaping ▪ Cooling ▪ Process Water ▪ Swimming Pools	▪ Crop Irrigation ▪ Livestock ▪ Cooling ▪ Boiler Feed ▪ Process Water ▪ Conveyance ▪ Extraction	▪ Wildlife Habitat ▪ Power Generation ▪ Fishing ▪ Rafting ▪ Barges ▪ Downstream Flows

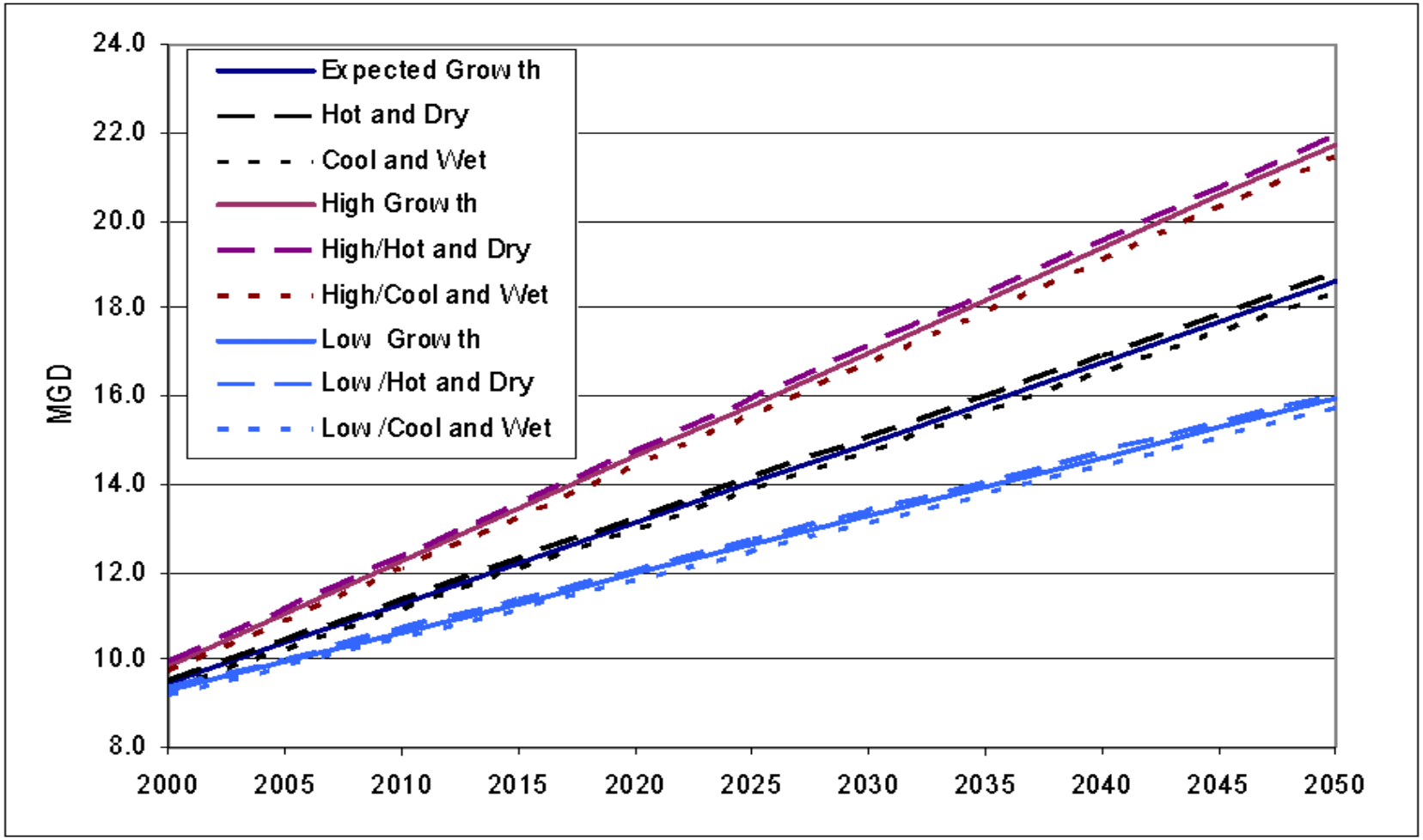
Factors that Affect Average Rates of Water Use

- Socioeconomic
  - Persons per household
  - Median household income
  - Lot size
- Weather
  - Maximum daily temperature
  - Precipitation & number of rainy days
  - Cooling degree days
- Price
- Conservation

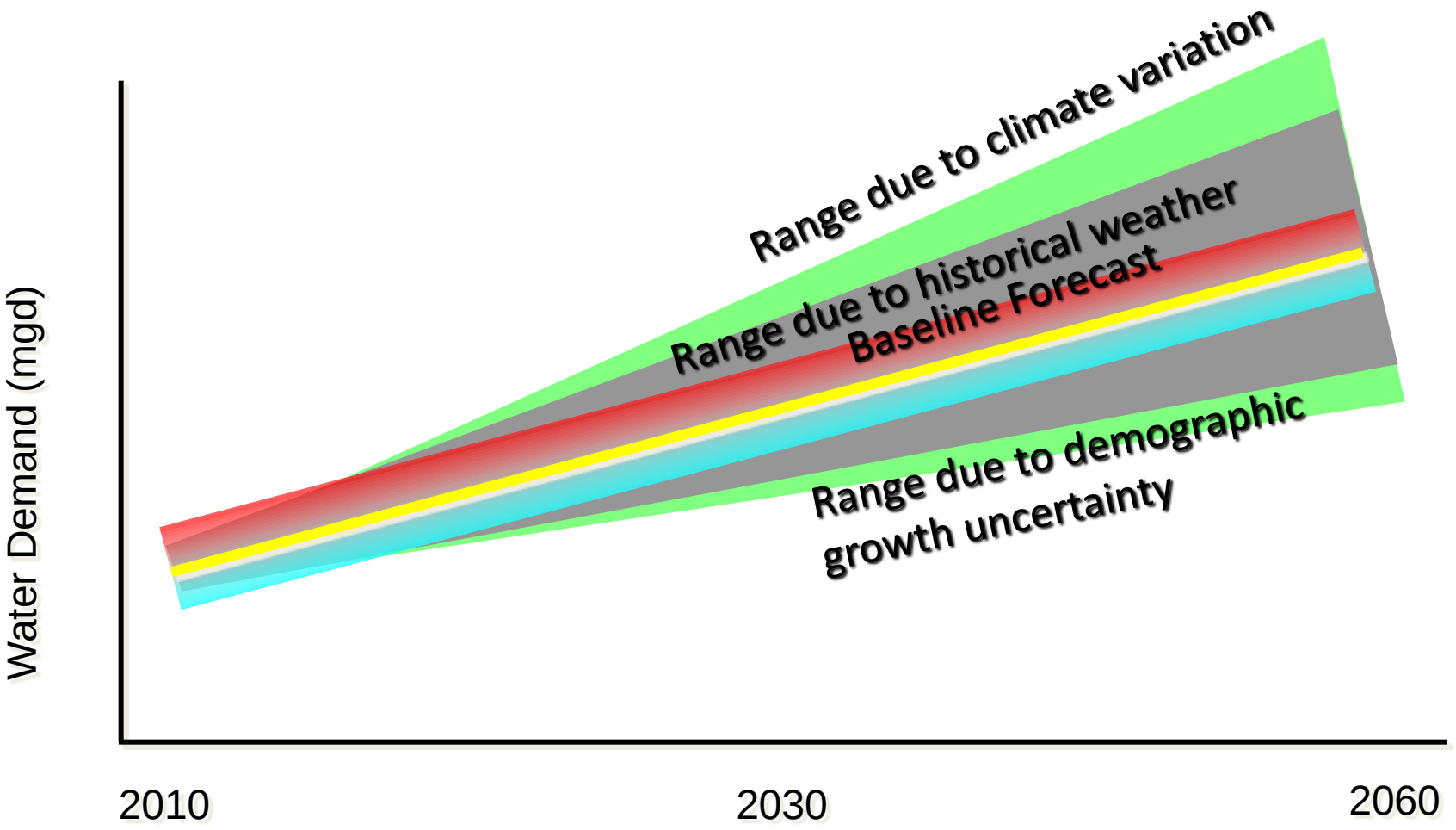
Uncertainty in a Demand Forecast

- Real world versus the model
- Demographic projections (Drivers)
  - Growth rates
  - New (or lost) large users
- Economic impacts
  - Economy
  - Water rates
- Weather & Climate

Example of Alternative Demand Scenarios



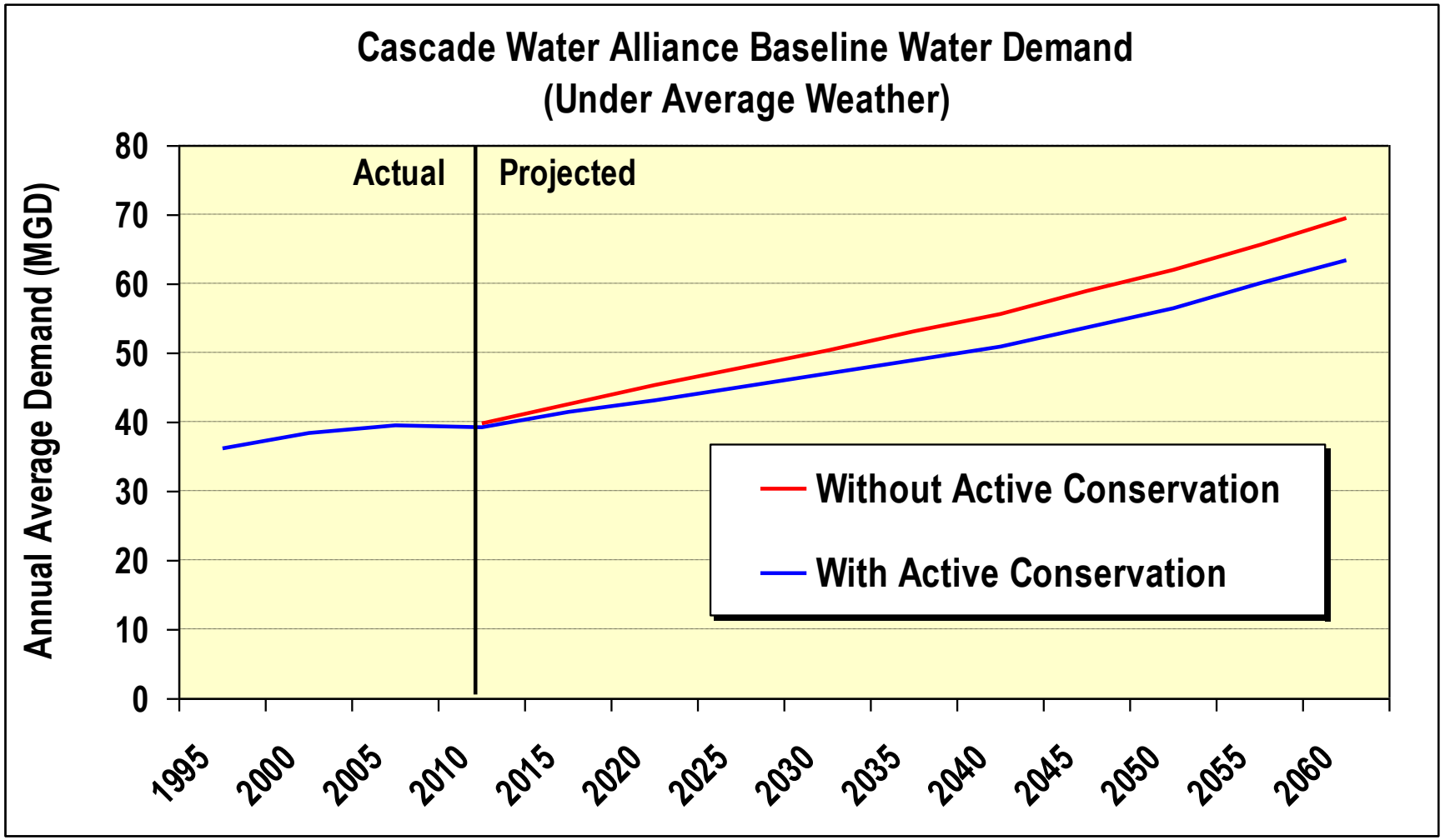
Sensitivity Analysis



Incorporating Conservation

- Estimate Baseline Demand
  - By sector to understand water use
  - Includes current conservation effects
- Estimate Impact of Conservation Measures
  - Estimated future savings
  - Percent reduction
  - Alternate levels of effectiveness
- Estimate Demand with Conservation
  - Alternate programs & levels of effectiveness

Baseline & Conservation Forecast



History of IWR-MAIN

- 1968: Municipal And Industrial Needs (MAIN) developed by Hittman Associates
- 1982: Institute for Water Resources - Municipal And Industrial Needs (IWR-MAIN)
- 1994: PMCL copyright (Version 6.0)
- 1999: IWR-MAIN Water Demand Management Suite©
- 2003: PMCL acquired by CDM

IWR-MAIN Water Demand Management Suite©

FORECAST MANAGER ©

Estimates water demand forecast by customer sector based on modeled water use patterns

CONSERVATION MANAGER ©

Estimates water demand by the end uses of water and provides estimates of water conservation savings

Prior IWR-MAIN Applications

- Orange (NC) Water and Sewer Authority
- City of San Diego
- ACT-ACF (AL, FL, GA) Comprehensive Study
- Eugene (OR) Water and Electric Board
- City of Albuquerque
- Puerto Rico Water and Sewer Authority

Thanks for Listening.

Missouri Department of Natural Resources

Questions?

Water Resources Center - www.dnr.mo.gov/env/wrc/