



TRI-STATE WATER

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Resource Coalition

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*Securing Water for Our Future*



# Water is life.

Two atoms of hydrogen joined to one of oxygen – simple, yet we cannot make more.

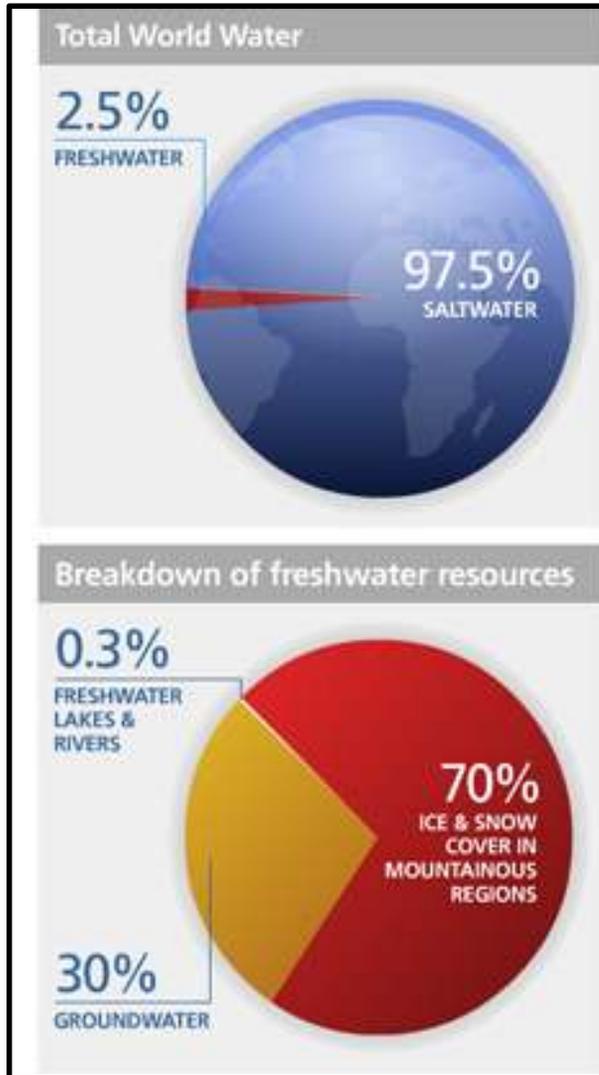
The substance from which we were born. Human babies are  $\frac{3}{4}$  water.



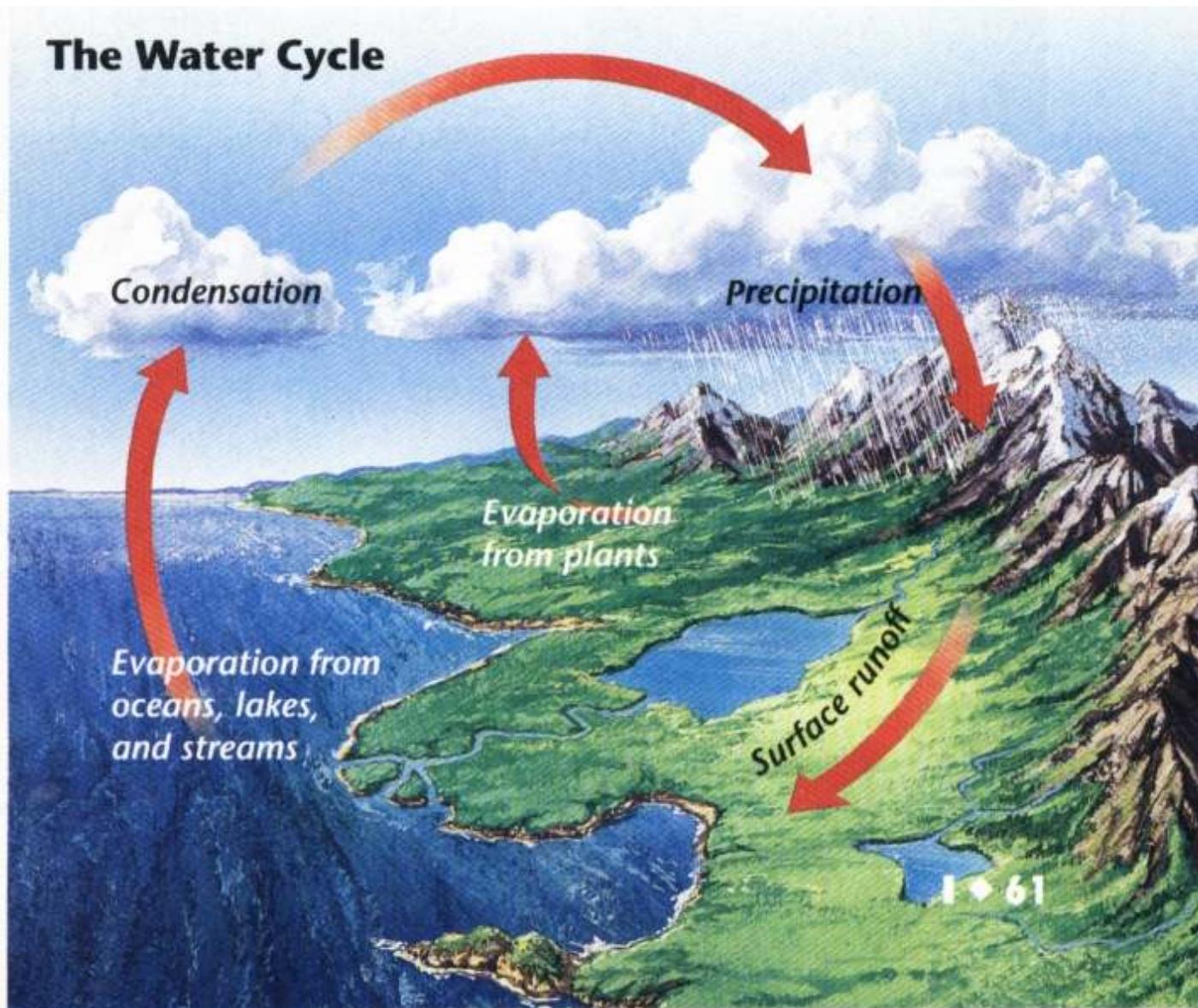
*Relative volume of the oceans (left), atmosphere (right) and Earth.*

*Dr. Adam Nieman*

While the volume of water contained in Earth's oceans seems like a lot, and it certainly is on a human scale, both the ocean and atmosphere are merely thin shells surrounding the solid parts of our planet. If every drop of water in the world was collected in a sphere, it would be just 869 miles in diameter. The illustration above shows a **comparison of the volume of water and the size of Earth**. The ball of water seems shockingly small, with a volume of only 338 million cubic miles (1.41 billion km<sup>3</sup>). – [www.theresilientearth.com](http://www.theresilientearth.com)



About **1%** of water on earth is fresh and accessible.



*...the water cycle and the life cycle are one. -Jacques-Yves Cousteau*



Americans use about 100 gallons of water at home each day – compared to 5 for world's poorest.

In 15 years, 1.8 billion people will live in regions of severe water scarcity.

A well in India.

Women in developing countries walk an average of 3.7 miles to get water. These women in Kenya spend up to 5 hours a day carrying water.

46% of people on earth do not have water piped to their homes





***“Water is the driving force in nature.”***

**-Leonardo da Vinci**



And a driving force for human beings



“Far more than oil, the control of water wealth throughout history has been pivotal to the rise and fall of great powers, the achievements of civilizations, the transformations of society’s vital habitats, and the quality of ordinary daily lives.”

-Steve Solomon, *Water: the epic struggle for wealth, power and civilization*



“...we’ve already left behind a century-long golden age when water was thoughtlessly abundant, free, and safe and entered a new era of high-stakes water. In 2008, Atlanta came within ninety days of running entirely out of clean water. California is in a desperate battle to hold off a water catastrophe. And in the last five years Australia nearly ran out of water – and had to scramble to reinvent the country’s entire water system.”

-Charles Fishman, *The Big Thirst*



## *Water: An Indispensable Resource*

*Water is life. It's the briny broth of our origins, the pounding circulatory system of the world. We stake our civilizations on the coasts and mighty rivers. Our deepest dread is the threat of having too little – or too much.*

Barbara Kingslover, National Geographic, Water Issue, April 2010

# Multiple Uses/Competing Interests



**Recreation**



**Power Generation**



**Fish & Wildlife**



**Water Supply**



**Agriculture**

A photograph showing two pairs of bare feet hanging from a dark wooden beam. The feet are positioned symmetrically, one pair on the left and one pair on the right. The background is a lush, green outdoor setting with a stream or river flowing through it. The water is clear and reflects the surrounding greenery. The overall scene is peaceful and natural.

**We Do Not Inherit the Earth  
from Our Ancestors; We  
Borrow It from Our Children**

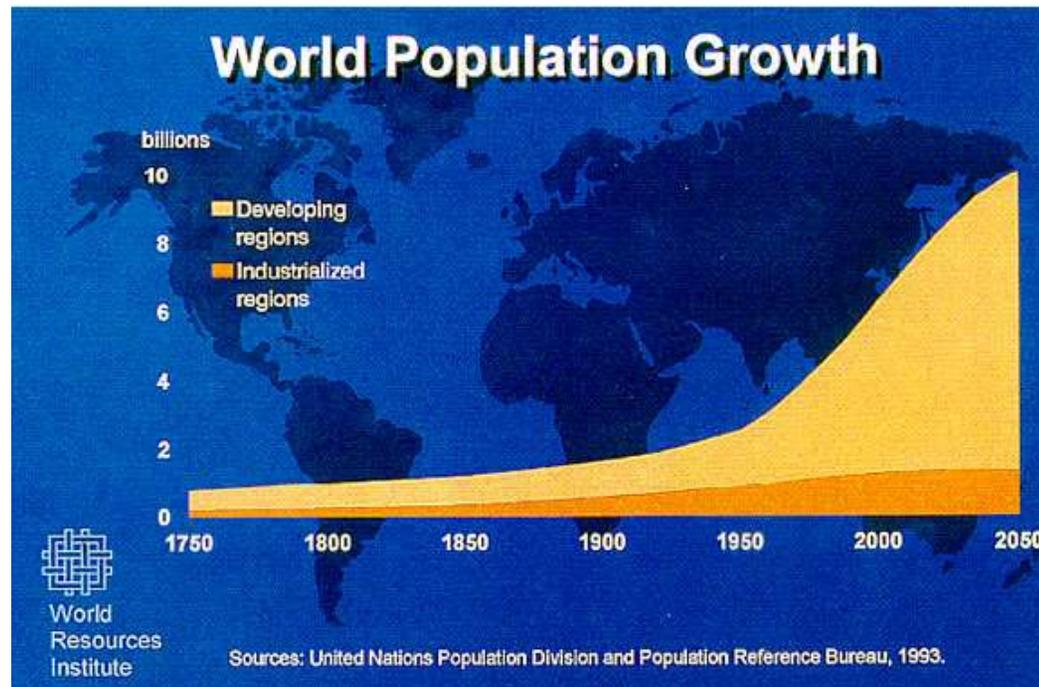


## *The Challenges*

*Civilization has been similarly slow to give up on our myth of the Earth's infinite generosity...Rather grandly, we have overdrawn our accounts.*

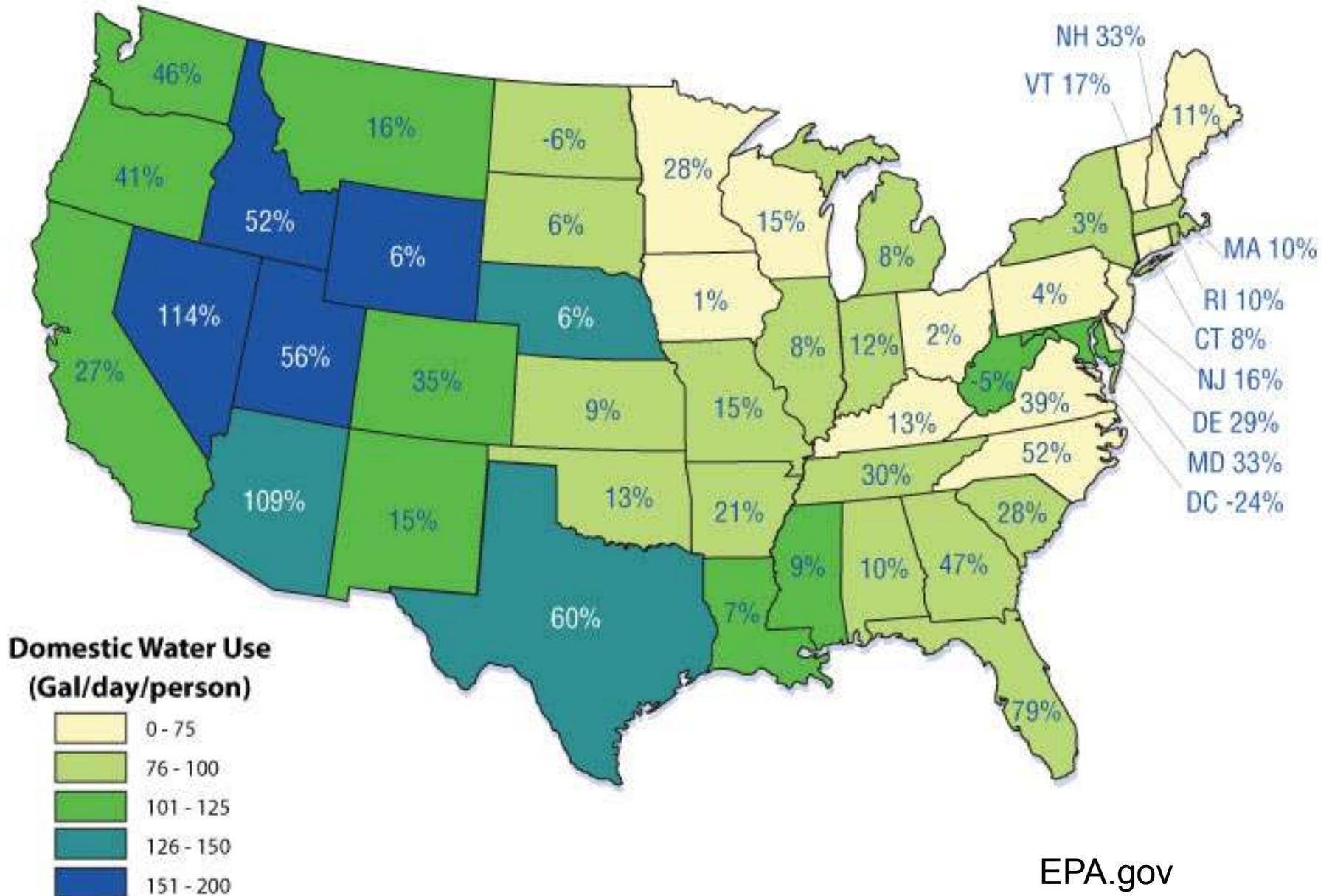
*Water is the ultimate commons.*

-Barbara Kingslover, National Geographic, Water Issue, April 2010

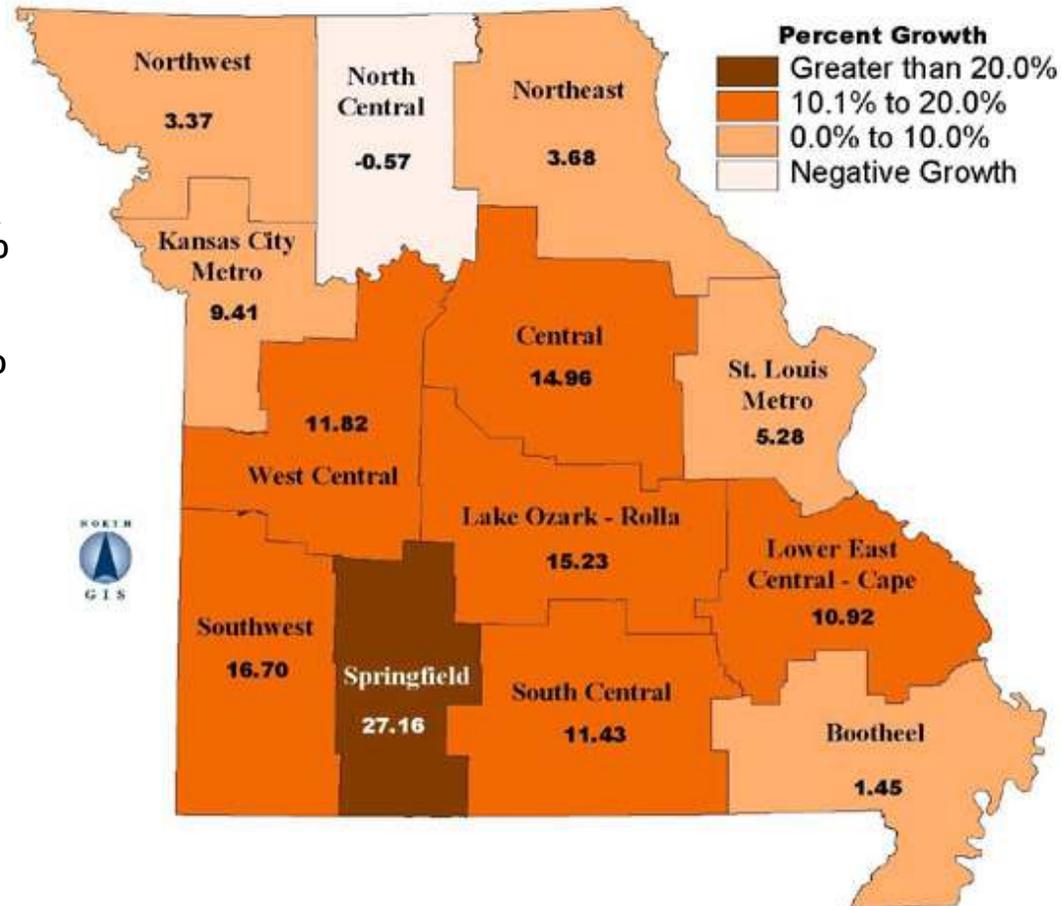


Two-thirds of our water is used to grow food. With 83 million more people on earth each year, water demand will keep going up unless we change how we use it.

## Domestic Water Use in Gallons per Day per Person and Projected Percent population Change by 2030



# Missouri Population Growth 1990-2000

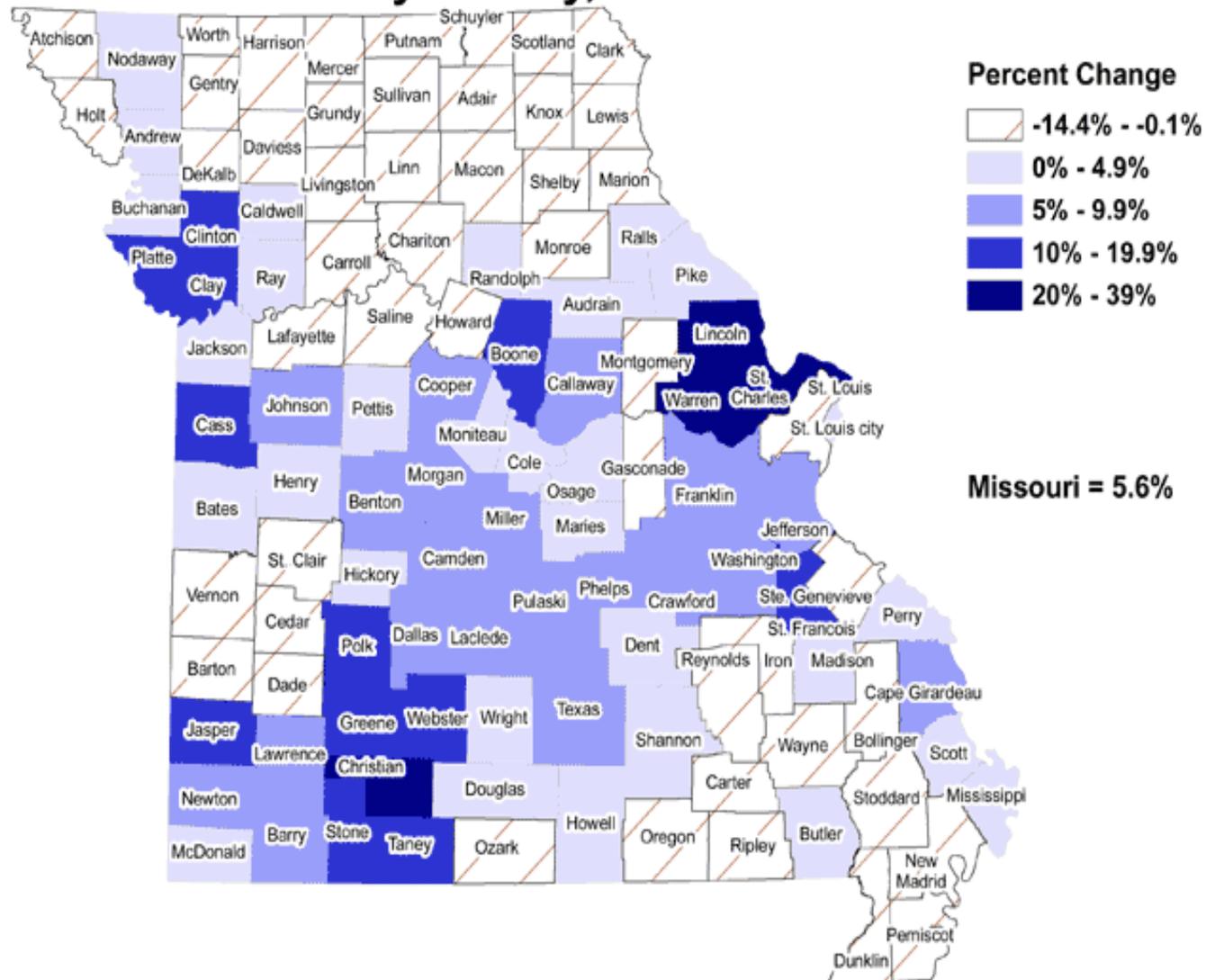


Springfield 27%

Southwest 17%

Source: Missouri Economic Research and Information Center, Missouri Department of Economic Development

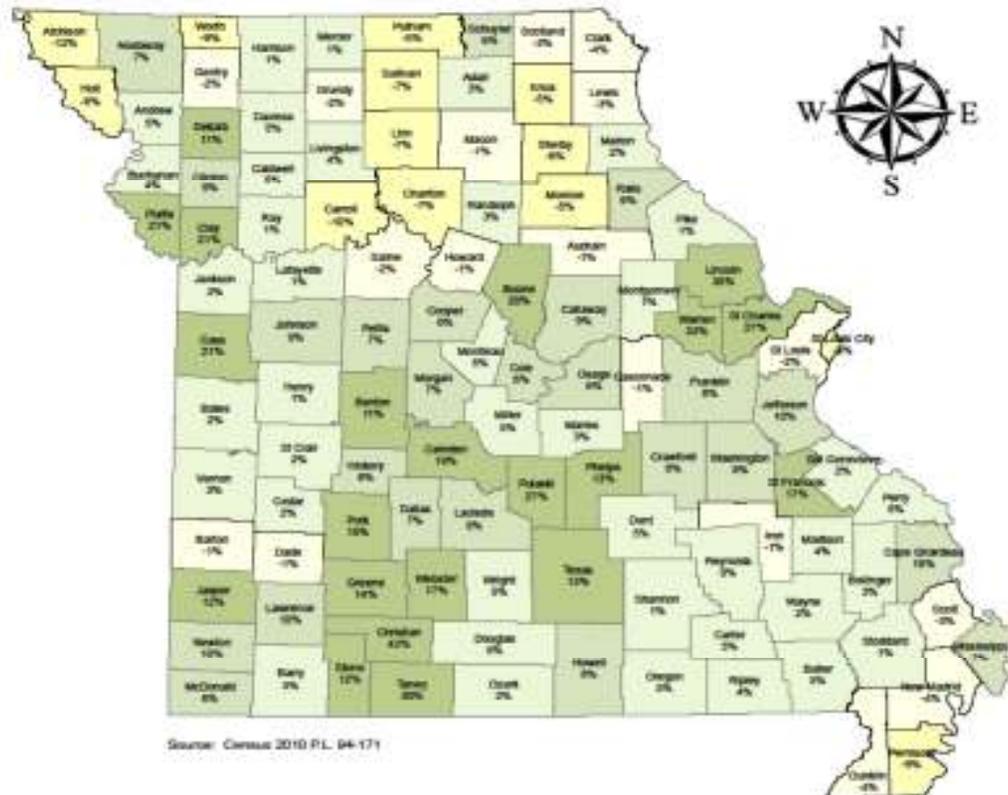
# Percent Change in Missouri Population by County, 2000-2008



Source: USDC, Bureau of the Census, Federal State Cooperative for Population Estimates, 2008  
 Prepared by: University of Missouri Extension, Office of Social and Economic Data Analysis (OSED)A  
 Map Generated on: 02 Apr 2009

## Missouri County Population Change 2000 to 2010 Percent Change

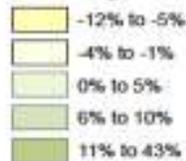
- Christian 43%
- Taney 30%
- Webster 17%
- Polk 15%
- Greene 14%
- Jasper 12%
- Stone 12%
- Lawrence 10%
- Newton 10%
- McDonald 6%
- Barry 5%



Source: Census 2010 PL 94-171

### Legend

% Change 2000 to 2010

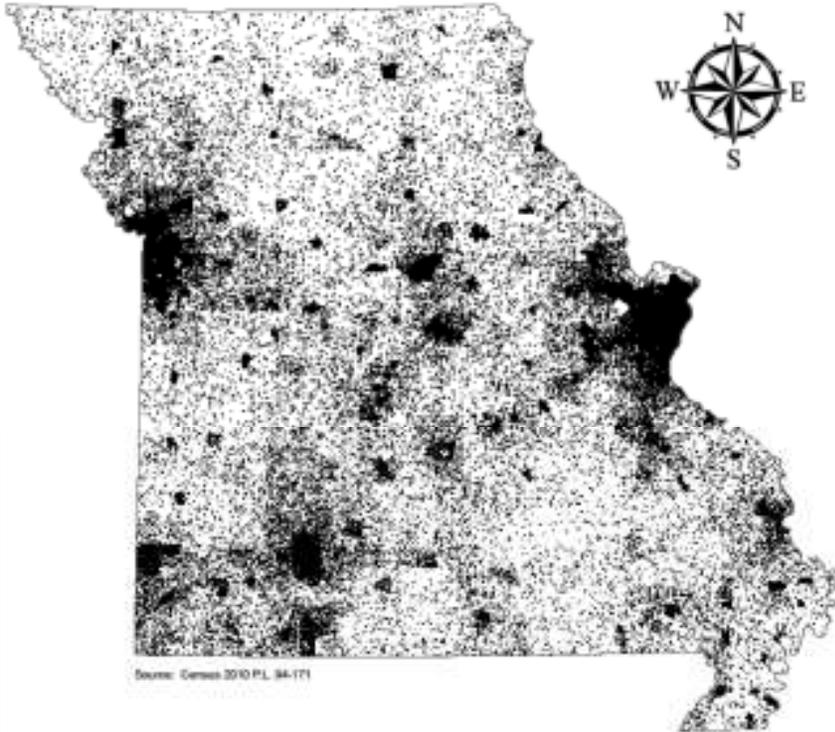


State Average = 7%

Prepared By Missouri Office of Administration  
Division of Budget and Planning 3/1/2011



## Missouri Population 2010



### Legend

 State of Missouri

1 Dot = 50 Persons

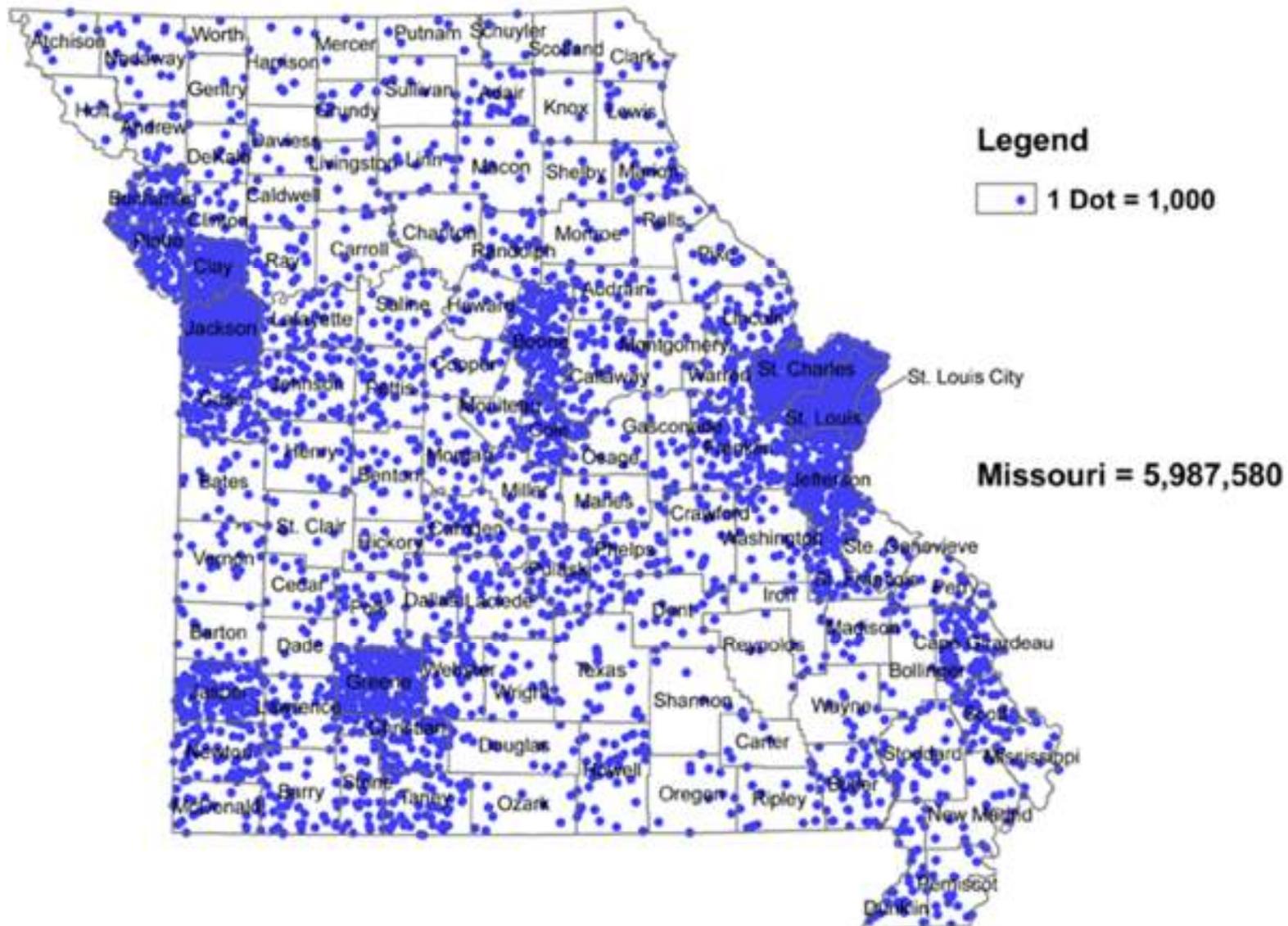
Total Population = 5,988,927

Note: Population density mapped by  
2010 census tract.

Prepared By Missouri Office of Administration  
Division of Budget and Planning 3/1/2011

# Population densities stress water supplies

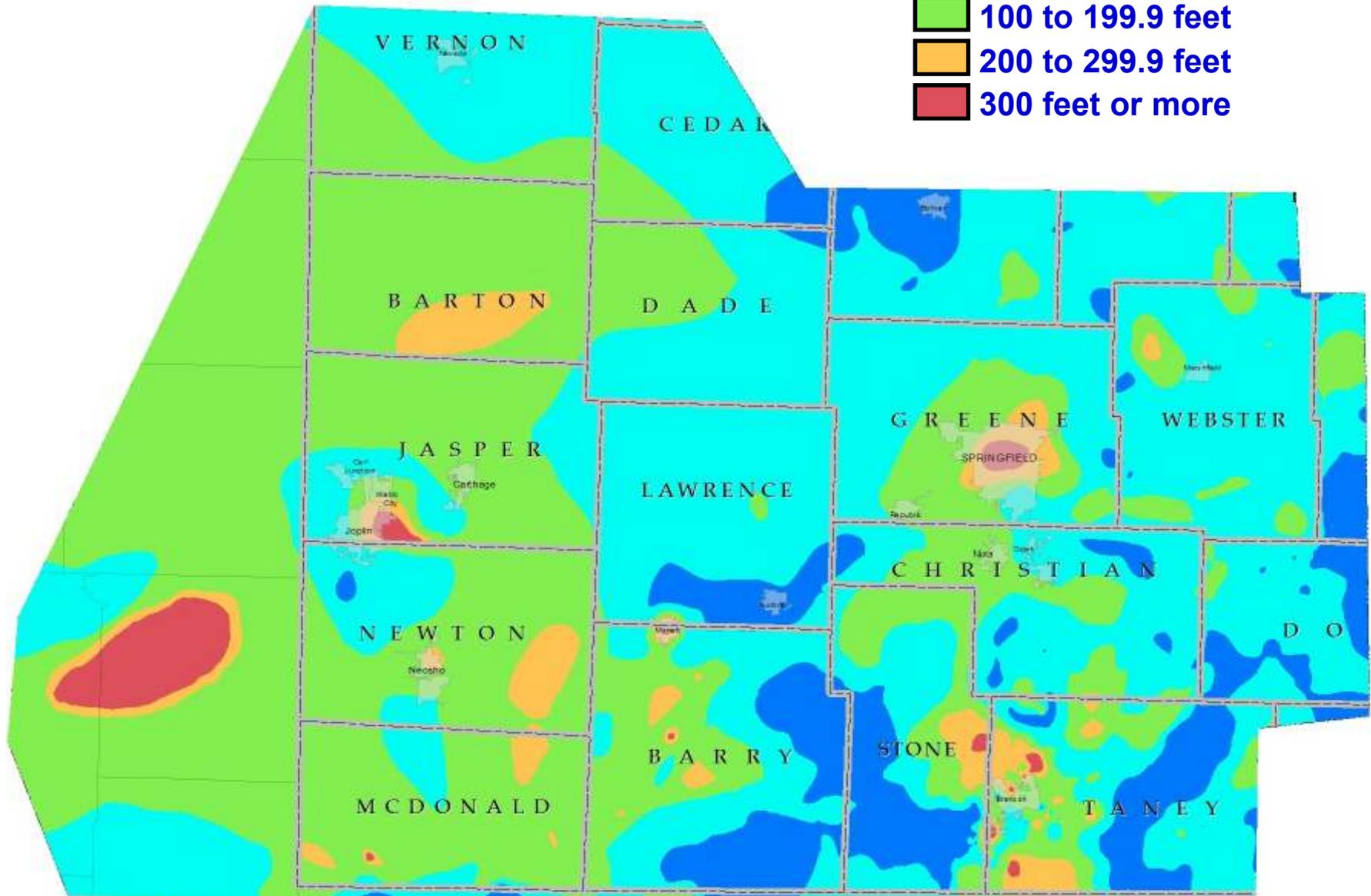
# Total Population, 2009



Data Source: U.S. Census Bureau, Population Division, Population Estimates, 2010  
Map Prepared By: University of Missouri Extension, Office of Social and Economic Data Analysis (SEDA)  
Map Generated On: 12 Oct 2010

# GROUNDWATER LEVEL DECLINE FROM PREDEVELOPMENT TO 2006-2007

- Little or no change
- Less than 100 feet
- 100 to 199.9 feet
- 200 to 299.9 feet
- 300 feet or more



Source: Mo DNR, Water Resources Center

# Where does our water come from?

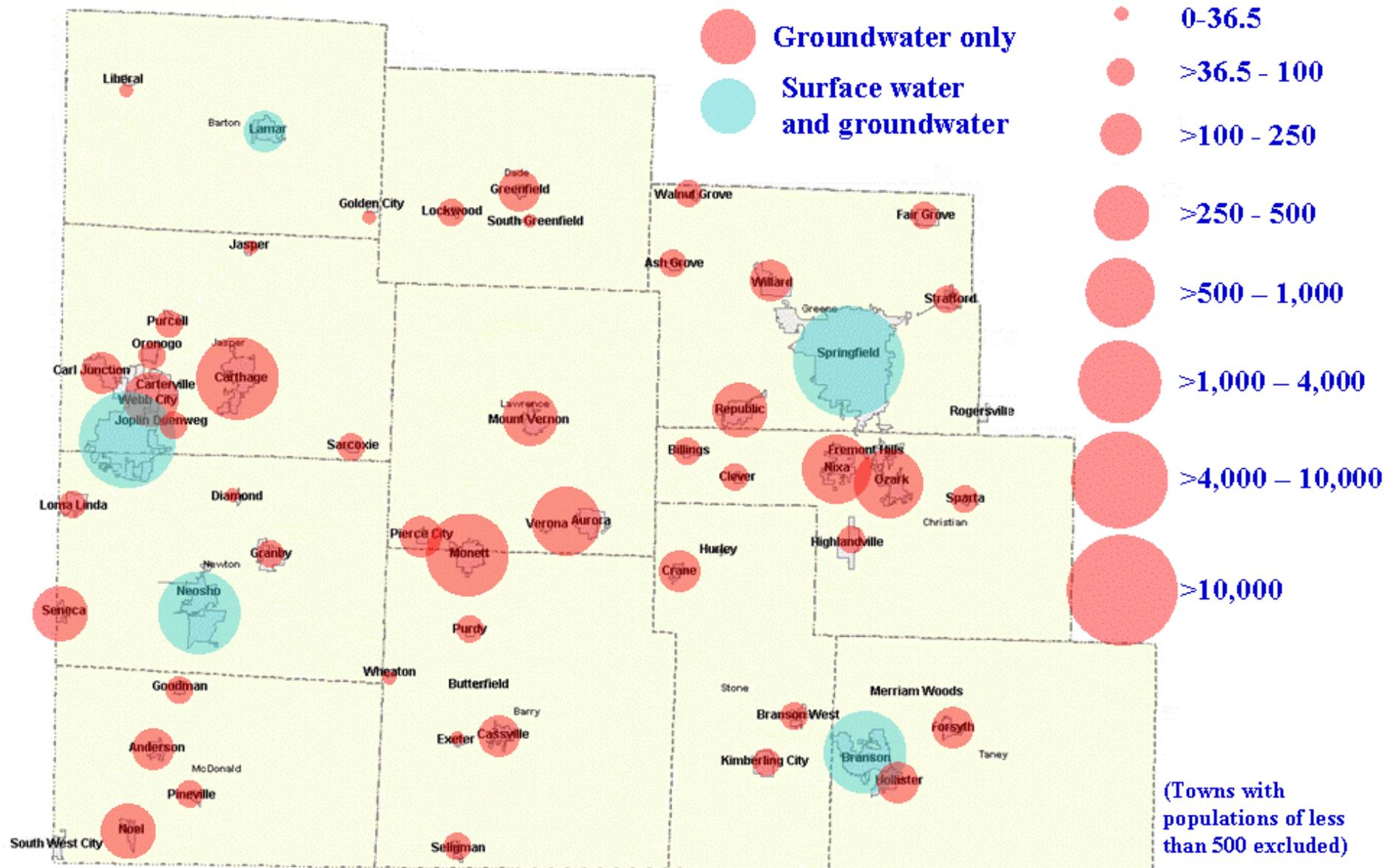
Surface



Ground – aquifers

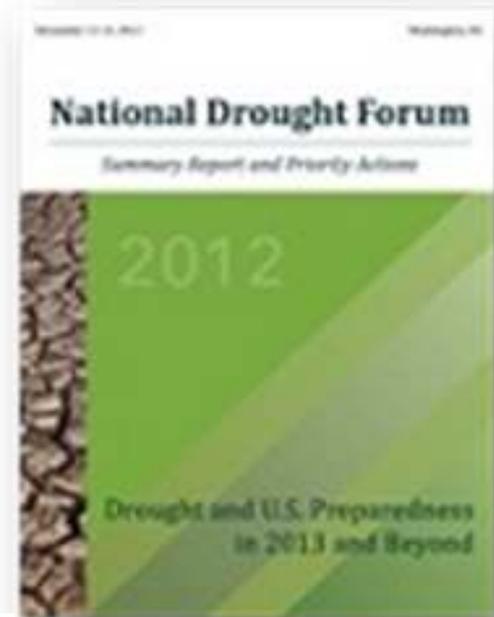


# Average Annual Municipal Water Use 1996 – 2008 (million gallons per year)





# DROUGHT 2012



## U.S. Drought Monitor Missouri

July 31, 2012  
Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	62.79	6.40
Last Week (07/24/2012 week)	0.00	100.00	100.00	100.00	68.86	8.09
3 Months Ago (05/01/2012 week)	83.81	16.19	0.00	0.00	0.00	0.00
Start of Calendar Year (12/27/2011 week)	86.48	4.52	0.00	0.00	0.00	0.00
Start of Water Year (05/01/2011 week)	65.19	44.81	22.45	6.66	0.00	0.00
One Year Ago (07/02/2011 week)	50.75	49.25	6.16	0.00	0.00	0.00

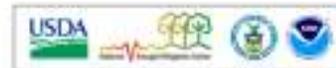
**Legend:**

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu>



Released Thursday, August 2, 2012  
Mark Svoboda, National Drought Mitigation Center

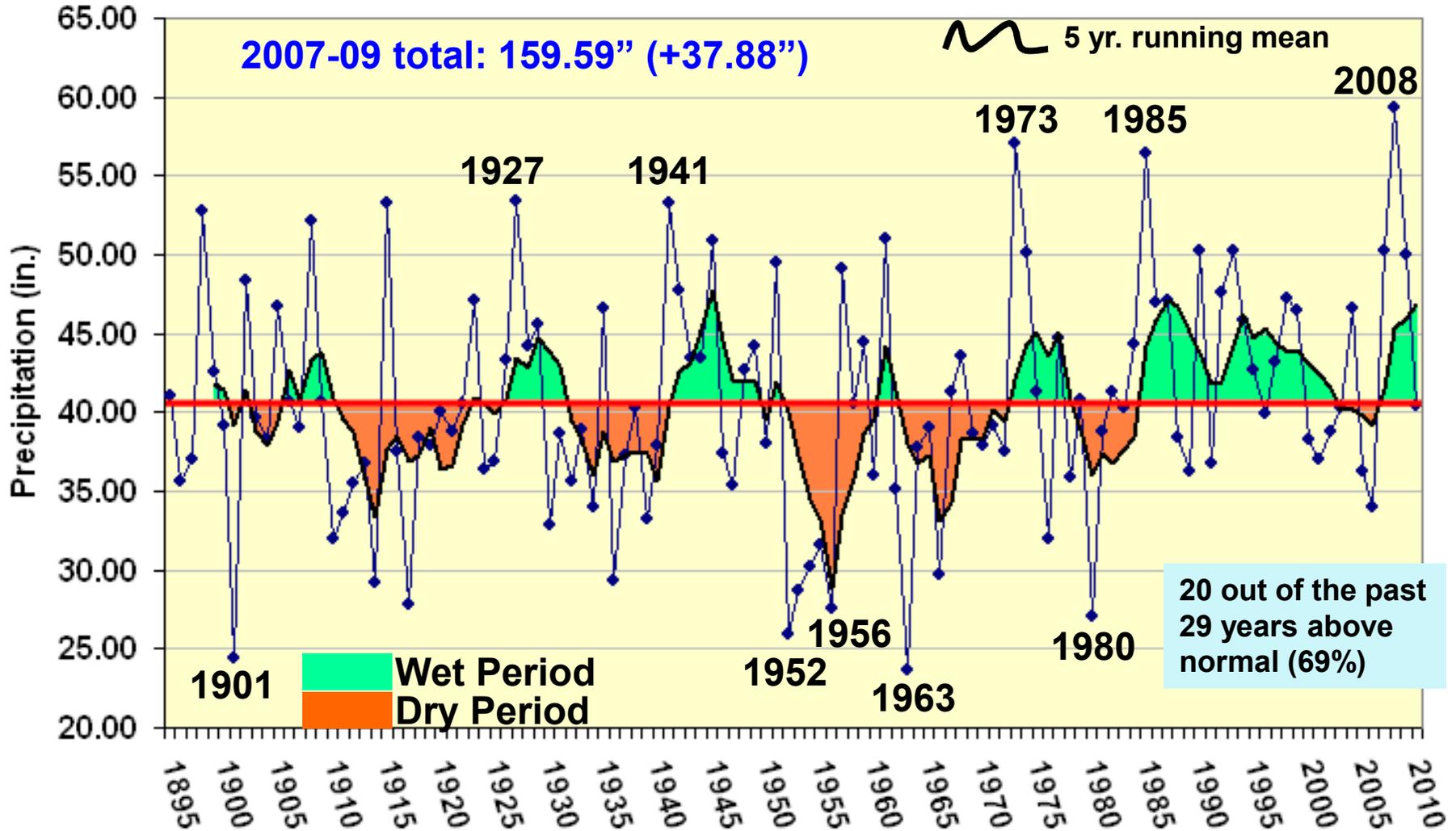
[U.S. Drought Portal  
www.drought.gov](http://www.drought.gov)



# Annual Average Precipitation (1895-2010)

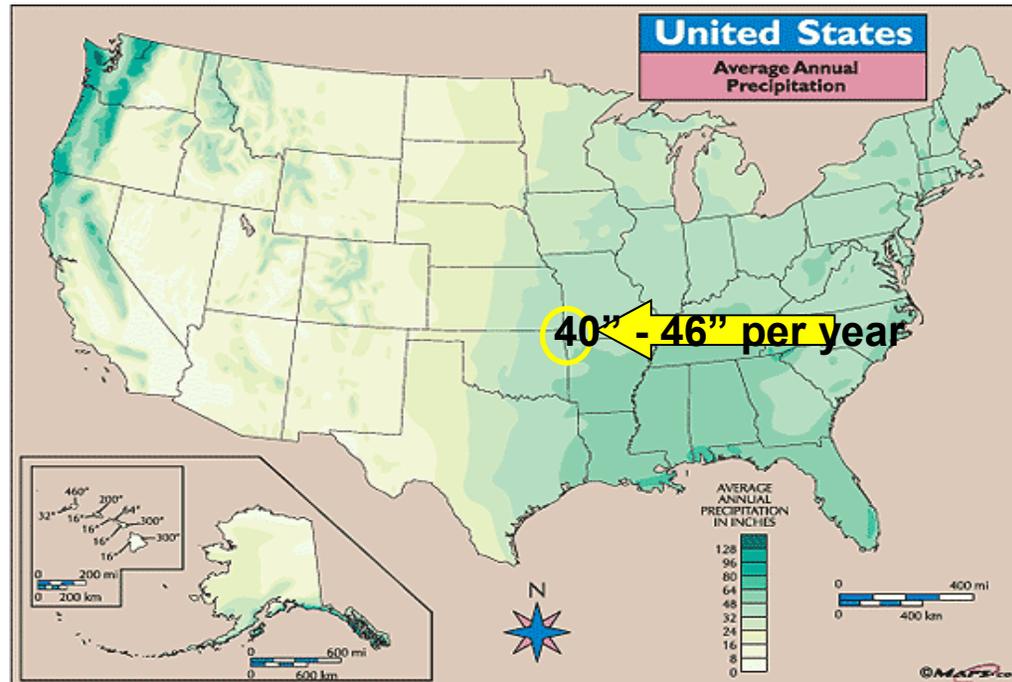


Long-term average: 40.57 in. —





# Riparian / Reasonable Use VS. Prior Appropriation



**Decaying infrastructure:** Nearly every American city west of the Appalachian Mountains is at the age where the original infrastructure is now badly in need of repair/replacement. The east coast cities went through this in the 60's.



**A USA TODAY study of residential water rates over the past 12 years finds that crumbling infrastructure is forcing repairs from coast to coast, with costs more than doubling in 1 of 4 localities.**

# Water is not priced to reflect its value



Average pool is ~20,000 Gallons

Pool full of **topsoil** (bags) cu ft \$2.64 = **\$7,057**

Pool full of **gasoline** at \$3.29 = **\$65,800**

Pool full of **milk** at \$4 per gallon = **\$80,000**

Pool full of **perfume** at 1 oz/\$29 is 1 gal/\$3,712 = **\$74,240,000**

Pool full of **water** (in Cassville) at \$.0033 per gallon = \$65 + \$11 (base) = **\$76**  
(**\$3.25 per 1,000 gallons**)



**Excess**



**Sustainability**



*Tri-State Water Resource Coalition:  
How We Got Started*



2001 – Joplin asked about sustainability of Ozark Aquifer.

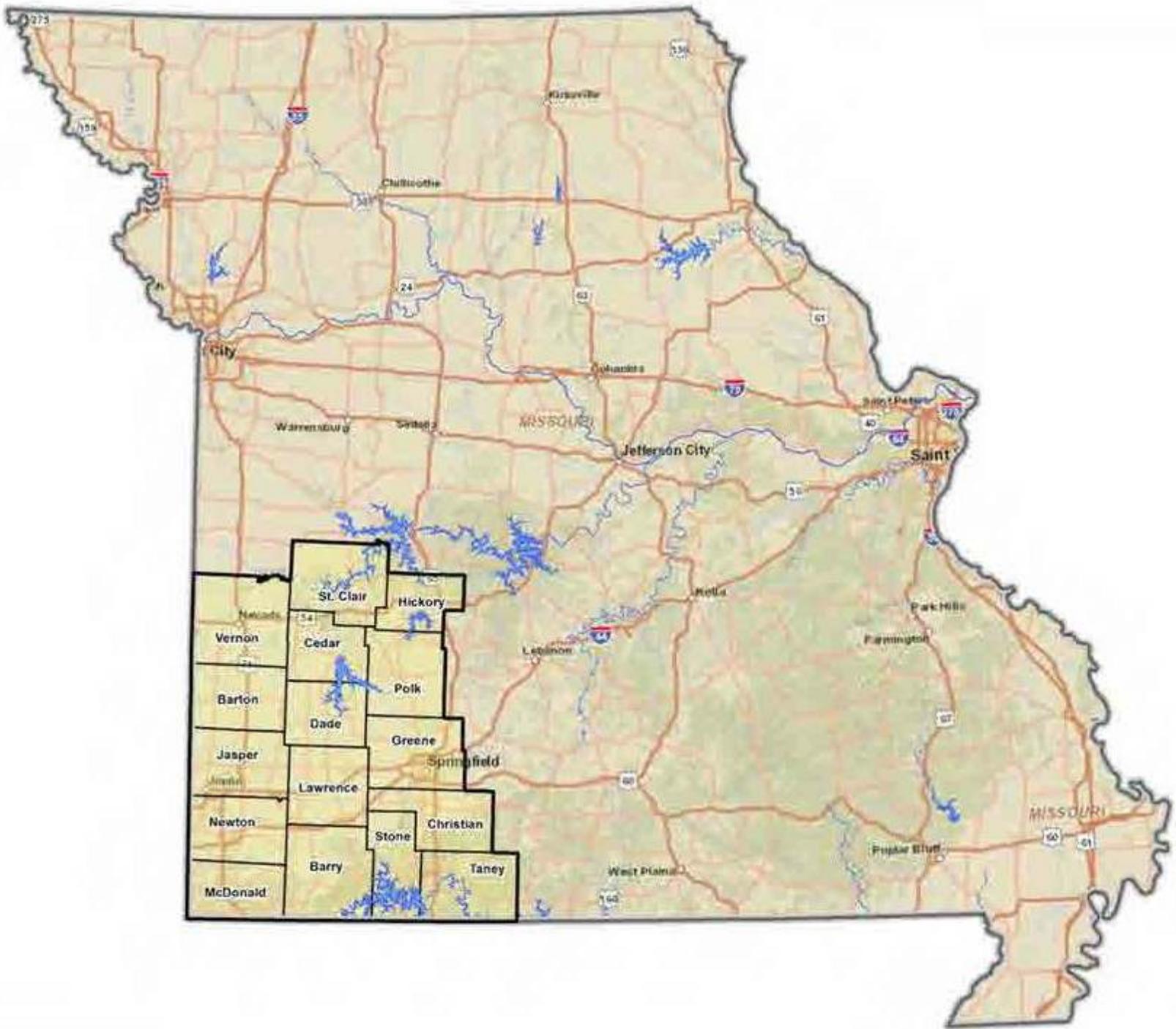
2002 – MO Am. Water Co. commissioned a study/ Wittman to construct a hydro-geologic model of the Ozark Aquifer. 2003 released.

**Uh oh, we could run out!**

2003 - Tri-State Water was born.



*Tri-State Water Resource Coalition:  
Leading the Way to a Secure  
Water Future*



- St. Clair
- Hickory
- Nevada
- Vernon
- Cedar
- Polk
- Barton
- Dade
- Greene
- Jasper
- Lawrence
- Springfield
- Newton
- Stone
- Christian
- Barry
- Stone
- Taney
- McDonald



## Membership Includes:

- Cities
- Counties
- Public and private water providers
- Nonprofit orgs such as Chambers of Commerce



**OFFICERS:**

**President – David Hertzberg, City of Joplin,**

**Past President - Roddy Rogers, City Utilities, Springfield**

**Vice-President - Matt Barnhart, Missouri American Water**

**Treasurer - Hal VanDaGriff, Empire District Electric**

**Secretary – Lynn Calton, City of Lamar**

**BOARD OF DIRECTORS:**

**John Bartosh - Jasper County**

**Bob Williams - Carthage Water**

**Carl Francis - City of Webb City**

**Lynn Calton - City of Lamar**

**Steve Walensky – City of Cassville**

**Brian Bingle – City of Nixa**

**Pete Rauch - City of Monett**

**Gene Stanton – City of Mt. Vernon**

**Dean Kruithof – City of Branson**

**EXECUTIVE DIRECTOR:**

**Gail Melgren**



*Laying a Solid Foundation:  
The Research*



### **The Wittman Study – January, 2003**

***This study developed a hydro-geologic model of the Ozark Aquifer.***

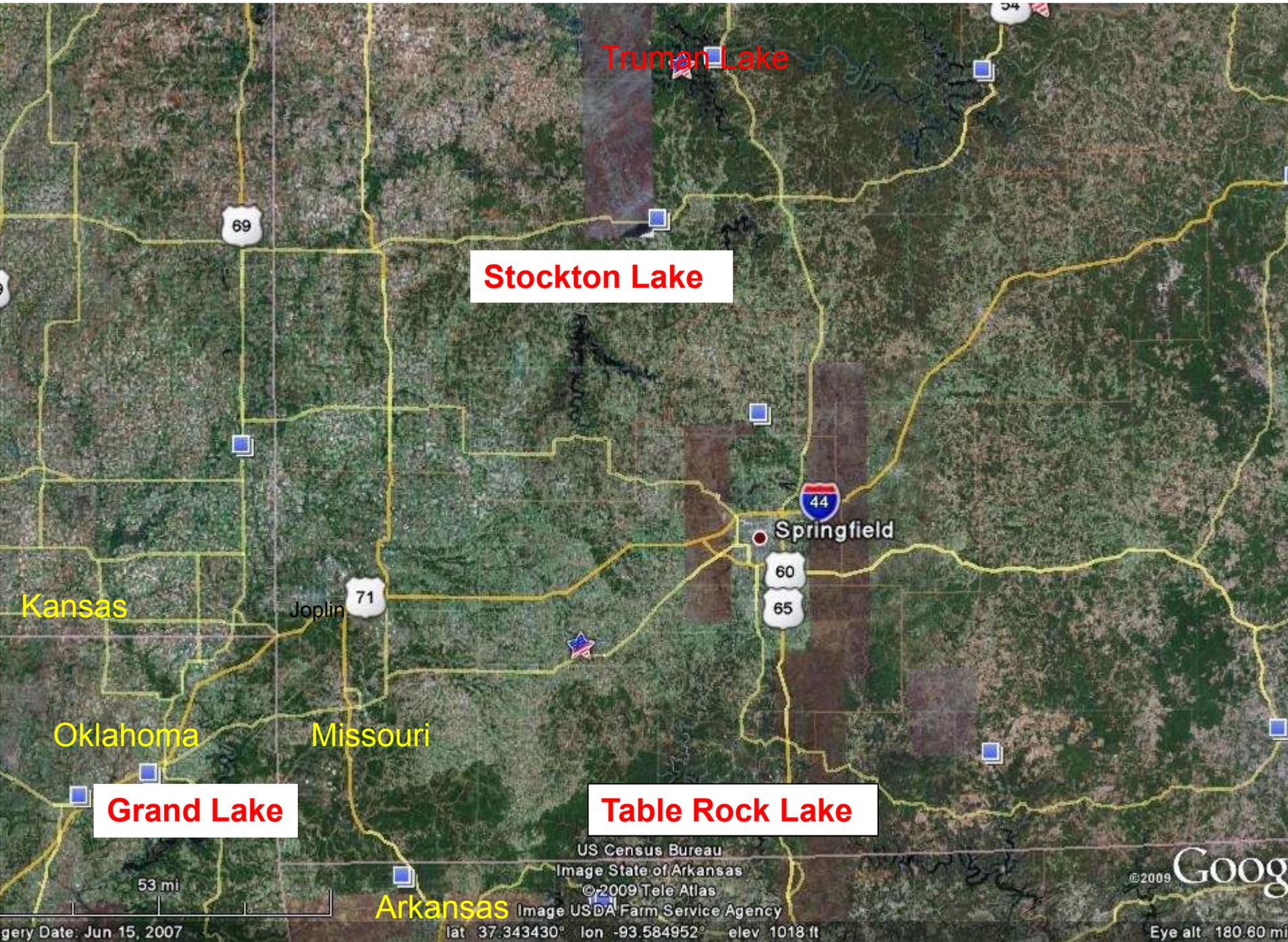
**•The Ozark Aquifer may be unable to satisfy demand, during an extended drought. That limit may come within 10 – 15 years for some parts of the Tri-State Water footprint.**



## Corps of Engineers Study (Black & Veatch) – October, 2006

**This study investigated the need for additional water, and potential sources of additional water for the region.**

- Rivers and streams do not have sufficient flow to meet long-term demand without the construction of an additional reservoir.
- Ground water (the Ozark Aquifer) is not a strong option due to decreasing levels and potential contamination in some parts of the footprint.
- The best opportunities for additional regional water supply were defined as Grand Lake, Table Rock Lake, Stockton Lake, and/or a new reservoir.**



Truman Lake

Stockton Lake

Grand Lake

Table Rock Lake

Kansas

Joplin

Oklahoma

Missouri

Arkansas

US Census Bureau  
Image State of Arkansas  
©2009 Tele Atlas  
Image USDA Farm Service Agency

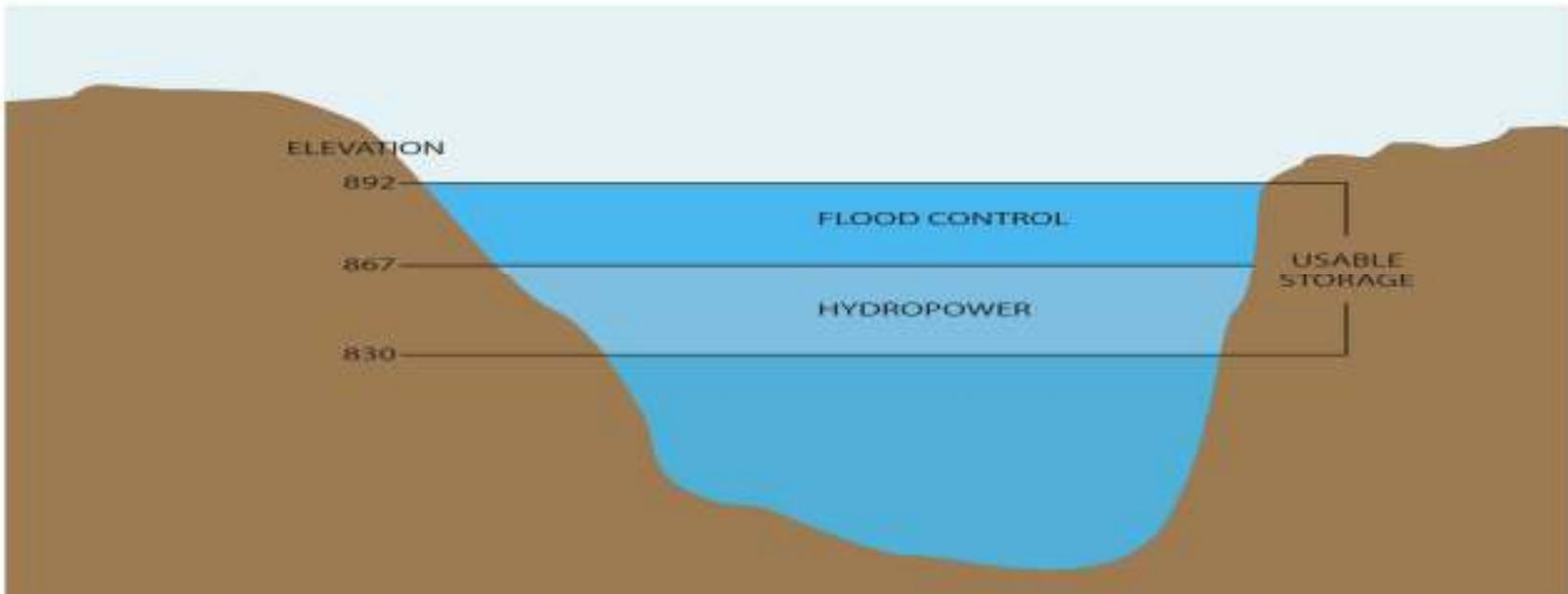
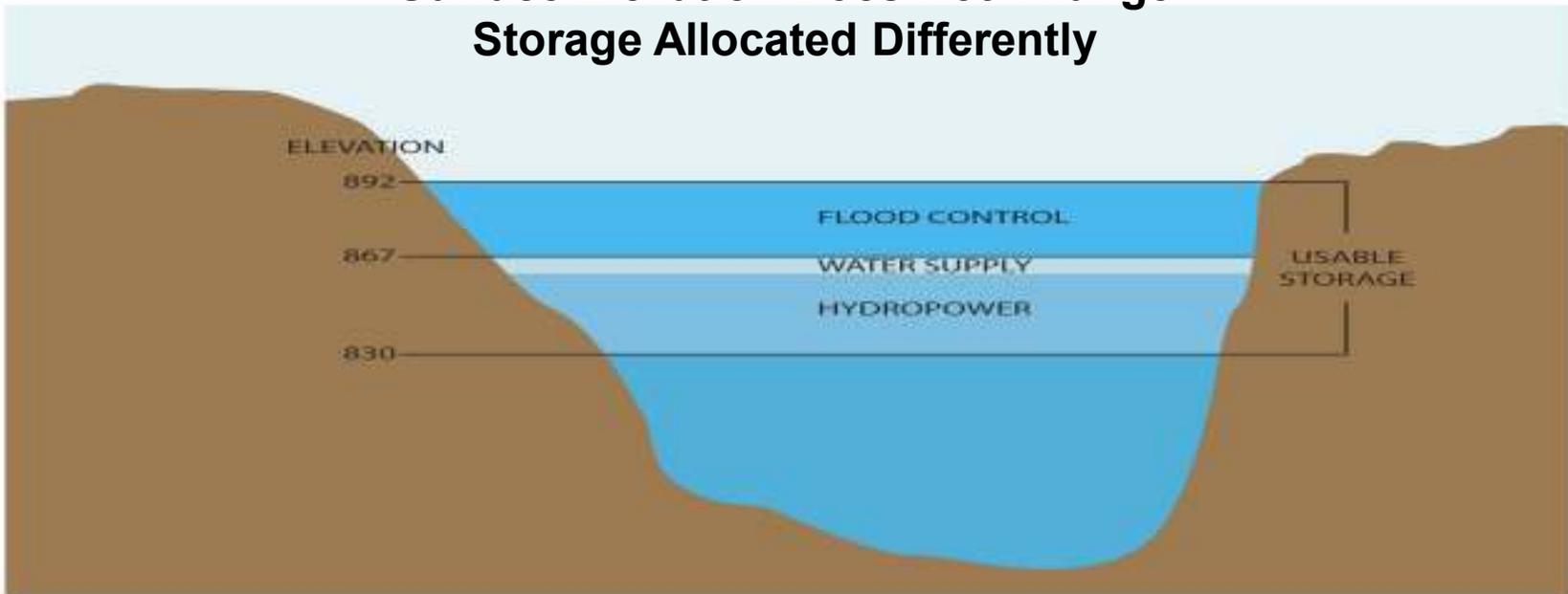
©2009 Google

Image Date: Jun 15, 2007

lat 37.343430° lon -93.584952° elev 1018 ft

Eye alt 180.60 mi

# Surface Elevation Does Not Change Storage Allocated Differently





## *Next Steps*

**2007 – Coalition made application to US Army Corps of Engineers for water from both Stockton and Table Rock Lakes**

- **Corps of Engineers replied that it could be 5 – 7 years before we would receive an answer (and the answer could be NO)**



**Tri-State Water Resource Coalition / Missouri Department of Natural Resources Reservoir Screening Study (Freese & Nichols)– July, 2009**

**This study identified potential sites for new reservoirs.**

- **It would not be economically feasible to construct one reservoir to serve the entire region.**
- **Fourteen potential sites were defined –**
  - **10 to supply the western side of Tri-State Water’s footprint, assuming Joplin as a treatment and distribution point and**
  - **4 potential sites to supply the eastern side of the footprint, assuming Springfield as a treatment and distribution point.**



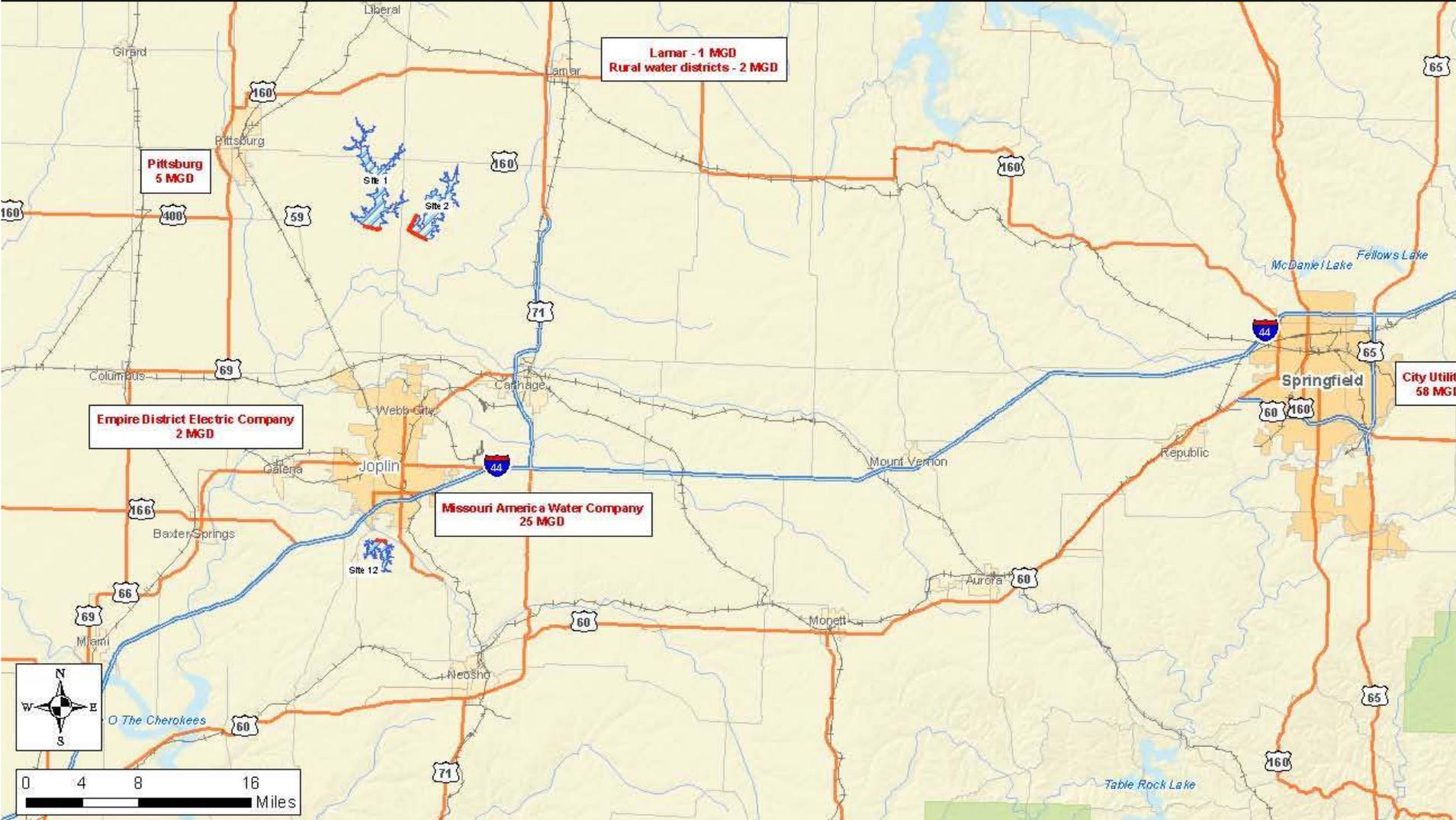


## Supplemental Reservoir Screening Study (Freese & Nichols) – June, 2010

The preferred sites identified in the original reservoir study would not provide economical water for the Pittsburg and Lamar areas so the consultant was asked to further investigate sites which would.

- **Three potential reservoir sites were investigated in more detail (two north of Joplin, between Lamar and Pittsburg, and one south of Joplin – an off-stream reservoir on Shoal Creek) along with the possibility of withdrawal of water from below Stockton Dam.**

# Supplemental Reservoir Study



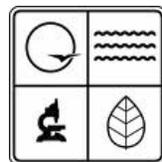


## Southwest Missouri Water Resource Study – Phase I: Forecast of Regional Water Demands 2010 – 2060 (CDM) – September 2012 (Revised November 2012)

This forecast is designed to **improve the understanding of current and estimated future water use** within publically-supplied residential and non-residential, self-supplied residential and non-residential, and agricultural water use sectors in a sixteen county region of Southwest Missouri.

The **first phase of a two** phase program to determine current and future regional water resource needs. **Phase I provides an analysis of both existing and future water demand** for each of the sixteen individual counties in the region.

Conservation scenarios were considered.



Missouri  
Department of  
Natural Resources



**US Army Corps  
of Engineers**  
Kansas City District



**Southwest Missouri Water Resource Study – Phase I: Forecast of Regional Water Demands 2010 – 2060 (CDM) – September 2012 (Revised November 2012)**

<b>Estimated S.W. Missouri Baseline and Projected Average Water Demands to 2060 (GPD)*</b>			
<b>YEAR</b>	<b>HIGH GROWTH</b>	<b>MEDIUM GROWTH</b>	<b>LOW GROWTH</b>
2010**	338,503,791	338,326,175	338,326,175
2030	414,026,845	382,615,101	358,502,024
2060	581,735,120	462,337,386	387,226,057
<b>% INCREASE</b>	<b>71.9%</b>	<b>36.7%</b>	<b>14.5%</b>

Under baseline conditions, that is, with no additional conservation measures, estimated system-wide demand under the medium growth scenario increases from 339.1 to 464.0 MGD, an increase of 36.8%. Water demand for the entire region is estimated to increase between 49.2 MGD and 245.0 MGD between 2010 and 2060, given the three different population growth scenarios. The total daily water demand in 2060 for the sixteen county region is estimated to grow to 388.3 MGD for the low growth scenario and up to 584.3 MGD for the high growth scenario.



## Southwest Missouri Water Resource Study – Phase I: Forecast of Regional Water Demands 2010 – 2060 (CDM) – September 2012 (Revised November 2012)

### **What about Conservation? – A piece in the puzzle, not a total solution**

Two scenarios were developed to assess the impacts of potential future conservation activities on regional publically supplied municipal and industrial water demands.

- Metering (residential and commercial)
- Leak detection programs
- Educational programs on water savings
- Residential and commercial water audits

### **How did Conservation impact Forecast Results?**

Under conservation scenario I, water demands are estimated to decrease by 1-3% annually based on implementation of moderate conservation activities.

Under conservation scenario II, water demands are expected to be reduced by 4-7% annually based on implementation of substantial conservation activities.



## Southwest Missouri Water Resource Study – Phase II: Forecast of Regional Water Supply and Gap Analysis

The Phase II study will evaluate water supply sources followed by a gap analysis that will identify counties and areas that may experience either water supply shortages or unreliable sources of water in the future.





## ***Available online as .pdf files***

**Joplin Hydro Study (Wittman)**

**Water Supply Study (Black & Veatch)**

**Reservoir Site Screening (Freese & Nichols)**

**Supplemental Reservoir Study (Freese & Nichols)**

**Report Summary (TSWRC)**

**Missouri Water Resource Study – Phase I (CDM)**

[www.tristatewater.org](http://www.tristatewater.org)

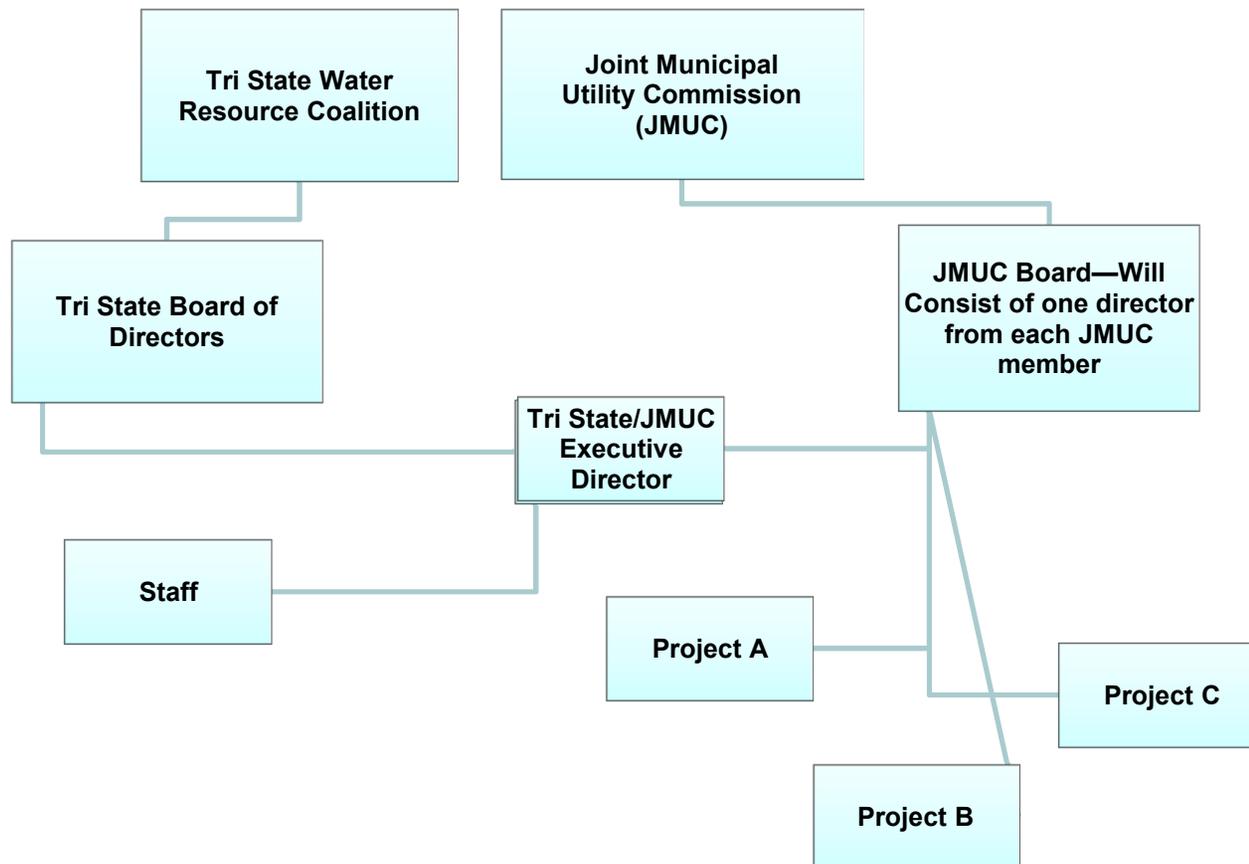


## ***The S.W. MO Joint Municipal Water Utility Commission***

- **Separate, but sisters**
- **Authorized through MO statutes**
- **Born April, 2012**
- **Representation across southwest MO**
- **Next steps...board of directors and bylaws**
- **General membership = small financial commitment**
- **Project(s) = \$\$\$**
- **Members choose to participate in project(s) cost**
- **May serve areas outside MO but members from MO**

# *Building Additional Regional Water Infrastructure*

## DEVELOPING A JMUC (Joint Municipal Utility Commission)



**Project debt must be approved by the JMUC Board of Directors and by the governing body of all project participants.**

**Initially Staff and Dues for Tri State/JMUC will be one and the same**

**Joining the JMUC creates no obligation to participate in any future projects but provides the opportunity.**



# **Tri-State Memorandum of Agreement Between Missouri, Oklahoma and Kansas**

## REGARDING

Cooperation on Water Quality and Water Quantity Issues in the States' Shared Water Resources

## PURPOSE

This Memorandum of Agreement (“MOA”) is entered into by and between the states of Missouri, Oklahoma and Kansas for the purpose of enhancing and promoting cooperation among the state agencies which address water quality and water quantity issues involving surface and ground water resources in the three states.



## Working the Communications Plan

- Washington D.C.
- Table Rock Lake Master Plan
- Jefferson City
- Conference coming up Nov. '13 (14<sup>th</sup> & 15<sup>th</sup>)







Director  
Southwest Missouri District  
Senator Claire McCaskill



# Tri -State Water Resource Coalition

*Securing Water for our Future*