

# **OCWP Panel #2: Demand, Hot Spots and Water Supply Options**

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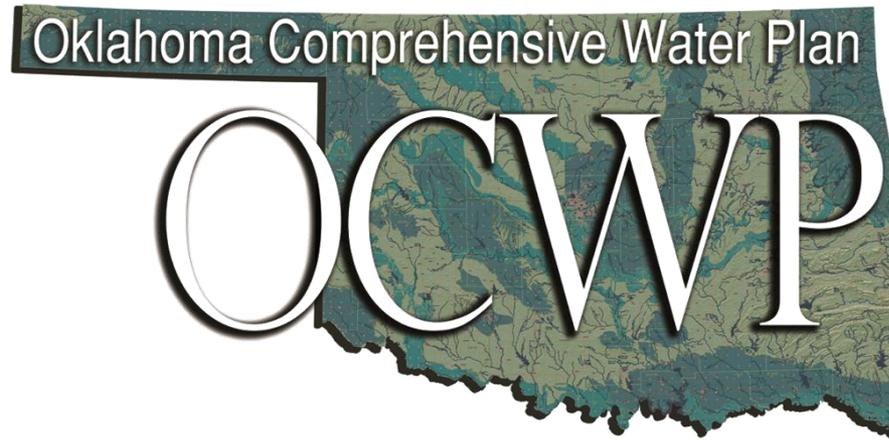
***Jessica Fritsche - CDM***  
***Dan Reisinger - CDM***

*Governor's Water Conference  
Norman, Oklahoma  
October 18, 2011*



US Army Corps  
of Engineers.



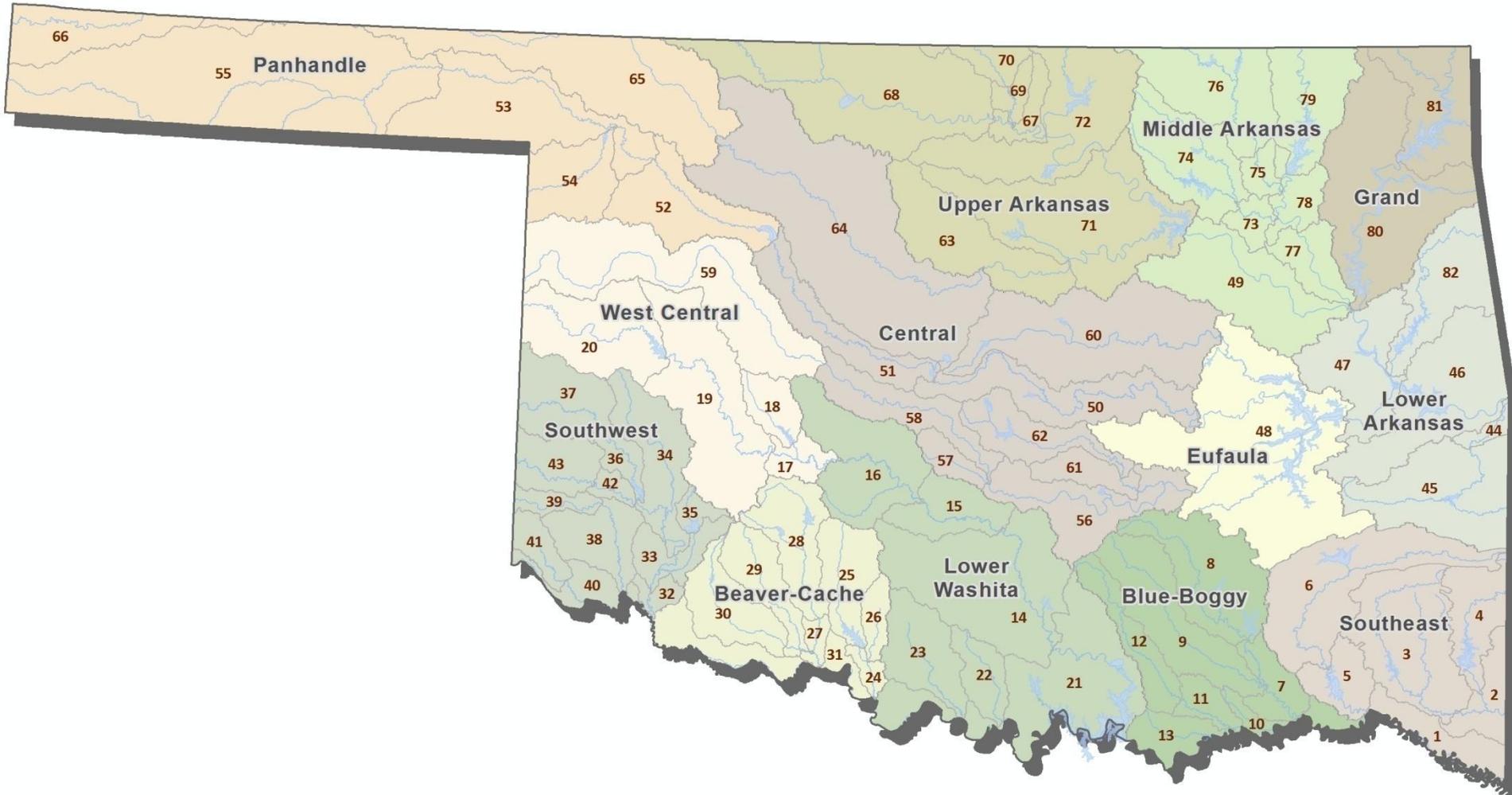


## Presentation Overview

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- Demand
- Hot Spots
- Water Supply Options
- Water Provider Resources

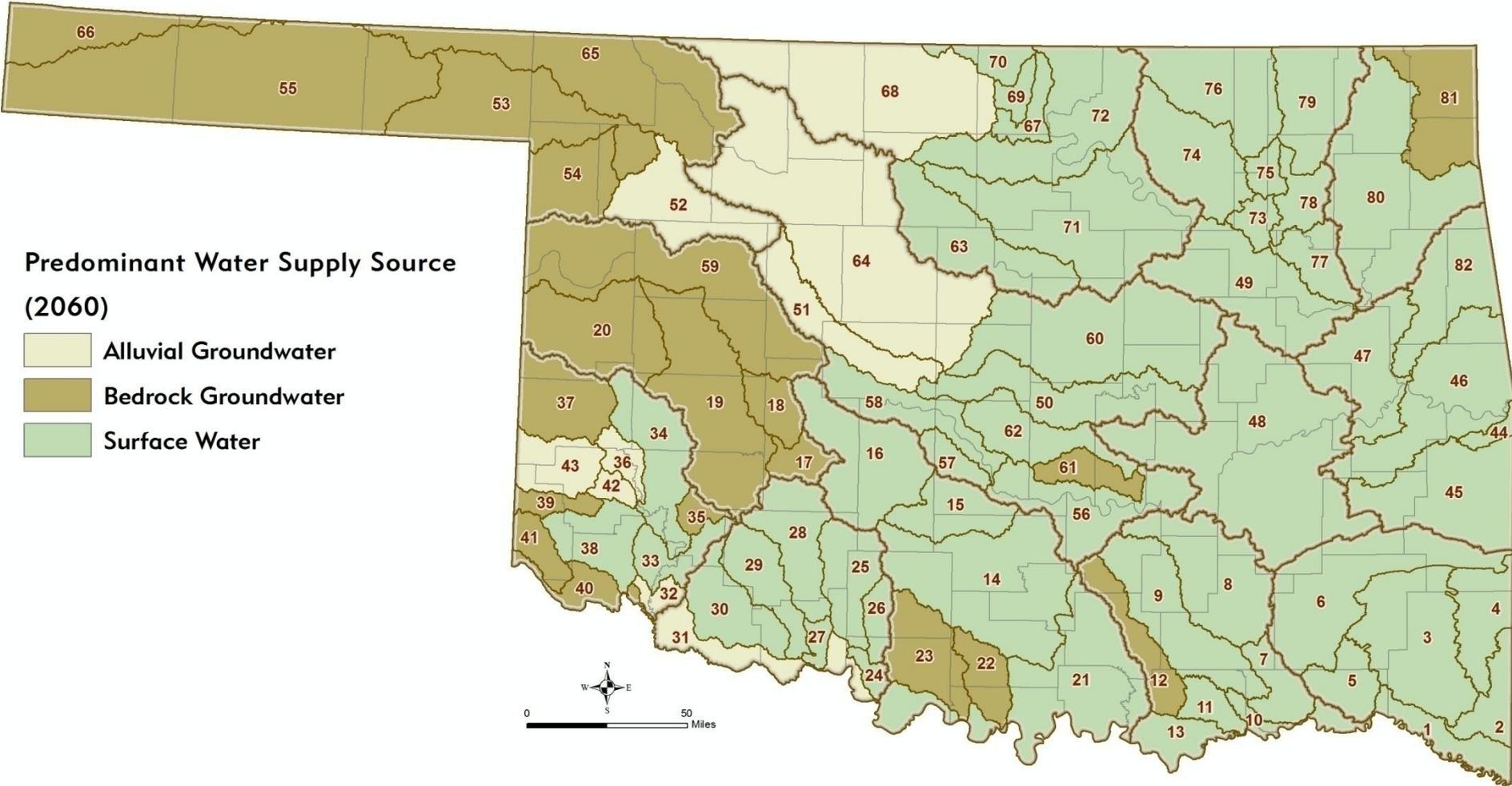
# Statewide OCWP Watershed Planning Region and Basin Delineation

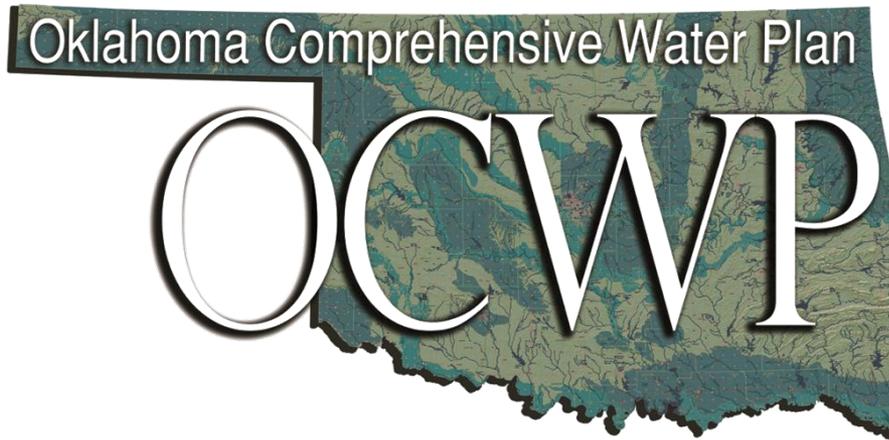


# 2060 Predominant Water Supply Source

## Predominant Water Supply Source (2060)

- Alluvial Groundwater
- Bedrock Groundwater
- Surface Water





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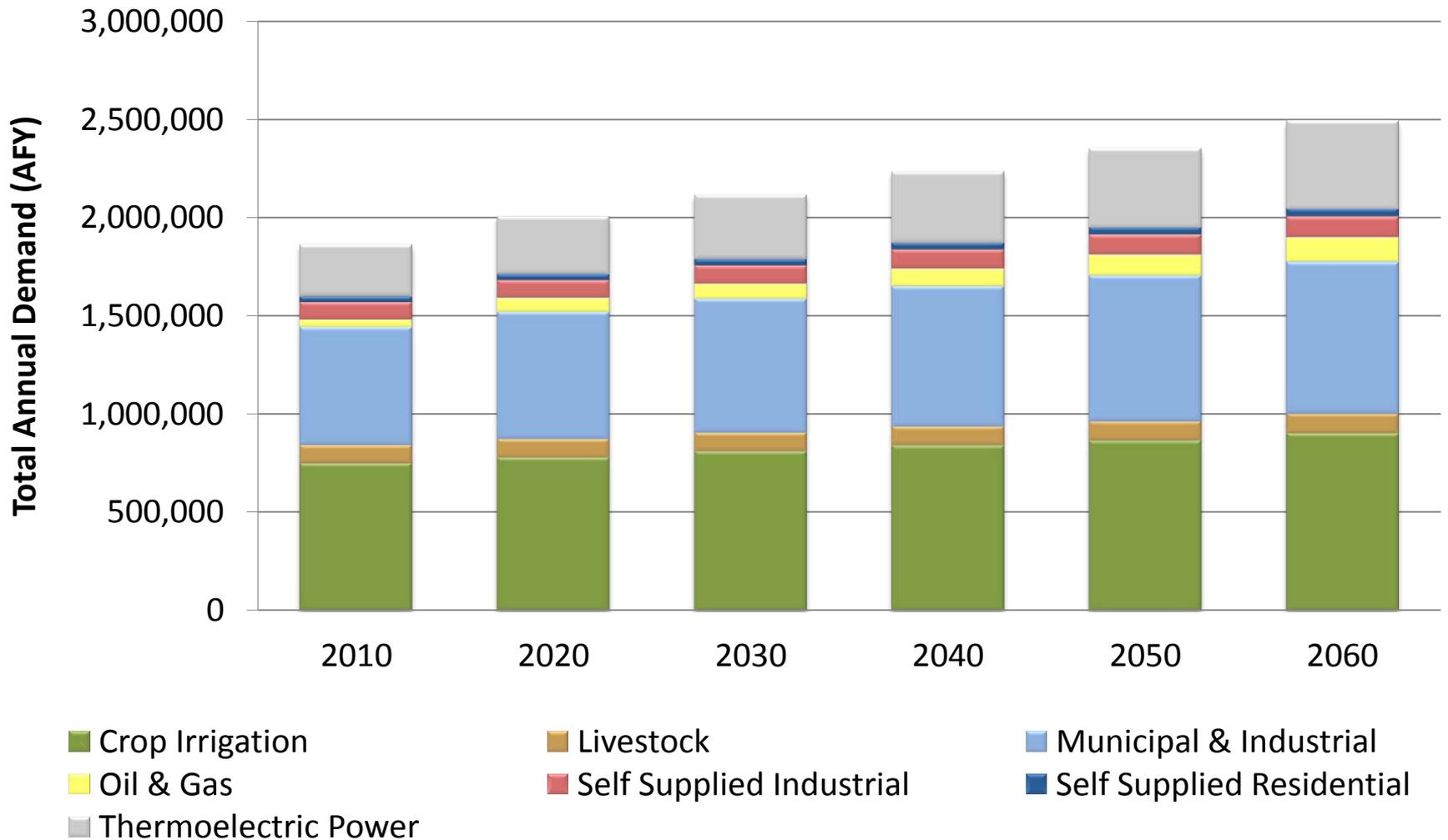
# Calculating Demand

- Demand is calculated based on key driver for the sector
  - *People*
  - *Crop Acres*
- Uses best available rate of use for key driver
  - *Gallons per household*
  - *AF per irrigated acre*

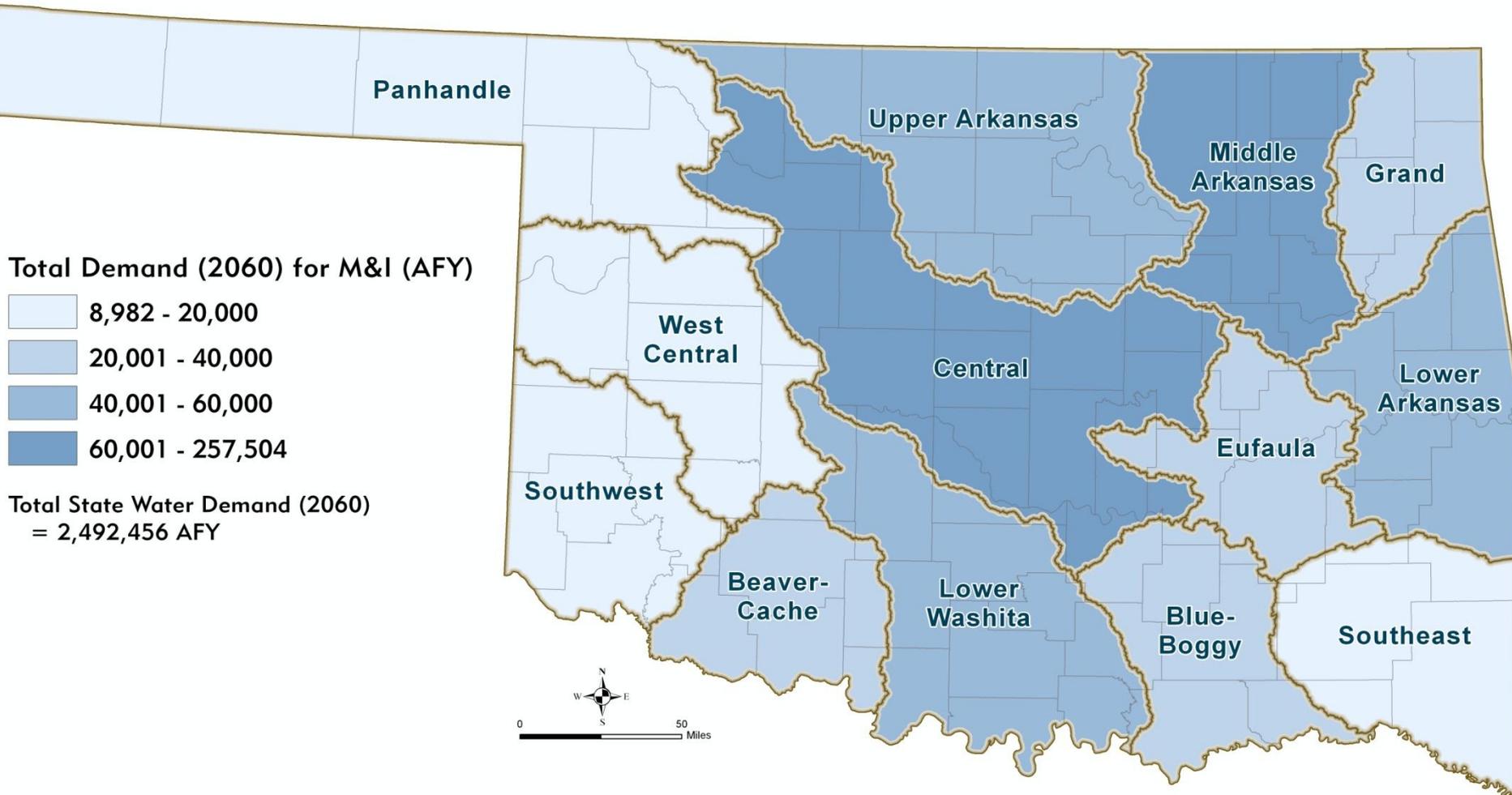
## Demand Sectors

- **Thermoelectric Power**
- **Self Supplied Residential**
- **Self Supplied Industrial**
- **Oil & Gas**
- **Municipal & Industrial**
- **Livestock**
- **Crop Irrigation**

# Total Statewide Demand by Sector

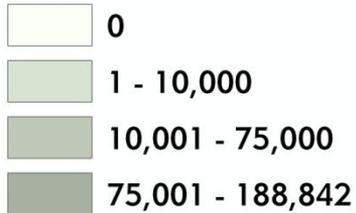


# 2060 Municipal & Industrial Water Demand by Region



# 2060 Thermoelectric Power Water Demand by Region

Total Demand (2060)  
for Thermoelectric Power (AFY)

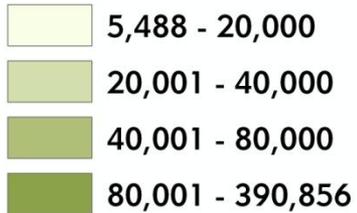


Total State Water Demand (2060)  
= 2,492,456 AFY

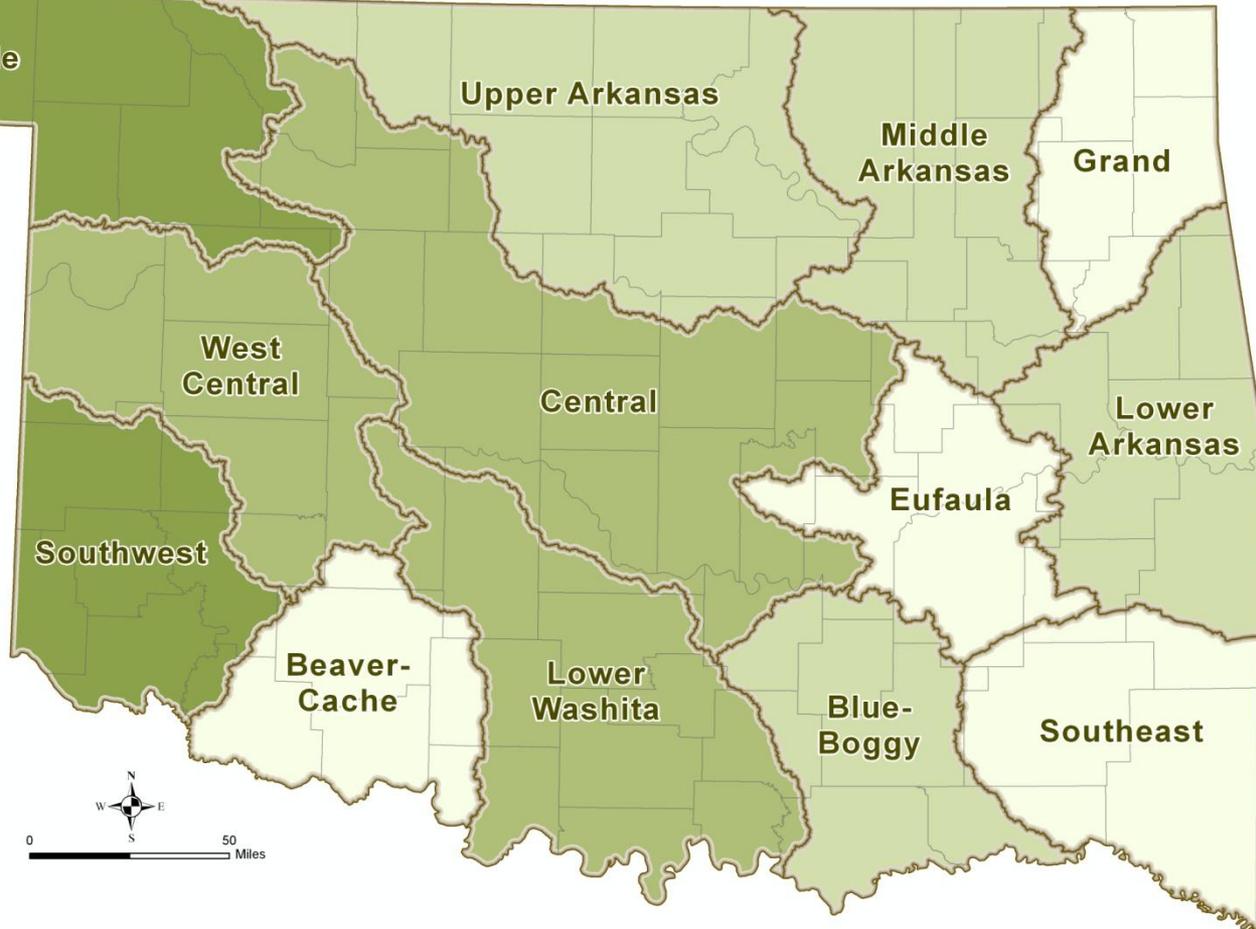
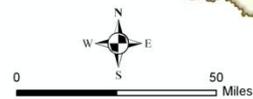


# 2060 Crop Irrigation Water Demand by Region

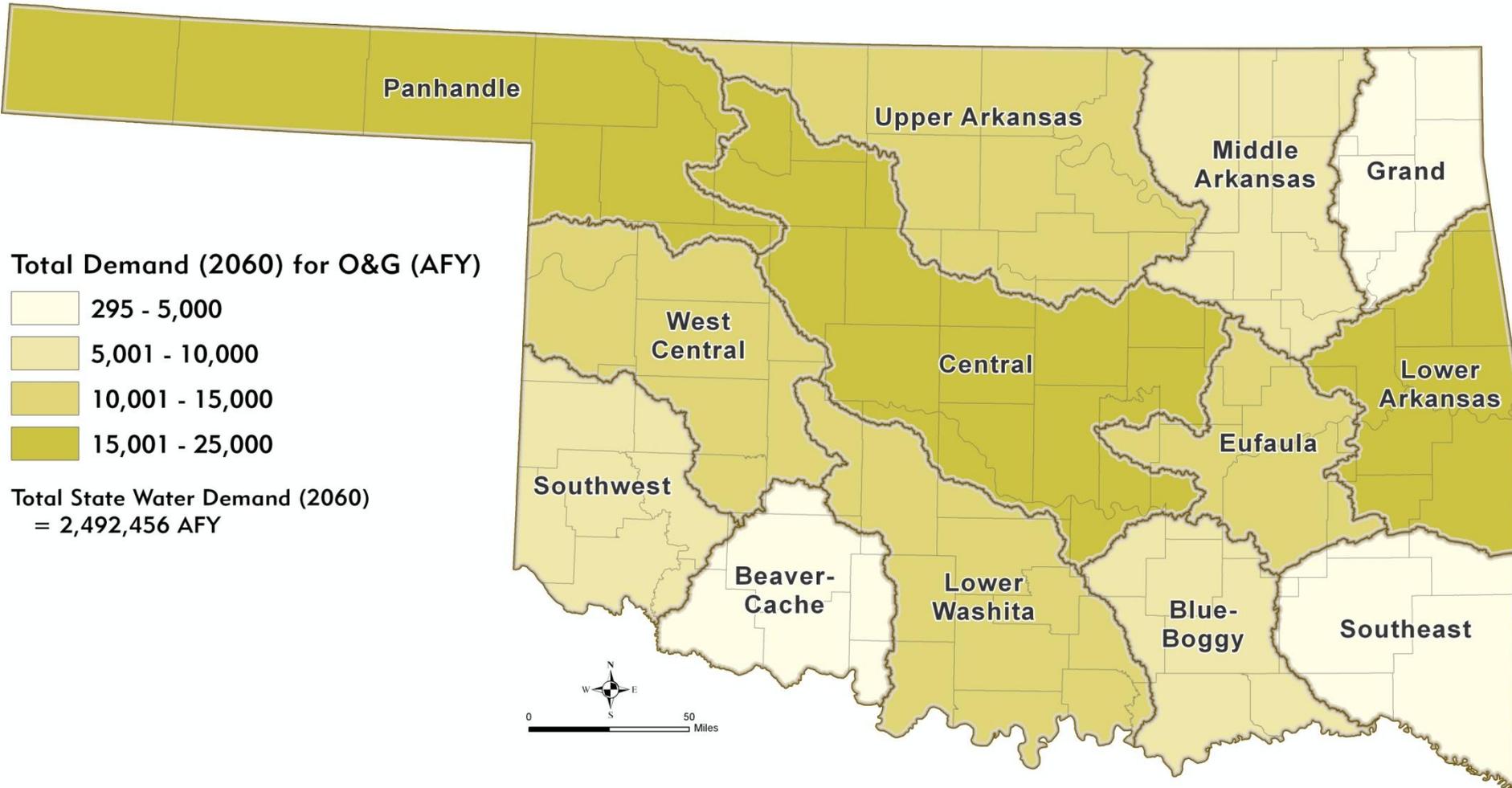
Total Demand (2060)  
for Crop Irrigation (AFY)



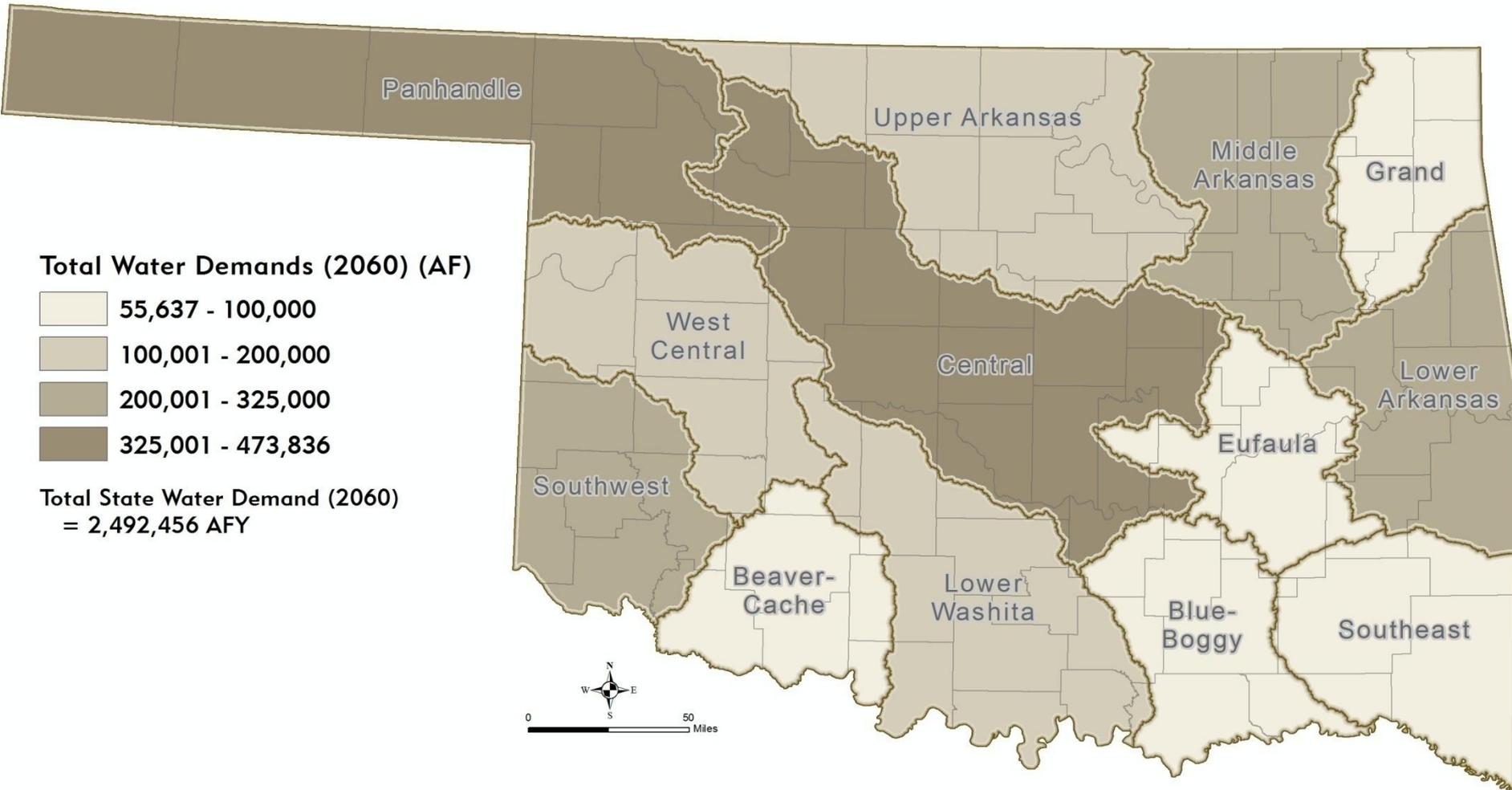
Total State Water Demand (2060)  
= 2,492,456 AFY



# 2060 Oil & Gas Water Demand by Region



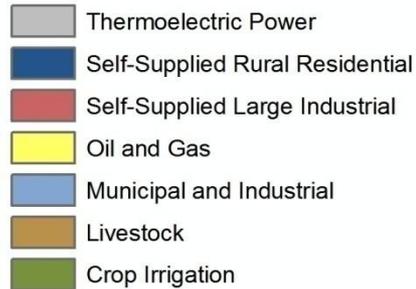
# 2060 Total Regional Water Demand by Region



# 2060 Total Regional Water Demand & Water Sector Demand Distribution

## Pie Charts

2060 - Total Demands by Sector  
(% of Total Region Demands)

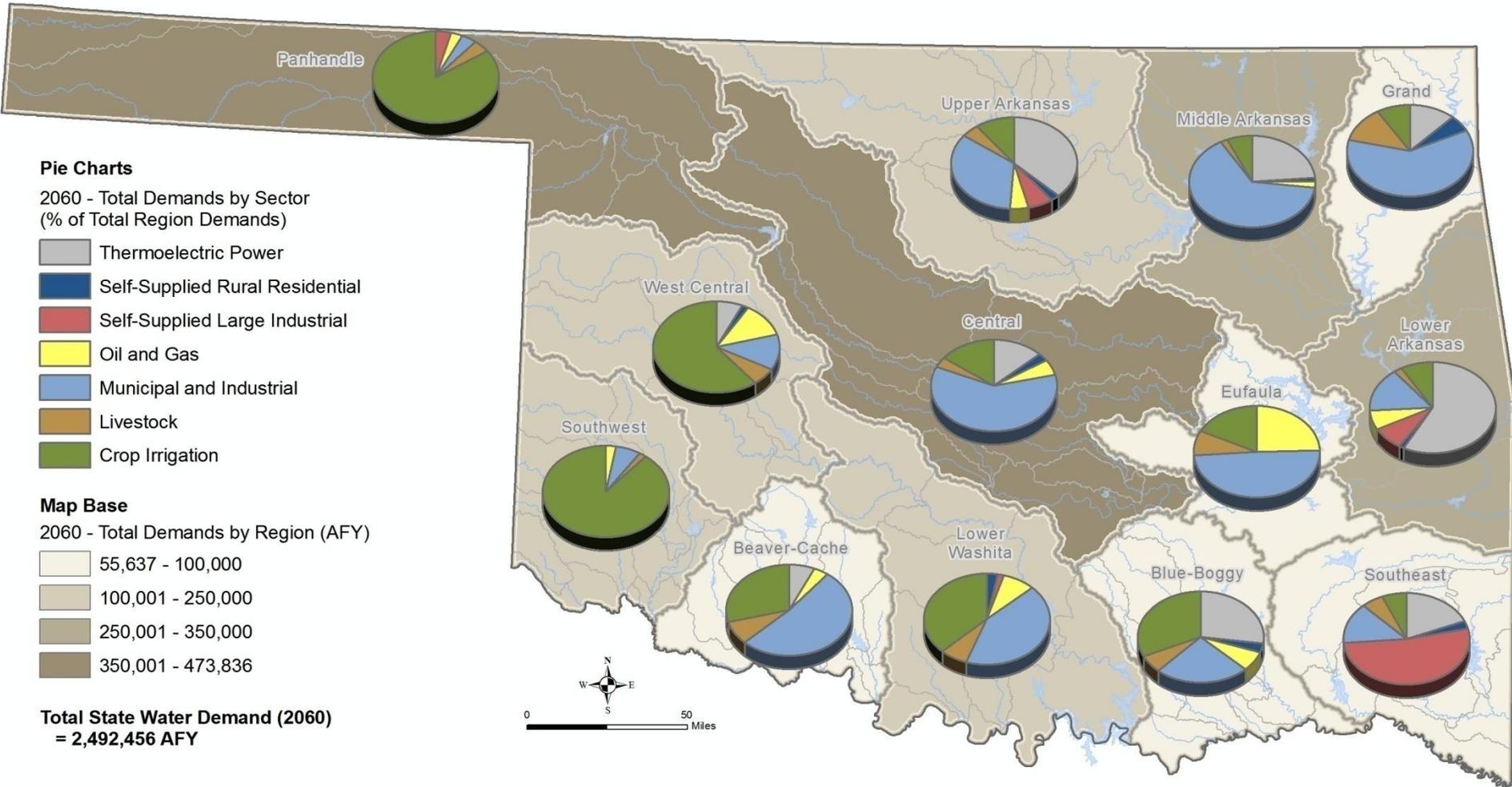
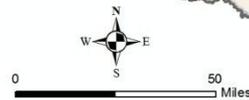


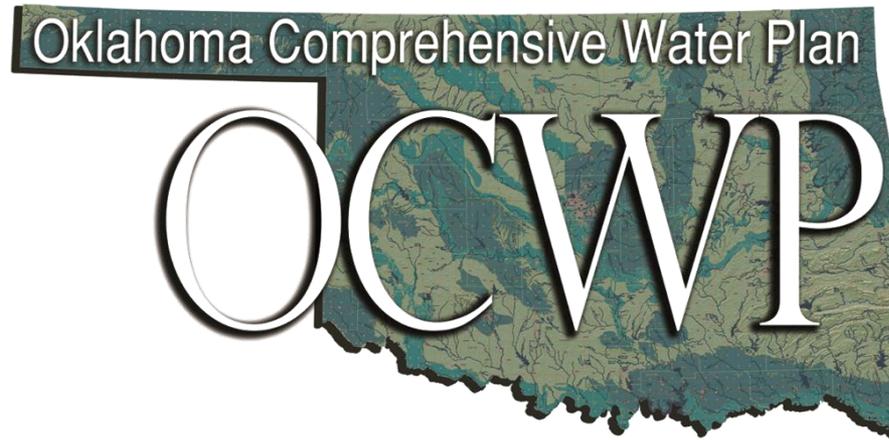
## Map Base

2060 - Total Demands by Region (AFY)



**Total State Water Demand (2060)**  
= 2,492,456 AFY



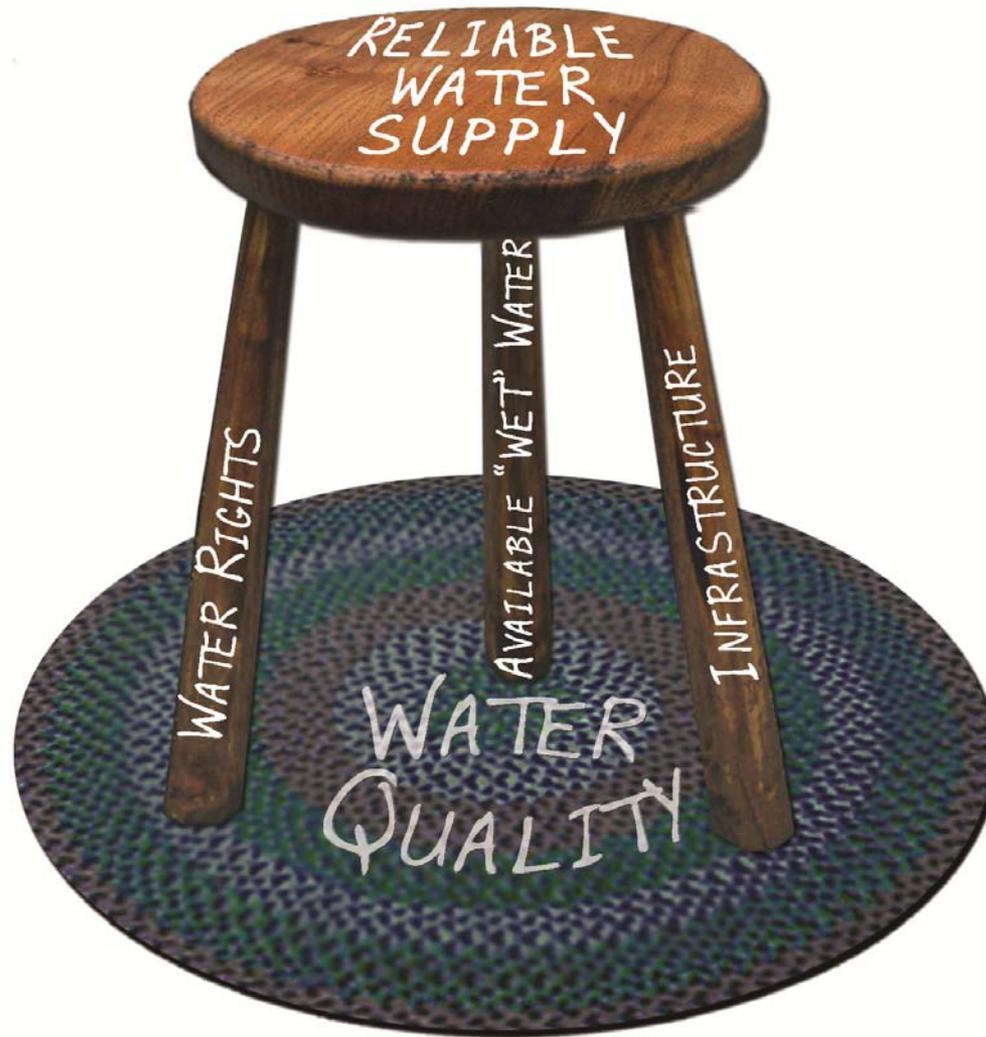


## Presentation Overview

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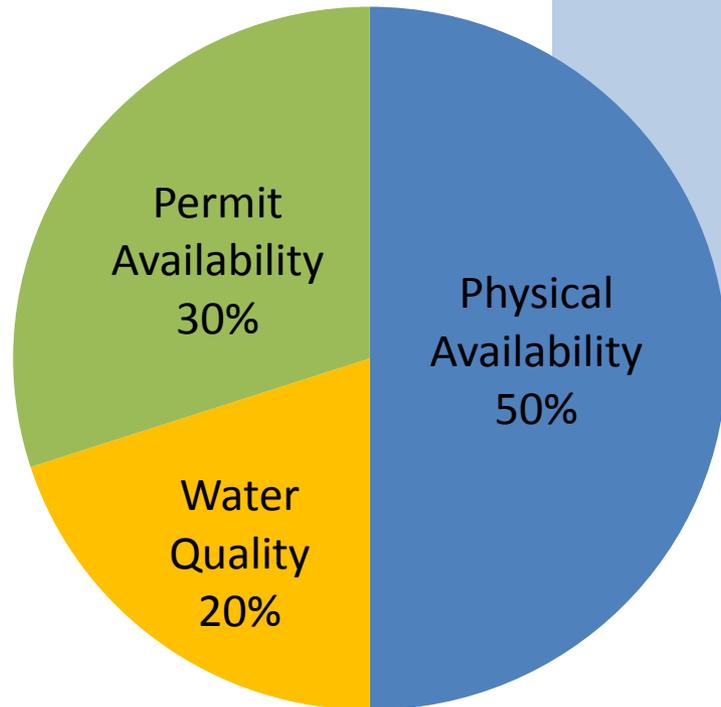
- **Demand**
- **Hot Spots**
- **Water Supply Options**
- **Water Provider Resources**

# Planning for a Reliable Supply

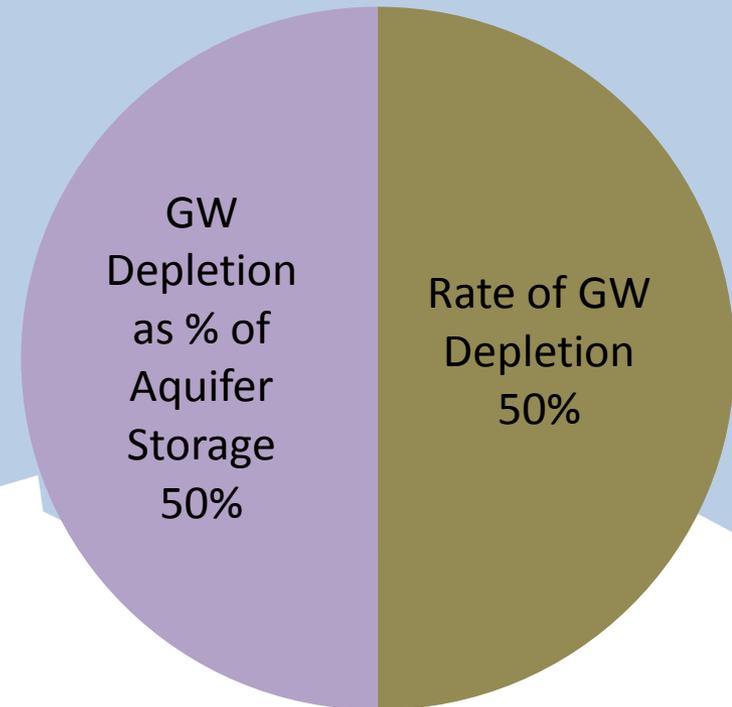


# Evaluation Criteria Based on Available Data and Criticality to Supply

## Surface Water

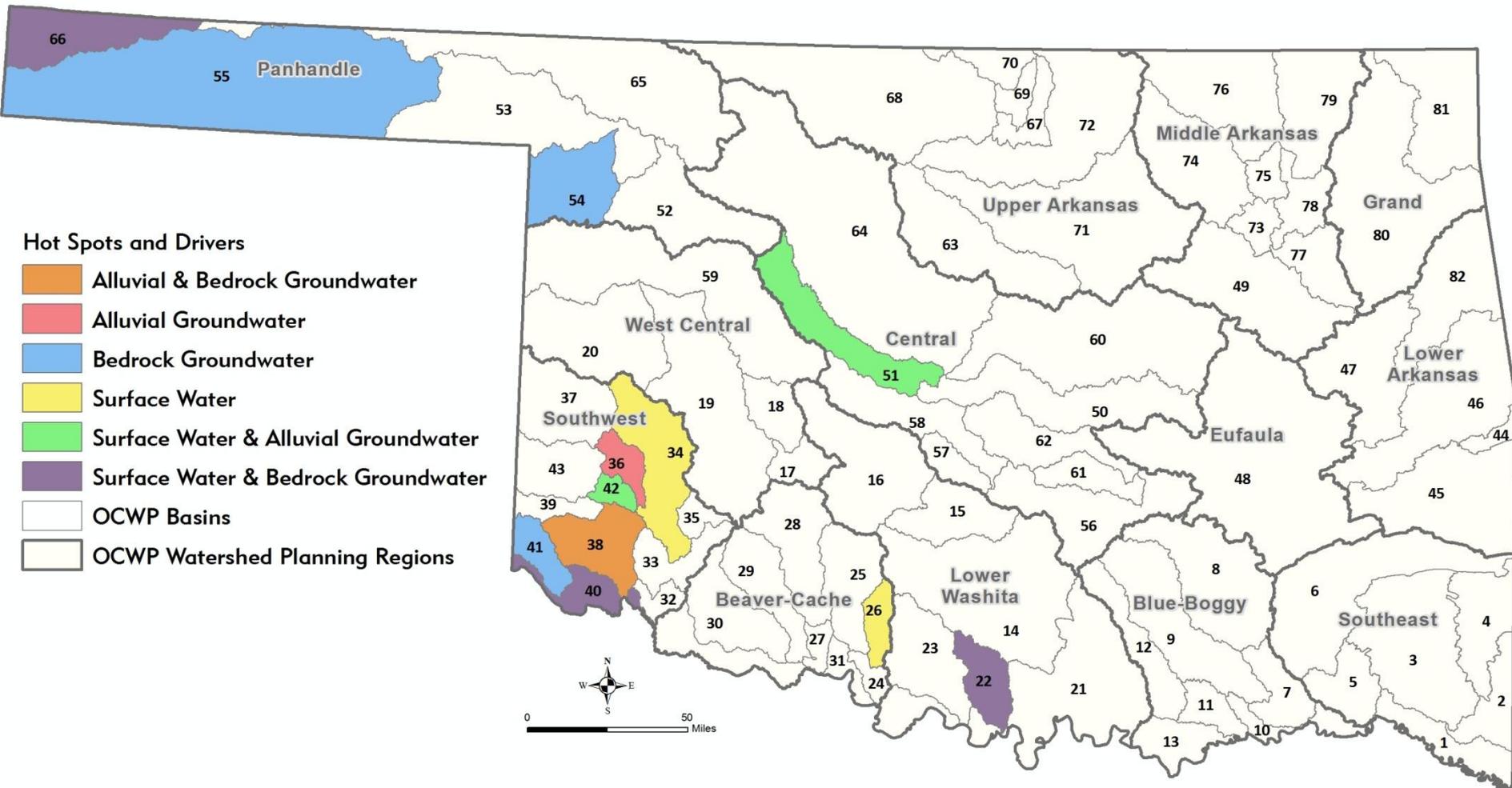


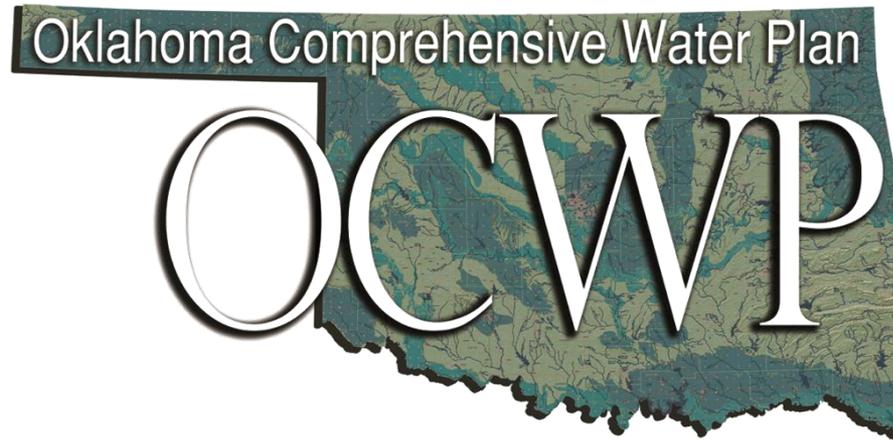
## Groundwater



- Less robust statewide groundwater quality data
- No permitting constraints projected through 2060

# Hot Spots





## Presentation Overview

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- Demand
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- **Water Supply Options**
- Water Provider Resources

# Water Supply Options

Demand Management

Reservoir Use

Out-of-Basin Supplies

Increasing Reliance on Surface Water

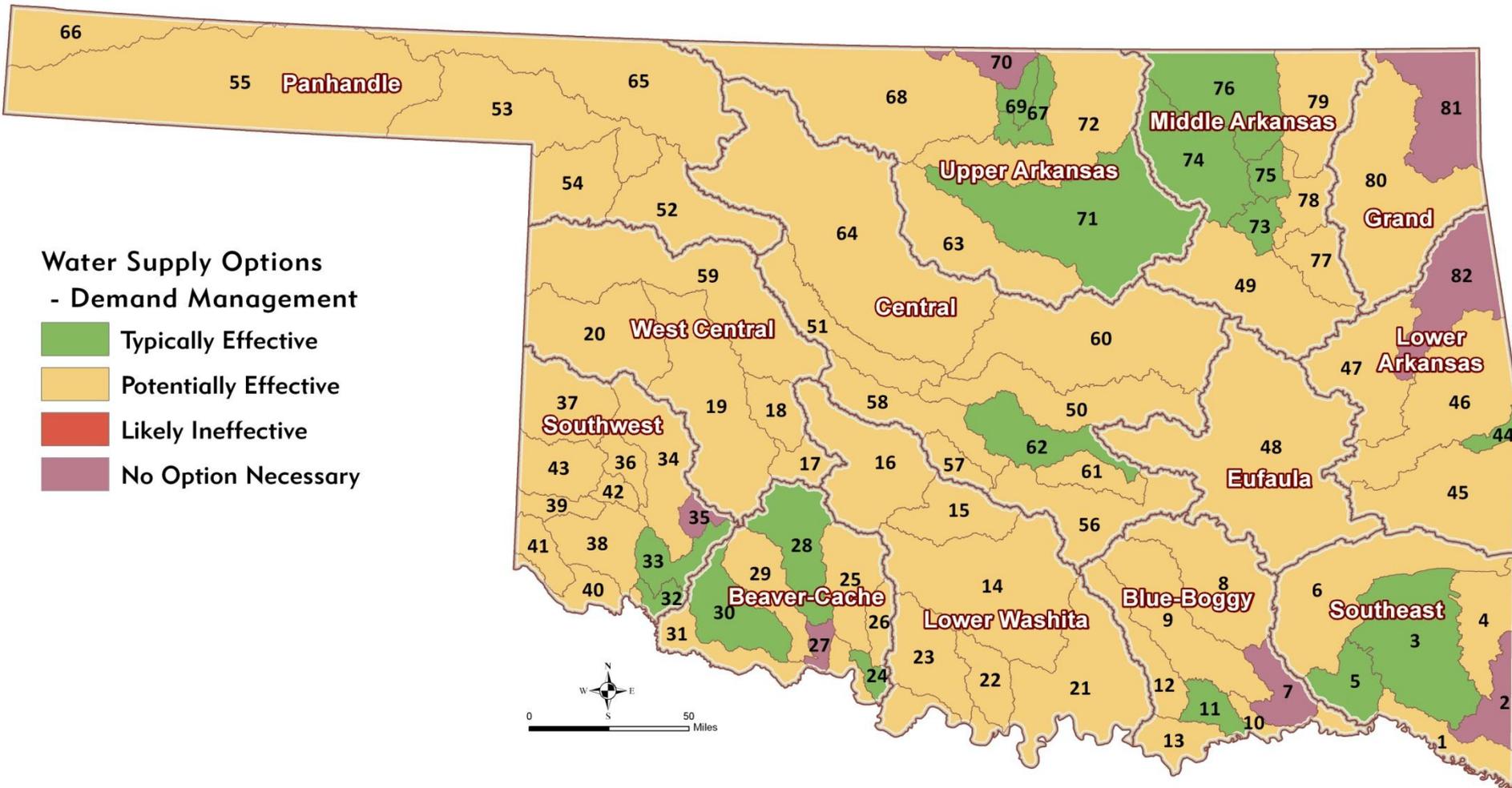
Increasing Reliance on Groundwater

Marginal Quality Water

# Basin Water Supply Options, Demand Management

## Water Supply Options - Demand Management

-  Typically Effective
-  Potentially Effective
-  Likely Ineffective
-  No Option Necessary



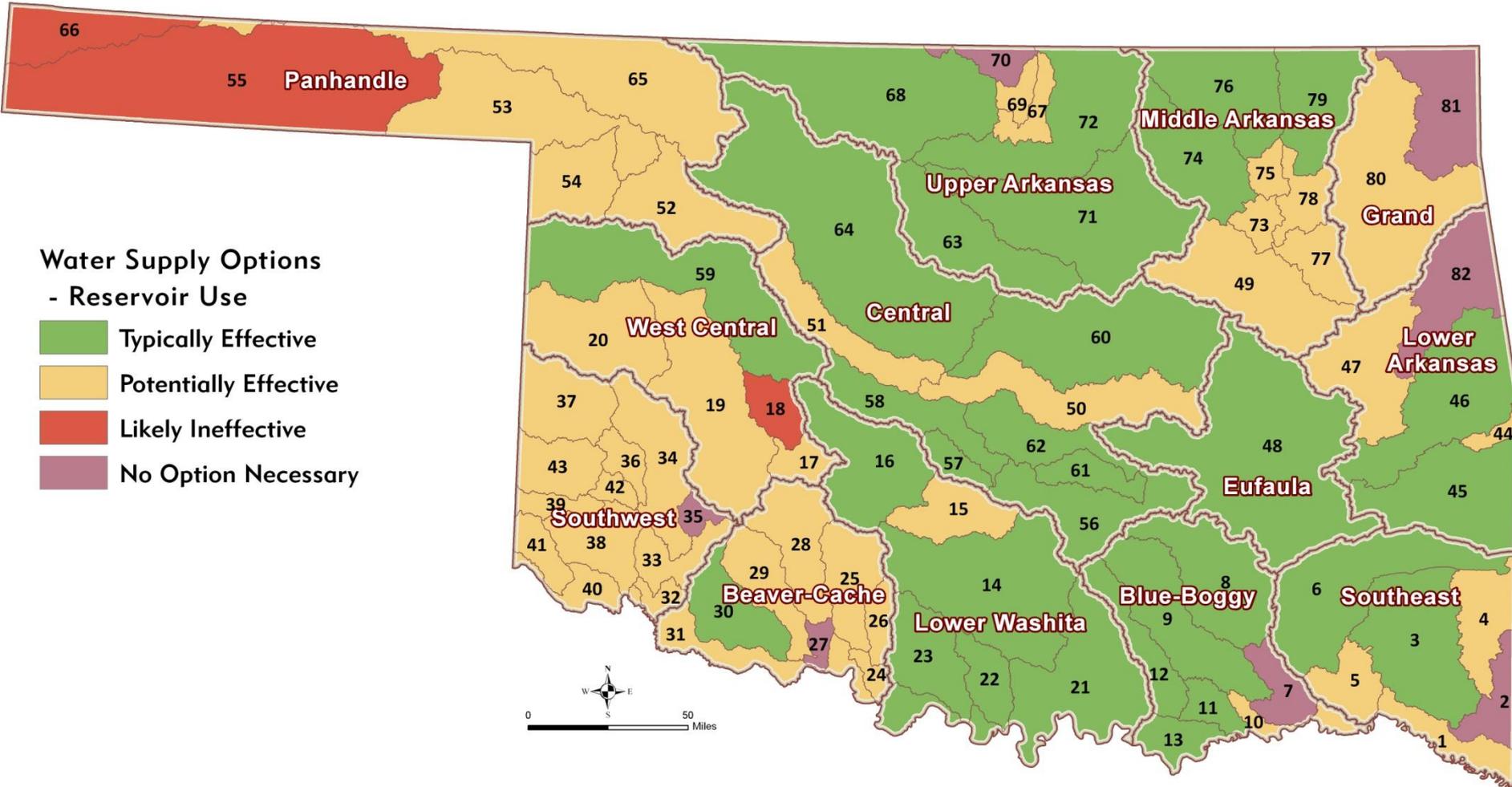
# Conservation

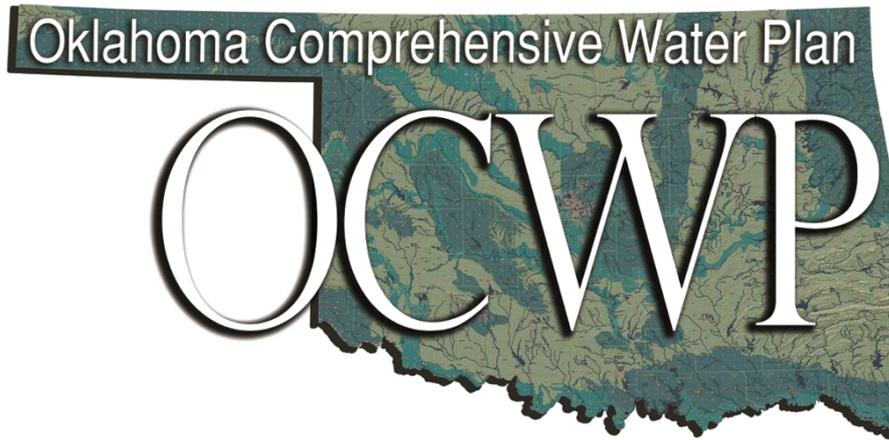


- M&I Conservation
  - *Water Efficient Appliances*
  - *Education*
  - *Water System Improvements*
- Agricultural Conservation
  - *Increased Irrigation Efficiency*

# Basin Water Supply Options, Reservoir Use

- Water Supply Options  
- Reservoir Use
- Typically Effective
  - Potentially Effective
  - Likely Ineffective
  - No Option Necessary





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# Public Water Provider Information

- Population
- Water use per person
- Calculation of water demand
- Wholesale transfers

**Public Water Provider Demand Forecast (1 of 3)**  
Lower Arkansas Region

Provider	SDWIS ID <sup>1</sup>	County	Demand (AFY)					
			2010	2020	2030	2040	2050	2060
ADAIR CO RWD #1 (CHERRY TREE)	OK3000104	Adair	347	404	482	520	579	638
ADAIR CO RWD #2	OK3000105	Adair	157	183	209	238	262	289
ADAIR CO RWD #3	OK3000106	Adair	313	365	417	469	522	575
ADAIR CO RWD #4	OK3000107	Adair	87	101	116	130	145	160
ADAIR CO RWD #5	OK1021770	Adair	168	196	224	252	280	309

# Public Water Provider Information

## Wholesale Water Transfers (1 of 3) Lower Arkansas Region)

Provider	SDWIS ID <sup>1</sup>	Sales			Purchases		
		Sells To	Emergency or Ongoing	Treated or Raw or Both	Purchases from	Emergency or Ongoing	Treated or Raw or Both
ADAIR CO RWD #1 (CHERRY TREE)	OK3000104				Stilwell	O	T
ADAIR CO RWD #2	OK3000105				Stilwell	O	T
ADAIR CO RWD #3	OK3000106				Stilwell	O	T
ADAIR CO RWD #4	OK3000107				Stilwell	O	T

## OCWP Water Provider Survey Lower Arkansas Region

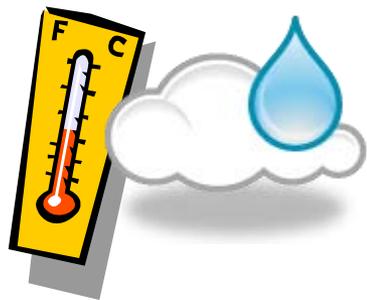
<p><b>Adair County RWD 1 (Cherry Tree)</b>  <b>Current Source of Supply</b>                      Primary source: City of Stilwell  <b>Short-Term Needs</b>                      Infrastructure improvements: refurbish standpipes; replace pump stations.  <b>Long-Term Needs</b>                      Infrastructure improvements: replace distribution system lines; add a connection to Sequoyah County Water Association.</p>	<p><b>Short-Term Needs</b>                      Infrastructure improvements: replace storage tank.  <b>Long-Term Needs</b>                      None identified.</p>	<p><b>Short-Term Needs</b>                      None identified.  <b>Long-Term Needs</b>                      New supply source: Possible water purchase from Tahlequah</p>
<p><b>Adair County RWD 2</b>  <b>Current Source of Supply</b>                      Primary source: City of Stilwell  <b>Short-Term Needs</b></p>	<p><b>Bokoshe PWA (LeFlore County)</b>  <b>Current Source of Supply</b>                      Primary source: Poteau Valley Improvement Authority  <b>Short-Term Needs</b>                      None identified.  <b>Long-Term Needs</b>                      None identified.</p>	<p><b>Cherokee Co RWD 3</b>  <b>Current Source of Supply</b>                      Primary source: City of Tahlequah, Seminary Springs  <b>Short-Term Needs</b>                      Infrastructure improvements: replace main distribution system lines.  <b>Long-Term Needs</b>                      Infrastructure improvements: replace water tower and booster pump station; increase water treatment capacity.</p>
<p><b>Braggs Water Works (Muskogee County)</b>  <b>Current Source of Supply</b></p>		

# Tools Developed for the OCWP Update

*under USACE / OWRB authorities*



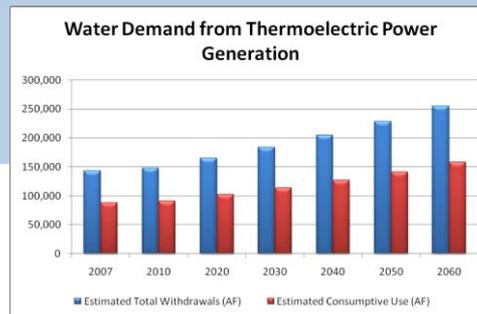
## Supply/Demand Gap Tool



## Climate Demand Model



## Reservoir Yield Model

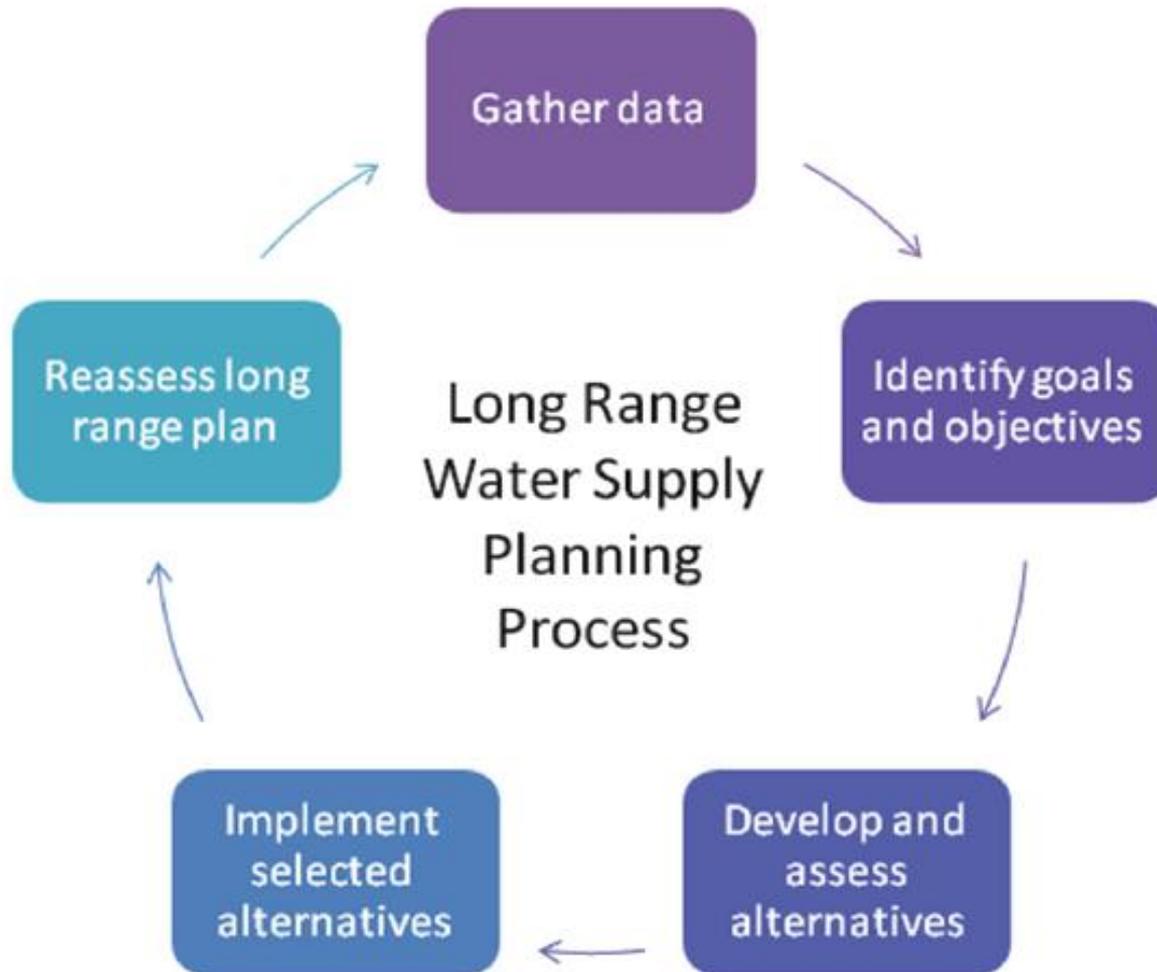


## Demand Projection Model



## Water Allocation Models

# Public Water Supply Planning Guide



**Figure 1-1 Strategic Planning Process**

# Framework for Long-term Water Supply Planning

- Targeted at small and medium sized public water providers
- Forms/tables to help gather and organize data
- Help defining objectives
- Industry standard calculations/methodology
- Help identifying and evaluating conceptual alternatives
- Brings information together needed for permits and loan applications

# Forms to Develop Individual Plan

**Table 3-3 Permits Actions Required**

<input type="checkbox"/>	<p>Attached permits and/or identify physical and/or electronic location of document(s) here.</p> <p>Physical Location: _____</p> <p>_____</p> <p>Electronic Location: _____</p> <p>_____</p>												
<input type="checkbox"/>	<p>Does the permit contain a schedule of use (reflects expected increase in water use)? If so, list below.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Permitted Use (AFY)</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Year	Permitted Use (AFY)										
Year	Permitted Use (AFY)												
<input type="checkbox"/>	<p>Included notes about source water availability based on experience:</p> <p>Experience related to changes in quantity (e.g., Has there been a period when you were unable to get enough source water): _____</p> <p>_____</p> <p>Experience related to changes in water quality (e.g., How does quality change during hot, dry periods? How does quality change after large rainfall events?) _____</p> <p>_____</p> <p>Have there been changes in the amount of water that you are purchasing from or selling to other providers? _____ Why?</p> <p>_____</p> <p>_____</p>												

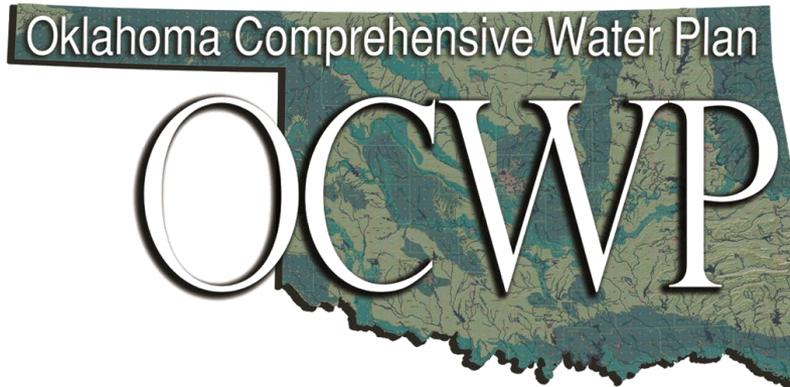
# Guidance and Example

**Table B3.3 Permit(s)**

	<p>Attached permits and/or identify physical and/or electronic location of document(s) here.            Physical Location: <u>Permit is kept in filing cabinet.</u>            Electronic Location: <u>N/A</u></p>										
	<p>Does the permit contain a schedule of use (reflects expected increase in water use)? <u>No.</u>            If so, list below.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Permitted Use (AF/Y)</th> </tr> </thead> <tbody> <tr> <td>N/A</td> <td>550</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Year	Permitted Use (AF/Y)	N/A	550						
Year	Permitted Use (AF/Y)										
N/A	550										
	<p>Included notes about source water availability based on experience:            Experience related to changes in quantity (e.g., Has there been a period when you were unable to get enough source water): <u>None known.</u>            Experience related to changes in water quality (e.g., How does quality change during hot, dry periods? How does quality change after large rainfall events?) <u>None known.</u>            Have there been changes in the amount of water that you are purchasing from or selling to other providers? <u>N/A</u> Why? <u>N/A</u>            Have there been any changes in the watershed that have influenced water quality? <u>No</u>            If so, describe: <u>N/A</u></p> <hr/> <p>Other notes: <u>Historically, we have had higher levels of copper due to natural conditions.</u></p>										

# Conclusion

- OCWP has developed demand estimates for seven sectors statewide.
- Twelve basins were identified as hot spots based on physical, permitting, and water quality criteria.
- Six water supply options were evaluated for the hot spots and other basins.
- Public water provider specific demands and water planning guide have been developed.



# **OCWP Technical Studies: Hot Spots and Water Supply Options**

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*Governor's Water Conference*  
*Norman, Oklahoma*  
*October 18, 2011*



US Army Corps  
of Engineers.

