





## Comprehensive Update of the Arkansas Water Plan

# WELCOME

### Planning Team





## Comprehensive Update of the Arkansas Water Plan

# Public Information & Stakeholder Involvement Meeting #2

Wednesday June 5, 2013  
AR Game & Fish Commission



## Today's Meeting

- Status of AR Water Plan Update
- Answer questions
- Discuss concerns



# Arkansas Natural Resources Commission

- Establishes policy that makes funding and regulatory decisions relative to soil conservation, nutrient management, water rights, dam safety, and water resources planning and development
- Composed of nine members appointed by the Governor and confirmed by the Senate



**Comprehensive Update of the Arkansas Water Plan**  
Draft Vision, Mission, and Goals

**Draft Vision for Managing Water Resources in Arkansas**

Water is vital to the prosperity and health of Arkansas's people and their natural surroundings. As such, water must be managed in a sustainable manner to support local and state economies, protect public health and natural resources, and enhance the quality of life of all citizens by applying appropriate policies and best practices with limited regulation and preservation of private property rights.

**Draft Mission of the Arkansas Water Plan**

The Arkansas Water Plan is the State's comprehensive planning process for the conservation, development, and protection of the State's water resources, with a goal of long-term sustainable use for the health, well-being, environmental, and economic benefit of the State of Arkansas. The Arkansas Water Plan will achieve the following goals.

**Draft Goals**

- ◆ Optimize the use of surface and groundwater for the differing economies of the unique regions of the State.
  - Reliably meet agriculture water needs.
  - Reliably meet municipal & industrial water needs.
  - Manage water resources in a manner that protects the ecological needs of fish and wildlife.
  - Reliably meet the water quantity and quality needs to help support navigation, recreation, and tourism.
- ◆ Utilize the best available science, data, tools and technologies to support water resources decisions.
  - Employ the latest supply management and water efficiency technologies among the different sectors of use including residential, commercial, industry, natural resources and agriculture.
  - Identify and address emerging water resource management needs as identified through the water planning process.
  - Use best available science and data to update and implement the Arkansas Water Plan, and identify and address data gaps and needs.

 October 18, 2012 Draft

Visit the ANRC Water Plan website for additional details

[ARWaterPlan.Arkansas.Gov](http://ARWaterPlan.Arkansas.Gov)



## Updating the AR Water Plan

Building upon & improving existing programs

**Comprehensive Update to  
the Arkansas Water Plan**

**Public & Stakeholder Input**

**Existing- New Data & Forecasted Needs**

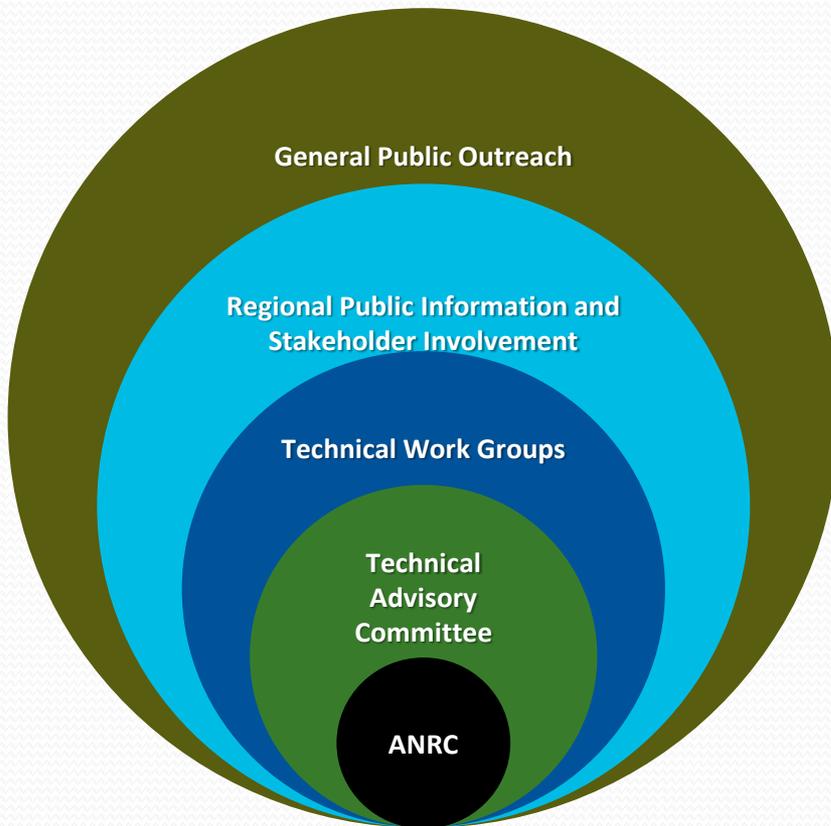
**Existing Policies and Programs**

**Existing State Water Plan, State, Local, and  
Federal Statutes/Laws**



## Interactive Planning Process

*Involving our Citizens in  
the Water Plan Update*



- **Public Information and Stakeholder Involvement Meetings**
- **Technical Work Groups**
  - Provide input on planning approach & help ensure information is accurate
- **Advisory/Technical Committee**
  - Helping shape the planning & stakeholder process





## Experts Volunteer and Contribute

Agriculture	
<b>Evan Teague</b>	Arkansas Farm Bureau
<b>Randy Veach</b>	Bureau
<b>Dennis Carman</b>	White River Irrigation District
<b>Andrew Grobmyer, Executive Vice President</b>	Agricultural Council of Arkansas
<b>Charles Glover and Andrew Wargo</b>	Arkansas Association of Conservation Districts
<b>Ben Noble</b>	Rice Federation
<b>Adam McClung, Vice President</b>	Cattleman's
<b>Marvin Childers</b>	Poultry Federation

Agriculture	
<b>Dow Brantley</b>	Producer
<b>Terry Dabbs</b>	Producer
<b>David Gairhan</b>	Producer
<b>Park Eldridge</b>	Lehman Elevator
<b>Davis Bell</b>	Producer
<b>Dr. Bert Greenwalt</b>	Arkansas State University
<b>Reed Cripps</b>	NRCS
<b>Jamie Burr</b>	Tyson Poultry water use
<b>Cynthia Edwards, Deputy Secretary of Agriculture</b>	Arkansas Department of Agriculture
<b>Chris Henry</b>	University of Arkansas Rice Research Center
<b>Becky Cross</b>	USDA – Ag Statistics



Aquaculture	
<b>Ted McNulty</b>	Director of Aquaculture, Arkansas Agricultural Department
<b>Mike Freeze Baitfish Producer</b>	President National Aquaculture Association, Producer
<b>Neal Anderson</b>	ANRC Commissioner, Producer
<b>Andrew Wargo</b>	Producer
<b>Eric Park, PhD</b>	President, Arkansas Bait & Ornamental Fish Growers Association
<b>Nathan Stone, PhD</b>	University of Arkansas Pine Bluff
<b>Wayne Branton</b>	President, Catfish Farmers of Arkansas

Municipal/Public Supply	
<b>Larry Lloyd, Chief Operating Officer</b>	Beaver Water District
<b>Dale Kimbrow Manager of Planning</b>	Central Arkansas Water
<b>Steve Parke</b>	Fort Smith
<b>Richard Penn, Utilities Director</b>	Hot Springs Municipal Water
<b>Dennis Sternberg, Executive Director</b>	Arkansas Rural Water Association
<b>Kevan Inboden</b>	Jonesboro City Water and Light
<b>Sherrel Johnson Robert Reynolds</b>	Union County Water Conservation Board
<b>Steve Wear</b>	Conway County Regional Water District
<b>Don Zimmerman Jim von Tungeln</b>	Arkansas Municipal League



### Industrial (larger water use)

<b>Matt Claypool, Director of Environmental Health and Safety</b>	Evergreen (pulp and paper)
<b>Lynn Cornelius</b>	FutureFuel (chemicals and biofuels)
<b>Larken Pennington</b>	Eldorado Chemical
<b>Jamie Burr</b>	Tyson (Poultry)
<b>Joe Earney</b>	Simmons (Poultry)
<b>Tony Hodge</b>	Nucor Steel
<b>Amber Houston, Associate Regulatory Specialist</b>	BHP Billiton Petroleum (Natural Gas/Fracking)
<b>Pat Beck</b>	Southwest Energy (SWN) (SEECO)
<b>Rowlan Greaves</b>	(Natural Gas/Fracking)
<b>John Newton, Maintenance Foreman- Fayetteville Shale</b>	XTO
<b>Jay Hansen, Petroleum Geologist</b>	Arkansas Oil and Gas Commission

### Thermoelectric Energy

<b>Bradley Hardin, Mgr. State Government Affairs</b>	AEP Southwestern Electric Power Company
<b>Tina Burt, Senior Environmental Analyst</b>	Entergy
<b>Stephen Cain, Manager of Environmental Compliance</b>	Arkansas Electric Cooperative Corporation
<b>Greg Carter backed up by Scott Carney</b>	American Electric Power (parent company) to Southwest Electric Power Company



**Navigation**

<b>Brian Rosenthal</b>	Rose Law Firm
<b>Mike Biggs, Little Rock District</b>	US Army Corps of Engineers
<b>Gary Young, Vicksburg District</b>	US Army Corps of Engineers
<b>Paul F. Hamm, Memphis District</b>	US Army Corps of Engineers
<b>Gene Higginbotham, Executive Director</b>	Arkansas Waterways Commission
<b>Ken Gould</b>	U of A Little Rock, Bowen School of Law

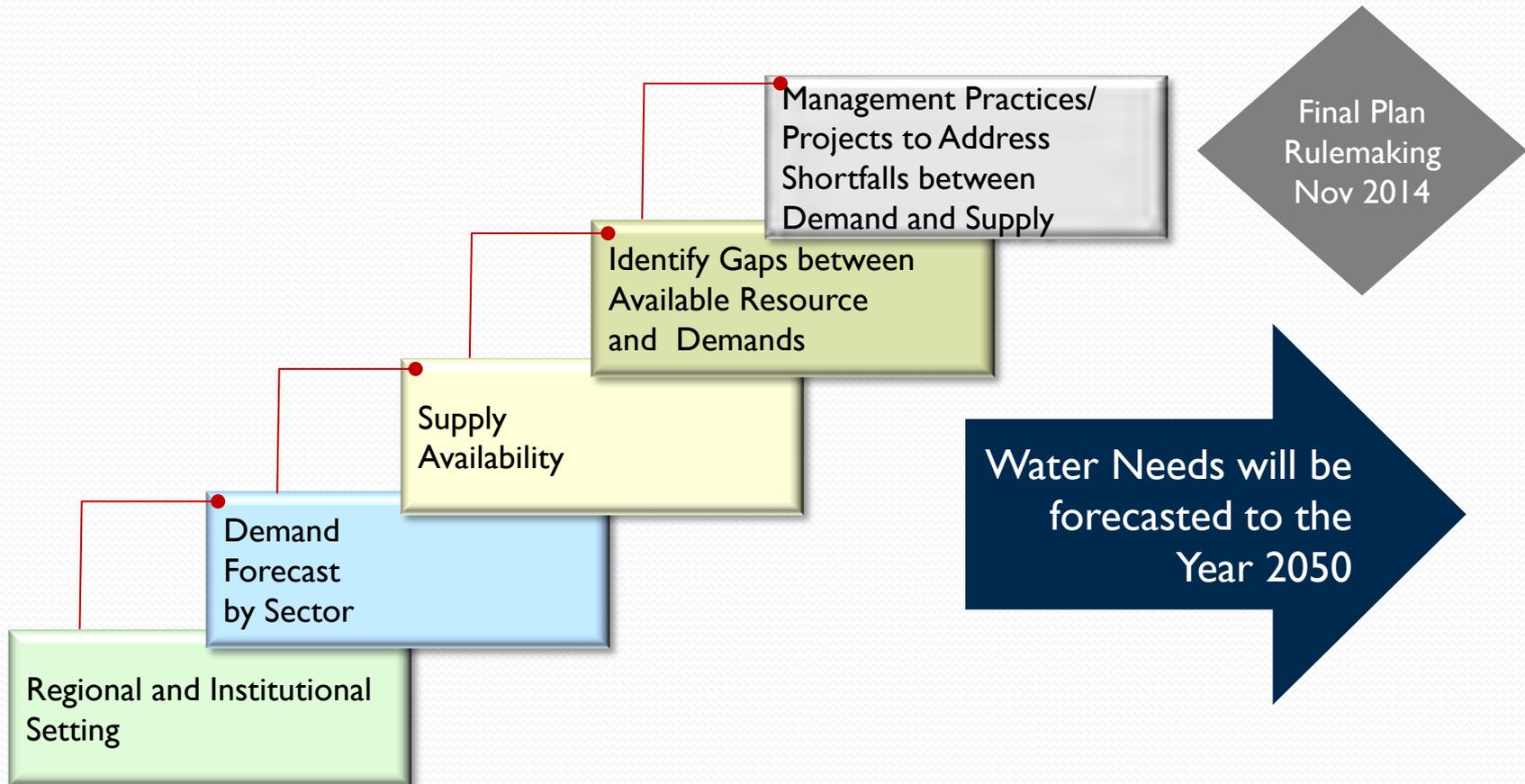
**Additional Participants and/or Technical Resources**

<b>Debbie Doss</b>	Arkansas Canoe Club and Arkansas Conservation Coalition
<b>Tim Snell</b>	The Nature Conservancy
<b>Alice Andrews</b>	Ozark Society
<b>Chris Soller</b>	Arkansas Natural Resources Commission
<b>Mike Guess</b>	Arkansas Natural Resources Commission
<b>Terry Holland</b>	United States Geological Survey
<b>Lyle Godfrey, P.E.</b>	Arkansas Department of Health
<b>Mike Armstrong</b>	Arkansas Game and Fish

**Thanks to all Work Group members that contributed time, expertise and input!**



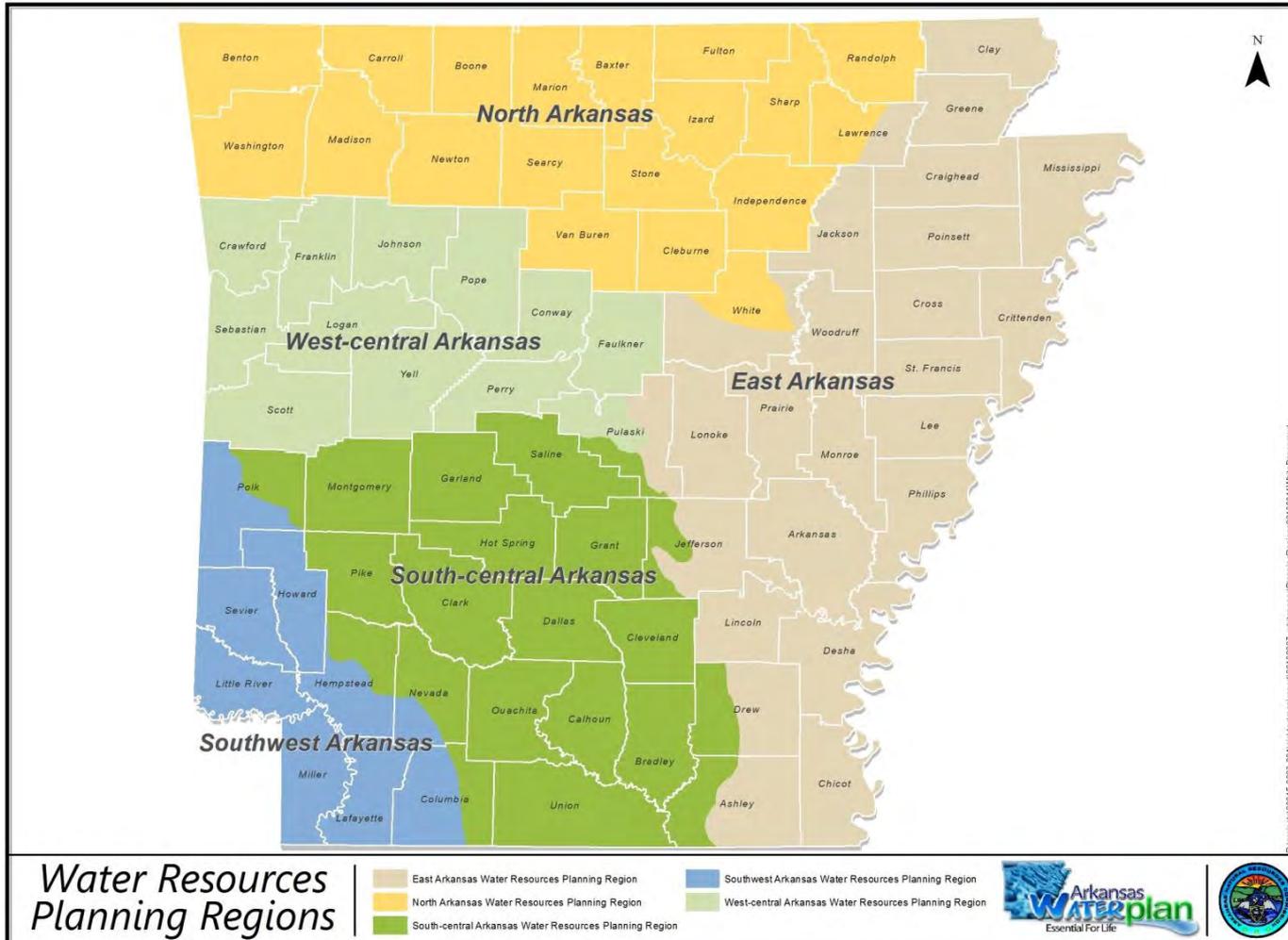
## Major Technical & Planning Elements





# Comprehensive Update of the Arkansas Water Plan

## Overview of Planning Regions

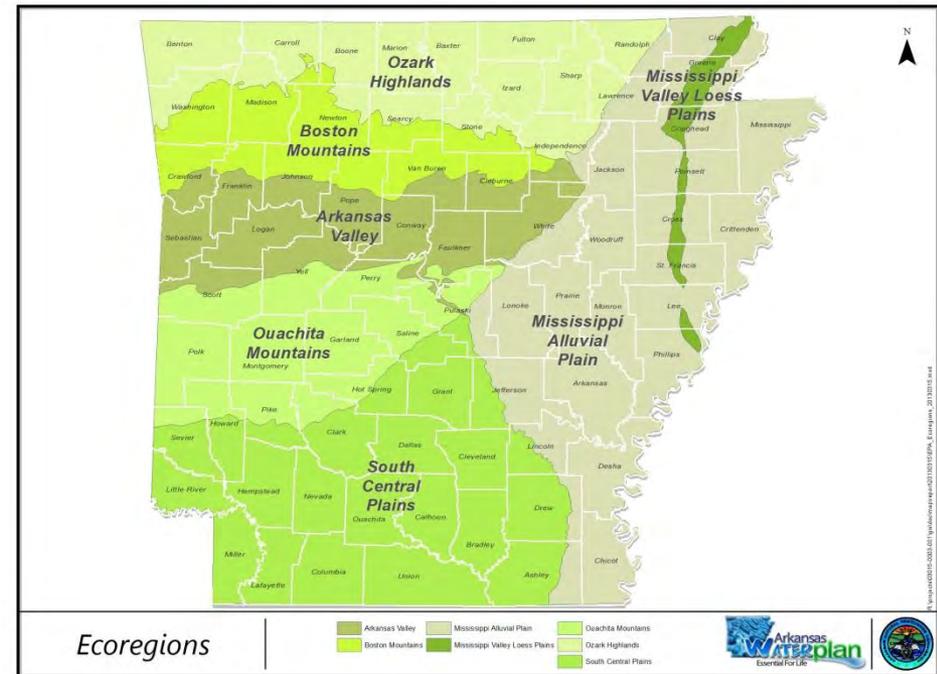


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## Overview of Physical Setting & Demographics

- Arkansas 24<sup>th</sup> largest state  
53,162 square miles (260 miles long by 240 miles wide)
- Elevation - high of 2,753 feet (Mt. Magazine) low 55 feet at Ouachita River Bed
- There are 7 Ecoregions in the interior highlands and gulf coastal plain

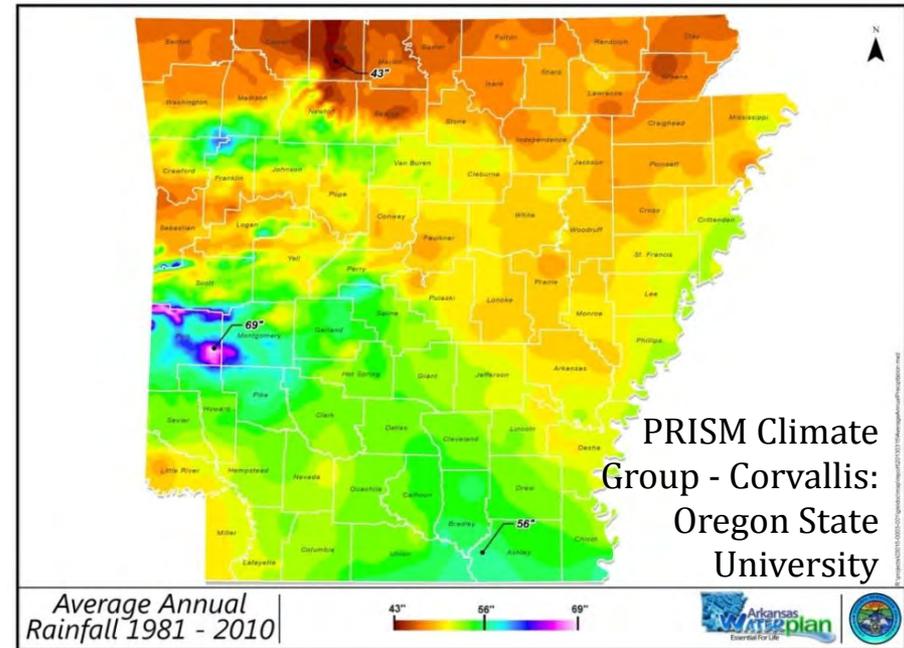


Source: University of Arkansas, Division of Agriculture, A preliminary analysis of water resources in Arkansas, 2011



## Overview of Physical Setting & Demographics

- Arkansas's 2012 population of 2.9 million makes it the 32 most populated state (California #1 and Wyoming #50)
- Average precipitation ranges from 43 to 69 inches per year
- Rainfall is typically lower in July and August; especially in the Delta when crop water needs are high





## West-Central Water Resources Planning Region

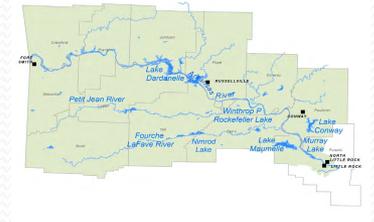


# West-Central Water Resources Planning Region

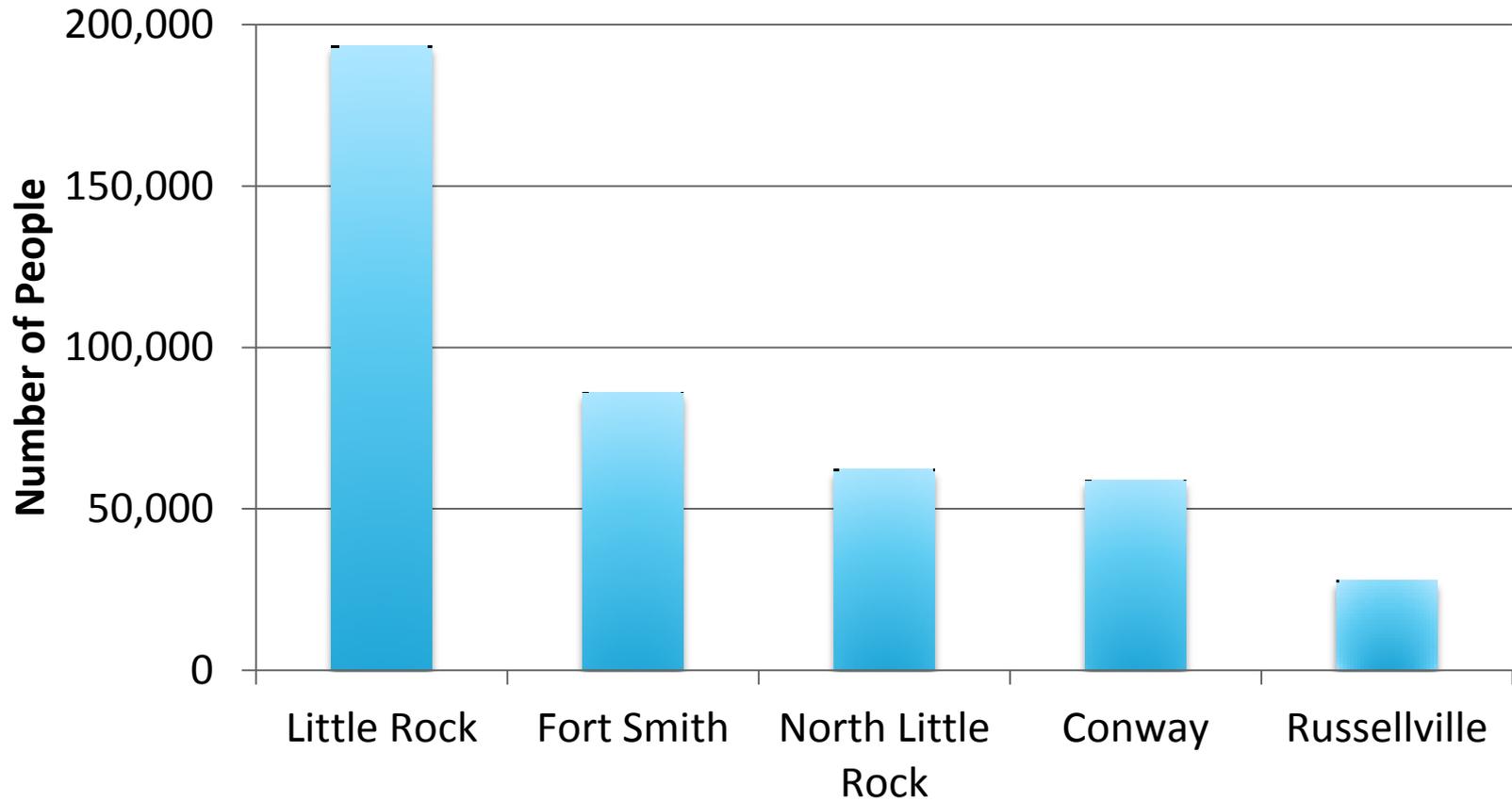


Characteristic	Value
Area	7,977 sq-mi
Counties	12 (11 full, 1 partial)
Elevation	250 – 2753 ft
Precipitation	46 – 68 in
Major Rivers	Arkansas River, Petit Jean River, Fourche la Fave River
Major Impoundments	Lake Dardanelle, Nimrod Lake, Lake Maumelle, Winthrop Rockefeller Lake, Murray Lake, Lake Conway
Economic Drivers	Livestock agriculture (cattle), Manufacturing, Trade, Natural gas
Recreation	Boating, Fishing, Tourism (wineries, state parks, Fort Smith)
Dominant Land Use	Forest (deciduous + pine/evergreen)

# West-Central Water Resources Planning Region



## 2010 Population





# Comprehensive Update of the Arkansas Water Plan

## Water Use & Forecasting Results



## Water Use and Demand Forecasting

*How much do we use today & how much will we need by 2050?*

### **Major Water Use Sectors**

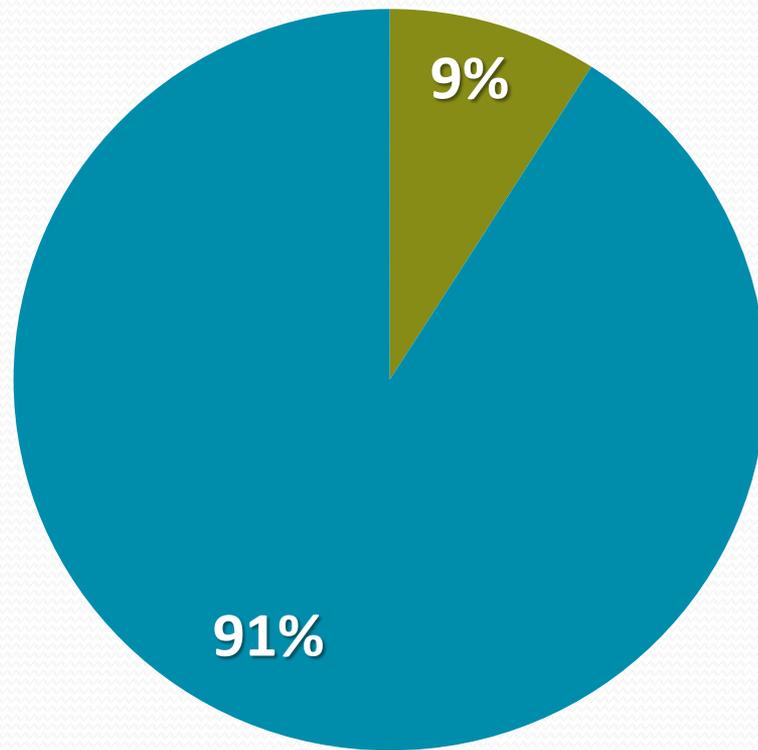
- Municipal/Public and Self-Supplied
- Agriculture – Crop, Livestock, Aquaculture, Duck Hunting and Habitat Maintenance
- Industrial - including Mining and Shale Gas
- Thermoelectric Energy
- Navigation

Visit the [ANRC Water Plan website](http://ARWaterPlan.Arkansas.Gov) for additional details

**ARWaterPlan.Arkansas.Gov**



## Water Demand is 10% of Total Annual Precipitation



- Demands (Surface and Groundwater)
- Annual Precipitation in Arkansas



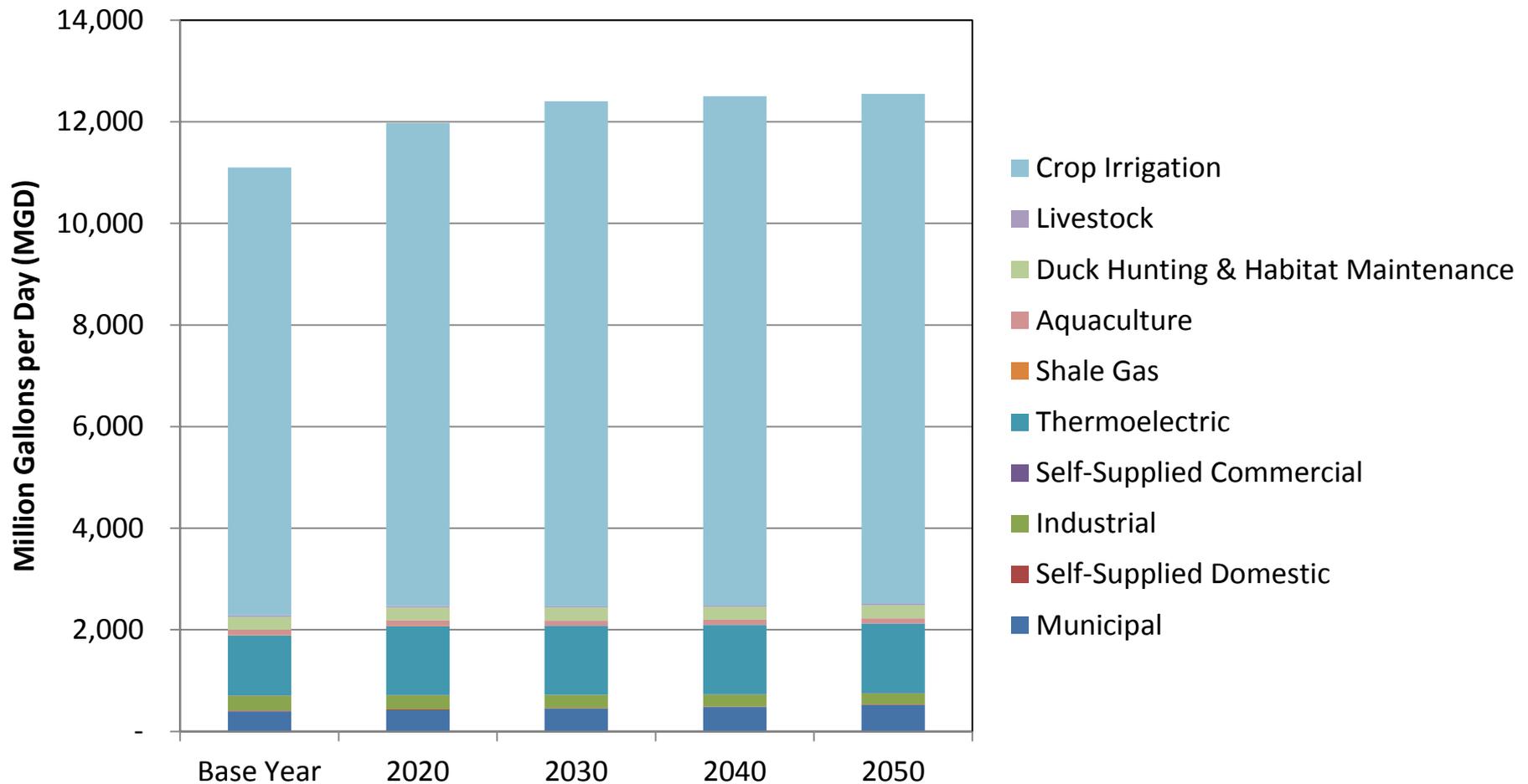
## Water Demand Forecasting

- Each demand sector is complex- *use best available data*
- Identify source of supply- *Surface or groundwater*
- Data compilation & summarization- *statewide, regional, & county level*
- Determine water use “drivers”
- Current use is increased or decreased based on a rate of change of the water use “driver”

# Statewide Water Forecast – All Demand Sectors

*Total statewide water use forecasted to increase 13%*

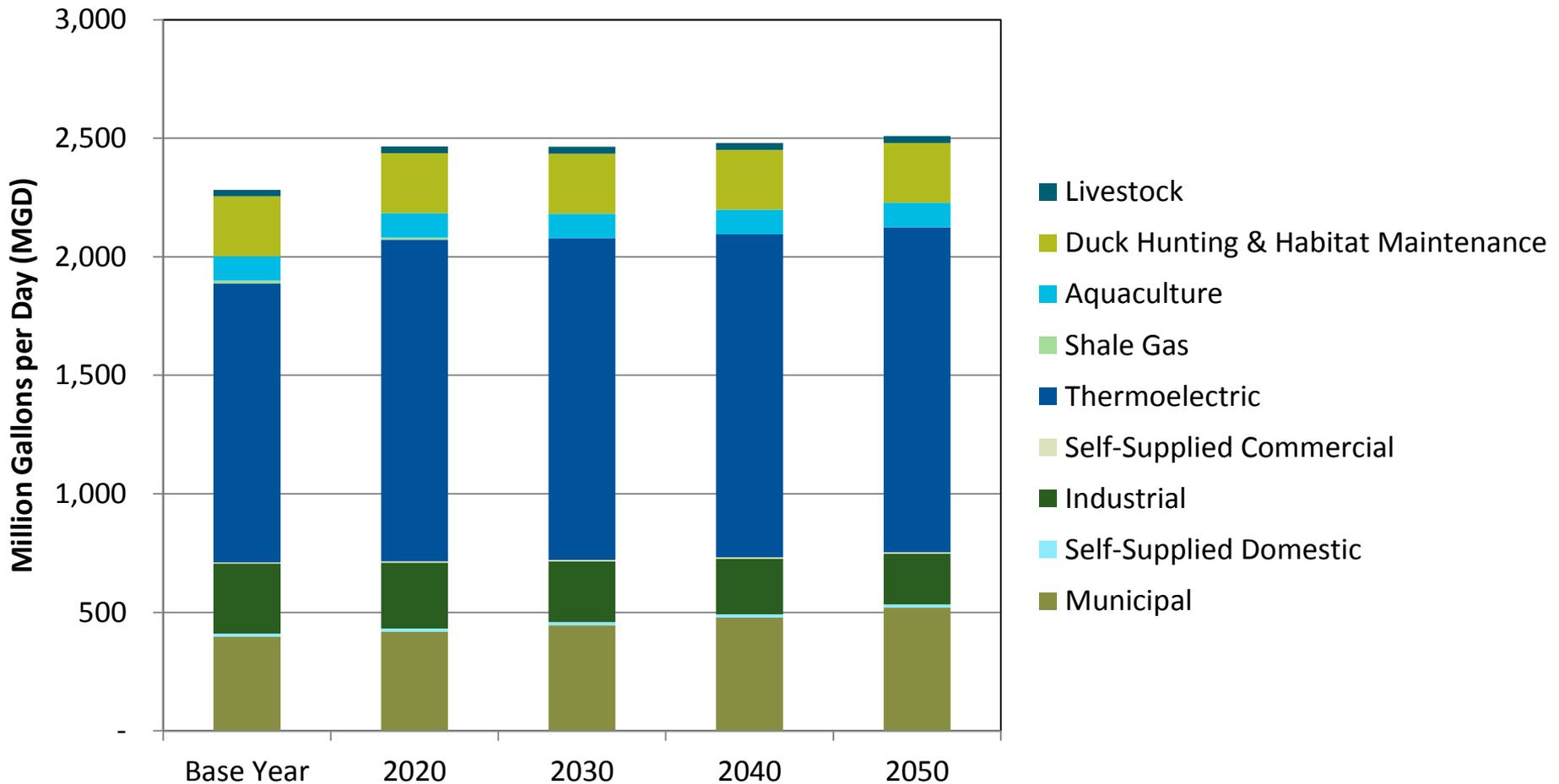
**Arkansas Statewide Demands: Medium Scenario**



# Statewide Water Forecast - Excluding Irrigation

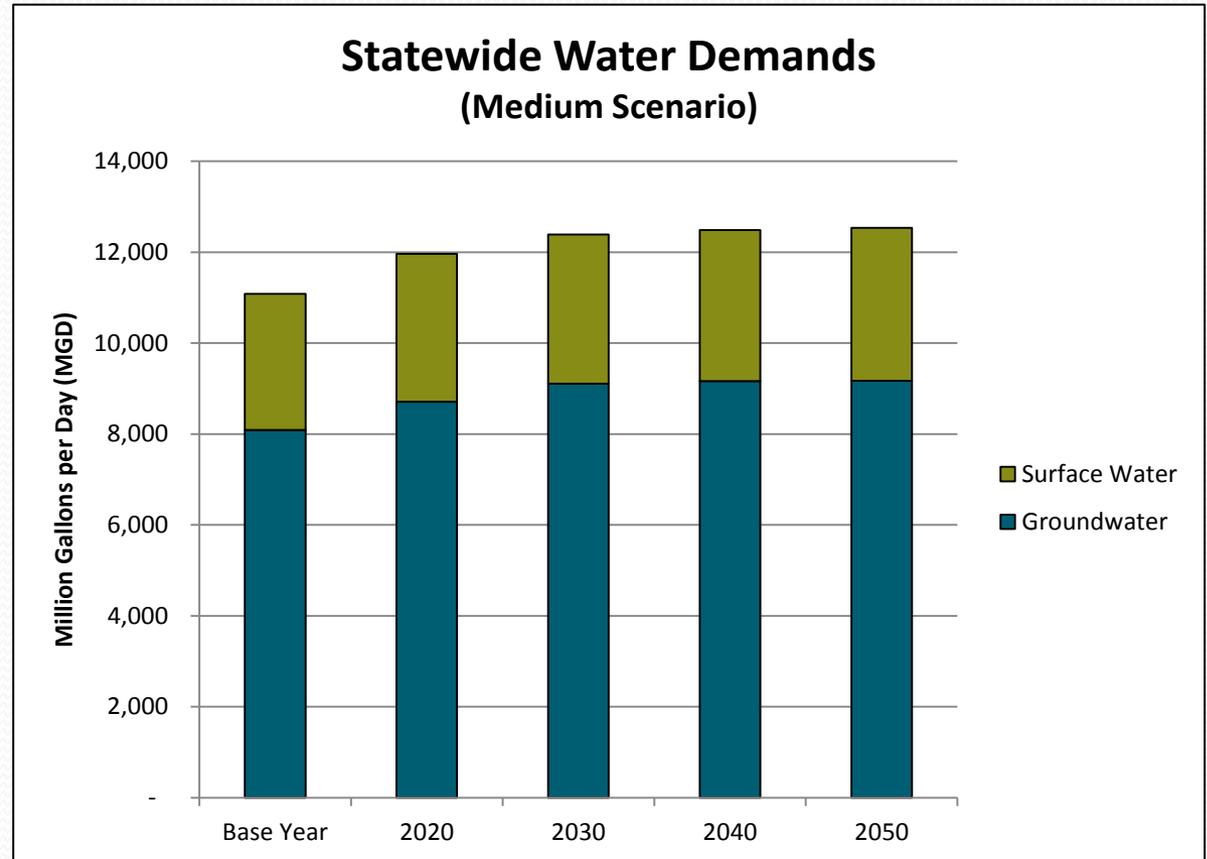
*Increase of 10% for all non-irrigation sectors*

**Arkansas Statewide Demands: Medium Scenario  
(Excluding Irrigation Demands)**



# Statewide Water Forecast by Source of Supply

- All Sectors  
73% Groundwater  
27% Surface Water
- Agriculture  
85% Groundwater
- Municipal  
71% Surface Water



# Municipal/Public and Self-Supplied Forecast

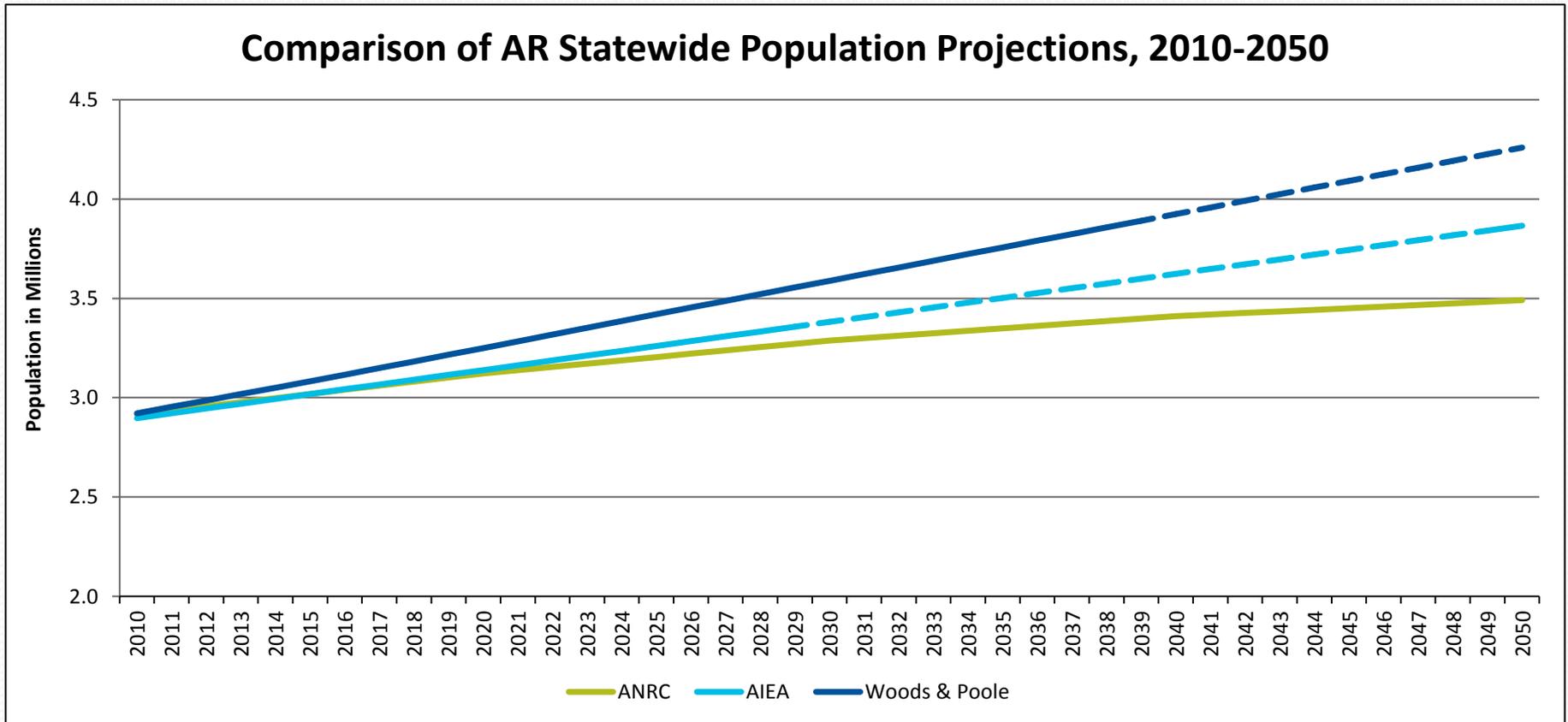
## Why is it important?

Helping ensure reliable and quality drinking water supply for our citizens, business and industry.



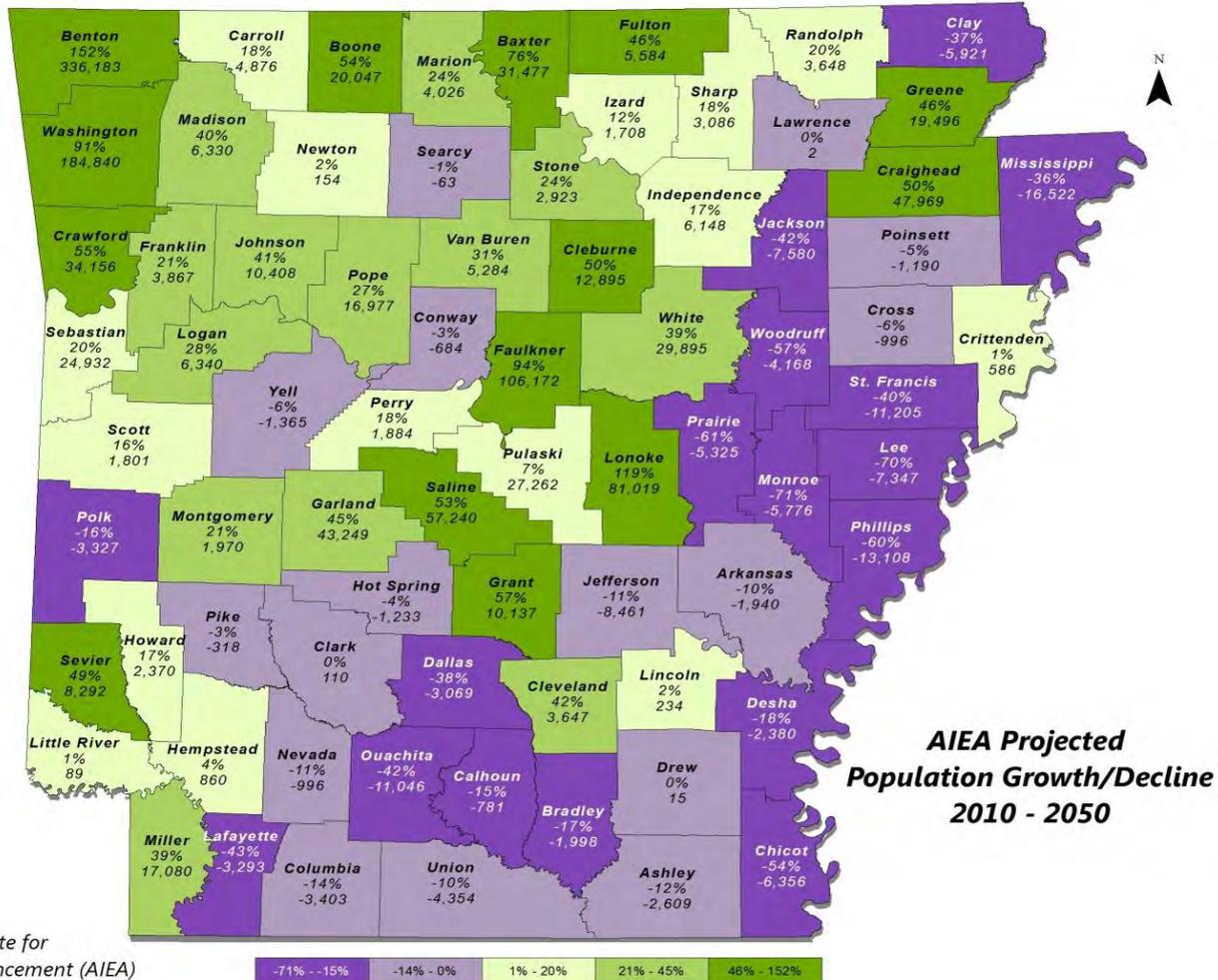
# Municipally-Supplied Demand Forecast

- Three population projection scenarios will drive domestic demands (municipally-supplied and self-supplied): Dotted lines represent extrapolation at last year rate of change



# County Population Projections

## Arkansas Institute for Economic Advancement (AIEA) Scenario



Arkansas Institute for Economic Advancement (AIEA)

# Statewide Municipally-Supplied Demand Forecast

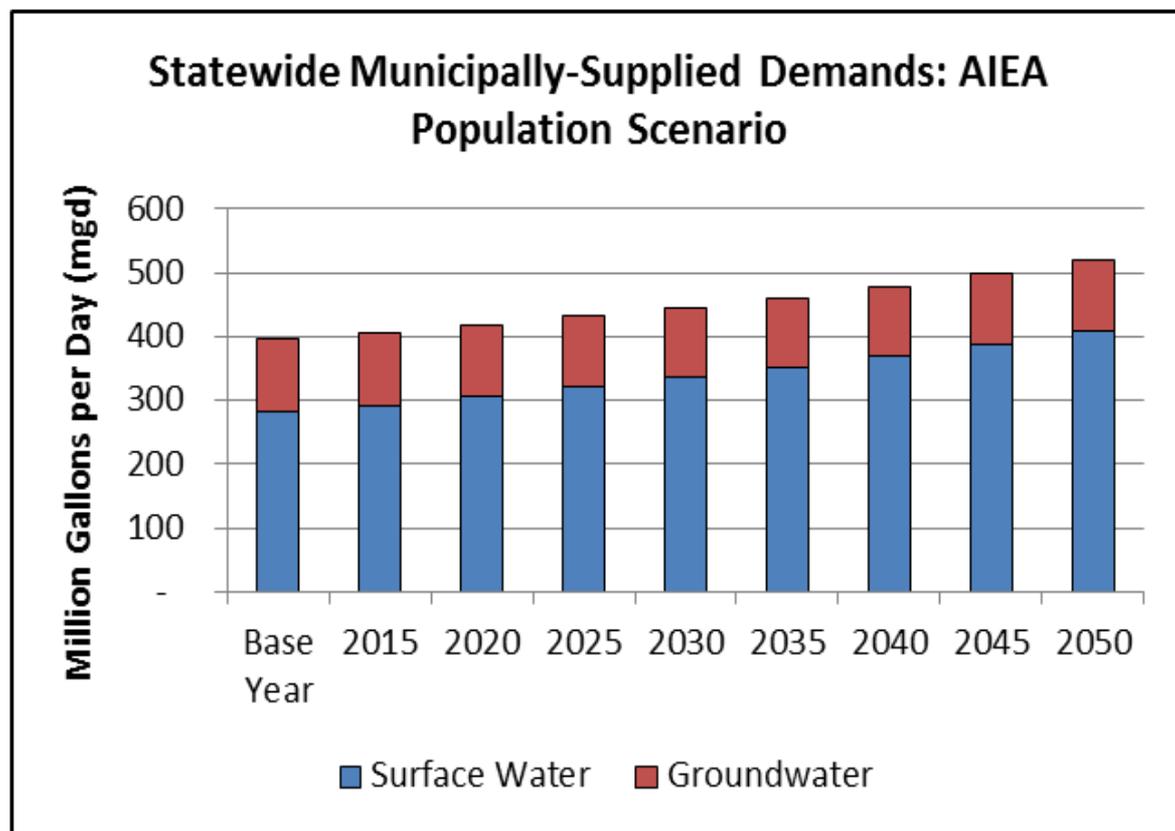
## 75 Counties in AR

- 56 Counties

Gallons per capita/day  
of 100-200

- 44 Counties

Gallons per capita/day  
of 100-150

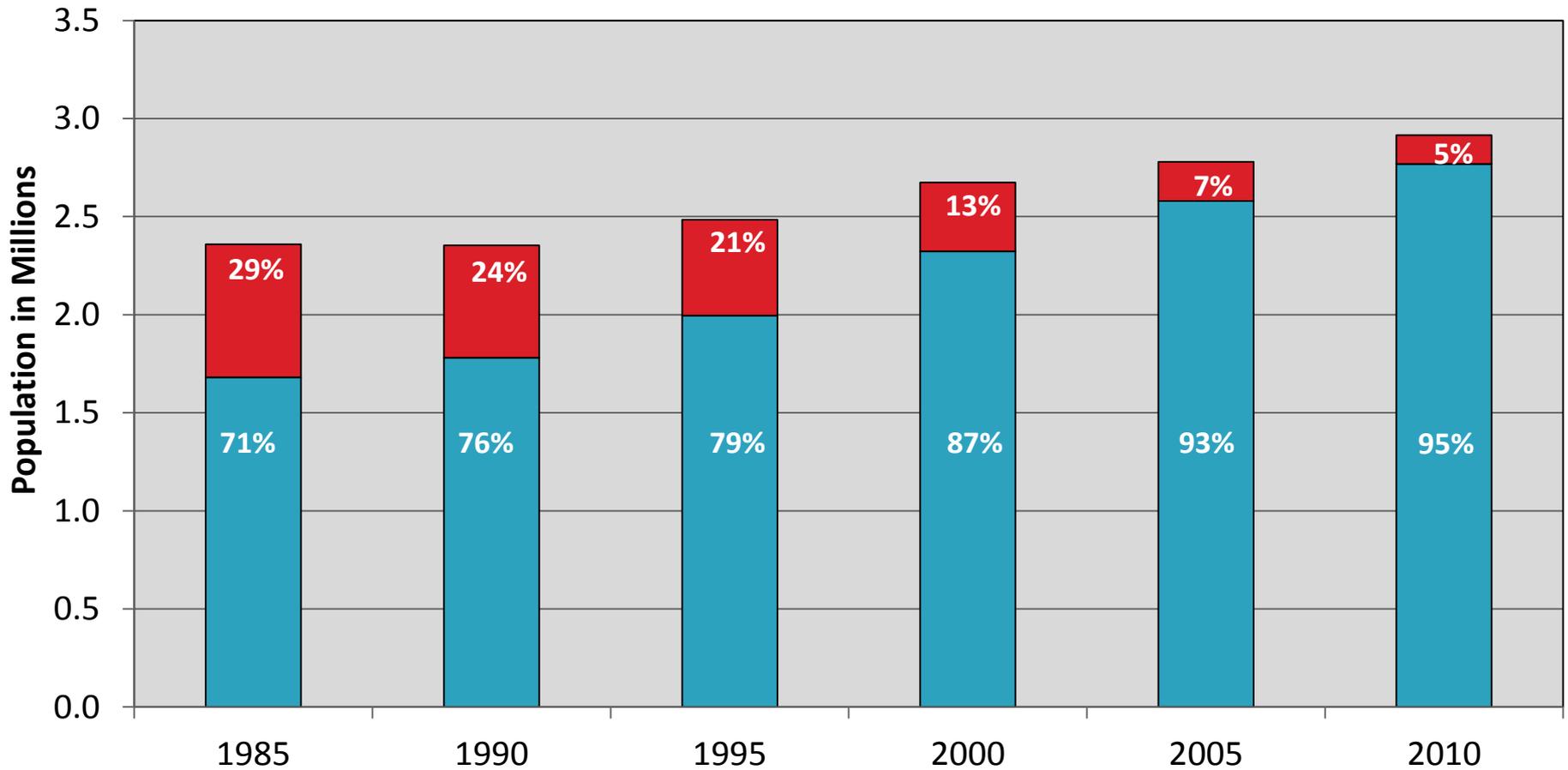


## Self-Supplied Domestic

- Residential water users not connected to a municipal system (people on individual wells)
- About 5% of the State's population
- Demand driven by population
- USGS 2010 Report - self-supplied domestic gpcd values range from 80.0 to 98.2 and are different for each county

# Trends in Self-Supplied Domestic Population

## Arkansas Municipally-Supplied and Self-Supplied Population, 1985-2010



# Agricultural Forecast – Crop, Livestock, Aquaculture and Duck Hunting

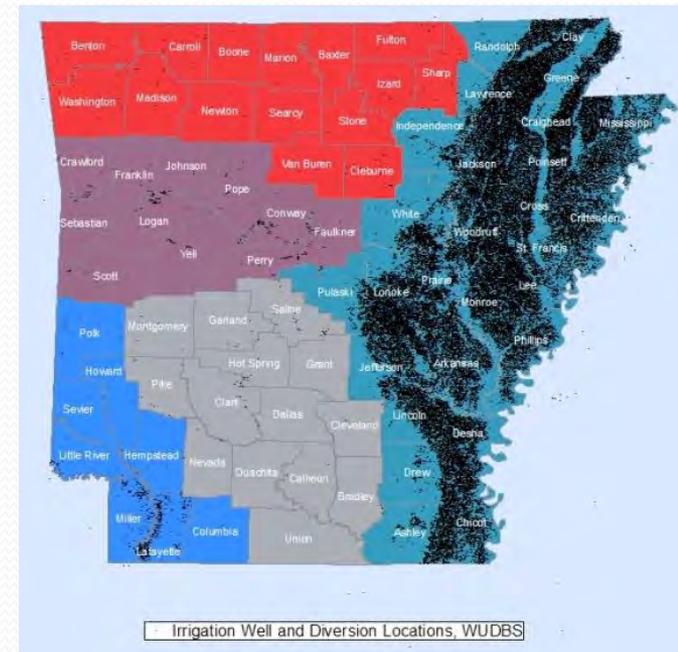
## Why is it important?

Agriculture is a major driver of the state's economy. Providing food, fiber, and jobs for our citizens and the nation.

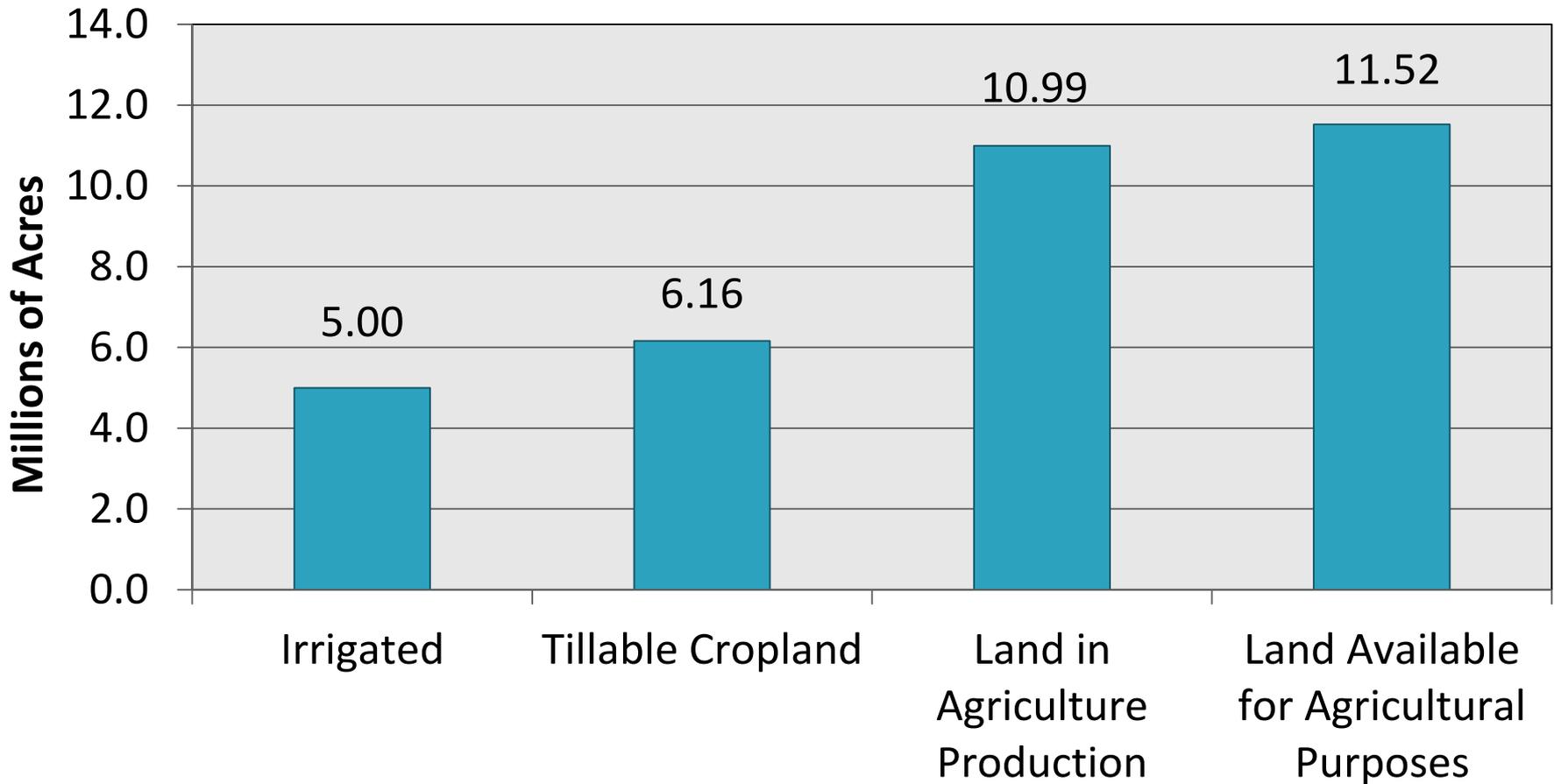


# Crop Irrigation Demand Forecast

- Approach - Irrigated acres multiplied times county crop water application rate
- Determine baseline irrigated acres
- Determine crop irrigation application rates (2000-2010) for each crop to account for weather
- Rate of growth based on trend from 2000-2010 for all crops except corn where price was best indicator for growth
- Determine reasonable maximum of total irrigable acres based on the amount of tillable land per county

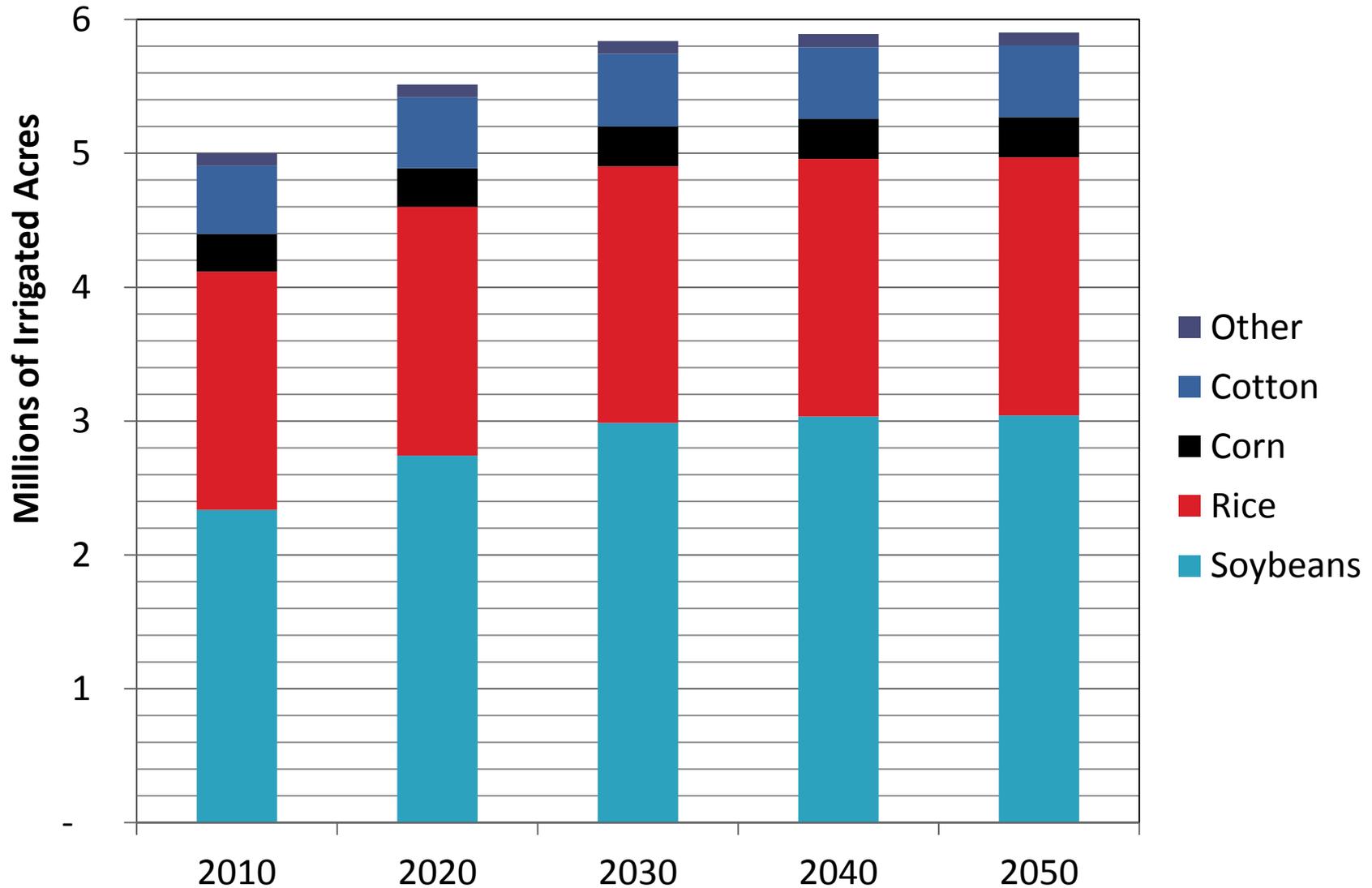


# Comparison of Agricultural Lands –Statewide 2010

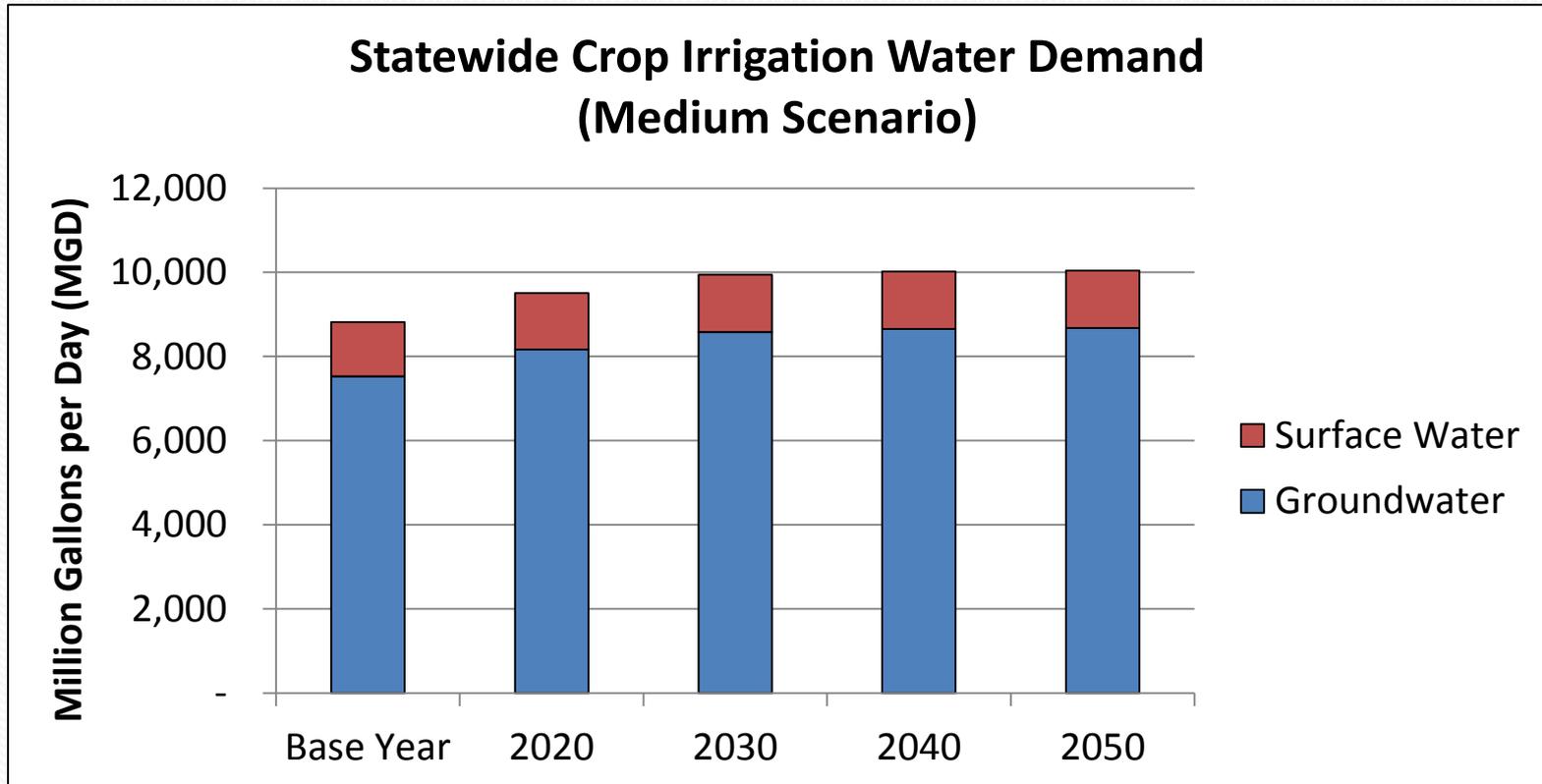


Note: Irrigated derived from CAP (soybean and rice) and WUDBS (all other)

# Statewide Irrigated Acreage Forecast



# Statewide Results of Crop Irrigation Forecast



13% increase in withdrawals for irrigation from 2010-2050

99% of growth experienced by 2030

Combination of irrigated acres growth by crop type and specific application rates for crop

# Livestock Component of Forecast

Forecast is water use to grow and sustain livestock  
Processing livestock is an industrial water use



# Livestock Water Demand Forecast

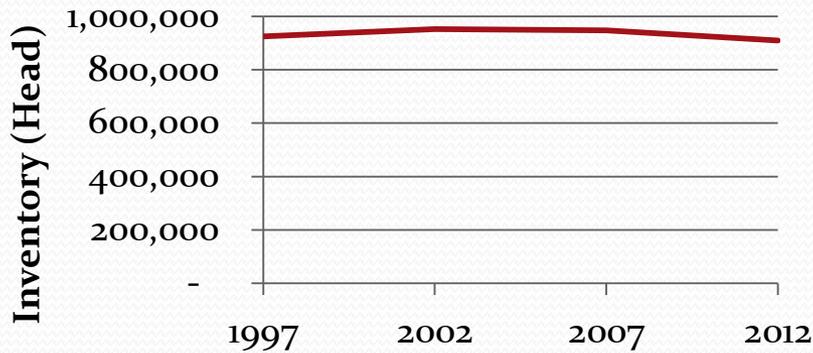
- Number of animals  $\times$  daily water requirement
- County level forecast with growth rate to 2022 derived from national USDA Agricultural Projections
- Demand from 2022-2050 held constant (no additional growth)
- Livestock Groups - Dairy Cows, Beef Cattle, Hogs and Pigs, Chickens , Turkeys, Sheep, including Lambs, Goats, Equine (Horses and Ponies)



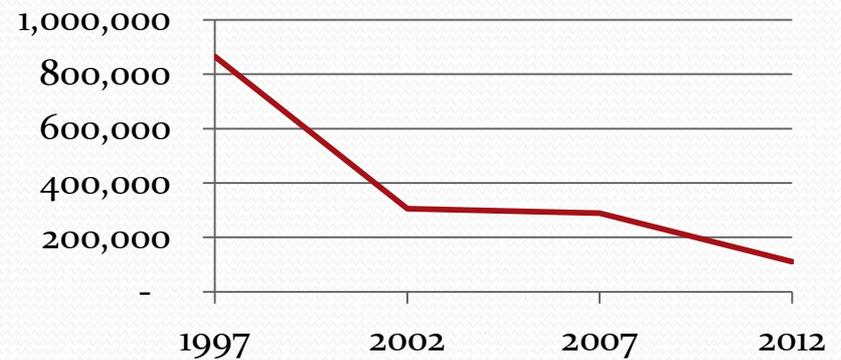
# Historical Statewide Animal Counts

Source: COA (1997, 2002, 2007); CAP Survey (2012)

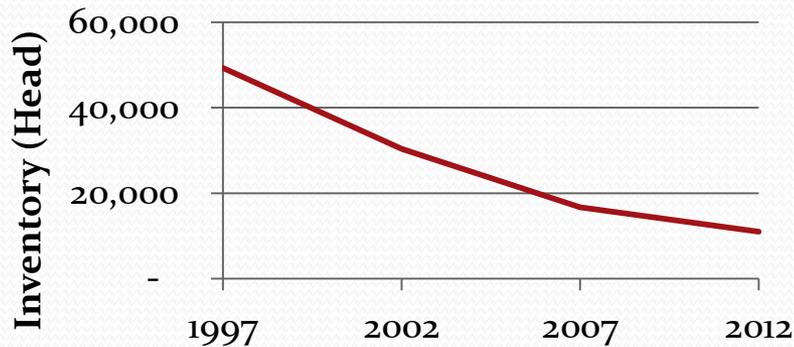
## Beef Cattle



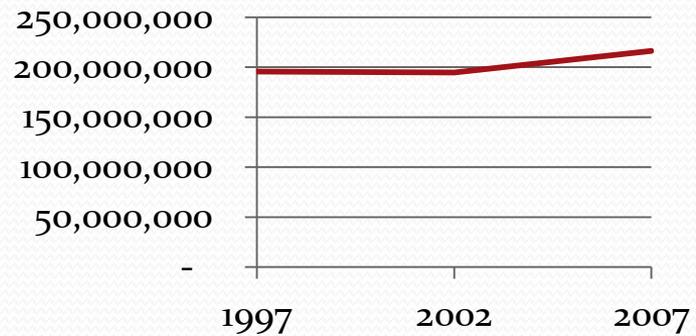
## Hogs and Pigs



## Dairy Cattle



## Total Chickens



# Statewide Animal Counts

Livestock Group	Base Year	2050	Percent Growth
Dairy Cows	11,000	11,000	0%
Beef Cattle	909,000	950,754	4.5%
Sheep and Goats	66,776	66,776	0%
Hogs and Pigs	110,000	110,000	0%
Chickens	215,082,244	244,447,393	13.7%
Turkeys	9,339,092	10,441,336	11.8%
Horses	78,968	78,968	0%

# Livestock Water Requirements

Livestock Group	Range of Water Requirements (Gallons per head per day)(GHD)	Arkansas Water Plan Updated Water Requirements (GHD)
Dairy Cows <sup>1</sup>	18-50	35
Beef Cattle <sup>2</sup>	6.6-16	12
Sheep and Goats <sup>3</sup>	0.7-3.3	2
Hogs and Pigs <sup>4</sup>	1-24	4.5
Chickens <sup>5</sup>	0.02-0.12	0.1
Turkeys <sup>5</sup>	0.05-0.22	0.12
Horses <sup>6</sup>	8.5-15	12

1 Brugger and Dorsey 2006; Lardy et al 2008; Bickert et al 2000; Martin et al 2001; USGS 2009; NRCS 1980

2 Parker et al 2000; Gadberry ; Lardy et al 2008; Martin et al 2001; USGS 2009; NRCS 1980

3 Ministry 2007; USGS 2009; NRCS 1980

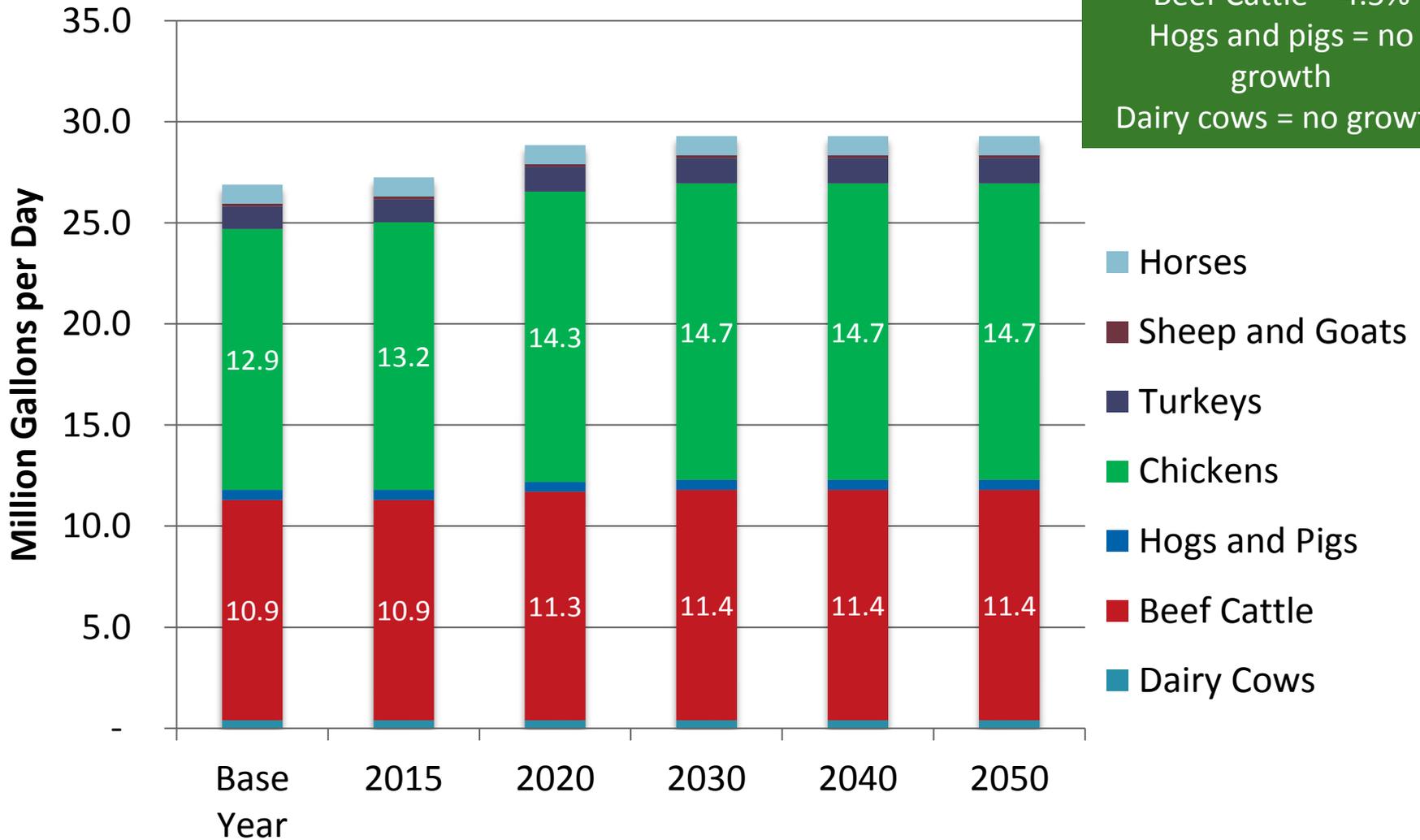
4 Froese 2003; Lardy et al 2008; Martin et al 2001; Prairie Swine Center Inc 2000; USGS 2009; NRCS 1980

5 AGRI-FACTS 2008; Bell et al 2002; Martin et al 2001; Williams et al 2013; USGS 2009; NRCS 1980

6 AGRI-FACTS 2008; American 2000; Lardy et al 2008; Ministry 2007; Martin et al 2001; USGS 2009; NRCS 1980

# Livestock Annual Water Demand Forecast

**Percent Increase  
(Base Year - 2022)**  
 Chickens = 13.7%  
 Beef Cattle = 4.5%  
 Hogs and pigs = no growth  
 Dairy cows = no growth



# Aquaculture Component of Forecast

Groundwater is critical source of supply to mitigate for disease and comply with legal requirements for interstate sale



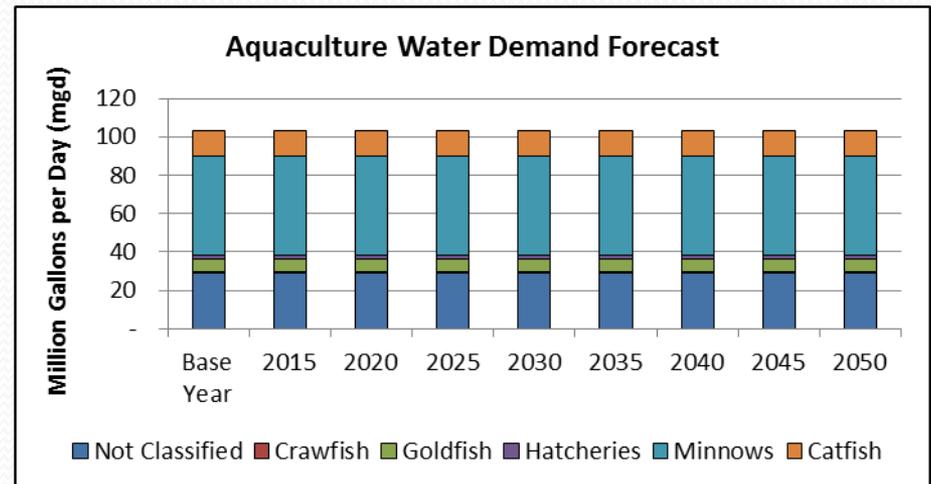
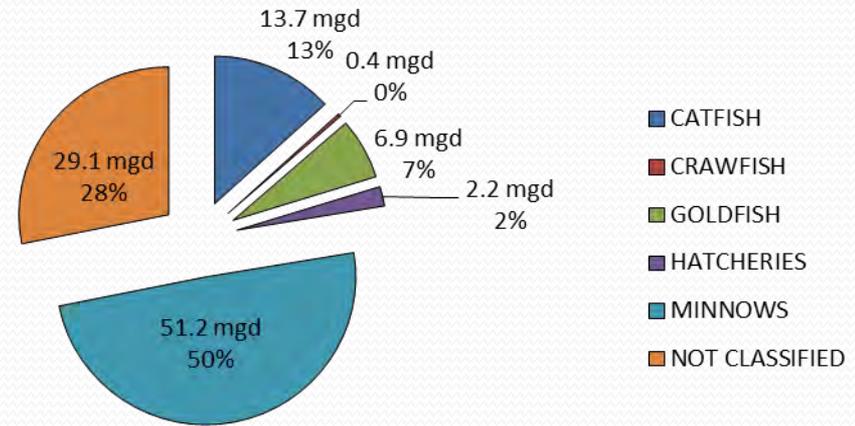
# Aquaculture Water Demand Forecast Statewide Acres by Species Type

Species Type	Base Year Acres	Data Source	Percent of Total
Catfish	9,700	USDA	25%
Crawfish	267	WUDBS	1%
Goldfish	2,576	WUDBS	6%
Hatcheries	827	WUDBS	2%
Minnows	19,119	WUDBS	44%
Not Classified	10,880	WUDBS	22%
Total	43,369		100%

# Aquaculture Water Demand Forecast

- Total base year demands are 103.43 mgd
- About half of statewide aquaculture demands are from minnow production
- Demand occurs in 24 counties mainly in central and eastern Arkansas

Base Year Arkansas Aquaculture Water Demand by Species Type



# Duck Hunting and Habitat Maintenance Component of Forecast

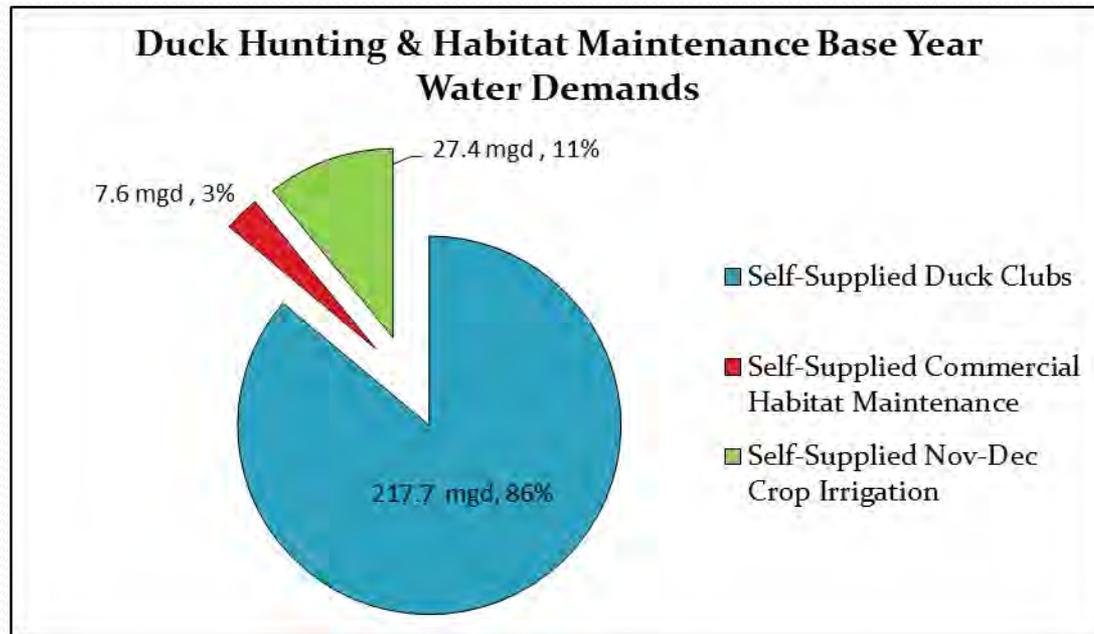


RICE AND DUCK CAPITAL OF THE WORLD - STUTTGART, AR



# Duck Hunting & Habitat Maintenance

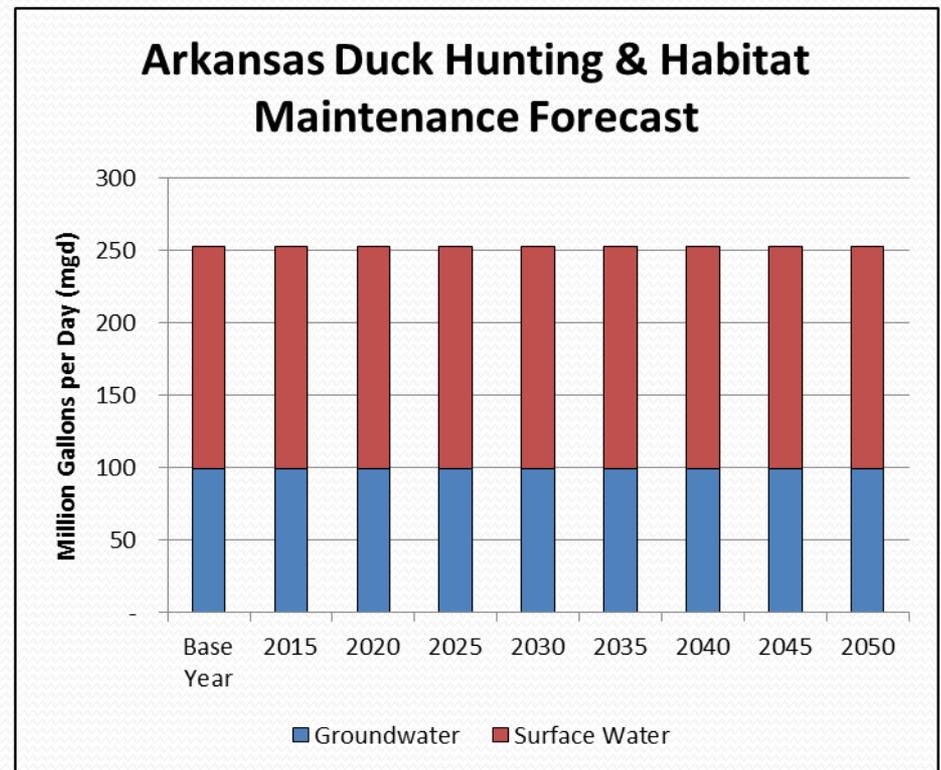
- Incorporated “off-season” crop irrigation demands into the sector demands
- Sector demands also include Arkansas Game & Fish Commission habitat maintenance demands derived from the WUDBS commercial database
- Base year demands are held constant through 2050



# Duck Hunting & Habitat Maintenance

## Forecast Results

- Duck Hunting Clubs use about 64% surface water and 36% groundwater.
- Habitat maintenance uses about 98% surface water and 2% groundwater
- Crop irrigation duck hunting water use is about 26% surface water and 74% groundwater
- Overall, duck hunting & habitat maintenance uses about 40% groundwater and 60% surface water

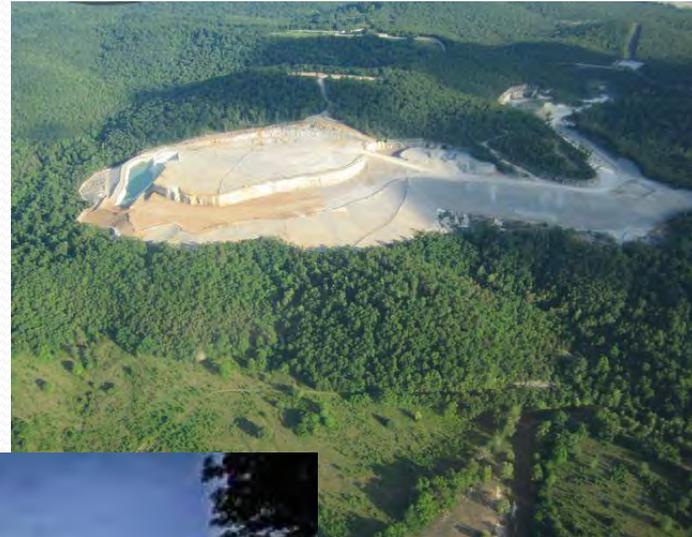


# Industrial Forecast

## Including Mining and Shale Gas Water Needs

**Why is it important?**

**Industry provides the durable and non-durable goods and materials that enhance our lives and is an key economic driver of the economy.**

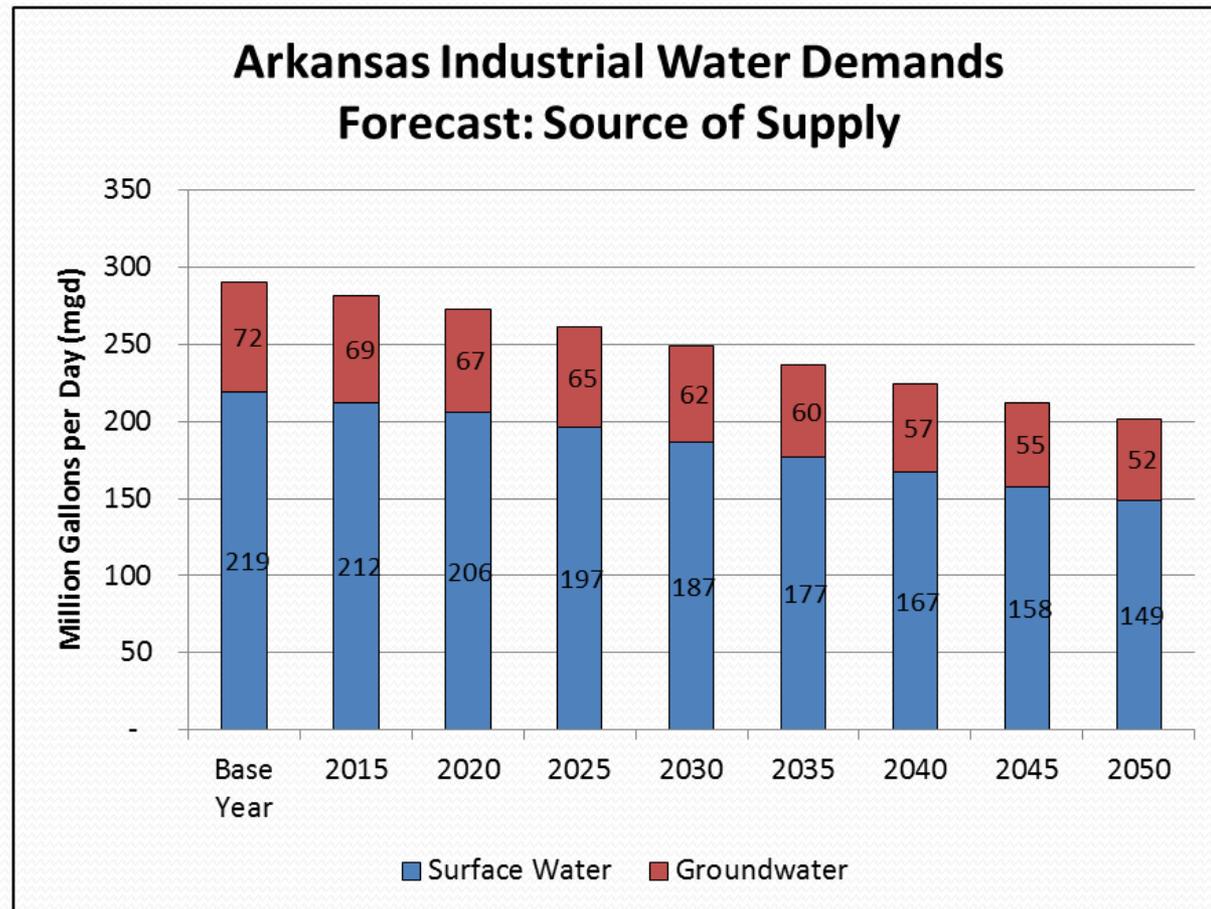


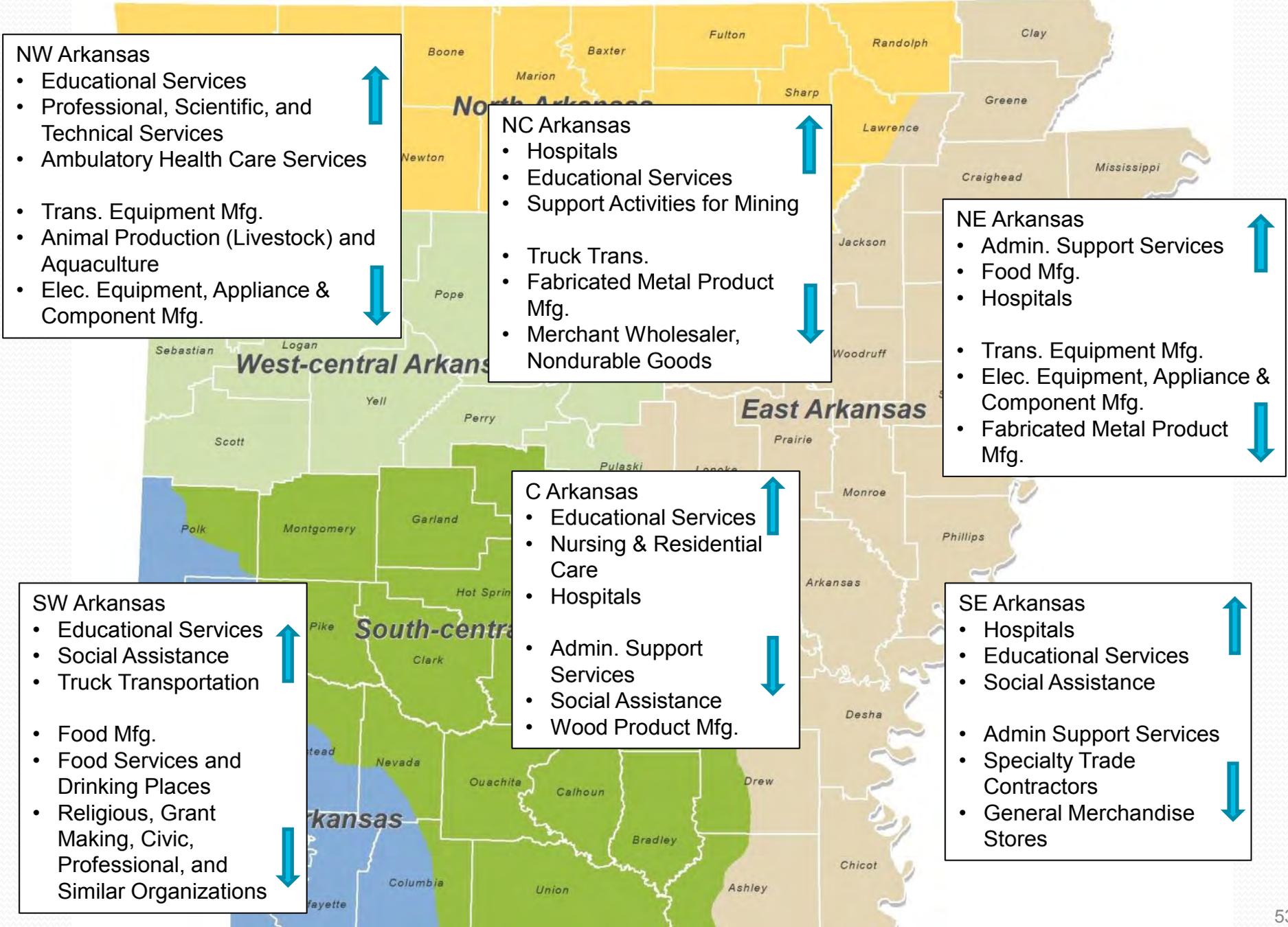
# Industrial Water Demand Forecast

- Use average deliveries by industry type by county from 2008-2010 Water-use Registration Data Base (WUDBS) to derive baseline
- Use of Arkansas Department of Workforce Services Workforce Investment Area projected employment by industry type to derive water demands from 2010 to 2020
- Use Woods & Poole county-level manufacturing (NAICS 31-33) employment to drive both self-supplied and municipally supplied growth from 2020 to 2050

# Industrial Water Demand Forecast

- Demands include both municipally-supplied and self-supplied demands.
- Industrial water demands decrease by 31% from Base Year to 2050
- Decrease attributed to projected decline in the demand driver (employment)
- Demand forecasted to decline in nearly all counties





Source: Employment Sector Growth Dept. of Workforce Services

# Shale Gas Water Demand Forecast

- Water use = 4.73 million gallons per well
- Diverted water is 3.7 million gallons per well (100% from Surface Water) 1.03 million gallons (21.7% of water demand) is from diffuse water
- Assume 100% of per well water demand occurs during the year the well is first permitted and active (no refracking assumed)
- Assume a county's maximum well density in its portion of the Fayetteville Shale Play extent is 7 wells per square mile
- Distribute future wells using the current proportion of cumulative wells by county
- If a county's well density reaches its maximum, assign wells to other counties in the Play unless they are at maximum density

# Shale Gas Water Demand Forecast

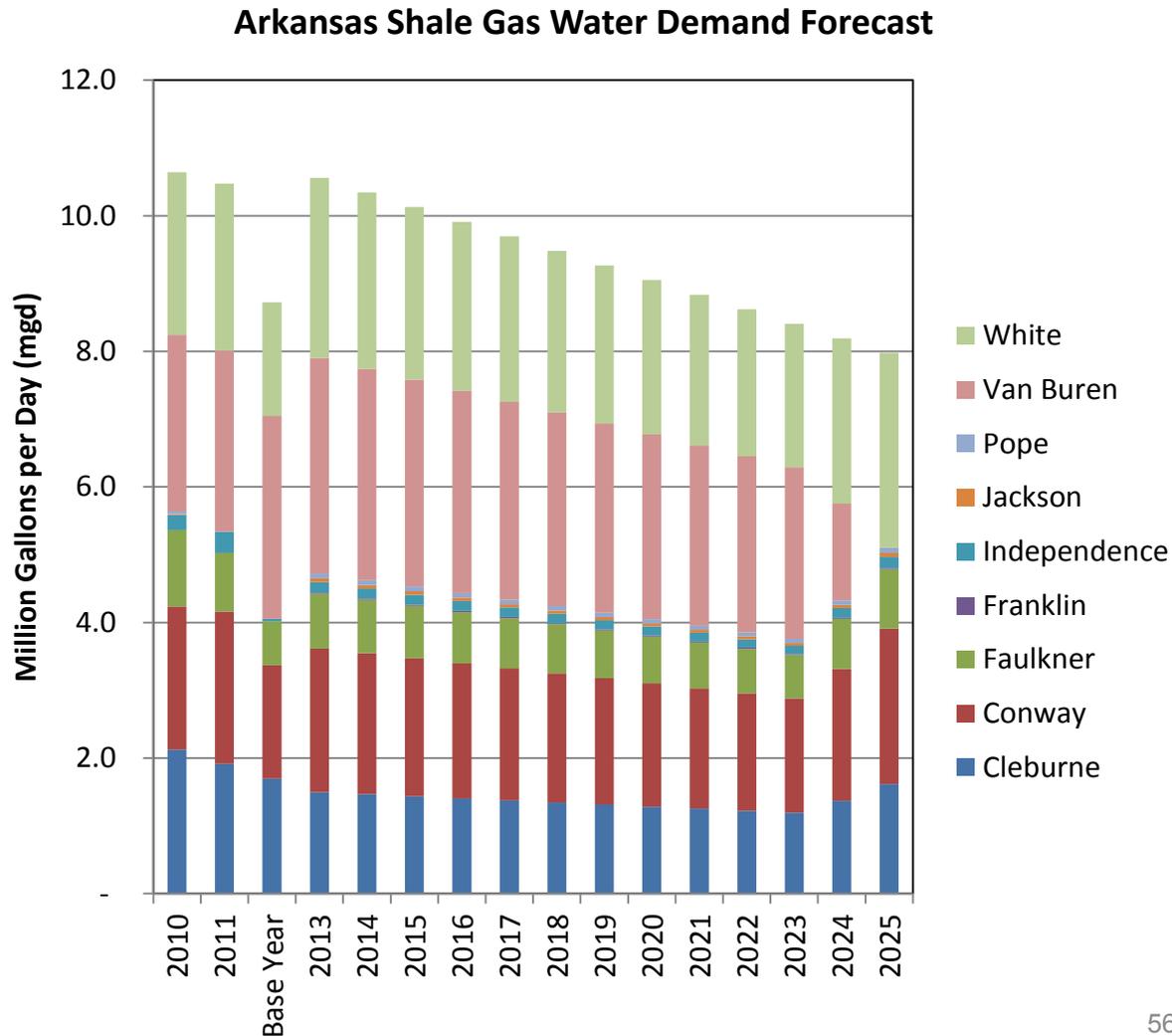
## Current Well Distribution:

County	Cumulative Wells	Well Proportion
Cleburne	652	14.2%
Conway	924	20.1%
Faulkner	351	7.6%
Franklin	8	0.2%
Independence	67	1.5%
Jackson	23	0.5%
Pope	31	0.7%
Van Buren	1,385	30.1%
White	1,157	25.2%
<b>Total</b>	<b>4,598</b>	<b>100%</b>



# Shale Gas Water Demand Forecast: Results

- All demands are from surface water sources
- 2008-2012 trend shows gradual decline in new annual permitted wells
- Annual well development peak occurred in 2009
- Full development of shale expected by 2025

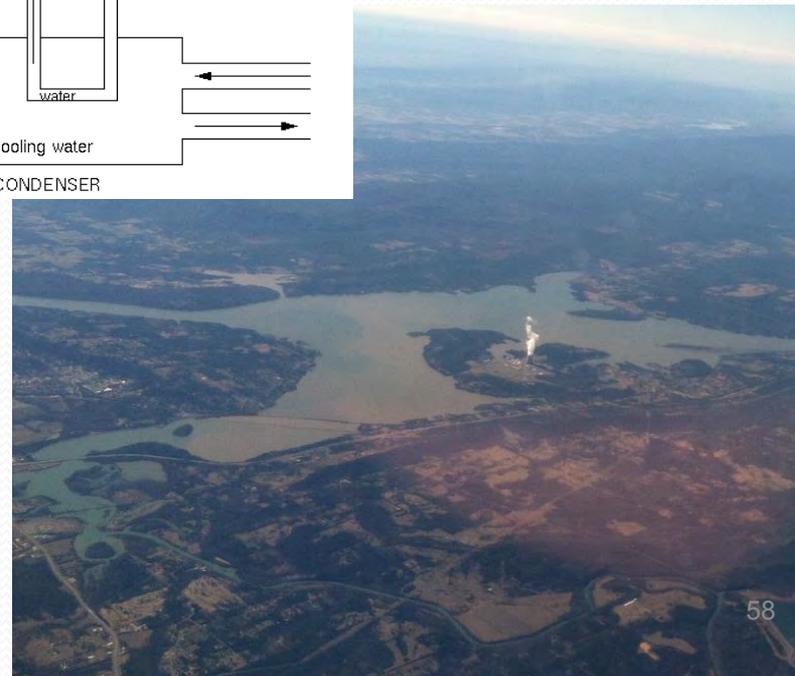
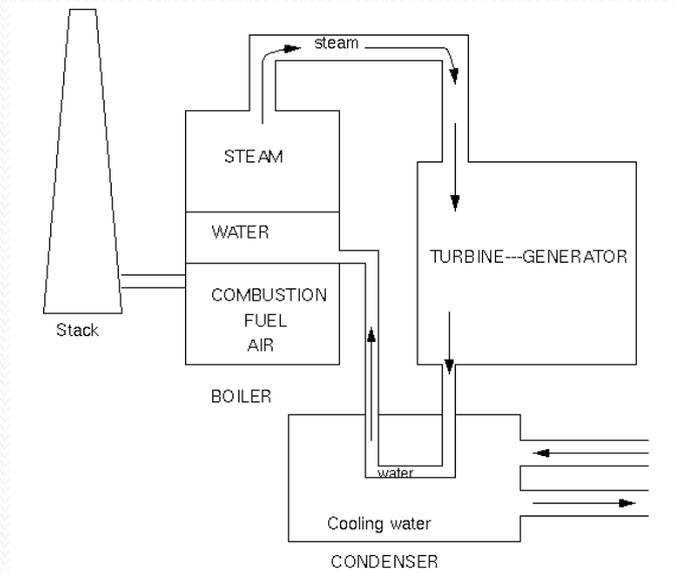




# Thermoelectric Energy Forecast

## Why is it important?

Providing energy to heat, cool and light our homes and businesses. Providing power for industry and manufacturing

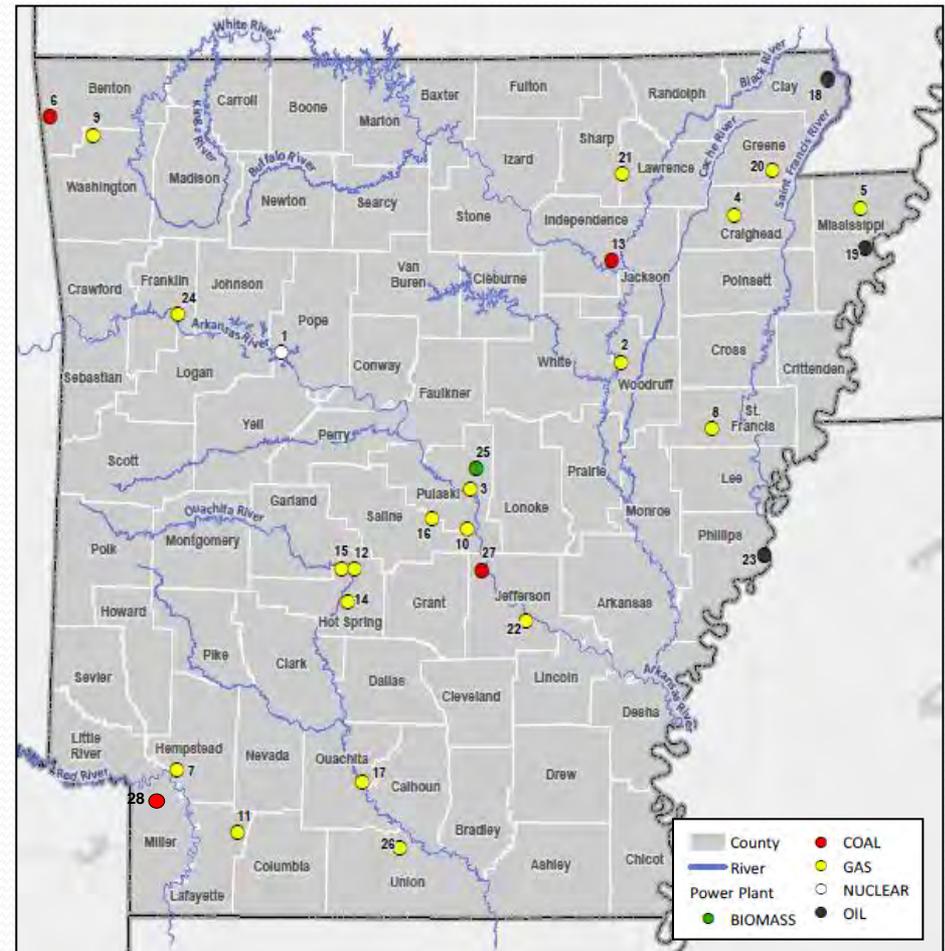


# Thermoelectric Water Demand Forecast

- Energy Information Administration projection scenarios used for energy needs
- Plant maximum sustainable capacity factors used for modeling future power generation in the state
- No new thermoelectric power plants planned in the short-term future
- Biomass is the most likely renewable source in the future

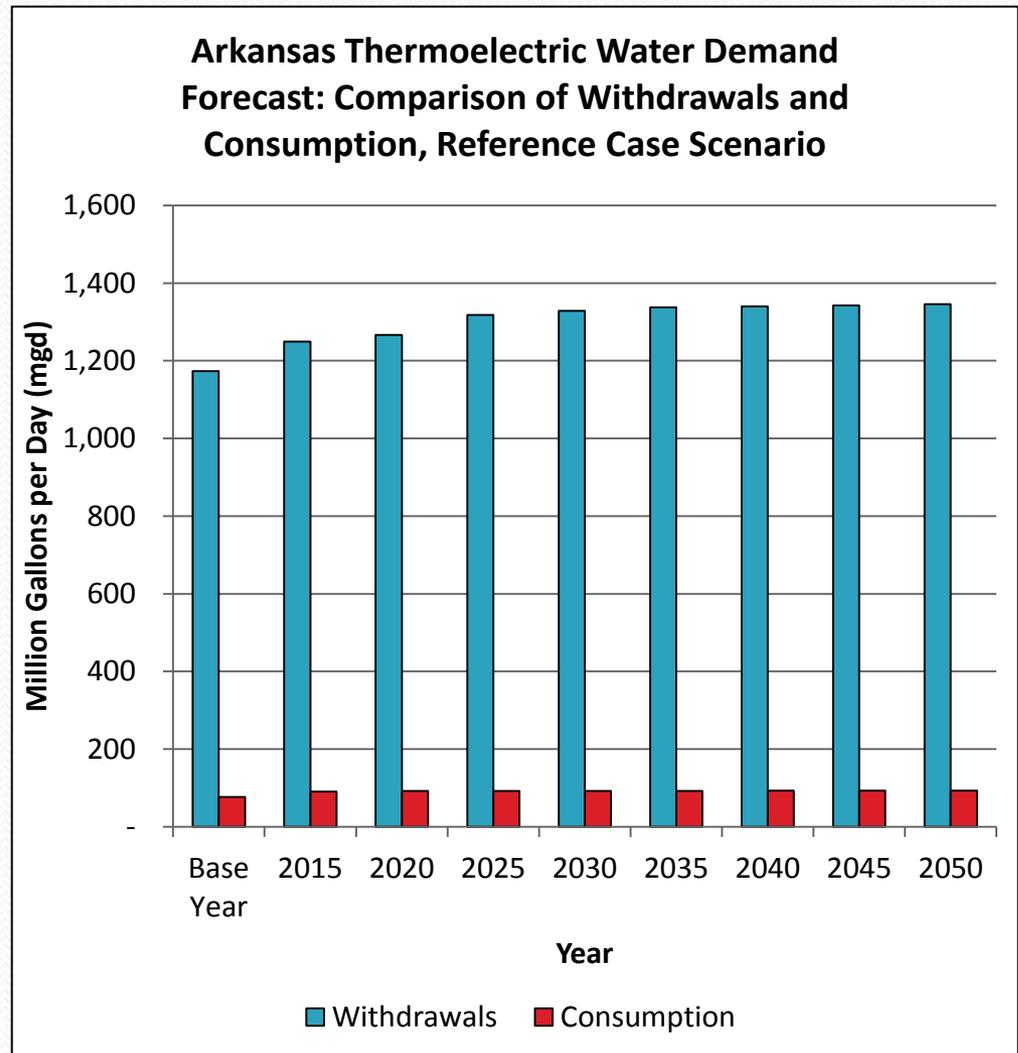
# Thermoelectric Power Plants in Arkansas

Map Number	Plant Name	Map Number	Plant Name
1	Arkansas Nuclear One	15	Lake Catherine
2	Carl Bailey	16	Mabelvale
3	Cecil Lynch	17	McClellan
4	City Water & Light	18	Municipal Light
5	Dell Power Station	19	Osceola
6	Flint Creek	20	Paragould Reciprocating
7	Fulton	21	Paragould Turbine
8	Hamilton Moses	22	Pine Bluff Energy Center
9	Harry D. Mattison	23	Robert E Ritchie
10	Harry L. Oswald	24	Thomas Fitzhugh
11	Harvey Couch	25	Two Pines Gas Recovery
12	Magnet Cove	26	Union Power Partners LP
13	Independence	27	White Bluff
14	Hot Spring	28	John W. Turk



# Thermoelectric Water Demand Forecast Results: Comparison of Withdrawals & Consumption

- About 99.7% of withdrawals for thermoelectric power generation are from surface water sources
- 0.3% are small water using typically natural gas with combustion turbine
- 93% of water withdrawn for thermoelectric power production in the state is returned to surface water

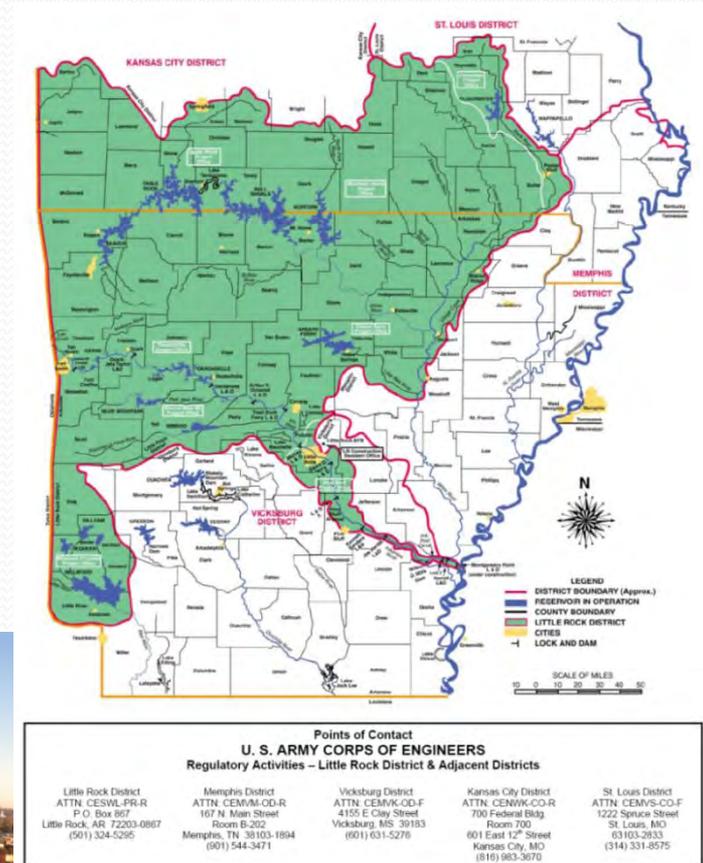
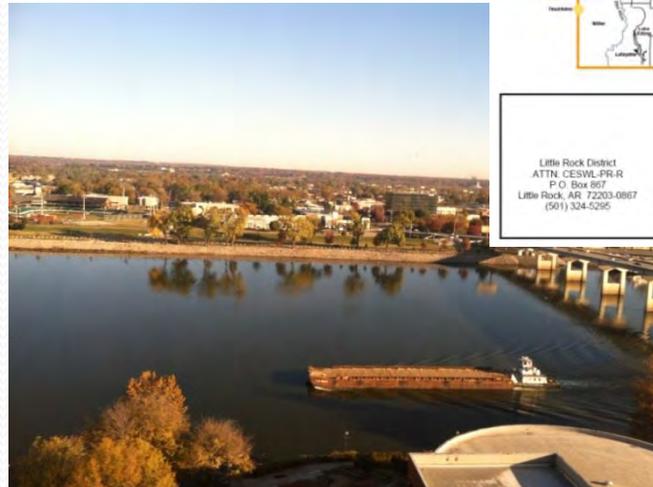


# Navigation Forecast

## Why is it important?

Providing transportation and delivery of goods and materials to our citizens, industry, and agriculture.

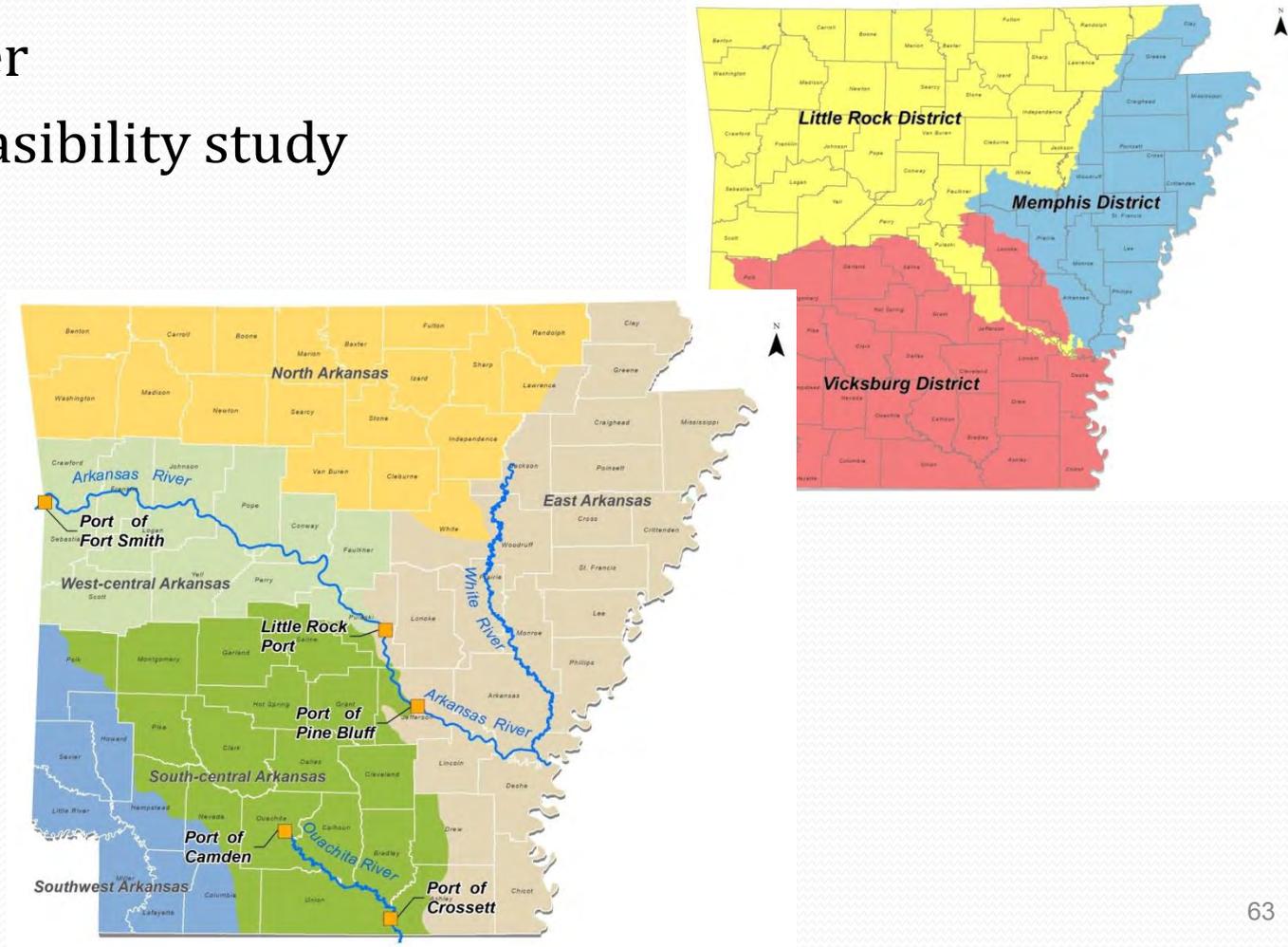
All Data and Results are Preliminary and Subject to Change



# Identified Navigation Systems

- Arkansas River
- Ouachita River
- Red River (feasibility study ongoing)
- White River

## USACE Districts in Arkansas



# Navigation Water Demand Forecast

- Identified existing federal and state authorized navigation projects
- No significant change in navigation water needs from current through 2050
- It was assumed that the existing flow and depth requirements will remain unchanged over the planning horizon and the minimum flows to for rivers and streams and depths of lakes and rivers will remain more or less as they are today
- Existing commercial navigation will continue to be supported with adequate funding: Arkansas River, White River, Ouachita River – Maintenance is key challenge on White River

## Future Navigation Potential or Initiatives

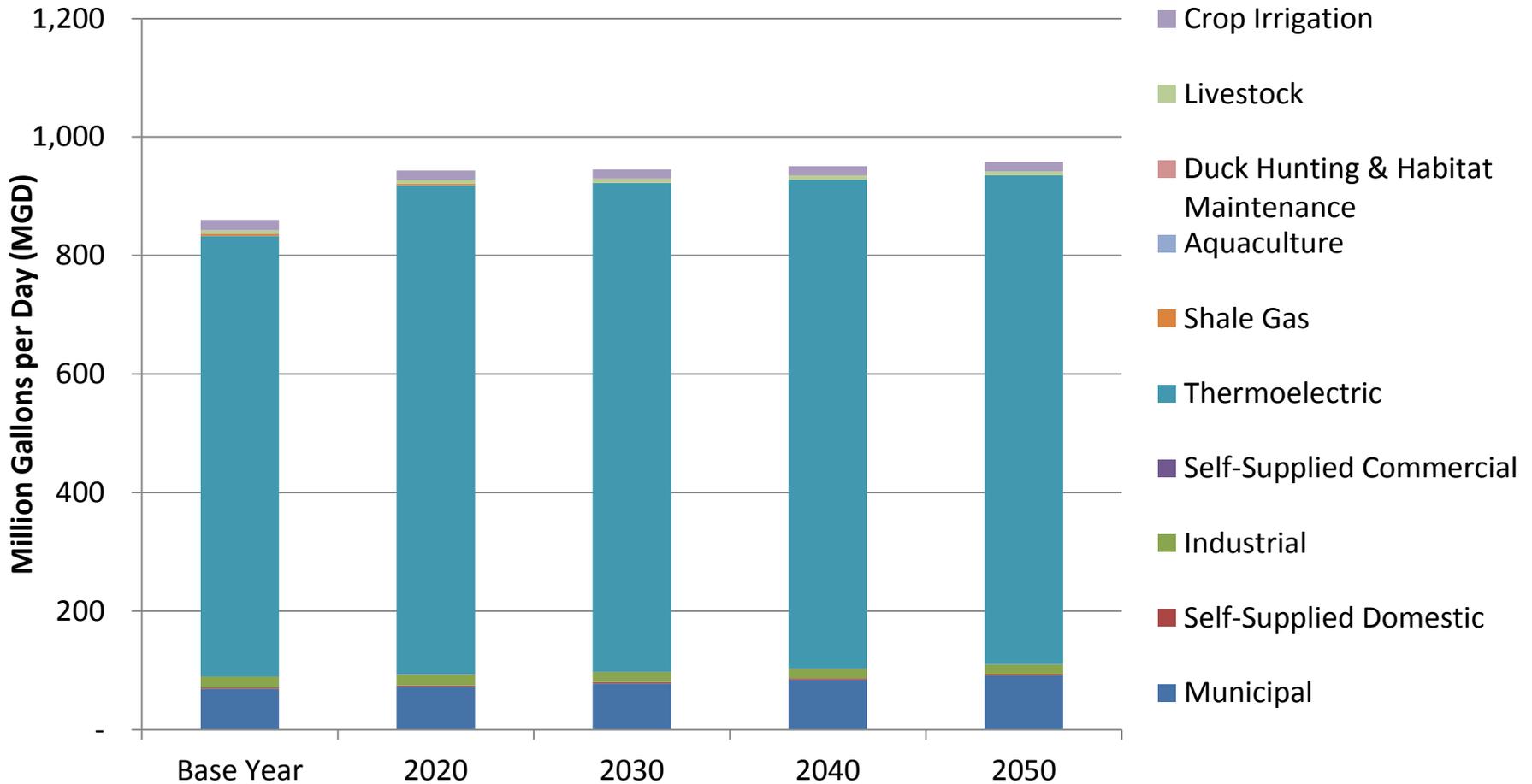
- Additional studies are still being reviewed by the planning team to determine relevance to the Water Plan update i.e., Red River Feasibility Study, Arkansas 12 foot “proposed” channel, South West Arkansas Navigation Study potential implementation

# West-Central Water Resources Planning Region



11% water use increase in 2050

**West-central Arkansas Regional Demands:  
Medium Scenario**

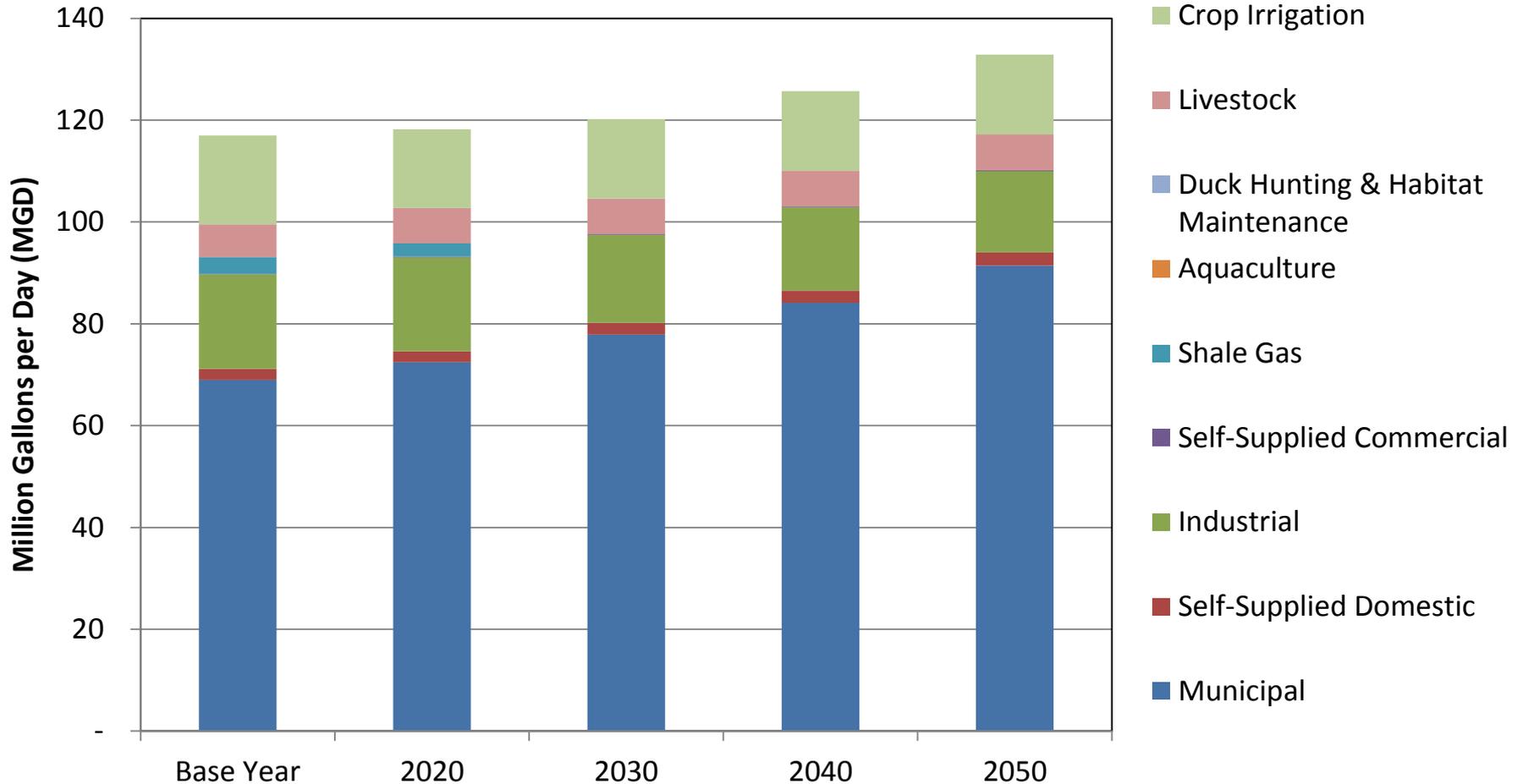


# West-Central Water Resources Planning Region



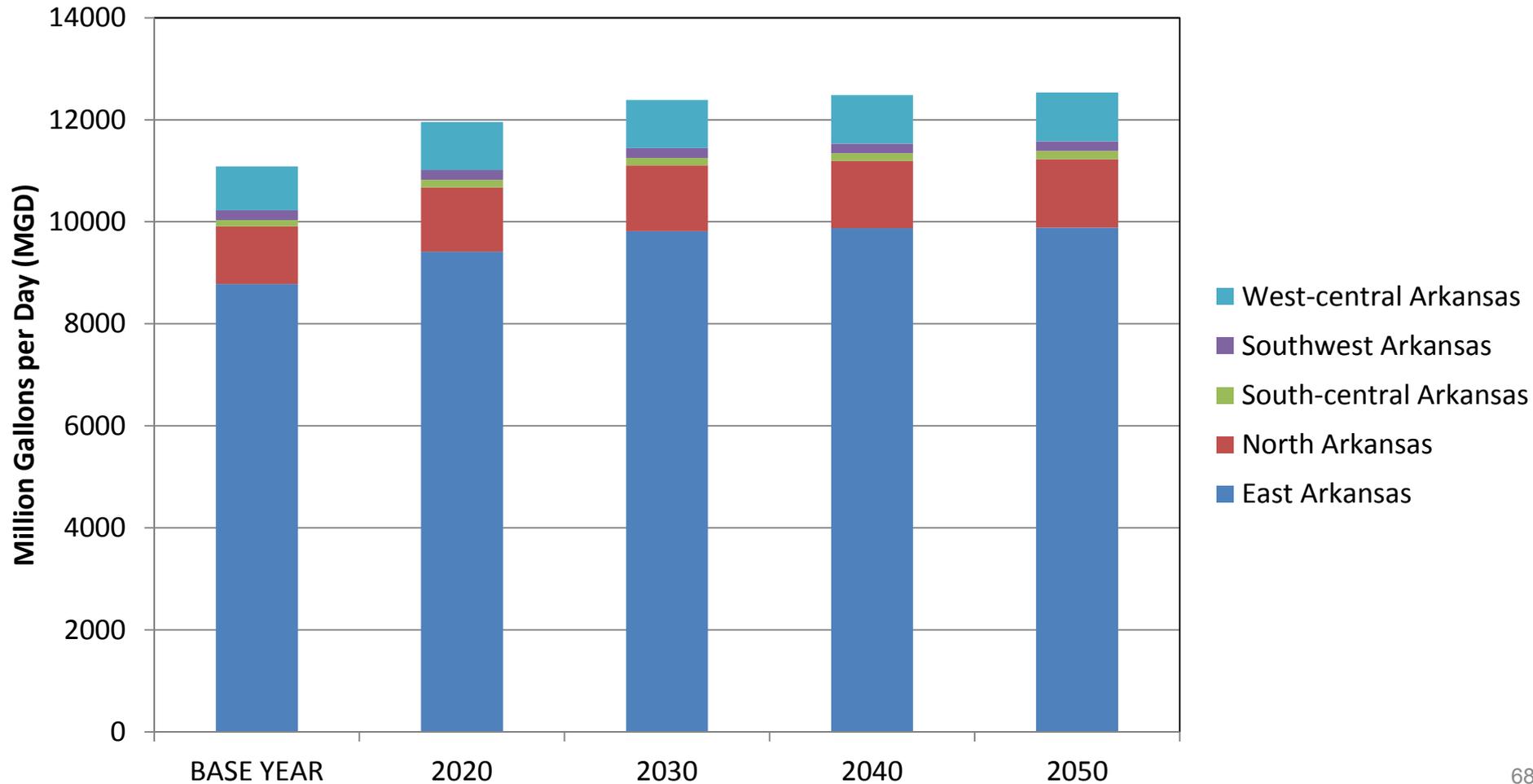
14% water use increase in 2050

**West-central Arkansas Regional Demands: Medium Scenario (excluding Thermoelectric Demands)**



# Statewide Water Demands by Water Planning Region

Arkansas Water Demands by Water Planning Region - Medium Scenario



# What to Expect for Meetings #3 & #4

Water Supply Availability

Addressing Shortfalls between Supply and Demands



## The AR Water Plan Update

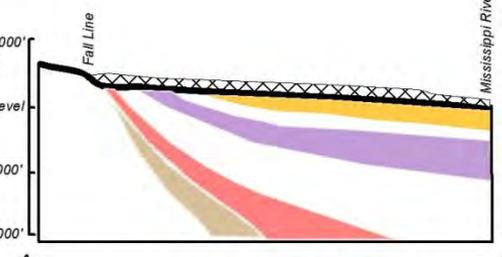
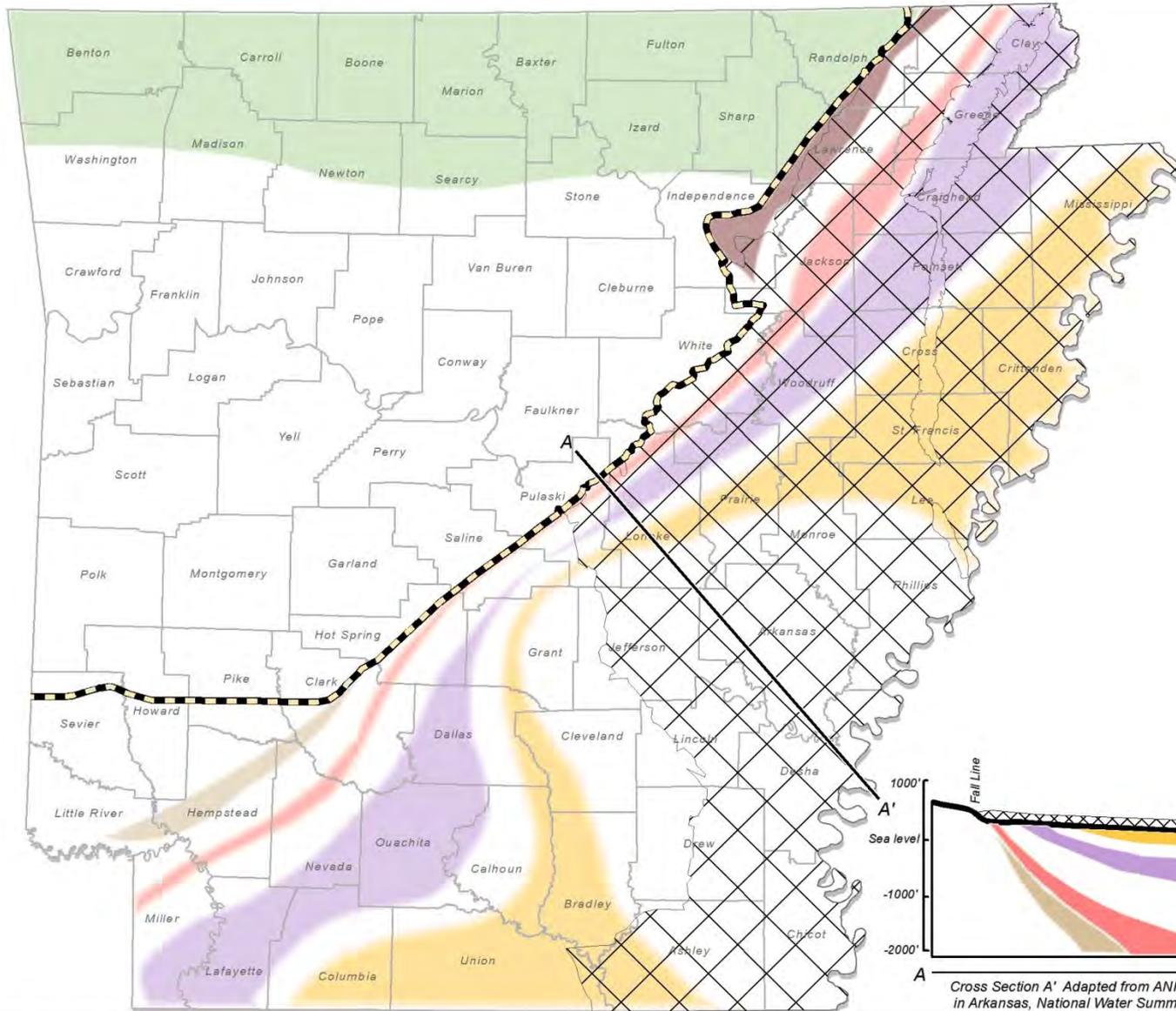
Requires Assessment of Current and Future Water Supply Availability

**Groundwater**

**Surface Water**

**Water Quality**

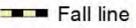
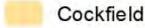
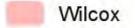
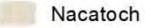
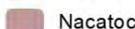
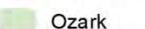
**Fish and Wildlife  
Flows**



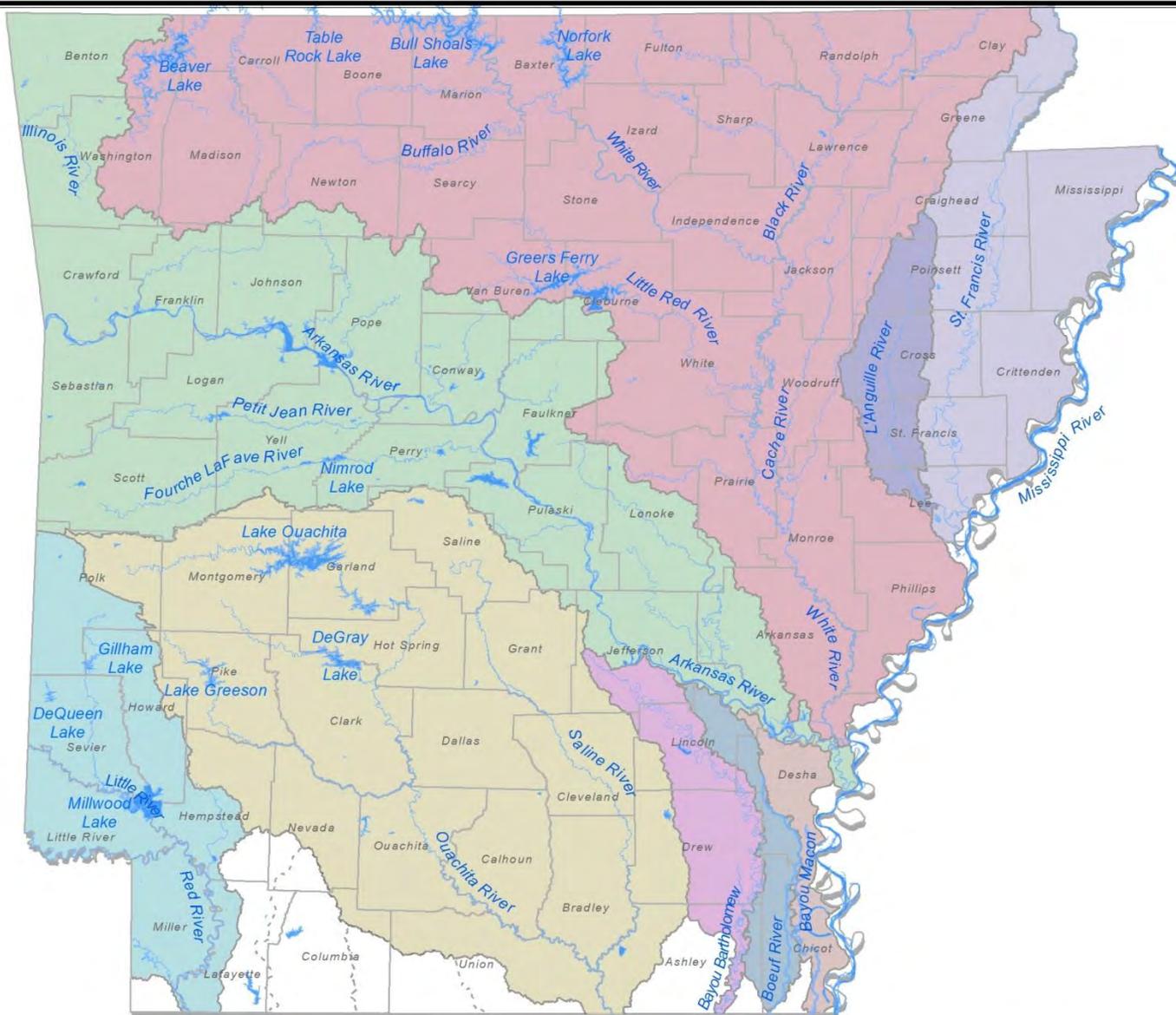
Cross Section A' Adapted from ANRC Principle Aquifers in Arkansas, National Water Summary - Arkansas

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# Aquifers

-  Fall line
-  Cockfield
-  Wilcox
-  Nacatoch SW
-  Alluvial Extent
-  Sparta/Memphis
-  Nacatoch NE
-  Ozark





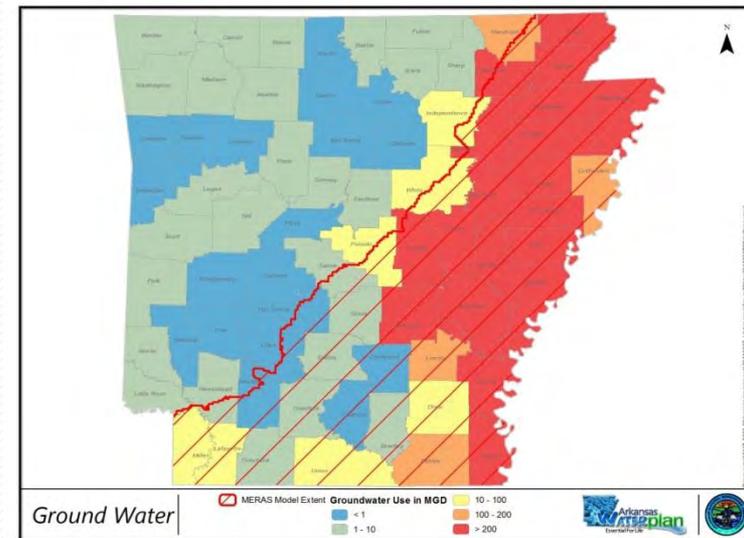
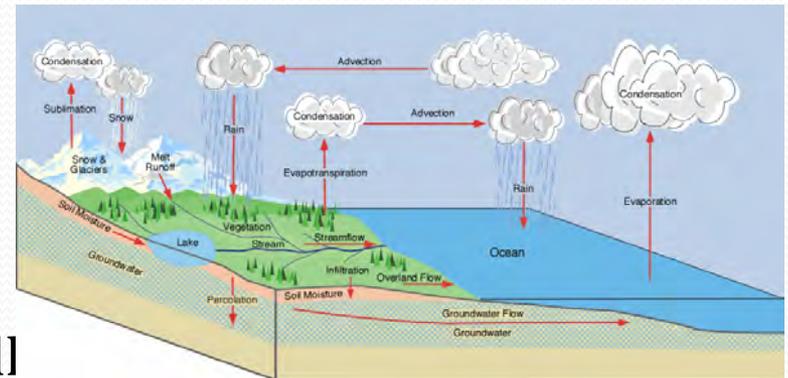
# Surface Water

- Arkansas River
- Boeuf River
- Red River
- Bayou Bartholomew
- L'Anguille River
- St. Francis River
- Bayou Macon
- Ouachita River
- White River



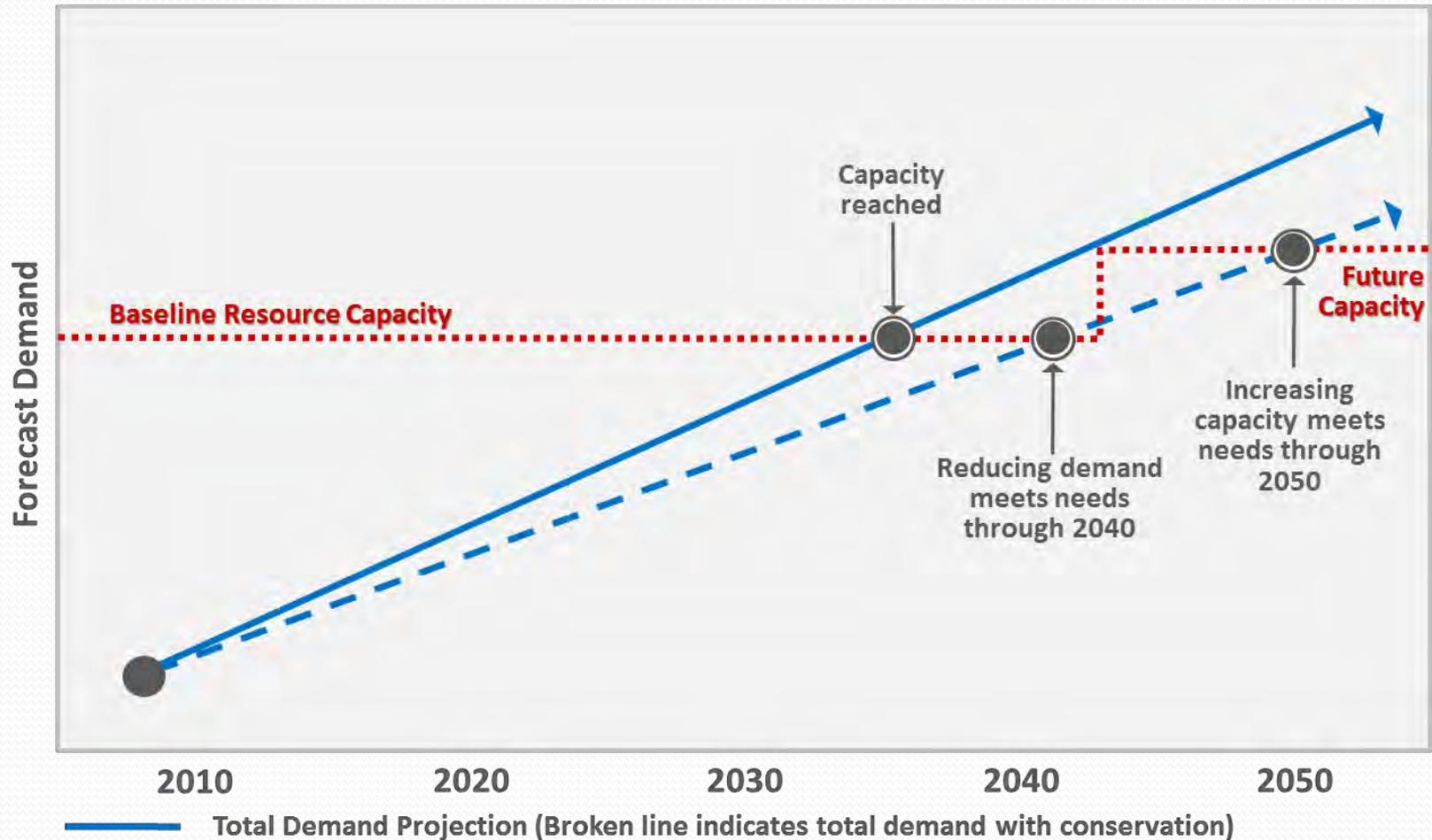
# Development and Use of Models

- Models are used to understand complex systems
- Models allow for the testing of numerous variables
- Conceptual and numerical models will be used in the Water Plan update
- The 1990 Water Plan identified critical groundwater areas in east and south-central Arkansas where withdrawals rates are exceeding recharge rates
- ANRC and USGS have developed a numeric model of the Mississippi alluvial and Sparta/Memphis aquifer systems

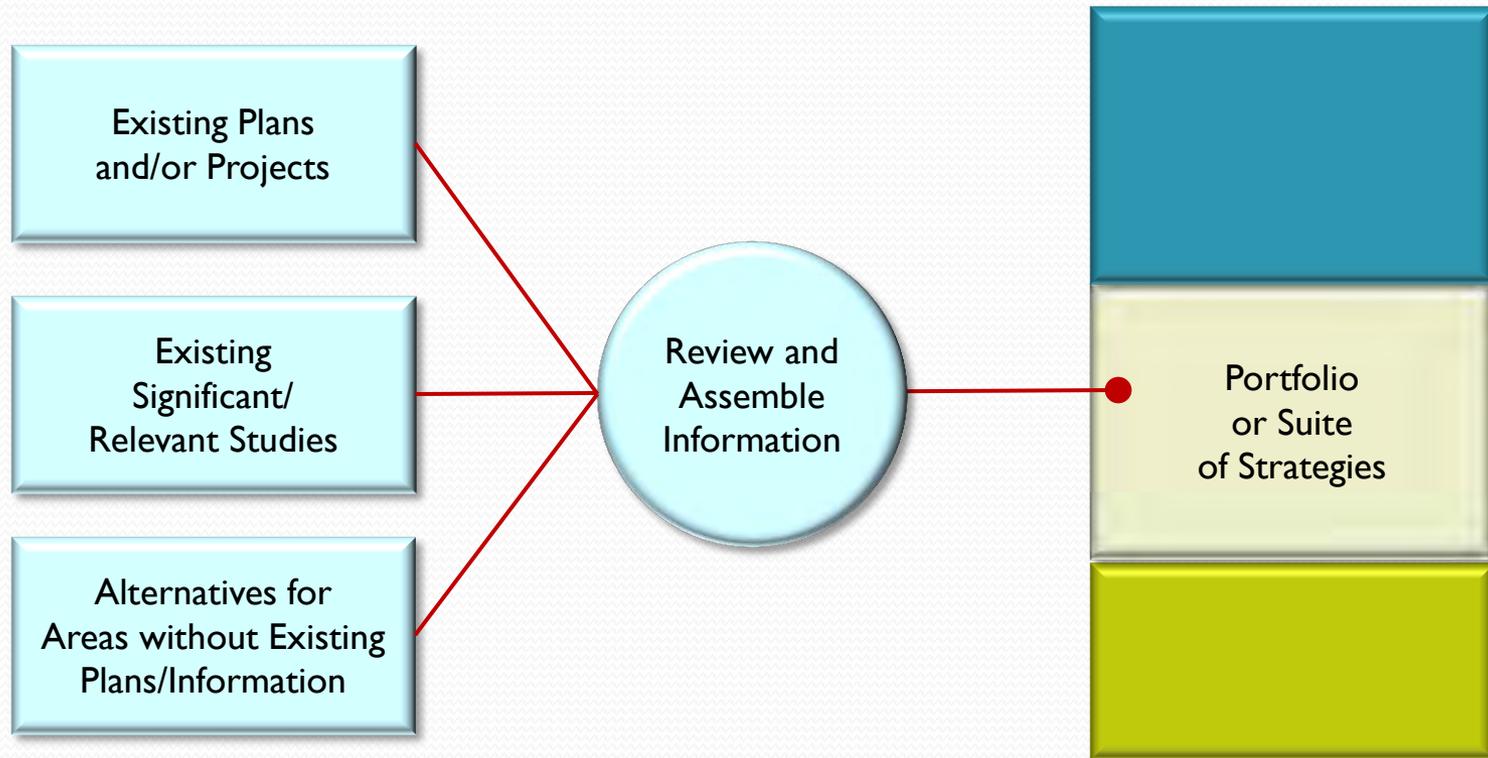


# Identify Gap(s) between Water Supply & Water Needs

## Development of Strategies to Meet the Identified Needs



# Identification/Selection of Water Resource Strategies/Management Actions





# How to Follow the Arkansas Water Planning Process and Get More Information

- Visit the Water Plan Website at: [ARWaterPlan.Arkansas.gov](http://ARWaterPlan.Arkansas.gov)
- Send an e-mail to: [ArkansasWater@CDMSmith.com](mailto:ArkansasWater@CDMSmith.com)
- Provide us your address and we will send periodic updates
- Visit the ANRC website to follow Commission activities

**ARKANSAS WATER PLAN UPDATE**  
First Issue No. 1 | October 2013

### Kick-off Information

Welcome from Arkansas Natural Resources Commission Director J. Randy Young

It is my pleasure to announce the official kick-off of the Arkansas Water Plan Update. There is no resource more important to our state than water. We depend upon water for our very existence. Water gives the food we eat, recharges our bodies, and supports our businesses, industries, and overall economy. Water is equally vital to our natural environment, fisheries, wildlife, and recreation opportunities.

I invite all Arkansians to join me in charting our path forward for the wise and efficient use, management, and development of our precious water resources. It has been over 35 years since we completed our last state water plan. The Arkansas Natural Resources Commission needs the cooperation and support of all of our citizens, our senior water use workers, and our political and business leaders to ensure a successful update to the Arkansas Water Plan by November 2014. Get involved in the public participation process and become part of the 2014 Arkansas Water Plan. To follow or participate in the state water planning process, go to [ArkansasWaterPlan.com](http://ArkansasWaterPlan.com) for continuous updates and progress reports.

Please take a moment to mark through this fact sheet to learn more about the Water Plan Update.

### What Needs to be Done?

The Arkansas Water Plan is the state's comprehensive planning process for the conservation, development, and protection of Arkansas water resources, with a goal of long-term sustainable use for the health, well-being, environmental, and economic benefit of the State of Arkansas. The Water Plan Update will be based on these principles and will follow existing Arkansas Law.

Careful planning and management is essential to assure consistent availability of high quality groundwater surface water by identifying and resolving water problems and promoting sound, solutions and investments to meet future water needs. The most recent data and extensive research will guide planning objectives and potential solutions.

Statewide water planning began in Arkansas in 1966 and the first plan was completed in 1975. In 1985, the legislature created the Arkansas Soil and Water Conservation Commission to update the original plan and this update was completed in 1993. The 1993 Arkansas State Water Plan was successful in addressing the needs of the state over the last two decades,

However, our state has changed and how our citizens use and value water has changed. According to the U.S. Census, by the year 2030 our state's population is expected to exceed 3 million residents (Figure 1).

Year	Population (millions)
1980	2.2
2000	2.6
2010	3.0

Figure 1. Arkansas Population Growth and Projections

Visit the ANRC Water Plan website for additional details

[ARWaterPlan.Arkansas.Gov](http://ARWaterPlan.Arkansas.Gov)