

Tennessee's Water Resources

*A Regional Concern if Ever There Was
One*

Lynnisse Roehrich-Patrick
Associate Executive Director

**Tennessee Advisory Commission on
Intergovernmental Relations**

What is a Region?

Is it

- *bigger than a city?*
- *bigger than a county?*
- *bigger than a state?*
- *bigger than a country?*
- *... a continent?*

***What determines
a region's boundaries?***

Tennessee's Water Resources

Having It All~

~Where you need it

~When you need it

~of the Quality you need

~in the Quantity you need

Water Resource Policy

Challenges

➤ Needs of Tennessee residents

- Domestic consumption
- Recreation
- Power generation

➤ Needs of Business and Industry

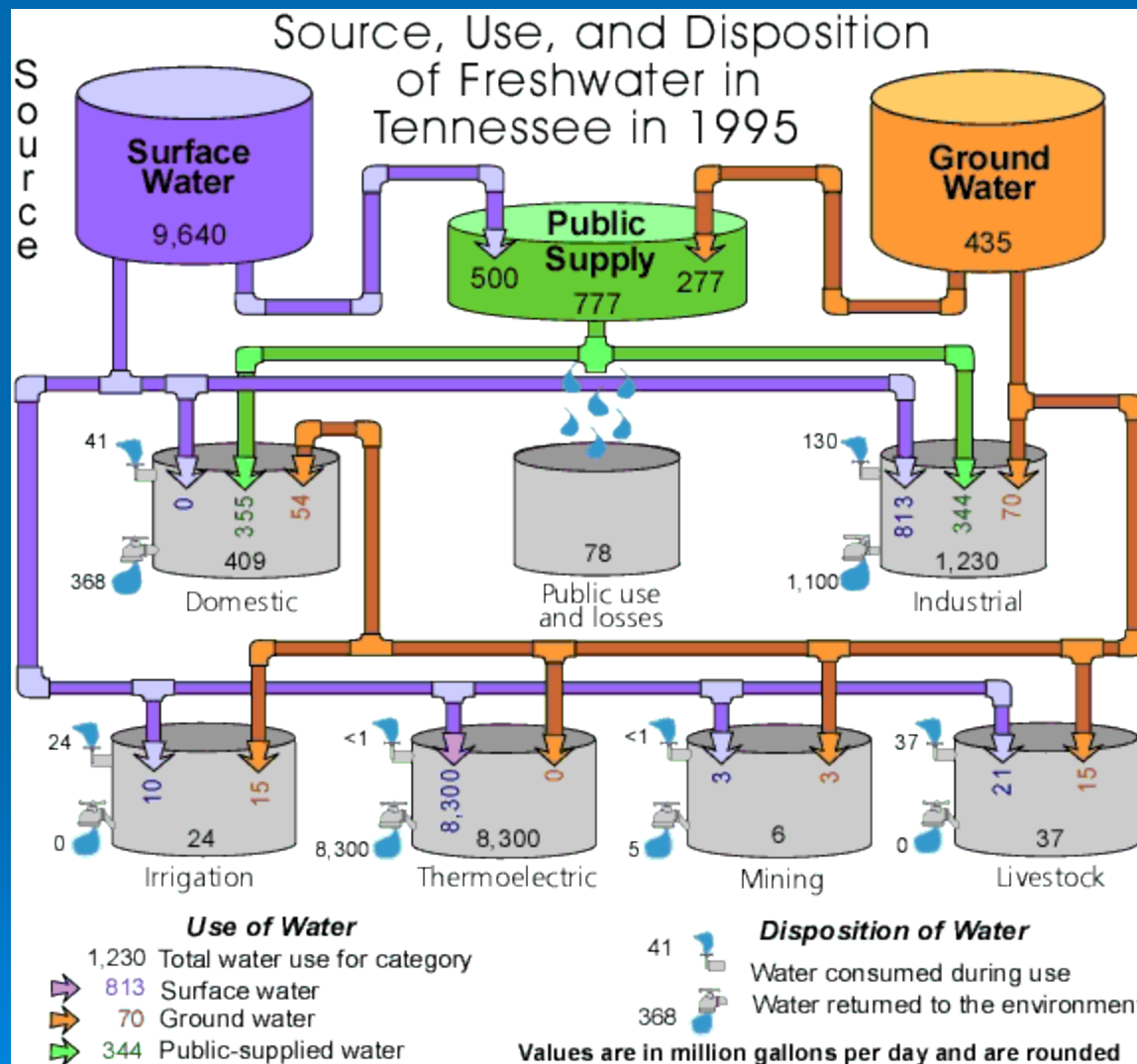
- Consumption
- Navigation
- Power generation

➤ Demands in other states that share watersheds

Managing competing interests!

Source, Use, and Disposition of Water in Tennessee in 1995

Total of 10.1 billion gallons per day.

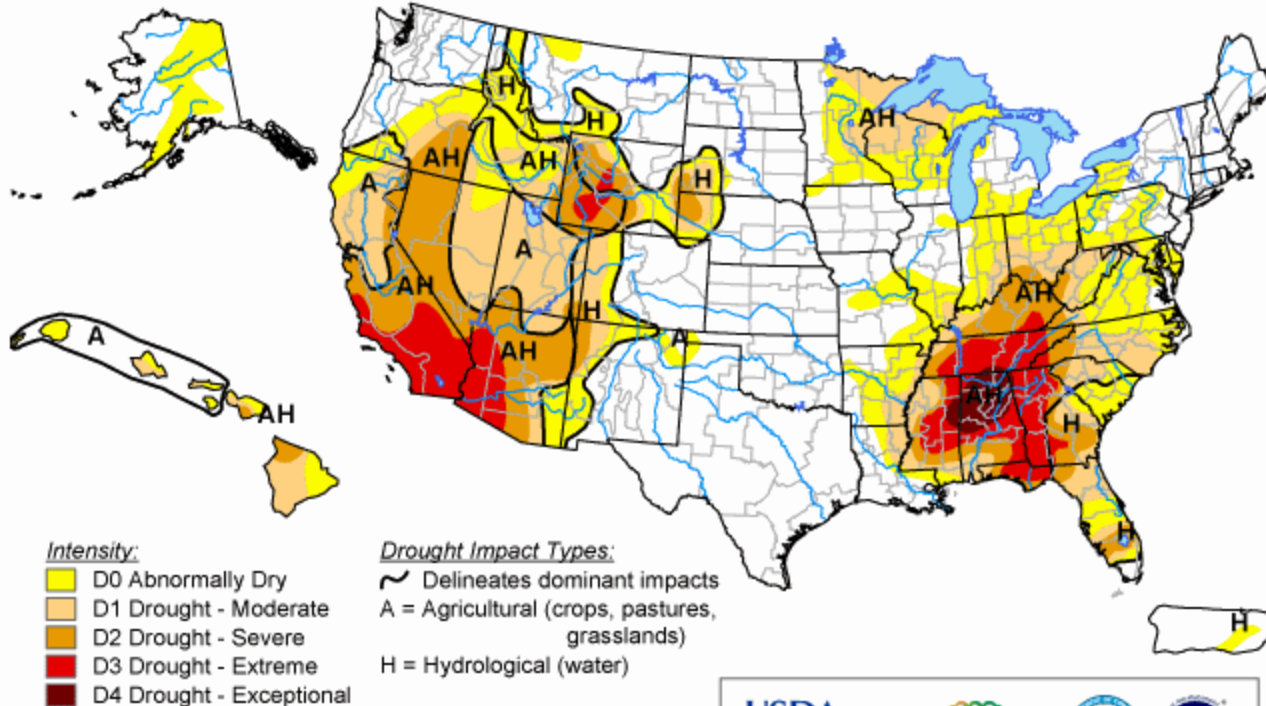


Source: U.S. Geological Survey and the Tennessee Department of Environment and Conservation. <http://tn.water.usgs.gov/wustates/tn/summarypipes.html>

Where & When You Want It?

U.S. Drought Monitor

June 26, 2007
Valid 8 a.m. EDT



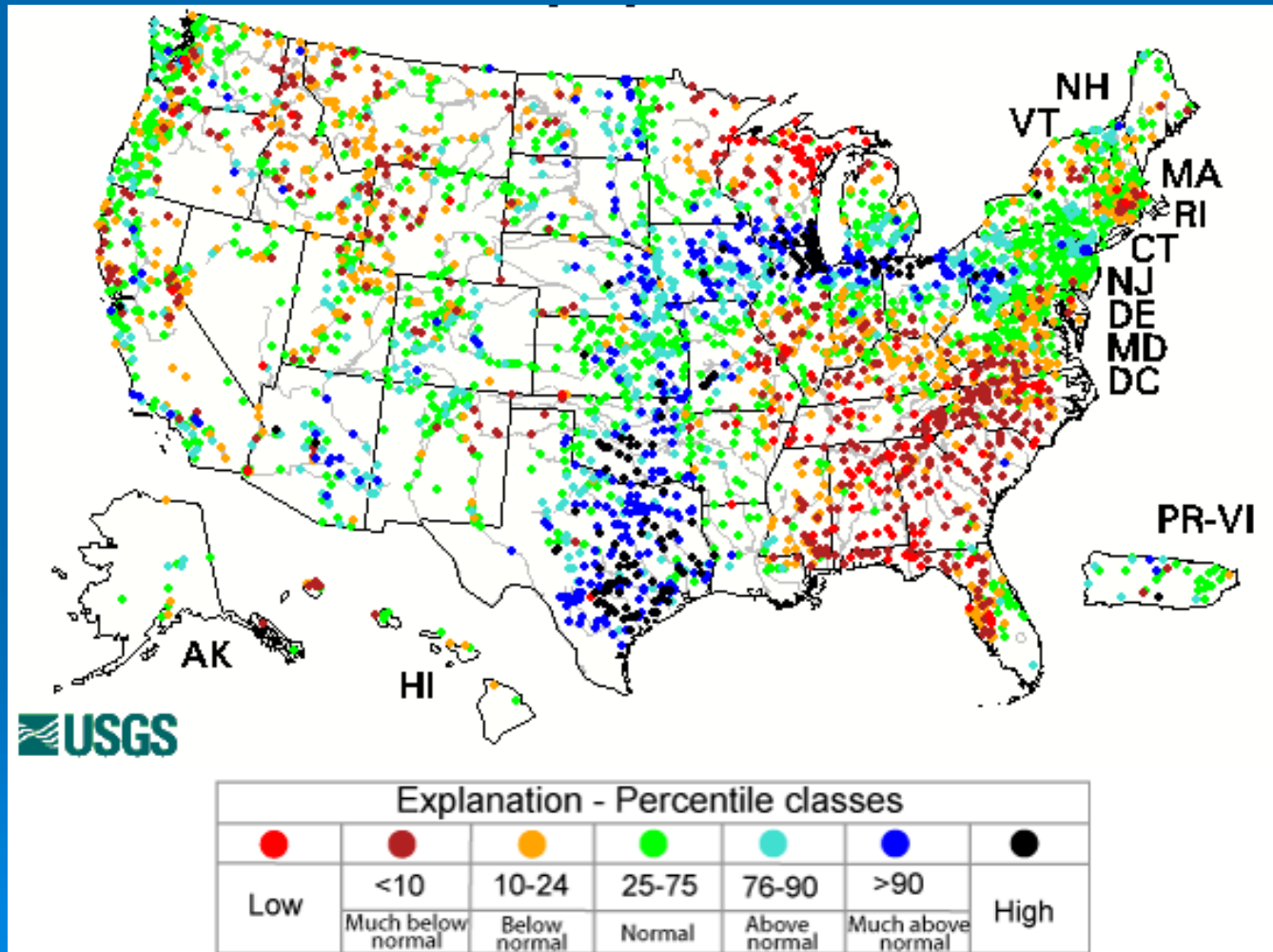
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>



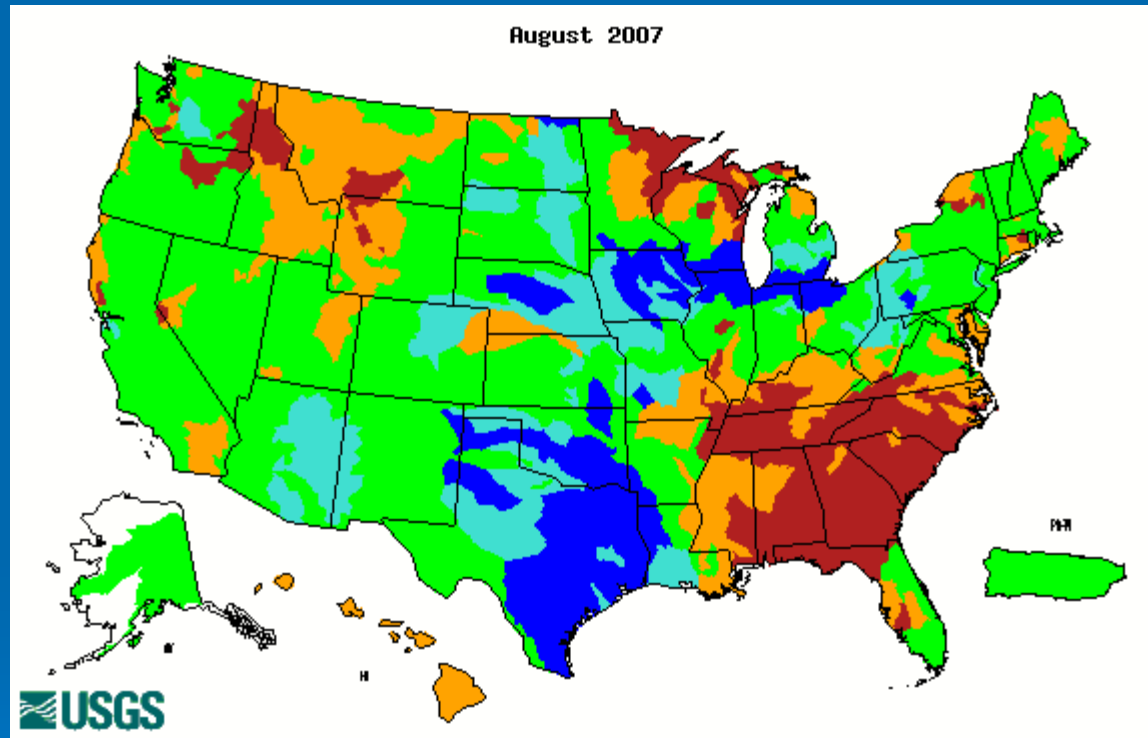
Released Thursday, June 28, 2007
Author: Douglas Le Comte, CPC/NOAA

Average Stream Flow during August 1-27, 2007



Where & When You Want It?

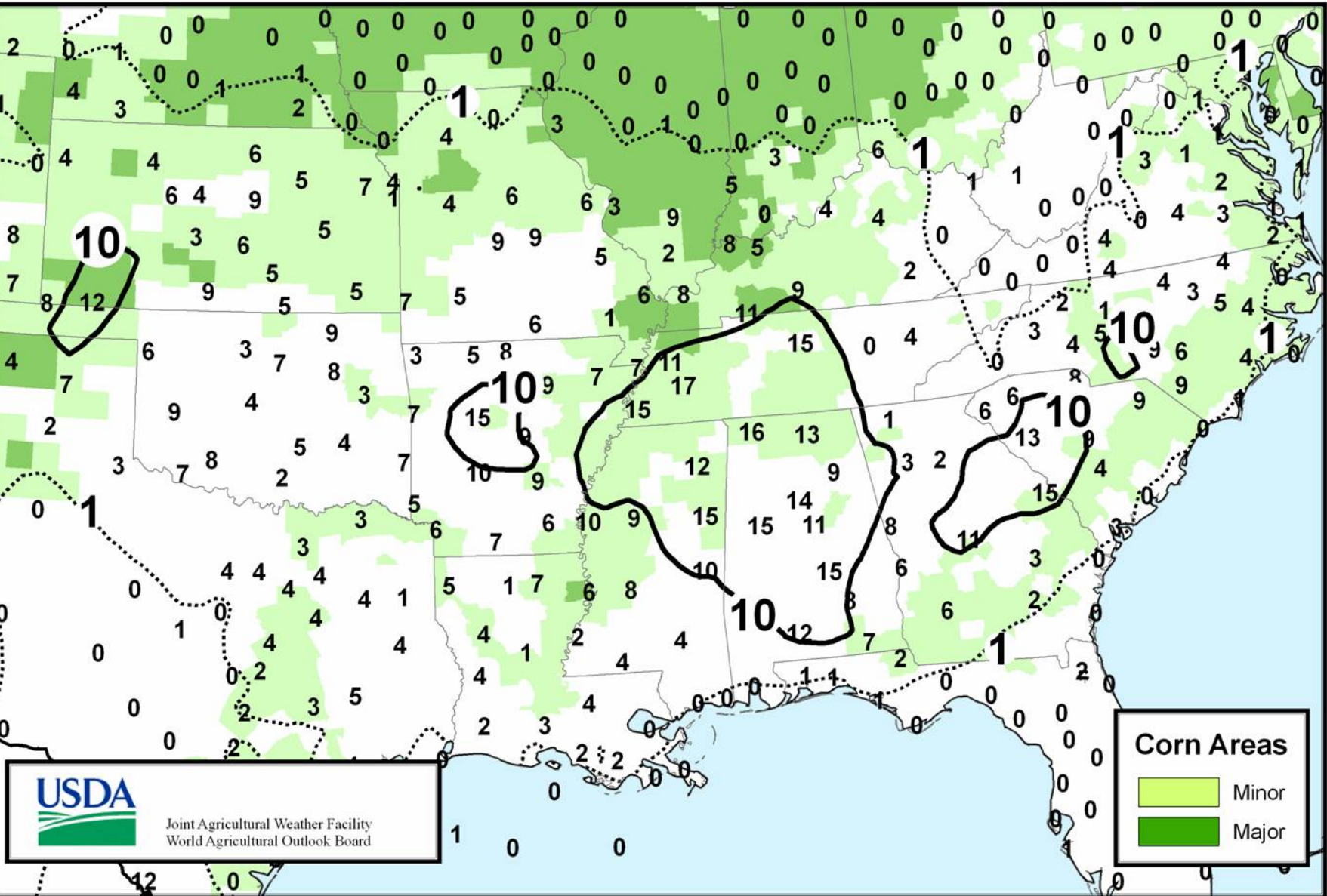
Monthly Average Stream Flow



Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Number of Days 100 F or Greater

August 1-27, 2007



Where You Need It?

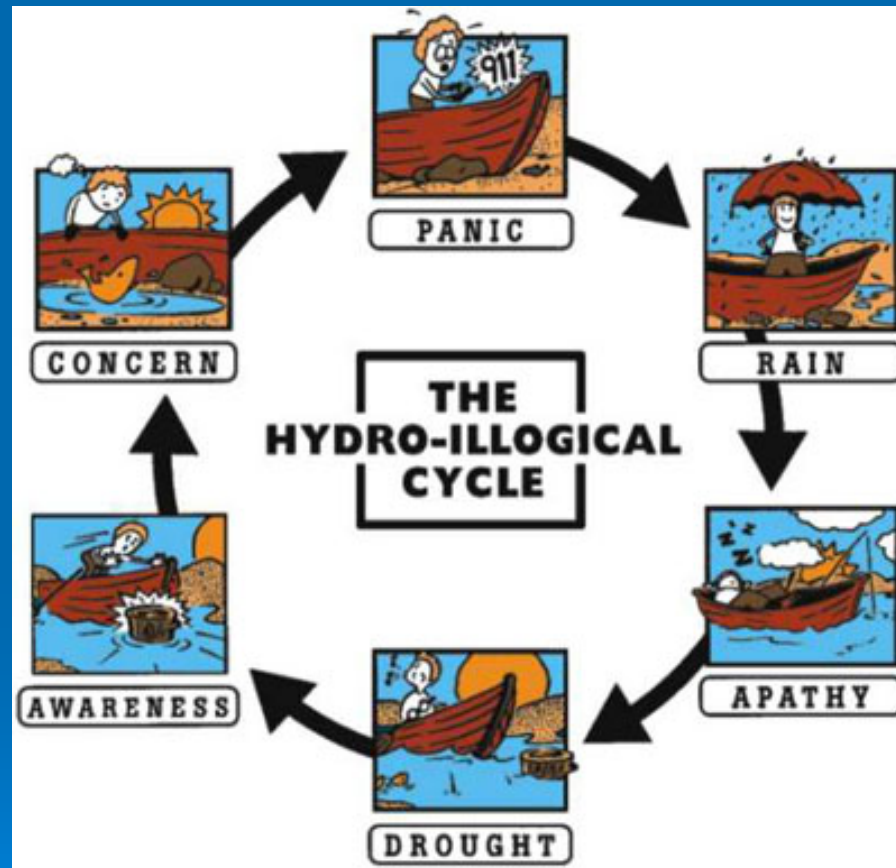
Franklin, Tennessee, August 27, 2007

With less than a tenth of an inch of rain so far this month, and more than 14 days with high temperatures at or above 100°F, water in retention ponds has been decreasing to record levels. This one is nearly dry. Water restrictions are currently in effect. Photo courtesy of Jordan Gerth.

Source: National Drought Mitigation Center

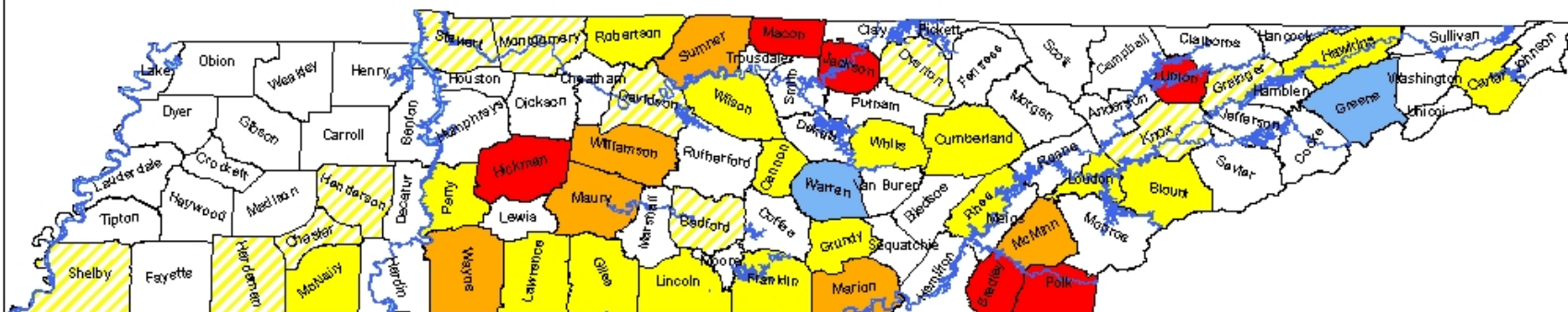


The Hydro-illogical Cycle



Source: National Drought Mitigation Center, University of Nebraska, Lincoln, Nebraska, USA.

Tennessee Counties in Which Water has Been Restricted or Required to have Additional Treatment as of September 21, 2007

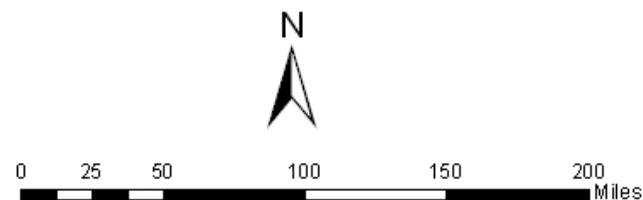


Legend

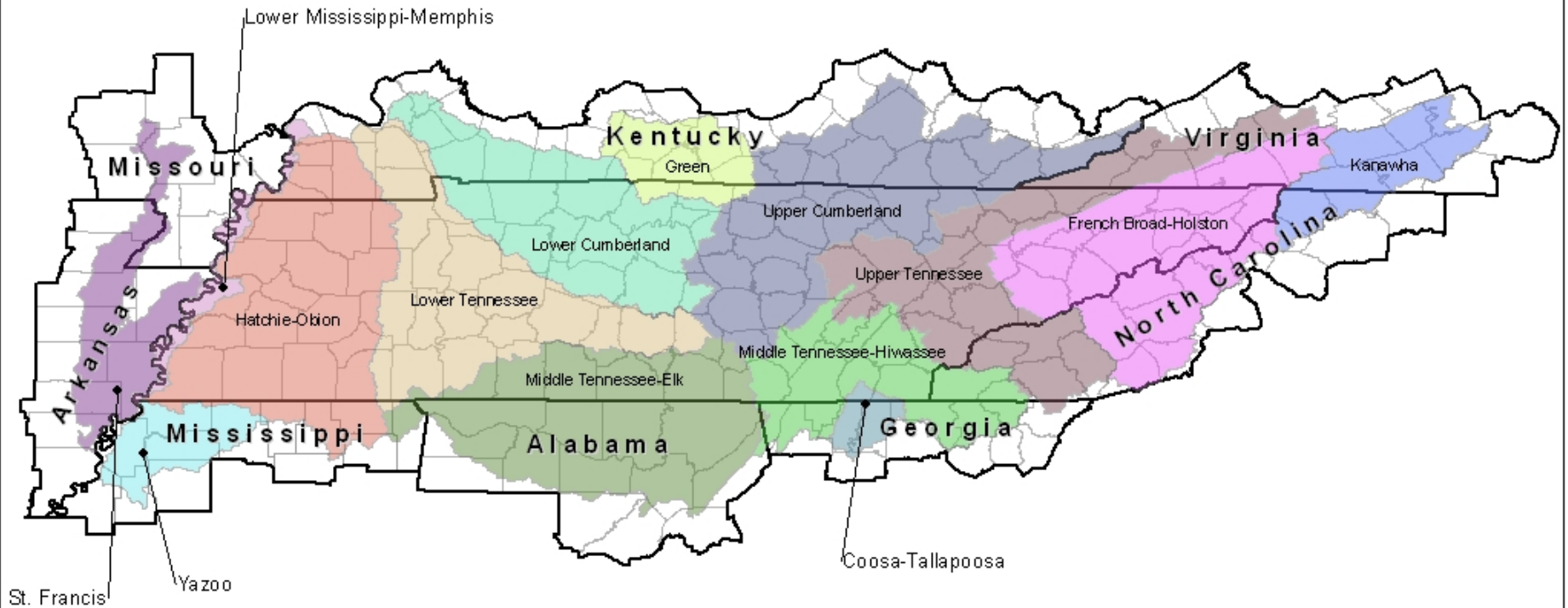
- No Restrictions or Additional Treatment
- Mandatory Restrictions
- Voluntary Restrictions
- Voluntary Restrictions (from News Article)
- Mandatory and Voluntary Restrictions
- Additional Treatment

Source: Tennessee Emergency Management Agency and News Articles from around Tennessee

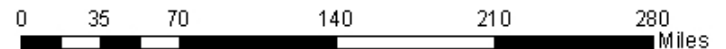
Note: Restrictions and treatment requirements are not county wide as depicted by county level shading.



Tennessee's Water Basins and Sharing States



TACIR



Water Disputes in the Southeast and Their Impact on Tennessee

- *Growing competition by different users over the same surface and groundwater supplies is increasingly taking the form of “up” versus “downstream” use and dependence on water supply sources that extend over several jurisdictions and even states.*
- *Land use changes, population growth, rapid urbanization, and regional climate variation are imposing new, largely unanticipated pressures on the region’s water and reveal the impossibility of separating, and discretely managing, water supply and water quality.*
- *Protecting local water supplies and keeping them safe, clean, and available—while promoting economic growth—are proving to be difficult-to-reconcile goals in rapidly growing metropolitan areas and smaller communities that seek to broaden their tax base and economically diversify.*

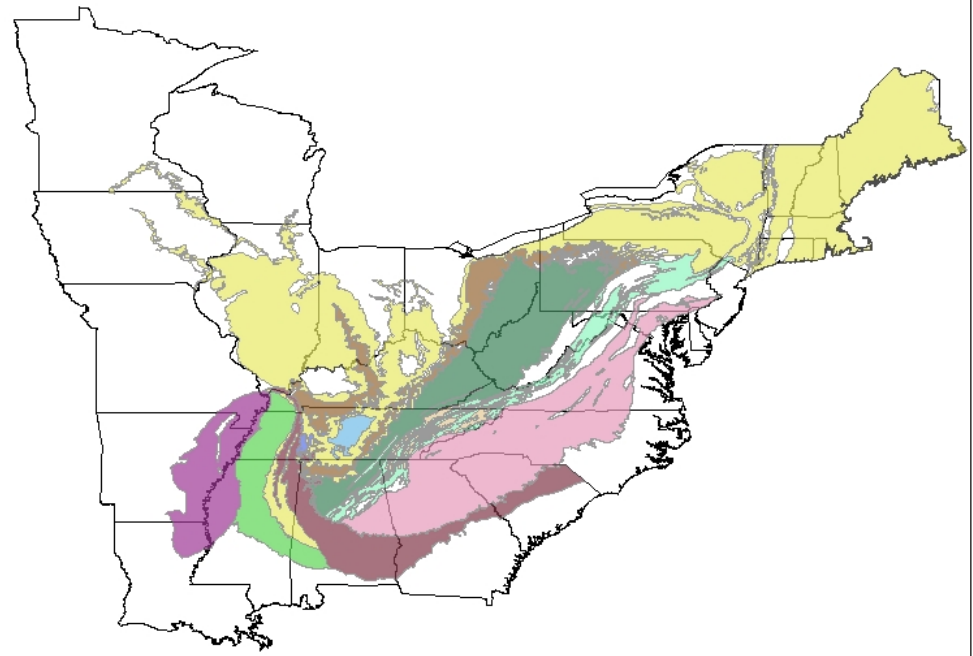
Source: Research Needs for Protecting Tennessee’s Water Supply: A Baseline for Continued Policy Development (Feldman & Albertson 2003).

Memphis and its Light, Water & Gas Division have been sued by the state of Mississippi. The lawsuit was filed in the U.S. Federal District in Oxford in February 2005. (It was expected to go to trial in August 2007, according to the Commercial Appeal.)












Mississippi claims that one-third of the water Memphis pumps—about 60 million gallons a day—comes from south of the state line. This water is "unreasonably and unlawfully diverted," causing harm to the aquifer, it says.

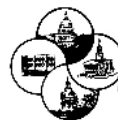
Source: *U.S. Water News Online.*

Shared Aquifers of Tennessee and Other States 2007



Legend

- | | |
|--|--|
|  Mississippi River Valley alluvial aquifer |  Piedmont and Blue Ridge crystalline-rock aquifers |
|  Mississippi embayment aquifer system |  Silurian-Devonian aquifers |
|  Mississippian aquifers |  Southeastern Coastal Plain aquifer system |
|  Ordovician aquifers |  Valley and Ridge aquifers |
|  Other rocks |  Valley and Ridge carbonate-rock aquifers |
|  Pennsylvanian aquifers | |



TACIR



0 115 230 460 690 920 Miles

Statewide Precipitation Ranks for Tennessee , 2006-2007

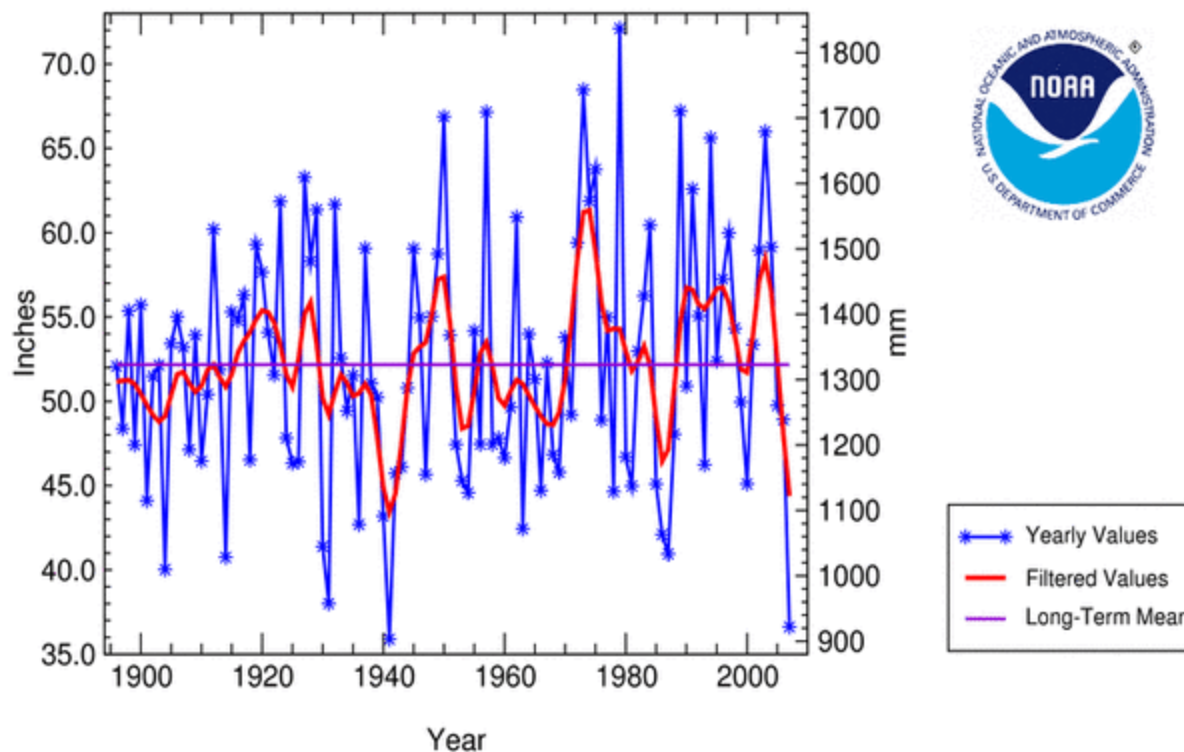
Period	Rank
Nov	<u>45th driest</u>
Oct-Nov	<u>32nd wettest, (82nd driest)</u>
Sep-Nov	<u>48th wettest, (66th driest)</u>
Aug-Nov	<u>37th driest</u>
Jul-Nov	<u>28th driest</u>
Jun-Nov	<u>24th driest</u>
May-Nov	<u>9th driest</u>
Apr-Nov	<u>8th driest</u>
Mar-Nov	<u>2nd driest</u>
Feb-Nov	<u>1st driest</u>
Jan-Nov	<u>2nd driest</u>
Dec-Nov	<u>2nd driest</u>

Source: National Climatic Data Center/NESDIS/NOAA.

<http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/st040dv00pcp.html>

When You Need It?

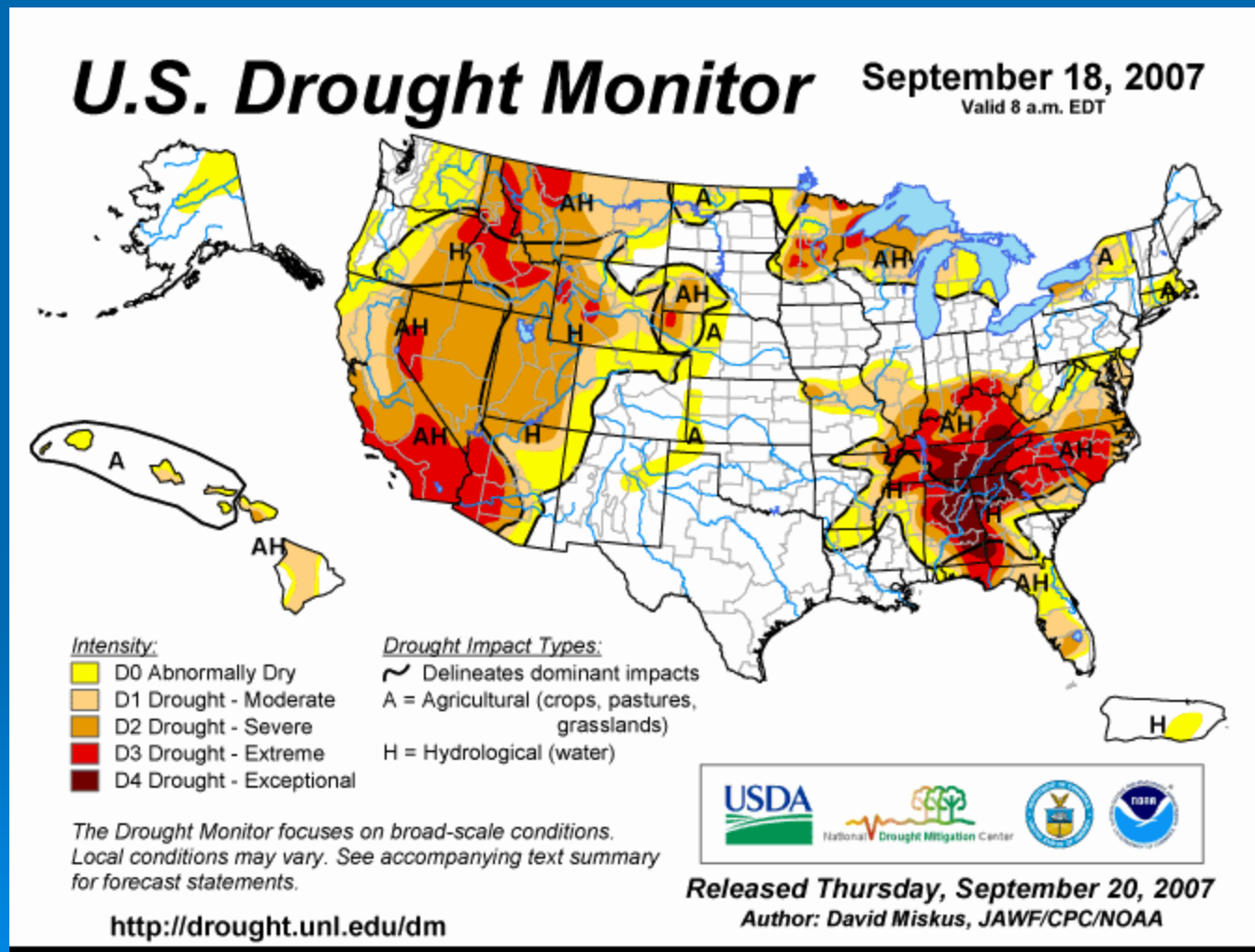
Tennessee Statewide Precipitation
December - November, 1895 - 2007



National Climatic Data Center / NESDIS / NOAA

Where & When You Want It?

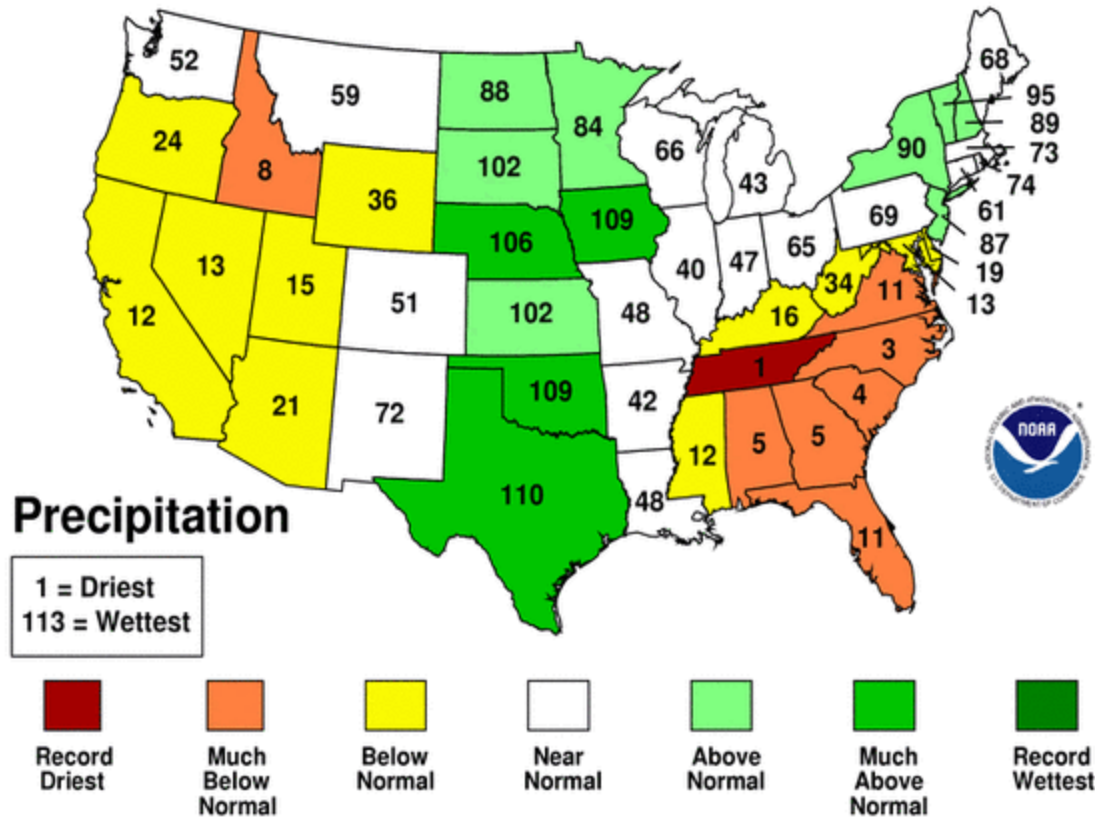
Part Deux



Where & When You Want It?

January-October 2007 Statewide Ranks

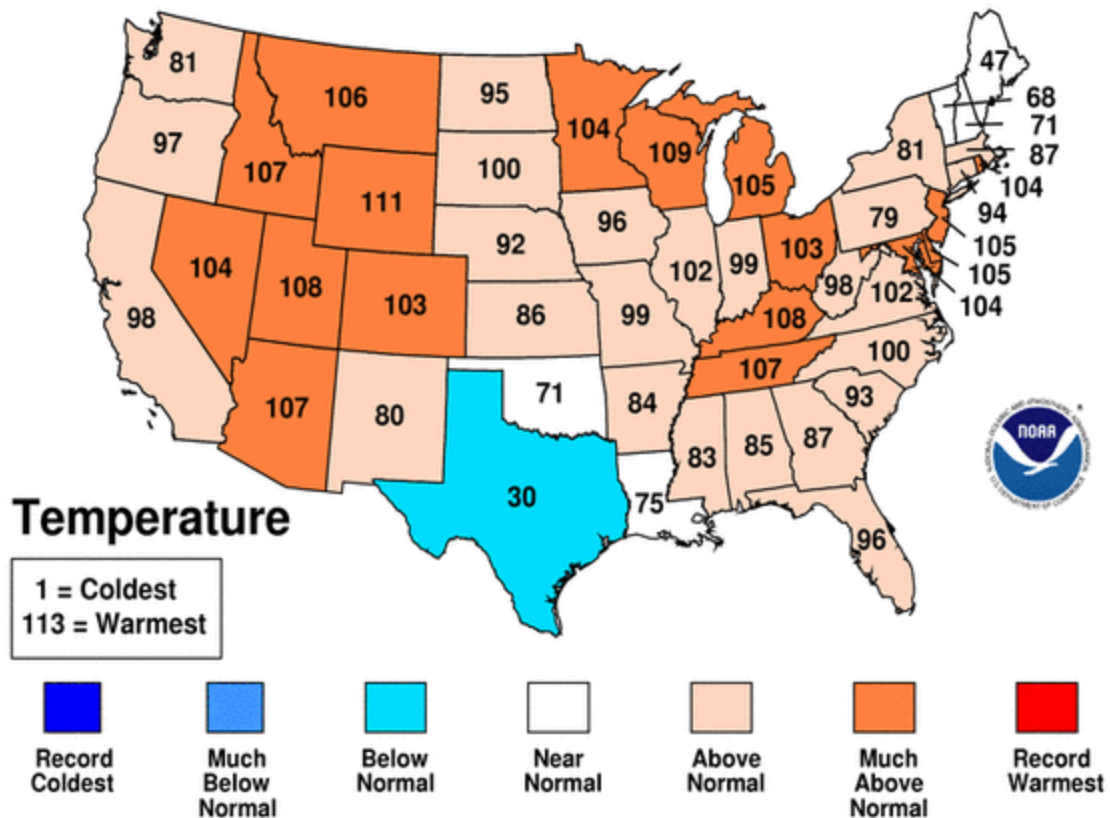
National Climatic Data Center/NESDIS/NOAA



Compounding the Problem

January-October 2007 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA



Where You Need It?

Orme, Tennessee, November 08, 2007

Orme Mayor Tony Reames makes one of his regular trips to check the filtration, pump and tank system in Orme, Tennessee, November 8, 2007. A small town tucked away in the mountains of southern Tennessee is getting by on just a few hours of water a day because its spring has run dry in the drought sweeping the U.S. Southeast.

Source: Montreal Gazette



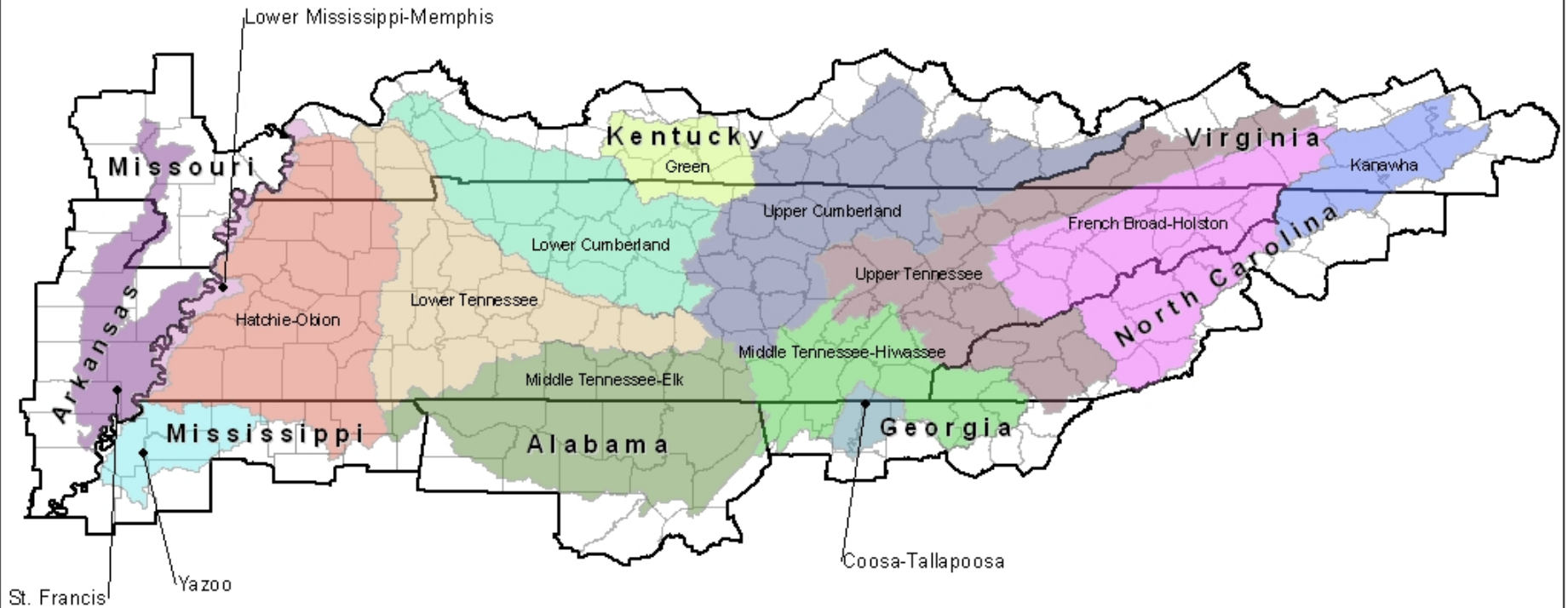
“There is only so much water on this mountain.”

Crossville city attorney Lanny Colvard

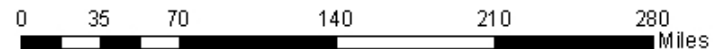
- Crossville, the county seat of Cumberland County, the 5th fastest-growing county in Tennessee, faces conflict with its neighbors as it seeks to provide for its own future water needs. Its city council recently approved a plan to restrict further expansions by other utility districts that purchase city water. Worried that its own sources of supply are barely adequate for anticipated needs, Crossville officials are seeking to limit the ability of neighbors to tap into local reservoirs. Meanwhile, Cumberland County has sought help in the form of a \$5 million federal grant to develop a regional pilot program and feasibility study of various water supply options and implement a long-term solution.
- Crossville has been pinning hopes for additional water on a dam to be constructed on the Caney Fork River. As of this writing, there appears little chance that a permit will be issued for such a project due, in part, to environmental opposition. Enlargement of the city’s current Meadow park Lake Dam is another option being explored in lieu of the Caney Fork proposal. While the ultimate choice of water supply alternative remains uncertain, it appears likely that some combination of pumping water uphill from TVA’s Watts Bar Reservoir on the Tennessee River, storing rainwater in new lakes and ponds, or building new dams on nearby creeks and streams may be adopted.

Source: Research Needs for Protecting Tennessee’s Water Supply: A Baseline for Continued Policy Development (Feldman & Albertson 2003).

Tennessee's Water Basins and Sharing States



TACIR

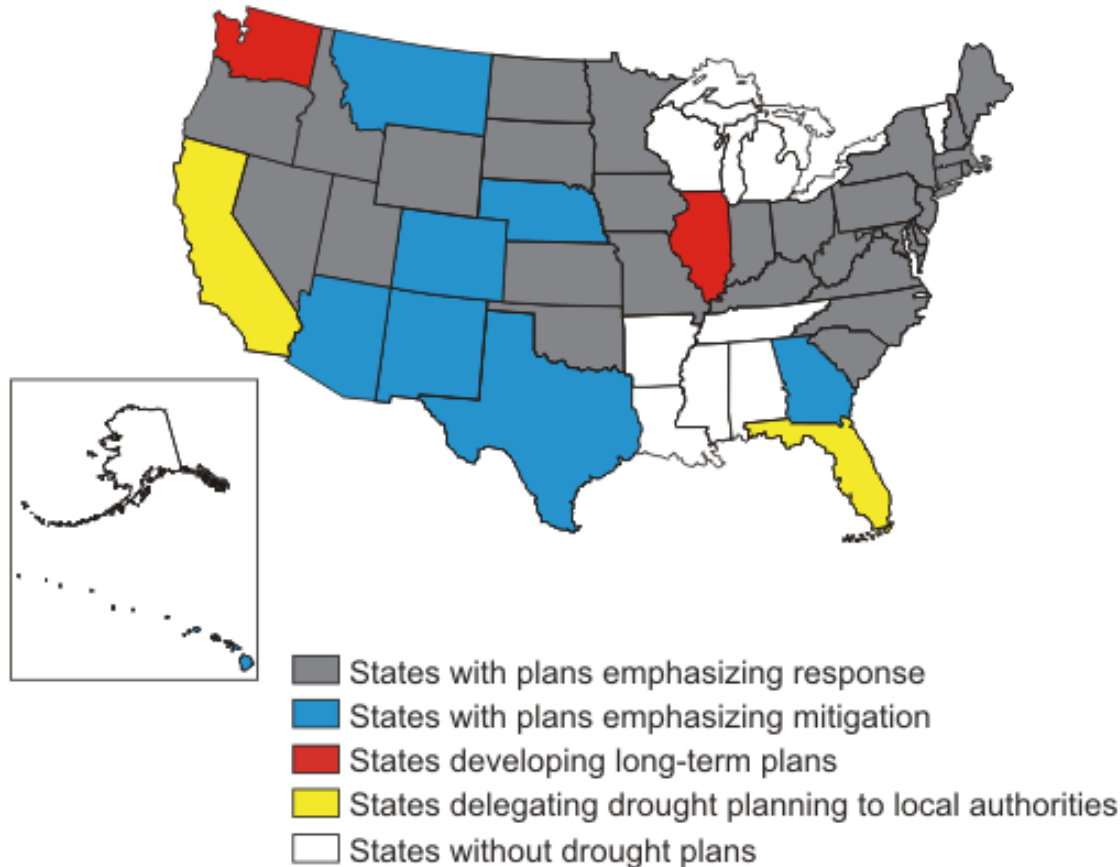


Managing Water Resources

Complicating Factors

- Interests within and between states compete more and more for the same resource as we grow and develop
- State boundaries don't recognize watersheds
- Watersheds don't recognize state boundaries
- The weather doesn't always cooperate

Status of Drought Planning October 2006



Source: National Drought Mitigation Center, University of Nebraska, Lincoln, Nebraska, USA.

Normandy Dam

TVA's Duck River "Balancing Act"



Normandy Reservoir is located on the Duck River in south central Tennessee. The 17-mile-long reservoir was completed in the 1970s to aid in the economic development of the upper Duck River region.

Source: TVA, <http://www.tva.gov/sites/normandy.htm>.

“Development, management, and protection of water resources should be controlled by that level of government nearest the problem and most capable of effectively representing the vital interest involved.”

National Water Commission, 1973.

“Conflict, unlike any
we’ve seen before,
may soon be
facing our nation.”

Colonel Byron Jorns

Water Wars: The Need for a National Water Policy

30 March 2007

**“And it never failed
that during the dry years
the people forgot about the rich years,
and during the wet years
they lost all memory of the dry years.
It was always that way.”**

—John Steinbeck
East of Eden

Stored Water vs. Natural Water Droughts

- **Stored water droughts** occur when large stores of water in man-made reservoirs, natural lakes, and groundwater aquifers depleted by very long, unusually low periods of precipitation.
- **Natural water droughts** quickly and fairly frequently follow just a few weeks or months of below-normal rainfall.

Source: National Drought Policy Commission Report (2000).

How Stored Water Droughts Happen

- People without enough stored water build reservoirs or tap into surface (natural lakes and streams) or groundwater (aquifers) storage.
- Reliable water supports population growth and more diverse water uses:
 - *Hydro-power dams create popular fishing and boating lakes and valuable lake view property.*
 - *Reservoir operating policies ensure minimum flows for fish and wastewater dilution when there would not otherwise be enough water in the stream.*
 - *Cities and farmers increase their withdrawals as they prosper and grow.*

Source: National Drought Policy Commission Report (2000).

How Stored Water Droughts Happen

- An unusually long dry period forces reservoir operators to draw down man-made lakes to
 - support withdrawals for cities and farms,
 - produce hydropower,
 - and keep enough water in navigation channels for barges to float.
- But
 - homes and businesses around the lake now have views of mud flats,
 - boat ramps no longer reach the water, and
 - lake fisheries suffer when releases are made for riverine species.

Source: National Drought Policy Commission Report (2000).

Center Hill Dam Right Abutment Seepage



Source: U.S. Army Corp of Engineers, Nashville District.

How Stored Water Droughts Happen

No one can tell when it will rain enough to reverse this trend, so water deliveries have to be reduced, *but to whom first and by how much?*

- There may be a conflict between fairness and good economic policy in making water allocations.
- The newest water uses may generate more income and tax revenue than the oldest established uses.

Such conflicts are normally resolved on a case-by-case basis.

Source: National Drought Policy Commission Report (2000).

The Sunday Tennessean—Water MIA

23 September 2007

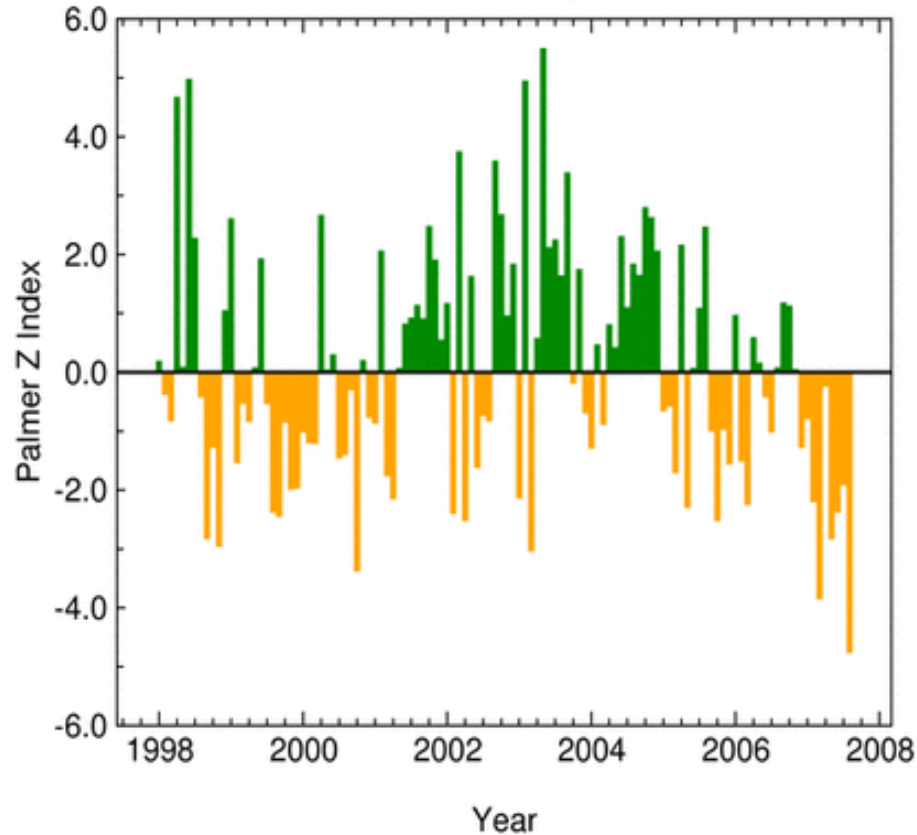
A look at the water that goes missing from some utilities in the Nashville area.*
Utility Water bought, pumped or treated (gallons per month, unless noted otherwise)

	Average proportion of water unaccounted for or unbilled per month	
DAVIDSON COUNTY		
Metro Water Services	2.67 billion	24.90%
RUTHERFORD COUNTY		
Consolidated Utility District	295.1 million	18%-25%
Murfreesboro city	321 million	26%
Smyrna city	316.6 million	7%
SUMNER COUNTY		
Castalian Springs-Bethpage Utility District	28 million	32%
Gallatin Water Department	195 million	15%
Hendersonville Utility District	148.3 million	28%
Portland Water System	1.8 million	27%-30%
White House Utility District	10.7 million	20%
WILLIAMSON COUNTY		
Brentwood Water Department	249 million	13%
Milcrofton Utility District	37 million	24%
Mallory Valley Utility District	100 million	10%
Nolensville-College Grove Utility District	66 million	20%
HB & TS Utility District	67 million	16.75%
WILSON COUNTY		
Gladeville Utility District (for the first 8 mos of 2007)	30 million	15.5%
Lebanon Water System (gallons per day)	7.5 million	15%-25%
West Wilson Utility District	150 million	20%
Water and Wastewater Authority of Wilson County	30 million	Generally around 10%

* Some utilities did not return calls for comment last week, including the cities of Franklin, La Vergne and Westmoreland, and LaGuardo Utility District.

When You Need It?

Tennessee Statewide Z Index*
January 1998 - August 2007



*Palmer Z Index
Short-Term Drought



National Climatic Data Center / NESDIS / NOAA

Initial Project Goals

Identify

- water resource challenges
- processes in place to manage them
- gaps between challenges and processes



Overall Project Goals

~Identify the Following~

- water resource management challenges
- processes in place to manage them
- gaps between challenges and management processes
- ways to fill gaps
 - *Tennessee's experts*
 - *Other state's policies and plans*
 - *Other studies*

Tennessee's Water Resource Management Framework

- State laws and regulations
- State agencies—first among them, TDEC
- Federal laws and regulations
- Lead federal agencies—TVA and the Corp
- Interstate and interagency compacts and agreements