

# Oklahoma COMPREHENSIVE Water PLAN

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*Effective water resource management is inevitably enhanced when strong relationships are built between citizens and participating federal, state, and local organizations. Fostering these relationships will ensure a successful OCWP update.*

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## 2010 Status Report

During the final two years of the OCWP update, public input will be blended with science, technology, engineering, and related disciplines to establish a sound and progressive water future for Oklahoma citizens. Integral to the update are the many partnerships between the OWRB and other state and federal agencies, universities, organizations, and engineering firms. Collaboration among these OCWP partners, each possessing advanced expertise to address emerging water issues and problems, will heighten understanding of the state's water resources to an unprecedented level, resulting in significant improvements to current water management policy.

Bringing together this diverse knowledge and expertise to address the concerns of Oklahoma citizens presents both a unique challenge and a welcome opportunity for the OWRB. Creation of a plan that is well-vetted and based upon sound science—one that can be defended as fair and objective—enhances the success of water-related decision making.

## Water Plan Goals

- Provide safe and dependable water supply for all Oklahomans while improving the economy and protecting the environment.
- Provide information so that water providers, policy makers, and water users can make informed decisions concerning the use and management of Oklahoma's water resources.

## Oklahoma Comprehensive Water Plan Process



The current update of the Oklahoma Comprehensive Water Plan, originally published in 1980 and last updated in 1995, seeks to establish reliable water supply for all Oklahomans through at least the next 50 years. The OCWP's carefully designed process has received considerable attention as a national model and affirmation as the new future trend in water resources planning.

The update is utilizing an innovative two-pronged approach: inclusive and robust public participation to build sound water policy complemented by expert technical evaluation utilizing state and national authorities on water management. This approach ensures broad public input, comprehensive analysis, and realistic management strategies that will result in an effective and opportunistic plan for Oklahoma's water future.

**OCWP Partners**

- Oklahoma Water Resources Board
- Oklahoma Water Resources Research Institute
- U.S. Army Corps of Engineers
- CDM ♦ AMEC ♦ C.H. Guernsey
- U.S. Geological Survey
- U.S. Environmental Protection Agency
- U.S. Bureau of Reclamation
- National Oceanic and Atmospheric Administration
- U.S. Fish & Wildlife Service
- Oklahoma Secretary of Environment
- Oklahoma Dept. of Environmental Quality
- Oklahoma Dept. of Agriculture, Food & Forestry
- Oklahoma Dept. of Wildlife Conservation
- Oklahoma Conservation Commission
- Oklahoma Climatological Survey
- Oklahoma Corporation Commission
- Oklahoma Dept. of Mines
- Oklahoma State University
- University of Oklahoma
- University of Tulsa

# Policy Development & Public Participation

During 2009, the Oklahoma Water Resources Research Institute (OWRRI) held a series of three workshops covering ten topics. Twenty water resource management approaches, developed by 240 water policy development participants, will serve as the basis for discussion during the 2010 special “Water” Town Hall, facilitated by the Oklahoma Academy of State Goals and scheduled for May 23-26 in Norman.

About 177 individuals, consisting of 144 OCWP public input participants joined by 33 Academy members, will provide a fresh, yet knowledgeable, perspective at the Town Hall. These participants, selected by the OCWP Planning Advisory Board according to their specific interests and areas of expertise, will be divided into six groups that will review and amend the approaches or propose new approaches for discussion among the group at large. On the final day of the meeting, all recommendations will be finalized and prioritized.

The process planned for the Water Town Hall follows the “Academy standard.” Led by experienced facilitators, participants will dissect the issues and work toward a consensus on water policy recommendations. The resulting document will be presented in the Spring of 2011 at eleven regional meeting locations during the final round of public feedback.

Educational materials are being prepared by the Academy in advance of the Town Hall, and participants are encouraged to be well-prepared for an intense multi-day discussion of vital water issues. For more information on the Water Town Hall, contact the OWRRI at 405-744-9994 or by e-mail at [waterplan@okstate.edu](mailto:waterplan@okstate.edu).



June 4 workshop



The Oklahoma Academy for State Goals is a nonprofit organization consisting of nonpartisan members who research Oklahoma’s most pressing policy issues and provide objective recommendations for implementation through community and legislative action. Simply put, the Academy seeks to “improve the quality of life” for Oklahomans. Academy involvement lends additional credibility and integrity to the OCWP’s policy development process, which represents perhaps the most progressive public input strategy on water planning ever undertaken.

*The Academy was founded by Governor Henry Bellmon in 1967 to bring public attention to policy issues, provide objective, thorough research and act as a catalyst for positive change.*

*The mission of the Oklahoma Academy is to identify issues facing Oklahoma, provide well-researched, objective information, foster nonpartisan collaboration, develop responsible recommendations, and encourage community and legislative action.*

*The vision of the Oklahoma Academy is to empower Oklahomans to improve their quality of life through effective public policy development and implementation.*

## Discussion Topics

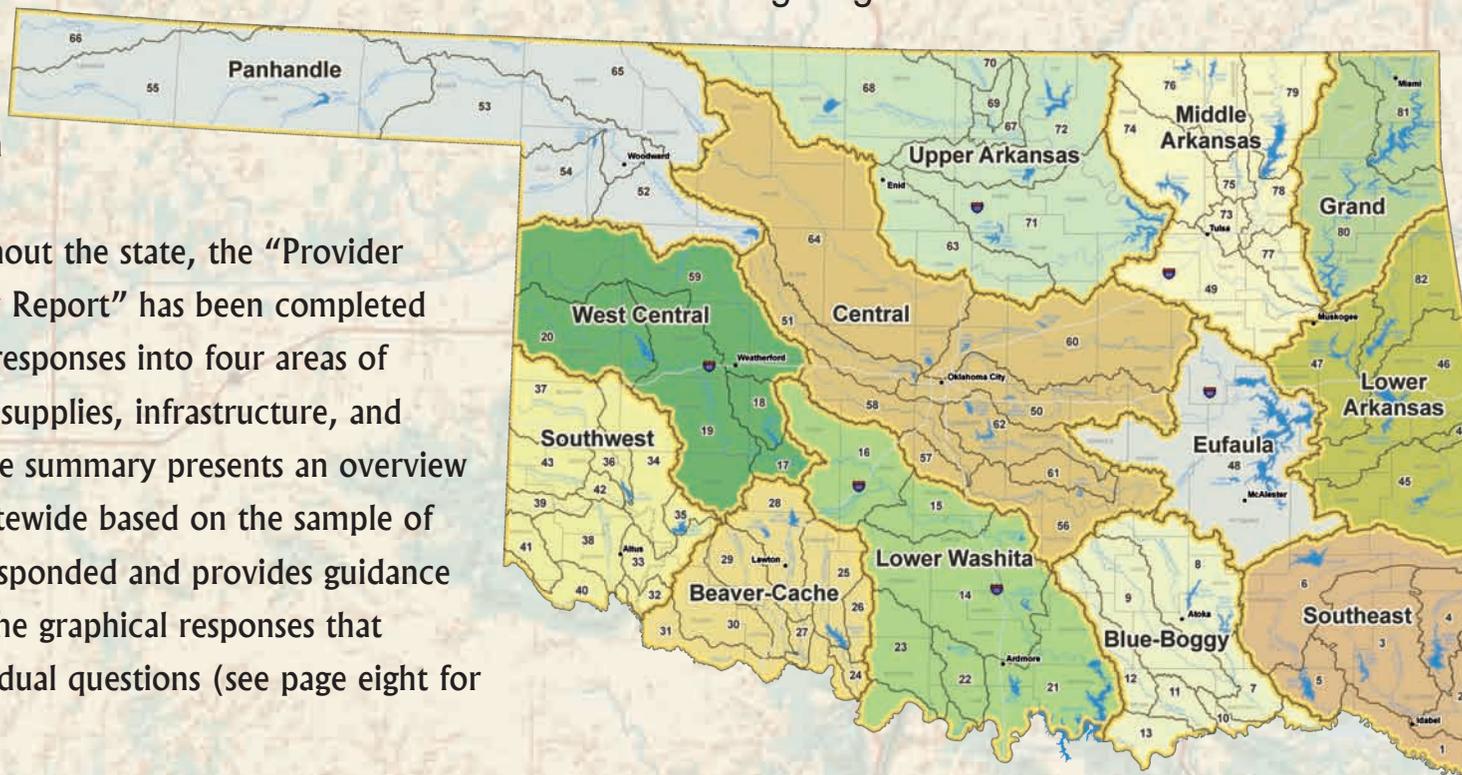
- *Water Availability Including During and After Emergencies*
- *Water Conservation*
- *Land Use Practices*
- *Intergovernmental Water Resource Management*
- *Interagency Water Resource Management*
- *Surface and Groundwater Relationship*
- *Water Sales and Transfers*
- *Conflict Resolution*
- *Balancing Supply and Demand in the Face of Change*
- *Stakeholder Involvement*
- *Local and Regional Issues in the State Plan*

# Technical Studies and Research

Adapted from existing OWRB stream system analysis boundaries and revised to include a USGS stream gage at or near the basin outlet, eighty-two surface water basins have been grouped into thirteen watershed planning regions to analyze water supply and demand. The “Oklahoma H2O Tool,” a database and Geographic Information System (GIS) based analysis tool, has been created to compare projected demands to physical supplies in each basin. A key foundation of OCWP technical work, Oklahoma H2O will provide planners with basin-level information on potential gaps in supply and water system managers with the flexibility to pose various “what-if” scenarios in making vital supply and management decisions.

As a follow-up to the 2008 survey conducted to obtain information on public water suppliers throughout the state, the “Provider Survey Summary Report” has been completed that categorizes responses into four areas of focus: demands, supplies, infrastructure, and conservation. The summary presents an overview of conditions statewide based on the sample of providers that responded and provides guidance on interpreting the graphical responses that summarize individual questions (see page eight for more details).

OCWP Watershed Planning Regions and Basins

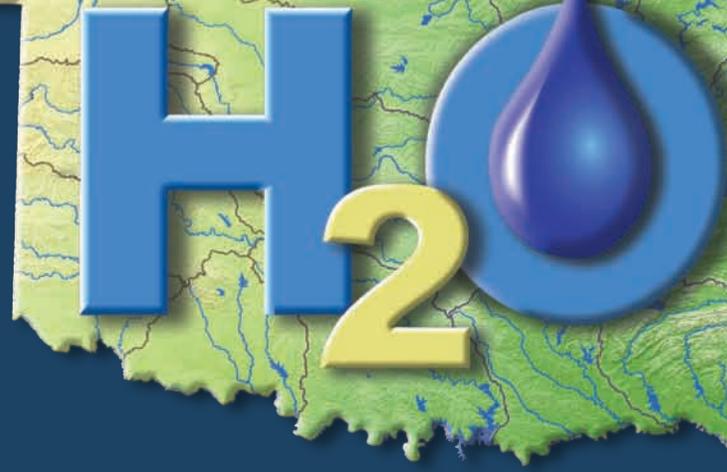


Regional reports and basin-level fact sheets are being developed for the thirteen watershed planning regions and eighty-two basins. The reports and fact sheets will provide such information as region-wide demands and supplies by sector and source, basin-wide demands and supplies by sector and source, surface and groundwater gaps, water quality analysis, and possible basin-level supply solutions for addressing the gaps, including interbasin transfers, conservation, increased storage, and variations in proportions of surface water and groundwater use. A section on public water providers will also be included, listing suppliers, projected demands, known infrastructure needs, and other key findings from the Public Water Provider Survey and follow-up activities by the Oklahoma Department of Environmental Quality (ODEQ).

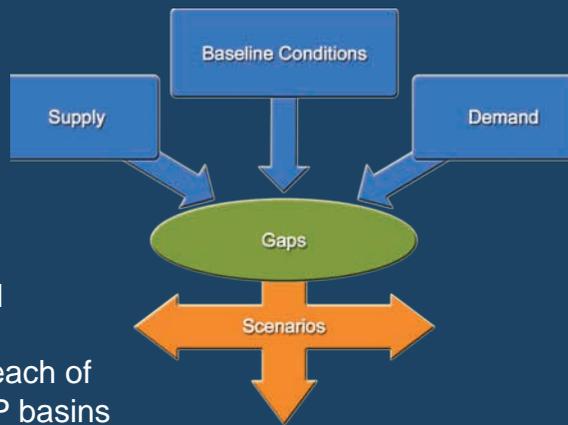
The USGS, in cooperation with the OWRB, has completed a summary of water use information for Oklahoma, presenting 1950-2005 estimates of freshwater withdrawal for water use in Oklahoma by source and category in five-year intervals. Withdrawal data were aggregated and tabulated by county, major river basin, and principal aquifer. This historical analysis provides a valuable perspective for future water development and use.

The Oklahoma Department of Agriculture, Food and Forestry (ODAFF) is documenting past, present, and future needs and demands for agriculture to better assess the role that agriculture will play in relation to future water use and allocation. Also underway is an analysis of projected water savings from a range of conservation measures by sector to help meet future water needs.

# Oklahoma



One of the key products of the OCWP's technical phase is the "Oklahoma H2O Tool," a versatile geographic information system (GIS) based analysis tool created to compare projected water demands to physical supplies in each of the eighty-two OCWP basins and thirteen watershed planning regions. Oklahoma H2O is being used in the planning process to identify areas of potential shortages (physical water supply availability constraints) and to more closely examine demands, supplies, and potential water supply solutions. The Oklahoma H2O tool was developed to allow unprecedented flexibility in the performance of a variety of "what-if" scenarios leading to informed decisions based on wide-ranging—and at times conflicting—factors.



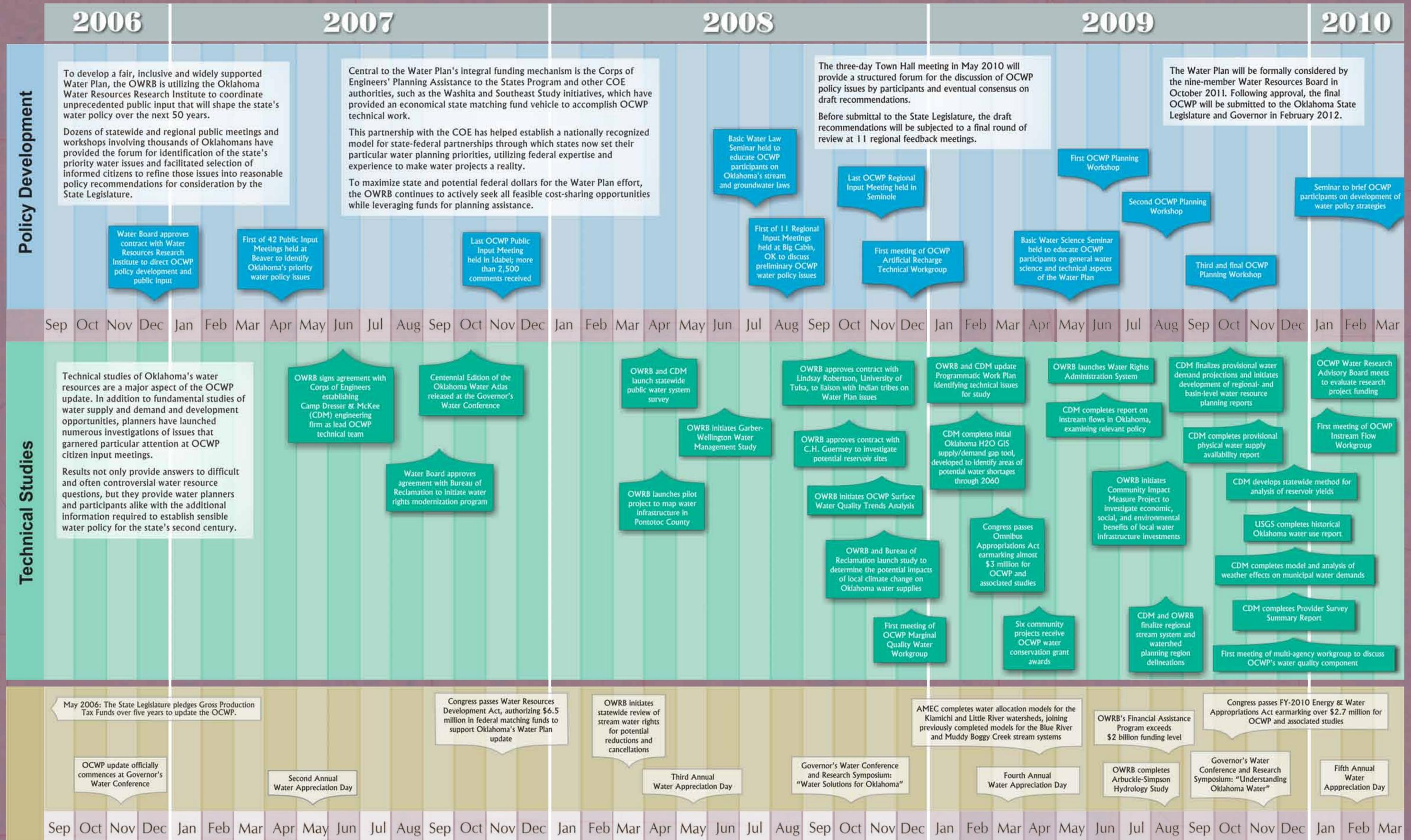
A technical memorandum has been completed by CDM, the OCWP's lead engineering firm, defining a proposed approach for single-reservoir firm yield analysis in Oklahoma. This document outlines the general analytical approach, demonstrates the approach by testing two reservoirs, and discusses the utility of the approach in determining reservoir yields across the state.

A technical memorandum summarizing the analysis of the relationship between weather conditions and municipal water demand has also been completed by CDM. Regression analysis was used to assess the relationship between weather and water production for five municipal water providers in Oklahoma: Durant, Edmond, Lawton, Norman, and Tulsa. The relationships are expressed as elasticity, or the percent change in monthly water production given a percent change in monthly weather. Coupled with projections of potential future Oklahoma weather patterns under climate variability scenarios, these relationships can be used in subsequent studies to estimate potential changes in future municipal water demands regionally and/or statewide.

"Instream Flows in Oklahoma and the West," another CDM Technical Memorandum, characterizes existing programs and policies that protect water quantities in Oklahoma streams and lakes. It also defines the range of current policies employed in surrounding states to provide insight for future policy framework and goals. A technical work group consisting of various interest group representatives has been formed to review and provide input on instream flow regulations in other states and consider the suitability of implementation in Oklahoma.

A stream water allocation model has been completed for the Upper Canadian River basin using the Central Resource Allocation Model (CRAM model), which has been developed by AMEC Earth & Environment. The objective is to use the model to 1) characterize surface water flow in the basin on a monthly and annual basis for the last 50 years, accounting for currently active stream water rights; 2) evaluate potential interference of new stream water applications on existing water rights; and 3) anticipate shortages due to changes in flow characteristics caused by natural and anthropogenic sources. This model is one of five that have been completed and will be used to supplement information in the basin supply fact sheets. Models have also been completed for the Blue, Muddy-Clear Boggy, Kiamichi, and Little River Basins.

# Oklahoma Comprehensive Water Plan (2006-2012)



# Provider Survey Summary

In 2008, a survey was sent to 785 municipal and rural water providers throughout Oklahoma to collect vital background water supply and system information. The resulting information has provided unique insights into the state's public water supply use and will greatly assist in the development of statewide water demand projections, local water plans, and assessments of infrastructure requirements.

The Oklahoma Rural Water Association (ORWA) and the Oklahoma Municipal League (OML) assisted the OWRB in collecting responses from individual providers. Of the 785 providers receiving the survey, 561 responded. The responding providers serve an estimated 3,100,000 Oklahoma residents, which is about 86 percent of the state's 3,600,000 total population.

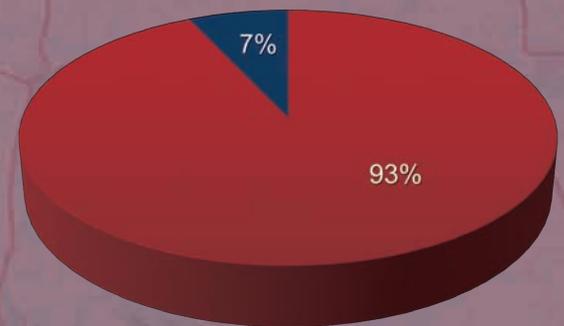
According to the "Provider Survey Summary Report," completed in December 2009, the 2007 reported total demand by responders was 193.4 billion gallons per year. Individual providers serve a wide range of populations. Nearly 50 percent of those responding provide water to populations of less than 1,200, while more than 90 percent provide water to populations of less than 10,000. The two largest providers, Oklahoma City and Tulsa, indicated they directly serve more than 600,000 and 470,000 customers, respectively.

A majority of providers that presented population projections for future planning horizons expect future population increases (87 percent, or 331 of 378 responding to this question). However, only about 7 percent of providers (responding to this question) completed a water supply plan in the last 10 years.

Increases in water demands are expected, and while many of the responding providers identified excess water treatment plant capacity, 46 percent of responding providers' water distribution infrastructure is more than 30 years old. In addition to that, half of all reported treatment plants are more than 30 years old with half of all reported expansions occurring at least 6 years ago. Less than half of the planned distribution system improvements are fully or partially funded (38 percent). The OWRB has contracted with the (Oklahoma Department of Environmental Quality (ODEQ) to interview those providers that failed to respond and to fill in survey gaps where needed.

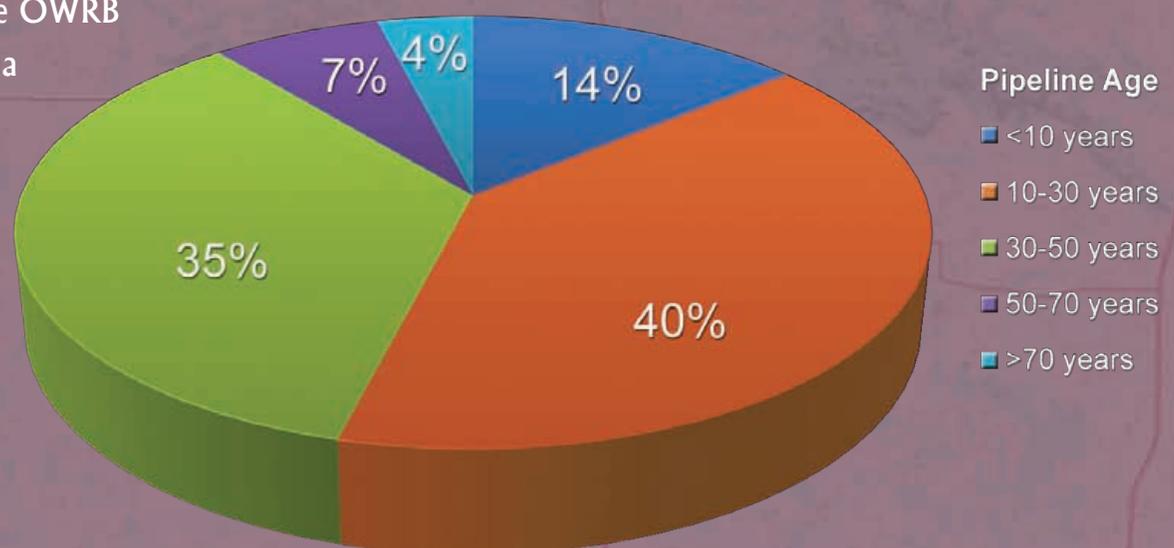
Visit the OCWP web page at [www.owrb.ok.gov/supply/ocwp/ocwp.php](http://www.owrb.ok.gov/supply/ocwp/ocwp.php) to view the entire Provider Survey Summary Report.

## Providers Without a Water Plan



*About 93 percent of responding providers have not completed a water supply plan in the last 10 years.*

## Our Aging Infrastructure



*This chart shows the approximate reported age of distribution system lines, an indicator of the advancing age of our state's infrastructure.*

# Garber-Wellington Water Management Study

Initiated in June 2008, the Garber-Wellington Water Management Study is addressing growing concerns about the future of water availability in central Oklahoma. Funded with State monies through the Oklahoma Comprehensive Water Plan and federal funds through the U.S. Bureau of Reclamation (Reclamation) and U.S. Geological Survey (USGS), the investigation is a cooperative effort between OWRB, USGS, Association of Central Oklahoma Governments (ACOG), Oklahoma Geological Survey (OGS), Reclamation, Tinker Air Force Base, and other state and federal agencies.

The Garber-Wellington aquifer, also referred to as the Central Oklahoma aquifer, underlies about 3,000 square miles in central Oklahoma, where the aquifer is used for municipal, industrial, commercial, agricultural, and domestic water supplies. With the exception of Oklahoma City, all the major communities in central Oklahoma rely either solely or partly on ground water from this aquifer. In addition to public water supply wells, more than 20,000 homeowners use groundwater for household or yard use.

The objective of the study is to conduct an investigation of the hydrogeology of the Garber-Wellington aquifer that will provide the OWRB with information necessary to determine the amount of water that may be withdrawn from the aquifer while ensuring a dependable water supply for future growth. USGS will be key in developing a groundwater-flow model that will be used to predict the impacts of long-term groundwater withdrawals on the aquifer and to simulate water management strategies.

In 2009, the USGS and OWRB measured water levels in about 280 shallow water wells in the aquifer during a four-week period. Data collected were used to update a potentiometric surface map from measured water levels collected in a study conducted by the USGS in 1986-87. A comparison showed that water levels from 1986-87 were higher than water levels measured in 2009. A map showing the difference in water levels indicates the greatest decrease in water levels is located in the Moore-Norman area.

In cooperation with the Oklahoma Climatological Survey (OCS) and Oklahoma Ground Water Association (OGWA), groundwater observation wells were drilled at two Oklahoma Mesonet environmental monitoring stations. The wells are equipped with pressure transducers and water-level recorders that provide continuous groundwater-level data,



*Study team members Jim Roberts (STR, Inc.), Stan Paxton (USGS), Scott Bowen (Tinker AFB), John Harrington (ACOG), and Kent Wilkins (OWRB) examining an outcrop of the Garber Sandstone*

which are essential to understanding the aquifer and how it responds to variations in precipitation and other climatic factors. Real-time daily water-level measurements and hydrographs can be viewed on the Mesonet website ([www.mesonet.org](http://www.mesonet.org)) along with other climatic data. In addition to the Mesonet observation wells, the OWRB is monitoring water levels in seven existing wells. Hourly water-level data are available online through the OWRB Water Well Record Search (<http://www.owrb.ok.gov/wd/search/search.php>).

Current efforts are focused on developing the geohydrologic framework and water budget of the aquifer. USGS is analyzing well data from Tinker Air Force Base in order to refine the aquifer characteristics in the model from the borehole geophysical logs available across the aquifer. OWRB staff is reviewing the annual water use records of about 530 groundwater permits in the Garber-Wellington aquifer for 1967 to 2008.



*Drilling a groundwater observation well at the Shawnee Mesonet station*

# OCWP Community Impact Measure Project

Four Oklahoma communities receiving American Recovery and Reinvestment Act (ARRA) funds for water/wastewater projects through the Clean Water State Revolving Fund (CWSRF) participated in a pilot study to measure the specific impacts of infrastructure investments. The initial phase of the study, which was jointly funded through OCWP and U.S. Environmental Protection Agency ARRA monies, focused on the personal and professional opinions of 36 civic leaders, water professionals, and citizens in Ardmore, Grove, Piedmont, and Norman.

Faculty and graduate student researchers from the University of Oklahoma interviewed each of the participants regarding the benefits gained through local water and wastewater infrastructure projects. The interview data were then compiled and evaluated according to the following perceived benefits: economic growth, property value increases, waterborne illness reduction, recreational benefits, energy savings, phosphorus reduction, greenhouse gas emission reduction, quality of life benefits, sustainability, and monetary savings to citizens (from using the SRF program and from not delaying projects).

This close-up look at the effects of water/wastewater investment allowed researchers to determine what mattered most to stakeholders about water and wastewater infrastructure. The result was a report outlining the measures in a way where they could be used by local leaders to assess competing projects and community priorities and carry on informed dialog with citizens about them.

Phase II of the project, which is expected to begin in May of 2010, will be to expand the avenue for working with Oklahoma entities that received assistance through the ARRA as well as entities considering future investments. Information gathered during Phase I will be translated into a computer program, which will then be utilized to help calculate the impacts of enhanced infrastructure investment. The final software program will be available on the OWRB website in 2011 and will allow communities to self-quantify the social, economic, and environmental benefits of infrastructure investments. Additionally, Phase II will include an Oklahoma-specific primer and resource guide that will provide direction for communities about developing more sustainable systems.

The end result of the Community Impact Measure Project will be more educated citizens and community leaders when it comes to making water and wastewater infrastructure decisions in Oklahoma.

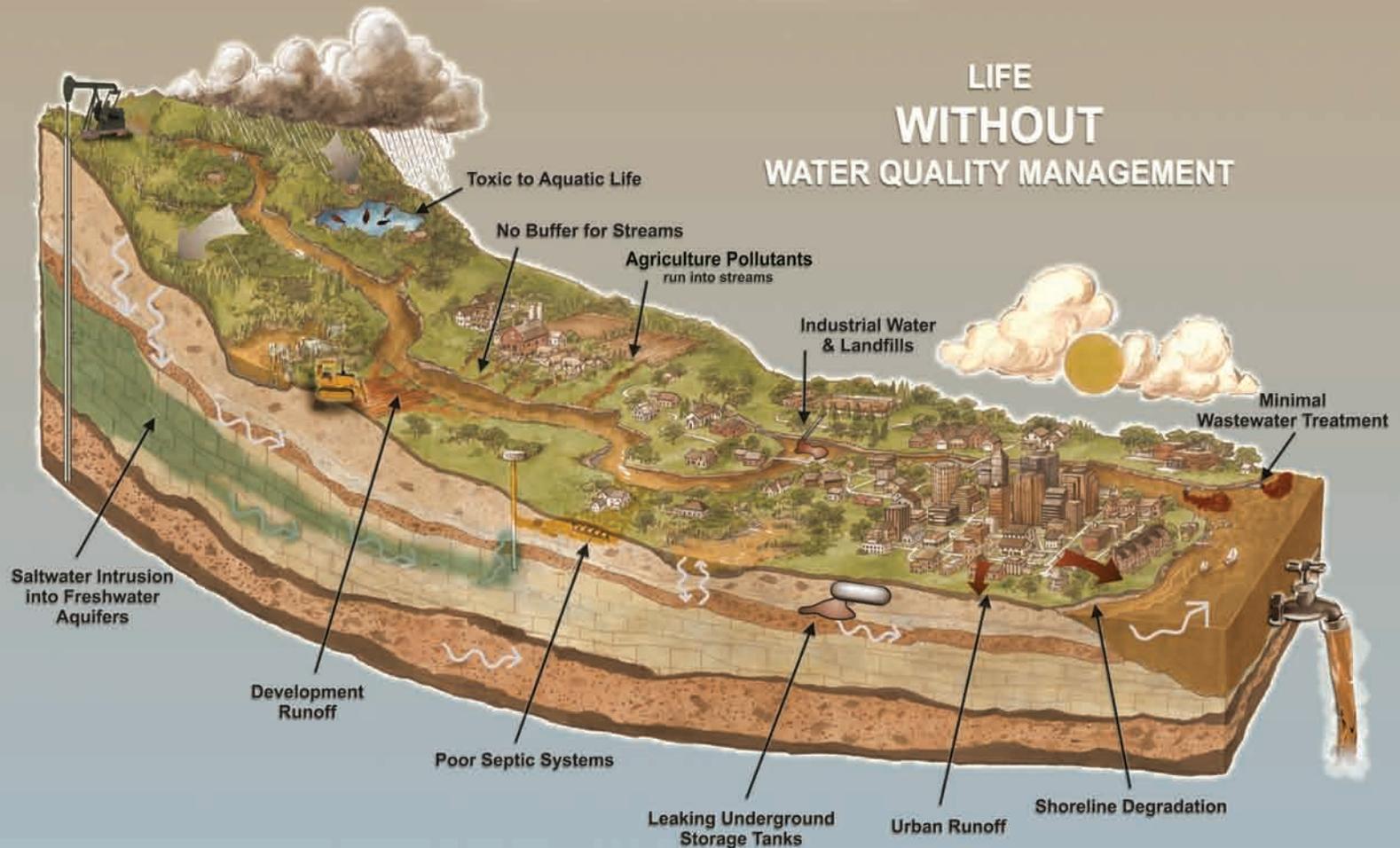


*Rehabilitation of a lift station at the Norman Wastewater Treatment Plant to increase maximum pumping capacity. This \$8.5 million project, funded through CWSRF ARRA, included enlargement of the existing flow equalization basin, a pump station, an emergency generator, associated yard piping, and electrical and instrumentation improvements. The new facility will help eliminate five existing pumping stations in northern Norman. During the Community Impact Measure Project, community stakeholders in Norman were asked about the overall benefits gained from these types of infrastructure investments.*

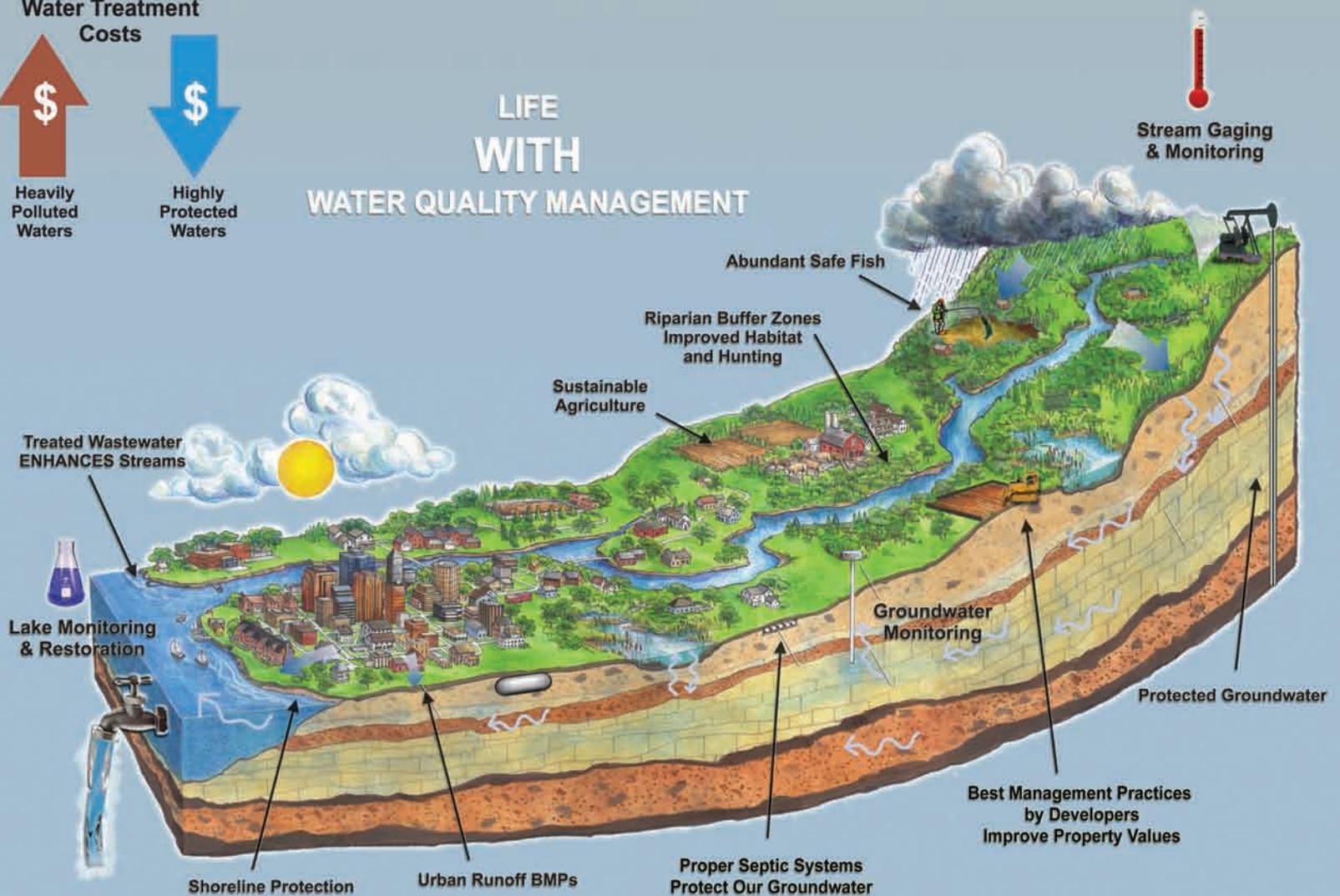
Water is crucial to the social, economic, and environmental well-being of any community, yet the considerable impacts of water and wastewater infrastructure investments are often not well understood by citizens and even civic leaders. While it is generally accepted that those investments provide various social, environmental, and economic benefits, the specific impacts have never before been measured.

# Water Quality Management and the Oklahoma Comprehensive Water Plan

## Preserving Our Future

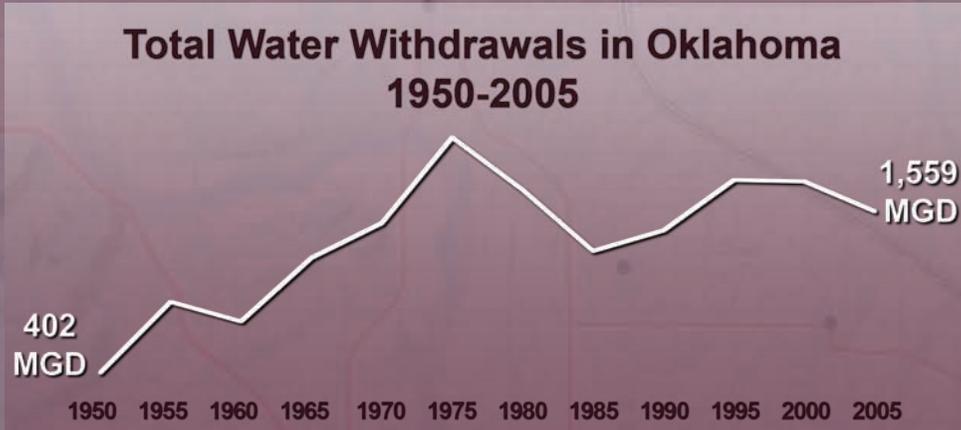


### LIFE WITH WATER QUALITY MANAGEMENT



# Water Use in Oklahoma

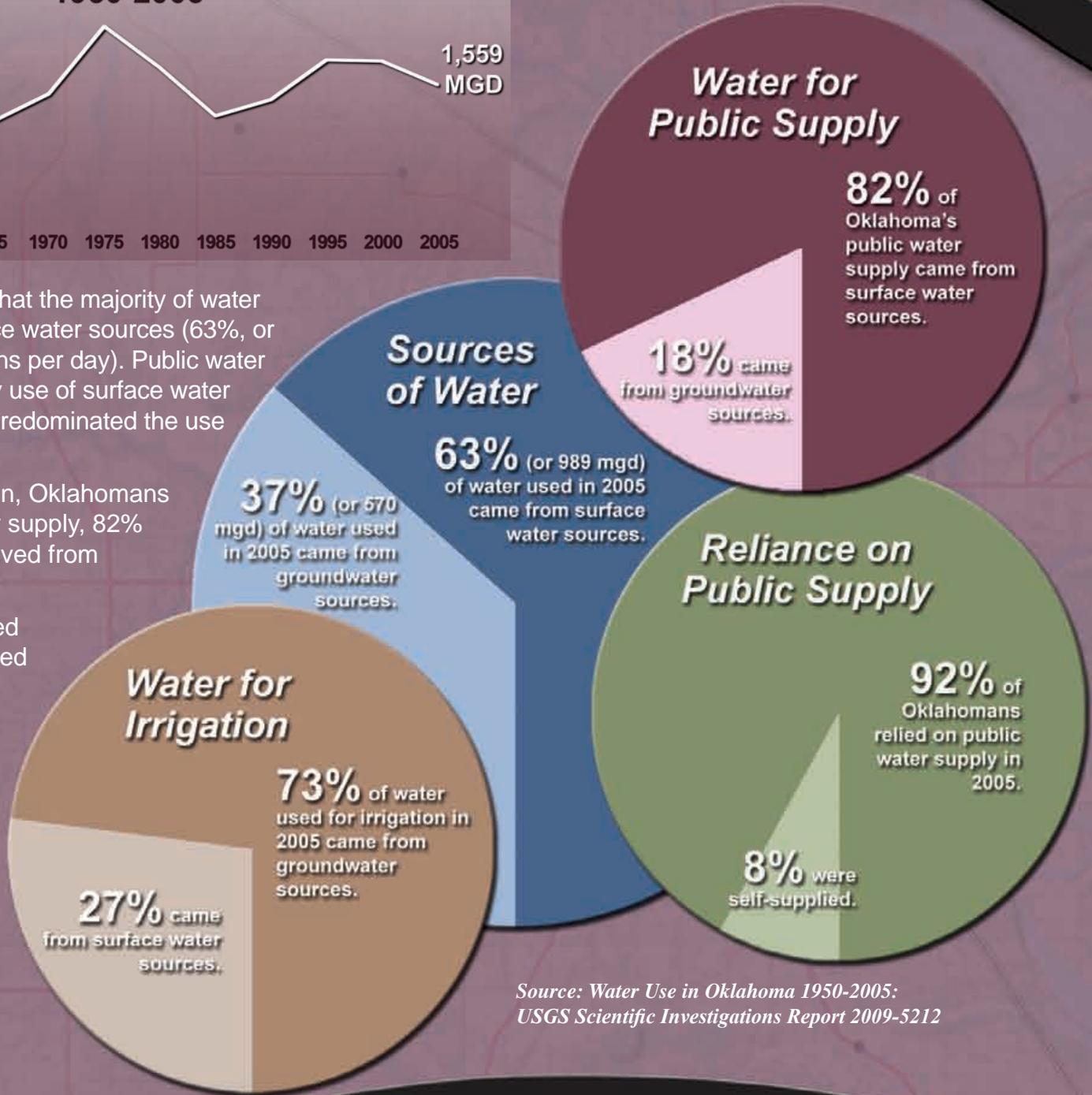
From 1950 to 2005, water use in Oklahoma increased from 402 million gallons per day (mgd) to 1,559 mgd. In that interval, water use has been impacted considerably by a number of factors, including population growth, economic trends, legal decisions, periodic droughts, infrastructure growth, and the institution of water conservation measures by municipalities, industries, and agriculture.



Data from 2005 show that the majority of water used came from surface water sources (63%, or about 989 million gallons per day). Public water supply was the primary use of surface water (54%) while irrigation predominated the use of groundwater (63%).

With 92%, or 3.2 million, Oklahomans relying on public water supply, 82% of that supply was derived from surface sources.

Groundwater accounted for 73% of all water used in 2005 for irrigation purposes, and was applied to more than 385,000 acres throughout the state; 60% of groundwater allocated for irrigation was used in Oklahoma's Panhandle region.



Source: *Water Use in Oklahoma 1950-2005: USGS Scientific Investigations Report 2009-5212*

