



water

noun: from Old English wæter; akin to Old High German wazzar water, Greek hydōr, Latin unda wave ... the liquid that descends from the clouds as rain, forms streams, lakes, and seas, and is a major constituent of all living matter ...

*An Oklahoma Academy Town Hall, May 2010, Norman
Oklahoma Water Resources Board - Oklahoma Water Resources Research Institute*

The Oklahoma Academy is a statewide nonprofit, nonpartisan, membership organization founded by Governor Henry Bellmon in 1967, and revitalized by him in 1985, 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.

The Academy Process identifies areas of need and problems facing Oklahoma, conducts research on identified critical issues, and develops long range goals, consensus recommendations, and agendas for action. Through the Town Hall conference process, forums and summits, the Academy increases citizen awareness, encourages civic engagement and sets the stage for thoughtfully improving Oklahoma.

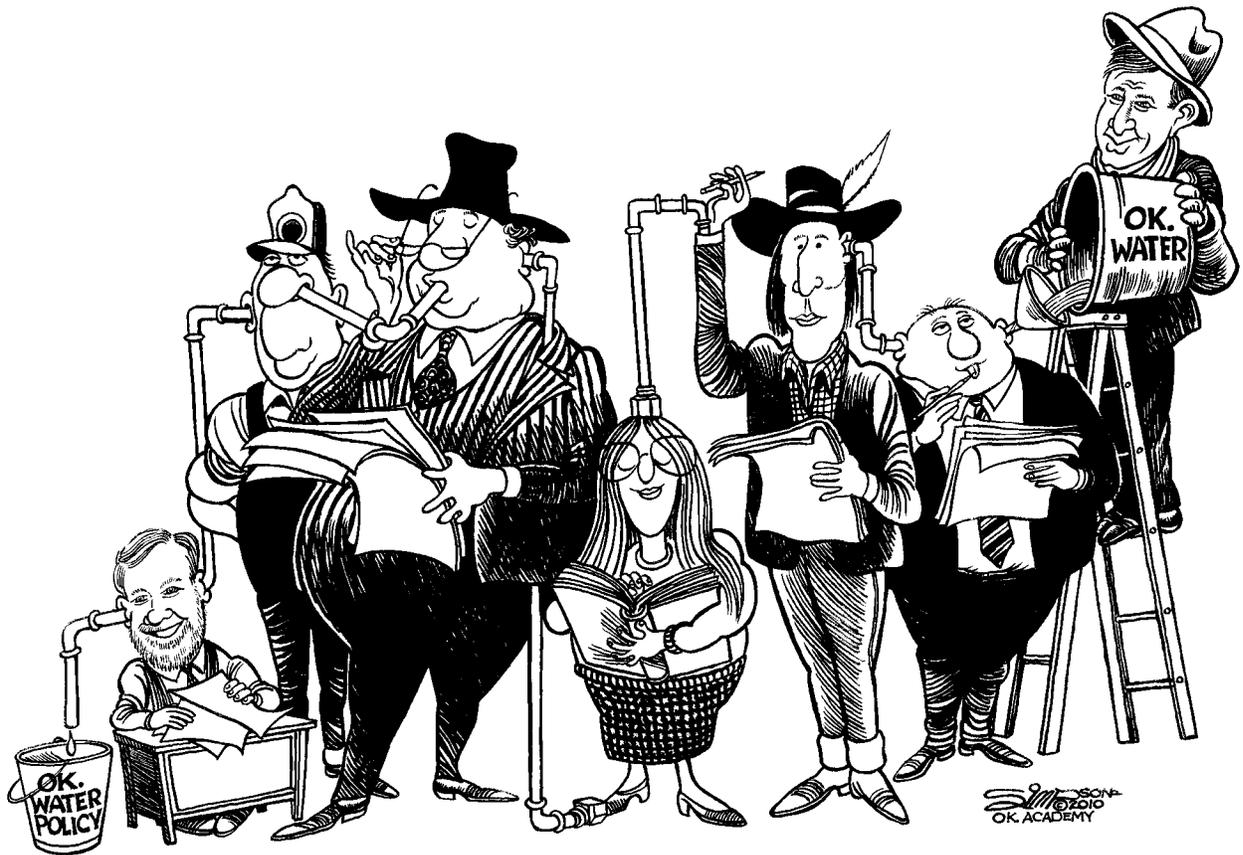


“Moving Ideas Into Action”

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*Welcome to the
Oklahoma Academy Town Hall*



“... in May 2010, the Oklahoma Academy for State Goals will sponsor a Town Hall meeting where 185 Oklahoma citizens will determine which management strategies should be included in the updated Water Plan ...”

The Oklahoma Academy

Neal A. McCaleb, Chairman, The Oklahoma Academy

The Oklahoma Academy for State Goals was founded in 1967 at the encouragement of the late Henry Bellmon. Mr. Bellmon served Oklahoma as State Representative, twice as Governor and as United States Senator. The Academy was reorganized in 1985 by his vision to assemble a group of Oklahomans with a wide range of interests and perspectives to deliberate, discuss and recommend actions for the greater good of Oklahomans and their prosperity.



Neal McCaleb, Chairman
Oklahoma Academy

The “tincture of time” is an important ingredient in any policy development period, and it is absolutely so in this Town Hall discussion.

It will be necessary to fully participate in all three days of these discussions, as I have found from my own experience that my opinions and conclusions evolve in the process of these group deliberations as revelations of new facts and perspectives are introduced.

We will gather at this Town Hall to review, analyze and make recommendations on the work product of the Oklahoma State Water Plan.

This is neither an easy nor unimportant task and we each bring to these discussions our own biases and perspectives formed by our experience and our vision of what Oklahoma can be. Inevitably discussions on Oklahoma’s water resources can become contentious. We are not all agreed on who owns the water -- the State, the individual or the several Sovereign Tribal nations pre-existing statehood. These will be topics for deliberation viewed through the lens of Oklahoma’s future.

The “tincture of time” is an important ingredient in any policy development period, and it is absolutely so in this Town Hall discussion.

The majority of the participants here have been involved in the development of a set of approaches at the local and regional levels. A substantial minority come to this event without that experience. However, the purpose and the unique chemistry of personal interaction and communal deliberation should put us all on equal footing and authority on this most important subject.

This process has proven very useful for the Academy over the years. We have devoted Town Halls to

criminal justice reform, improvement of education, health of our citizenry, environmental sustainability and economic viability, Tribal Sovereignty and State relationships to name a few.

The Academy has found that the most effective tool for coming to grips with important and difficult issues is a “Town Hall” conference. There we collectively research the subject, organize the issue into manageable discussion groups, thoroughly deliberate and collaboratively discuss the topic, and report the consensus findings to the Town Hall plenary sessions for integration into an overall set of recommendations.

In the end, we seek not just talk but action that can improve the quality of life and prosperity of all Oklahomans. Our Town Halls don’t end with our recommendations; they begin the arduous process of implementation. In your case - active and powerful inputs into the Oklahoma Comprehensive Water Plan.

Thank you for your time and devotion to the future of our great State.

The Town Hall Team

The Oklahoma Academy Leadership Team

You have volunteered to participate in an Oklahoma Academy Town Hall leading to extensive input into the Oklahoma Comprehensive Water Plan. It is likely that you have never participated in a process quite like this. Some introduction and explanation is in order.

A considerate, informed and helpful discussion requires discipline, structure, and civility - while not inhibiting creative thought and frank discussion. This is not easy. The Academy has developed a process to optimize this public policy debate. We ask you to trust that process.

The Oklahoma Academy has developed significant expertise at organizing and conducting successful Town Halls. Therefore the OWRB and OWRRI have requested the Academy to create a Water Town Hall for you. It is via this Town Hall that your State Water Plan inputs will be organized.

Read, learn, listen ... make friends and chat ... and most of all ... enthusiastically share your informed opinions within YOUR Town Hall process. This is your individual responsibility and commitment.

John Feaver

John is the President of the University of Science and Arts of Oklahoma in Chickasha and a Past Chairman of the Oklahoma Academy. He is the Academy's most experienced and successful Town Hall facilitator. John will preside over your Town Hall proceedings. He knows his stuff.

Julie Knutson

Julie is the President and CEO of the Oklahoma Academy. She has organized ten significant statewide Town Halls plus many forums and conferences. She is the most experienced public policy CEO in Oklahoma. Julie is the principal organizer of this Town Hall. She knows her stuff.

Mike Lapolla and Craig Knutson

Mike and Craig are the co-chairs of the Academy's Research Design and Production Committee. They have organized and produced this book for you. The purpose of this book is to serve as a resource and reference to help you prepare yourself for the Town Hall discussions. This is the tenth such major research book they have produced for the Academy. They know their stuff too.



John Feaver
Town Hall Chairman



Julie Knutson
Town Hall CEO



Craig Knutson
Town Hall Research



Michael Lapolla
Town Hall Research

Why This Special Town Hall?

Will Focht, PhD, Director, Oklahoma Water Resources Research Institute at OSU, Stillwater

In 2006, the Oklahoma Water Resources Research Institute (“Water Research Institute”) entered into discussions with the Oklahoma Water Resources Board (“Water Board”) and the Oklahoma Secretary of Environment concerning the update of Oklahoma’s Comprehensive Water Plan.

According to state law, the plan must be revised and updated every 10 years; it was time to get busy. The Water Board envisioned a two-pronged process: a technical study that would evaluate water supply needs over the next 50 years and a grassroots public involvement process that would produce recommendations on how water resources should be managed to assure that adequate supplies of clean water would be available to meet these needs. We were given four and a half years to finish our jobs, which meant that we needed to start in January 2007 in order to finish by July 2011.

The Water Research Institute proposed a five-phase public participation process, which was approved by the Water Board in late 2006. This special Town Hall meeting is part of that process. In this article, I briefly summarize the process and explain why it was designed the way it was.

Our Goal: A Good and Right Plan

The ultimate goal of the process is to produce both a “good” plan and the “right” plan. By good, I mean that the plan should be based on the best available science. A good plan should work well – at least on paper. But working well on paper is not enough. We also wanted a plan that was the right plan for Oklahoma. This means that we wanted to produce a plan that Oklahomans would embrace and support. We recognized that water is important to all Oklahomans and all should play a role in its responsible stewardship.

The technical studies were designed to produce information that was needed to develop a good



Will Focht, PhD, Director
OWRRI

plan. The results of these studies are reported elsewhere in this document. The public involvement process was designed to produce the right plan by rigorously involving the public in informed discussions about what provisions should be included in it. A properly designed process will not only produce good and right recommendations but also build trust and improve political efficacy to enable participants to be more productive and involved citizens.

Coupling the Good and the Right

The challenge for us was to find a way to couple the best science with a robust participation process. To accomplish this, we designed a process that would not only involve the public in learning about water resources and their management but also in asking questions and designing management strategies that experts would then analyze. It was adapted from an “analysis-deliberation” (A&D) framework published in 1996 by the National Research Council.

In the first two phases of our process (local and regional input meetings), we engaged citizens in setting an agenda for what the water plan should consider. We asked citizens to tell us what their water concerns were, what issues they wanted addressed, and how they wanted them addressed. From these comments, we grouped similar issues together and asked citizens to rate their importance for further consideration. The results of these meetings were the definition of ten “themes” of similar issues that Oklahomans told us they wanted considered in the water plan.

In the third phase, we asked citizens to deliberate on how the issues contained within each theme should be addressed in a series of planning workshops. Each of the ten workgroups met three times, about 10 weeks apart, to ask questions and learn about the predicted effectiveness of the strategies that they developed. Workshop

participants read about technical studies and attended water science and water policy seminars before the workshops began; they then learned more from experts who attended the workshops and from the studies conducted between workshops. The planning workshops concluded with a series of water resource management strategies (included in this resource document).

In the fourth phase, we will ask Oklahomans to reach agreement on a series of strategic recommendations to be sent to the Water Board for their consideration as they write the water plan. This is the purpose of the Town Hall. After the draft water plan is prepared, we will conduct a series of regional feedback meetings across the State to seek comments on the draft plan and to solicit suggestions about how the plan should be implemented. This feedback will be communicated to the Water Board as they develop the final water plan.

FIT: Fair, Inclusive and Transparent

To build support for the final plan, we wanted to make the process as good as it could be. Our guiding principles were that the process should be FIT: fair, inclusive, and transparent. In other words, we did our best to make sure that participants in the process would be treated equally, that all interests would be represented, and that everything we did was conducted in the open. We decided from the very beginning that the process would be more FIT if we did our best to recruit participants who held different interests; our theory was that the more we did to get as many interests as possible represented in our discussions, the better chance we would have of getting recommendations that stand a good chance of being acceptable to all Oklahomans.

As a result, we asked all participants to be true to themselves and to honestly and forthrightly offer their personal views. We believed that selecting people simply because they have a particular occupation or belong to a particular organization is insufficient to assuring that all voices are heard. This is because not everyone working in

a particular career or belonging to a particular organization think alike; to think so would be prejudicial. Moreover, people can have important and unique views even if they do not belong to any particular organization.

Finally, we recognized that it would be hard to reach agreement on an issue if people thought of themselves as representatives of a particular constituency. We constantly reminded people that we wanted them to simply represent

themselves and if they did so, then we could expect that the product of their deliberations would find broad support. This is what, we believe, to be the essence of a “grassroots” participation process.

The Importance of the Town Hall

The key to successful implementation of the analysis-deliberation process is to ensure that participants are both well informed (the “analysis informs” component) and participate in responsive and FIT discussions (the “deliberation frames” component). We worked hard to build the knowledge and deliberative competency of the participants throughout our process. We also worked hard to design a FIT process. As a result, we believe that the planning workshops produced strategies that will serve as a valuable starting point for Town Hall deliberations.

The Oklahoma Academy for State Goals has long experience and a proven record of success in conducting Town Halls aimed at exploring consensus on policy recommendations that eventually find support among policymakers and implementers. There was no reason why our process should “reinvent the wheel.”

We therefore asked the Academy if it would agree to host this special Town Hall on water. We were ecstatic that they agreed. We are now about to embark on the most important and critical phase of our entire process. We have every reason to believe that this Town Hall will also find success and we look forward to the recommendations that come from it.



Your Town Hall



Broken Bow Lake



Grand Lake



Illinois River



Cimarron River



Turner Falls



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Grand Lake



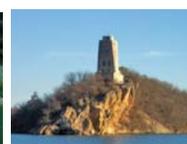
Illinois River



Cimarron River



Turner Falls



Lake Murray



*Water and
Economic Health*

The State Chamber Perspective

Ronn W. Cupp, Senior Vice President, The State Chamber of Oklahoma

Water is Oklahoma's most precious – and most abundant natural resource – and perhaps our most controversial. The late U.S. Senator from Oklahoma, Robert S. Kerr, was fond of saying that we aren't far removed from the day when water rights were settled with a Winchester. While that may be a little extreme for this day and time, water discussions do tend to become emotional. In recent years, philosophical discussions of water in Oklahoma have focused on two separate and distinct approaches:

1. *Water is a scarce resource, and consequently, the Oklahoma Water Resources Board (OWRB) should manage it for conservation and environmental uses as priorities with an increasing state role in all facets of water management; and*
2. *Water is a resource that varies with rainfall, but is sufficient to meet the needs of Oklahoma now and in the foreseeable future. Consequently, the OWRB should manage water for utilization of all uses – agricultural, industrial, municipal, oil and gas production, power generation, mining, environmental flow and rural water supply.*

There is one tenet that crosses all boundaries: first and foremost, the needs of Oklahoma's citizens must be met, and water must be provided to secure the future of our economy. All other uses are secondary.

Some have suggested that Oklahoma is running out of water and that a "sustainable" approach for the future is best. The truth is, Oklahoma has plenty of water for current use and to meet future needs. An average of 35 million acre feet of quality water runs out the southeast corner of the state and into



the Gulf of Mexico each and every year (an acre foot is more than 325,000 gallons).

In Oklahoma law, stream water is considered to be water that is owned by the public and is subject to appropriation. An appropriation is a right to use water, and a permit is required from the OWRB in order to secure an appropriation. The permit filing date determines who gets the water, ie: "first in time, first in right."

Groundwater law is much different. The law utilizes an allocation system that ties ownership of groundwater to surface land ownership so that the amount of water allocated to each landowner is determined by the number of acres of land overlying the basin he or she owns. The OWRB regulates the use of groundwater, even though it is considered private property like oil, gas, coal and other minerals.

A permit is required for non-domestic use of groundwater. Non-domestic beneficial users of groundwater include agriculture, municipalities (water supply), industry, oil and gas producers, utilities (power generation), navigation, recreation and fish and wildlife. There are no preferences among uses in Oklahoma law, except that stream water appropriations cannot interfere with domestic uses.

The Oklahoma Comprehensive Water Plan was first published in 1980 and updated in 1995. In 2006, the Oklahoma Legislature appropriated funds for the second update, which is a five-year study. The updating process began in 2007 with 42 local input meetings all across the state. In the latter part of 2008, 11 regional meetings were held to review and place priorities on input from the local meetings. In 2009, a series of Planning Workshops were held to develop strategies for various water issues.

That brings us to the Town Hall meetings. Participants in the Town Hall process will need to carefully consider the impacts of any departures from current water law that may have a significant negative and costly impact on water users of the state. They will need to consider if proposed changes warrant modifying well established water law. On each proposed issue, participants should ask how the current law has failed and how the proposed change solves the problem.

The Draft Programmatic Work Plan – a planning document to provide overall guidance and direction for technical elements of the water plan, contains the following proposals that create concern:

1. *Changing water policy and law to require conjunctive use regulation of stream water and groundwater, resulting in the favoring of stream water uses over competing groundwater uses;*
2. *Abandoning Oklahoma’s current groundwater law – meaning the loss of private property rights – by restricting groundwater permits to no more than basin recharge amounts;*
3. *Changing stream water use permitting by limiting permits to monthly or seasonable yields, making availability of the water unreliable;*
4. *Considering the impact of groundwater withdrawals on all hydrologically connected stream flows;*
5. *Implementing instream flow requirements, potentially adversely impacting all stream/ surface water users;*
6. *Increasing the state’s role in all facets of water management; and*
7. *Prioritizing uses that are positive for some, but negative for others.*

While all these proposed changes are not inherently bad, they are significant departures from current

law and regulations and have the potential to negatively impact water users.

The real issue in Oklahoma is not a lack of water, but a lack of water development. Water is a resource, and we need to view it as a resource to be managed for the benefit of Oklahomans. We need to determine how much water we really have, figure our needs for the next 50 years, devise a plan to get water where it’s needed, and finally, develop a plan to fund the needed infrastructure.

We should begin with three premises:

- (1) stream and surface water are state resources, and planning should be based on statewide issues and development;*
- (2) the private property aspect of groundwater law should be left alone; and*
- (3) no one in water-rich areas of Oklahoma will ever lack water.*

The update of the Oklahoma Comprehensive Water Plan will be a foundational document to determine policy, planning and action for water development in our state for the next 50 years. Available data clearly show that Oklahoma currently has an ample supply of combined water resources to meet both current and future projected needs. The final updated plan should reflect that and refrain from any radical departure from water law and regulations that have worked successfully the past 40 years.

One thing is certain: if Oklahoma is to ever have a truly comprehensive water strategy that meets the needs of the entire state, we must overcome the regional biases that have hampered water development in the state for decades and focus on the big picture.

Only then can we devise a strategy to raise the funding necessary to build and maintain the infrastructure necessary to provide water for all Oklahomans.

Role of Agriculture in Oklahoma's Water Plan

This report was jointly prepared by eighteen Oklahoma agricultural experts (see below)

Report Co-Authors/Coordinators/Sponsors

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The purpose of this white paper is to discuss the importance of water to Oklahoma agriculture and impacts of agriculture on the current and future economy of the state.¹ The average streamflow and groundwater recharge would likely be lower were it not for the existence of crop production agriculture and the stewardship of agricultural land managers. Additionally, agriculture continues to be an essential and vibrant part of Oklahoma's diverse economy.

Oklahoma climate data shows 1980-2000 were above average in precipitation, an aberration. Preceding that was a cyclical pattern of shifting from wet periods to dry periods every 5-10 years. Data from the first decade of the 21st century suggest we are returning to the more cyclical phase.¹⁷ Competition for water from all demand sectors will increase as agriculture manages increasing production risk that results from more variable precipitation patterns.

Water Usage

Farms cover 35 of Oklahoma's 44 million acres, therefore they are the first recipients, first users, and first managers of around 75% of Oklahoma's precipitation. Water accounts for 100% of the agricultural economy. All agricultural production requires the consumptive use of water withdrawn from soil moisture, groundwater or surface water. Water management is essential to successful agricultural production and to the

rural communities that depend on that production. Limited water supply could cause other sectors to outbid agriculture, rural communities and rural businesses for needed water, resulting in adverse consequences to the farm sector.

Livestock production and aquaculture account for about 12% of the water use in the state.² Livestock water use includes daily water intake, water for waste disposal, animal cooling, and dust suppression. Conditions are favorable for livestock production, and part of that is based on water availability and effective water management.³

Groundwater permits (not exclusive to agriculture) have expanded from less than 500 in 1972 permitting about 144,000 acre feet per year to over 10,000 today permitting over 3 million acre feet per year.^{4 5} The state's population was about 2.3 million in 1960, and is expected to nearly double to 5 million in 2060.⁶ Of the 86,565 farms in the state, 3,026 farms were irrigated, with 534,768 acres under irrigation.⁷ Farmland⁸ is a major provider of renewable water resources in the state.

Precipitation provides on average 34 inches or 127 million acre feet of water to Oklahoma annually. Farmland management directly controls the partitioning of this renewable water resource between runoff, recharge, and evapotranspiration.

When land is converted from perennial vegetation to annual crops, runoff and recharge increase. With effective stewardship of agricultural land, that runoff maintains the quality of Oklahoma waters. Thus, the current quantities of streamflow and groundwater recharge in the state are on average higher than they would be if annual crop production ceased.

“The average stream flow and groundwater recharge would likely be lower were it not for the existence of crop production agriculture and the stewardship of agricultural land managers.”

The future of surface and groundwater resources is inextricably linked to agricultural land management. Water resource plans should therefore consider the water impacts from trends in land management and land cover such as: 1) increased adoption of no-till on cropland, 2) bioenergy development, 3) loss of farmland to urban expansion, and 4) change in land cover (e.g., red cedar displacing grassland).

Irrigation

Irrigation is the number one use of Oklahoma water. Agricultural production often uses both surface and groundwater to supplement. Irrigation is primarily a Western Oklahoma phenomenon. Groundwater accounts for about 70-75% of total irrigation water use.

Irrigation increases crop yields and produces significant economic value in Oklahoma. Crop yields are on average 69% higher than yields on non-irrigated portions of the same farms. The irrigation amounts average 1.1 acre feet per acre of irrigated land. Irrigation is estimated to increase the value of production by \$221 per acre on average, or \$203 per acre foot. Irrigation of primary crops⁹ directly added about \$91 million to the state's economy in 2008.

Forests and rangelands are important to Oklahoma because of economic impact and ecosystem services. Commercial value of forests was about \$534,000 in 1960 and \$4.7 million in 2008.¹⁰ Forests and rangelands provide forage for livestock and wildlife and fisheries-based recreation, both

estimated to exceed \$1 billion per year. Other ecosystem services include water-based recreation, watershed protection, biodiversity, and carbon sequestration.

Of the terrestrial carbon sinks, forests worldwide typically account for about 60% of the carbon sequestered,¹¹ and carbon stored in Oklahoma rangeland exceeds cropland carbon storage by 3-fold or more. Agricultural production provides the economic base which allows improved management of the natural resources. Horticulture and urban landscaping are also an important part of the discussion. Greenhouse and nursery cash receipts have grown from about \$3.4 million in 1960 to \$165.7 million in 2008. Estimates of growing season landscape and lawn water use are about 50% of municipal and city water use.¹²

Agriculture also has the potential to provide renewable fuel, pharmaceutical assets, carbon offsets and other environmental assets. As the state's population grows, there will be increasing competition for land, water and other natural resources. That competition will drive up the benefits and costs in all affected economic categories.

In 1960, there were about 35.8 million acres of land in farms. Cash farm receipts were about \$694 million. There were about 14 million acres of cropland.¹³ Today, there are about 35.1 million acres. Cropland has declined marginally to about 13 million acres. The annual value of agricultural production varies by account from



about \$5.3 billion to over \$7 billion.¹⁴ A key to maintaining Oklahoma’s economic competitiveness is preserving options for future land use by agriculture—protecting access to water for agriculture is essential for those options.

Economic Impacts

Preliminary analysis shows that, in 2008, the direct impact for the Oklahoma agriculture sector, including production and processing, was estimated to be about \$20.3 billion, and the total impact of the agriculture sector on the Oklahoma economy was estimated at over \$28 billion.¹⁵ The sector’s impact on state employment was over 179,000 jobs. The pressure on shifting land and water resources out of agriculture along the rural-urban fringes of population growth areas will intensify.

Oklahoma agriculture exports over \$1.6 billion in products to foreign consumers.¹⁶ That improves the economic health of both the industry and the state economy as a whole. Those dollars are re-invested in the industry, but also in non-agricultural sectors of the state. Such exports aid in feeding a hungry world, thereby improving global stability.



END NOTES

- 1 February 2010 study based on report prepared by DASNR Water Center, OSU, with leadership of Secretary Peach at ODAFF, and cooperation and support of OCA, OFB, AF&R, and OPP.
- 2 OWRB.
- 3 *Ibid*, LMIC.
- 4 OWRB website and various OWRB publications.
- 5 Smith, D., “Oklahoma’s Water Resources: Past, Present & Future”, presentation to the Governor’s Water Conference, Midwest City, Oklahoma, November 4, 2009.
- 6 Census Bureau, US Census website.
- 7 USDA-NASS, “2007 Census of Agriculture”.
- 8 “Farmland” in this context includes improved (cropped) land and unimproved (pasture, range) land in farms.
- 9 “primary crops” generally suggests the commonly-irrigated crops of grains and cotton.
- 10 *ibid*, “Oklahoma Agriculture: 1960”, and “Oklahoma Agricultural Statistics: 2009”.
- 11 Lewis, D. “Forestry & Global Climate Change”, presentation to OLLI, Stillwater, Oklahoma, Fall 2008.
- 12 Department of Horticulture and Landscape Architecture, Oklahoma State University.
- 13 “Oklahoma Agriculture: 1960-1961; Annual Report”, State Board of Agriculture and Agricultural Marketing Service-USDA.
- 14 USDA, “2007 Census of Agriculture”; Oklahoma Department of Agriculture, Food and Forestry, “Oklahoma Agricultural Statistics—2009”.
- 15 Shideler, D. et al. study in progress to evaluate the impact of agriculture on Oklahoma’s economy, Department of Agricultural Economics, Oklahoma State University, expected release July 2010.
- 16 Oklahoma Agricultural Statistics, 2009.
- 17 see Oklahoma Climatological Survey 100 years of precipitation: http://climate.mesonet.org/climate_trends.html

Water, Climate Change, and Economic Advantage

Dr. Ken Crawford, State Climatologist and Gary McManus, Assistant State Climatologist

The recommendations below are abstracted from a general climate change issue paper published by the Oklahoma Climatological Survey. Copies of the complete paper may be obtained online at http://climate.ok.gov/newsmedia/climate_statement.pdf; or by calling (405) 325-2541 or email: ocs@ou.edu

Recommendations

OCS recommends that Oklahoma aggressively pursue four initiatives to address the risks of both climate variability and climate change.

First, the state should undertake a comprehensive assessment of Oklahoma's social and economic vulnerability to climate variability as well as climate change. Learning to adapt to nature's extremes now will yield benefits in reduced disaster losses, regardless of the future trajectory of climate change. Climate change may also bring economic opportunities that would be identified in such an assessment.

Second, OCS recommends immediate funding of the Oklahoma Water Resources Board's Comprehensive Water Plan study to identify existing as well as projected needs for water.

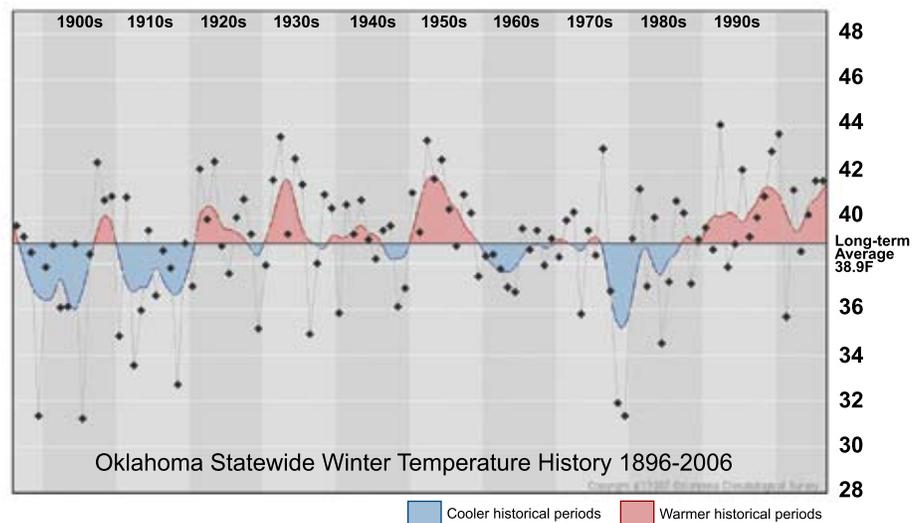
Third, OCS encourages efficiency programs to reduce our growing demand for energy.

Fourth, OCS recommends investment in renewable energy technology and production. Oklahoma has already demonstrated the successes of wind energy; similar efforts should be undertaken to advance development of solar and sustainable bio-energy as well as fostering further research and development of wind energy.

Even if climate does not evolve as expected, these steps will yield longterm benefits to Oklahoma's society and economy through reduced losses to existing climate and weather threats and cost-savings through reduced energy use. If climate does evolve as expected, Oklahoma will be better positioned to adapt to those changes without rapid social upheaval.

Furthermore, building resilience to climate and weather events will help position Oklahoma at a relative advantage to neighboring states, especially in attracting businesses that are dependent upon a continuous water supply.

This statement is the first in a series issued by OCS which delineates the impacts, both beneficial and detrimental, of a warming climate system on the economy of Oklahoma and the quality of life for Oklahomans. Future statements will illuminate possible impacts to specific industries, such as water management and agriculture.



Oklahoma statewide average winter temperatures since 1896. The warming trend evident since the late 1980s has occurred during an extended drought-free period.



*Water and
Your Physical Health*

Water, Conflict and Hope: U. S. Perspectives

Michael Greenberg, PhD, Associate Editor, American Journal of Public Health

Water has been both a source of conflict and a weapon used in conflicts, and water systems have been targets in conflicts started for a wide range of reasons. Water-related disputes often end before obvious ecological and human health consequences emerge, but not always.

United States Perspective

Part of US western lore, memorialized in books, television, and film, are conflicts between farmers, ranchers, and urban dwellers over limited water supplies. For example, a century ago (1907-1913), the Los Angeles, California, aqueduct was attacked to try to prevent diversion of water from Owen Valley to the growing city of Los Angeles.

In 1935, Arizona called out the National Guard and militia to its border with California to demonstrate its anger with the construction of the Parker Dam that would transfer water from the Colorado Basin to California. With metropolises growing in Los Angeles; Phoenix, Arizona; Las Vegas, Nevada; and other dry Sunbelt locations, the potential for conflict is growing.

The western Sunbelt is not the only area in the United States with water-related conflicts. Florida, although surrounded by water, nevertheless has limited freshwater sources, and the state government is under pressure to redirect suburban encroachment and waste management sites away from the Everglades, inland freshwater bodies, and Florida's major aquifers.

This is a nonviolent, but exceedingly important struggle that will impact the economy, the environment, and the quality of life in Florida. Moreover, Florida is engaged in an ongoing and unresolved water dispute with Georgia and Alabama—just one of several interstate conflicts over water. Even the Northeast, despite its abundant rainfall and snow, has had water resource disputes, especially during droughts. For example, during the late 1960s, the Northeast experienced a severe drought. For 36 months, low precipitation



*Hetch Hetchy Reservoir (CA)
America's first major controversial water project*

led to calls for bathless and shaveless days, curtailment of toilet flushing, business closings, and other conservation measures.

Some fire departments faced increasing threat of fire and less water pressure to fight fires. As the drought worsened, flow in rivers declined to the point where almost half of what was flowing downstream to be used as public potable water was treated sewage. Some areas had more water than others because they had instituted more effective conservation practices and relied on underground supplies that could be drawn upon during a drought.

Rather than share dwindling water supplies, some local governments and private water companies rebuffed requests to spread limited resources. There was serious intercity political conflict.

In New Jersey, former Governor Richard Hughes declared a public health emergency and ordered the water departments to share water.

Overall, the United States has legal processes for adjudicating these disputes, thereby reducing potential human and ecological consequences and allowing for strategic planning and investments rather than violence.

Water and Your Health ... in Oklahoma

Jeanne O. Hayes, MD, University of Oklahoma School of Community Medicine

Jeanne Hayes, MD is an experienced Tulsa pediatrician who practices at the University of Oklahoma School of Community Medicine. She is completing a Master of Public Health (MPH) degree at OU. Dr. Hayes has a long-standing interest in water as a physician, mother and eastern Oklahoma landowner.

Water is essential for human health. Not only is water consumption necessary for the maintenance of life, water is also an important part of basic human hygiene. Protecting the quality and quantity of water is of primary importance to all societies, and the prevention of its contamination a primary concern for public health. It is believed that improved sanitation and greater access to clean drinking water has increased the lifespan and improved the general health of Americans, greater than any other advancement in the field of medicine.

History of Waterborne Illness

Waterborne Illness was a major cause of morbidity and mortality in the United States in the late 19th and early 20th century. It is estimated that one in five people died of microbial infections, the major source of which was exposure to drinking water contaminated by cholera and typhus. In the early 1900's this health threat was effectively eradicated by the widespread use of chlorine to disinfect municipal drinking water.

The 1970's represents another important time period for water and health issues. The Environmental Protection Agency was created, and the passage of both the Safe Drinking Water Act, which regulates the purification of drinking water, and the Clean Water Act, which regulates industry discharge into surface waters occurred. Both of these were enacted for the purpose of protecting public health from contaminated water.

The CDC now estimates that 900,000 people become ill each year and 900 people die as a result of waterborne disease. This is assuredly an underestimation due to problems identifying disease outbreaks as waterborne. Community acquired infections have symptoms indistinguishable from illnesses caused by waterborne pathogens, and it is oftentimes difficult to identify sources of infection because the same pathogens that can contaminate water, also contaminate food.

Health Effects

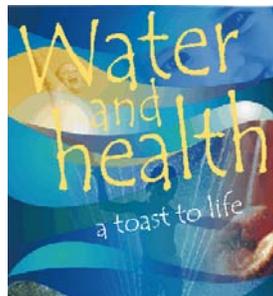
It is clear to see that from a public health standpoint, it is important to understand the significance of water contamination and its effect on health. It is also important to keep in mind that certain vulnerable populations are more effected by water contamination than others. These include

pregnant women and developing fetuses, infants and children, the elderly, people suffering from chronic diseases, and people with weakened immune systems such as those undergoing chemotherapy for cancer treatment.

These more susceptible populations may develop more severe infectious disease symptoms from a smaller quantity of contaminant. Developing fetuses and children are particularly vulnerable to chemical exposure due to the rapidly developing organ systems of fetuses, and the continued neurologic development of infants and young children. These populations make it difficult to confidently say a water source has a 'safe' level of contamination.

Regulated Water Purity

The National Primary Drinking Water Regulations, developed by the EPA, list over 80 regulated water contaminants, their maximum contaminant level allowable in drinking water, their most



frequent environmental source, and their potential health effects. The regulations are divided into 5 categories of contaminants. These include microbial contaminants, and four subcategories of chemical contaminants: inorganic, organic, disinfectants and disinfectant by products, and radionucleotides. A review of the information contained in the regulations allows for some generalizations to be made by type of contaminant.

Microbials: The most significant form of water contamination from a public health standpoint occurs when water becomes contaminated by pathogenic microbials. This is because the ill effects from exposure occur almost immediately and can be widespread. Waterborne microbial pathogens such as coliform bacteria, protozoa, and viruses, enter surface water sources through direct contamination by animal and human feces.



Humans can be exposed through inadequately treated drinking water (protozoa such as cryptosporidium are difficult to eradicate), but the most frequent exposures occur through the recreational uses of water.

Swimming pools, hot tubs, fountains, ponds, lakes, and rivers can all become contaminated by microbials. Exposure to these pathogenic microbials most often causes acute gastroenteritis symptoms of vomiting, diarrhea, and dehydration, with particular morbidity occurring in young children and the elderly. Less commonly, some protozoa found in warm stagnant waters can enter through the nasopharynx and cause amebic meningoencephalitis, a particularly deadly infection.

Chemicals: Chemical contamination of water is less significant from a public health standpoint only in that its impact on health typically is not acute, and occurs over the long run, allowing for more time to address these issues when discovered. The chemical contamination of drinking water and

the chemical pollution of watersheds has become a growing problem as water and watersheds have become the final sinks for industrial and agricultural chemicals. The majority of the tens of thousands of chemicals being produced today have unknown health effects and have never been tested for toxicity.

Chemicals can contaminate both surface and ground water sources. Surface waters are particularly susceptible to contamination by chemical discharges from industries, agricultural chemicals such as fertilizers, and erosion of contaminated soil during significant rainfall events. Ground water can be contaminated by the erosion of naturally occurring deposits in the soil, such as lead, arsenic, and copper, as well as discharges from the rupture of underground storage tanks.

Inorganics: Inorganic chemicals find their way to surface waters through contamination from byproducts of industry, including aerospace, steel, metal, and plastics; petroleum and metal refinery discharges; agricultural fertilizers and other chemicals that runoff into streams following heavy rainfall; and erosion of soils that contain naturally occurring deposits, as well as excessive amounts of chemicals such as nitrates from over fertilization.

There is a wide range of health effects from exposure to these chemicals, most of which involve chronic disease. These include increased cholesterol, hypertension, kidney and liver diseases, dermatitis, gastrointestinal disease, and increased risk of cancers. Inorganic chemical contaminants that are a major health concern for children include nitrates, lead and fluoride. These can cause methemoglobinemia ('blue baby syndrome') in children less than 6 months of age, mental impairment and learning disabilities, and mottling of teeth and bone disease, respectively.

Organics: Organic compounds originate mainly from the agricultural industry and chemical factories, and enter surface waters through runoff and industry discharges. Health effects include diseases of major organs such as the liver and

kidney, bone marrow disease, increased risk for cancers, and disruptions in the reproductive system.

Disinfectants and disinfectant byproducts that are created when chlorine interacts with organic compounds can be toxic to humans. We are exposed by treated drinking water, and health problems include dermatitis, eye and nose irritation, and sometimes liver and kidney disease.

Radionucleotides enter groundwater from the decay of naturally occurring elements in the soil, and exposure to any of these compounds results in an increased risk of cancer.

Water Quality and Dumping

Water quality issues are emerging which concern the possible presence of pharmaceuticals, including antibiotics, personal care products, and hormonally active agents in drinking water, and their uncertain health effects. Most of these chemicals come from domestic wastes; however, some hormonally active agents and antibiotics which contaminate surface water originate from concentrated animal feed operations (CAFOs) and poultry operations.

Possible human implications are the disruption in normal function of the reproductive system, hypothalamus, pituitary and thyroid. Questions remain as to whether there is a link between the rising rates of obesity and exposure to hormonally active chemicals. There is continued concern about the emergence of ‘super bugs’, microbials that are resistant to antibiotics due to repeated exposure to low levels of antibiotics in the environment. Researchers looking at the growing rates of autism in children are considering exposure to chemicals in the environment as a possible cause.

So What?

So, what does this mean in regard to the health of Oklahomans? The Oklahoma Department of Commerce lists the main industries in Oklahoma as Aerospace, Petroleum (including refineries), Agricultural (which includes CAFOs and Poultry

industries), Biomedical, and Manufacturing (tires, metal, and plastics, to name just a few).

Through these industries there exists a potential for Oklahomans to be exposed to many chemicals that have negative impacts on health, as well as microbial contamination of surface waters from animal sources. However, industry discharges and the treatment of our drinking water are well regulated. Significant contamination from these sources would only occur if there was an unexpected and unplanned event.

What continues to be of great concern is the contamination of surface waters from unregulated sources, such as agricultural runoff of fertilizers and other chemicals, and animal feces during significant rainfall events. The drinking of ground water accessed through private wells is also not regulated, and it is up to the owners of the wells to check for contamination.

Final Remarks

Oklahoma is currently ranked 49th in the country in overall measures of health. Can we afford to have contaminated water add to the burden of disease in this state? It is not possible to rid water of all contamination. Therefore, we must be aware of possible problems and limit exposures to them. Continued monitoring of ground and surface waters in the state is essential.

Health care providers should receive training to improve their understanding and recognition of waterborne disease. This will improve the accuracy of surveillance data, and the more rapid recognition of new pathogens.

The public should be better informed about the actual risks from water contaminants so that they will not overreact or under react to situations.

And finally, it is easier and more cost effective to prevent contamination and pollution of Oklahoma’s fresh water supplies to protect public health, than to try to correct it when it occurs.



Other Water Town Halls

2002 - New Mexico First

2003 - Oklahoma Academy

2004 - Arizona Town Hall

2002: New Mexico's Water

New Mexico First Town Hall, May 2002, Socorro, NM

EXECUTIVE SUMMARY

“A New Mexico where water is valued as the lifeblood of the state’s rich cultural diversity and the basis for its economic engine”.

This is the vision of the 28th New Mexico First Town Hall. Establishing a framework for policy decisions that involve tough trade-offs is imperative, the attendees agreed, as is identifying institutional, technological and behavioral changes that will optimize the availability and quality of water. New Mexico’s water supply is finite and highly variable. Furthermore, in many areas it is not sustainable given present use levels, much less future needs. Also, most of the state’s surface water is already spoken for, although most water rights claims have not been adjudicated. In some areas, legal rights to appropriate water exceed the amount of water available. The Town Hall articulated four questions that pose significant challenges and offer opportunities to move New Mexico into a new era of active water management. The Town Hall declared that balance is a fundamental guiding principle: (1) balance between sustainable supply and demand, (2) growth and environmental protection, (3) agricultural and municipal/industrial uses and (4) rural and urban communities.

Who Has the Rights To Use New Mexico’s Water? Knowing who has the rights to use what water is essential for planning; yet the current adjudication process is slow, cumbersome and expensive. Increased funding for the Office of the State Engineer could allow for staffing creases and database development. Further, parties should be encouraged to enter into negotiated settlements instead of litigation.

How Do Additional Factors Relevant to New Mexico Affect Our Water Resources? Among other obligations, we must comply with Endangered Species Act standards on riparian



habitat maintenance, honor Native American rights, honor the legal standard of prior appropriation of rights, conform to treaties with Mexico and meet rigid delivery schedules to fulfill our interstate river compacts. These factors are often the source of litigation; instead New Mexico should foster alternative, collaborative ways of handling such disputes. In addition, New Mexico should explore renegotiating interstate compacts, treaties and obligations. We must also find ways to store excess water above external delivery obligations in wet years.

How Will We Plan for the Future? Planning for New Mexico’s water needs is complicated by water supply variability from region to region, year to year and season to season. This reality is being addressed by current regional planning efforts, which engage stakeholders at all levels. The challenge will be to integrate regional initiatives into a statewide plan. Information is key to planning, and New Mexico needs additional resources to complete a water rights database. Finding funds to support these projects is a significant challenge, as is creating a plan that will balance the benefits of economic growth with the imperative to preserve traditional cultures and quality of life while remaining within projected supply.

How Can We Involve the Public in Addressing Critical Water Issues? Diverse groups must be engaged; decision makers must be given tools; scientists must be trained. Agricultural users must be given resources and incentives to implement conservation and watershed rehabilitation programs. Better-informed citizens are more likely to participate in planning processes and help garner the support of others for decisions they help to make. Universities, the New Mexico Department of Education, the national labs and others might jointly convene public forums to debate priorities for regional and statewide water administration.

RECOMMENDATIONS

Adjudicate water rights for the entire state with the goal of completion within 15-25 years.

Enforcement of water rights and usage, protection against losing New Mexico's water to neighboring states and Mexico and an effective system for transferring water rights and for water banking all depend on an accurate accounting. To date, only a small portion of water rights claims have been adjudicated, so the Town Hall urges the following actions:

- *The governor, legislature and judiciary should establish and fund procedures to determine the volume and priority dates of water rights, including Native American rights, by 2018, with first priority given to interstate streams*
- *The legislature should authorize and fund the creation of New Mexico water courts to allow specialized judicial consideration of complex water rights cases and to improve the efficiency and timeliness of adjudications and administrative appeals from the State Engineer.*

Aggressively develop, preserve and protect New Mexico's water sources.

- *The growing demand for water in New Mexico makes it imperative to supplement our finite supply with new sources and protect existing resources.*
- *Adequate resources should also be provided for New Mexico's legal defense against external threats.*
- *The legislature should authorize and fund the Office of the State Engineer to provide a comprehensive water model to determine quantities and projected longevity of our water resources.*
- *An entity, preferably already existing, should be designated to coordinate and implement water-related activities. A dedicated revenue stream should be established for this purpose.*
- *Conservation should be aggressively promoted; strategies could include tax incentives, water banking, public education and involvement, structuring water rates to provide incentives for conservation and conservation technologies.*
- *Watersheds and riparian areas should be rehabilitated, protected and maintained through comprehensive management.* • *Current and*



*Canyon Largo, New Mexico
San Juan River Basin*

- *developing technologies should be deployed for the purification of water of impaired quality.*
- *Methods for reuse of treated effluent for beneficial use should be researched/implemented.*
- *Building codes should be revised to encourage water saving and harvesting designs, such as water-collecting gutters, storm sewers and landscaping.*
- *Infrastructure and systems for conservation and more efficient distribution and waste collection and disposal should be upgraded.*
- *Existing consortiums of research institutions should be developed and enhanced to work on developing technology in evaporation, sensor technology, real-time data collection, desalinization, reinjection, watershed rehabilitation and weather modification.*
- *Water law should be aggressively enforced by priority and amount and those who illegally use water as well as those who damage water infrastructure should be prosecuted.*
- *Loss of entitlements should be prevented by placing full allocations to beneficial use of the San Juan-Chama Project water and Gila River water.*

Provide adequate funding, appropriate organizational structure, and necessary statutory language to ensure implementation of all aspects of New Mexico's active water resource management.

The Town Hall sees an urgent need to adequately fund and coordinate the activities of all state agencies and other entities involved in water management, including:

- *water rights adjudication: admin and mediation*
- *water resources: data collection, supply assess*
- *water planning: regional, drought, conservation*
- *compliance issues (e.g., interstate river compacts)*
- *interaction and cross-agency coordination*
- *providing accountability to the legislature*
providing technical assistance to communities to
secure water rights and water supplies

These elements of water management currently are assigned to specific agencies. For those that are not, the Town Hall recommends:

1. *Add to the Interstate Stream Commission's statutory mandate to include explicit authority to acquire and manage water for environmental and quality of life uses.*
2. *Support a State Engineer's forum to develop legislation in 2003 to address current loopholes in the permitting process, including unregulated domestic well development, lack of required metering for surface and ground water diversions and clarifying the purpose of impounding water for unregulated uses.*
3. *Provide adequate funding of existing agencies to allow them to fulfill their statutory authorities.*
4. *Provide resources to the OSE to exercise its authority to limit ground water diversions and require metering of domestic well use.*
5. *Adequately endow the Water Trust Board and appropriate funds for water projects, especially to leverage federal funds.*
6. *Avoid costly and lengthy litigation by having the 2003 legislature consider a joint memorial to the U.S. Congress asking that judicial agencies emphasize settlement of Native American water claims.*
7. *Ask the state legislature for a joint memorial to encourage our congressional delegation to secure additional federal funding for our national labs and universities for water-related research and development.*

Create a state water plan, integrating regional plans, no later than December 31, 2004.

The Town Hall believes a comprehensive state water plan, reflecting significant public

involvement, is a central tool for actively managing water resources. To this end, the Town Hall agrees that the legislature should mandate the creation of a state water plan, with its content elements defined, utilizing completed regional water plans to the extent practical. The Town Hall makes these further recommendations:

1. *Include in the mandate adequate funding for staff, consultants, quantification, database development and other expenses.*
2. *Include in the plan mechanisms for implementation of recommendations, ongoing management of the resource and regular revisions and updates.*
3. *Incorporate concepts of sustainability to ensure that short-term uses do not compromise our ability to meet long-term needs.*
4. *Strengthen the existing regional water-planning template and create a state water-planning template to ensure stakeholder-driven public participation.*
5. *Use the state water plan as a strategic umbrella, placing regional plans under it to generate a list of projects within the state framework, followed by prioritization of funding for projects.*
6. *Provide in the plan model ordinances for small communities and templates for drought plans.*
7. *Public education integral to the state water plan.*

The Implementation Team should also: Work with the media to ensure comprehensive, timely water-issue coverage: Recommend funding for public information officers and legislative liaisons at the Office of the State Engineer and the Interstate Stream Commission. Work with other entities in the state that can assist with public awareness.

Create a recurring revenue source for funding the Office of the State Engineer, Interstate Stream Commission and Water Trust Fund.

The Town Hall believes that a long-term revenue source, in addition to general funding, is needed for managing the state's water.



2003: Oklahoma's Water

Oklahoma Academy Town Hall, October 2003, Quartz Mountain, OK

INTRODUCTION

The 2003 Town Hall is an examination of two principal natural resources: energy and water. These assets have at different times and under varying circumstances represented the flash point of politics, commerce and wealth in Oklahoma. Control of energy (or more precisely its physical sources) and water can represent enormous wealth, determine the vitality of cities and regions and influence the course of peoples and their culture.

At times, water and forms of energy have had scarce intrinsic value because of their abundance. Natural gas was flared instead of consumed; water produced and stored in amounts vastly beyond the rate of depletion. Now both are prized assets.

If the question is how to best manage these indisputable assets, the answers may be different for energy versus water ... As for water, best use cannot be determined without resolving the question of control. Significant political and economic interests are at stake for those who control or own those hydrogen and oxygen compounds.

In contrast with the situation nearly 100 years ago, the public discourse on the control of natural resources involves a far more influential force in the form of our state's tribal governments. It should be no surprise given the history of Native Americans and oil that the tribes are vigorously asserting tribal sovereignty in the arenas of energy and water. The participation by the tribes in this dynamic must be recognized and accepted by all citizens of Oklahoma.

A MEANINGFUL WATER PLAN

State law requires that the State Water Plan be "updated" every ten years. The next update is due in 2005. To-date, there seems to be little energy



behind this effort beyond the efforts of the Oklahoma Water Resources Board staff. Any effort to responsibly produce a Plan must begin as soon as possible. The Legislature has appointed 19 legislators to this task. They have yet to meet.

Responsibility for the "updating process"

The responsibility for coordinating the "updating process" resides under statute with the Oklahoma Water Resources Board, subject to legislative oversight and funding. Regional governmental organizations should take responsibility for providing input unique for their respective regions.

Problems and concerns with the process

There are a number of concerns relative to the process to update the water plan:

- Lack of adequate time for development of the plan due to pending expiration of the existing plan;
- Inadequate financial resources to achieve the best plan possible (noting that critical scientific data, research and analysis and the accurate inventory of water resources are vital);
- Regional bias that adversely impacts overall state interests; and
- Lack of legislative support and commitment, evidenced by the legislature's operation in a crisis management mode.

Essential components of an effective plan

An effective water resources management plan should educate people that water is a valuable resource to be managed and conserved. The plan may include provisions for the coordination between state agencies and between the state and federal agencies.

Other components include:

- *Dispute resolution authority and enforcement;*
- *Vertical integration of the stakeholders (e.g., OWRB, regional governments, local governments, environmental, commercial and agricultural grassroots organizations);*
- *Water infrastructure financing;*
- *Tribal rights issues;*
- *Adequate funding for effective implementation;*
- *Adequate education for effective implementation;*
- *An accurate inventory of the state's water resources;*
- *Cost projections;*
- *Authority and composition of the regional planning bodies;*
- *Issues and implementation of water transfer; and*
- *Oklahoma's future water needs (with 50-year to 100-year horizons).*

Goals for water management

Water management goals include:

- *Developing new lakes and reservoirs*
- *Promoting desalinization projects*
- *A new emphasis on watershed planning (as opposed to individual body of water planning);*
- *Promotion of economic opportunity and development;*
- *Preservation and enhancement of the environment;*
- *Protection of lives and property from floods and drought;*
- *Expansion of agricultural production and agribusiness activity;*
- *Development of recreational opportunities;*
- *Maintenance and improvement of water quality;*
- *Encouragement of water conservation;*
- *Placement of excess and surplus water to beneficial use;*
- *Water supply and quality should be adequate to assure development that is economically, environmentally and socially sustainable for the foreseeable future;*
- *Encouragement of public participation in water resource planning; and*
- *Development of water-related infrastructure.*

TRIBAL SOVEREIGNTY

Creating a responsible sovereignty balance Tribal sovereignty is considered at this point in our Town Hall report because it is a bridge issue which affects not only water and energy issues, but influences other important aspects of our economy. Sovereignty is also relevant here because energy producers, agribusinesses, water planners and others have an important stake in the creation of a sovereignty balance. Tribal sovereignty is an issue with deep federal roots. States have little direct

influence on the issue. That said, tribal sovereignty is a reality that requires the State of Oklahoma, in sovereign-to-sovereign negotiations, to compact with a tribe when the rights or interests of the two sovereigns conflict or their sovereignty overlaps.

Oklahoma has the second highest state proportion of citizens claiming Native American ancestry. About 11% claim Indian ancestry. Only Alaska has greater proportions. Given legal reality and precedent, it seems that states must either negotiate or litigate.

Both state and federal law provide for tribal authority in our environmental regulatory scheme. The fact that Oklahoma is the home of 39 tribes present special challenges in establishing consistent and predictable environmental regulation. Such a scheme is essential to economic growth. Meeting this challenge requires a solution that honors tribal sovereignty with the objective of forging a consistent predictable statewide regulatory scheme.

In the case of water ownership and rights, water quality issues and regulation and water usage, the tribes claim that (at least in part and as to certain lands) the State must compact with them if the State desires to exercise its overlapping sovereignty. Otherwise either the State cannot affect the interest or the Tribes have sole jurisdiction.

No other state has a stronger incentive to resolve these potential conflicts than does Oklahoma. A recent vehicle for establishing a "common ground" is the compact – or agreements between tribal and state governments. Compacts are not universally popular or well understood. And, they may require the approval of the federal government.

Resolution of state/tribal government conflict

The significance of the sovereign tribes to Oklahoma, in economic terms as well as population and legal status, compels the state to employ negotiation as the preferred means of conflict resolution before resorting to other forms, such as litigation or changes in federal law. The fact that tribes have sovereign status does not lead to the conclusion that the relative interests are inherently

adversarial. Negotiation, however, requires both sides to have a solid understanding of their relative rights and how those rights would be recognized in court. Negotiation should be successful because the unique legal rights of tribes can be an asset to the state and there are mutual interests that can be served by cooperation. Moreover, negotiation lessens animosity and usually allows for better and more cost-effective results than litigation. Litigation should occur only after good faith efforts at negotiation have been exhausted and only in pursuit of narrowly defined issues that are properly styled.

State approach to tribal compacts

The state should not abandon compacts but explore new methods of developing compacts. Our compacts are working as well as can be expected considering that the process involves the state and 39 sovereign tribes. New methods, such as the multi-tribe and model compacting, ease the burden of negotiation on all parties and, in principle, may be favorable.

Benefits to state of successful compacts

The current compacting environment is restrictive, burdensome and time consuming, involving federal restrictions and federal decision. Compacts should be used to level the playing field between tribes and states, addressing critical issues such as tobacco, gaming, water rights and environmental standards.

Compacts which facilitate fair revenue sharing provisions benefit the state and its citizens. Further, water issues are more likely than any other issue to lead to litigation, especially because water rights are so emotionally charged for the stakeholders. To the extent water compacts are able to be negotiated, the process is contentious and extended, sometimes taking up to 20 years.

A more effective compact process, possibly involving dedicated groups with institutional knowledge and expertise, would avoid the cumbersome and time-consuming process. This potential elimination of delay and uncertainty could have a direct positive impact on economic development both for the tribe and for the state.

ROLE OF WATER

Oklahoma's Economy, Culture and Future

It is helpful to analogize water with oil and gas production.

Would Oklahomans ever dream of pumping oil, and then letting all the oil Oklahoma does not use seep back into the ground? Would Oklahomans ever dream of producing natural gas, then “flaring” all the natural gas that Oklahoma does not consume? Would Oklahomans refuse to sell energy commodities to Illinois because “we don’t like them?” Would modern Oklahomans think about drilling on Indian lands without permission . . . or allow Native Americans to have the sole right to dictate how/where/when drilling could and could not take place in the state?

The Oklahoma Water Plan was written and published in 1995 and legislation requires it to be revised every 10 years (2005). It is acknowledged that the plan is comprehensive yet ineffective because of a lack of actionable items supported by funding and/or proper organization.

One of several major voids in the Plan relates to a “state water transfer policy.” Most agree that selling surplus water is acceptable. Many disagree about the definition of “excess” ... or even if “excess water” is an acceptable concept. While Oklahoma law provides for a definition of “surplus water,” reality requires a lot of judgments – both scientific and emotional – to be made in defining “excess or surplus water” for any significant proposed transfer.

Intrastate and interstate transfer of “excess water”

The concept of excess water is problematic. The visceral tendency is to disregard the notion of excess when water is so precious. Memories of the pernicious effects of drought – especially to a state ravaged by the Dust Bowl – are not easily disposed of in favor of abstract commodity management.

A definition of excess water that would allow the transfer of water both within and without the boundaries of Oklahoma must take into account numerous factors. The current statutory definition

is supply less all current beneficial use, projected use for 50 years into the future and low flow protection (ensuring domestic water use rights). The statutory definition should be changed to “supply less the following”:

- *The future use of water by local citizens and entities;*
- *The present and future needs for water by all Oklahomans;*
- *Appropriate lake level management plans and release policies (including adjustments for future sedimentation);*
- *Financing opportunities for water and waste water infrastructure and related economic development projects;*
- *Obligations of the state and municipal trusts for repayment of construction and maintenance costs of the water supply storage; and*
Protection of the integrity of lakes, rivers and streams involved (including but not limited to wildlife management and water fowl) in the watershed.

Distinctions should be made between surface water and ground water, while recognizing there is a connection between ground water and surface water. (The Arbuckle Simpson aquifer, with its emanating springs that form the base flow of streams is an example of this connection.) There is, generally speaking, more surface water in Oklahoma than the Clean Water Act and Environmental Protection Agency require, and in theory the water could be transferred either within or without the state.

There must be a balance of interests, acknowledging the tension between the economic benefits and market forces, but also the environmental concerns. Once these factors are considered in the determination of excess water, transfers should be prioritized first to in-state and second to out-of-state transfers.

Accurate and timely surplus water forecasts

The Oklahoma Water Resources Board is currently providing an adequate projection of future uses. These projections are based on projections of population and water use, monitoring of groundwater and surface water levels and assessments of potential areas of shortfall. The projections could be improved with respect to forecasting groundwater availability and environmental needs.

Optimal Water Planning Structure

Regional Planning Groups (“RPGs”) should be created, based upon the model established in Texas Senate Bill #1. The RPGs should be organized, for administrative reasons, around the existing Council of Governments (“COG”) structure. Membership on the RPGs should be inclusive of all major stakeholders, including, but not limited to, municipal, farming, ranching, industrial, tribal, and environmental interests. OWRB should support the RPG process, and integrate their regional plans into one state-wide plan. The updated water plan should result from a “bottom-up” regional planning process. This process should have a two-tiered approach with the first tier being a technical analysis and the second tier would focus on the input of the participating stakeholders in the planning process. This procedure should also be transparent and should be open to all stakeholders.

The planning process must all be based on comprehensive information to allow for better decisions. The reason to fund the planning process and its implementation adequately is in part to provide this comprehensive information, which can be used to educate the stakeholders and decision makers so that better decisions can be made. One education technique that has worked well is to provide visual learning tools which indicate visually the effects of making choices. Recently, federal grants have been awarded for the creation of these types of decision assistance tools.

The planning process must also look for solutions for the communities in Oklahoma that will be facing new EPA rules that will be issued over the course of the next few years. The planning process should provide means for communities to deal with these issues effectively.

Because the planning process requires a review every ten years, the planning process should include an annual report to continue the educational responsibilities and maintain the interest of the stakeholders between each of the ten-year planning periods. Those in charge of implementing the plan must be independent of those establishing the plan. All projects must relate to the overall plan. Tribes must be included from the beginning.

Water Conflict Resolution

The most contentious “water war” in recent Oklahoma history was over a proposal to sell water to Texas. Lost in that emotional argument was the question of why Texas wanted to buy the water. The answer is Texas Senate Bill 1, which established a planning structure for Texas to assess future needs and try to match those needs with supply. Texas quickly determined that demand will exceed supply and proceeded to remedy the problem.

Almost every water dispute (Illinois River, Lake Altus, Tar Creek, selling water) is characterized by (1) no authorized body to adjudicate or resolve the dispute; (2) lack of knowledge of the technical and policy issues due to lack of committed resources; and (3) the lack any comprehensive regional planning processes that are effective and proactive. Many believe that the detail of an effective planning process must be included in an updated Water Plan if it is to be a responsible one. One alternative is for these disputes to be settled in the courts.

Resolution of water disputes

In general, courts should be the forum of last resort for the resolution of water disputes. Intermediate levels of resolution are preferred, ranging from informal proceedings at the OWRB to formalized proceedings before neutral third-parties such as IIMADR (Institute of Issue Management and Alternative Dispute Resolution), to other third party mediation dispute resolution procedures agreed to between the involved parties. The benefits of using such procedures can range from education of the disputing parties to formal agreements based on compromise.

Groundwater/Surface Water Issues

Water transfer, pollution, usage and recharge issues are controversial. Current Oklahoma law and policies do not always adequately address these issues and tribal concerns.

Need for new dispute resolution mechanism

Generally speaking, Oklahoma law is effective in regulating the use of underlying ground water.

However, some question whether there is efficient use by landowners and whether Oklahoma regulations are appropriate. Oklahoma needs to create a mechanism to give perceived stakeholders a forum to address concerns about possible conflicts between private property interests and what may be perceived as larger societal needs recognizing the existing relationship between underlying groundwater and surface water emanating from the sole source aquifer.

The linkage between groundwater and surface water requires significant study. After the dimensions of this linkage have been determined, Oklahoma’s laws have been reviewed in light of any tensions between groundwater and surface water rights and in light of any tension between public and private interests.

Philosophical conflicts exist between our desire for environmental quality and sustainability guarantees and our fundamental property rights. One promising alternative to government regulation of groundwater is the creation of voluntary private corps of citizens that have property and water rights in a shared basis/aquifer. Proper balancing of incentives for sustainable water usage would be encouraged. These may be chartered by the state, but would consist of private, local, communal owned and controlled organizations.

Obviously, the Oklahoma legislature and the Governor and executive branch should be responsible for making critical water rights decisions; however, these decisions must include input from interested stakeholders. In particular, tribal governments have made claim to water rights incidental to tribal lands in Oklahoma. The rights claimed are based on various historical and legal precedents.

In recent years, tribes and the state have managed a good working relationship in addressing water issues. The compacting process is useful in reaching solutions to issues arising from competing interests. In addition, the state government and the tribes have many opportunities to partner for mutual benefit.

Recommendations of the Town Hall

In conjunction with the **Oklahoma Water Plan** due to be updated in 2005, the Academy Town Hall acknowledges the importance of water as an economic driver for the future of our state, and believes there should be a sense of urgency in the development of a comprehensive plan to provide statewide access to the distribution system, providing adequate water resources throughout the state. The Oklahoma Academy Town Hall makes the following recommendations regarding water:

1. The Oklahoma Water Resources Board (OWRB) plan should integrate a comprehensive water conservation program that includes the following components: (1) the encouragement of progressive pricing mechanisms, (2) funding of innovative approaches to conserve water quantity and preserve quality, (3) incentives for decreasing water use in all areas, (4) mandatory conservation in government facilities, and (5) the harnessing of market forces to preserve and protect water resources. The OWRB should facilitate drafting a completely new state water plan to include all stakeholders in the drafting process.
2. The OWRB should coordinate the planning process for ongoing state water plan updates. A regional planning structure should be adopted. Each regional group should include reps from all area water stakeholders. These interests should include existing organizations such as COGs or the local government representatives and tribal representatives, agriculture, recreational, environmental, and industrial users. University and state agency staff should be utilized as planning resources. The Oklahoma Water Plan should be open to on-going review with amendments as needed.
3. The Oklahoma Legislature should amend current law to establish the creation of regional water planning groups (RPG) which could be

geographically and administratively organized around the Councils of Government (COGs). Membership of the RPGs should be broad representation of all stakeholders including tribes, environmental, agricultural, farming, industrial and municipal representatives. It may be appropriate for the RPGs to have trust authority for the purpose of being an eligible entity for financial assistance for implementation of water/waste water infrastructure projects and activities.

4. Governor Henry should take the leadership to secure adequate funding from any and all state and federal sources for development and implementation of a statewide water plan.
5. The regional water plans should be submitted to the OWRB to ensure that such plans meet criteria established by the legislature, and that water and waste water funding is provided only for projects included in regional water plans.

Financing

To catapult Oklahoma's energy and water resource development into the forefront, the Academy recommends the establishment of a **Critical Infrastructure Finance Authority** (CIFA) to finance specific large-scale water and energy infrastructure projects by bundling such projects for bond financing.

1. The Authority will focus on **Water** infrastructure projects to facilitate intrastate water transfers infrastructure projects. Water projects funded through CIFA would be consistent with the state water plan and should include projects generated through regional planning districts.
2. Energy projects funded through CIFA would include regional and statewide grid systems, new pipeline projects, etc.

2004: Arizona's Water

A Report of the 85th (2004) Arizona Town Hall, Grand Canyon, AZ

Historical Perspective

Arizona Town Hall addressed water issues in 1964, 1977, 1985 and 1997. The background report for the 1964 Town Hall quoted a 1963 U.S. Geological Survey Water Supply Paper that is as true of Arizona in 2004 as it was in 1963:

“Arizona’s water problem is grave. The beautiful scenery, fine climate and fertile soil, like those of other southwestern states, have combined to entice an even larger number of people to settle there, and water demands have grown accordingly.”

Since 1964, an alphabet soup of projects and entities have become reality—ADEQ, ADWR, AMA, CAP, CAWCD and GMA, just to name a few. However, the problem remains; current Arizonans, and the millions more who will join us in the future, live in an arid region and need water.

Continuing its commitment to address water issues, and recognizing the challenges and opportunities facing Arizona now and in the future, Arizona Town Hall again turns its eyes to water. The Eighty-fifth Arizona Town Hall welcomed 177 participants to the South Rim of the Grand Canyon on October 31-November 3, 2004 for three days of debate on “Arizona’s Water Future: Challenges and Opportunities.”

Community leaders, experts and residents from throughout the state gathered to address the issues and seek consensus. The following conclusions and recommendations represent areas of consensus reached by the participants.

While not all of the Town Hall participants agree with each of these conclusions and recommendations, this report reflects the significant degree of consensus achieved at the Eighty-fifth Arizona Town Hall.



Expectations and Goals

Arizonans expect a safe and reliable water supply to support Arizona’s diverse and increasing population, sustain our varied economic interests and preserve our wonderful quality of life now and for future generations. Arizonans demand certainty that water will be available to support both

consumptive and non-consumptive uses including when they turn on the tap, open irrigation pipes, visit recreation areas and to sustain natural habitats.

To meet these expectations, participants identified research, data collection, education, strategic planning, conservation, environmental protection and increased coordination as goals. Through statewide leadership and local control, Arizona must address regional concerns while improving water quantity and quality. Regardless of our expectations and goals, water is going to become more expensive.

Current Challenges

Although Arizona and other Colorado River basin states are suffering from a drought, many Arizonans do not understand the critical nature of Arizona’s water challenges. In the short term, all Arizonans must be educated about the severity of the issue, supply limitations and potential solutions. In essence, Arizonans need to become water literate.

Other short-term challenges include drought response, voluntary water transfers and cooperation between public and private entities, tribal communities, basin states and Mexico to protect and restore aquifers. Many of these issues also are long-term challenges.

A statewide water assessment plan, taking into consideration regional needs, must be implemented by state and local policymakers. To avoid crisis management, Arizona must engage in long-term

planning based on good science and data collection that should be made widely available throughout the state. The statewide drought plan should be finalized, adopted and implemented by the state and local policymakers by the end of 2006. Planners also must evaluate what levels of population can be sustained by available water supplies. Further research and development of new technologies should be part of the long-term strategy to improve water supplies.

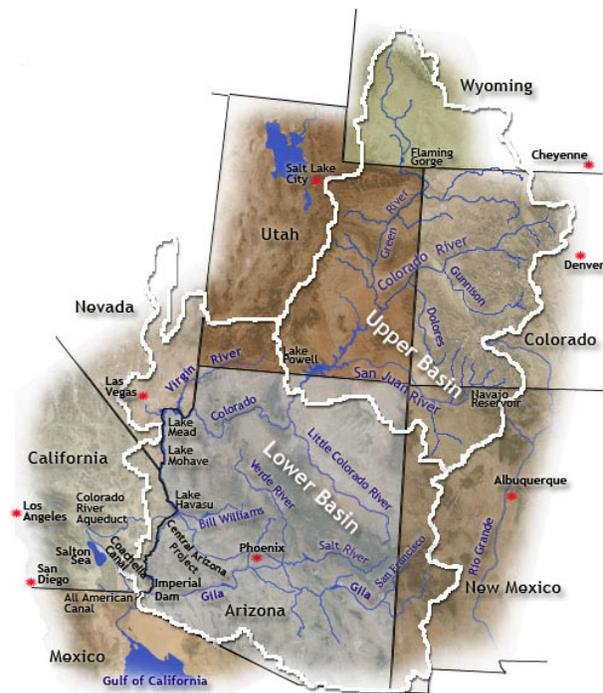
Continuing efforts to reduce uncertainty requires resolving water rights disputes, identifying supplies and uses and estimating population growth. Such efforts are necessary to develop and implement both long and short-term goals. Arizona now must address both short and long-term challenges.

Water Supplies

Sustainability of water supplies should be the primary goal of the state. Participants generally accepted the background report's working definition of sustainability as "the ability of current generations to meet their needs without compromising future generations to meet their needs." The measurement and implementation of "sustainability" varies by region.

Safe yield, which is a subset of sustainability, is defined as a long-term balance between the annual withdrawal and recharge of groundwater. This basin-wide concept may not address localized areas of groundwater overdraft. Safe yield is an appropriate goal for the AMAs where it applies, but may not be suitable for all areas. Management goals should reflect local conditions.

Past predictions of water supply and demand have been inadequate at best. Participants strongly agreed that the collection and dissemination of information about water supplies and demand is a statewide concern and must be improved, particularly in non-AMA areas. The Arizona Department of Water Resources (ADWR) should be responsible for such research and communication and coordinate long-range, statewide water planning. Adequate and sustained funding must be provided for such activities.



The Lower Basin of the Colorado River

Water Options

Conservation requires comprehensive public education beyond slogans and sound bites. Pricing of water, to reflect its long-term cost, recognizing existing contract requirements, is the most effective conservation tool. Consideration should be given to step and block pricing as a tool of conservation. Incentives, not penalties, should be offered to encourage conservation.

Recycling water and efficient use of effluent must be expanded beyond current processes. Although expensive, recycling has proven to be a useful technology. The quality of recycled water should be improved to expand its potential use. Public awareness and education about the safety of water treatments could lead to use of recycled water for human use. Existing regulations should be amended or new regulations adopted to allow expanded use of quality recycled water.

Water exchanges within Arizona, including tribal communities, and with other states should be explored. If legal issues regarding water transferability can be resolved, water exchanges or sales from agricultural users could increase water availability to non-agricultural users.

Financial participation with California and Mexico in desalination of sea water should be explored as a means to increase Arizona's share of Colorado River water. While sea desalination technology is improving, the cost and environmental impact may be an obstacle to current use.

Proper watershed management of new water reclamation projects, such as collection of storm water run-off, can utilize and redistribute water supplies. Water banking practices should be improved and expanded.

Arizona must continue developing and testing new technologies to improve efficiency in production and transfer capability and prevent contamination. New technologies and sources also raise new concerns, such as costs, legal issues, environmental impacts and diversion of infrastructure investment.

The viability of the various water options is a product of values, priorities, public perceptions, education and economics.

Water Management

Compared to other states, Arizona effectively manages water, particularly within AMAs. The strength of the AMAs is the flexibility to adapt to the needs of particular localities.

The AMAs must recognize that their decisions impact other regions. AMAs should evaluate their procedures in light of balancing population growth and water supplies.

In areas outside AMAs, water users, water sources and environmentally sensitive areas have few protections. For example, wildcat subdivisions resulting from lot splitting and exempt wells are significant issues in both AMA and non-AMA areas and make strategic planning problematic.

Such tools include the authority to meter wells and report the results, regulate exempt wells, impose water impact fees and authorize local governments to restrict subdivision development to only areas with adequate water supplies in order to insure adequate supplies for new growth and protect existing water users.

While water shortages have prompted many communities to better manage their resources, it is imperative that communities plan for water shortages before they occur.

To avoid crisis management, the ADWR must play a bigger role in water management and be proactive. It should immediately implement a comprehensive water storage and recovery planning process. It must have the necessary funds, staffing and resources to accomplish its goals. ADWR also can encourage conservation and facilitate cooperation between regional management entities.

Management policies should encourage conservation. Where appropriate, market forces should be allowed to reflect the long-term cost of water and promote its efficient use. Management policies should ensure accurate data collection and information dissemination throughout the state.

A comprehensive water banking system should be further developed. The system must ensure that proper locations are used, a means of recovery is provided, and the quality of the banked water is considered. Maximum use of Natural Resource Conservation Districts should be utilized because they are a legal subdivision of state government with locally elected officials. They have been in water conservation activities for more than fifty years.

Balancing Economic & Population Growth

Water needs to be recognized as a key factor in managing growth in both urban and rural areas. Continuing pressure for growth is a fact of life. At some point, the exceptional quality of life enjoyed by Arizonans may be affected unless new populations can pay for the water resources required to support them.

Sound water policy is an important contributor to Arizona's economic vitality. Effective water management and infrastructure investment sustain economic health. Agricultural economies in rural areas depend on available and affordable water. Arizona should create incentives for more efficient industrial water use.

Active Management Areas

Existing AMAs generally are effective but need some modification. A major concern is the rapid growth of the Central Arizona Groundwater Replenishment District (CAGRDR) membership and the District's ability to meet the growing long-term replenishment obligations. Another concern is that developers are rushing to develop land on untapped aquifers and in non-AMA areas located just outside AMA boundaries.

New or amended legislation also is required to empower counties and local entities to address water management issues such as water adequacy for subdivisions, lot split authority, land use and monitoring of water resources and recording of statements of adequacy or inadequacy. In addition legislation should be considered to authorize locally initiated and operated regional water authorities for coordinated management of regional water resources.

Environmental and Quality of Life Issues

Water management should be approached in a multi-faceted manner. It should include producing quality water, restoring and sustaining healthy ecosystems and providing recreational uses, while also addressing the needs of agriculture, industry and domestic water users and water providers. These goals will require increased levels of funding to meet higher costs.

Quality of life and healthy natural environments are mutually dependent, not mutually exclusive. Comprehensive, multi-use watershed planning is essential to assure a sustainable water supply for human use while maintaining a healthy natural environment such as preserving the natural flow in our remaining river systems, including the Verde, San Pedro and Upper Gila Rivers. In-stream groundwater recharge programs can concurrently support riparian preservation and recreational areas.

To improve watershed health, Arizona must manage the vegetation in watersheds to decrease non-native plants. Ongoing forest management, including reduction of forest and woodland tree densities and restoring grasslands, will improve



Havasus Falls in the Grand Canyon

watershed health and provide recharge for our communities, recreation and wildlife. Riparian areas need to be protected and, where feasible, restored using appropriate tools such as the well setback recommendations of the Governor's Water Management Commission. Consideration should be given to existing uses in watershed areas.

Federal, state and local governments should improve inter-agency communication and coordination of goals and activities. They also must work together to implement and enforce environmental regulations and protections. Additional funding and support should be developed for existing programs, including programs based on the Endangered Species Act – Section 10, such as the Lower Colorado River Multi-Species Conservation Program and the Arizona Water Protection Fund.

Citizen participation in policymaking must be encouraged to develop trust and identify common ground. Communication and mediation, not litigation, are most effective for resolution.

Colorado River Water

Arizona's allocation of water from the Colorado River is critical to the state's current and future economic vitality. Because of the junior status of the CAP and other Arizona post-1968 contractors among the recipients of water in the Lower Basin, improving their priorities requires unified and significant, but not impossible, efforts.

Arizona must defend its current water rights, while at the same time work to maintain good relations with its sister river basin states. The current drought has necessitated more dialogue between the states. Negotiations between states should include establishment of shortage criteria.

Arizona’s agricultural users are particularly concerned about Arizona’s current priority. Agricultural water users and other post-1968 contractors are concerned about the priority of their water rights because they will be the first to lose water if shortages occur in the Lower Basin.

Storage reservoirs along the Colorado River, such as Lake Powell, should continue. Operation of the Yuma desalination plant is the responsibility of the federal government and is critical to the resolving of delivery of water to Mexico while protecting environmental values. Utilization should be expedited, recognizing the need to maintain adequate flows to the Cienega consistent with U. S. treaty obligations.

The 1964 Arizona Town Hall stated that “no solution should be suggested or implemented that would result in any water in the Colorado River entering Mexico which is not chargeable to Mexico’s treaty allocation.”

Forty years later, 100,000 acre feet per year of water is being removed from storage, delivered to Mexico, and not charged to the Mexican treaty obligation. Operation of the Yuma desalination plant would preserve this water and keep delivering to Mexico within the treaty obligation.

The water quality of the Colorado River continues to be a major concern for all users.

Native American Claims

Native American water claim settlements present great opportunities for collaboration between non-tribal communities

and tribes on water and non-water related issues, but challenges remain. The resulting certainty of allocations and supplies will allow policymakers to move forward with planning.

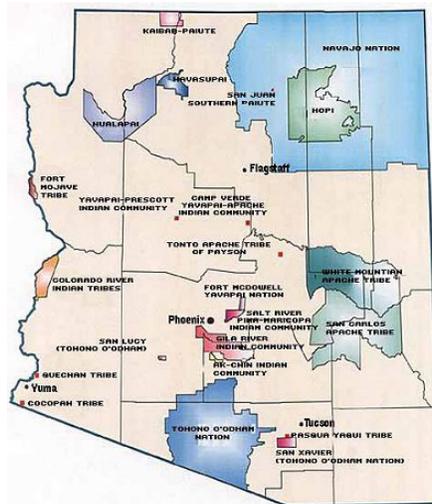
The tribal communities in Arizona have a tremendous economic opportunity as a result of the settlements, including leasing water rights to municipalities, developing their own agricultural interests and/or using their rights in other ways. Inter-governmental collaboration about infrastructure development and water exchanges should occur.

The stakeholders in the settlement of Native American claims are commended for their remarkable achievements. Remaining Native American water claims should be resolved as quickly as possible through negotiation and not costly litigation.

Fluctuating Water Supplies

Arizona must prepare for the variability of water supplies. Collaboration about the effect of fluctuating water supplies should involve all levels of government and should include all stakeholders. However, the state, through ADWR, should take the lead in strategic planning. ADWR should collect and disseminate necessary information, establish guidelines and monitor activities to address the fluctuations. Drought contingency planning should be a top priority, and all providers and communities should be required to have drought contingency plans.

Local entities need to have the tools necessary to develop comprehensive watershed plans and to enforce their implementation. Coordination with state agencies, such as the Arizona Corporation Commission (ACC), Arizona Department of Environmental Quality (ADEQ), ADWR and other agencies should occur.



Indian Reservations in Arizona

Private water companies should be given greater flexibility to adjust pricing to reflect the longterm cost of water, to pay for additional planning, to develop appropriate infrastructure investment and to promote conservation. Pricing flexibility and clearly established drought mitigation criteria are necessary.

Flood plain management should be an integrated component of land use plans, with a focus on ensuring natural flows, encouraging recharge and protecting riparian habitats in addition to the primary purpose of protecting homes, businesses and farmlands. In some areas of the state, water logging is a greater concern than shortages, and these areas could be a source of supply. Expanding the portfolio of water options will reduce, but not eliminate, the impact of fluctuating supplies. Town Hall believes that water banking is a beneficial use and therefore, recommends that water banking continue through entities such as the Arizona Water Banking Authority.

The conversion of agricultural water use to municipal and industrial use is a continuing trend, but consideration should be given to policies designed to preserve a significant measure of agricultural use. Such use can act as a buffer — providing increased water resources in times of critical shortage.

Water Conservation

Although Arizona has made progress in water conservation compared to other states, more must be done to create a culture of conservation. Societal values must adjust to desert and arid region realities. Mandatory use restrictions and other conservation measures may be necessary in times of water shortage.

A statewide water conservation framework should be put into place, with local communities developing specific conservation plans. Plans should take into consideration the various economic interests in each region, for example tourism and agricultural uses. Local water policymakers should develop baseline conservation goals, measure progress and establish trigger

mechanisms to implement mandatory practices if voluntary conservation is not adequate.

General access to water must remain affordable. Alternative pricing structures should be explored and developed to allow basic access and discourage waste. Institutional barriers, such as certain inflexible ACC policies, currently undermine such efforts.

Education programs for all Arizonans are critical to create a statewide conservation ethic and encourage participation in conservation activities. Arizona should take a national leadership role in developing and implementing a new K-12 conservation curriculum that is aligned to state educational standards.

Financial incentives for conservation should be offered for low water use landscape modifications and installations, conservation easements and new technologies. Policymakers should evaluate existing water subsidies and not reward wasteful practices.

Current Resources

A number of effective programs and institutions, staffed with talented people, exist to address Arizona's water needs. However, these resources are inadequate to resolve Arizona's current and future challenges.

ADWR must play a central leadership and advocacy role. The Agency's statewide mission should be expanded and strengthened in the areas of policy development, planning and data collection. ADWR's strategic plan should be implemented by local policymakers on a regional basis. Town Hall recommends that a primary objective in any planning process is for ADWR to collect comprehensive hydrological data on all Arizona water resources, including water quality in conjunction with ADEQ, and disseminate such information throughout the state.

It also should lead in the statewide conservation campaign. Town Hall recognizes that ADWR is significantly under-funded and understaffed.

Non-AMA communities need ADWR to serve a central research and coordination function to provide accurate assessment data on water supplies and demand.

Town Hall recommends that additional dedicated funding be provided to ADWR to fulfill its mission. In addition to increased general budget appropriations, new funding mechanisms should be explored.

Town Hall commends the establishment of the virtual “water university” that, working with the public and private sectors, brings together the resources of Arizona State University, Northern Arizona University and the University of Arizona. Collaborative efforts also should include community colleges and other educational institutions.

New Infrastructure

Existing infrastructure should be improved and maintained. Additional physical infrastructure required to assure adequate quality and water delivery include the following: pipelines, storage facilities, the means to deposit and recover recharged water and recover storm-water, more and improved water treatment and transfer facilities, and additional monitoring equipment.

Proper funding is necessary for physical infrastructure. The cost of any new infrastructure should be evaluated in light of its anticipated benefits. Cost analysis should include anticipated future maintenance costs.

New Information and Planning Resources

While significant information and planning resources exist in AMAs, there are major data gaps regarding non-AMAs and all wells. There is a need for improved collaboration among the various holders of available information. Public officials often lack necessary information to make effective water management decisions.

Local officials often lack funding for travel to training or the ability to bring the expertise to their community for education of those in leadership roles. Arizona’s virtual water university concept is an example of positive collaboration and accessibility to information and expertise.

In order to plan effectively, more information about population growth, statewide water plan assessment, supply and demand, the nature and quality of resources must be obtained. Additionally, ADWR needs to complete more studies and provide more information to users and planners. Regular monitoring activities also must improve.

Funding

Water management policies and information needs deserve to be among the very highest priorities for state funding. Arizonans should participate in funding water management strategies necessary to secure Arizona’s water future. Costs caused by growth should be funded by growth.

Costs of ADWR and programs that have wide benefits should be broadly funded. Funding options include:

- Bonding
- Exempt well fees
- Federal programs such as Water 2025
- Surcharges
- Permit and impact fees
- Private donations, tax credits or deductions
- Property taxes; and
- User taxes

The primary recommendation from this Town Hall is that dedicated and secure funding sources be created to finance Arizona’s critical water management, planning and infrastructure needs. Without such secure funding, the other recommendations of this report are not achievable.



Water in the USA

California - North Dakota - Georgia - Kansas

California's Central Valley: The Appalachia of the West

The Economist, January 21, 2010

This article describes water policy issues in California's central valley between Bakersfield and Visalia. This was the region settled by many migrants from Oklahoma in the 1930's.

California's agricultural heartland threatens to become a wasteland.

Mike Chrisman looks out from his SUV as he drives through seemingly endless rows of walnut trees on his property near Visalia, in central California. "I have to be optimistic, I'm so tied to this land," he says. His great-grandfather, after trying his luck in the Gold Rush, settled in Visalia in the 1850s, and the family has been there ever since. But as California's secretary for natural resources—a job at the intersection of the environmental and farming lobbies, perennially at loggerheads over the state's scarcest resource, water—Mr Chrisman also knows that optimism has become a minority view.

His land is in California's Central Valley, a region that covers 19 counties and stretches for 450 miles (725km) from the Cascade mountains in the north to the Tehachapis in the south, and is bounded in the east by the Sierra Nevada and the west by California's Coast Ranges. Much of it was an inland sea in its geological past, and its alluvial soils and Mediterranean climate make parts of it, particularly the San Joaquin valley in the south, about the most fertile agricultural region in the world.

But this status is at risk because water, the vital ingredient to make the soil productive, is increasingly scarce. Some of the reasons are natural; California has been in one of its periodic droughts since 2006, and climate change is a long-term threat to the state's mountain snowpacks. Others are political; the pumps and aqueducts that carry water from the wetter north to the dry fields in the south are creaking with age, threatening ecosystems and endangering species.



The California Central Valley

"Water is our biggest issue," says Bill Phillimore, the manager at Paramount Farms near Bakersfield, the largest grower of pistachios and almonds in the world, and of pomegranates and citrus fruits in America.

Water used to be 20% of Paramount's costs, he says, but now accounts for 30%. As a result, many farmers are letting their fields lie fallow or switching from thirsty crops, such as cotton, to those that need less. Paramount's trees, lined up like soldiers on parade as far as the eye can see, are irrigated by tiny "micro-sprinklers" at their base so that water hits only the roots and no drop goes to waste.

Farming will not disappear, but whether it will be as big as it is now is a question, says Mr Phillimore, adding that "If the agriculture goes away, there is nothing." In the San Joaquin valley agriculture provides almost 20% of the jobs. The alternatives are depressing and scant. For example, many of California's prisons are sited in the Central Valley's wide expanses, in what is sometimes called an "archipelago".

A big problem is that the workforce in the Central Valley is badly educated, says Carol Whiteside, the founder of the Great Valley Centre, a not-for-profit organisation whose aim is to improve the region. The largest farms are often still owned by the families that arrived a century or so ago—the descendants of Portuguese and Dutch immigrants are big in dairy farms, for example.

But most of the whites tend to be “Okies” who arrived from the dust bowl of the Great Plains during the depression, such as the fictional Joad family in John Steinbeck’s “The Grapes of Wrath”, who drove up and down in search of work on the stretch of Highway 99 where Paramount Farms now sits.

Economically, socially and educationally, their descendants have barely moved up. Nor have more recent immigrant groups such as the Hmong, Thai and Mien, who came to work in the fields during the 1970s and now live in Central Valley cities such as Stockton, Fresno and Modesto—or, of course, the Mexicans, who have been coming since then and are now the majority of workers in the fields, where Spanish is the common language.

These demographic trends, combined with the water shortage, are causing worry. The Central Valley is already one of the poorest regions of the country. And its population, about 6.7m in 2008, is among the fastest-growing; it is expected to double in the next 40 years, as new immigrants continue to pour in looking for farm work.

This has led to comparisons with Appalachia, which has also relied on a declining extractive industry (coal mining) and has suffered from high unemployment, poverty and a relatively unskilled workforce. A report commissioned by Congress in 2005 argued that the San Joaquin valley is in some respects behind Appalachia’s coal country in diversifying its economy.

As the almond trees of the San Joaquin valley go into their February bloom, turning the plains white with their buds and abuzz with millions of bees who are temporarily imported to pollinate them,



it may be hard to see devastation in the making. Nonetheless, the Central Valley’s future looks increasingly barren.

Water Has Political Value

March 17, 2010

As a vote approaches (it happened on March 21) on the federal healthcare bills, two “undecided” California Democrats, Dennis Cardoza and Jim Costa, now appear to be “yes” votes.

The U.S. Department of Interior announced yesterday that it is increasing water allocations for the Central Valley of California, a region that depends on these water allocations to support local agriculture and jobs. The region has recently been starved for water and as a result unemployment has soared. Not surprisingly, Cardoza and Costa had a hand in the announcement:

“Typically, Reclamation would release the March allocation update around March 22nd, but moved up the announcement at the urging of Senators Feinstein and Boxer, and Congressmen Costa and Cardoza.” U.S. Department of Interior news release, 3/16/10) Source - <http://nrcc.org>. Slightly edited for space.

Too Much Water in Fargo

Joe Barrett, The Wall Street Journal, February 17, 2010

Giant Channel Designed to Avert Floods Raises Alarm in Towns Downstream

FARGO, ND—Some 100,000 volunteers from around the upper Midwest came together in a massive sand-bagging operation last spring to save this city from a record flood of the Red River.

Now, that unity is starting to show cracks. Planning is moving ahead for a more than \$1 billion channel-building project that is designed to protect the Fargo and Moorhead, MN, metropolitan area from even the most severe floods. But the huge ditch could worsen the problem for people living downstream and has drawn opposition from those in its proposed path.

This month, the Army Corps of Engineers outlined several possible routes for a man-made channel—nearly half a mile wide and at least 25 miles long—that would divert floodwaters around the metro area, which has a total population of about 200,000. The massive public-works project would take more than six years to build and employ thousands of workers.

Fargo officials say a permanent solution is essential to protect the region's cultural and business hub that year after year has fought off major floods, including one in 1997 that devastated Grand Forks 80 miles to the north. "Are we going to have to fail to get this moving?" said Fargo Mayor Dennis Walaker, the city's former public-works director who quarterbacked last year's flood fight.

But downstream, in farming towns like Hendrum, MN, population 300, anxiety and skepticism are high. In a flood, Hendrum, which sits amid snowblown fields in sight of the trees that line the river, could face an extra 10 inches of water because of the diversion—enough to cut off the town completely, even if higher levees are built to protect it.

"It's going to turn us into an island," said Mayor Curt Johannsen. "Why have the small got to be sacrificed for the big?"

On Monday night, the Minnesota House of Representatives passed a bill that forbids the state from chipping in for a diversion unless it mitigates the impact on downstream towns. "We don't want to stop the train," said state Rep. Kent Eken. "We just don't want to get run over by it."

As towns and farms developed in the rich lands along the river in the late 19th and early 20th century, the region was in a dry phase, experts believe. In some years in the 1930s, the river, which separates North Dakota from Minnesota and runs north into Canada, dried up in spots.

Then a wet phase began about halfway through the past century, and the area began experiencing major floods on a regular basis. The flat terrain and the frozen ground as the water makes its way north intensify the problem.

In 1997, surging floodwaters forced the evacuation of 60,000 people and brought major downtown



An old farmhouse and barn are surrounded by Red River floodwaters last March in Fargo, ND.

fires in Grand Forks. A more than \$400 million levee and diversion-building effort has left that city well-fortified against flooding.

Fargo has always been able to scrape by with a mix of permanent levees and emergency measures. But Mr. Walaker said he was finally able to get national attention with last year's flood, which forced a more than \$40 million mobilization of National Guard troops, city workers and volunteers to prevent the city from being inundated.

He recalls pulling his car to the side of the road when he got a call from President Barack Obama. In May, officials from North Dakota and Minnesota met in Washington with the Corps of Engineers to press for a long-term plan.

A Corps of Engineers review of possible solutions concluded a diversion would be most cost-effective, said Aaron Snyder, project manager for the Corps of Engineers.

Now, the project is racing the clock, Mr. Snyder said. Local officials must decide by April whether to back a 25-mile route through Minnesota that would cost about \$1.1 billion, with a local share of \$577 million, or a 36-mile route through North Dakota that would cost \$1.3 billion and carry a much larger local share of \$729 million.



Workers scramble to position an outlet hose for a pump during efforts to fight back the bloated Red River in Fargo, ND, last March.

The Corps of Engineers has backed the Minnesota route because it is more cost-effective and less complicated. The North Dakota route would have to cross five tributaries of the Red River but would also add protection by diverting the water from those rivers.

In either case, Fargo and the state of North Dakota are expected to foot as much as 90% of the local costs, because they are expected to reap about that much of the benefits.

That makes a Minnesota route a tough sell in some quarters. The city of Dilworth, Minn., has voted to oppose a Minnesota diversion, which would run to the city's east. "It's going to cut off any chance of future growth for our town," said Mayor Chad Olson.

The Corps of Engineers hopes to have a completed proposal ready by the end of the year for congressional consideration, among a slew of other long-term water resources projects. The chances of approval for the Fargo project are expected to be better this year than next, in part because a major supporter, Democratic North Dakota Sen. Byron Dorgan, chairman of the Senate Energy and Water Appropriations Subcommittee, won't seek re-election in the fall.

Meanwhile, this winter's heavy snows mean the floodwaters could be back by spring. Last month, the National Weather Service said the area was sitting on a "keg of dynamite."

*Write to Joe Barrett at joseph.barrett@wsj.com
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Water Planning in Georgia

The Water Council, Atlanta, GA, Adopted January 8, 2008

Executive Summary

Of all Georgia's natural resources, none is more important to the future of our state than water. The wise use and management of water is critical to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.

Georgia has abundant water resources, with fourteen major river systems and multiple groundwater aquifer systems. These waters are shared natural resources. Streams and rivers run through many political jurisdictions. The rain that falls in one region of Georgia may replenish the aquifers used by communities many miles away. And, while water in Georgia is abundant, it is not an unlimited resource. It must be carefully managed to meet long-term water needs.

Georgia is one of the fastest growing states in the nation, and population growth and economic prosperity in the state are tied to our water resources. As the state's population and economy grow, demands on the state's water will grow as well. Over the past several decades, decisions about water management were made largely in response to specific issues or needs. Meeting future water challenges will require a more proactive and comprehensive approach.

To prepare for a future in which we better balance increasing and sometimes conflicting demands on the state's water resources, the General Assembly charged the Environmental Protection Division (EPD) with developing a draft comprehensive statewide water plan and presenting it to the Water Council.

The Water Council was charged with providing oversight in the plan's development and submitting a final plan to the Georgia General Assembly for action during the 2008 session.

In preparing the plan, EPD, in cooperation with the Water Council, assembled basin advisory committees, a statewide advisory committee, and technical advisory committees to discuss potential water policies and management practices and to consider regional concerns. Hundreds of individuals representing agricultural and business interests, local governments, nonprofit agencies, trade associations and others have provided input into the plan's development through an extensive public involvement process.

What has emerged is a blueprint that, when executed, will guide future decisions about water management across the state. It provides a flexible framework for regional water planning that will follow in the years to come.

Early on, the Water Council and EPD recognized that flexibility and adaptability are essential for any effective plan. Water resources and water needs vary widely by region, and future growth and development will occur differently in each region. The plan allows for these regional differences while also providing statewide policies and management practices to support regional planning.



Tri-State "Water War"

Some of these statewide policies and practices will require rulemaking, which will include a public involvement process before being brought to the Board of Natural Resources for consideration.

The Water Council and many stakeholders also recognized a need for better information about how much water we have and how much water we will need. New jobs, homes, schools, and businesses all require water and wastewater services. But currently, we do not have good measurements of how much water is available from Georgia's streams and aquifers, or how much waterborne pollutants our streams and rivers can safely assimilate. In addition, there are no reliable forecasts of how much water the state will need, or how much wastewater will be discharged, as the state continues to grow.

We cannot effectively plan for and manage what we do not measure. Better information is needed on water quantity as well as water quality. The state must determine how much water can be removed from rivers, lakes, and aquifers without causing unacceptable negative impacts and determine how much wastewater and stormwater streams can handle before water quality begins to degrade.

The state also must develop a better understanding how much water is, and needs to be, returned to

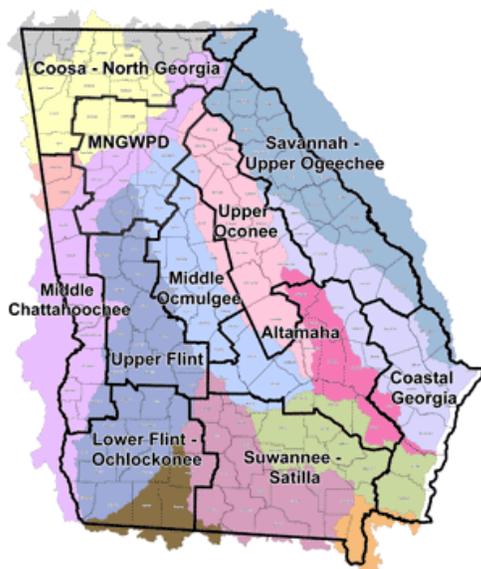
our natural systems, and must consider alternative ways to meet our long-term water needs. These assessments will provide the foundation for regional planning decisions across the state.

The comprehensive state plan hinges on development of regional water plans. Regional forecasts of future needs for water and wastewater will be completed. Then, regional plans will be developed to identify the management practices to be employed, following state policy and guidance, to ensure that the anticipated demands can be met.

Once the regional plans have been developed and approved, the state and the regions must partner to implement the plans. Regional plans primarily will be implemented by the various water users in the region, with state permitting and financial assistance as consistent with the regional plan.

Looking toward a future with increasing demands on water resources, it is clear that coordinated water planning will be an on-going need. The Comprehensive Statewide Water Management Plan provides a framework to measure water resources, to forecast how much water supply and assimilative capacity will be needed to support future growth, and to identify regional solutions to water needs.

This plan will help guide the stewardship of Georgia's precious water resources to ensure that those resources continue to support growth and prosperity statewide while maintaining healthy natural systems.



Georgia Water Planning Districts

Kansas Rethinks Water

Kansas Geological Survey

LAWRENCE -- Kansans have long struggled with the best way to manage the state's water. Now a new book from the University of Kansas-based Kansas Geological Survey questions some of the traditional ways state and local agencies have made decisions about water.

Survey water specialist Marios Sophocleous edited the book, "Perspectives on Sustainable Development of Water Resources in Kansas," which points out flaws in a traditional management concept known as safe yield.

Under a safe yield approach to water management, Sophocleous says, water use is limited to the amount of annual recharge -- that is, the amount replenished naturally through precipitation and water seepage from the surface.

Sensible as this simple formula seems, Sophocleous says, "if you use safe yield as a definite recipe, you end up depleting other water supplies." Like many simple concepts, safe yield doesn't tell the whole story. The problem is that safe yield ignores the complex relationships between surface water (lakes, streams, springs and marshes) and groundwater (water found in underground rock formations called aquifers).

For example, under natural conditions, before wells start pumping, aquifers discharge water to streams, marshes and springs. The amount discharged equals the amount of recharge. This means that under a traditional safe yield approach, pumping removes groundwater that would otherwise be discharged at the surface. The streams, marshes and springs eventually dry up.

"This is what has happened to some perennial streams in western Kansas," Sophocleous says. Sophocleous says that a recognition of the connection between surface water and groundwater is already shaping the way water resources are managed in Kansas. Two of the state's five

groundwater management districts now factor in natural ground-water discharge when evaluating new applications to use groundwater.

Promoting a better understanding of the complexities of the water system was one of the goals with this new book. Towards that end, Sophocleous asked nine other water scientists to write chapters discussing issues of safe yield and sustainability from a variety of perspectives. In addition to Sophocleous's chapters on Kansas water resources and sustainability issues, the book includes chapters on water chemistry, agriculture and climate change. "The book presents the most up-to-date views on the subject and places the discussion on a sound scientific footing," Sophocleous says.

Sophocleous admits that understanding the complex relationships between ground and surface water is just a first step down the path towards sustainable development, managing the state's water so that both current and future needs are met. "As a concept," Sophocleous says, "sustainable development is still pretty vague. No one knows for sure exactly what it means or how it can be attained."

How the concept will be applied in Kansas remains to be worked out, but it will be different in different parts of the state. In western Kansas, where irrigation sucks up 90 percent of the ground water, sustainability will be difficult to achieve. In central and eastern Kansas, where there's less irrigation and more precipitation, "sustainability is a possibility," Sophocleous says. But, he adds, "education is vital if consensus on these issues is to be achieved." Written in semi-technical language, the book contains numerous illustrations and a lengthy glossary.

Story By Liz Brosiu. <http://www.ur.ku.edu/News/98N/SeptNews/Sept15/water.html>. Copies of the book are available from the Kansas Geological Survey at 1930 Constant Avenue in Lawrence (785- 864-3965).



Water in Oklahoma

The Oklahoma Comprehensive Water Plan

Kyle Arthur, Director of Water Planning and Brian Vance, Director of Information, OWRB

The Original 1980 OCWP

The State Legislature planted the seeds for development of a state water plan through creation of the Governor's Water Study Committee in 1955. Citizen and legislative representatives of the Committee, appointed by Governor Raymond Gary to gather public opinion on the state's critical water problems and recommend appropriate solutions, held meetings throughout the state to obtain first-hand knowledge of Oklahoma's water situation and identify future water resource needs.

A landmark recommendation of the committee led to creation of the Oklahoma Water Resources Board (OWRB) in 1957. The Water Board was initially given the task of managing the state's water supplies and developing a fair, long-range plan to assure the best and most effective use of water to meet the needs of Oklahoma citizens. Despite this legislative authority, limited staff and funding impeded the OWRB's early attempts to create a state water plan.

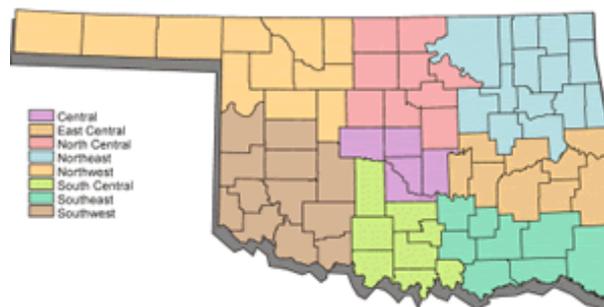
A major catalyst to the Board's efforts proved to be the federal Water Resources Planning Act of 1965 that provided grants to states to prepare individual water management plans. As part of this preliminary planning effort, the OWRB, in conjunction with other appropriate local, state and federal entities, compiled 11 reports collectively entitled the Appraisal of Water and Related Land Resources of Oklahoma. These reports assessed hydrologic, economic, geologic and social characteristics of each of the state's planning regions; identified local water problems; and proposed specific water development projects.

Still, this effort failed to fully incorporate long-range projections of water problems and requirements. In 1974, Senate Bill 510 gave specific statutory authority to the OWRB to expand on the appraisals and construct from them a comprehensive state water plan for submission to the State Legislature.

The initial phase of plan development utilized state agencies, universities and numerous federal agencies which, along with the OWRB, comprised the OCWP's Planning Committee. State objectives of the original 1980 Water Plan were:

- promotion of economic opportunity and development;
- preservation and enhancement of the environment;
- protection of lives and property from floods;
- expansion of agricultural production and agribusiness activity;
- development of recreational opportunities;
- maintenance and improvement of water quality;
- encouragement of water conservation;
- placement of excess and surplus water to beneficial use; and
- encouragement of public participation in water resource planning.

The Corps of Engineers' Planning Assistance to the States Program, Bureau of Reclamation's Technical Assistance to the States Program, write-in requests from the Congressional Delegation and other cooperative financial agreements were essential in funding plan formation. Substate planning districts assisted in developing population projections and future water requirements and, in an effort to gain broad-based input and public support for the plan, open meetings were held throughout Oklahoma.



OCWP Planning Regions

Because of central Oklahoma's immediate water needs and the wealth of information already available on the Red River Basin, Phase I of the OCWP addressed the water supply needs of the state's 33 southern counties. Perhaps due to this limited scope, the Legislature failed to take action on the Phase I Water Plan following its submittal in 1975. Instead, the Legislature directed the OWRB to prepare a similar plan for the remaining 44 counties encompassing the Arkansas River Basin.

The final two-phase draft of the original OCWP was completed in early 1980 and adopted by the legislature the following year. The primary impetus of the Water Plan was to meet Oklahoma's future demands through regional development and provide additional water to Oklahoma's water deficient areas by transferring surplus water from east to west. This ambitious transfer project was to be accomplished through the construction of separate northern and southern water conveyance systems. However, neither system could be economically justified under federal guidelines.

The 1980 OCWP offered numerous recommendations that have resulted in stronger water development and management programs. The most significant recommendation was an initiative that provided a mechanism for financing community water and sewer system improvements. From an original state appropriation of \$25 million in 1982, the OWRB's Financial Assistance Program has funded more than \$2 billion in water and wastewater infrastructure projects throughout Oklahoma. The program has insulated small communities from the financial crises posed by aging systems, weather-related emergencies, dwindling budgets, and increasingly stringent environmental regulations.



2012 OCWP Watershed Planning Regions

1995 Update

Although the 1980 OCWP spawned numerous achievements related to improved management of state water resources, profound social, political and economic changes - including the sudden collapse of the world oil market and decline in the U.S. agricultural industry - devastated Oklahoma's economy, significantly reducing projected growth patterns of population, industry, water use and other factors.

Another monumental change was the federal government's declining role in state funding necessitating the expansion or more efficient use of existing projects, rather than the development of new ones. Other major issues receiving increased federal and state attention at the time included nonpoint source pollution control, development of watershed management strategies, groundwater quality, and wetlands protection.

Through HB 2036, passed in 1992, the State Legislature not only directed the OWRB to update the OCWP but it provided for continuous updates every 10 years.

As stated in HB 2036, the first update and future decennial revisions should provide for the continuous management, protection, conservation, development (both structural and nonstructural) and utilization of state water resources in accordance with the following principles, which also guided development of the original Water Plan:

- *Multipurpose dams and reservoirs, both existing and planned, should be utilized to the maximum extent possible;*
- *Water should be stored in the area of usage during periods of surplus supply for use during periods of short supply;*
- *Water within the state should be developed to the maximum extent feasible for the benefit of Oklahomans, rather than for the benefit of out-of-state, downstream users;*
- *The statutory power of the OWRB in the granting of water rights to water users shall be preserved;*

- *Only excess or surplus water should be utilized outside the areas of origin and citizens within the area of origin possess a prior right to the water originating therein;*
- *All citizens, municipalities and other entities in need of water for beneficial use shall be entitled to appropriate water and vest rights in accordance with state and federal law in the most feasible manner.*

Furthermore, HB 2036 emphasized that the powers granted by the legislation be utilized “for the benefit of the people of the state, for the increase of their commerce and prosperity and for the improvement of their health and living conditions.” In reality, this credo directs all basic planning disciplines.

In development of the 1995 update, which was published in 1997, the OWRB participated with numerous federal and state agencies and organizations who contributed their collective knowledge and expertise. These participants did not collaborate to replace or significantly alter the state’s existing water resource planning strategy. Instead, they set out to build upon the successes of the 1980 OCWP and modify it to reflect changing water resource philosophies and trends of water use.

The 1995 Water Plan update focused on exploring solutions to Oklahoma’s water issues and problems from a policy, rather than a project, perspective. The policy approach for each identified water resource issue was instituted by assessing general needs, identifying problem areas and opportunities, establishing objectives, and recommending specific and appropriate policy choices to achieve desired goals. The update addressed the following 11 categories of water resource policy issues:

- *water rights*
- *water quality*
- *water and wastewater systems*
- *reservoir operations*
- *water marketing*
- *water supply augmentation*
- *water conservation*
- *water resource planning*
- *floodplain management*
- *problem mediation and arbitration and*
- *data collection and management*

To accomplish public participation objectives, the update directed creation of two Water Plan Advisory Committees representing various water uses. The Citizens Advisory Committee brought a grass-roots perspective to the planning table while the Technical Advisory Sub-Committee allowed state and federal water agencies to contribute their knowledge and experience.

Committee members identified 31 water-related issues and offered recommendations to guide legislative efforts in addressing each issue or problem.

In addition, public meetings held throughout the state in conjunction with OWRB rules hearings provided an opportunity for Oklahoma citizens to shape the final Water Plan document through comment on the state’s current and future water requirements as well as water issue recommendations offered to the State Legislature.

The 2012 Plan Update

The OWRB and its cooperators are incorporating innovative techniques in addition to traditional planning methodologies to guide the 2012 OCWP update. The update process is blending direct input from the public with science, technology, engineering, and related disciplines to establish a sound and progressive water future for Oklahoma. Integral to the update are the many partnerships between the OWRB and other state and federal agencies, universities, organizations, and engineering firms who possess advanced expertise to address emerging water issues and problems.

Process for Broad Participation

To develop a fair, inclusive and widely supported Water Plan, the OWRB contracted with the Oklahoma Water Resources Research Institute in 2006 to coordinate public input and develop water policy recommendations. Dozens of statewide and regional public meetings and workshops involving thousands of Oklahomans have provided the forum for identification of the state’s priority water issues and facilitated selection of informed citizens to refine those issues into reasonable policy recommendations for consideration by the State Legislature.

Editor's Note: This legislation was still alive when this book was prepared. However all indications are that it will not likely advance in the Legislature this year. It is included here to stimulate discussion and to allow Town Hall members to project the value of such a Water Center as the Water Plan is updated.

**ENGROSSED SENATE
BILL NO. 1689**

**By: Paddack, Gumm and Johnson
(Constance) of the Senate and Billy
of the House**

groundwater basin - codification - effective date -emergency]

BE IT ENACTED BY THE PEOPLE OF THE STATE OF OKLAHOMA:

SECTION 1. NEW LAW A new section of law to be codified in the Oklahoma Statutes as Section 1086.10 of Title 82, unless there is created a duplication in numbering, reads as follows:

A. This act shall be known and may be cited as the “Oklahoma Water Center Act”.

B. The Oklahoma Water Resources Board shall include provisions in the Oklahoma Comprehensive Water Plan, as otherwise authorized by law and updated in 2011, for creation of a water science and research advisory council for implementation of the Oklahoma Comprehensive Water Plan. The council shall be known as the Oklahoma Water Center.

C. The Oklahoma Water Center shall consist of members from state and federal agencies and institutions of higher education and other appropriate entities that conduct activities related to coordinated water research, planning, water quantity and water quality, as identified in the Oklahoma Comprehensive Water Plan, updated in 2011. The members shall be appointed by and serve at the pleasure of the Executive Director of the Oklahoma Water Resources Board.

D. Members of the Oklahoma Water Center appointed pursuant to this section shall serve without compensation but may be eligible for necessary travel reimbursement as authorized by the Executive Director of the Oklahoma Water Resources Board and subject to the provisions of the State Travel Reimbursement Act.

E. The Oklahoma Water Center shall:

- 1. Act as a water science and research advisory council to the Oklahoma Water Resources Board in implementation of the Oklahoma Comprehensive Water Plan;**
- 2. Review state and federal assistance opportunities for coordinated research, planning, design, and construction for water-related environmental infrastructure and resource protection and development projects, including projects for water supply, storage, treatment, and related facilities, water quality protection, wastewater treatment, and related facilities, environmental restoration, and surface water resource protection, flood control, recreation, and development, as identified in the Oklahoma Comprehensive Water Plan; and**
- 3. Perform other duties as indentified in the update of the Oklahoma Comprehensive Water Plan.**

F. The Oklahoma Water Resources Board shall provide staff for the Oklahoma Water Center.

The Science of Water in Oklahoma

Kyle Arthur, OWRB and Rick Brown, Camp, Dresser and McKee, Denver

The update to the Oklahoma Comprehensive Water Plan builds upon a wealth of information that has been developed by the Oklahoma Water Resources Board (OWRB) and other state, federal, and local members of Oklahoma's water community. This update is the third major statewide water planning effort undertaken by the OWRB, with the most notable previous state plans developed in 1980, and 1995. A major difference between this update and previous state water plans is the detailed focus on evaluating water resources on a watershed basis, and inclusion of a robust public participation process. Other important differences in this update are enhanced focus on understanding issues and challenges facing water providers and users and developing technical tools to support local entities and stakeholders in their planning.

This update will provide Oklahoma's citizens, water users, and policy makers with a broad range of detailed data and information to help plan for the future. This background paper highlights the following topics that are being addressed in the water plan update.

- *Water Supply - A quantification of surface and groundwater resources that tells us how much water we have and where it is located.*
- *Water Demands – Information on how we use water today and projections of how much water will be needed each decade through 2060.*
- *Planning Insights: Development of technical and decision-making tools that can help us meet future challenges.*

The OWRB's approach to the OCWP is to pursue both technical studies and develop policy recommendations to address current and emerging needs. This strategy will provide the best opportunity for collaborative solutions to the state's current and future water needs.

*See Figure 1
2-Pronged Approach to Water Supply Planning*

Water Supply

Oklahoma's water supplies are driven by the state's diverse climate and influenced by land use, geography, and geology. The state's central location in the United States results in a wide range of precipitation, with areas of the panhandle receiving an annual average of only about 16 inches of precipitation, while the southeastern portion of the state receives an average of over 50 inches (Fig 2).

*See Figure 2
Average Annual Precipitation in Oklahoma*

Water supplies can be evaluated using a myriad of different boundaries and geographic extents. For example, one could analyze the sum total of all demands and supplies for the entire state, without further subdivision. However, that level of analysis would not allow an analysis of localized supply and demand issues. In contrast, the analyses could be performed at such a micro-level of analysis (e.g., a single residence) as to not provide practical results. Thus, supply analyses were developed on a watershed or "basin" basis, guided by the location of surface water streamflow gages and availability of acceptable flow data. Similarly, the comparison of supplies and future demands was conducted on a basin basis, requiring the projected water demands to be allocated among those same basins.

The statewide water supply availability analysis was performed on a geographic basis by subdividing the state into 82 surface water basins using United States Geologic Survey (USGS) Hydrologic Units 12 (HUC12) boundaries. The basins used for this analysis were adapted from existing OWRB stream system analysis boundaries. Figure 3 shows the basins and 13 aggregated Watershed Planning Regions used in the supply availability analysis, including region names and basin numbers.

Figure 1
Two-Pronged Approach to Water Supply Planning

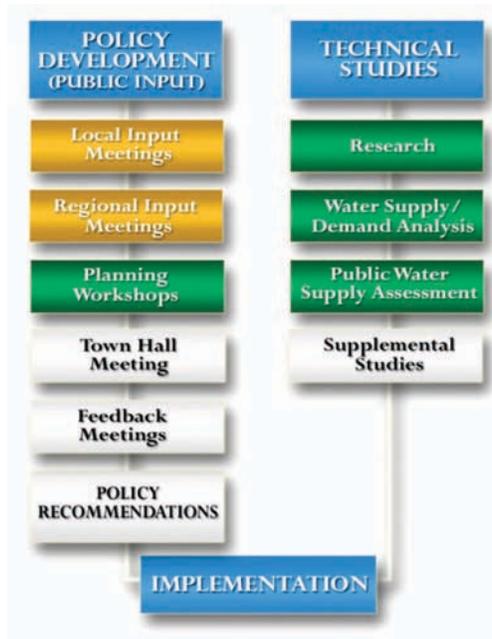
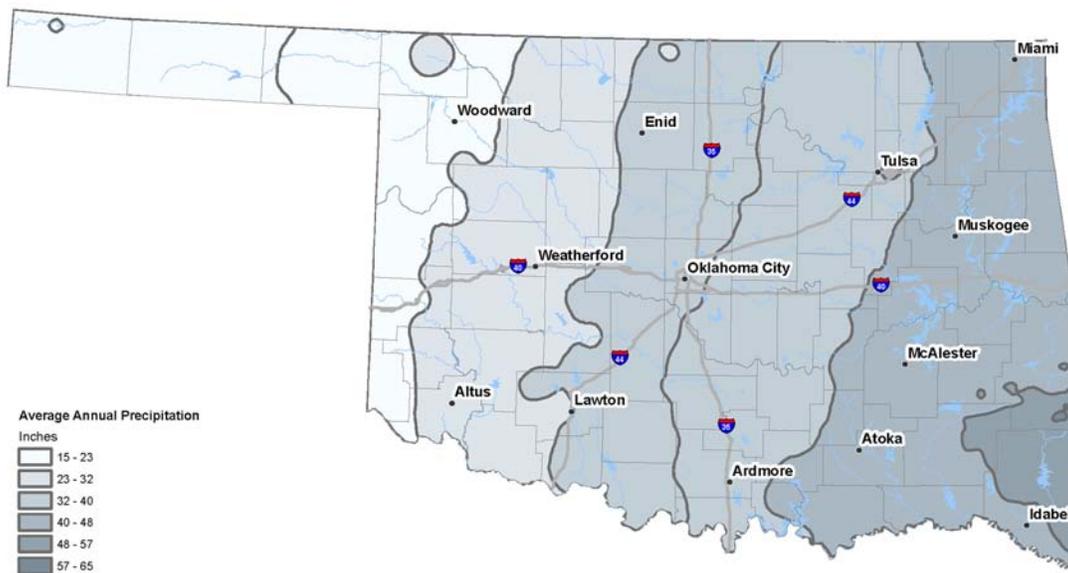


Figure 2
Average Annual Precipitation in Oklahoma



*See Figure 3
The 82 OCWP Basins
and 13 Watershed Planning Regions*

Precipitation strongly influences the state's surface water and groundwater resources. Precipitation directly affects surface water supplies via storm runoff. Alluvial groundwater aquifers are made up of sediment deposited by rivers, and are generally filled by surface water or infiltration of precipitation. Bedrock aquifers are typically deeper formations not directly associated with rivers; they are generally filled with water that infiltrates into the aquifer from the surface or other overlying aquifers. Bedrock groundwater is somewhat influenced by today's precipitation but more so by broader geologic factors and longer-term climate conditions.

As a key foundation of the OCWP technical work, a database and geographical information system (GIS) based analysis tool was created to compare projected demands to physical supplies for each of the 82 OCWP basins. The "Oklahoma H₂O Tool" 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 supply availability tool was developed to allow flexibility in the performance of a variety of "what-if" scenarios. It provides unprecedented capabilities to make informed decisions based on a variety of factors. The analysis incorporates data on supply and demands to determine the available water (surface water and groundwater) in each OCWP basin.

Although not discussed in detail here, the state's overall supply availability is also influenced by legal considerations based on Oklahoma's water laws and federally enforced Interstate Compacts. Interstate Compacts describe how we share water between our neighboring states and identify what is available for Oklahoma. Oklahoma is party to four Interstate Compacts. The OCWP technical analyses are evaluating the physical and legal availability of water supplies to meet Oklahoma's future needs, along with water quality considerations and infrastructure required to meet those needs.

Surface Water

The extremes of Oklahoma's climate diversity have historically resulted in periods of flooding and extended times of drought. To help address these natural disasters, 34 major storage projects were constructed between 1940 and 1985. Oklahoma has over 3.2 million acre feet (AF) of water supply storage and over 25 million AF of flood storage (Oklahoma Water Atlas). (An acre-foot is equal to approximately 325,000 gallons.) Oklahoma's major surface water resources and average surface water gauged flows (1950-2007) are shown in Figures 4 and 5.

*See Figure 4
Oklahoma's Surface Water Resources*

The rivers and streams of eastern Oklahoma typically have higher annual flows than those in western portions of the state. Portions of the Arkansas, Cimarron, and Canadian Rivers systems can generate over 250,000 acre-feet per year (AFY) of runoff. In contrast, in areas of western Oklahoma, significantly less annual flows are typical. During the 2006 drought, some of these river systems experienced a 10-fold decrease or more in total flows.

*See Figure 5
Average Gauged Stream Flow 1950-2007*

Pertinent information for the state's major water storage projects are shown in Table 1

Groundwater

As shown in Figure 6, the major alluvial and terrace aquifers of Oklahoma are in many cases aligned with major surface water features. Both the alluvial groundwater supply and surface water quantities generally increase from west to east across Oklahoma. Major alluvial groundwater aquifers are defined as those with wells capable of yielding 150 gallons of water per minute or more, with the highest yields typically found in alluvial wells along the Arkansas, Canadian, Cimarron, North Canadian, Red River, and Washita Rivers. Alluvial groundwater will continue to be an important supply for all water use sectors.

Table 1
Major Reservoirs in Oklahoma

<i>Name</i>	<i>Source</i>	<i>Purpose</i>	<i>Storage</i>	<i>Yield</i>	<i>NSA</i>	<i>By</i>	<i>Date</i>
<i>Oologah</i>	<i>Verdigris River</i>	<i>WS, FC, N, R, FW</i>	<i>342,600</i>	<i>172,480</i>	<i>31,040</i>	<i>COE</i>	<i>1974</i>
<i>Skiatook</i>	<i>Hominy Creek</i>	<i>WS, FC, WQ, R, FW</i>	<i>280,200</i>	<i>85,130</i>	<i>10,190</i>	<i>COE</i>	<i>1982</i>
<i>Sardis Lake</i>	<i>Jackfork Creek</i>	<i>WS, FC, R, FW</i>	<i>270,270</i>	<i>156,800</i>	<i>13,610</i>	<i>COE</i>	<i>1981</i>
<i>Kaw</i>	<i>Arkansas River</i>	<i>WS, FC, WQ, R, FW</i>	<i>203,000</i>	<i>230,720</i>	<i>18,775</i>	<i>COE</i>	<i>1976</i>
<i>Waurika</i>	<i>Beaver Creek</i>	<i>WS, FC, WQ, R, FW, I</i>	<i>170,200</i>	<i>45,590</i>	<i>10,100</i>	<i>COE</i>	<i>1977</i>
<i>Foss Reservoir</i>	<i>Washita River</i>	<i>WS, FC, R, I</i>	<i>165,480</i>	<i>18,000</i>	<i>6,800</i>	<i>BOR</i>	<i>1961</i>
<i>Broken Bow</i>	<i>Mountain Fork River</i>	<i>WS, FC, P, R, FW</i>	<i>152,500</i>	<i>196,000</i>	<i>14,200</i>	<i>COE</i>	<i>1970</i>
<i>Texoma</i>	<i>Red River</i>	<i>WS, FC, P, N, R, FLOW</i>	<i>150,000</i>	<i>168,000 (2)</i>	<i>86,910</i>	<i>COE</i>	<i>1944</i>
<i>Lugert-Altus</i>	<i>North Fork of Red River</i>	<i>WS, FC, I</i>	<i>132,830</i>	<i>47,100</i>	<i>6,260</i>	<i>BOR</i>	<i>1948</i>
<i>Hugo</i>	<i>Kiamichi River</i>	<i>WS, FC, WQ, R, FW</i>	<i>121,500</i>	<i>165,800</i>	<i>13,144</i>	<i>COE</i>	<i>1974</i>
<i>McGee Creek</i>	<i>McGee Creek</i>	<i>WS, FC, R, WQ, FW</i>	<i>107,980</i>	<i>71,800</i>	<i>3,810</i>	<i>BOR</i>	<i>1985</i>
<i>Thunderbird</i>	<i>Little River</i>	<i>WS, FC, R</i>	<i>105,900</i>	<i>21,700</i>	<i>6,070</i>	<i>BOR</i>	<i>1965</i>
<i>Canton Lake</i>	<i>North Canadian River</i>	<i>WS, FC, I</i>	<i>97,170</i>	<i>18,480</i>	<i>7,910</i>	<i>COE</i>	<i>1948</i>
<i>Tom Steed</i>	<i>Otter Creek</i>	<i>WS, FC, R, FW</i>	<i>88,970</i>	<i>16,000</i>	<i>6,400</i>	<i>BOR</i>	<i>1977</i>
<i>Fort Cobb</i>	<i>Cobb Creek</i>	<i>WS, FC, R, FW</i>	<i>78,350</i>	<i>18,000</i>	<i>4,070</i>	<i>BOR</i>	<i>1959</i>
<i>Optima</i>	<i>North Canadian River</i>	<i>WS, FC, R, FW</i>	<i>76,200</i>	<i>N/A</i>	<i>5,340</i>	<i>COE</i>	<i>1978</i>
<i>Pine Creek</i>	<i>Little River</i>	<i>WS, FC, WQ, FW, R</i>	<i>70,560</i>	<i>134,400</i>	<i>3,750</i>	<i>COE</i>	<i>1969</i>
<i>Arbuckles</i>	<i>Rock Creek</i>	<i>WS, FC, R, FW</i>	<i>62,600</i>	<i>24,000</i>	<i>2,350</i>	<i>BOR</i>	<i>1967</i>
<i>Eufaula</i>	<i>Canadian River</i>	<i>WS, FC, N, P</i>	<i>56,000</i>	<i>56,000</i>	<i>105,500</i>	<i>COE</i>	<i>1964</i>
<i>Wister</i>	<i>Poteau River</i>	<i>WS, FC, R, FW</i>	<i>39,082</i>	<i>31,400</i>	<i>7,386</i>	<i>COE</i>	<i>1949</i>
<i>Copan Lake</i>	<i>Little Caney River</i>	<i>WS, FC, R, FW</i>	<i>33,600</i>	<i>21,300</i>	<i>4,850</i>	<i>COE</i>	<i>1981</i>
<i>Arcadia</i>	<i>Deep Fork</i>	<i>WS, FC, R</i>	<i>27,380</i>	<i>12,320</i>	<i>1,820</i>	<i>COE</i>	<i>1984</i>
<i>Hulah</i>	<i>Caney River</i>	<i>WS, FC, LF</i>	<i>26,960</i>	<i>18,928</i>	<i>3,570</i>	<i>COE</i>	<i>1951</i>
<i>Tenkiller Ferry</i>	<i>Illinois River</i>	<i>FC, P</i>	<i>25,400</i>	<i>29,792</i>	<i>12,900</i>	<i>COE</i>	<i>1953</i>
<i>Keystone</i>	<i>Arkansas River</i>	<i>WS, FC, P, N, FW</i>	<i>20,000</i>	<i>22,400</i>	<i>22,420</i>	<i>COE</i>	<i>1974</i>
<i>Birch</i>	<i>Birch Creek</i>	<i>WS, FC, WQ, R, FW</i>	<i>15,165</i>	<i>6,700</i>	<i>1,145</i>	<i>COE</i>	<i>1977</i>
<i>Heyburn</i>	<i>Polecat Creek</i>	<i>WS, FC, R, FW</i>	<i>2,340</i>	<i>1,904</i>	<i>880</i>	<i>COE</i>	<i>1950</i>
<i>Fort Supply</i>	<i>Wolf Creek</i>	<i>WS, FC</i>	<i>400</i>	<i>224</i>	<i>1,820</i>	<i>COE</i>	<i>1942</i>
<i>Grand</i>	<i>Grand (Neosho) River</i>	<i>FC, P</i>	<i>N/A</i>	<i>N/A</i>	<i>46,500</i>	<i>GRDA</i>	<i>1940</i>
<i>Robert S. Kerr</i>	<i>Main Stem Arkansas River</i>	<i>N, P, R</i>	<i>N/A</i>	<i>N/A</i>	<i>32,800</i>	<i>COE</i>	<i>1970</i>
<i>Fort Gibson</i>	<i>Grand (Neosho) River</i>	<i>FC, P</i>	<i>N/A</i>	<i>N/A</i>	<i>19,900</i>	<i>COE</i>	<i>1953</i>
<i>Webbers Falls</i>	<i>Arkansas River</i>	<i>N, P</i>	<i>N/A</i>	<i>N/A</i>	<i>11,640</i>	<i>COE</i>	<i>1970</i>
<i>Hudson (Markham Ferry)</i>	<i>Grand (Neosho) River</i>	<i>FC, P</i>	<i>N/A</i>	<i>N/A</i>	<i>10,900</i>	<i>GRDA</i>	<i>1964</i>
<i>Great Salt Plains</i>	<i>Salt Fork of Arkansas River</i>	<i>FC, WS, FW, R</i>	<i>N/A</i>	<i>N/A</i>	<i>8,690</i>	<i>COE</i>	<i>1941</i>
Total				2,922,637	1,622,968		

(1) Includes water quality storage where applicable. (2) Oklahoma portion of total yield.

PURPOSE: WS - Water Supply; FC - Flood Control; WQ - Water Quality; R - Recreation; LF- Low Flow Regulation; CS - Cooling Water; FW - Fish & Wildlife; P - Power; I - Irrigation, N - Navigation

BY (BUILT BY): BOR - U. S. Bureau of Reclamation; COE - U.S. Army Corps of Engineers; GRDA - Grand River Dam Authority

STORAGE: Water supply storage in acre-feet

SUPPLY: Water supply yield in acre-feet

NSA: Normal surface area in acres

Figure 3
The 82 OCWP Basins and 13 Watershed Planning Regions

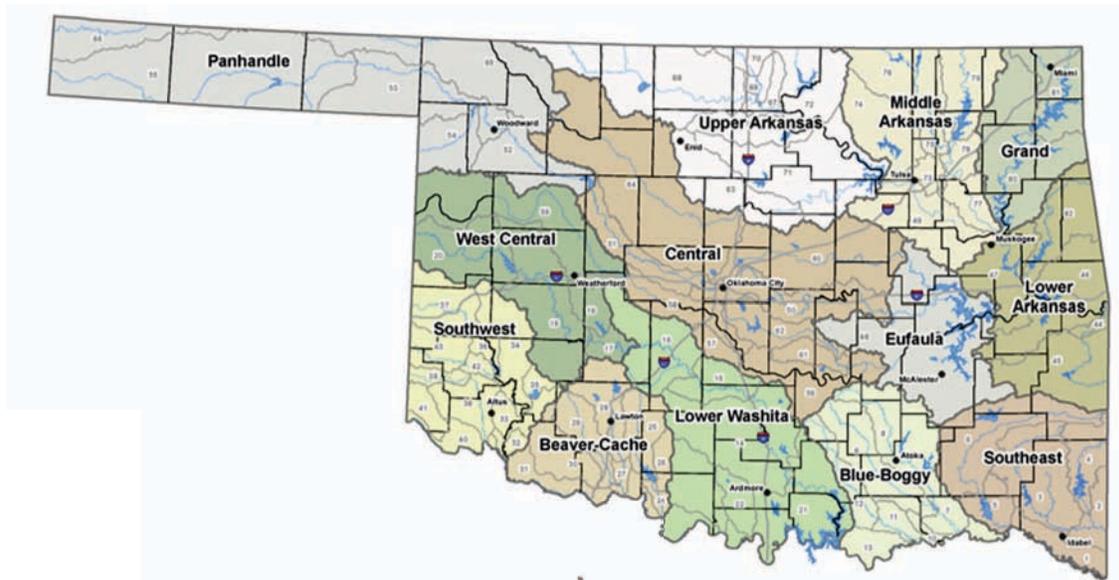


Figure 4
Oklahoma's Major Surface Water Resources



Figure 5
 Average Gauged Stream Flow 1950-2007

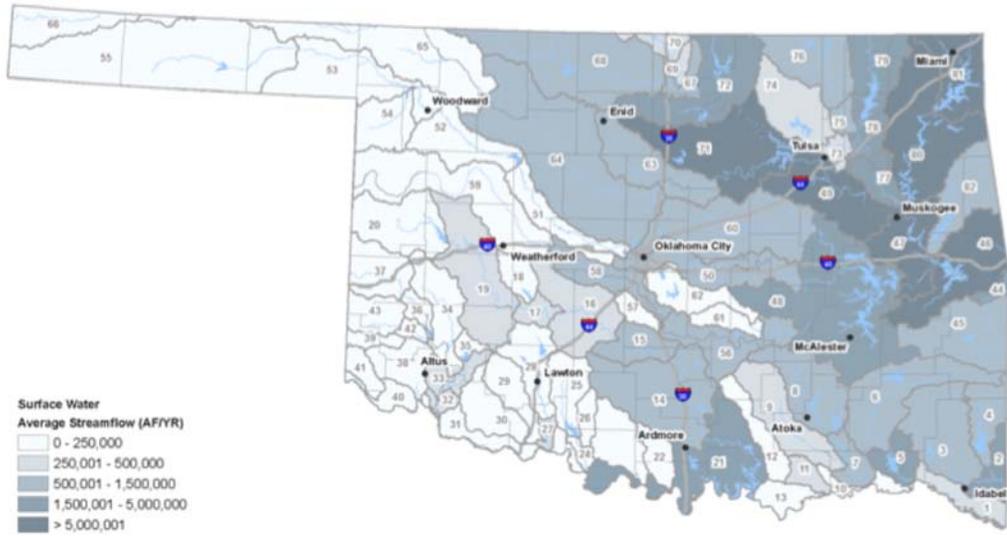
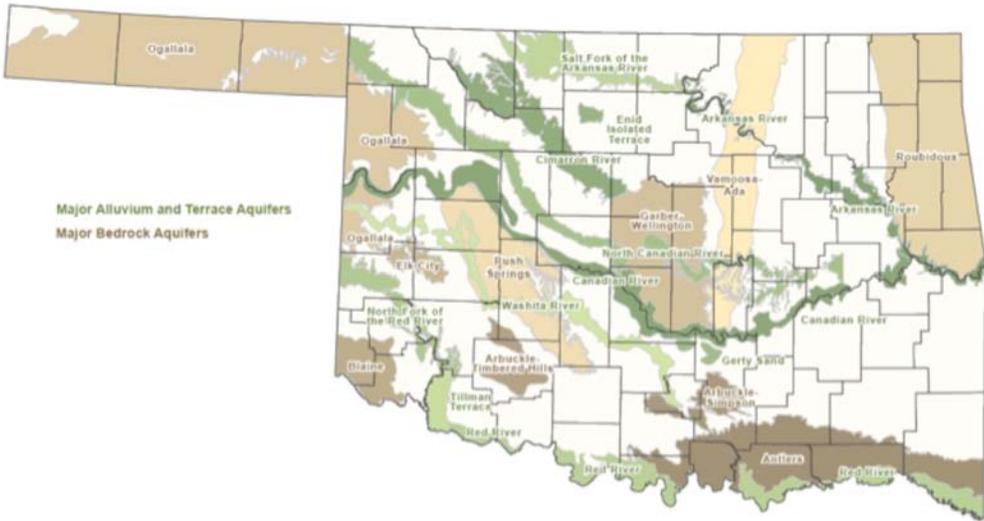


Figure 6
 Major Groundwater Aquifers in Oklahoma



Also shown in Figure 6 are the state's major bedrock aquifers, which include the Antlers, Arbuckle-Simpson, Arbuckle-Timbered Hills, Blaine, Elk City, Garber-Wellington, Ogallala, Rush Springs, and Roubidoux. Oklahoma has significant bedrock groundwater resources, with groundwater well yields ranging from less than 50 gallons per minute to approximately 1,000 gallons per minute in the Rush Springs aquifer. Bedrock groundwater will be an important future source of supply for Oklahoma; therefore, efficient management of this resource is needed for its continued reliable use.

Table 2 lists the major aquifers and select aquifer properties. The amount of water that can be recovered from these aquifers varies significantly from one aquifer to another, and can be a function of site-specific economic feasibility.

See Figure 6
Major Aquifers of Oklahoma

See Table 2
Properties of Major Aquifers of Oklahoma

Water Demands

Key drivers for water planning in Oklahoma include generally increased water demands as a result of population growth and increases in other water use sectors (e.g., agriculture and energy development). Figure 7 provides a summary of Oklahoma's present and projected population by supplier source. The state's population is expected to grow from 3.6 million in 2007 to 4.8 million in 2060. The five counties with the highest 2007 population are Oklahoma, Tulsa, Cleveland, Canadian, and Rogers (701,807, 585,068, 236,492, 103,559, and 83,105, respectively). The majority of the remaining 2007 countywide populations fall in the 10,000-70,000 range.

Between 2010 and 2060, the three fastest-growing counties in terms of population are expected to be Oklahoma, Tulsa, and Cleveland (122,118, 106,660, and 60,602, respectively). In terms of percent population growth, the three fastest growing counties from 2010 to 2060 are expected to be Love, Marshall, and Texas (232%, 123%, and

123%, respectively). Thirteen of Oklahoma's 77 counties are expected to have less than 10 percent population growth from 2010 to 2060, with one county at zero growth and one county with a slight population decline.

See Figure 7
Oklahoma's Projected
Population and Source of Water Supply

Water demand projections for all major water uses throughout the state were developed for the 2007 base year, or starting point of the forecast and then at 10-year intervals from 2010 to 2060. Water uses are grouped into four major categories—public supplied Municipal and Industrial (M&I), self-supplied residential, self-supplied nonresidential, and agriculture, which were subdivided into a total of seven water use sectors. These forecasts were developed for each county in the state.

Figure 8 summarizes the projected total water demand for the state by water use sector. Overall, by the year 2060 water use in Oklahoma is projected to increase from approximately 1.82 million AFY in 2010 to about 2.43 million AFY by 2060.

See Figure 8
Total Statewide Water Demands by Demand Sector

A brief overview of each demand sector is provided below.

Municipal and Industrial (M&I)

M&I demands represent water that is provided by public water systems to homes, businesses, and industries throughout Oklahoma. Water uses include water for bathing, flushing, washing, drinking, landscape irrigation, car washing, recreation, domestic animal care, etc. The quantity of water associated with system losses (e.g., distribution system leakage) and unmetered connections was estimated and included in the M&I demands.

Self-Supplied Residential

This sector includes demands for households on private wells that are not connected to a public water supply system. It is assumed that these

households are located primarily in outlying communities and rural areas of the state. While some self-supplied rural residential homes use well water for livestock care, the demands for the self-supplied rural residential sector only represent water use inside the home, as well as non-agricultural related outdoor use. Agricultural irrigation and livestock use is described below.

Self-Supplied Industrial

Large industries that are identified as self-supplied users with available water use data and employment counts are included in this group. These industries include sand companies, gypsum production plants, quarry mines, concrete plants, petroleum refineries, paper mills, sawmills, bottling and distribution plants, chemical plants, tire manufacturing plants, lime production, natural gas plants, and meat packing plants.

Thermoelectric Power

Self-supplied and municipal-supplied thermoelectric power producing plants are included in this sector. Water demand estimates are based on megawatt-hours (MWh) produced by each plant and average water needs per MWh, unless substantiated by water use information showing otherwise. Power generation and water use is assumed to have a linear relationship into the future. According to reports from the U.S. Department of Energy, power generation is estimated to grow 1.1 percent annually over the next 30 years. This growth rate is assumed for Oklahoma power generation through 2060.

Agriculture (Livestock and Crop Irrigation)

Agriculture demands are estimated by two sub-sectors: livestock and crop irrigation. United States Department of Agriculture (USDA) Census

*Table 2
Properties of Major Aquifers in Oklahoma*

<i>Aquifer</i>	<i>Type</i>	<i>Acres</i>	<i>Acre-Feet</i>
<i>Ogallala</i>	<i>Bedrock</i>	<i>4,376,988</i>	<i>90,590,163</i>
<i>Rush Springs</i>	<i>Bedrock</i>	<i>1,549,593</i>	<i>79,838,095</i>
<i>Garber-Wellington</i>	<i>Bedrock</i>	<i>1,832,124</i>	<i>58,599,398</i>
<i>Antlers</i>	<i>Bedrock</i>	<i>2,723,662</i>	<i>53,589,751</i>
<i>Roubidoux</i>	<i>Bedrock</i>	<i>2,942,358</i>	<i>43,030,750</i>
<i>Vamoosa-Ada</i>	<i>Bedrock</i>	<i>1,649,642</i>	<i>14,931,579</i>
<i>Arbuckle-Simpson</i>	<i>Bedrock</i>	<i>337,629</i>	<i>9,471,084</i>
<i>North Canadian River</i>	<i>Alluvium and Terrace</i>	<i>1,254,796</i>	<i>8,286,769</i>
<i>Canadian River</i>	<i>Alluvium and Terrace</i>	<i>1,364,937</i>	<i>5,016,569</i>
<i>Washita River</i>	<i>Alluvium and Terrace</i>	<i>696,750</i>	<i>4,920,626</i>
<i>Cimarron River</i>	<i>Alluvium and Terrace</i>	<i>832,540</i>	<i>3,858,713</i>
<i>North Fork of the Red River</i>	<i>Alluvium and Terrace</i>	<i>426,461</i>	<i>3,761,883</i>
<i>Red River</i>	<i>Alluvium and Terrace</i>	<i>884,283</i>	<i>2,591,280</i>
<i>Elk City</i>	<i>Bedrock</i>	<i>193,136</i>	<i>2,243,573</i>
<i>Salt Fork of the Arkansas River</i>	<i>Alluvium and Terrace</i>	<i>541,795</i>	<i>2,191,199</i>
<i>Blaine</i>	<i>Bedrock</i>	<i>465,152</i>	<i>1,402,380</i>
<i>Tillman Terrace</i>	<i>Alluvium and Terrace</i>	<i>182,575</i>	<i>1,283,400</i>
<i>Arbuckle-Timbered Hills</i>	<i>Bedrock</i>	<i>240,333</i>	<i>961,336</i>
<i>Arkansas River</i>	<i>Alluvium and Terrace</i>	<i>536,052</i>	<i>945,803</i>
<i>Enid Isolated Terrace</i>	<i>Alluvium and Terrace</i>	<i>51,803</i>	<i>259,793</i>
<i>Gerty Sand</i>	<i>Alluvium and Terrace</i>	<i>70,416</i>	<i>223,521</i>

Figure 7
 Oklahoma's Projected Population and Source of Water Supply

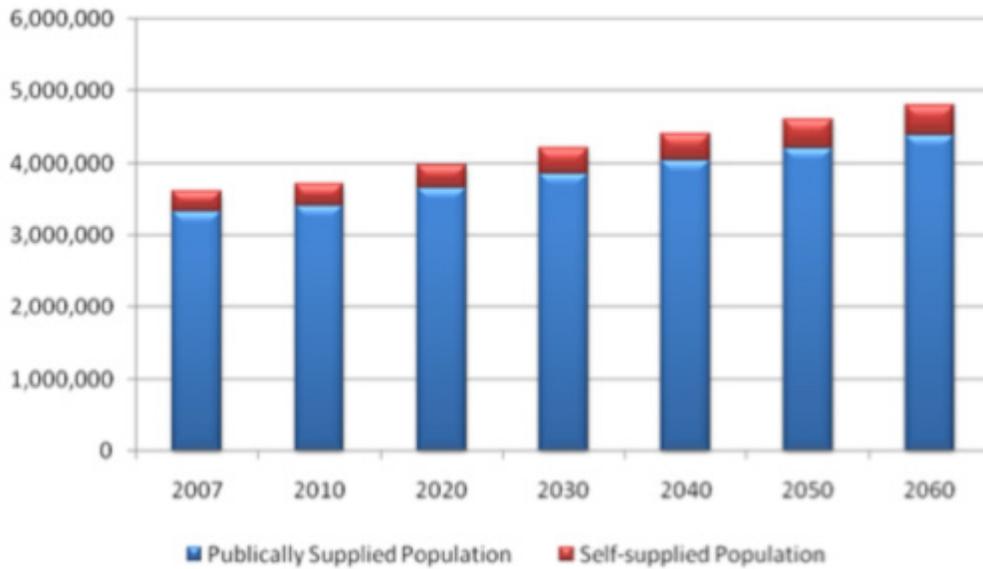
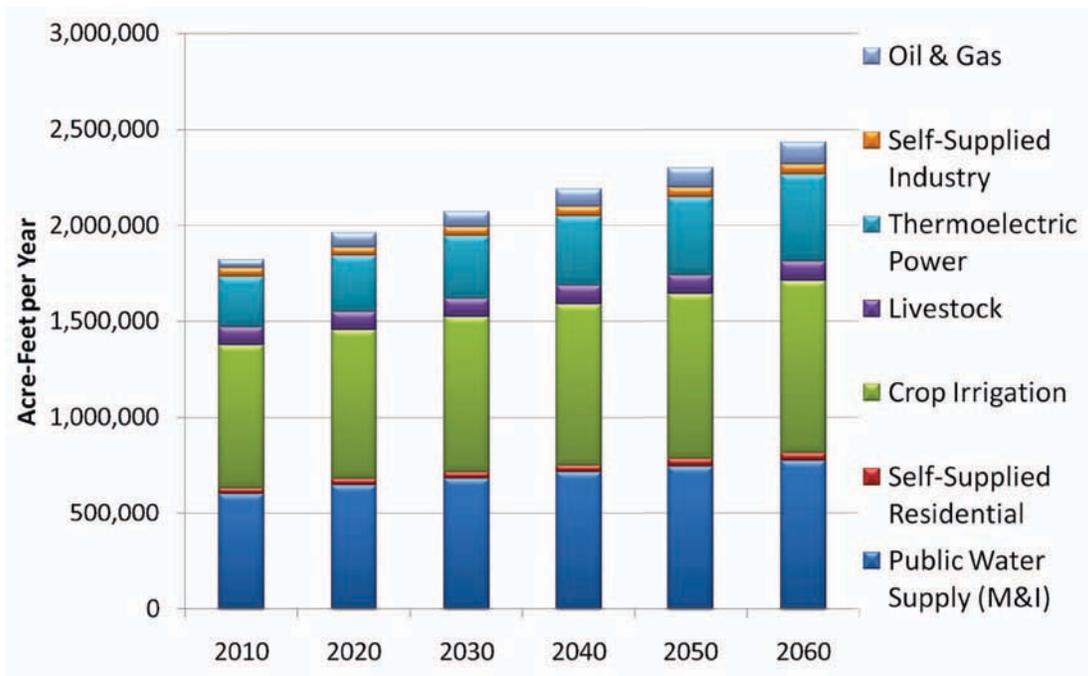


Figure 8
 Total Statewide Water Demands by Demand Sector



of Agriculture data were utilized for both sub-sectors. Livestock demands are evaluated by livestock group and are based on average day water requirements for each group. Data were obtained from the most recent available Agriculture Census on irrigated acres by crop type by county.

These data were combined with crop irrigation water requirements, as published in the Natural Resource Conservation Service (NRCS) Irrigation Guide for Oklahoma. Adjustments were made to the crop requirements to include water losses from on-farm irrigation delivery system inefficiencies.

Oil and Gas

This sector represents water used in oil and gas drilling and exploration activities but does not include water used at oil and gas refineries. Drilling and exploration activities use water for supplemental fluid in enhanced recovery operations, during well drilling and completion, during workover of an oil or gas well, as rig wash water, as coolant for equipment, and for sanitary purposes. Water use from both conventional and unconventional drilling techniques was considered, and projections of drilling activities were provided by the Oklahoma oil and gas industry.

Demands for each of the above sectors were also allocated to the OCWP basins for further analysis. Summaries of demand projections by county, basin, and demand sector are provided in Figures 9 and 10. As shown in these figures, Oklahoma's urban areas have relatively high demand densities associated with M&I water use, while western Oklahoma's higher demand density is largely driven by agricultural demand.

*See Figure 9
2060 County Demands (All Sectors)*

*See Figure 10
2060 Basin Demand
by Demand Sector and Demand Density*

Preliminary Insights from the Planning Process

At this point in the OCWP process there is still a significant amount of data analysis and interpretation to be completed. Consequently,

there are still a number of conclusions and recommendations that will need to be considered and developed. However, some information is available based on the data that has been collected to date. An important source for some of this information is a recently-completed survey of water providers.

In 2008, as part of the OCWP update, a survey was sent to 785 municipal and rural water providers to collect information on water supply systems across the state. 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 a survey, 561 responded. The providers that responded to the survey serve water to about 3,100,000 Oklahomans, or about 86 percent of the state's residents.

The survey was designed to gather information on public water suppliers' planning efforts, supply needs, and infrastructure needs. The OCWP is taking unprecedented steps to consider the needs of public water suppliers as the OWRB plans for the needs of Oklahoma's citizens now and for the next 50 years. The information obtained from this survey provides foundational data and insights that are being used in the following ways:

- *Development of county- and provider-level demand projections, using providers' survey responses to estimate existing regional-specific per-capita water demands*
- *Statewide assessment of public water supply systems, as documented in the report*
- *Provider-specific information that will be integrated into the Basin Supply Fact Sheets and Watershed Supply Assessments in subsequent phases of the OCWP development*
- *Data to make provider-level water use projections, when limited local data are available, for use in their individual planning efforts or project planning in the future*

Figure 9
2060 County Demands (All Sectors)

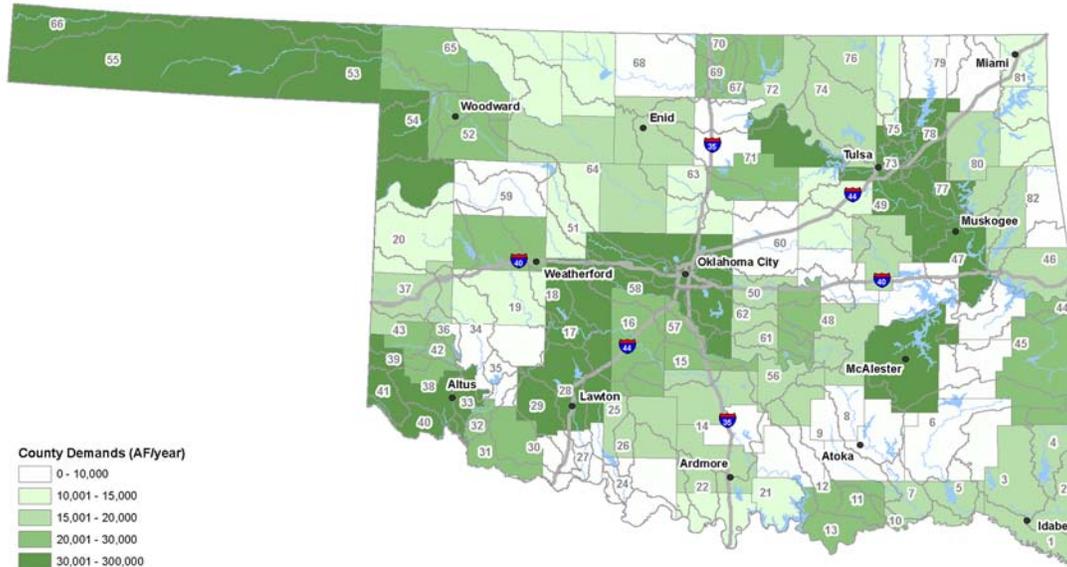
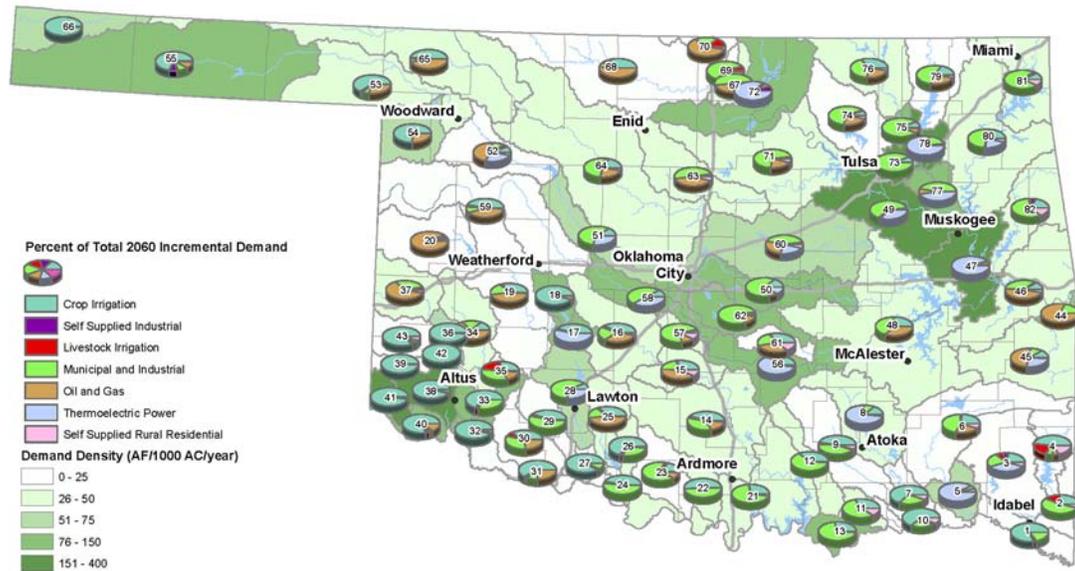


Figure 10
2060 Basin Demand by Demand Sector and Demand Density



The survey addressed questions related to supplies, demands, infrastructure, and conservation.

Public water supply providers surveyed include both municipalities and rural water districts. Providers that categorized themselves as “Other” include but are not limited to limited service water trusts, government agencies, small water corporations, and non-profit corporations.

A summary of responding provider types is presented in Figure 11. Overall, the survey captured responses from providers across all regions of Oklahoma.

Water suppliers in Oklahoma provide a critical service to the state’s citizens. The survey identified several important trends to help OWRB identify technical needs of providers and to identify related policy implications. A few of the important findings of the survey are provided below.

A majority of providers that presented population projections for future planning horizons expect population increases in the future (87 percent, or 331 of 378 responding providers). However, only a small fraction (6.4 percent) of responding providers have 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 greater than 30 years old. In addition to that, half of all reported treatment plants are greater than 30 years old with half of all reported expansions occurring more than 6 years ago. Less than half of the planned distribution system improvements are fully or partially funded (38%).

*See Figure 11
Number of Providers Participating in Survey*

In addition to the information obtained from the provider survey, several additional trends and factors have been identified and discussed by the Oklahoma water community, including:

- Population growth trends in metropolitan areas, as well as continuing urban expansion into rural areas, will place considerable demands on the use, availability, and quality of water throughout Oklahoma.
- Oklahoma’s demographic trends indicate that a large portion of growth will be in the current urban areas and along southern boundary with Texas. Western Oklahoma has less available water but is not expected to see the same level of growth. Meeting urban growth needs will require infrastructure to store and convey water supplies.
- Climate change, drought episodes, environmental regulations, legal considerations, and water requirements for economic development, agriculture, and recreation will result in greater stress on state waters and water managers. These factors are important drivers and consideration in the management of water resources and Oklahoma’s water planning process.
- A significant challenge facing the state is infrastructure. This includes:
 - *developing the infrastructure needed to move water from the location of supply to the location of need (overall water supply is not major issue on a statewide basis but localized shortages to current and future needs exist and will increase over time)*
 - *maintenance of existing infrastructure*
 - *replacement of aging infrastructure, including storage, treatment, and conveyance systems*
- Future challenges and needs to address priority water resource issues will likely fall into four major categories: 1) Technical; 2) Financial; 3) Policy and; 4) Administration. These issues will be further assessed as part of the ongoing planning process. To date several technical tools/documents have been developed to help

The Management of Water in Oklahoma

Kyle Arthur, Dean Couch and Terri Sparks, Oklahoma Water Resources Board

Water Use and Rights Administration
Oklahoma's water resources - with the sole exception of surface supplies in the Grand River Basin, which are under the jurisdiction of the Grand River Dam Authority (GRDA) -- are administered by the Oklahoma Water Resources Board. The agency's nine-member decision-making body, appointed by the Governor, is responsible for the appropriation, distribution and management of waters in the state.

Any person who intends to acquire a water right must file a permit application which is considered for approval by the Board. Stream water is considered to be public water subject to appropriation, while groundwater is private property that belongs to the overlying surface owner but is subject to reasonable regulation by the OWRB.

The statutes that incorporate the appropriation doctrine for stream water recognize and protect a limited riparian right to a domestic use. However, the Oklahoma Supreme Court has declared that Oklahoma is a dual doctrine state and that the riparian right to a reasonable use in addition to the domestic use is superior to all appropriation uses.

Riparian rights are not subject to any permitting or oversight by the Oklahoma Water Resources Board. The statutes governing groundwater use incorporate an allocation system to authorize pumping a volume of water based on the number of acres of land that the permittee owns or leases overlying a basin.

For both classes of water (surface and ground), a fundamental requirement is that the permit holder must put the water to beneficial use. Beneficial uses of water include agriculture, irrigation, hydroelectric power generation, municipal, industrial, navigation, recreation, and fish and wildlife propagation. State water law recognizes no preferences among these uses, except that stream water appropriations cannot interfere with domestic

uses. Permits are not required for domestic use, defined as the use of water "for household purposes, for farm and domestic animals up to the normal grazing capacity of the land and for the irrigation of land not exceeding a total of three acres in area for the growing of gardens, orchards and lawns." Domestic use also includes other minor uses which do not exceed five acre-feet per year.

Grand River Dam Authority

As mentioned, Grand River Dam Authority, established by the State Legislature in 1935, is responsible for administering water resources in the Grand River Basin, and can provide water and power within the 24 counties in northeast Oklahoma. Expressly, the agency is a conservation and reclamation district that is also designated as a state agency created to control, store, preserve and distribute waters of the Grand River and its tributaries for any useful purpose.

The entity is a nonappropriated agency with revenue derived from the sale of power and water. Instead of actual appropriation of waters, the agency enters into repayment contracts for the use of surface water resources in the basin. Groundwater use in the basin remains under jurisdiction of the OWRB. In addition to general

Grand Lake, NE Oklahoma



control and management of river/tributary waters and hydropower projects at Grand Lake, Lake Hudson and the W.R. Holway Project, GRDA operates and maintains an integrated electric transmission system, including over 2,000 miles of line and related switching stations and transformer substations.

Stream Compacts

To resolve and prevent disputes over waters shared with neighboring states, Oklahoma participates in four interstate stream compacts: the Arkansas River Compact with Arkansas; the Arkansas River Compact with Kansas; the Red River Compact with Arkansas, Louisiana and Texas; and the Canadian River Compact with New Mexico and Texas. Compacts clearly spell out how much water a signatory state is allowed to develop or store on an interstate stream.

Water Quality and Pollution Control

Because ownership and rights to use water does not include the right to pollute or degrade fresh water resources, numerous agencies and organizations have responsibilities related to the enforcement of state and federal pollution laws. However, the Oklahoma Department of Environmental Quality supervises the majority of the state's environmental protection and management programs. The quality of surface and groundwaters is of enormous importance to public health and prosperity in Oklahoma and, as a result, potentially harmful pollutants from both point and nonpoint sources are closely monitored to ensure that Oklahoma rivers, streams and lakes receive at least adequate protection.

State Water Agencies

There are many agencies and institutions that are involved in water-related matters in Oklahoma. The major state agencies that contribute to the regulation or management of Oklahoma's water resources immediately follow:

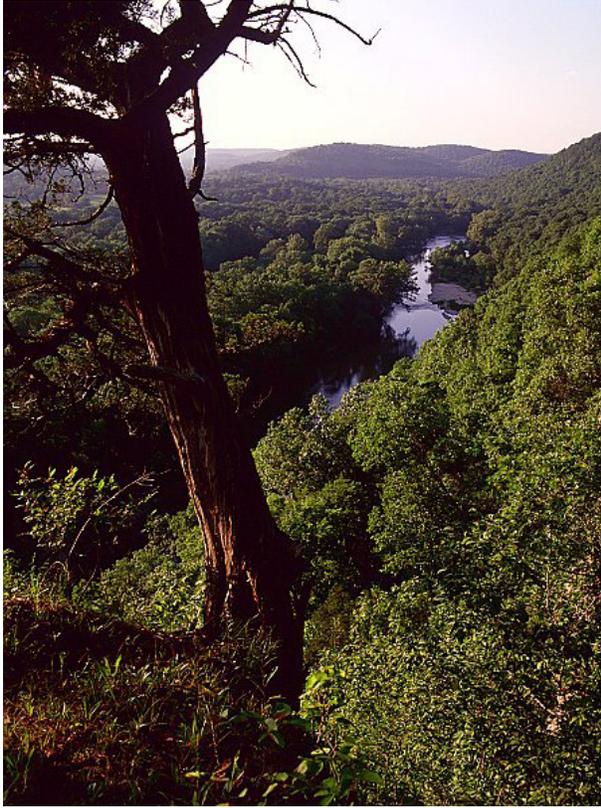
The OK Department of Agriculture, Food and Forestry enforces rules relating to the state's agricultural industry. The agency has specific duties and responsibilities in the areas of pesticide use,

storage, registration and application; fertilizer use and storage; confined animal feeding operations; and forestry operations.

The OK Conservation Commission develops and administers programs to control and prevent soil erosion; prevent floodwater and sediment damage; reduce nonpoint source pollution; promote implementation of Geographic Information System (GIS) technology in Oklahoma; protect state wetlands; and further the conservation, development and utilization of the state's renewable resources. In cooperation with Oklahoma's 87 conservation districts, the agency is involved in land use planning, reclamation of abandoned mine lands, water quality monitoring and in the overall conservation of soil, water, wildlife and forestry resources. With the assistance from the USDA Watershed Program, Oklahoma Conservation Districts, designated as local watershed project sponsors, have constructed 2,105 upstream flood control dams in 64 counties.

The OK Corporation Commission regulates oil and gas activities in the state to prevent pollution of Oklahoma's surface and groundwater resources. The Commission has exclusive jurisdiction over salt water, mineral brines, waste oil, and other deleterious substances produced from, obtained or used in connection with the drilling, development, production and procession of oil and gas. The Commission also regulates transportation and transmission companies, public utilities, motor carriers, pipeline safety and for-profit water corporations.

The Office of the Secretary of the Environment is the recipient and administrator of Federal Clean Water Act funds, coordinates pollution control activities to avoid duplication of effort, acts on behalf of the public as trustee for natural resources, and performs other duties and powers as may be assigned by the Governor. This Office is responsible for overseeing and coordinating activities of a number of state environmental agencies including the Oklahoma Water Resources Board, the Department of Environmental Quality and the Department of Wildlife Conservation.



Illinois River near Tahlequah

The OK Department of Environmental Quality has jurisdiction over a number of water-related, environmental areas, including treatment and discharge of industrial and municipal wastewaters and stormwaters; nonpoint source discharges and pollution (excluding those associated with agricultural or oil and gas related activities); public and private water supplies; underground injection control (excluding brine recovery, saltwater disposal or secondary/tertiary oil recovery); fresh water wellhead protection; enforcement of Oklahoma's Water Quality Standards; and development and update of the state's Water Quality Management Plan. In addition, the ODEQ has jurisdiction over air quality, hazardous and solid waste, radioactive waste, Superfund program activities and emergency response.

The Grand River Dam Authority controls the waters of the Grand River and its tributaries. The Oklahoma Department of Mines is the environmental regulatory authority empowered to execute, enforce and implement provisions of

state and federally mandated programs in the area of health, safety, mining and land reclamation practices associated with surface and subsurface mining.

The OK Scenic Rivers Commission fosters programs to develop and protect the state's scenic river areas and adjacent lands.

The OK Department of Tourism and Recreation promotes tourism and recreation in the state and develops, operates and maintains state parks, recreation areas and lodges.

The OK Department of Transportation is the coordinating agency for the state's transportation systems, including the McClellan-Kerr Arkansas River Navigation System. Under the agency's jurisdiction are the Port Authority and Oklahoma Waterways Advisory Board.

The OK Water Resources Board promulgates and adopts water quality standards and related implementation documents for the state as well as directs programs to assess and improve lake water quality. The agency also administers state water quantity laws through the issuance of stream and groundwater permits; investigates stream and groundwater resources; approves and assists irrigation district organization; administers the state dam safety program; supervises state weather modification activities; establishes water well construction standards; and licenses water well drillers. The OWRB also administers the Financial Assistance Program for water/wastewater projects; coordinates the National Flood Insurance Program in Oklahoma; negotiates and administers interstate stream compacts; and updates the state water plan.

The OK Department of Wildlife Conservation enforces state fishing and hunting laws and, in general, protects and manages the state's wildlife resources. The agency ensures that water resource projects and programs -- such as reservoir construction and management, water quality standards development, Section 404 permits and pollution related activities -- properly consider and provide for Oklahoma's fish and wildlife.

Federal Water Agencies

The major federal agencies that contribute to the regulation or management of Oklahoma's water resources immediately follow:



The U.S. Department of Agriculture's Farm Service Agency administers the Conservation Reserve Program (CRP), Agricultural Conservation Program (ACP) and Swampbuster and Sodbuster provisions of the Food Security Act of 1985, as amended. The Water and Environmental Programs (WEP), administered under USDA's Rural Development Program, provides loans, grants and loan guarantees for drinking water, sanitary sewer, solid waste and storm drainage facilities in rural areas and cities and towns of 10,000 or less. USDA's Natural Resources Conservation Service is responsible for developing and implementing soil and water conservation programs in cooperation with landowners, community planning agencies, and federal, state and local agencies.

The U.S. Army Corps of Engineers has major responsibilities in flood protection, navigation and the planning and development of multipurpose water resource projects. The Corps also regulates the disposal of dredge and fill material in navigable waters under the Section 404 (Clean Water Act) permit program.

The Bureau of Reclamation assists in the development and conservation of water, power and related land resources throughout the western United States. Bureau projects are operated to serve municipal and industrial, irrigation, water quality improvement and flood control purposes.

The Federal Energy Regulatory Commission provides technical assistance and review of water resource development projects in which hydroelectric power generation is among the project purposes. FERC, an agency of the U.S. Department of Energy, also licenses hydropower projects developed by non-federal entities.

The U.S. Environmental Protection Agency administers numerous federal environmental laws regulating water quality, such as the Clean Water Act, Safe Drinking Water Act, Resource Conservation and Recovery Act, Superfund program and National Environmental Policy Act.

EPA accomplishes this duty by setting national water quality standards used to develop site-specific waste discharge permits, enforcing those permits, and providing technical, emergency, and grant assistance to state and local governments. In addition, EPA is the lead federal agency for administering the Safe Drinking Water and Wastewater Facility Construction Loan Account-State Revolving Funds.

The U.S. Fish and Wildlife Service assists states in the planning and development of projects to restore and manage fish and wildlife resources.

The U.S. Geological Survey investigates the occurrence, quantity, quality, distribution, use and movement of the nation's surface and groundwater resources. Oklahoma cooperates with the USGS in maintaining stream gaging stations throughout the state. The Southwestern Power Administration, of the Department of Energy, markets hydropower power produced at federal dams in the southwestern United States

Native American Water Rights Claims

Indian water rights claims, relating to both ownership and inherent sovereign rights to regulate use and quality of water, raise important issues that are being addressed in the update to the Oklahoma Comprehensive Water Plan.

Suffice it to say such issues can be very complex and present significant challenges and new opportunities for the state and tribal governments to work together to find mutually beneficial solutions.





Topic 1

Water Availability
including during and after emergencies

Water Availability Including During/After Emergencies

Planning Workgroup Facilitators: Gary Strickland and MaryJac Rauh

GROUP

Facilitators: Gary Strickland and MaryJac Rauh.
Experts: Gene Lilly, US Army Corp of Engineers; James Allard, U.S. Bureau of Reclamation; Bob Fabian, Oklahoma Water Resources Board; Nicole Rowan, Camp, Dresser and McKee. Participants: Robert Hitt; Jerome Ewen; Paul Mullan; John Duck; Mike Thralls; Marjorie Griswold; John Redman; Carlie Lawson; Karen Riffel; Larry Casey; Kevin Stubbs; Jim Burroughs; Randy Davis; Phyllis Holcomb; Randy Worden; Robert Stephenson; Lowell Hobbs; Bruce Price; Marla Peek; and Bob Howard.

QUESTION

How should we protect the safety and reliability of water supplies in the face of shortages as a result of natural and other hazards?

1. Protection against supply disruption
2. Storage for use during shortages
3. Prioritization of water allocation during water shortages
4. Education and research on water supply disruptions, shortages and responses
5. Funding of water availability initiatives

Oklahoma Emergency and Drought Management Plan

Plan Update

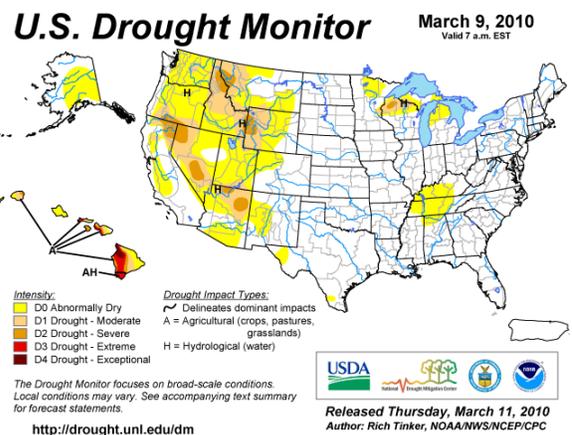
The Oklahoma Drought Management Plan was developed in response to the 1995-1996 drought. Though the State has experienced severe droughts since that time, the plan has not been updated. The Plan should be strengthened and updated every five years, with final approval by the Legislature and Governor. Consistent funding should be provided for plan updates and administrative costs of the plan should be minimized. Plan administrators should submit annual reports to the Legislature and the public for accountability. The State should also consider renaming the plan as the Oklahoma Water Emergency Management Plan or the Oklahoma

Water Disaster Management Plan to make clear that floods, terrorism, and contamination are other emergencies that should be considered.

Contents of the Plan

The Plan should:

1. Include provisions for legal, financial, and technical assistance to develop local water emergency management plans
2. Respect local control and seek to protect people, businesses and municipalities against liabilities during water shortages
3. Include incentives for cooperation and mutual aid during water shortage that encourage private water owners to (a) share in times of water shortage, (b) interconnect water systems, and (c) develop back-up water supplies. Incentives should also be given to develop reciprocity agreements so that the transfer of water during an emergency will be easier to accomplish
4. Address how these incentives should be funded [For example, a mechanism to pay for water use such as a coordinated fee structure, or system supply reimbursement are possibilities. Funding to encourage mutual aid could be provided through tax credits. Funding for back-up water supplies could be secured by public water suppliers setting aside a portion of their revenues or add on a fee, implemented by legislation, that goes into a restricted fund.]



5. Provide access to grants and resources in times of shortage (funds should be distributed at the local level and not go into a statewide fund)
6. Require that the water suppliers and others should be monitored to ensure they are not price-gouging consumers during an emergency

State Water Emergency Management Coordinator

A State Water Emergency Management Coordinator should be given authority to implement the plan and should have clear power to act when needed as well as designate lines of authority among agencies. The Coordinator should also designate a central place for people to contact when there is a water emergency.

Water Information Office

Office Establishment

The State should establish a water information office to develop and implement a comprehensive education program concerning water availability during shortages, and conservation. Education should be targeted to the public, schools, municipalities, county governments, and rural water districts. The programs administered by the water information office should be reviewed periodically to assure that initial goals are being achieved. Results of these reviews should be reported to the State Legislature. Office operations could be funded from a voluntary check-off option on water bills

Education Coordinator

The Oklahoma Conservation Commission's education coordinator could be the main source for materials and information; however, the coordinator's role should be expanded to include water availability and conservation. Educators from other agencies and entities would also need to be included.

Duties should consist of developing core education and communication curricula. The water information office should also promote and conduct continuing education workshops and develop advertisements, websites, email lists and social networks, such as Twitter and Facebook.

Emergency Communication

Informing citizens can be difficult, especially during an emergency. Therefore, Oklahoma could adopt a program similar to Colorado's reverse 911 program. This program should be used to notify and encourage citizens to take appropriate action during an emergency.

An Amber Alert-type system using multimedia communications should be established for use by municipalities, television stations, schools and others, keeping in mind that parts of the State receive their news from bordering states.

Long-Term Development of Water Infrastructure

Long-Term Regional Plans

The State should develop long-term regional plans to ensure adequate supplies of water are available for future needs.

An important aspect of any water plan is to ensure that water can get where it is needed when it is needed. For this to be possible, regional water supply systems should be connected and economically feasible transportation systems developed to move excess water to areas of need in times of emergency.

A water grid could be developed, possibly using the Grand River Dam Authority as a model. (GRDA supplies electricity throughout central and eastern Oklahoma through a series of transmission lines and two transmission service centers.) Regional agreements should be established to connect water supply systems and manage these transfers, and management plans should be developed to control sharing and environmental issues associated with this movement of water.

Increased Water Storage

In order to increase water storage:

1. The State and Federal government should work together to rehabilitate existing water supplies and flood control structures to provide additional water storage, irrigation supply, and flood control.

2. The State should develop a water banking system to store excess water.
3. Additional emergency water supplies should be developed by using new water treatment technologies to bring lower quality water supplies on-line.
4. Research should be conducted on building new multi-purpose dams that provide at least two of the possible uses: additional public water supply, irrigation supply, aquifer recharge, and flood control.

Infrastructure Funding

Sources of revenue for a water development fund should be established. These could include “pay its own way” and increasing the state revolving fund for infrastructure perhaps through water sales (revenue from the sale of water should not go into the State’s general fund). Distribution of funds could be modeled after the Rural Electrification Act of 1937 (the REA provided loans to states for rural electrification that furnished electricity to people in rural areas).

Topic 1: Recorder’s Notes

The Drought Management Plan is supposed to be a living document; it needs serious updating. It currently has no teeth and is ineffective. The drought plan should be converted to an overarching, all-hazards plan that references hazard-specific water emergencies such as drought, flood, terrorism, extreme heat or cold and tornados.

Legislation should be passed that renames the plan and strengthens authorities and resources. Annual or biannual reports to the legislature are needed and comprehensive reviews should be done less often, possibly every five years. The update process should allow for legislative involvement, especially regarding funding and enforceability. This will also provide political legitimacy (public accountability).

The drought plan could be placed within the water plan rather than having a separate plan. Some discussion focused on using the statewide emergency plan instead of strengthening the drought plan.

However, it seemed important that local hazard management plans continue. Drought response should be consolidated under one agency to increase effectiveness. The plan should also address water quality. A go-to agency and a go-to person should be identified and these should have adequate authority and resources. While the Governor is ultimately responsible, clear lines of authority and process are needed.

It is suggested that some protections against liability during a hazard be put in place. Research should be done, especially regarding climate, social science, and policy. Interaction with federal agencies was also discussed, and it was mentioned that mutual aid agreements are already in place.

Partners in Conservation Award for Oklahoma

Ken Salazar, Secretary of the Interior, May 2009

Oklahoma State Senate, Communications Division,
State Capitol, Oklahoma City, OK 73105, 5/28/09

Earlier this month, members of an Oklahoma delegation traveled to Washington, D.C. to receive the Partners in Conservation Award from Secretary of the Interior Ken Salazar. This coalition of individuals and agencies worked collaboratively with the Bureau of Reclamation and the Chickasaw Nation to protect valuable aquifer resources and to improve water resource conditions in Oklahoma.

The award to the aquifer resources project was one of 26 national awards to individuals and organizations presented at a ceremony at Interior headquarters in Washington, D.C. “The Partners in Conservation Awards demonstrate that our greatest conservation legacies often emerge when stakeholders, agencies, and citizens from a wide range of backgrounds come together to address shared challenges,” the Secretary said.

“In this case, the Bureau of Reclamation and Chickasaw Nation joined forces with federal and state partners to combat the recent drought and



protect the water needed by the Nation, the cities of Ada and Sulphur, Reclamation’s Arbuckle Project and the Chickasaw National Recreation Area.”

This partnership involved the late Harold Wingard, landowner, as well as the Chickasaw Nation, the Bureau of Reclamation’s Oklahoma-Texas Area Office and Technical Service Center, the National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, Oklahoma Climatological Survey, Oklahoma Department of Environmental Quality, Oklahoma State University, Oklahoma Water Resources Board, Oklahoma Conservation Commission, Oklahoma State University, Oklahoma Department of Environmental Quality, and the US EPA Robert S. Kerr Lab.

As Oklahoma moves toward completion of its comprehensive statewide water plan, one important strategy that is being used is artificial aquifer recharge. In 2008, the state passed Senate Bill 1410 and directed OWRB to develop criteria to prioritize and recommend demonstration projects designed to recharge aquifers through the state.

“These 26 awards ... celebrate partnerships that conserve and restore our nation’s treasured landscapes and watersheds, partnerships that engage Native American communities, and partnerships that engage youth.” Salazar noted.



Oklahoma Climatological Survey: Ken Crawford. Oklahoma Conservation Commission: Darrell Dominick, Robert Toole. Oklahoma Department of Environmental Quality: John Craig. Oklahoma State University: Meghan Dailey, Todd Halihan, Yasemin Leventeli. Oklahoma Water Resources Board: Duane Smith, Kyle Arthur. U.S. Environmental Protection Agency: Robert W. Puls. Harold Wingard, landowner. Susan Paddack, Oklahoma State Senator.

Technological Advancements Increase Water Resources

Kelly Hurt, PhD, Member, Aquifer Recharge Demonstration Project

The *Rime of the Ancient Mariner* details the torment of sailors at sea who find themselves running low on drinking water while afloat in an ocean of salty water. Interestingly enough, it captures the essence of Oklahoma's water situation quite nicely in four lines:

*Water, water, everywhere,
And all the boards did shrink;
Water, water, everywhere,
Nor any drop to drink.*



The Ancient Mariner

Oil or Gas?

It is now conventional wisdom that “water is in short supply” or “water is the next oil”. However, water supply and pricing is not analogous to oil, instead, it is much more comparable to the dynamics of natural gas production. In fact, it is quite foreseeable that new technology will change conventional water wisdom much like it did with the natural gas industry. A decade ago, the conventional wisdom was that natural gas production was on the decline, never to rise again. Since then, new hydraulic fracturing technology became economical in the face of higher natural gas prices related to supply side shortages. This new technology allowed the production of natural gas from shale formations that before were not considered as potential resources.

The widespread application of this technology that followed, along with current economic woes, led to a glut of natural gas hitting the markets and the eventual collapse of natural gas prices from more than \$13 per MBTU to current prices of roughly \$5 MBTU. With this new technology and newly recognized reserves of natural gas throughout the continental U.S.; estimates of total reserves increased by 35% between 2006 and 2008 representing the largest two year increase in reserve estimates to date (note 1). Consequently, in the coming years, we will witness the transition of our economy from foreign crude oil and coal to domestically produced natural gas.

Water will follow a very similar path as it becomes conventional wisdom that only “shallow fresh ground water and nearby supplies of fresh surface water” are in short supply. As these supplies have dwindled in relation to total water demand, the response has been to drill deeper wells and build longer pipelines to new lakes and distant aquifers. However, competition for these water resources and the costs of building lakes and pipelines have skyrocketed.

Desalination

At the same time, advances in desalination technology have decreased dramatically as projects in states like Texas and Florida have resulted in the continued refinement of the technology. Just like with natural gas, desalination technology now opens up vast, untapped resources at cost-competitive rates.

Most, if not all, aquifers in the state of Oklahoma have salt water in them at depth. Thus, the analogy continues as we see that the recent application of this technology is starting the eventual transition of our water supply from only fresh water to a combination of fresh and brackish (slightly salty water) thereby greatly increasing our supply of water while also keeping downward pressure on prices.

Brackish Ground Water

Brackish ground waters are commonly encountered throughout Oklahoma and preliminary analyses have concluded that there is enough of it to create a 400 year supply of drinking water for Oklahoma.

These waters become slightly salty due to either their long term dissolution of salts from the surrounding rocks over time or from interaction with formation waters deposited by ancient seas. In either case, these waters are rather “clean” other than having slightly higher levels of dissolved salts than allowed by drinking water standards.

They have the advantage of being insulated from the fecal bacteria, fertilizers, and other types of human related contaminants that threaten shallower ground water and lakes. Consequently, it is primarily a matter of removing salts from otherwise clean water.

A common misperception about desalination is that it is too expensive. However, that conventional wisdom is based on treating both the much higher concentrations of salt and the human contaminants found in sea water. Inland desalination of brackish ground water is less expensive because the concentration of salt is typically 1/6th of seawater and pretreatment for human contaminants is not necessary.

In addition, these waters can be minimally treated and then blended with other sources of fresh water to increase the total supply. In summary, the idea is not a revolution away from fresh water to brackish water but an evolution to using both sources.

This evolution merely requires the construction of treatment facilities that can handle both water sources; a type of 4-wheel drive treatment that can go where others cannot, thereby, opening up uncontested and untapped water resources.

The Technology

The technology is simple; brackish water is pumped through filters so fine that primarily only water can pass through them. Salts rejected by the filter accumulate in a much smaller volume

of concentrate water that is then disposed. The remaining water is highly pure water with a very low salt content; perfect drinking water.

In states where this technology is now being used, brackish desalination treatment costs, including operational costs and debt service for capital outlays, are between \$1 and \$2 per thousand gallons of water. Thus, desalination costs are equal to or less expensive than most public water treatment systems in Oklahoma today.

In addition, current studies are being undertaken to determine what kinds of value added products can be made from the salt reject so that none of the water is wasted. Examples include the production of road salt, potash, and a type of wall board material similar to sheetrock.

Conclusions

New brackish desalination technology can bring water resources that are literally beneath our feet to the market. This technology has proven in other states to be less expensive than building new lakes and pipelines.

The Oklahoma Water Resources Board is currently chairing a Marginal Quality Water Taskforce to investigate the supplies and uses of non-traditional water resources. Through this and other project based efforts, the State of Oklahoma is quickly moving forward.

In summary, there isn't a lack of water in Oklahoma, just a lack of awareness and experience with using advanced, cost-competitive desalination technologies to bring new water resources to the market.

As this awareness and experience increases through the efforts of early adopters, water supplies will increase, prices will stabilize and maybe, just maybe, the old saying that, “Whisky is for drinking and water is for fighting” will become a thing of the past.

1 <http://www.nytimes.com/2009/06/18/business/energy-environment/18gas.html>

Water Availability and Management of Water Resources

Robert W. Puls, Ph.D., National Risk Management Research Laboratory, USEPA, Ada

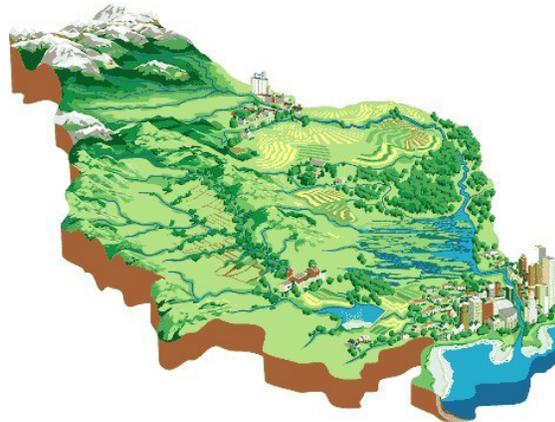
One of the most pressing national and global issues is the availability of freshwater due to global climate change, energy scarcity issues and the increase in world population and accompanying economic growth. Estimates of water supplies and flows through the world's hydrologic cycle and their spatiotemporal variability indicate an impending world crisis.

Increasing use of water due to population and associated economic growth pressures, are creating water shortages in many parts of the U.S. that are projected to have population increases in the next 25 years.

Scarcity of energy resources results in the increasing use of alternative fuels, some of which require enormous water withdrawals for fuel processing. Increasing regional and global temperatures is causing loss of freshwater supplies due to increased evapotranspiration and reduced recharge of underground drinking water supplies. Agriculture is the dominant component of human water use, accounting for almost 70% of all water withdrawals.

Many factors significantly impact increasing water demand in Oklahoma, including population growth, economic growth, technological development, land use and urbanization, rate of environmental degradation, government programs, climate change, and others. Water demand management is the realistic way forward. Climate change adds further risks and uncertainties to the picture requiring the adoption of adaptive management strategies for water resource sustainability.

Sustainable development is defined as the use of ground water and surface water in a manner that can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences.



A Watershed Model

Climate change impacts on water supplies need to be addressed now because decisions today will affect society's ability to adapt to increasing variability in tomorrow's climate. If we are to balance freshwater supply with demand, and also protect the integrity of aquatic ecosystems, a fundamental change in current wasteful patterns of consumption is needed. Recognition of the links between drinking water supply, population growth, economic expansion, climate change and the development of alternative energy sources is needed to insure the sustainability of Oklahoma water resources in the future.

Water planners and developers, because of natural resource constraints and the accumulating adverse environmental impact of past projects, are beginning to change the way they approach the problems of water supply. This is evident as a shift is occurring from water resource development toward water supply and demand management. Tightening fiscal environments and the reduction in the potential for developing additional surface water and groundwater supplies have added impetus to this shift. In addition, people now place a higher value on maintaining the ecological function of freshwater ecosystems. There is also growing public pressure for the costs and benefits of water development projects to be shared more equitably and efficiently across society.

DRIVERS IMPACTING AVAILABILITY

Pollution of Water Resources

Increased pollution of surface water resources from increased temperature of drinking water supplies in some regions adversely impact water quality. Warmer waters result in less dissolved oxygen and increased hypoxia to our surface waters. Warmer waters also support higher levels of microorganisms and pathogens creating increased challenges and demands on water treatment facilities. Increased temperatures will increase evapotranspiration resulting in reductions in water volume with concomitant increases in contaminant concentrations present in these waters.

Anthropogenic contamination of water resources has significantly declined thanks to Superfund, RCRA and other regulatory programs in the U.S.; however we can no longer afford to ‘write off’ potential drinking water supplies due to contamination. Continued restoration of aquifers, rivers, lakes, streams, and wetlands are of increasing importance to increase our supply of fresh drinking water. Improvements in water quality will not only positively impact drinking water resources but also biotic and ecologic function which will have positive economic impacts for fishery industries and recreation.

Naturally occurring contaminants in water supplies can limit the availability of drinking water resources. Naturally occurring arsenic and uranium above maximum contaminant levels set for drinking water can limit the use of some ground water resources or dramatically increase the cost of using these resources for drinking water purposes. While surface treatment options are available, they are often too costly to implement, especially for rural and small suppliers.

Reduction in our carbon emissions is driving massive investments in the use of geologic carbon capture and storage (CCS). Research is needed to assess the potential impacts of CCS to underground sources of drinking water (USDW). Similarly, the increased use of hydraulic fracturing for oil and gas extraction can have potential negative impacts on

USDWs without proper safeguards, adequate site characterization and proper site management.

Climate Change Impacts to Flows of Water

Increased runoff and less ground water recharge due to extreme weather related events (e.g. droughts, fires, high intensity rainfall events) will reduce available water resources due to reduced supply of underground drinking water and increased erosion impacting the quality of surface waters (sediment loading). We are already experiencing reduced availability of drinking water supplies in some regions due to increased temperatures, increased evapotranspiration of surface water supplies, and less precipitation. Reduced rainfall means reductions in stream flows, more wildfires, and more erosion.

Alternative Energy Development Impacts

Increasingly the nexus between energy needs and water needs complicates water availability management and conservation. Extraction of oil and natural gas for energy independence and security often trumps concerns over water needs now and in the future. Alternative fuels (e.g. corn-based ethanol) also place huge demands on water availability. Reductions in drinking water resources are already occurring from increased withdrawals of surface and ground water for alternative energy uses/processing. Biofuels (e.g. corn ethanol) require excessive water demands for fuel processing and could limit agricultural production and/or compete with other uses. Oil shale gas plays employing horizontal hydraulic fracturing can use up to 4 million gallons of water per well.

Reduced surface water flows can mean lack of cooling waters for nuclear processing limiting development of needed new reactors for energy independence.

CONSERVATION MANAGEMENT NEEDS

Proactive Water Management

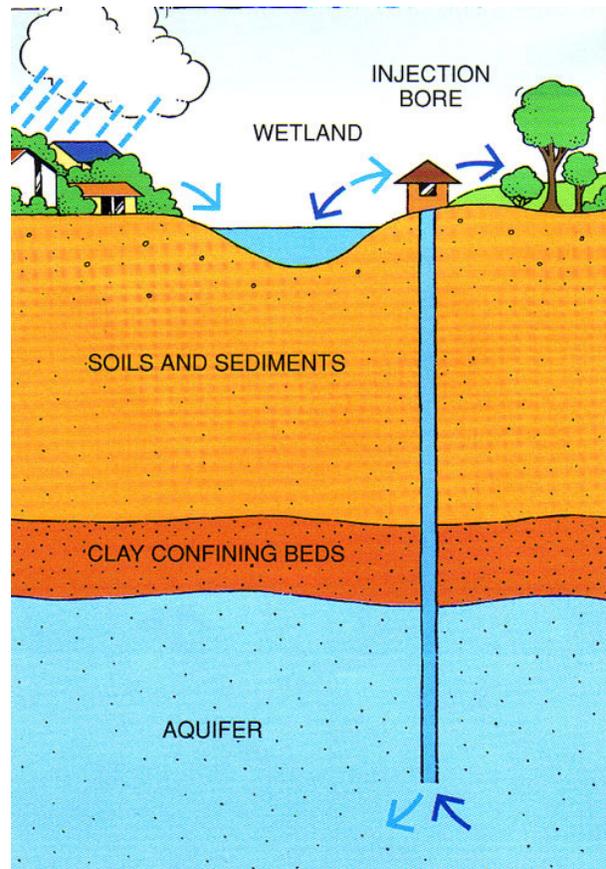
Climate change models predict potential decreased rainfall and increased evapotranspiration in the south central and south western parts of the U. S.

in coming decades. Water resource management will be needed to mitigate these effects. Aquifer storage and recovery (ASR) has been demonstrated as an efficient way to conserve our water resources for future use and minimize losses in the short term. However, issues related to adverse water quality impacts to receiving aquifers have also been documented. We are not running out of water; we are losing the ability to sustain the amount of water we use and the way we use it. Water is a renewable resource; after it is used, it goes somewhere else in the hydrologic cycle. Certain compartments are however threatened such as riparian corridors and aquifers where ground water is used faster than it is recharged.

ASR has emerged in some states as a water-storage technique. ASR involves injecting water into an aquifer through wells or by surface spreading and infiltration and then pumping it out when needed. The aquifer essentially functions as a water “bank,” whereby deposits are made in times of surplus, typically during the rainy season, and withdrawals occur when available water falls short of demand. Most ASR wells being used today are to recharge underground sources of drinking water, but ASR can be expanded for other non-drinking water purposes.

Substantial amounts of water can be stored deep underground. Such strategies may reduce the need to construct large and expensive surface reservoirs. ASR systems are considered to be more environmentally friendly than surface reservoirs and offer more protection from tampering (water security) and potential contamination. ASR may also restore and expand the function of an aquifer that has experienced long-term declines in water levels due to heavy pumping to meet growing urban and agricultural water needs.

Better conservation of drinking water supplies is desperately needed. Increased use of non potable supplies for non drinking water uses is needed to conserve available drinking water supplies. Many new golf course development projects now employ this strategy. New housing and industrial development projects should also employ dual



an aquifer model

water supply systems; one system for potable water uses and the other for non potable uses (e.g. irrigation).

Dual systems for storm water and sewer water discharges would also save money on treatment costs. Increased fees are often considered the best and most effective route to better conservation; but education and outreach to the public coupled with smart development practices may be the best path forward. Water monitoring, especially ground water withdrawals, needs to receive the same attention that monitoring of our surface water now receive both here in Oklahoma but also nationally.

Ground water and surface waters are connected and healthy ecosystems are characterized by healthy hydrologic connections. We must continue to develop faster, cheaper and more effective methods to restore contaminated aquifers. We must employ more effective ways to manage the way we use

ground water. Current practices of withdrawing ground water at unsustainable rates will ultimately have significant social, economic, and ecological costs. Our land-use decisions and water-use policies must consider the interrelationship between ground water and surface water supplies and the capacity of individual watersheds to sustain existing, as well as future, water uses.

Water supply and energy are interconnected. Where water is already scarce, water re-use is already happening, but research is needed to evaluate water re-use strategies depending on water usage endpoints. We need education & outreach to change current thinking and psychology about the interconnectedness of water resources and how we use our water resources. Sustainable water supplies are needed for sustainable energy (oil, coal, natural gas, nuclear). Biofuels (e.g., ethanol) and hydrogen based fuels will require significantly more water than fossil fuels. New power-plant sitings will face more constraints if the water needed for cooling, advanced scrubbing, and CO₂ removal/sequestration is not available.

Watershed management/protection should be integrated into an overall strategy whose ultimate goal is a sustainable water infrastructure plan for communities, states, regions and the nation. A “sustainable water infrastructure:

(1) “includes the traditional man-made or built infrastructure components and the natural infrastructure, such as rivers, lakes, streams, groundwater aquifers, floodplains, floodways, wetlands, and the watersheds that serve or are affected by water and wastewater systems.

(2) integrates the traditional components with the protection and restoration of natural systems, conservation and efficiency, reuse and reclamation, and the active incorporation of new decentralized technologies, green infrastructure and low impact development to ensure the long-term reliability and resilience of our water resources.”¹

RESEARCH NEEDS

The following is a list (certainly not all inclusive) of some key research needs to move us toward a sustainable water infrastructure to meet our growing water demands:

1. More research is needed to better understand how we can move to a true sustainable water infrastructure paradigm that includes both surface water and ground water dimensions and supporting ecosystem services.
2. Better methods to restore contaminated aquifers
3. Better methods for quantifying ground water contribution as baseflow to surface waters
4. Geophysical methods for locating and describing the morphology of conduits and channels through which interactions between surface and ground water occurs
5. Improvements for water-aging and tracing techniques to help in quantifying ground water or surface water sources within a watershed
6. Research to provide a scientific basis for understanding how specific land use practices and land-use changes affect ecosystem health and ground water quantity and quality
7. Development and adoption of management practices that increase infiltration and reduce runoff in urban watersheds
8. Better understanding of watershed management choices and impacts to sustainable delivery of ecological services
9. Better understanding of septic system threats to ground water quality on a watershed basis
10. More technical assistance for state water-quality programs and local governments to utilize available tools and information to protect ground water and surface water resources

Why Is Water Monitoring Important?

Kim Winton, PhD, Director, U.S. Geological Survey Oklahoma Water Science Center

Long-term, high-quality water-resource monitoring is vital to provide baseline water- quantity and water-quality information to diagnose trends/ changes in water resources. Readily-available water of high-quality is vital to support most human activities and to maintain our surrounding ecosystems.

Water-Resource Changes in Time and Place

Changes in water-resource quantity and quality can be caused by installation of best-management practices, climate change, cultural practices, effluent discharge practices and regulations, droughts, floods, and other causes. Readily-accessible historical water-resource data, particularly continuous data, enable accurate assessment of trends, which is vital for management and regulation of our water resources and activities which affect those resources.

Evaluation of trends in water resources (both quantity and quality) enable one to measure the effects of water-resource management strategies, such as changes in point-source discharges from publicly-owned treatment works (POTWs) and industrial discharges, compliance with total maximum daily load (TMDL) recommendations, and amelioration of non-point-source discharges to streams and aquifers affected by best-management practices.

Water Data and Water-Resource Management

High-quality hydrologic data collected using consistent methods are vital for:

1. *providing information to Compacts between states (agreements between states related to the quantity or quality of water that passes state boundaries),*
2. *evaluation of in-stream flows necessary for waste-load allocations and for understanding trends in surface-water availability and condition of aquatic habitat,*
3. *flood prediction and preparation,*

4. *water-use permitting based on current and historical discharge measurements, and*
5. *gaining better understanding of how flow conditions and seasonality affect water quality and proportions of contributions of constituents from point and non-point sources.*

History of Stream Gaging and Water-Resource Data Collection in Oklahoma

Surface-Water Network

The U.S. Geological Survey (USGS) currently operates a stream-gaging network of 200 real-time gages (<http://ok.water.usgs.gov/>). This network is supported through cost-share between USGS federal matching funds (Cooperative Water Program and National Streamflow Information Program) and funds from federal, state agencies, tribes and cities. USGS also operates 24 real-time surface-water-quality monitors in Oklahoma through the aforementioned cost-share programs. USGS, other agencies and tribes also periodically sample networks of surface-water-quality sites across Oklahoma.

Targeting high-flow conditions is vital for gaining complete understanding of fate and transport of sediments, metals, nutrients, bacteria, and organic compounds in surface water in the State.

For instance, in the Illinois River of northeast Oklahoma 78-93 percent of phosphorus is transported to Lake Tenkiller during high flows which occur less than 1 percent of the time (Tortorelli and Pickup, 2006).

Similarly, fecal-indicator bacteria counts commonly increase exponentially with streamflow in that basin (Andrews and others, 2009) and others in the State.



Groundwater Network

The groundwater network operated by the USGS in Oklahoma has had as many as 35 gages that continuously collected data. The USGS currently only operates 7 real-time groundwater-level gages in Oklahoma. Data collected by these continuous monitors are supplemented by annual ground-water-level mass measurements by the Oklahoma Water Resources Board, and periodic measurements by other entities, but current groundwater-resource monitoring is not sufficient to provide understanding of the complexities in time and place of groundwater availability and quality. For instance, without several decades of continuous water-level and water-quality data from the Fittstown well and the Blue River surface-water gage, the Arbuckle Simpson Aquifer study would have been lacking critical data.

How long-term data are used:

Hydrologic investigations (studies) analyze the data that can be used to:

1. *evaluate trends in flow or changes in contaminant loads, concentrations, and yields for surface water;*
2. *evaluate water availability and water quality of aquifers*
3. *evaluate water use and trends in water use,*
4. *develop regressions for continuously-monitored data such as turbidity in streams versus contaminants of concern to provide real-time estimates of chemical concentrations or fecal-indicator bacteria counts to provide on-line warnings of conditions which may preclude primary contact or inform operators of water-treatment plants,*
5. *develop models of ground- and surface- water systems that enable regulatory agencies to test management and permitting scenarios,*
6. *evaluate effectiveness of best management practices, other land-use changes, or WWTP improvements through basin and/or reservoir models such as SWAT (Neitsch and others, 2005), CE-QUAL-W2 (Cole and Wells, 2003; and Galloway and Green, 2006) and others), and*
7. *investigate the health of aquatic ecosystems.*

Where do we need to go? What are some gaps?

1. *Groundwater/surface-water interaction models are available, but more data are needed over a range of hydrologic conditions to calibrate them in most parts of the State.*
2. *More accurate recharge estimates are needed for most of the State.*
3. *Data collection and monitoring need to be planned and*

funded for the long term. Data to calibrate models to test management and climate scenarios need to be available before problems emerge. For example, a city had supported a stream gage for many years then suffered budget cuts which led to discontinuation of the gage. Data from that gage were needed during a subsequent flood.

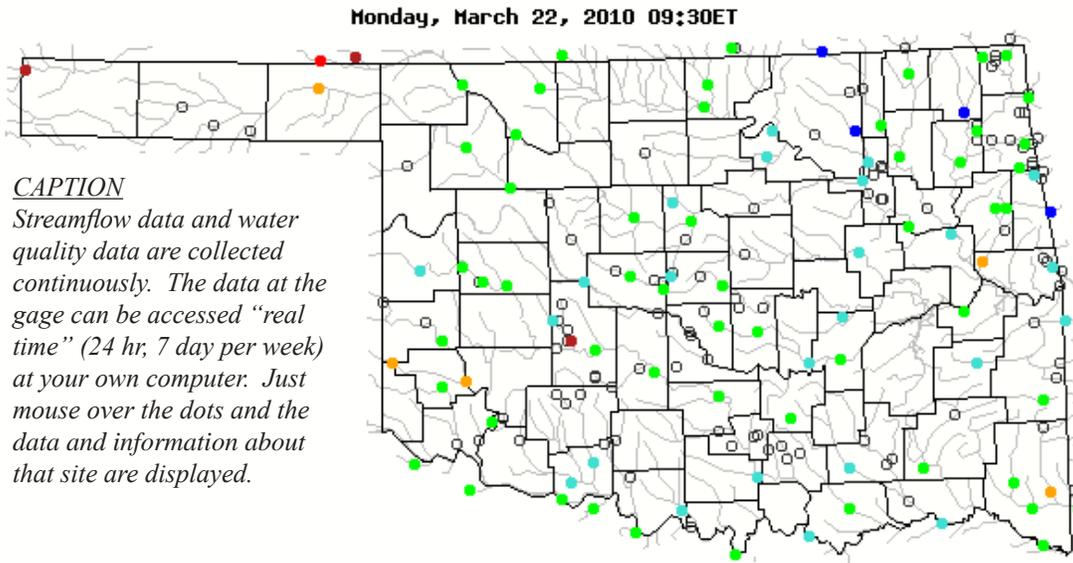
4. *Most of the state's aquifers have been studied, but these studies should be updated to take advantage of recent improvements in modeling software.*
5. *Greater evaluation of the occurrence and distribution of emerging contaminants (endocrine disruptors, food additives, steroids, pharmaceuticals, etc.) is needed. Evaluations of exposure to dilute mixtures of these compounds indicate possible health consequences for wildlife and humans.*
6. *More evaluation is needed of sediment transport and degradation of water bodies due to sediment-associated constituents (pesticides, nutrients, bacteria).*
7. *Evaluation of water resources in context of geologic settings is needed. For example, how do local geologic settings affect hydrology and water quality (e.g. karstic, arsenic, nutrients, and uranium).*
8. *Homeowners relying on domestic wells need information to make informed decisions about well use, construction, and water treatment. Domestic wells are not regulated for water quality. Development of maps could help homeowners and well drillers identify areas with high radon, arsenic, uranium or other trace metals associated with the aquifer.*
9. *As potable water becomes scarcer, we need information about alternative sources. For example, El Paso routinely desalinates and uses brackish water for drinking water. Locations of such "marginal" water (the water that is between the base of fresh water and the base of treatable water) is not well defined in the US.*

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Water Watch

United States Geological Survey at <http://waterwatch.usgs.gov/>



CAPTION
 Streamflow data and water quality data are collected continuously. The data at the gage can be accessed “real time” (24 hr, 7 day per week) at your own computer. Just mouse over the dots and the data and information about that site are displayed.

Explanation - Percentile classes							
●	●	●	●	●	●	●	○
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

The “Real-time streamflow” map tracks short-term changes (over several hours) in rivers and streams. Although the general appearance of the map changes very little from one hour to the next, individual sites may change rapidly in response to major rain events or to reservoir releases.

The map depicts streamflow conditions as computed at USGS streamgages. The colors represent real-time streamflow compared to percentiles of historical daily streamflow for the day of the year.

This map represents conditions relative to those that have historically occurred at this time of year. Only streamgages having at least 30 years of record are used.

States containing no dots indicate locations where flow data for the current day are temporarily unavailable. During winter months, some states (or parts of states) may have fewer dots than at other times of the year due to ice effects.

The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.

Alternative data formats of this map in postscript , GIS coverage, or GIS shapefile are available.



Topic 2

Water Conservation

Water Conservation

Planning Workgroup Facilitators: Brad Tipton and Kimberly Williams

GROUP

Facilitators: Brad Tipton and Kimberly Williams.
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QUESTION

What measures should be taken to improve water use efficiency, reduce water waste, and reuse/recycle water – and how should these measures be encouraged?

1. *Means to encourage reduced consumption*
2. *Uses of marginal (e.g., saline or nutrient-laden) water*
3. *Gray and black water reuse and reclamation*
4. *Means to reduce waste in water use*
5. *Monitoring and reporting of water conservation efforts*
6. *Education and research programs, priorities, and funding*

To implement conservation practices across the State, education is needed on the benefits of conservation and the measures that can be taken to conserve water. Incentives should be provided to encourage and facilitate implementation of water conservation. Water resources should be used wisely through use efficiency and water capture.

Implementing these ideas will help ensure Oklahoma has an adequate supply of water to meet the needs of all Oklahomans over the next 50 years.

Water Capture Systems

Water capture is a form of water conservation that reduces the impact of water use and allows for the use of non-potable water where appropriate. Three ways to capture rainwater are the installation of green roofs, constructed rainwater capture systems, and soil infiltration.

- A green roof is one that is partially or completely covered with soil or other growth medium, vegetation, and drainage system. Green roofs have many benefits including reducing stormwater runoff and filtering pollutants and heavy metals out of rainwater.
- Constructed rainwater capture systems such as cisterns provide water for non-potable uses like irrigation, laundry, and toilets – as well as drinking water, if filtered. Captured water could also be used to recharge groundwater. Water capture should be done only on a local scale; large-scale water capture projects could affect water streamflows and impoundment storage. Review of and changes to building codes may be required.
- Soil can also be used as a water capture system. If soil is properly managed, it can hold water to allow for infiltration. Ways to help the soil retain more moisture include adding organic matter (through composting and/or cover cropping), terracing and other land contouring, and sculpting city lots to reduce or prevent runoff. Better management of concrete and street surfaces should be done by using permeable surfaces to allow lawn-watering runoff and pool drainage to seep into the soil instead of running down the street.

Management of Stormwater Runoff

The State should promote beneficial uses of stormwater runoff. For example, stormwater runoff can be collected and used for non-potable

uses for both municipal and industrial entities. In addition, reducing stormwater runoff through landscaping, rainwater capture, and implementation of best management practices will decrease water pollution. Municipalities can return water to the soil by allowing the water to percolate through covered surfaces. To promote changing how communities manage runoff, incentives should be developed through various local funding sources. Also, enforcement may be required to ensure communities begin using runoff controls.

Adaptive Crop Selection and Xeriscaping

1. Proper land management can result in efficient use of water. The State should encourage matching the use of the land to the various soil types, landscapes, and climate of the area for more efficient use of water. Some government policies encourage overuse of water by subsidizing the growth of crops not sustained by the natural weather conditions of an area. These subsidies could be discontinued to promote change and encourage crop selection that is adapted to natural weather conditions. While this may seem controversial, it will be acceptable if subsidies are replaced with education.
2. Home and business owners should utilize water efficient plants when landscaping. This practice is commonly referred to as xeriscaping and should be encouraged by the State and local governments. Incentives such as tax credits should be offered for changing landscaping from one that requires a large amount of water to one that is more native and adapted to the climate.
3. The continued promotion of no-till farming is important as it helps promote soil building and minimizes negative impacts on streams. While education and incentives are currently provided that encourage no-till farming, more research should be conducted to make no-till more successful for agriculture producers. The research should focus on ways to reduce chemical applications to protect water quality.
4. Research funds should be made available to universities and private companies to identify and promote the growth of drought resistant crops. The information should be made avail-

able to families, independent growers, and small diverse agriculture producers – not just large-scale producers.

Municipal Irrigation Regulation

Some local governments are implementing a permitting program for citizen water systems such as lawn irrigation systems. This program should be encouraged and continued. Local governments should also require soil moisture monitoring through a program like the MesoNet's Simple Irrigation Plan (SIP) program to help ensure that watering is based upon soil moisture needs. Further, local governments should mandate that citizens be allowed only to water between dusk and dawn to reduce evaporation.

Local Food Promotion

Growing local food (food that is adapted to the region) uses less water and thus conserves resources for other needs. The sale of local foods could be promoted through farmer's markets, farm-to-school programs, and local grocery retailers

Urban Water Reuse

Water can be used efficiently in several ways. Using water multiple times prior to discharge maximizes the use of the water and conserves fresh water sources. The State should encourage the increased use of treated wastewater and gray water.

To encourage this:

1. State and city codes should be reviewed and updated. Education of city officials on new technologies and reuse possibilities should be done.
2. Municipalities should use treated wastewater to water municipal properties such as parks and golf courses.
3. Water reuse should be encouraged in the industrial and business sectors through the use of reclaimed water in landscape irrigation, cooling systems, and car washes.
4. Cities should encourage businesses and industries to reuse water by implementing a rate structure that bases charges on the amount of wastewater generated above what is considered normal for that particular industry or business.

5. Neighborhoods should be retrofitted with a purple pipe network (purple pipes are the standard pipe used to designate recycled water) to increase gray and treated wastewater use.
6. Promote personal reuse by encouraging re-piping of homes to use gray water for outdoor non-potable use and for toilet flushing.
7. Incentives, such as tax credits, should be made available to improve conservation infrastructure. For example, existing buildings should be retrofitted incrementally, beginning with installation of low flow faucets. This should be done before regulated changes are mandated. Water savings should be monitored by determining the amount of water that should be used and then metering to ensure the targeted amount is not exceeded. New buildings should be required to have water recycling/reuse systems. This should be encouraged not only through tax credits but also through a cost-sharing program to make reuse more feasible (information on the cost savings of recycled versus potable water for all uses should be provided). Changes in infrastructure could allow one business to use the treated wastewater/gray water of another business and then return the water to its source for use downstream.

Agricultural Reuse

Agriculture and agribusiness is another area where treated waste or gray water can be used. Agribusiness can maximize the secondary use of water by recharging groundwater with treated clean effluent, or collecting water and then reusing it for all types of irrigation (not just crops). This can be encouraged through tax credits.

Infrastructure Maintenance

Leaky pipes and fixtures result in a large amount of water loss. These leaks happen not only in homes and business but in the infrastructure designed to deliver water. Repair and update of water infrastructure is important and funding should be

provided to small communities that cannot afford to make the necessary repairs. Funding should be made available for them to purchase equipment to monitor their systems to avoid additional water losses. Citizens should be educated on the cost of water lost through leaks. Assistance should be provided to low-income water users to fix leaky pipes and fixtures.

Transferring water through open, unlined ditches can result in water loss through seepage and evaporation. Water users who use this type of water conveyance system should update their systems to reduce water loss.

Well Metering

Since most wells are not currently monitored, the State does not have accurate records of water use and therefore cannot accurately estimate water supply. To remedy this, the State should monitor water use and supply; meters should be installed on all wells, both domestic and non-domestic. Metering will promote honesty and efficiency in water usage. Implementation of a well metering program should be phased-in. Meters must be installed anytime property changes ownership, otherwise owners could have between five and ten years to install a meter. The program could be funded through rates and fees paid by end users.



Education Concerning Conservation and the Value of Water

Citizens need to create a new norm: make conservation effortless because that is the normal way to live. Education can play a large role in getting people to change their behavior and should be targeted towards everyone – young and old.

1. Conservation education of the State's youth should start at a very young age and continue through high school. Summer camps should be developed that provide students, kindergarten through 12th grade, the experience of water

usage in the 21st century. The students could experience hauling water to the house, storing and using the water without modern technology. This will increase students' awareness of the value of water.

In addition, the OWRB in conjunction with the Oklahoma Academy of Sciences, Noble Foundation, Kerr Center and others, could support science fairs that promote education about the State's water resources and award scholarships. Funding for this project could come from fines and penalties levied on water use violations.

2. Education programs similar to the EPA's "WaterSense" program should be used or new programs developed that educate people about the true value of water and the use and misuse of it. This can lead to more efficient use of water and could encourage people to install water efficient fixtures.

Three measures to improve water efficiencies are use of environmental quality incentives programs (EQUIP) targeted at large-scale users, implementation of a conservation rate system that charges higher fees for greater use, and provision of discounts for wise use.

3. Working with local conservation districts is an avenue to get landowners to practice water conservation. The State, through OSU Cooperative Extension and others, should develop educational materials about conservation methods that include public media such as the Internet, with easy access by consumers. Municipal and rural water providers should include bill inserts that contain information regarding the cost of water use, cost of water waste, and conservation tips. It is important to make sure that water conservation educators, including organizations have the resources, are successful.

Education about water capture systems should not be limited to home and business owners but also include local officials through organizations such as the Association of County Commissioners of Oklahoma and the Oklahoma Municipal League.

4. Demonstration projects should be developed across the state and funded through an added fee on water bills. One avenue for education through demonstration is at the State Capital.

Faucets and toilets should be updated as a first step to show citizens that the State government is committed to conservation.

5. As with most changes, education will be essential to success. Education should be implemented through a number of existing entities such as the Conservation Commission, local conservation districts, the OWRB, OWRRI, rural water districts, USDA, Kerr Center for Sustainable Agriculture, and OSU Cooperative Extension. Education should also be offered on the benefits of soil building utilizing compost (made by diverting organic waste from landfills). It should be targeted to everyone including city, county and state officials, children, and agriculture producers.
6. Funding for education does not have to come from the State's budget; it can come through increased water costs especially since water suppliers can easily inform the public about conservation measures. The Oklahoma Conservation Commission (Clean Water Act funds) is another option for education funding.

Forms of Incentives

People are resistant to change. To get them to act, incentives should be used. Monetary incentives can be designed as either tax credits to make plumbing more conservation friendly, or incremental increases to water rates to nudge water users and public water suppliers to comply with water conservation requirements. However, other types of incentives can result in success as well. For example, recognizing those who act as "good" citizens can encourage a change in behavior. The incentive can be as simple as identifying the most water efficient lawn of the month.

Water Pricing

To encourage further the efficient use of water, realistic pricing should be instituted. Most water suppliers do not charge for the actual value of the water they deliver. The State should mandate and then enforce public water suppliers to develop a realistic pricing structure. State funding for improvement projects should be tied to the mandate to help with enforcement. Education and outreach to customers should be done so they understand why water rates are rising.

Evaluation of Water Conservation Measures

No matter what water conservation practices are adopted, research should be conducted to evaluate the outcomes of conservation programs. The findings should be communicated to the public and State officials.

Also, conservation measures and information should remain current; new resources should be researched.

Topic 2: Recorder’s Notes

Water capture is a method of conservation that lowers the impact of water use. It can decrease the impact of stormwater run-off. Water capture can have unintended consequences so managing stormwater should be thought through.

For example, run-off control ponds can become contaminated with organics, resulting in the creation of an additional problem. In regards to efficient use, it was discussed that recommending mandates would be too specific for this approach.

However, local conditions should be considered, therefore the types of efficiencies and how they are “encouraged” should be a local decision. It was also said that water is not used efficiently because uses are not metered and deliberate errors may be made when use is reported.

This results in inefficient use because users are not held accountable for their actual use. Education is important; there is a fundamental lack of understanding of how conservation can be done and the resulting benefits. It is important to address the differences in audiences and education accordingly.

A conservation culture should to be developed in the elementary education system, and introduced into water policy. Showing people “what’s in it for me?” will make education programs successful. Schools should decide, with legislative input, how best to implement conservation education in school curriculum. It is also important to educate legislators about conservation. Research by educational institutions needs to explore conservation options and technologies fully.

A variety of incentives is needed to encourage and facilitate implementation of water conservation because of people’s resistance to change. Municipalities should take a strong lead because of their accessibility to the public and their ability to offer financial incentives through rate structures and rebates. Incentives do not need always to be financial.

Cost/benefit analyses should be done, and only those options that show significant conservation benefits relative to costs should be adopted. For example, green roofs – are they appropriate and practical? It is important to charge for the “actual” value of water. It is worth more than users are currently paying. By charging the true value of water, efficient use and conservation would be encouraged.

Conservation Information: Who? What? Where?

Greg Kloxin, Assistant Director, Oklahoma Conservation Commission

Admittedly cliché-ic, my first thought, “education is paramount to any conservation endeavor”, rings true and strong. No matter the soundness of theory used, implementation plans fail for lack of strategic learning experiences that result in those necessary “revelational” experiences that drive behavior. This of course must evolve from a solid set of concepts deemed necessary to deliver, i.e., as it regards this theme, what are the salient topics that must be conveyed regarding water conservation, both quantity and quality?

System Ecology and Function

At the heart of water conservation are the natural (and man-made) systems which convey and store our water. Understanding of the general ecology, function, and affect these systems have on water quality and quantity is a must. Critical elements of stream ecology like the function of riparian corridors are essential in promoting best management practices (BMPs) that have been shown to reduce nonpoint source (NPS) pollution by up to 90 percent. Teaching folks the ecology and function of wetlands lays a foundation for understanding the role these systems play in the natural cleaning process. Floodplain and reservoir system functions are also important topics to consider in developing water conservation curriculum.

Principles of Pollutions

Once the foundation of system ecology and function are laid, educators must convey basic principles of pollution. A clear understanding of what impacts water quality and discussion of sources are essential if the public is expected to change behaviors and adopt better practices. Many folks are still unaware that direct access to streams by livestock can have a huge impact on both stream water quality and system stability. Even

fewer people understand that many conventional stormwater “BMPs” like curb and gutter (which are actually required by ordinance in most cities), although well intended, actually contribute to hydrologic flashiness, downstream overload, streambank erosion, channel incision and other system problems. The same concept applies to water quantity. People must be apprised of how basic activities impact water consumption.

Best Management Practices

Education efforts should next focus on promotion of best management practices that conserve both quantity and quality of water. Critical to this charge is the necessity to effectively convey the sense of individual responsibility and land ethic. When it comes to doing the right thing, the people should be empowered, not the government.

Delivery of Information

In my view, educational failures aren’t so much an issue with the information as much as its delivery.

A quick poll of even the youngest of stakeholders regarding whether or not clean water is important will yield a one-sided response extolling the virtues thereof. To this end, Oklahoma is implementing this fledgling program in cooperation and administrative context with its nonpoint source management program and using it to further incentivize practices producers already implement for priority watershed projects.

Realizing such “angles” that promote synergy in programs is an effective part of successful educational delivery.

Information Delivery Mechanisms

The last thought I will offer regarding education concerns the delivery mechanism, i.e., who are the integral educators? Of course nothing supersedes the influence and potential of the home, but someone has to educate the parents,



grandparents, and others of the family who best command the attention of the next generation. One of the greatest measures of educational success is when the lessons are being actively taught by the students.

Educational programs stemming from federal and state government are wonderful, but people officed in OKC or Tulsa will never command the influence that a fourth generation producer can on the local level.

Data Collection and Monitoring

Most folks outside of the bureaucratic circle don't have an understanding and thus appreciation for the significant effort and accountability the agencies undertake in their monitoring programs. Suffice it to say, much water related data is collected, and contrary to popular belief, Oklahoma's many faces of water management work effectively to limit overlap and avoid duplication of effort (see Shanon Phillips commentary under Interagency Water Resource Management).

Perhaps the most significant thought to consider regarding data collection is that the need for it will never stop. Scientists' eternal cries for more data are really justifiable and not just a maniacal manifestation of some twisted addiction. The environment and its systems are complex and highly variable, so the data collected from them will be as well. The more variable the system you measure, the more data necessary to capture and reflect this variability.

Consider 2006 and 2007, one of the driest and wettest years on record, respectively. Such extremes necessitate years (really decade or more) of data to adequately characterize "normals" for basic water quality parameters much less trends.

Complex this with ever rising costs for personnel, necessary equipment, lab analysis, and other requirements, and with a variety of state and federal mandates, one should begin to see why monitoring is borne by so many agencies and programs.



Monitoring programs across the state are vital to water resource management, but their scope (spatially and temporally) and effectiveness are constrained by funding. Yes, data collection is expensive, but to make critical management decisions without adequate data puts resources (and most importantly people) at risk for much greater costs when things fail. Many folks do not realize that the bulk of monitoring efforts in this state are funded through federal programs. In my view, the state should bear the responsibility to ensure adequate funding for monitoring programs necessary to protect its citizens and resources. I believe when citizens are willing to pay for water as a resource (i.e., not just payment for delivery), the monies will be available for this and other critical water management needs.

Increasing Capacity

So what can we do to increase the capacity of information delivery? One of the first steps is a state funded and maintained central repository for water program data. Separate websites hosting each agency's data (including EPA's STORET database) is useful, but the most effective presentation is a one stop shop for everything water related in Oklahoma. This effort could be greatly expanded and energized with adequate funding to accommodate much more information, maintain a more current status of data available, and improve the "friendliness" of user access.

Another medium of information conveyance that needs to be tapped are social networking sites like Facebook, MySpace, and Twitter. State agencies are currently restricted by law from using these sites. Again, a unified effort by water programs through these sites could allow a one-stop shop for access to the latest reports, public notices, data, educational articles, etc. Perhaps the greatest value of these sites is that they provide opportunity for feedback and blogs, which would facilitate discussion and commentary from stakeholders regarding just about anything (e.g., resource issues, data needs, complaints, etc). The opportunities with these types of sites are nearly endless.

Let's Keep Our Water Fit to Drink

Clay Pope, Executive Director, Oklahoma Association of Conservation Districts

Water is our most precious resource. Oil, gas, timber, even food takes a back seat to water. You can live about five weeks without food. You won't last five days without water. Not only does all life depend on water, it has to be clean if it is to be utilized. Even if you have millions of gallons of water available for use, if it isn't fit to drink you really don't have anything. That's why water quality is everyone's business.

Often when we think of water quality, however, our focus tends to be on the concept of water treatment—building brick and mortar structures designed to clean water for consumption or industrial use once it has entered a reservoir or when it is brought up from an aquifer.

What is lost in the discussion is the concept of working with landowners in the watershed ABOVE the reservoir or in the alluvial terrace of an aquifer on best management practices to protect the water before it ever enters the lake or percolates through the soil, even though this type of approach is often more affordable than building new treatment plants and it often provides a more long-term solution to water quality issues by addressing the problem at the source.

That's the bad news.

The good news is that the farmers, ranchers and other landowners of Oklahoma, in partnership with the State and Federal Government are already taking action to protect our water in these watersheds. Currently, over \$37 million has been dedicated for non-point runoff control through the Oklahoma Conservation Commission's water quality efforts in conjunction with the USDA Natural Resources Conservation Service (NRCS) Farm Bill Conservation Programs, the USDA Farm Services Agency Conservation Reserve Enhancement Program (CREP),

the EPA Clean Water Act 319 (319) Program and local Conservation Districts.

Through these efforts, the Conservation Partnership is working with landowners to address run-off in areas such as the North Canadian River (Oklahoma River) Watershed, the Eucha-Spavanaw Watershed, the Illinois River Watershed and the Fort Cobb Watershed.

In these and other watersheds, agriculture producers and other landowners are undertaking practices such as switching to no-till farming, improved pasture management, grass plantings, and improved manure handling to control run-off.

They're fencing off miles of vegetative buffers strips to control nutrient and bacteria in the water and to keep livestock out of the streams. Marginal land is being converted to grass to help reduce erosion. All this through voluntary efforts often started by the local landowners themselves and in which the landowners "cost-share" with the government, putting money out of their own pockets to undertake these improvements.

The programs utilized by the Conservation Commission to help landowners do this work mirror those that have been used for decades to control soil erosion. These programs provide financial assistance to landowners to help defray the cost of the improvement they are doing. As an example, if a farmer installs a buffer strip on their land, the program will pay up to 90% of the cost of installing this practice. In addition, the Conservation Commission and the NRCS provide technical assistance to the producer, helping them design their practice and overseeing the process of instillation.

Landowners are encouraged to undertake these programs largely through the efforts of local conservation district staff who work



in cooperation with conservation commission employees to help identify those producers whose action would have the most impact on improving the quality of water in the watershed.



We have found that by having a independent conservation agency that has a positive history with landowners (the Conservation Commission has a long-standing relationship with producers while agencies such as DEQ or

We have found that by having local conservation districts take the lead in these projects, local landowners feel more comfortable that these types of initiatives are not being “shoved down their throat” by State Government agencies in Oklahoma City or Federal Agencies in Washington D.C. but that they are working with their friends and neighbors who they trust to work with them in a fair and equitable manner.

the Water Board are viewed as being friendly to friendly to the cities or “two green”), that by having local leadership for programs (local conservation districts give a local face to programs, provide leadership for these efforts and provide feedback to state and federal agencies) and by having technical standards and technical assistance from the Federal Government in the form of the NRCS, we can work with producers and get improvements done on the ground that make a real difference for water quality. Does this approach work?

Local Districts are run by a five member board of directors, three of which are locally elected by the local cooperators themselves (cooperators DO NOT have to be landowners or agriculture producers, they simply have to agree to work with the district on natural resource issues), and two of which are appointed by the state Conservation Commission.

In March 2010 we received word that Oklahoma now ranks in the top five states in overall non-point source pollution reduction. Consider all of the phosphorus and nitrogen level reduction that has occurred nationally. Well - Oklahoma was responsible for 16% and 10% reduction respectively. We have more non-point source pollution water quality success stories than any state in the nation! All of this is accomplished with less than 1% of the available federal funds such as 319.

All five board members have to themselves be local cooperators, providing a local leadership component that leads by example on their own land. Local district boards help set the priorities for federal and state conservation programs in their geographic area of responsibility and provide feedback to state and federal agencies on what works on the land, how programs should be changed, and how best to approach the cooperators in their area to address a given problem.

We have seen reductions of over 60% in the nutrient loading in parts of Eucha-Spavinaw Watershed near Tulsa and over 70% reductions in nutrient loading in parts of the Illinois River Watershed.

By using this system, originally established in the 1930's to address the ravages of soil erosion and the horrors of the dust bowl, we have found that landowners throughout Oklahoma are willing to undertake non-point source water quality work in the same fashion they addressed soil erosion.

Just this year alone, 4 streams have been “de-listed” from the Environmental Protection Agency’s (EPA) 303d list of impaired streams for issues such as nitrogen, phosphorous and turbidity (suspended soil particles in the water). In addition, another 170 streams were kept off the 303d list because of the work the conservation partnership was able to do on the land around the stream, working with landowners to address the issues that threatened these streams before they rose to the level of ranking on the list. All this

The Conservation Commission and The Conservation Partnership sponsor “non-point source pollution” programs in Oklahoma. We always will run out of project money before we run out of landowners willing to participate.

done not through regulations or by running agriculture or industry out of a watershed, but through voluntary, locally-led efforts with technical and financial assistance to the landowner.

This is great, but more needs to be done.

Through the work of the Conservation Commission, NRCS and local conservation districts, we're making headway in water quality, but it costs money. Again, it should be stated that Oklahoma has **NEVER** undertaken a 319 program where the money hasn't run out before we ran out of landowners who wanted to work to address the problem. Oklahoma landowners learned the hard way during the Dust Bowl what happens when we don't care for our environment.

We have to make sure during today's tight State budgets we keep working with these stewards of the land to address water quality issues the same way we've always addressed soil conservation-through voluntary, locally-led conservation efforts.

Cities and towns should be encouraged to work with local conservation districts and the Conservation Commission to help provide the funding necessary to undertake non-point source pollution work, something they have been hesitant to do in Oklahoma.

Recent actions by the Water Resources Board to provide "Principal Forgiveness Loans" to a partnership of the Conservation Commission and the Oklahoma Department of Wildlife Conservation for water quality and wildlife habitat work in the Illinois River Watershed should be built upon and duplicated.

Any revenue generated for water resources in Oklahoma should include some component for non-point source work and land treatment. Municipalities should be educated on the opportunities afforded to them by partnering with landowners in their watershed to find cooperative solutions to non-point source pollution problems.



They should know that idea is not new nor was it originated in Oklahoma, in fact New York City treats very little of its drinking water because it made the decision years ago to work with upstate farmers. Together, the city and its rural neighbors worked to make improvements to the land, including installing riparian buffers and changing manure application practices.

While New York City did spend several millions of dollars in cost-share assistance to these producers and in the purchase of conservation easements, the cost was far less than the projected amount that would have been spent to build treatment plants. (one online report said it would have cost New York around \$9 billion to build a filtration and treatment system while they were able to address this problem with a \$500 million Conservation Reserve Enhancement Program or CREP.

This is a 4 to 1 Federal to state or local match USDA program-Tulsa and Elk City are both undertaking this in partnership with the State of Oklahoma Conservation Commission and the local Conservation Districts).

If these types of dollars are made available and if the focus from our leaders, like that of New York City, takes a cooperative, locally-led approach, we can address our current and future environmental concerns the same way we addressed past challenges. When the state and federal governments provide the assistance necessary to educate landowners on what the problems are and then provide them with the financial assistance to correct the problems, we can make a difference.

The bottom line is that Oklahoma is doing great things in the area of non-point source pollution control through land treatment. The challenge is not the structure of the program, but the lack of resources we can dedicate to this critical issue. If we can address this problem, we can be assured that when we say we have water, water everywhere, it will be fit to drink.

Conservation: San Diego

Bill Rose, Water Conservation Program Executive, San Diego County Water Authority

Excerpt from “Conservation: A way of life in San Diego County”, February 2010 Journal of the American Water Works Association, pages 70-73. Complete text is available from AWWA. Permissions granted by AWWA.

San Diego County residents and businesses have done a very good job of conserving water especially indoors, since the drought of the early 1990s. But recent historic dry conditions, environmental challenges in the Sacramento-San Joaquin River Delta, and early indications that climate change is having an impact on the amount of water in the West mean that more needs to be done to improve water-use efficiency.

On average, about 50% of the household’s water use takes place outdoors to sustain landscapes. The San Diego County Water Authority (SDCWA), as the region’s water wholesaler, along with its member agencies, is developing new programs and resources to assist the community with effectively reducing outdoor water use as a key strategy to reduce demand. To raise awareness and gain involvement of key groups and individuals who could assist with this challenge, the SDCWA convened its first Water Conservation Summit in 2006.

At that summit, San Diego County water agencies came together with land-use planning agencies; businesses that design, build, supply, and maintain urban landscapes; and interested individuals to explore ways to increase market supply and demand for water-efficient landscaping in San Diego County.

The event brought into focus a long-term vision to transform the marketplace and the need to develop new, practical resources to support behavioral

change regarding greater water efficiency by San Diego County’s residents and businesses.

Subsequent summits allowed SDCWA and its member agencies to broaden participation to encompass more than the “usual suspects.” The participation of business and industry groups, as well as a wide range of presentations on successful programs from entities throughout Southern California, helped spread expertise and knowledge of best practices for outdoor water irrigation relevant to San Diego County’s Mediterranean-style climate. Some new businesses have already been established to meet the need identified by early summit participants. More important, the need for ensuring efficient water use and eliminating water waste is now better understood and publicized throughout this region.

Future Outlook

On the basis of the invaluable input and experiences achieved by SDCWA’s extensive regional outreach, the primary focus of future conservation programs is likely to revolve around behavior change (best practices for industry and residents) and measurable performance (quantifiable water savings).



The key to advancing these initiatives will be the region’s new Conservation brand, designed to communicate that water-efficient measures can be both beautiful and cost-effective. The public will no longer perceive water conservation as a compromise, but rather as a much-needed and beneficial upgrade for ratepayers and their properties so that they can stay in sync with the region’s economic reality (rising water rates) and long-term sustainability needs.

Future emphasis will continue to build on the synergy between water and energy savings and on developing and sharing new tools and techniques to help permanently transform water use in the region.

Conservation: Denver

Ann Depperschmidt, Community Relations Specialist, Denver Water

Excerpt from “Denver Water uses laughs for serious consideration”, February 2010 Journal of the American Water Works Association, pages 81-83. Complete text is available from AWWA. Permissions granted by AWWA.

When Jason Knauf was first asked to saunter half naked through the streets of Denver, he thought to himself, “Uhh, really? You really want me to do that?”

“But I’m not that shy, so I did it,” he said. Knauf, a Denver-based comedic actor, ambled around various crowded events – the Colorado Rockies home opener, JazzFest Denver, Cherry Creek Arts Festival, and others – wearing only what he needed to, well, comply with public decency laws and flaunting a sandwich board with Denver Water’s signature slogan: Use Only What You Need.

“It took a humorous approach to being environmentally conscious,” said Knauf, who was hired by Denver Water’s advertising agency, Sukle Advertising + Design, to wear the sandwich boards through crowds in Denver. “I know for a fact that people remembered it,” he said.

Denver Water recently received AWWA’s 2008 Public Communications Achievement Award for a utility serving more than 25,000 connections. It’s the first time Denver Water has received the national award, which is presented to a utility that demonstrates a “strong, broad-based commitment to public outreach and communications.”

The campaign uses other techniques to promote Denver Water’s Use Only What You need message. In addition to wearing the sandwich boards, Knauf ran through downtown Denver during the Democratic National Convention wearing a foam toilet costume. Two other hired talents ran

behind him holding a sign that said: “Stop running toilets.”

“You’re a celebrity when you’re the running toilet,” Knauf said. “People will run up to you to get some pictures with you; you’re the hit of the town.”

The costumed runner triggered a spark of recognition among people attending those local events. Time after time Knauf said people snapped his photo and complimented the campaign. They also talked to him, and to others hired to wear the sandwich boards or toilet costume at various events, about ways they use less water at home.

“I got a lot of response from people,” Knauf said. “I was surprised at how many people talked about the ways they were already conserving water.”

Denver Water plans to stick with its nontraditional advertising tactics to continue this water conservation momentum. Utilities from around the country have asked Denver Water about the Use Only What You Need campaign and its methods, and there’s been “phenomenal interest” from other sustainable organizations, McGuire-Collier said.



She credited the campaign’s success to the fact that the water utility took a bold and forward-thinking approach to grabbing customers’ attention, instead of relying solely on more traditional, less-noticeable advertising tactics that other government agencies typically rely on. The campaign also refrains from preaching or demanding

something from people; instead it asks them to do something they can feel good about.

“People respond differently to being told to conserve than they do to ‘please don’t waste,’” McGuire-Collier said. “Use Only What You Need” taps into that feel-good place in people.”

Using Marginal Quality Water (MQW)

Bryan Mitchell and John Rehring, CDM, Denver; Kyle Arthur and Terri Sparks, OWRB

As Oklahomans' water needs continue to grow, additional sources of water must be considered – including supplies that historically not been tapped to meet demands. The Oklahoma Legislature passed Senate Bill 1627 (SB1627) in 2008 requiring OWRB to establish a technical work group to analyze the potential for expanded use of “Marginal Quality Water” (MQW) from various sources throughout Oklahoma. SB1627 required that the group include representatives from state and federal agencies, industry, and other stakeholders.

MQW Evaluation Process

Through facilitated discussions, the group defined MQW as water that historically may have been unusable because of technological or economic issues with diverting, treating, and/or conveying the water. It can include waters that would not typically be considered for beneficial uses in the state's seven water use sectors:

- Public Water Supply (also referred to as Municipal and Industrial or M&I)
- Self-supplied Residential
- Crop Irrigation
- Livestock
- Thermoelectric Power
- Self-supplied Industry
- Oil & Gas

Five categories of MQWs were identified for further characterization and technical analysis, including:

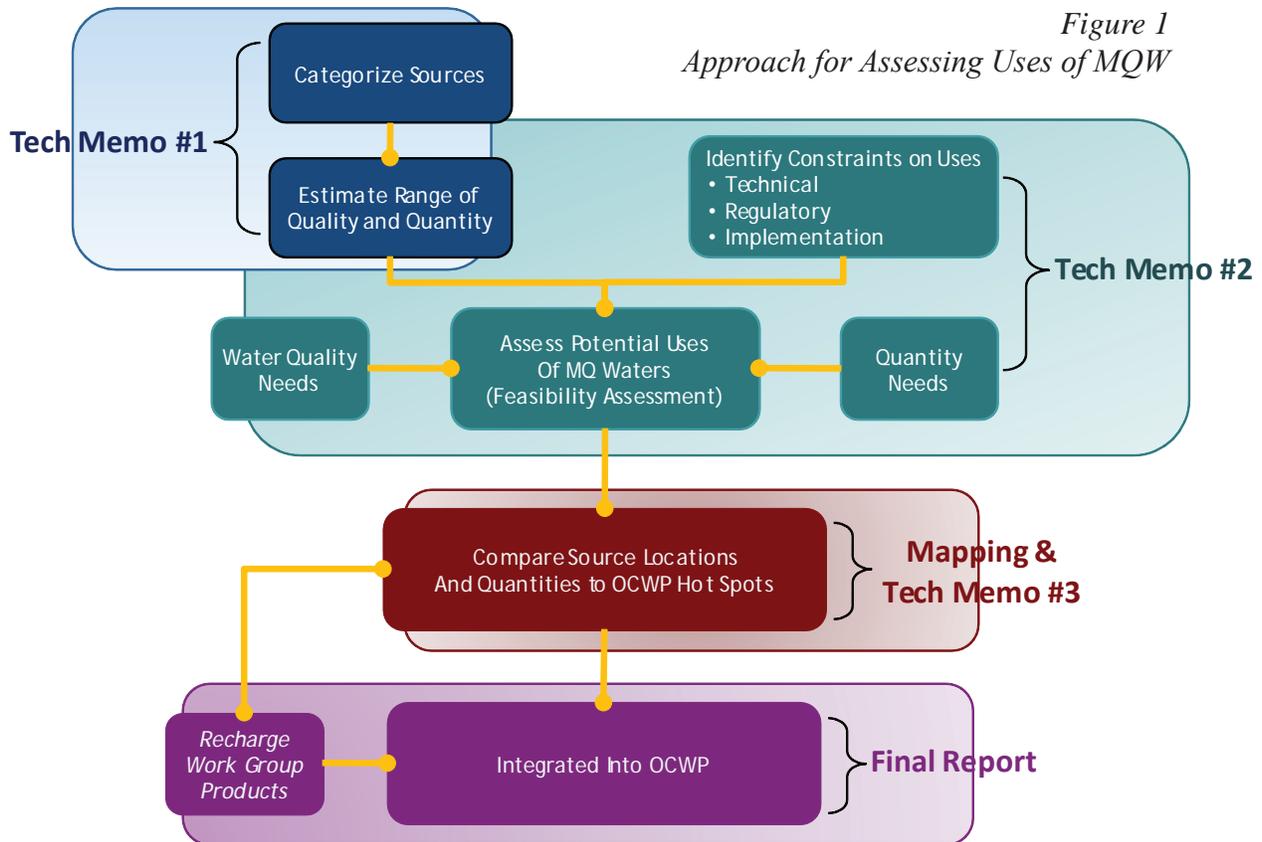
- **Treated wastewater effluent:** Treated wastewater effluent is wastewater that has gone through primary, secondary, and/or tertiary treatment processes to meet regulated discharge limits for a variety of water quality parameters. This analysis was limited to municipal discharges to surface waters.

- **Stormwater runoff**
Impervious surfaces like driveways, sidewalks, and streets prevent stormwater runoff from naturally entering the hydrologic cycle. Stormwater oftentimes conveys debris, chemicals, sediment, and other pollutants to storm sewer systems or directly into a receiving waterbody. Stormwater may or may not be treated through best management practices (BMPs) prior to entering waterbodies.
- **Oil and gas flowback/produced water**
Flowback water is the water that returns to the surface during initial oil and gas well development and hydraulic fracturing, while produced water is a byproduct of well production.
- **Brackish surface and groundwater**
Surface and groundwater sources that have higher salinity than freshwater, but less than seawater, are considered brackish.
- **Water w/elevated levels of key constituents**
Sources of water that have concentrations of key constituents that would require advanced treatment before beneficial use, such as nitrate reduction/removal prior to public water supply (potable) use.

Work on this project is in progress and its results will be integrated into the overall OCWP. A phased approach is being taken to meet the objectives of the legislation (see figure 1). This consists of:

- Quantifying and characterizing MQW sources temporally through 2060 and geographically across the state
- Assessing constraints to MQW use
- Matching projected water shortages across Oklahoma with MQW sources and assessing the feasibility of utilizing MQW

Figure 1
Approach for Assessing Uses of MQW



The MQW assessments and analyses include characterizing the identified sources of MQW and estimating the range of available quality and quantity. Innovative OCWP tools are being used to quantify MQW availability. For example, the Oklahoma H₂O Tool, a statewide database of water demands by decade, demand sector, and location – using 82 sub-basins in a GIS interface – is being used to estimate return flows from municipal and industrial water use and quantify the amount of treated effluent that might be available for reuse in each basin.

Preliminary Findings

Opportunities for increased utilization of MQW supplies may exist at local and statewide levels for several combinations of MQW supply and Oklahoma’s various water demand sectors. Drawing conclusions regarding the feasibility of supply/demand combinations on a broad, statewide basis is challenging. Localized conditions and site-specific issues could cause the feasibility of using a

given specific supply to vary significantly. Rather, this assessment is intended to serve as a guide for the relative feasibility of each MQW supply/demand combination on a categorical basis.

Historical limitations on the use of MQW to meet various water needs have likely been based on the economics of its use relative to other source-of-supply options. However, this statewide screening analysis provides insights into the relative viability of using MQW supplies to meet Oklahoma’s future water needs. Specifically, the following trends were identified through this analysis:

- **Treated Wastewater** from municipal treatment facilities, often referred to as “water reuse,” is a potentially viable source of supply for non-potable uses. Because supplies are greater in and near the state’s cities and towns, M&I non-potable demands (e.g., landscape irrigation) and some industrial or power-generating facilities are likely to be the most cost-effective application for this source of MQW supply.

- **Stormwater** collected in municipal storm sewer systems could be utilized – primarily for non-potable uses – where suitable storage could be provided to buffer the intermittent supply against the demands placed upon this source. Again, the more urban nature of this source of MQW supply suggests that its most cost-effective use will be in and around the state’s communities and more highly-developed areas. Stormwater released to receiving waters (surface water or groundwater) was not considered in this evaluation.

- **Flowback and Produced Water** can be a locally significant source of MQW, but utilization of this resource is likely to be limited by temporal, location, and water quality issues. Because oil and gas production activities at a given site are not permanent, the water co-production at each site will eventually cease. In addition, the location of significant water users’ demands relative to oil and gas production activities may negatively impact the cost-effectiveness of using the water resource. Of Oklahoma’s seven demand sectors, reuse of flowback and produced water to support the water needs of nearby oil and gas drilling may be the most viable from a technical and economic perspective.

- **Brackish Water** would in most cases need advanced treatment to meet potable water quality standards and many industrial users’ needs. Advanced treatment incurs capital and operational costs that are significantly higher than traditional treatment technologies. The most viable users of brackish water supplies are likely public water

suppliers (M&I demand) and industrial users who have the financial resources and technical capability to operate advanced treatment facilities, and who have limited alternatives for supply. Some of the more salinity-tolerant crops such as barley and wheat, and some livestock groups such as dairy and beef cattle, could potentially use brackish water supplies to meet their needs without treatment.

- Waters containing elevated levels of **Contaminants of Concern** (as defined for this work group effort) are potential candidates for non-potable uses. Industry use of these MQW sources will be heavily contingent on the specific water quality needs of each industrial user. Potable use of waters with elevated levels of contaminants of concern would require advanced treatment, which would likely only be cost-effective in situations where alternative supplies are not readily available.



Stormwater Runoff Model

Water Reuse

Of all the sources of MQW being evaluated, water reuse – beneficially using treated wastewater to meet certain demands – is perhaps the most commonly used MQW supply nationwide. As users face greater and greater water supply challenges and as more water supply shortages are projected in our future, the beneficial use of our effluent is becoming a significant topic of discussion.

Unplanned indirect reuse – discharging treated wastewater to receiving waters, then diverting and using that water for others’ needs downstream – occurs throughout Oklahoma and the entire U.S.

This practice is regulated through wastewater discharge permits (pursuant to the Clean Water

Act) and the Safe Drinking Water Act. Intentional augmentation of potable water supply sources with treated wastewater effluent or “planned indirect potable reuse” (e.g., discharges to potable-supply reservoirs or direct recharge of aquifers) is far less common but increasing in the U.S., particularly in areas where water shortages are intensifying (WEF 2008). This reuse practice can reduce the need for long-distance transfers of new water sources, using existing local water resources to the best extent possible.

Analyses of water reuse in the MQW work group are focusing on direct non-potable reuse applications, where treated wastewater is piped directly from the wastewater treatment facility to delivery points for beneficial non-potable uses.

Some of the concerns that arise with implementing water reuse are reductions in stream flows for recreational and environmental uses, potential reductions of supplies for downstream permit holders, public perception and acceptance, and other technical, regulatory, environmental, and implementation issues. Other stakeholders view it as a part of their solution toward addressing growing demands. In arid and water-short regions of our nation, treated wastewater is commonly reused for a wide variety of beneficial purposes. Water quality requirements associated with treated wastewater discharges also can drive reuse.

In a limited number of locations in Oklahoma, treated wastewater effluent is directly reused for landscape irrigation (e.g., golf courses) and industrial purposes (e.g., cooling towers at power plants). These local applications are exceptions to the general practice of treat and release.

Oklahoma’s water future will almost certainly include significant increases in water reuse, potentially ranging from simple non-potable applications to indirect potable reuse using advanced treatment processes. The MQW work group is focusing on the options that exist today and identifying potential uses for treated effluent in the future.

More than 40 states have established formal regulations or guidelines for reuse of treated effluent (EPA 2004). Currently in Oklahoma, state standards do not clearly define or provide guidelines for the reuse of treated wastewater effluent. To widely implement reuse, whether park irrigation or indirect potable reuse, new statewide rules and guidelines will need to be established.

Next Steps

Additional investigation is underway to identify the constraints and potential uses of MQW including the potential technical, regulatory, and implementation constraints on the uses as well as the quality and quantity of MQW needed by various water use sectors in the state.

Treatment solutions to these identified constraints and quality/quantity issues will be summarized along with a qualitative assessment of potential uses by source category. Identification of MQW source locations and their proximity to OCWP physical supply shortage areas will be facilitated through use of the Oklahoma H₂O Tool.

These efforts have all been supported through the statewide technical work group to make recommendations for priority areas where further investigation into MQW and water reuse options may be warranted to leverage Oklahoma’s water resources to best benefit its citizens, economy, and environment.

On completion of the legislative work group’s activities, the conclusions from these evaluations will be integrated into the OCWP to demonstrate the potential role of MQW in meeting Oklahoma’s near- and long-term water needs.

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Importance of Environmental Flows for OK Streams

Mike Fuhr, State Director, The Nature Conservancy, Tulsa

Background

Across the globe, water resources are managed to supply energy, drinking water, grow food, and control floods. Oklahoma is no different. To meet our increasing needs, water planners are struggling to secure adequate supplies for a growing population. However, with progressive policies to guide careful planning and management, human needs for water can be met while maintaining the health of Oklahoma's freshwater ecosystems.

In recent decades, scientists have amassed considerable evidence that naturally-varying water flows are essential to the health and sustainability of freshwater habitat and the creatures that live there.

Environmental flows refer to the quality, quantity and timing of water flows required to sustain healthy freshwater ecosystems and the benefits they provide to human communities. Integrating environmental flow considerations into water management results in healthier freshwater ecosystems that benefit people and nature. Meeting the needs of people and freshwater ecosystems are not mutually exclusive.

Flows in Our Rivers

Every river and stream system has a natural, seasonal flow pattern—often referred to as the environmental flow—to which the aquatic system's inhabitants are adapted. This flow pattern, which varies from season to season, can be best viewed by looking at the hydrograph of a river system. Every river is unique to some degree.

To conserve all parts of the flow regime, one has to factor in many elements of streamflow. These factors can be summarized as five critical elements. Previous research has shown that almost all streamflow parameters that matter to various components of the aquatic ecosystem are describing one of these five elements.

1. Magnitude is defined as the amount of water flowing through the river at any point in time.
2. Timing refers to the season in which a particular flow event occurs. As we have seen, Oklahoma streams flood in the winter and spring. In order for these flows to maintain the portions of the stream that are dependent on them, they must happen at the right time.
3. Duration refers to the length of time a flow event occurs.
4. Frequency refers to how often a flow event occurs. The condition of a stream channel is maintained by the effective discharge, a flow that occurs every 1 to 2 years. Adjustment in this timing would destabilize the stream.
5. Rate of change refers to the speed at which flows change, how fast do flows rise and fall? This becomes very important for species like mussels that cannot move quickly.

It's not necessarily a question of how much water a river needs, but how much can these key parameters be altered before having an appreciable effect on ecosystem function and sustainability.

River Ecology and Its Relationship to Flows

So, why are these flows important? Stream life is dependent not only on the amount of water in a stream, but also the predictability of timing of certain flow events. Let's look at the Kiamichi River as an example (Figure 1, next page). Bottomland hardwood forests stabilize streambanks, and provide shade and nutrients for the stream. They also help maintain water quality and add to the scenic nature of our rivers. Their viability is linked to flooding in the late winter and early spring. The timing of these floods is important. Spring floods create the right moisture conditions for germination and seedling growth,



as well as mature tree growth. These floods also transport seeds and enrich seed banks with nutrients. In addition, these nutrients are important for streamside pastures and croplands.

For smallmouth bass, an important sportfish that's tied to the economy of southeastern Oklahoma, stream flow conditions, not the number of adult spawners, primarily determine spawning success.

While large floods are essential to maintain riparian forests, smallmouth bass require low flow periods during the spring, as floods during or after spawn will blow out the nests and lead to poor survival of their broods. Thus, the proper magnitude and frequency of floods are important. These floods should not occur every year, but frequently enough to maintain both the riparian forests and the sport fish community.

The Ouachita rock pocketbook, like other mussels, relies on flow to carry in nutrients and carry away its waste, and for its reproduction. Like other mussels, it requires sufficient flows in winter to carry its young to host fish on which they attach for a short period of time. Numbers of this mussel are currently declining. It is hypothesized that higher temperatures in summer due to lower-than-natural base flows slow their metabolism, reducing their overall health and reproductive ability.

Importance to People

Outside of the benefits to people associated with direct usage of our state's water, these flows are important to Oklahoma for many other reasons. Hydropower generators associated with dams require through-flow to generate electricity. Water quality, something recognized as very important to people, protects human and environmental health, and clean water is required for many users

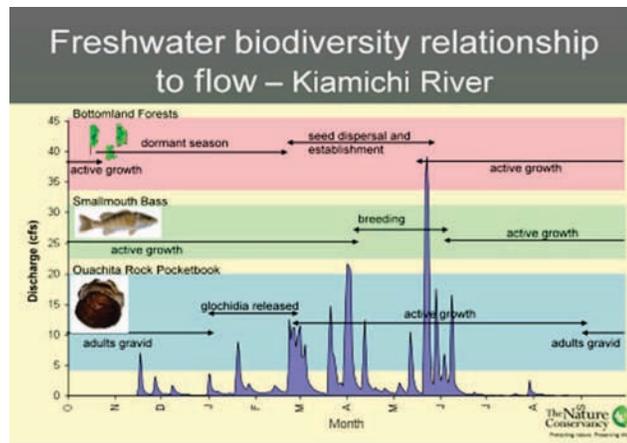


Figure 1: A hydrograph describing the flow in Oklahoma's Kiamichi River. Looking at three species, parts of their life history cycles are dependent on the variation in flows naturally occurring in this river. This variation can be altered by different human activities if we are not careful.

in addition to fish and wildlife. And although treatment plants help clean wastewater prior to release into natural systems, adequate streamflow is relied on to dilute and disperse any remaining harmful substances, including some bacteria. Minimum flows insure that these materials can be diluted and dispersed to reduced concentrations within

limits defined by federal and state agencies.

Tourism in many parts of the state is tied directly to the flow of our rivers, especially when considering hunting and fishing, as well as kayaking, canoeing, and swimming. These activities account for millions of dollars that pour into our economy.

Worldwide, water conflicts are escalating as cities, industries, agriculture, and energy producers compete for limited freshwater supplies. At the same time, there is a growing awareness of the need to maintain adequate freshwater flows in rivers, streams, lakes, floodplains, aquifers, and estuaries to sustain biodiversity and the many benefits derived from the healthy, functioning ecosystems upon which local communities and economies depend. An efficient, integrated water resource management system can help Oklahoma provide for growing human populations while protecting and restoring healthy freshwater ecosystems that are such an important part of our wonderful state.

"Environmental flows should not be viewed as an 'allocation' of water, but rather a desirable outcome of integrated management of water and land resources for long term sustainability." Brian Richter, in Rethinking Environmental Flows: From Allocations And Reserves to Sustainability, River Research and Applications, 2009



Topic 3

Land Use Practices

Land Use Practices

Planning Workgroup Facilitators: Wes Lee and John Haase

GROUP

Facilitators: Wes Lee and John Haase. Experts: Mark Derichsweiler, Oklahoma Dept. of Environmental Quality; Dr. Mike Smolen, Oklahoma State University Cooperative Extension Services; Bryan Mitchell, Camp, Dresser and McKee; Greg Kloxin, Oklahoma Conservation Commission. Participants: Roy Lee Lindsey, Jr.; Fred Fischer; Tom Weichel; Bill Wentroth; Thomas Lee Tucker; Pat Burt; Olen Gray; CM Lin; Mary Jane Calvey; Jerry Brabander; Junior Welch; Brett Kimbro; Dan Sebert; Darrel Dominick; Bob Drake; Joe Schulte; Victoria Gonzales; Angela Williams; and Dale Maronek.

QUESTION

How should the plan protect/enhance water quality & quantity through appropriate land stewardship? In other words, what land use practices should be used to reduce threats to water quality & quantity?

1. *Watershed-level management and land-use planning*
2. *Urban sprawl and development in floodplains*
3. *Riparian areas, bottomlands, wetlands, and conservation easements*
4. *Runoff controls, road maintenance, and erosion control*
5. *Fertilizer and pesticide application, and invasive species*
6. *Wellhead protection, septic tanks*
7. *Methods to encourage best management practices*
8. *Education and research needs*
9. *Funding of land use studies and incentives*

Establish a Statewide

Coordinator for Best Management Practices

A statewide coordinator (“czar” type position) should be established with sufficient authority to encourage collaborative, comprehensive planning and avoid duplication of efforts in implementing best management practices.

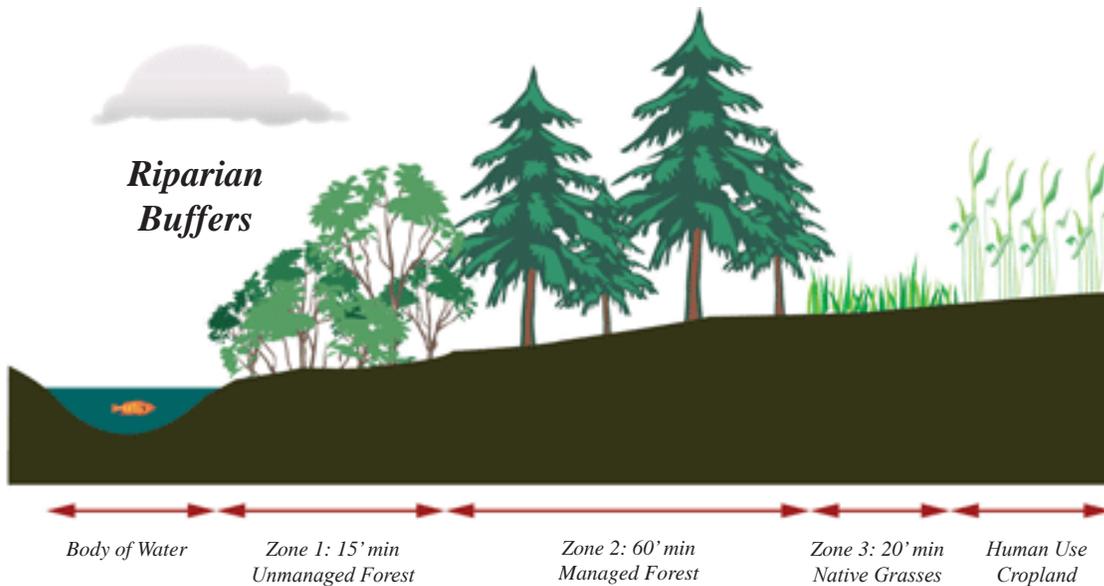
To achieve this, the coordinator should work with watershed coalitions and appropriate state agency personnel, which may include cabinet level secretaries, to coordinate best management practices and facilitate the work of the state agencies to address the issues and recommendations from the coalitions. Watershed coalitions should submit their action plans and annual reports to the coordinator for dissemination to the appropriate agencies.

Develop Statewide Minimum Standards

City and county governments should be authorized to develop, implement and enforce land use practices based on a set of statewide minimum standards for development best management practices.

The standards should be centered on appropriate outcomes, which can provide a baseline from which to establish regulations and develop education programs for builders and other land users. Implementation of BMPs may include incentives, enforcement provisions, and education through training programs.

The education programs should cover sedimentation, pollution, and related areas to be developed by agencies and organizations such as EPA, ODEQ, OWRB, OSU, NRCS, and Corps of Engineers.



Topic 3: Recorder's Notes

The reason for the statewide minimum standards is that cities are not consistent with land use standards or enforcement of their standards; counties cannot have the same standards as cities within their county because of this inconsistency.

While stormwater management and construction permitting requirements do exist, they are enforced by complaint. Therefore, it is important to have education so that everyone understands the regulations.

The established minimum standards should not be measured by a checklist approach but by established performance outcomes that describe the results.

Cost/benefit analyses should be done, and only those options that show significant

conservation benefits relative to costs should be adopted. For example, green roofs – are they appropriate and practical?

It is important to charge for the “actual” value of water. It is worth more than users are currently paying. By charging the true value of water, efficient use and conservation would be encouraged.

Editor's Notes

This workgroup had substantial discussion on the duties of the coalitions including developing action plans and identify land use practices that affect water quality and quantity.

The formation and duties of the coalitions will be discussed during the Stakeholder Involvement section.

Water Conservation and Riparian Buffers

Robert Gregory, Executive Director, Land Legacy, Tulsa

With the importance that streams, creeks, and lakes play in our daily lives, from providing drinking water supply to recreational uses and transportation, it is imperative that land use practices, especially in sensitive watersheds, reflect this important relationship.

There are numerous land use practices that can be detrimental to water quality for agriculture, wildlife and humans. These land use practices can come at a high environmental and financial cost. There are also some very straight-forward and effective methods that can be taken to have a very positive impact on water quality.

Destruction of Riparian Buffers

One of the most common practices with some of the most detrimental effects on water quality is the severe damage or destruction of riparian areas. The land adjacent to bodies of water such as creeks, streams, and lakes, when healthy, can provide an extensive list of benefits to humans and the environment. Riparian areas or buffers can be severely damaged by the removal of native vegetation, soil and bank erosion, and channel alteration.

Often times, these riparian areas contain some of the most fertile and productive soil in the area making it a prime location for pastureland and cropland. Common agricultural uses require that pesticides and fertilizers also be applied in these sensitive riparian areas.

This leads to a higher potential for both ground and surface water pollution and contamination. The removal of the vegetation within these riparian buffers allows these potential pollutants to reach the water bodies much quicker.

Research has shown that approximately 80% of all contaminants can be filtered by healthy, functioning riparian buffers.

Nutrient Loading

Fertilizers and pesticides of all types can lead to excessive nutrient loading that can produce eutrophication and associated undesirable chemical conditions in the water. Also, the types of algae that sometimes grow prolifically under conditions of eutrophication can release undesirable organic compounds that produce taste and odor problems in water.

Excessive nutrient levels also decrease the clarity of the water and can deplete the level of dissolved oxygen, which can cause fish kills. These conditions diminish the reliability and desirability of water across the state for drinking water supply use, as well as for sport fishing and other recreational uses.

Sediment

Another problem associated with water quality concerns is that of sediment, which can be both a pollutant and a carrier of pollutants. Large amounts of sediment can clog streams, channels and floodplains causing more flood damage and increasing the amount of erosion from the banks of the water bodies.

Sediment can also contain contaminants that attach to the sediment particles and are transported directly into the water bodies. Unlimited access of cattle and other livestock to streams and creeks can make this problem even larger as the banks are continually stressed by the movement of these animals to, from and across the bodies of water.

Proper land use practices can significantly improve water quality by reducing the levels of contaminant runoff and stream bank erosion.

Establishment of Riparian Buffers

These land use practices include the establishment of riparian buffers, employment of recommended “best management practices,” and adherence

to conservation, timber and nutrient management plans.

Riparian buffers are strips of grass, trees or other vegetation established adjacent to streams, wetlands or other water bodies. The benefits of riparian buffers include the filtration of nutrients and the interception and trapping of contaminants in runoff from both surface water and ground water before reaching a stream. Riparian buffers also provide habitat and corridors for fish and wildlife and help stabilize and restore damaged stream banks from erosion.

The land designated for a riparian buffer must be adjacent and parallel to a stream or other water body. The width of the buffer may range considerably depending on slope, soil type, vegetation, and other factors but usually vary from 100 to 300 feet. Cattle grazing along with plowing or removal of vegetation should be prevented or strictly limited within the buffer. No structures or septic systems should be allowed within the buffer to prevent additional water runoff sources.

Buffers can be established voluntarily by landowners or by the use of “conservation easements.” Easements can be term or permanent agreements that restrict certain land use practices, such as cattle grazing, clear-cutting, or construction within a prescribed riparian buffer.

A number of other “best management practices” can also be employed to enhance water quality. Among these is the creation of alternative water sources for cattle grazing on lands adjacent to streams and water bodies, with riparian buffers fenced to prevent access. The application of fertilizers and other nutrients should also be conducted within limits established by appropriate



Example of riparian buffers

state and federal agencies, including the US Department of Agriculture. Structures and septic systems should be constructed in locations that minimize any potential impact on water quality, generally as far from a stream or water body as possible.

To assist in identifying the most appropriate “best management practices” and other land use tools, landowners can seek technical assistance to develop conservation, timber and nutrient management plans. These plans will provide specific recommendations to landowners on how to best manage properties both to ensure their maximum productivity for agriculture or wildlife habitat purposes and for the preservation of natural resources including water quality. Multiple state and federal agencies provide this service to landowners for little or no cost, including the Oklahoma Conservation Commission, Oklahoma Forestry Services, the USDA Natural Resources Conservation Service, the US Forest Service, and others.

Multiple funding sources exist for landowners who choose to create riparian buffers, employ best management practices, and develop conservation, timber or nutrient management plans.

Summary

By employing these land use tools, contamination can be significantly reduced, stream bank erosion can be minimized and sedimentation reduced, thereby improving the quality of Oklahoma’s water bodies for agricultural uses, drinking water sources, recreational uses and for wildlife populations while avoiding the potentially devastating environmental and financial costs of poor water quality.

Unprotected Waters and State Water Supply

Eric Held, P.E., Manager of Conservation Programs, Ducks Unlimited, Inc.

Headwater tributaries, including intermittent streams as well as adjacent floodplain wetlands, and geographically isolated wetlands collectively provide critically important habitat for many species of fish and wildlife, and they are the primary or initial sources or channels of most of the water that flows through the nation's and Oklahoma's waterways. These waters and wetlands supply drinking water to almost 2.6 million Oklahomans, or nearly 71% of the State's population.

Oklahoma has lost nearly two-thirds of its wetlands, and many remaining wetlands are "geographically isolated." Headwaters and geographically isolated wetlands have critical and essential fish and wildlife habitat values, and they provide a host of other important ecological goods and services to the state's residents.

Oklahomans value their state's natural resources and biodiversity, especially abundant supplies of clean water – all of which are directly linked to the state's waterways, including headwaters, geographically isolated waters, and the many smaller, non-navigable perennial and intermittent streams. Wetlands also provide sanctuary for many of the Federal and state-listed threatened and endangered species.

The importance of these headwaters, small and intermittent streams, and isolated wetlands to wildlife, water quality and water supply – and ultimately to people – cannot be overstated. They are often the lifeblood of Oklahoma's larger lakes, rivers, and streams.

Headwaters are where Oklahoma's larger rivers and lakes are born. In fact, waters that often may appear geographically isolated are connected to larger bodies of water in ways that aren't apparent,

such as through subsurface flow. This connectivity and the processes by which it occurs provides important functions including groundwater recharge, pollutant filtration, flood water storage, and fish and wildlife habitat.

Science tells us that headwaters and geographically isolated wetlands collectively are responsible for the quality and quantity of all our waters. We cannot achieve and maintain good water quality without protecting all important waters and wetlands in the aquatic ecosystem. This holds true for temporary and seasonal wetlands that may hold water for weeks to months, and intermittent streams that do not flow year round or may have been "ditched" or otherwise altered by human activity on the landscape.



The Clean Water Act in the past served to slow the loss of wetlands and clean up Oklahoma's streams and waters. More recently however, the SWANCC and Rapanos decisions have placed Clean Water Act protections in doubt for many of Oklahoma's surface waters, including geographically isolated

wetlands and headwater streams and their adjacent wetlands. Subsequent Corps and EPA guidance from 2003 and 2007 effectively stripped protection from many of the state's waterways.

In Oklahoma, 8,092 total miles of streams supply surface water intakes for public drinking water systems. Of this, 5,330 miles, or 66%, are intermittent, ephemeral, or headwater streams that may not be statutorily protected at present. Over 2.3 million people in Oklahoma, or ~71% of the state's population, receive drinking water from public drinking water systems whose water sources rely at least in part on intermittent, ephemeral, or headwater streams (*EPA, Analysis of the Surface Drinking Water Provided by Intermittent, Ephemeral, and Headwater Streams in the U.S., 2009.*)

As long as federal or state protections remain weakened and not comprehensive over entire hydrological systems (including subsurface connections to isolated wetlands), over 60% of the Oklahoman's water supply is at risk of degradation, quantity reductions, and other factors that almost certainly will negatively affect the quality of life of Oklahomans, their local and regional economies including agriculture, and their fish and wildlife resources. Some of the essential functions that headwaters and other wetlands provide are detailed below.

Storing Water and Maintaining Stream and River Flows

Headwaters and geographically isolated waters supply and maintain flows in all of the state's surface waters and groundwater aquifers by temporarily storing and then slowly releasing much of the water that enters hydrological systems.

By retaining water during rain and snow melt events, headwaters and geographically isolated waters ensure that water more evenly and slowly flows into downstream waters and also recharges groundwater aquifers. Headwaters and associated wetlands also filter water and naturally improve water quality. Their water storage functions also reduce damaging flooding, provide sources of drinking and/or agricultural irrigation water, and maintain important habitat for fish and other wildlife.

Both large and small streams may occasionally dry up or run low during low-flow periods; water temperatures typically also increase during such periods.

Water stored in headwaters and geographically isolated waters serve to recharge groundwater that supplies streams through spring flows, and they also maintain suitable downstream flows and temperatures that people, fish, and other wildlife depend on during these dry periods.

These functions will become increasingly important as climate change places temperature stress on people, agricultural producers, and

aquatic wildlife. Forested wetlands provide both water and cooling shade for adjacent streams. By contrast, when streams and wetlands are destroyed, streams throughout the aquatic system experience increased flooding due to the loss of water retention upstream, and habitat is destroyed.

Trapping Sediment

Headwaters and geographically isolated waters and wetlands capture enormous amounts of sediment. Where they are not destroyed or degraded, these waters capture sediment before it reaches downstream waters. This provides important biological and water quality benefits, such as clearer water to support vegetation and fish reproduction.

When sediment washes downstream, it can fill in spawning areas and harm the reproduction and diversity of fish and other species, such as macroinvertebrates, that serve as the foundation for the food web of the entire aquatic ecosystems. Reductions in sediment loads are also an important natural function of these waters and associated wetlands that reduce the cost of primary treatment for production of drinking water for people.

Storing & Recycling Nutrients; Providing Food and Oxygen

Headwaters and geographically isolated waters store and beneficially recycle nutrients, preventing unnaturally high levels of nutrients (such as phosphorous and nitrogen) that exacerbate harmful plant and algal growth in downstream waters, a process called eutrophication. Eutrophication causes algal blooms that impairs water clarity, and causes reductions in dissolved oxygen vital to fish that often results in fish kills. Headwaters also facilitate the processing of nutrients in ways that maintain water quality for people, wildlife and fish.

Detritus is processed by bacteria living in wetlands, which in turn are eaten by macroinvertebrates that serve as food for fish, frogs, and other wildlife. Finally, nutrient reduction via wetlands also is an important ecological service that reduces primary treatment costs for production of drinking water for people.

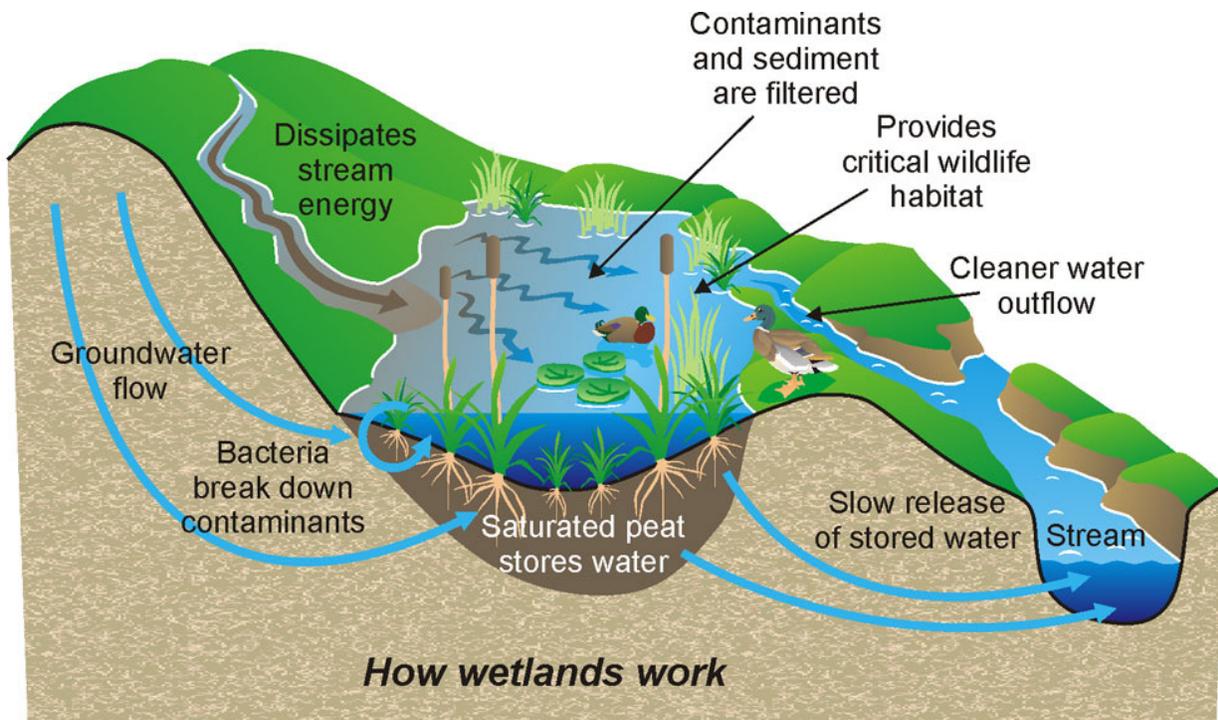
Providing Habitat

All habitat types are important and interlinked. This is especially true of Oklahoma's smaller streams and wetlands. Many aquatic and semi-aquatic species begin their lives and return to spawn or breed in small tributaries and wetlands. Many fish species rely on wetlands, especially floodplain wetlands, for spawning and support and development of pre-adult life stages.

Given their unique breeding, feeding and wintering requirements, many amphibians depend on movement from wetlands to nearby streams, lakes and rivers. For amphibians, successful breeding and survival is oftentimes dependent on the lack of a direct surface connection between nearby waters.

For instance, many amphibians find particularly successful breeding conditions in temporary wetlands that dry in summer or fall and do not support populations of predaceous fish. Upon metamorphosis from larval to adult forms, a process that must occur in wetlands, many amphibians move to upland habitats, or nearby tributaries and other waters to feed and or over-winter.

Due in large part to their movements to nearby waters, amphibians are an important link in the ecosystem's food web and serve as a food source for fish and other aquatic wildlife.





Topic 4

*Intergovernmental
Water Resource Management*

Intergovernmental Water Resource Management

Planning Workgroup Facilitators: Wes Lee and John Haase

GROUP

Facilitators: Wes Lee and John Haase. Experts: Lindsay Robertson, University of Oklahoma College of Law; Hal Simpson, Camp, Dresser and McKee; Jerry Barnett, Oklahoma Water Resources Board. Participants: James Collard; Angela Burckhalter; Robert Tippeconnie; Mike Frickenschmidt; Mike Mathis; R. Scott Vaughn; James Milton; Randy Archer; Chuck Mills; Harvey Arnold; James Zellner; Larry Boggs; Jeff Boxrucker; Garner Garrison; Keith Wright; and Julie Daniels

QUESTION

How can the governments of the United States, Indian Nations, Oklahoma, neighboring states, counties, and municipalities work more cooperatively and effectively to manage water resources within their areas of jurisdiction?

1. *Intergovernmental agreements to address rights and standards*
2. *Coordinated planning and plan implementation*
3. *Elimination of regulatory conflicts and overlaps*
4. *Regulatory loopholes*
5. *Unfunded mandates*
6. *Data and resource sharing*

Intergovernmental Coordination

The State should create basin (intergovernmental) advisory committees that funnel water issues of concern to those basin governmental entities and recommendations to the OWRB, the Governor, and the Legislature. The advisory committees should be comprised of representatives from State, municipal, county, and tribal governments – as appointed by their respective governing bodies. Federal agency representatives may be asked to serve on the committees, as appropriate, as *ex officio* representatives. The advisory committees could be based on either the 13 established basins or the 5 OWRB field areas.

Interstate Water Planning

Oklahoma is planning for its water future by looking at both supply and demand; however,

one thing Oklahoma may not be able to predict accurately is how much water flows into the State from other states. Other states have the same concern with how much water Oklahoma lets flow out-of-state through major rivers. While the current system of interstate compacts helps provide a sense of security as to how much water enters and leaves Oklahoma, it does not solve all the problems that can occur when multiple states share water resources. To be proactive in avoiding additional water conflicts and issues, the Oklahoma Water Resources Board should take a facilitative role in discussing the establishment of interstate committees for regional water planning through the State's existing interstate compacts.

These committees should be created under the compacts through a rule-change that would not require Congressional approval. However, if compact states do not agree to conduct joint water planning via the compacts, then the OWRB should encourage the creation of committees outside of the compacts. (For example, a conference could be convened that would bring together either the Governors or key legislators of compact states to discuss regional water planning.) In either case, the states should look at ways to improve deliberations.

Surface-Ground Water Interaction Compact Commission

The State should explore the establishment of an interstate compact commission that would have the ability to gather data pertaining to surface and groundwater relationships where these waters cross state lines. Oklahoma should enter into compact discussions with other states regarding our shared aquifers.

Native American Water Rights

The state of Oklahoma shall continue the dialogue between representatives of the State and the Indian Nations with the expectation to proactively resolve water issues. The dialogue should be ongoing and organized through a “regional” approach.

Interstate Water Compacts

Excerpts from © Dianna Everett, Vertical File, Research Division, Oklahoma Historical Society

Throughout the American West, water, or the lack of it, has been a primary concern of citizens and government officials alike.

Oklahoma's principal river systems, the Canadian, Red and Arkansas, provide residents with life-giving liquid for crop irrigation, livestock watering, household use, industrial development, and recreation. These rivers rise in and flow through states to the west and north of Oklahoma, and while some of the water that reaches Oklahoma is used here, eventually more than 34 million acre-foot exits the state and flows downstream into Arkansas and Louisiana.

Dam construction and lakes, irrigation projects, and urban development in adjacent states and in Oklahoma have continually stopped the free flow of water, creating interstate controversies over water rights. Under the twentieth-century interpretation of the U.S. Constitution's compact clause (Article 1, Section 10, Clause 3), states may, with the consent of Congress, form agreements to solve common problems, and in the twentieth century interstate compacts became a means of using negotiation, rather than lawsuits, to settle water-rights claims.

Oklahoma participates in four interstate stream agreements. Water compacts serve to regulate each state's usage. The water flowing in each stream is measured and apportioned to each state, with the goal of avoiding inequity. Each state maintains a storage and distribution plan. The compacts also promote water conservation, monitor and regulate pollution, and monitor commercial and urban development along each river.

CANADIAN RIVER

The Canadian River (North and "South" Canadian branches) flows through New Mexico and the Texas Panhandle before entering Oklahoma, where it flows into the Arkansas River. The state's first water pact came in 1926 when Oklahoma and New Mexico agreed to share proportionally the Canadian River's waters. Texas declined to

participate. However, on December 6, 1950, the three states modified and approved the earlier compact, and water was reapportioned. The Oklahoma Legislature approved in 1951, Congress approved, and the president signed the agreement into law on May 19, 1952. The Canadian River Compact Commission, with representatives of the three states, administers the compact, in cooperation with the federal government.

ARKANSAS RIVER

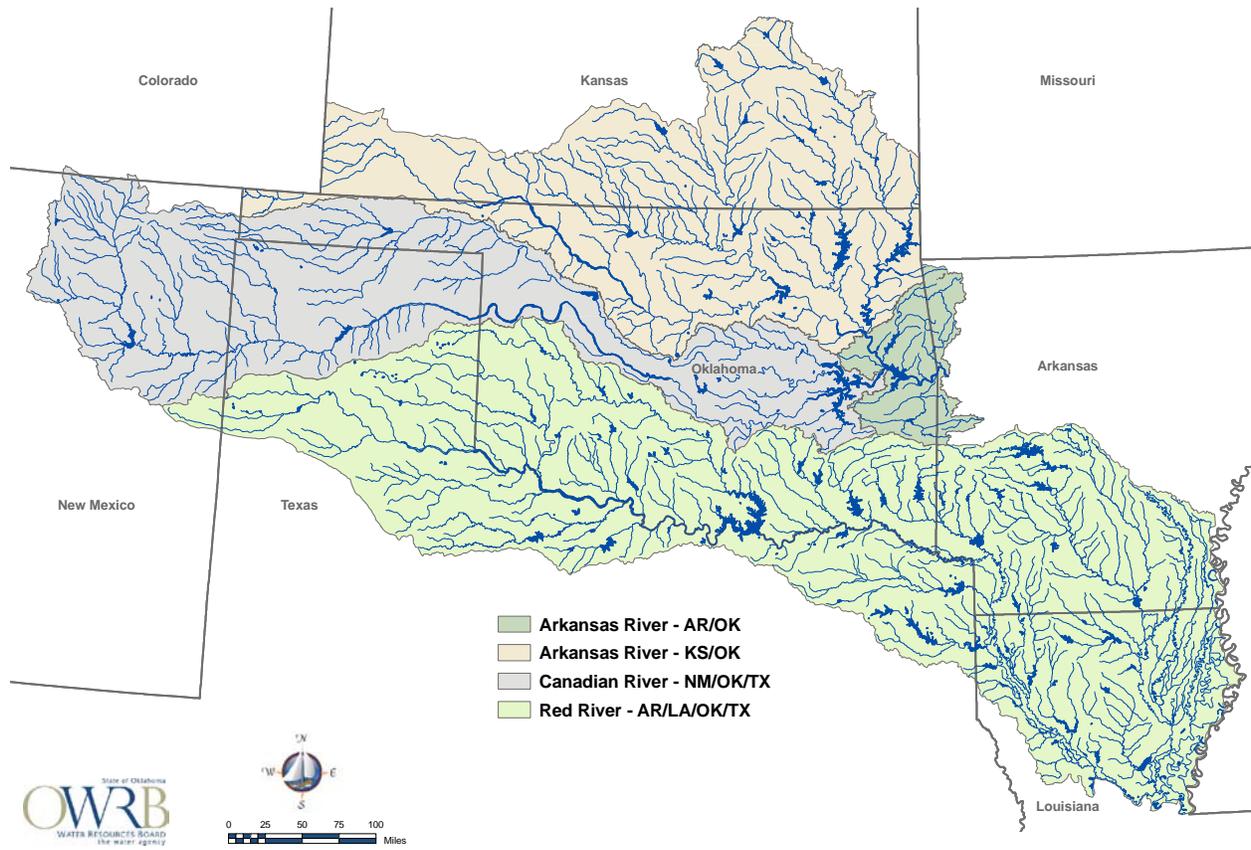
The Arkansas River flows through Colorado, Kansas, Oklahoma, and Arkansas. Those four states have rights to use the water. Oklahoma has water compacts with Kansas and Arkansas to apportion the waters of the Arkansas River basin, regulate pollution, and manage water resources (Kansas and Colorado signed a separate compact in 1949.) The Kansas-Oklahoma Arkansas River Compact was authorized in 1955 by Congress and approved in 1965 by the two states and by Congress in 1966. The rivers covered in this agreement are the Arkansas proper, the Salt Fork, the Cimarron, and the Grand. The compact is administered by the Kansas-Oklahoma Arkansas River Commission. The Arkansas-Oklahoma Arkansas River Compact came in 1971 (revised in 1972). It covers the Arkansas proper in eastern Oklahoma and western Arkansas and is administered by the Arkansas-Oklahoma Arkansas River Compact Commission.

RED RIVER

The Red River flows through the Texas Panhandle and through Oklahoma, Arkansas, and Louisiana, discharging into the Mississippi River. Those four states have rights to the water. In 1955 Congress authorized the four to negotiate a compact. After a lengthy process, the document was finally signed in 1978 and approved by the federal government. The Red River Compact Commission, consisting of two members from each state, administers the agreement.

Full text and bibliography at <http://digital.library.okstate.edu/encyclopedia/entries/W/WA052.html>

Oklahoma's Interstate Stream Compact Areas



Oklahoma and Federal Indian Water Law 101

Stephen H. Greetham, Chief General Counsel, Chickasaw Nation Division of Commerce

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Introduction

Whether it is the Apache Tribe's suit on the Red River, the implications of the Cherokee Nation's rights on the Illinois River, or the Chickasaw and Choctaw Nations' rights in southeast Oklahoma, Oklahoma water conflicts increasingly involve *tribal* water rights.

This article provides, from the perspective of a tribal lawyer, a primer on federal Indian water law. While my focus is on *substantive* law, here, current policy questions turn on the *process* by which we ought to move forward—intersovereign negotiation or litigation.

Basic Rules of Federal Indian Water Law

The Context

Control over water provides a community with control over its future, and for tribes, this provides a hope for fulfilling the central promise of their treaties: A permanent homeland. To appreciate this, one should perhaps consider as a starting point the facts on the ground only a decade before Oklahoma statehood:

[I]t is open to serious doubt whether that large tract of land, known distinctively as the 'Indian Territory,' is a territory of the United States [A] reference to some of the treaties under which it is held by the Indians, indicates that it stands in an entirely different relation to the United States from other territories, and that for most purposes it is to be considered as an independent country ...

Atlantic & Pacific Ry. Co. v. Mingus (1897). Those treaties established a general and unique right in certain tribes to be forever free from the power of

any state's laws. While the facts on the ground changed, those freedoms are still law and are reiterated in Oklahoma's Constitution.

Consider next the Court's decision in its most famous tribal water rights case:

The Indians had command of the lands and the waters - command of all their beneficial use, whether kept for hunting, and grazing roving herds of stock, or turned to agriculture and the arts of civilization. Did they give up all this? Did they reduce the area of their occupation and give up the waters which made it valuable or adequate?

Winters v. United States (1908). *Winters'* questions cut to the heart of a critical matter: When tribes lost their lands, *what did they retain?* *Winters'* general principles (not to mention its principled application) give tribal leaders and citizens hope that foundational elements of their continuance are retained, and having already lost so much, tribes are disinclined to give up more.

For the states that now occupy tribal homelands, the corollaries to *Winters'* questions can be difficult. Notwithstanding hydrologic reality, water law operates in a complex of parallel universes—federal law versus state law, sovereign rights versus proprietary interests, *etc.*—and this can (and typically does) give rise to conflict, regulatory uncertainty, and adverse economic impacts. But those challenges can (and must) be addressed. Resolution of the associated challenges is a policy priority for many states, and Oklahoma's water planners focused on this issue in one of its top policy recommendations of its last State Water Plan (see p. 138). To date, though, we have made little (if any) progress.

The Scope and Extent of Tribal Water Rights

Leaving *process* aside, this article focuses on the rules by which tribal claims are *substantively* quantified—that is, formally defined as to their scope and extent. Lawyers can debate *how* federal Indian water law rules may apply to specific fact

patterns and legal histories, but the existence of tribal claims is not debatable. As the federal court presiding over the Illinois River chicken litter suit stated only a few months ago, “[t]

“The last State Water Plan indicated a preference for negotiation, though little progress has since been made. The time is ripe to tackle our shared challenge.”

he claimed interests of the Cherokee Nation in the water rights portion of the subject matter of this action *are substantial* and are neither fabricated nor frivolous.” *Oklahoma v. Tyson Foods, Inc.* (2009) (emphasis added). The court even recognized, given the unique treaty status of the Five Tribes, that the claims of those tribes extend to “much of the surplus water within [their] historic boundaries.” The court’s statements are consistent with what tribal advocates have argued for years.

So the stage is set. What are we to do now? As state and tribal leaders consider that question, here is an outline of federal Indian water law quantification rules.

1. Winters rights – *Winters* provides the framework for the “reserved water rights” doctrine. *Winters* provides that the establishment of an Indian reservation impliedly reserves a federal water right for the tribe. Such right is senior as of the date of the reservation, extends to a quantity of water necessary for the reservation’s purposes, and reaches interconnected surface and groundwaters.

2. Walton rights – *Colville Confederated Tribes v. Walton* (1981) provides that in addition to a portion of a tribe’s reservation land base, each tribal allottee received a “ratable share” of his or her tribe’s irrigation-purpose water right. A non-tribal citizen subsequently acquiring an allotment will generally acquire a right, if pursued with “reasonable diligence” after original acquisition, to appropriate up to the amount of the original “ratable share.” Inadequate pursuit of that “ratable share” forfeits what right may have been available.

3. Winans rights – Unlike *Winters*, which recognized the implied *creation* of a right, *United States v. Winans* (1905) affirmed the implied *continuation* of a preexisting use. The substance of

any *Winans* right depends on the content of the relevant treaty, executive order, or statute and the facts of the preexisting tribal use, but generally, it can include sufficient

flows for hunting and fishing economies, defined consumptive uses, or protection of natural springs that support culturally important practices or species.

4. Five Tribes rights – The historical and legal uniqueness of the Five Tribes’ (Cherokee, Chickasaw, Choctaw, Creek, and Seminole Nations) treaties—which treaty provisions were the focus of the *Mingus* Court’s discussion (above)—vest those tribes with claims that do not follow the *Winters* or *Winans* “reserved rights” analysis. As stated in the *Tyson* court’s ruling:

[T]he question to be asked is not, How much water was reserved to the tribes? but how much water has been taken away? The shift in the nature of the question transfers the burden of establishing a right to water from the tribes to the state. The shift also creates a presumption that surplus water is the property of the tribes rather than the state.

Tyson (internal quotation marks omitted). Resolution of Five Tribe claims will profoundly impact eastern Oklahoma and the communities that would rely on the waters arising therefrom.

Conclusion

Fair and sustainable resolution of the issues with which our shared history has left us is essential to our shared future. Some “resolution” will eventually be achieved, but it remains unclear whether it will be achieved by happenstance or proactive engagement.

Today, tribal and state leaders face two fundamental questions: Should we litigate or negotiate, and if we choose to negotiate, how do we start? The last State Water Plan indicated a preference for negotiation, though little progress has since been made. The time is ripe to tackle our shared challenge.

“Treatment as a State”

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This is a heavily excerpted presentation of the complete (35 pages and 185 footnotes) article. Complete citation: Sanders, Marren, *Clean Water in Indian Country: The Risks (and Rewards) of Being Treated in the Same Manner as a State* (July 30, 2009). *William Mitchell Law Review*, Forthcoming. Available at SSRN: <http://ssrn.com/abstract=1444630>. Footnotes numbers have been included but footnote text omitted here for publication clarity but may be referenced in the complete article.

A BSTRACT
This article examines the “Treatment as a State” (TAS) provision of the Clean Water Act and the requirements that Native nations must satisfy in order to exercise their sovereign right to environmental regulation within the reservation. To gain TAS status and set their own water quality standards (WQS), Native nations must prove that they have a functioning tribal government with authority and capacity to regulate. Therefore, tribes considering taking the TAS step must critically evaluate their internal capacity to do so.

The establishment of tribal WQS offers significant advantages to Native nations, but also very real risks as they face legal and legislative uncertainty and jurisdictional challenges. It concludes that despite a history of colonization and assimilation, tribes can and are playing a critical role in the sustainability of clean water in Indian country. Building infrastructure is not an easy task. However, for many tribes the challenge may be worth the risks.

The outline of the complete article follows:

1. Introduction

2. The Clean Water Act

- a. Background
- b. “Treatment as a State” Provision
- c. Devolution, Delegation, or Something Else Entirely?
- d. The Bane of Jurisdiction
- e. The Wisconsin Debacle

3. More Risk Than Reward?

- a. Here Today, Gone Tomorrow?
- b. Federal “Core” Standards
- c. The Oklahoma Rider

4. Rewards

5. What Can Tribes Do?

- a. Institutional Capacity
 - i. Stable Institutions and Policies
 - ii. Dispute Resolution and Separation of Politics
 - iii. A Capable Bureaucracy
 - iv. Cultural Match or Legitimacy
 - v. Strategic Orientation

6. Conclusion

Introduction

The Clean Water Act (CWA) was created to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.”² CWA goals were to be carried out through government-to-government partnerships. However, like many environmental statutes, the CWA omitted Native nations, leaving the role of tribes under the act unclear. This omission proved critical as reservations faced severe pollution concerns and prompted Congress to pass the “treat as a state” provision of the CWA in 1987.³ However, to be treated like a state and set their own water quality standards (WQS), Native nations must prove that they have a functioning tribal government with authority and capacity to regulate.⁴

This article examines the TAS provision and the requirements that tribes must satisfy in order to exercise their sovereign right to environmental regula-

tion within the reservation. TAS status carries with it enormous benefits or rewards, but also very real risks as tribes face legal and legislative uncertainty and jurisdictional challenges. Tribes considering taking the TAS step must critically evaluate their internal capacity to do so. They must be prepared to “hold their own” at the table.⁵ This means building expertise and management capabilities, so that their information and know-how is at least equal, if not better than, non-Indian governments.⁶ I conclude that there are many questions that must be answered by tribes who wish to successfully

2b. “Treatment as a State” Provision

“[W]ithout some modification, our programs, as designed, often fail to function adequately on Indian lands. This raises the serious possibility that, in the absence of some special alternative response by EPA, the environment of Indian reservations will be less effectively protected than the environment elsewhere. Such a result is unacceptable.”¹⁸

As a first step toward complying with its new Indian policy and to expressly open the door to tribes assuming “full responsibility” for clean water standards in Indian country, in 1987 the CWA was amended authorizing the EPA to “treat tribe[s] as a State. . . to the degree necessary to carry out the objectives of” the act.¹⁹ The EPA is authorized to treat tribes as states for certain identified purposes, including: (1) grants²⁰; (2) water quality standards (WQS)²¹; (3) nonpoint source management²²; (4) National Pollutant Discharge Elimination System (NPDES) permits²³; and (5) dredge and fill permits.²⁴

The “Treatment as State” or “TAS” provision was a “prequalification” requirement that, once satisfied, allowed the qualifying tribe to become



While this eliminated a separate step in the process, the requirements of the TAS prequalification procedure must still be met. A tribe hoping to gain approval to administer WQS must satisfy the following statutory conditions:

eligible to apply for these grants and program approvals.²⁵ Decisions as to whether a tribe was qualified for TAS status were made on a case-by-case basis and the application process was onerous.²⁶ In 1994, recognizing the TAS prequalification process as “burdensome, time-consuming and offensive to tribes” the EPA combined TAS review into program approval applications.²⁷

1. The tribe must be federally recognized and must be “exercising governmental authority over a Federal Indian reservation.”²⁸
2. The tribe must have a governing body carrying out substantial governmental duties and powers.²⁹
3. The functions exercised by the Indian tribe must pertain to the management and protection of water resources which are held by an Indian tribe, held by the United States in trust for Indians, held by a member of an Indian tribe if such property interest is subject to a trust restriction on alienation, or otherwise within the borders of an Indian reservation;³⁰ and
4. The Indian tribe must be “reasonably” capable, in the Administrator’s judgment, of carrying out the functions.³¹

As a consequence, WQS approval applications must include statements that the tribe is federally recognized³² and describing the form and functions of the tribal government, including the tribal government’s source of authority for carrying out these functions.³³ The tribe must also submit a statement describing its authority to regulate water quality, including a map or legal description of the area over which it asserts such authority, a statement from the tribe’s legal counsel (or equivalent official) which describes the basis for the assertion of authority, and an identification of the surface waters for which the tribe proposes to establish WQS.³⁴

The application also requires that a narrative statement detailing the capability of the tribe to administer an effective WQS program be submitted.³⁵ This statement must include a

description of the tribe's previous management experience; a list of existing environmental or public health programs administered by the tribe and copies of related tribal laws, policies, and regulations, a description of the entity (or entities) which exercise the executive, legislative, and judicial functions of the tribal government; and a description of the technical and administrative capabilities of the staff to administer and manage an effective WQS program, or a plan which proposes how the tribe will acquire additional administrative and technical expertise.³⁶ The plan must also address how the tribe will "obtain the funds to acquire the administrative and technical expertise."³⁷

Within thirty days of receipt, the "substance and basis of the Tribe's assertion of authority to regulate the quality of reservation waters" is made available for notice and comment to "all appropriate governmental entities."³⁸ If a conflicting or competing claim of jurisdiction is received, the Regional Administrator has the final decision as to whether or not the tribe has "adequately demonstrated that it meets the requirements of [the applications.]"³⁹ If the tribe meets these requirements, it may administer the WQS program, however, the Agency "retain[s] authority to limit its approval of a tribal application to those land areas where the tribe has demonstrated jurisdiction."⁴⁰

c. The Oklahoma Rider

*"[The] revival of water pollution law in Indian country is not universally admired. In fact, it is frequently resented. Each and every tribal delegation runs into stiff opposition -- invariably from an offended state, often from polluters who have prospered in the shadows of the status quo."*¹¹⁷

Giving tribes no other choice is exactly what happened when the Pawnee Nation of Oklahoma gained TAS status and WQS program approval in 2004.¹¹⁸ Not surprisingly, a lawsuit was filed by the state challenging the EPA's decision and Oklahoma Senator James Inhofe, chairman of the Senate Environmental and Public Works Committee, requested an investigation into the handling of TAS applications in the state.¹¹⁹

What came as a surprise, not only to the tribe but also the EPA and the governor of Oklahoma, was a midnight rider attached to a transportation bill after the House and Senate had agreed on the bill's final version Congress passed the Safe, Accountable, Flexible, Efficient Transportation Equity Act of 2005.¹²¹

Tucked away in subtitle B "Miscellaneous Provisions" is a short paragraph essentially stating that

... if Oklahoma gains approval to run state environmental programs, the EPA, on request of the state, must approve administration of the state program in Indian country located within the state "without any further demonstration of [state] authority."¹²² The act also provides that the EPA may treat an Oklahoma tribe as a state only if, in addition to satisfying federal TAS requirements, the tribe and the state enter into a cooperative agreement. Oklahoma must agree to "treatment of [the tribe] as a State and to jointly plan administer program requirements."¹²³ ...

Effectively ending the legal battle over the Pawnee Nation's TAS status, non-Indian sentiment for the amendment was generally favorable.¹²⁴ The rider was viewed by the tribes as "the most scary, direct, take-the-gloves-off-and-go-for-the-jugular attack on tribal sovereignty"

5. Conclusion

*"Respect is not demonstrated by high-sounding proclamations that risk nothing. The true test comes when one's self interests are at stake."*¹⁸²



Flag of the Pawnee Nation

TAS and Oklahoma Tribes

Source: thomas.loc.gov and Ryan Jackson, Office of Senator James Inhofe (OK)

The following is the original federal provision (2005) as amended by routine technical corrections legislation (2008):

Public Law 109-59 -- SEC. 10211. ENVIRONMENTAL PROGRAMS.

(a) Oklahoma.--Notwithstanding any other provision of law, if the Administrator of the Environmental Protection Agency (referred to in this section as the "Administrator") determines that a regulatory program submitted by the State of Oklahoma for approval by the Administrator under a law administered by the Administrator meets applicable requirements of the law, and the Administrator approves the State to administer the State program under the law with respect to areas in the State that are not Indian country, on request of the State, the Administrator shall approve the State to administer the State program in the areas of the State that are in Indian country, without any further demonstration of authority by the State.

(b) Treatment as State.--Notwithstanding any other provision of law, the Administrator may treat an Indian tribe in the State of Oklahoma as a State under a law administered by the Administrator only if--

(1) the Indian tribe meets requirements under the law to be treated as a State; and (2) the Indian tribe and the agency of the State of Oklahoma with federally delegated program authority enter into a cooperative agreement, subject to review and approval of the Administrator after notice and opportunity for public hearing, under which the Indian tribe and that State agency agree to treatment of the Indian tribe as a State and to jointly plan administer program requirements.

Public Law 110-244 -- SEC. 101(s)(3). SURFACE TRANSPORTATION TECHNICAL CORRECTIONS.

(s) Correction of Miscellaneous Typographical Errors.--

(3) Section 10211(b)(2) of such Act (119 Stat. 1937) is amended by striking "plan administer" and inserting "plan and administer".

TAS status and establishment of tribal WQS offers significant advantages to Native nations, but they are not without risks and may not be the best solution for tribes seeking to assert sovereignty over natural resources and clean water. The CWA initially omitted tribes, but with the advent of the "self-determination" policy, the EPA was authorized to treat tribes in the same manner as a state for purposes of certain environmental regulation. However, tribes wishing to exercise their sovereign right to regulate clean water must have a functioning tribal government with authority and capacity to create effective WQS.¹⁸³

Once approval is gained, the TAS status brings with it many rewards including the ability to reduce "checkerboard" environmental jurisdiction within reservations, strengthen government-to-government relationships, influence federal environmental regulatory policy and processes, and designate cultural, medicinal, and ceremonial uses for water.¹⁸⁴

These benefits must be balanced against the risks of promulgating WQS because tribal governments applying for TAS status may be exposed to challenges that risk their sovereign ability to protect

their lands and natural resources. Tribes opting to enact their own WQS are often confronted with vague EPA support, non-Indian jurisdictional challenges, and the ongoing threat of changing federal law and policy. Tribes who wish to successfully regulate clean water must critically evaluate their ability to do so. Tribal infrastructure must include stable institutions and policies, a fair and effective dispute resolution system, separation of politics from business management, a competent bureaucracy, cultural match or legitimacy, and strategic orientation.

Tribal sovereignty is not just making the federal government live up to its trust and treaty obligations. It is recognizing that regardless of stated policies of self-determination and government-to-government relations, self-determination operationally falls to the tribes who must assert sovereignty by performing the functions of effective governments.¹⁸⁵ Despite a history of colonization and assimilation, tribes can and are developing, implementing, monitoring, and enforcing their own environmental standards and playing a critical role in the sustainability of these resources for the benefit of Indians and non-Indians alike.

Why The Amendment Was Necessary

Ryan Jackson, Legislative Director and Counsel, Office of Senator James Inhofe (Oklahoma)

Editor Note: Mr. Jackson was the majority counsel on the U.S. Senate Environment and Public Works Committee when this amendment was adopted.

Federal environmental statutes such as the Clean Water Act and the Clean Air Act among others were amended to authorize the EPA to treat tribes as states for purposes of various environmental programs. Only relatively recently have Indian nations in Oklahoma begun the process of applying for this status. Federal environmental statutes require Indian nations to make an application demonstrating requirements specified in those statutes.

Oklahoma Challenges

Oklahoma poses unique challenges to implementing treatment as a state because Indian land in Oklahoma is scattered throughout the state (often referred to as checkerboard jurisdiction), trust status of Indian land can change, and Oklahoma has no reservations. No other state has these unique challenges.

The Oklahoma Request

As Indian nations in Oklahoma began to become interested in treatment as a state to propose regulations and permit activities; Oklahoma state agencies, cities, and many other potentially affected entities became very concerned about a patchwork of competing regulations over a pre-existing and otherwise sufficient state standard. These complications were the focus of one of the Governor's Water Conferences and a number of other public forums in the state, so the characterization that the provision is a "rider" is not accurate.

It was the result of much input over a two to three year period and was developed principally to avoid the complexity of competing environmental standards, overlapping jurisdictions, and a resulting patchwork of varying standards throughout the state creating uncertainty.

The Amendment

In 2005, Senator Inhofe authored what was ultimately enacted as Public Law 109-59. This legislation authorized federal transportation and other national infrastructure in addition to the federal standards for construction of that infrastructure. In that law, section 10211, as amended by a technical corrections bill, addresses treatment as a state.

Section 10211, as amended, has two parts and only addresses regulatory programs. Subsection (a) allows the state of Oklahoma to request environmental regulatory jurisdiction over all lands within the boundaries of the state upon an application to the EPA.

Subsection (b) allows EPA to treat a tribe as a state under federal environmental regulations for the purposes of a regulatory program in conjunction with a cooperate agreement with the state agency of jurisdiction in addition to the other elements a tribe must meet under already existing federal law after a public hearing.

The cooperative agreement must describe how the tribe and the State agency of jurisdiction agree to jointly plan and administer environmental program requirements. Some Indian nations in Oklahoma currently have treatment as a state for the purposes of receiving certain federal grants from EPA. It is not the intent of section 10211, as amended, to exclude tribes in Oklahoma from the eligibility to receive funding for various environmental monitoring.

In fact, applications from Indian nations in Oklahoma for grant authority have drawn that distinction. Under federal law for a tribe to receive or be eligible to receive some grants, the tribe must have a treatment as a state designation. Additionally, section 10211, as amended, is meant to supplement other existing state law. The state legislature's authority to approve cooperative agreements and compacts is recognized.

Subject: Tribal Consultation
The White House, Office of the Press Secretary, November 5, 2009

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

SUBJECT: Tribal Consultation

The United States has a unique legal and political relationship with Indian tribal governments, established through and confirmed by the Constitution of the United States, treaties, statutes, executive orders, and judicial decisions. In recognition of that special relationship, pursuant to Executive Order 13175 of November 6, 2000, executive departments and agencies (agencies) are charged with engaging in regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, and are responsible for strengthening the government-to-government relationship between the United States and Indian tribes.

History has shown that failure to include the voices of tribal officials in formulating policy affecting their communities has all too often led to undesirable and, at times, devastating and tragic results. By contrast, meaningful dialogue between Federal officials and tribal officials has greatly improved Federal policy toward Indian tribes. Consultation is a critical ingredient of a sound and productive Federal-tribal relationship.

My Administration is committed to regular and meaningful consultation and collaboration with tribal officials in policy decisions that have tribal implications including, as an initial step, through complete and consistent implementation of Executive Order 13175. Accordingly, I hereby direct each agency head to submit to the Director of the Office of Management and Budget (OMB), within 90 days after the date of this memorandum, a detailed plan of actions the agency will take to implement the policies and directives of Executive Order 13175. This plan shall be developed after consultation by the agency with Indian tribes and tribal officials as defined in Executive Order 13175. I also direct each agency head to submit to the Director of the OMB, within 270 days after the date of this memorandum, and annually thereafter, a progress report on the status of each action included in its plan together with any proposed updates to its plan.

Each agency's plan and subsequent reports shall designate an appropriate official to coordinate implementation of the plan and preparation of progress reports required by this memorandum. The Assistant to the President for Domestic Policy and the Director of the OMB shall review agency plans and subsequent reports for consistency with the policies and directives of Executive Order 13175.

In addition, the Director of the OMB, in coordination with the Assistant to the President for Domestic Policy, shall submit to me, within 1 year from the date of this memorandum, a report on more (OVER) 2 the implementation of Executive Order 13175 across the executive branch based on the review of agency plans and progress reports. Recommendations for improving the plans and making the tribal consultation process more effective, if any, should be included in this report.

The terms "Indian tribe," "tribal officials," and "policies that have tribal implications" as used in this memorandum are as defined in Executive Order . The Director of the OMB is hereby authorized and directed to publish this memorandum in the Federal Register.

This memorandum is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person. Executive departments and agencies shall carry out the provisions of this memorandum to the extent permitted by law and consistent with their statutory and regulatory authorities and their enforcement mechanisms. BARACK OBAMA

Why We Did The Tribal Water Compact

Howard Barnett, Jr., Chief of Staff, Keating Administration and current President, OSU-Tulsa

I was chief of Staff for Governor Frank Keating and acted as his lead negotiator in developing the draft so-called Water Compact with the Choctaw and Chickasaw Nations concerning water in six river basins in 22 counties of Southeastern Oklahoma. We undertook the negotiations at the direction of several resolutions passed by and - judging from the reaction of the legislature after the draft Compact was agreed – promptly forgotten by the legislature in 1999 and 2000.

These resolutions set forth some guiding principles (the “Cornerstone Principles”) and directed the Governor to enter into compact negotiations to settle the question of who owned the water which other articles have discussed and to provide a framework for water transfers out of these basins. I mention these resolutions to remind all of the following: 1) the legislature was well aware and in favor of both entering into a compact and selling water from these basins, and 2) Governor Keating was following legislative intent in moving forward on both issues.

The above is not offered defensively but to set the stage for the following account of what went into these negotiations in 2000 and 2001 that caused such a stir. Governor Walters has set forth well the driving forces behind the desire to undertake these negotiations and those reasons remain valid today. The primary one is the very real risk that a court will require us to give the water to Texas without compensation. Not only does that mean we don’t get any money but more importantly it means we may not get the protections which were negotiated in our drafts of the Compact with the tribes and the water sale agreement with the North Texas Water Alliance, as described below.

The first thing we did was enter into a Memorandum of Understanding with the tribes

which outlined our intent. The primary purpose of this was to have agreement from the very beginning on the Cornerstone Principles so we

would be negotiating within the legislative intent of the above mentioned resolutions. The thrust of the Cornerstone Principles was as follows:

“The primary one is the very real risk that a court will require us to give the water to Texas without compensation.”

1. *Local use of water was the first priority.*
2. *Use of water by all Oklahomans was to be the next priority and protected.*
3. *Appropriate lake level management plans were to be developed (these would ensure that we had trigger points below which lakes would not fall to allow us to deal with drought situations).*
4. *The State’s obligation to pay our debt to the federal government for the construction of Sardis Lake was to be recognized first from any sale of water.*
5. *Wildlife management plans were to be developed and incorporated into any agreements.*

The MOU also contemplated a framework under which bids could be solicited for sales of water. The idea was to simultaneously negotiate the compact with the tribes and a potential sale of water. While the tribes and the State had an interest in resolving the tribes’ claims of ownership to the waters in their original tribal lands, bluntly, if there was not going to be a sale of water and, thus, some funds to allot, there really was no incentive to getting anything done.

We encountered two sticking points early on in the negotiations which Governor Keating was insistent on and which ultimately made it into the draft Compact: water must be made available to



Oklahomans without cost and both the water sale agreement and the Compact would be submitted together to the legislature for approval. We have always had intra-state water transfers (both Tulsa and Oklahoma City get their water from outside their boundaries) without cost and the Governor wanted that confirmed for all time.

Getting the agreement for Oklahomans to use the water free was a big deal because the tribes took the position – reasonably, I might add – that either they had an ownership interest or not and if they did, then fairness would say they get paid appropriately for any water used by anyone. So their being willing to give up on that was a huge concession. The agreement to have the legislature approve was important to us for political reasons but it was not legally necessary (it is now), so that was a tough one as well.

In the negotiations with Texas, we faced – and any sale will face – the challenge of building in enough protections for the transferring state (Oklahoma) - such as the ability to limit the water taken in drought conditions or competing needs of Oklahomans - versus the need of the receiving state (Texas) to know that the flow of water was sufficiently stable to warrant the price to be paid and, more importantly, the expenditure of the dollars to build the necessary infrastructure.

This latter was exacerbated in Texas's case by their relatively short time frame to make a decision on where to get water, thus make it imperative for them to make the right first choice.

We have to understand that these competing forces pit rights against money: the stronger the right of Oklahoma to limit the water taken to preserve our interests the less the water is worth to Texas. Ultimately, we never got to a final proposal to send to the legislature because of these tensions. By building in the protections we wanted the price simply got too low to make it worth the effort it would have taken (politically) to try to push it through, if we could have at all.

One final point on the tribes: we had a good legal opinion that the State would prevail over the tribes' claims to the water. However, the opinion noted both the fact that the tribes' claims were at least good enough to get them into court and that the history of such litigation was long and drawn out, even if you win. Based on this, we chose to negotiate.

We ended up agreeing to split the proceeds of any sale 50-50. Some said that was too much given the weakness of their claims. But if you posit 20 years of litigation (note that the Cherokee litigation concerning the Arkansas River went on longer), it is easy to see that the present value of money today is worth giving up a bigger share than might otherwise be warranted.

Any action on Southeast Oklahoma water must take the tribes into account. They can be part of the solution but they must be treated with respect and given an appropriate seat at the table. Any other approach will, in my opinion, be doomed to failure.

Your Good Ideas: Who Pays For Them?

Shanon Phillips, Director, Water Quality Division, OK Conservation Commission

Oklahoma citizens are passionate about protecting their water, based on the overwhelming participation in the State's Water Plan process. The process has effectively demonstrated the wide range of people both interested and invested in water-related programs in Oklahoma. The process has also proven that Oklahomans are fervent about protecting not only the amount of water they need to sustain their lives and interests, but also the quality of that water.

State of Oklahoma Funding

However, we also know that as we work on the water plan, the State currently devotes less than 1% of its state funding towards programs that focus on water protection. And during economic hard times such as the ones we're currently experiencing, natural resource programs including the water programs are called on to make larger programmatic cuts than public safety, health and human services, education, and similar programs. In essence, it appears that the State isn't putting its money where its mouth is.

Why do we pay at least eight to ten dollars a gallon for bottled water at a convenience store in 20 oz. increments, but charge one third to half that rate per 1000 gallons for water from a tap? We pay a service charge for water delivery, but the water is basically free. We value the service but not the resource itself. We know that plentiful, clean, and yes, cheap water ensures the growth of our economy, but we may have gone beyond the point where the process is sustainable.

Our State has invested heavily in water resources. Reservoirs and flood control structures are just one example where the foresight of Oklahoma's leaders allowed us to develop numerous, reliable sources of

water statewide for many uses, but also protected our infrastructure and economy from flooding that frequently devastated parts of the State. In fact, flood control infrastructure allowed for even greater economic development opportunities than had previously existed because we weren't replacing roads, bridges, buildings, etc. every year. We estimate that upstream flood control structures developed by the USDA and maintained by Conservation Districts provide at least \$75 million in annual savings due to flood prevention. When flood control capacities of the larger reservoirs are added, the economic value from flood control alone completely dwarfs both the annual state investment in water programs and the amount we expect citizens to pay for the resource through their water bills.

Our State's water program needs pertain to both water quantity and water quality. As our state grows, these investments in water infrastructure continue to age and many have reached the end of their designed life span. Like our roads, schools, and other infrastructure, these investments require upkeep which is largely unfunded. Cities and communities struggle to absorb the costs required for updated water and wastewater treatment and other components of water delivery. Rate hikes to absorb these costs are heavily contested and are not always possible. Communities and citizens statewide struggle during periods of drought and many are experiencing lower water levels or poorer water quality in their wells in addition to their surface water sources.

On the water quality side, programs have significantly improved, yet we still monitor under 55% of our stream miles and although we monitor about 95% of our major lakes, the majority of waters monitored are not fully evaluated to determine



whether they are impaired. Oklahoma estimated in the latest Clean Water Needs Survey (due from EPA in early 2010) that the state needed more than \$4.1 billion over the next 20 years just for drinking water programs. That figure doesn't include monies needed to meet clean water requirements or regulations on disinfection byproducts, groundwater, and other issues.

The State has 715 waterbodies (9484 miles of stream and 579,543 acres of lake) listed on its 2010 303(d) list as being impaired. All these waterbodies require additional money to develop a clean-up plan, let alone to implement the actual clean-up.

The problem, obviously, is that water is undervalued and therefore under funded. A "Google" search to find estimates of water value provides a number of links, none of which have the dollar per gallon figure we'd like to cite. Of course, Oklahoma is not alone in undervaluing water resources. It's likely that the State has even benefited from doing so. But as we evaluate our plan for future protection of water resources, we need to question if we can afford to do so in the future.

Justification for recent proposed federal legislation is that Oklahoman's can't afford to pay \$83 dollars a month for a water bill and therefore, government should pay for more of the costs. Huge demands for health care, defense, national debt, etc. raise the question about whether this is likely. But the real question is - why can't we afford to pay \$83 a month for water?

We accept that for services like electricity, natural gas, fuel for our vehicles, etc, we'll pay at least double the amount we pay monthly to have clean, reliable sources of water. The average monthly water bill in the U.S. is \$51.00 per month, whereas the average electric bill was \$100 per month. The average cost for cable TV is greater than \$50 per month. The average cost of gas for a car is more than \$100 per month, etc. Why are these services more valuable to us than water?

Federal Dollars

Like other States, Oklahoma benefits from federal dollars that are available to States for water programs. These dollars come from a variety of different federal agencies including the EPA, U.S. Dept. of Agriculture, U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Army Corp of Engineers, and many other agencies.

However, we likely cannot expect a similar level of federal investment in rehabilitating and retrofitting our water infrastructure as we saw in building our water infrastructure. We also know federal funds are not sufficient to address our water quality needs. More of the cost of maintaining our water resources will likely need to come from Oklahomans.

While we've seen increases in federal programs to provide low interest loans for water projects, and some "stimulus money" to repair some of our upstream flood control structures, the loans must be repaid and demand far outweighs the amount of money available. Programs that fund water quality monitoring, control of nonpoint source pollution, and many other water programs have always been under funded as well and the economic forecast does not suggest a change any time soon.

So where could the money come from? Obviously, we need to insure that our legislators understand that increases for water program funding are of paramount importance. During this very session, we've had bills moving through our legislature that significantly jeopardize our ability to qualify for federal water program money (not to mention actually implement programs that protect water) at the same time we're seeing approximately a 17% cut in programs over a two year period.

Whether we expect the statewide citizens or the local governments to pay, the cost obviously must be significantly borne in fee increases and/or taxes. Current water program agencies operate on as little as 5% administration and the almost constant fight for program funding has ensured that operationally, very little overlap amongst agency water programs exists.



Topic 5

*Interagency
Water Management*

Interagency Resource Management

Planning Workgroup Facilitators: Gary Strickland and MaryJac Rauh

GROUP

Facilitators: Gary Strickland and MaryJac Rauh.
Experts: Amanda Storck, Office of Oklahoma Secretary of the Environment; Bill Davis, Camp, Dresser and McKee; Derek Smithee, Oklahoma Water Resources Board; Dr. Mike Smolen, Oklahoma State University Cooperative Extension Services. Participants: George Matthews; Kassandra Bentley; Joe Ihle; Mark Stout; Ed Crone; Don Goforth; Larry Cofer; Michael Vanderburg; George Lodes; Bob Donaho; Monty Matlock; Daryl Covey; John Schutte; Eric Held; Paul Freundt; Bill Brunk; Kim Baker; Laurie Anne Williams; Richard DeShazo; Richard Alig; and Marty Smith.

QUESTION

How should various State agencies having jurisdiction over water resources in Oklahoma work together more efficiently and effectively? Should these agencies, or parts of them, be consolidated into one or more agencies?

1. *Agency consolidation*
2. *Agency reorganization*
3. *Redefinition of agency jurisdictions, authorities, responsibilities*
4. *Changes in the services offered by agencies*
5. *Procedures for agency coordination and oversight*
6. *Streamlined permitting*
7. *Consistent enforcement and incentives for compliance*

Oklahoma has several agencies that have a role in water resource management. These agencies are not located in close proximity to each other and information comes in different formats making it difficult for the public to interact with them. In addition, water resource management is fragmented and inconsistent because of insufficient interagency coordination, jurisdictional conflicts, and regulatory gaps.

Options to remedy these problems include developing an agency coordination committee, consolidating all water regulation into one agency, or combining these two approaches.

Interagency Coordination

Establishment of Coordination Committee

A coordination committee should be established that includes representatives from all agencies having jurisdiction over water. Agency representatives should be the department or division heads from the sections of the agencies that have authority over water. Relevant federal agency personnel should also be included on the committee. The committee should work with regional stakeholder-based water resource management groups to help meet its goals. To help the agencies facilitate cooperation and to allow for ease of public access, agencies should be relocated in close proximity to each other.

Cabinet-level Advisor

The State should appoint a cabinet-level advisor to work with the agencies to develop and implement a memorandum of understanding that coordinates all water quantity and quality issues and the comprehensive water plan. Legislation should be developed to provide the necessary authority so that the committee can achieve its goals and be held accountable.

Meetings and Report

The committee should meet regularly and report annually to the Governor and Legislature on the progress in implementation of the comprehensive water plan, success of the coordination efforts between agencies and other accomplishments. The report also should suggest ideas for improving water resource management and making legislative changes. All meetings should be held under the Open Meetings Act, and all reports should meet the guidelines of the Open Records Act.

Working With Other Agencies

Shanon Phillips, Director, Water Quality Division, OK Conservation Commission

The summary report from the Interagency Water Resource Management Group expressed the following statements and recommendations to improve water management. The group felt Oklahoma's framework of multiple agencies with water authority made public participation difficult and caused fragmented, inconsistent management due to lack of agency coordination.

The group recommended developing a coordination committee with representation from all state and federal water agencies. The group recommended appointment of a cabinet-level advisor to facilitate agency coordination. The group also recommended that agencies be located in close proximity to one another.

Finally, the group recommended agency consolidation to facilitate citizen participation on water-related issues and to make water regulation more effective and efficient. The agency mission would be to implement the comprehensive water plan with funding from appropriate parts of the current state water regulation and enforcement budgets. I find these recommendations troubling.

My Concerns

First, as a participant in the water planning process, I was encouraged to see so many citizens actively devoting time to the water resources of the State. However, I was also discouraged by the lack of understanding of the complexity of the State's water programs. I heard from many citizens who were rightly concerned about issues that affect their livelihoods but had little understanding of programs or issues beyond those. I heard citizens representing many different aspects of water programs recommending consolidated control of water programs into their group as a way to achieve more efficiency, but wondered how they would feel when consolidation likely resulted in a different agency or group having control. Second, as a person who has been working in the State's

water programs for more than 15 years, I am proud of the progress I've seen the State make in building its water programs. However, I realize that evidently, many in the public are either unaware of this progress, or not as impressed as I am. Finally, I heard more complaining about program shortcomings than I heard discussion of progress or effectiveness. I believe we all recognize the need for additional resources for water programs, but I also feel we'll be more successful if we champion the successes and then work for additional resources to address the perceived shortcomings.

Your Challenge

The challenge in evaluating these recommendations is that much of the framework already exists. The State has cabinet level advisors with the authority and directive to facilitate interagency coordination on water related issues, primarily the Secretaries of Environment and Agriculture. Agencies cooperate in numerous working groups that regularly meet or communicate to coordinate functions. The primary agencies with water authorities are located within less than 3.5 miles and ten minutes of one another. And finally, all agencies have regular, facilitated meetings that allow for input from the public.

In addition, the governing boards of these agencies are formulated to be representative of the different stakeholder groups they represent.

Finally, every State agency works closely with existing local units of government such as Conservation Districts, towns, water authorities, etc to address issues. However, all these existing units of government are under resourced as well. The question is whether the creation of yet another level of authority, government, or administration or even consolidation will really improve their efficiency. I have to believe resources will almost always be limited. Therefore, rather than creating new levels of government, we should determine how to better utilize the existing framework.

Oklahoma Agencies

Oklahoma has at least ten state agencies with significant water responsibilities plus at least five additional agencies with more limited roles. At least ten federal agencies working in the state have significant water-related authorities. This diversity has significant benefits that work to address the issues raised by the group. A primary benefit is specialization of resources and knowledge. The specialization means that a wider variety of stakeholders have an opportunity to be heard and to have programs addressing their needs. Each of these agencies has a governing board of appointed and/or elected positions designated to represent specific stakeholder groups. Each of these agencies is housed under a cabinet level secretary who has the responsibility to coordinate activities of these agencies.

Oklahoma Performance

While it is true that this framework differs from some other states, it cannot be denied that many of Oklahoma's programs out-perform their counterparts in other states. The State's Revolving Loan Programs have been recognized nationally for their innovation and stability in financing. The State was one of the few states not forced by lawsuits to develop Total Maximum Daily Loads at an unsustainable rate with inadequate data. The State's Nonpoint Source Program is a national leader in documenting successful water restoration efforts. The state has a significantly more robust water monitoring program than many of its neighbors. These and other state water programs are good programs doing good work. In addition, water programs comprise less than one percent of the State's budget, so the programs function very well in most of what they do with very little of the state's budgetary resources.

Perception and Reality

The perception may be that consolidation of authorities could improve efficiency and save money. In reality, these agencies have already absorbed at least a 20-35% cut in 2002-2003 that has been largely un-restored and are currently absorbing at least an additional 17% cut. Agencies have already been forced to streamline and

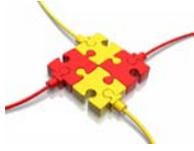
historical agency consolidations in the state have not demonstrated significant cost reductions. In addition, the physical processes of consolidation are time and resource intensive such that the cost of consolidation into one agency is likely prohibitive. For instance, new buildings would be required. Should the state devote resources towards new buildings or toward the actual functions of the agencies? Without evaluating the true reasons behind the perceived inefficiencies, or how consolidation could actually achieve efficiencies, it should not be recommended as a solution.

However, the existence of the framework to implement these recommendations does not excuse the fact that this group may be largely unaware of or content with agencies existing roles, cooperation, and effectiveness. Without having been part of the discussion, it isn't possible to determine whether the group was simply unaware of the existing coordination efforts made by State agencies, whether they felt these efforts were largely ineffective, or a combination of both. In addition, it is not possible to determine from this summary what types of issues they believed deserved more efficient cooperation, or whether any current programs were recognized for effectiveness or even deemed adequate.

My Suggestions

Based on my experience with Oklahoma's water programs and on the recommendations of the working group, I see three main areas that need improved efficiency. First, the roles of Oklahoma's various water agencies are obviously not well-understood by the public. Therefore their actions and successes are not well known. Agencies continually struggle with this issue, and some are more effective than others, but a coordinated campaign to clarify these roles is necessary. The cabinet level secretaries who facilitate coordination between agency programs are a logical place to house this campaign; however they currently lack sufficient resources.

Second, the processes for resolving conflicts and tackling issues need improvement. We must better identify why citizens believe agencies aren't



coordinating. Sometimes, when a citizen has a problem, they are unsure where to go and can frequently be shuffled between agencies, not necessarily because of lack of coordination, but

because in many cases, agencies lack authority and resources to handle their problem. This isn't necessarily something that would be solved by consolidation of authority, but in many cases, requires expansion of statutory authority combined with resources to implement those statutes.

We must do a better job explaining to citizens why their issue can't be tackled at this time. Too often agency response is perceived as the equivalent of "I can't help you" where instead we need a process to identify the solution and communicate it back to the citizen. Also, each agency has rules outlining the processes for public participation, but rule language is cumbersome at best for the average citizen. Public participation processes need to be better explained.

However, in both of these areas, the efforts for better communication must go both ways from and to the public. Public meetings are a mandatory portion of most agency programs. These meetings are advertised and held locally, but generally very poorly attended. Agencies pass rules often without any public comment. Agencies may need to find a better way of promoting public input, but if the public is interested in participation, they must make an effort as well.

Perhaps a campaign to showcase the available channels for public participation is called for so that citizens are aware of the avenues available to them to provide guidance and feedback to agencies related to issues as well as a better evaluation of where the system is not functioning effectively. Obviously, the Water Planning effort was very effective at achieving public participation.

Agencies should evaluate whether the processes involved in achieving the water plan level of public participation could be feasible for their public participation programs.

And the final area where agencies need improvement is funding. We know from performance compared to other states that Oklahoma makes good use of the resources it has. In many areas where performance could improve, I believe funding is a major contributor to comparatively low performance. For instance, many environmental agencies currently have authorities they can only partially enforce due to unfunded mandates. Agencies simply lack the resources to fully implement all of their authorities.

Many agencies rely significantly on federal funds to implement programs and therefore, must follow the will of the federal program. For instance, if the federal program focuses on work in polluted or impaired waters, then the State program using that money can't necessarily work to protect our outstanding resource waters.

My Summary

In summary, agencies need better communication with the public on issues related to agency function and cooperation. Agencies need to better understand citizen concerns and to effectively convey a solution strategy to the citizen. Many times, this inability has to do with statutory authorities, but most often, it relates to limited resources. And finally, improved performance in many areas will almost certainly require additional resources. If water is a priority for the State, then the State must find a way to prioritize additional funding for water programs.

The Water Plan is the perfect opportunity to showcase these needs. Use the plan to specify the issues where citizens perceive lack of coordination or inefficiencies are preventing effective programs. Use the plan to recommend ways for agencies to increase and improve their communication with citizens.

And finally, use the plan to recommend ways to increase resources for water programs. Rather than a divisive planning process, we would do better to showcase the strengths and progress of our existing water programs, and then propose a cooperative plan to address our weaknesses.

Consolidation or Coordination of Water Agencies

M. D. Smolen, PhD, Oklahoma State University, Stillwater

Released July 7, 2008 - STILLWATER, Okla. – When it comes to enhancing water quality, the nation’s eyes were on Oklahoma recently as Oklahoma State University’s Mike Smolen was honored by the American Society of Agricultural and Biological Engineers. A faculty member in the OSU Division of Agricultural Sciences and Natural Resources since 1990, Smolen serves as water quality coordinator for the Oklahoma Cooperative Extension Service, one of the division’s two statewide agencies. “Mike has an exemplary record of annual professional achievement, providing very real benefits year in and year out to Oklahoma, the region and the nation,” said Ron Elliott, head of DASNR’s department of biosystems and agricultural engineering.

Our current situation is characterized by fragmentation of authorities, lack of coordination among agencies, and regulatory gaps.

- *The Water Resources Board (OWRB) has authority to set water quality standards and issue water use permits.*
- *The Department of Environmental Quality has authority to regulate (permit) the discharge of pollutants from all sources except those under the control of other agencies (primarily mining, oil & gas, and agriculture).*

Oklahoma statute specifically charges each agency to “implement” the water quality standards. Further, Oklahoma statute creates a Water Quality Advisory Committee with representatives of each agency and the Secretary of Environment, chaired by the OWRB, to oversee this implementation. Although this Advisory Committee reports to the Speaker of the House and Senate Pro Tempore, implementation occurs at a snail’s pace, and coordination is minimal.

Why is coordination so weak, even though the framework for coordination exists?

The answer lies in the distinctly different missions of the agencies involved and their distinctly different constituencies. For example, Oklahoma

Department of Agriculture Food and Forestry (ODAFF) is charged with both promoting and regulating agricultural industries.

Likewise, the Department of Mines promotes and regulates mining, and the Corporation Commission promotes and regulates oil & gas. Each agency implements water quality rules to the extent required, but they must answer first to their governing boards and commissions. There is no line of authority that assures a common objective.

In the early 1990’s there was an attempt to consolidate all the environmental agencies under a single agency, the Department of Environmental Quality (DEQ). This effort was fought tooth and nail by the commodity and industry groups. The result was reorganization of water functions in the DEQ and the OWRB, such that discharge permitting was located exclusively in the DEQ and water quality standards located exclusively in OWRB. Other agencies retained their authorities even autonomy with respect to implementation of water rules.

Some of the arguments against consolidation were substantial. Most relevant was the observation that the new agency, DEQ, had no experience with the separate regulated industries, consequently they would be viewed with hostility by the industries and commodity groups they regulate. It was felt that this adversarial relationship would impose a hardship on the industries and not achieve the environmental objectives.

An approach not considered was to put the authority in the DEQ but have it operate through a contractual arrangement with the other agencies. This would keep the ODAFF, Corporation Commission, and Dept. of Mines in contact with their industries, while establishing a line of authority (and budget) from the DEQ.



Topic 6

*Surface and
Groundwater Relationship*

Surface and Groundwater Relationship

Planning Workgroup Facilitators: Claude Bess, Leland McDaniel and Recia Garcia

GROUP

Facilitators: Claude Bess, Leland McDaniel and Recia Garcia. Experts: Dr. Garey Fox, Oklahoma State University; Bob Blazs and Mark Becker, U.S. Geological Survey; Noel Osborn and Jerry Barnett, Oklahoma Water Resources Board; Hal Simpson, Camp, Dresser and McKee. Participants: Bill Cunningham; Sherry Barby; Zack Williams; Fred “Buster” Brown, Jr.; Stanley Barby; Jimmy Kinder; Daniel Fenner; Brooks Tramell; Tommy Coomes; Eldon Goeringer; Jill Herrlein; Terry L. Wyatt; Carolyn Sparks; Shannon Shirley; Bryan Kroeker; Guy Sewell; Ron Melton; Darrell Herber; Roland Pederson; Greg Turpin; Robert Bierschenk.

QUESTION

Should the management of surface and ground water resources be better coordinated? If so, how?

1. *Programs to better monitor the impacts of withdrawals on surface and ground waters*
2. *Determination of minimum in-stream flows for environmental purposes*
3. *Usefulness of a distinction between a right-of-use and a right-of-ownership*
4. *Methods for compensation for water rights restriction or infringement*
5. *Coordination of surface and groundwater permitting*

Studies and Changes to Laws

Hydrologic Studies

The State should fund and conduct hydrologic studies on ground and surface waters that examine past, current and future uses and the impacts on water quality and quantity. Studies should also

be done on the interaction of ground and stream waters. Statewide basin and sub-basin studies should be conducted. It is important that long-term monitoring of water supply and demand be done, as well as long-term hydrologic monitoring of natural water systems. Making informed decisions requires accurate data; models to predict the impacts of water use on ground and surface water interactions should be developed. These studies should be funded by the State using all options.

Funding of these studies should come from annual groundwater permit maintenance fees, similar to surface water permit fees, collected by the State. The money should also be used for enforcement, management and oversight.

Water Law Revision

Once the studies are completed, Oklahoma’s water law should be reformed or redefined based on the results. The law should be changed to recognize the relationship between surface and groundwater where it has been determined to exist.

The law should encourage conservation of water resources and be based on sustainable beneficial use. Sustainable and sustainability mean ensuring a safe and sufficient supply of ground and surface water reserves resulting from all present and future ground and surface water beneficial uses through State and local management, and enforcement.



Groundwater should remain a:

Option A: protected private property right based on an equal proportionate share associated with the amount of property owned over an aquifer ... or

Option B: protected *and preserved* private property right based on an equal proportionate share associated with the amount of property owned over an aquifer. The share cannot be determined until a hydrologic study is completed by the OWRB.

Law Revision Concerning Mining Pit Water

The regulation of mining “pit water” (water that comes to the surface when an aquifer is encountered during mining operations) should be placed under the jurisdiction of the OWRB.

Education and Monitoring Water Use

Accurate water use reporting provides important data; however, not all water use is accurately reported. An education program should be established to teach permitted water users how to report their water uses more accurately. The State should review and consider future enforcement options related to data gathering.

Another education program should focus on the uses of water. This should address urban/rural issues and educate the public about the economic importance of water other than for drinking and recreation. The Oklahoma Cooperative Extension Service, government agencies, and other organizations could provide these programs. An 800-number should be established that would provide citizens a way to report misuses of water.

Topic 6: Editor’s Notes

This workgroup also developed an approach suggesting the establishment of an interstate compact commission regarding ground and surface water interaction. That approach has been moved to Discussion Topic 4 - Intergovernmental Water Resource Management.

The group also discussed development of water management districts. The results of this discussion are included in the editor’s note in Discussion Topic 10 – Stakeholder Involvement.

Topic 6: Recorder’s Notes

Groundwater is considered a private property right by the State and some participants do not want any change to the current law. Others want to protect private property rights but allow change to water law to recognize the connection between surface water and groundwater. Some concern exists that the State will change the ownership of groundwater from the landowner to the public, like surface water.

If this happens, then the landowners should be justly compensated. Concern has also been expressed that the State will regulate groundwater rights to the point that it removes the viable economic use of the water from the land. If this happens, the landowners should be compensated for the loss of economic value of their property. No agreement was reached on how to balance the right to use water and preserve resources. Some said the OWRB has over allocated groundwater by permitting at two acre-feet and using a 20-year aquifer life. Some participants suggested that the 20-year aquifer life should be redefined as sustainable use. Concern was expressed regarding the use of the word “sustainable” in the approach. A definition was added to the approach, but some in the room were concerned that using water in a sustainable manner will affect property rights.

The reasoning behind the establishment of an 800 number is to report abuses of water use. One example given was suburban private clubs that pump groundwater into lakes to the point that water flows over the spillway. Some thought this was “depletion by waste.”

Concerning how this approach should be funded, the workgroup discussed imposing a groundwater production tax that would exclude agriculture and domestic use. However, some thought users would not report their actual use because they would have to pay taxes on it. The workgroup determined that charging an annual fee on groundwater permits, similar to the fee on surface water permits, could be done.

Surface & Groundwater Withdrawal for Anthropogenic Use

James Vincent and Paul Balkenbush, OK Department of Wildlife Conservation, Durant

Mr. Vincent and Mr. Balkenbush are experienced staff members of the Streams Management Program, of the Oklahoma Department of Wildlife Conservation in southeastern Oklahoma (Durant).

Anthropogenic means “of, relating to, or resulting from the influence of human beings on nature”.

The Oklahoma Department of Wildlife Conservation is the agency responsible for the management, conservation and protection of fish and wildlife in Oklahoma. Surface and groundwater are both of chief importance to the sustainability of these wild resources that we are charged to protect. The aquatic communities that inhabit Oklahoma’s streams have adapted over thousands of years to reliable base flows and present flow regimes. These systems and their tributaries all support important stream sport fisheries that would likely be affected by reductions in stream flows.

For example, flows in the natural streams that meander across the landscape above the Arbuckle-Simpson aquifer are sustained by groundwater inputs. Our agency manages 6.25-miles of this stream within the Blue River Public Fishing and Hunting Area (BRPFHA). This reach of stream is well known for its popular stream sport fishery which helps attract over 90,000 people per year to the BRPFHA. The economic influence this area has to the local economy is significant as the lifeblood of the prized destination is the Arbuckle Simpson Aquifer. Significant reduction in groundwater inputs may negatively influence the ecological integrity, social value and economic vitality of the region.

We must also be careful not to minimize the complexity of instream flow issues. The health of stream ecosystems rests on their ability to transport sediment and debris downstream; both important in the life cycles of aquatic organisms. During

this process streams are continuously meandering within their valley. This involves an exchange of sediment within the channel which ensures that, while the stream may migrate across the valley, the basic shape of the channel remains the same. Maintenance of natural flow regimes yields an efficient, healthy and functional stream system that is said to be geomorphically stable.

Reduction in groundwater recharge and stream flows may begin a ripple effect that commences with ecological disturbance and exponentially worsens as streams become geomorphically unstable. Unstable streams share common characteristics including; 1) increased erosion and sedimentation; 2) loss of riparian habitat; 3) reduced habitat complexity; and 4) eventual lowering of the water table. Such instances are well documented in scientific literature. Unfortunately, water resource managers may overlook these consequences as they are only perceivable in the distant future.

How much is too much? This question, concerning withdrawal of ground and surface water for anthropogenic use, can be accurately answered only with intensive study. This begins with the collection of baseline ecological and geomorphic data and predictive modeling. In their current absence we should exercise caution in managing our water resource.



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Oklahoma Water Law: A Practitioner's Perspective

James R. Barnett, President and General Counsel, Environmental Federation of Oklahoma

I was the Executive Director of the Oklahoma Water Resources Board from 1977 to 1991, and served as the Board's assigned assistant attorney general for several years before that.

In those capacities, I formed certain opinions about the State's role in managing Oklahoma's water resources. However, over the nineteen (19) years since leaving state service that I have been in private practice assisting individuals and entities with water resource matters, my perspective has changed on a number of issues.

Oklahoma Laws

One opinion that has not changed is that Oklahoma's stream and groundwater laws serve our State's citizens very well. The relatively small number of Oklahoma water controversies which end up in the courts, at least as compared to other western states, illustrates this point. Admittedly, the fact that Mother Nature has blessed Eastern Oklahoma with lots of rain as well as our state's aggressive reservoir development have helped to limit litigation. Nonetheless, I think our system of water laws has also played a significant role.

Oklahoma's stream water law is essentially a straightforward prior appropriation system similar to those of most western states. The bulk of our stream water code was adopted in 1963 and has remained substantially unchanged since that time. That is not to say issues have not arisen. There are always water right holders who dislike the "use it or lose it" concept and wish to indefinitely retain water that they neither use nor have definite plans to use.

Thankfully, thus far efforts to change the law to allow "hoarding" of water have been unsuccessful. Our state truly would face water shortages, at least on paper, if communities were able to lock up water indefinitely without any obligation to place it to

beneficial use. Another perceived shortcoming in the law arises out of the OWRB's longstanding failure to administratively reduce and cancel unused water rights. The Board has recently begun to tackle this problem and has an attorney dedicated full time to the effort. That effort is paying dividends inasmuch as approximately 140,000 acre-feet of water has recently been freed up for new users in the Red and Arkansas River Basins. It is in the context of water planning that the importance of this program becomes especially apparent. Absent an up-to-date reduction and cancellation program, planners cannot know with any specificity how much water remains available in our streams and reservoirs, the basic first step of any comprehensive water plan.

Groundwater Management

Oklahoma's groundwater management scheme, as set forth in the 1972 Oklahoma Groundwater Act (effective July 1, 1973), has also proven very workable, a key reason being that the Act is the product of a collaborative effort of the major water user groups in the state, including agriculture, municipal and industry. The 1972 Act was deemed necessary because none of the regulatory systems previously used, including the 1949 groundwater law in place at the time, had met Oklahoma's needs.

Recognizing the earlier systems' shortcomings and finding no other state's statutory scheme suitable for Oklahoma, the Water Law Advisory Committee recommended a regulatory system that was truly sui generis (wholly unlike any other). Administratively straightforward, the 1972 Oklahoma groundwater law's best feature is that it accomplishes the inherently difficult task of marrying the concept of groundwater as a private property right with a regulatory scheme providing for reasonable groundwater use regulation.



Despite that most compelling attribute, the law has not been without critics. Calling it a “mining law,” some claim that Oklahoma’s groundwater basins and subbasins will be completely drained in twenty (20) years. Nothing could be further from the truth. Even though the policy of the state is to utilize our groundwater, other than the special case of the Ogallala no Oklahoma groundwater basin or subbasin has been drained or even substantially depleted in the 37 years the law has been in place.

In fact, the one groundwater basin in the state declared “critical” under the 1949 law, the Tillman Terrace, fully recovered after area permits were reduced from 2 acre-feet per surface acre to 1 acre-foot pursuant to the Act.

The OWRB

In addition, OWRB groundwater basin modeling procedures have resulted in very conservative determinations of equal proportionate shares (i.e., regular permit amounts) for studied basins and subbasins. These include such factors as modeling a total acreage less than that actually existing, determining an aquifer to be fully utilized when substantial volumes of water remain, assuming a pumping well on every square mile of the land overlying the basin or subbasin, etc.

Just as with the Stream Water Law, all is not perfect with the Groundwater Act. Although the Board made steady, if unspectacular, progress in carrying out the Act’s provisions prior to 2002, since that date no hydrologic studies, maximum annual yield or equal proportionate share determinations have been made. However, the Board’s failure to carry out its statutory duties over the past eight (8) years should be viewed, not as a flaw in the law, but rather as an agency shortcoming.

The OWRB’s continued reluctance to fulfill its responsibilities means that vital information as to the quantity and quality of available groundwater for the State’s future needs is lacking. This gap will hamper the development of a truly comprehensive water plan.

Summary

Oklahoma water laws, both stream and ground, are the result of thoughtful consideration and drafting by an extremely broad-based and competent group of individuals representing all our state’s major water user groups.

The Water Law Advisory Committee’s handiwork, as reflected in our current statutes, should not and cannot be lightly disregarded in any fair assessment of Oklahoma’s water management system. Both the Stream Water Code and the Groundwater Act more than adequately meet the challenge of marrying Oklahoma’s unique hydrology with the state’s established law of property rights.

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The Implications of Surface and Ground Water Interactions on the Economics and Management of Water

Guy W. Sewell, Ph.D. East Central University, Ada, OK

Dr. Guy W. Sewell is an internationally recognized expert in the areas of subsurface fate and transport, and the biotreatment of hazardous waste. He is the Executive Director of the Institute for Environmental Science Education and Research (IESER) and holds the Robert S. Kerr Endowed Chair at East Central University in Ada, OK.

As participants in the Oklahoma comprehensive water planning process (OCWPP), we are trying to find fair and equitable ways for managing the State's water resources. At first glance, Economics may seem an unlikely tool for discussing ground water-surface water interactions, but the definition of Economics that I find most useful is "the study of the allocation of limited resources." So what does economics have to say about water?

Garrett Hardin's "Tragedy of the Commons" concept captures the challenges associated with open access resources such as water.¹ The theory suggests that this type of resource (sometimes called a commons) will be over allocated and potentially damaged unless regulated. Traditionally economists have identified two solutions to the problem: government regulation or individual ownership. In Oklahoma, as with many western states, we have chosen a combination of the approaches, treating surface water as a state regulated and allocated public property, and ground water as individually owned private property.

Traditionally both approaches are thought to be economically sound, however problems can arise because we are in conflict with another economic principle. In a market economy, transactions (buying and selling) should not impact third parties. This is referred to as an externality and it can result in overuse and resource damage.

Ground water-surface water interactions represent a classical source of externalities. To explain this we need to discuss a little hydrology. In Oklahoma, our rivers represent low points both in the local

topography and in the water table. This results in ground water discharging into the rivers (influent or gaining streams). This is called base flow (Figure 1). The concept of baseflow is a very important lesson for those concerned with water management and has several important implications.

One is that, for most of the time during the year, the water we see in rivers and streams is primarily ground water that has discharged to the streambed. A pumping well placed near the river will impact the flow of ground water into the river (baseflow) by altering the potentiometric surface (local water table), and can cause surface water to move from the river into the local surficial aquifer, becoming a localized effluent stream. Our surface water allocation system (prior appropriation) does not recognize this. This is sort of like trying to manage your checking account when someone you don't know, has your checkbook.

Figure 1 is a hypothetical hydrograph for a single rainfall event, and from it we can infer another important lesson. When surface water supplies are most limited, during seasons of limited rainfall, the water in the streams and rivers is almost exclusively baseflow. So when the allocation systems are most critically needed, the chance for conflict between them (externality) is the greatest.

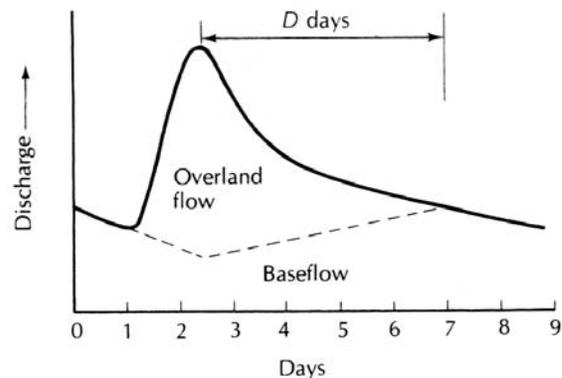


Figure 1. Hydrograph indicating baseflow after a rainfall event. $D = A0.2$ where A is the drainage basin in square miles; and D is number of days between storm peak and the end of overland flow (or runoff for this discussion). Modified from Fetter 2001.²

The un-recognized interactions of these two forms of water outside of their allocation systems is a significant source of potential problems and limits their efficient management under the current Oklahoma system of laws.

So how do we manage such complex systems? Here we move into the realm of natural resource management. Some states have implemented conjunctive management polices that attempt to capture the impacts of ground water-surface water interactions. But, as you might guess, the complexities of managing the evaluation of impacts of ground water withdrawals on surface water supplies, and balancing competing needs with variable water availability, can become overwhelming.

Multiuse, complex and interacting natural resources such as Oklahoma's water, can be characterized as a Social-Ecological System, or SES. SESs may, or may not, be sustainable. Part of the success or failure of SESs resides in the recognition of the interactions of the functional components (such as ground water-surface water interactions), stakeholders (owners, users and regulators) and allocation systems (prior appropriation, private property) by all of the people involved.³

This level of communication is hardly automatic. For example, most discussions on the appropriation and use of water are approached from two broad perspectives. One involves water in its legal framework. Who gets it, who owns it, who regulates it. The importance of water, to both life and commerce, has resulted in it having its own body of laws and legal precedence, which is unusually large for a natural resource. When citizens of Oklahoma are concerned about their current and future access to water they tend to see all discussions of water, in this often complex legal framework of "Water Law," as a commodity to own, control or allocate.

The other broad perspective is from a functional based view. This includes how water behaves, its distribution on the earth and its role in ecosystems. When people are concerned about water issues such as recreation, scenic beauty or in-stream flows they more often see water as a functional unit in the world around them.

I am not suggesting these groups are unified in their concerns, intended outcomes or politics, only that their perspective shares common elements and that communications between the perspective groups can be problematic. I'm sure most of us who have participated in the OCWPP have at some point experienced participants who were "talking past each other." The good news is that in systems where stakeholders are educated on the interactions within the SES, and discuss issues face-to-face, the chances for success (sustainability) are much greater.⁴ We need to applaud the OWRB and OWRRI for their efforts, which have addressed both education and communication in the OCWPP. Understanding complex systems interactions, such as those between ground water supplies and surface water supplies, and between different issue perspectives, are critical to effective resource management regardless of whether we use economics, policy or a combination as tools for water allocation.

I often hear that Oklahoma's current water allocation systems have worked well, which is true, and that we don't really need to change anything. Water allocation is much easier when there is plenty of water. The comparatively less-complex system of Riparian Rights used in the eastern states is a good example. In Oklahoma we are facing a situation where we have static water quantities and increasing water demand from both inside and outside the State's borders. We should take the baseflow lesson to heart and apply it to all water resources so that we understand that the management of Oklahoma's water resources will be the most complex, and the most needed, when water is in the most demand.

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Domestic Use and Set-Asides For Oklahoma Streams

R. Thomas Lay, Kerr, Irvine, Rhodes & Ables, P.C., Oklahoma City

This paper is a brief general discussion of domestic stream water use and set asides for Oklahoma streams, a/k/a, environmental instream flows. The discussion focuses on what domestic stream water use consists of, how domestic use is addressed in the stream water permitting process, the distinct differences between domestic use and environmental instream flows and how, regardless of those differences, the one provided for (domestic use), in operation and reality, accommodates the other not provided for (environmental instream flow maintenance).

What is Domestic Use of Stream Water?

“Beneficial use” of the waters of a definite stream (stream water, surface waters flowing in a “watercourse”) is the basis, the measure and the limit of the right to the use of stream water. See 82 O.S. §105.2 A. Domestic use of stream water is a well recognized beneficial use.

Very generally and simply put, domestic stream water use means water use by individuals to meet individual water use needs and purposes. More specifically and as defined by state law, domestic stream water use means the use of water by a family or household for:

- Household purposes;
- For farm and domestic animals up to the normal grazing capacity of the land;
- For the irrigation of land not exceeding a total of three (3) acres in area for the growing of gardens, orchards and lawns; and
- For such other purposes as specified by Water Board rule for which *de minimis* amounts are used.

See 82 O.S. §105.1, 2. The domestic water user must be one who owns lands riparian (adjacent) to the stream. Under the Water Board rule, domestic stream water use means essentially the same as the definition provided by statute plus a few additional uses described as follows:

- The use of water for agricultural purposes by natural individuals;
- The use of water for fire protection; and
- The use of water by non-household entities for drinking water purpose, restroom use and the watering of lawns ...

... provided that the amount of water used for these additional uses does not exceed five (5) acre-feet per year. See OAC 785:20-1-2.

Domestic Use and the Stream Water Permitting Process

Under state law, 82 O.S. §105.9, persons and entities intending to acquire the right to the beneficial use of any stream water, before constructing and completing works necessary to divert and use the water, and before commencing use of the water, must first obtain a permit to appropriate (stream water use permit, appropriative permit) from the Water Board. See also OAC 785:20-1-6. Domestic use, as a well-recognized type of beneficial use, is an exception to the rule; domestic use *does not require* an authorizing permit. See 82 O.S. §105.2 A.

Although domestic use of stream water under Oklahoma law does not require an authorizing stream water use permit, domestic use of stream water has a significant role in the Water Board’s appropriative (non-domestic use) permitting process.

In order to obtain a stream water use permit (use of stream water for non-domestic beneficial uses), the Water Board is required to first make certain determinations based on the permit application, Water Board documents and data, and where applicable, evidence presented at administrative hearing on the application. Those required determinations include, among other elements, that there *is water available for appropriation* (available for diversion and use by the permit applicant) at the application proposed points of

diversion from the stream and in the amount applied for and that the permit applied for diversion will not “interfere with” domestic uses or existing appropriation (permitted) uses (the priority system, first in time – first in right, senior appropriator (permit holder) prevails over junior).

Very simply and generally described, what the Water Board determines is, at the proposed point of diversion under the stream water permit application, on an annual basis how much stream flow is in the stream, how much of that average annual flow is required to be set aside (subtracted from available stream flow) to meet and satisfy the needs of senior permit holders (existing prior appropriators) and how much must be set aside (reserved, subtracted from available stream flow) to meet and satisfy estimated domestic needs and uses. See 82 O.S. Supp. 2009 §105.15, OAC 785:20-5-5(a).

In determining available stream flow, the Board considers the *mean annual precipitation run-off* in the watershed above the applied for point(s) of diversion, the *mean annual flow*, stream gauge measurements, estimated upstream and downstream domestic uses, all existing appropriations and other designated purposes (if any) in the particular stream system. The Board may also consider other evidence presented at hearing on an application and factors relevant under interstate compacts or other special laws. See, OAC 785:20-5-5(a)

1. *More specifically, the permit set aside from average annual stream flow for domestic use is defined by Water Board rule to be six (6) acre-feet per household per year or three (3) acre-feet per non-household domestic use. See OAC 785:20-5-5(a)*
2. *In the domestic use calculation process, it is the writer’s understanding that as a matter of agency procedure, the Board calculates the number of quarter sections along the stream upstream and downstream from the diversion point applied for, assumes one (1) domestic user per quarter section and then multiplies that number by six (6) acre-feet per*

year. The Board may generally determine that conditions or restrictions are necessary “to protect existing beneficial uses and rights,” and may establish and impose conditions on certain stream flow under which diversions may be allowed only during certain times of the year or when a certain level of stream flow (elevation) is reached. OAC 785:20-5-5(d) (2).

In sum on this point, the domestic user set aside from stream flow to determine water available for appropriation under a stream water use permit application is clearly a conservative set aside, e.g., a considerable amount (probably more that reflects reality) is set aside to meet and satisfy estimated domestic uses.

Domestic Use and Environmental In-Stream Flow Maintenance

Thirty years ago when I was General Counsel of the Oklahoma Water Resources Board, the Board received a request from the Arkansas-White-Red Basins Inter-Agency Committee for information dealing with Oklahoma water law and provisions for in-stream flows.

I was directed to prepare a written reply to the request. The reply was entitled “Instream Flow Opportunities Within Existing Legal Constraints (Under Oklahoma Law).” I had occasion to review and remind myself what I wrote on that subject those many years ago. For the most part, the views expressed in that paper are largely valid and correct today.

The legal concepts of domestic use of stream water and environmental instream flow maintenance are *totally different and distinct*.

Oklahoma’s current domestic stream water use law was created by the very substantial and significant 1963 amendments to the Oklahoma stream water use code. Very simply put, prior to 1963 Oklahoma had a *dual system* of stream water use rights, a legal regime of *riparian water rights* and the *appropriative water right system* (prior appropriation system). The two systems were *dramatically different and wholly incompatible* in

operation. Given the *problematic dual system*, the Oklahoma Legislature very wisely elected to follow the recommendations of a Citizens Committee to eliminate the riparian system and operate henceforth under a single system of prior appropriation. See, Sess. Laws of Okla., Ch. 205, at 267-270.



Certain interests represented on the Committee were concerned that some might argue that the recommended change in law was a constitutional taking based on a contention that the prior appropriation system provided rights which were lesser than those rights persons had already established (or could have established) under the to-be-eliminated riparian system.

One of the various legal mechanisms utilized to address this potential lesser rights (taking) argument was creating, in addition to appropriative water rights, separate and distinct rights of domestic stream use exercisable only by landowners who owned land riparian to a definite stream, e.g., those who potentially could have previously established riparian water rights.

As noted, exercise of the right by a riparian landowner does not require a permit authorizing that use, and is exercisable for defined uses and defined quantities, thus something of value to riparian landowners in addition to a landowner's potential appropriative water right, present or future.

As mentioned, the legal concepts of domestic stream water use and environmental instream flow maintenance are totally different, distinct, and incompatible. Domestic stream water use is a *legally provided* for beneficial use of stream water which, by definition, contemplates a *consumptive use* of available stream flow. Environmental instream flow maintenance is stream water set aside from stream flow otherwise available for use, which is *not expressly or specifically generally provided for* under current Oklahoma water law.

By definition, the set aside is a *non-consumptive use* of stream water, e.g., a stream flow *set aside, maintained, but not to be consumed*, but to instead serve general environmental related purposes. I also observed, however in the thirty-year-old paper that

notwithstanding the major differences, distinctions and incompatibilities, legal and otherwise, between those two stream water flow dynamics, the one provided for (domestic use), in reality, serves and operates to accommodate the one not provided for (environmental instream flows). The manner in which domestic use stream flow set asides are calculated and estimated is such that stream flow is set aside for that provided-for consumptive beneficial use.

In reality, the extent of current day actual domestic use of stream water is believed to be much less than is in fact used (consumed) for that beneficial use. Moreover, the Water Board's estimated domestic use set asides, which assumes one domestic (consumptive) user of stream flow per quarter section of land along a stream in a watershed, is probably not realistic for several watersheds.

This writer believes that in reality the domestic use stream flow set aside from water available for appropriation (consumptive use) is much greater than the amount of domestic use which in fact occurs.

The result of the existing (provided for) law and system is that much of the domestic use set aside is not consumed by riparian landowners and, accordingly, a great deal of stream flow set aside, regardless of purpose, is in reality available to meet and satisfy the interests of environmental instream flows.

Stated otherwise, although not for that non-provided for purpose (environmental instream flow maintenance), the provided-for steam flow set aside (domestic uses), in most streams, should serve to accommodate stream flow needs of the environment.



Topic 7

Water Sales and Transfers

Water Sales and Transfers

Planning Workgroup Facilitators: Claude Bess, Leland McDaniel and Recia Garcia

Facilitators: Claude Bess, Leland McDaniel and Recia Garcia. Experts: Dean Couch, Oklahoma Water Resources Board; Bryan Mitchell, Camp, Dresser and McKee. Participants: Roy Rider; Sam Samandi; Jack Accountius; Larry Hare; Ada Hill; Chris Tytanic; Stephen Greetham; Jack Yates; Vernon Smith; Sinclair Armstrong; Frank Acker; Barbara Gilbertson; Michael Graves; David Martinez; Paul Jackson; Steve LaForge; Mason Mungle; Robert Smith; Ron Suttles; Dave Taylor.

QUESTION

If water is going to be sold out-of-state or transferred in state, how should this be managed?

1. *Control over water exports*
2. *Distribution and use of funds from sales & transfers, including compensation to source regions & landowners*
3. *Costs to and responsibilities of buyers*
4. *Infrastructure for water movement*
5. *Ecological considerations of water movement*
6. *Definition of “excess/surplus” water*

Definition of Surplus Water

The transfer or marketing of water should be restricted to “surplus” waters. “Surplus water” should be redefined in a way that protects the 50- or 100-year projected needs of the State. The projections should include, but not be limited to, consumptive and non-consumptive uses, including environmental/in-stream flows and the economic foundation of the local area. The definition should also take into consideration historic available trends with particular emphasis on drought considerations and minimal availability during these times.

Water Management Entity

The State should establish a single statewide entity to issue permits related to sales and transfers of excess or surplus water. The goal of the entity should be to protect the interests of both

the basins-of-origin and Oklahoma’s long-term needs. Any determination to sell water should take into consideration the differences in moving groundwater and surface water. The entity should oversee revenue generated from any sale of water with input from local planning and development authorities. The State should develop and enforce rules to prevent water market speculators from profiteering. The marketing of groundwater should be limited to the extent it is legal and feasible.

Infrastructure

Infrastructure is an important consideration any time water is transferred (infrastructure is defined as intake, pumping, and conveyance facilities necessary to move water from one location to another for the next 50 years). The State should determine the capacity and condition of existing water transfer infrastructure and use it whenever possible.

If existing infrastructure is not adequate to meet water transfer needs of the importing basin, then new infrastructure alternatives should be identified (these should address environmental impacts).

The water plan should set guidelines to (1) determine who pays the cost of new infrastructure construction, operation, maintenance and replacement, and (2) designate ownership of and legal access to the infrastructure.

Water Quality

When water is moved from one area to another, it can affect water quality. Controls should be provided that protect the quality of water in both the basin-of-origin and the importing basin within Oklahoma. While transferring high quality water can enhance lower quality water, the effects of mixing or blending on both human consumption and the fish and wildlife of the area should be considered.

Conservation/Best Practices

In case of drought and other water shortages, enforceable controls should be established that protect the basin-of-origin. The importing basin must use conservation/best practices as developed and enforced by the State.

Compensation of Source Regions

The basin-of-origin, which may encompass multiple counties, should be fully compensated for any water transfer. Revenue could include, but not be limited to, monies received from water sales or leasing, usage taxes or fees such as from recreation, and gray water use. Fee distribution should be tied to related land sales and shoreline development, with the basin-of-origin having priority.

Editor's Note

A recommendation developed by this workgroup concerning extending the planning horizon to 100 years was moved to Topic 4 for discussion there.

Topic 7: Recorder's Notes

The workgroup chose not to specifically define excess or surplus water because people had different definitions. Some suggested the terms "dependable, reliable yield" or "firm yield" be included in the definition. Ultimately, they looked at the current definition and made some suggestions on how it should be revised.

Some in the workgroup wanted the planning horizon extended to 100 years; if Texas is planning on a 100-year horizon, Oklahoma should do the same. They also suggested that revisions should be done every five or ten years and that this will ensure accuracy in the numbers. The workgroup suggested that the planning horizon be changed to cover 100 years for the next plan update.

The intent is to have a central organizing agency (by central they do not mean just in Oklahoma City but one agency to go to) with local boards operating under it. Perhaps some hybrid of the Councils of

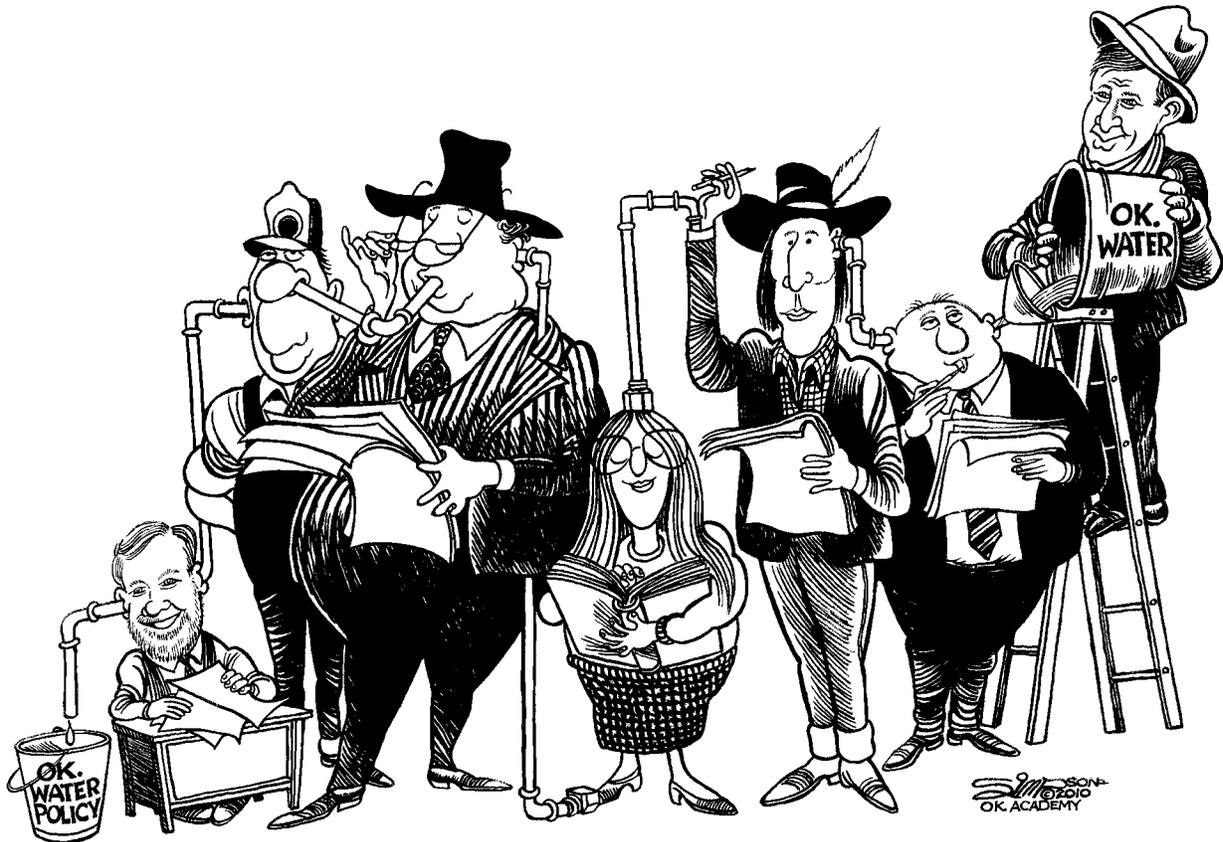
Government (COGs) and the RC&Ds would be the best way to establish the local boards and organizing agency. Also, it might be beneficial for a single entity to issue permits, but a local authority would hold the permit. Then the importing basin would have to contract with the local entity to buy water.

However, this approach could result in western Oklahoma having to pay to get water from eastern Oklahoma. This also could be used against the State when another state tries to buy water. Concern was expressed that local boards may not be interested in making decisions about water they don't own and money they won't get.

Much of the discussion was about water quantity but some said that quality is also an issue. If you transfer lower quality water to an area, it can increase treatment costs. If gray water is transferred, this can increase treatment cost if it is being used for drinking water. That is the purpose for the surcharge on gray water reuse: to offset additional treatment costs.

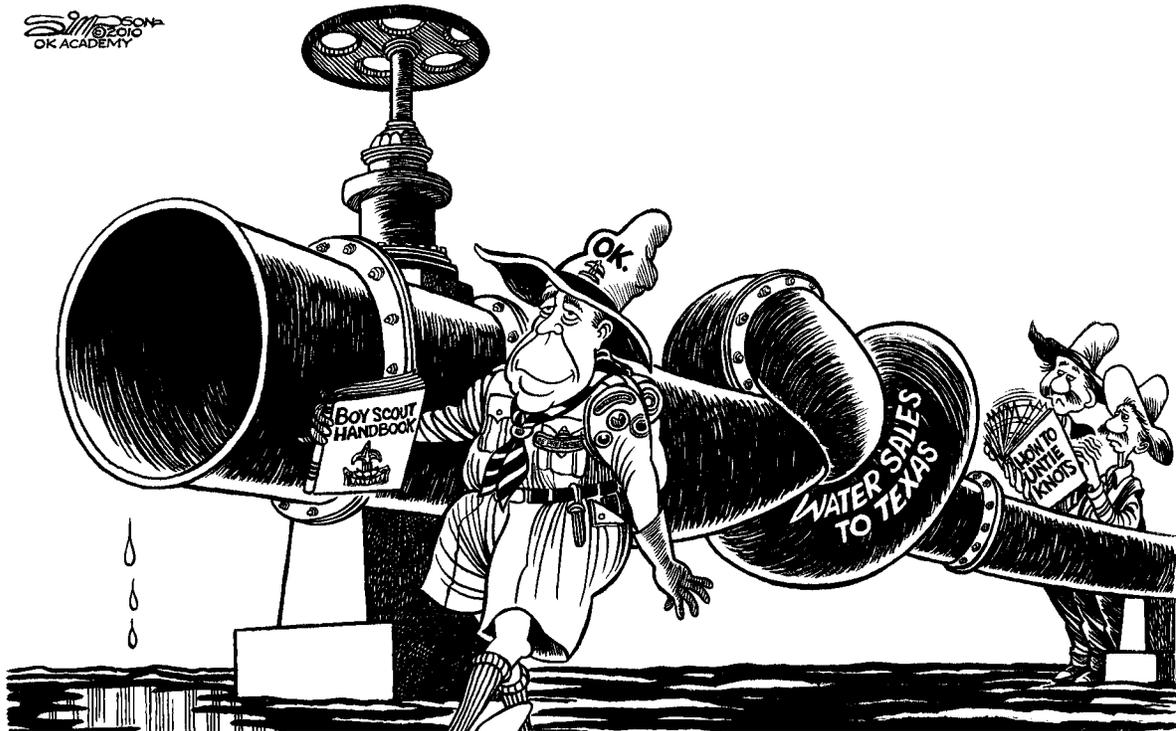
Some people are concerned that speculators will buy large amounts of water rights and then resell them at inflated prices. Therefore, protections should be put in place to prevent people from "gaming" the system.

A Town Hall Challenge



... when you get to this issue in this book - and within the actual Town Hall - you may start feeling overwhelmed. You may want to retreat to the safety of what you know for certain. Please don't! The secret of the Town Hall is to pace yourself and let the ideas "flow like water" into making sound policy ...

Another Town Hall Challenge



... this is the issue that will test you. As long as Texas continues to press the issue, Oklahomans must eventually take a side. We should prepare to do something. Inaction may not be an option. We will not be able to ignore it. HB 1483 (see next pages) gives us time to think ...

“Tying Some Knots” with OK House Bill 1483
Oklahoma State House of Representatives

ENROLLED HOUSE
BILL NO. 1483

By: DeWitt, McMullen, Fields, Denney, Sullivan, Tibbs and Nelson
of the House and

Justice, Ivester, Marlatt, Brogdon, Jolley, Sykes, Bass,
Garrison, Ford, Gumm, Laster, Lerblance, Schulz, Bingman,
Ballenger, Eason McIntyre, Leftwich, Burrage, Rice, Sparks,
Easley, Johnson (Constance), Sweeden, Wilson, Ellis,
Paddack, Crutchfield, Adelson, and Wyrick of the Senate

BE IT ENACTED BY THE PEOPLE OF THE STATE OF OKLAHOMA:

SECTION 1. NEW LAW A new section of law to be codified in the Oklahoma Statutes as Section <105.12A> of Title <82>, unless there is created a duplication in numbering, reads as follows:

A. The State of Oklahoma has long recognized the importance of the conservation and preservation of its public waters and the necessity to maintain adequate supplies for the present and future water requirements of the state and to protect the public welfare of its citizens, and has entered into interstate compacts for that purpose.

B. No permit issued by the Oklahoma Water Resources Board to use water outside the boundaries of the State of Oklahoma shall:

1. Impair the ability of the State of Oklahoma to meet its obligations under any interstate stream compact; or
2. Impair or affect the powers, rights, or obligations of the United States, or those claiming under its authority or law, in, over and to water apportioned by interstate compacts.

C. Water apportioned to the State of Oklahoma by an interstate compact is subject to the right and power of the State of Oklahoma to control, among other matters, the method of diversion of the water and the place of use.

D. No permit for the use of water out of state shall authorize use of water apportioned to the State of Oklahoma under an interstate compact unless specifically authorized by an act of the Oklahoma Legislature and thereafter as approved by it.

SECTION 2. AMENDATORY <82> O.S. 2001, Section <105.12>, is amended to read as follows:

Section <105.12> A. In order to protect the public welfare of the citizens of Oklahoma and before the Oklahoma Water Resources Board takes final action on the application, the Board shall determine from the evidence presented whether:

1. There is unappropriated water available in the amount applied for;
2. The applicant has a present or future need for the water and the use to which applicant intends to put the water is a beneficial use. In making this determination, the Board shall consider the availability of all stream water sources and other relevant matters as the Board deems appropriate, and may consider the availability of groundwater as an alternative source;
3. The proposed use does not interfere with domestic or existing appropriative uses; ~~and~~

4. If the application is for the transportation of water for use outside the stream system wherein the water originates, the proposed use must not interfere with existing or proposed beneficial uses within the stream system and the needs of the water users therein. In making this determination, the Board shall utilize the review conducted pursuant to subsection B of this section; and

5. If the application is for use of water out of state, the Board shall, in addition to the criteria set forth in this subsection, also evaluate whether the water that is the subject of the application could feasibly be transported to alleviate water shortages in the State of Oklahoma.

If the evidence is determined to be sufficient, and subject to subsection B of this section, the Board shall approve the application by issuing a permit to appropriate water. The permit shall state the time within which the water shall be applied to beneficial use. In the absence of appeal as provided by the Administrative Procedures Act, the decision of the Board shall be final.

B. 1. In the granting of water rights for the transportation of water for use outside the stream system wherein water originates, pending applications to use water within the stream system shall first be considered in order to assure that applicants within the stream system shall have all of the water required to adequately supply their beneficial uses.

2. The Board shall review the needs within such the area of origin every five (5) years to determine whether the water supply is adequate for municipal, industrial, domestic, and other beneficial uses.

C. The review conducted pursuant to paragraph 2 of subsection B of this section shall not be used to reduce the quantity of water authorized to be used pursuant to permits issued prior to such review. Such permits, however, remain subject to loss, in whole or in part, due to nonuse, forfeiture or abandonment, pursuant to this title.

D. On the filing of an application or amendment to use water outside the state, the applicant shall designate an agent in the State of Oklahoma for service of process and to receive other notices.

E. In the event of a conflict between the conditions of use required in Oklahoma and conditions required in another state, the water right holder shall consent to conditions imposed by the Board.

F. Permits and amendments that authorize the use of water outside the state shall be subject to review by the Board at least every ten (10) years after the date of issuance to determine whether there has been a substantial or material change relating to any matters set forth in subsection A of this section. The Board may impose additional conditions as described by Board rules to address any such substantial or material change.

G. Notwithstanding the provisions of any other law that may be deemed inconsistent with this section, the Board shall promulgate rules and apply the provisions of Section 1 of this act and subsections A, B, D, E, and F of this section to applications for use of water for which no final adjudication has been made by the Oklahoma Water Resources Board before the effective date of this act.

SECTION 3. It being immediately necessary for the preservation of the public peace, health and safety, an emergency is hereby declared to exist, by reason whereof this act shall take effect and be in full force from and after its passage and approval.

Passed the House of Representatives the <20th> day of <May>, 2009.
Passed the Senate the 21st day of May, 2009.

A Democrat and Republican Agree: Sell!

Governor David Walters and Howard Barnett, Jr.

A Billion Here and There

*David Walters, Oklahoma Governor
State of Oklahoma 1991-95*

When you read about water issues in other states, from droughts in the southeast to restrictions in Texas to seemingly uncontrollable fires in California, we can only be thankful to live in a state possessing natural and man-made infrastructure that provides so much water.

I was around during the establishment of the Department of Environmental Quality. As Governor, I asked Patty Eaton to run the Oklahoma Water Resources Board and to be Oklahoma's first Secretary of the Environment. We faced a number of issues in reorganizing our environmental agencies, but one stands out clearly: The sale of water to Texas.

This issue stirs great emotion. I recall one group of women near Lake Sardis, upset about the possible sale of water to Texas, donning T-shirts emblazoned with pictures of dead fish and attending a meeting I had in the region. This meeting was a forerunner of the modern day tea party yell-a-thons.

Having about all the controversy that I cared to handle at the time, I asked Secretary of the Environment Patty Eaton to abandon negotiations to sell water to Texas. Thus began a tradition that every political leader in Oklahoma has dutifully followed since, and that is to strap on running shoes and sprint from this issue.

I don't need to tell you that Oklahomans hate Texans. It even transcends football. Hating Texans is so politically popular in

“Oh, by the way, if they (Texas) establish their need - our surplus, the water gets transferred by permit for FREE. So what to do? Focus on a few numbers with me ...”

Oklahoma that we revere a former governor who declared war on them and put troops on the Red River Bridge.

So the idea of giving Oklahoma water to Texas stirs an ire that is intense and long remembered. Most politicians in southeastern Oklahoma have either come from or long been supported by the activists that are vehemently opposed to a sale of any water, excess or otherwise.

But we have to admit that Texans, while we hate them, are a relatively bright bunch. They have whipped up their economy to one 10 times the size of Oklahoma's and they periodically elect themselves a president. They have a lot of resources. What they don't have in North Texas is water.

So Texas is suing Oklahoma for access to our water. And they are going to win this lawsuit.

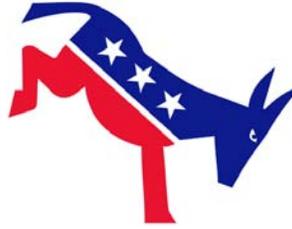
Now we have a lot of smart lawyers on our side, but let me give you a couple of sobering facts.

First of all, about 40 years ago Altus sued Texas for their restraint of water transfer to Oklahoma – just the reverse of today's case – and guess who won? Altus did. I'm guessing that we are going to hear about this precedent.

There are some equally impressive congressional transcripts from the Monroney and Kerr days when those famous senators justified to their colleagues the expenditure of all that federal money for the tremendous water infrastructure in Oklahoma based on our water needs AND the need for water in North Texas.

As former Democratic State Senator Carl Franklin's political signs used to say, "I Ain't No

Lawyer,” but I think I know a tough case when I see one. There will be a short lived victory here and there... but in the end, losing this case is inevitable.



Let's assume, despite these well supported numbers and tightly argued assumptions, that that I am wrong about volumes or pricing and that it's only half that amount. This would still mean that every year \$237,250,000, almost a quarter of a BILLION dollars

Oh, by the way, if they establish their need and our surplus, the water gets transferred by permit for free. So what to do? Focus on a few numbers with me for a moment ...

is going over the dam at Hugo.

The Oklahoma Water Resources Board estimates 1,300 million gallons spills over the dam at Hugo every day, where it is lost forever to the brine of the Red River heading for the ocean. On average, 1.3 million gallons a day! That's approximately 50 percent of all the water used in Oklahoma. We have more than five times that amount spilling into the Red River at other collectible points in southeast Oklahoma. The total amount of water departing Oklahoma via the Red River is over 20 times the amount vamoosing over the Hugo dam - 26 million gallons per day!

Imagine what we could do with our community water systems, wildlife conservation, economic development, green energy job parks and our general quality of life, particularly in southeast Oklahoma, if we had more than \$237 million dollars a year to spend on these needs. Last year we spent about \$75 million on waste and drinking water projects in all of Oklahoma. Oklahoma could cut taxes and raise education funding simultaneously!

For the moment, let's just focus on Hugo. How much is this relatively small portion of Oklahoma's Red River runoff worth going over the Hugo dam?

Assume we pay off that nagging debt for Sardis (financed, it would cost about \$750,000/year), pay Hugo for its excess allocation of water (\$300,000/year), contribute \$1,000,000 each year to the 22 country regional Waste Water Plan, contribute \$500,000 annually to the six-county economic development plan, and contribute \$250,000 annually to the Kaimichi Wildlife Development.

A good negotiator should be able to get \$1 for a thousand gallons of that water. I know Texas has offered much less over the last few years, but \$1 is a reasonable value. We won't really know the price until we have a serious negotiation, but a recent New York Times Magazine story reported Colorado farmers sold their water rights to Las Vegas for as much as \$12,000 per acre foot. That's the equivalent of \$37/thousand gallons. For the moment, let's assume our crack negotiators can get at least three percent of what some farmer in Colorado negotiated and \$1/thousand gallons is a good price.

Feeling generous? Lets double all of those amounts. You still have over \$200 million annually, just from the Hugo dam, to divide between the state, the tribes and other water-related needs.

\$1 per thousand x 1,300 million gallons per day ("mgd") is \$474,500,000 annually. Nearly a half-billion dollars ... annually!

Now you and I know families that can fight for a decade over a thousand dollars. How in the world are the state, tribes and other interested parties ever going to come together with \$200 million annually on the table? Fortunately that's why God created escrow accounts. Cut your deal with Texas and put the money in a savings escrow and eventually

figure out later how to divide it. Trust me, a billion-or-two account balance will force the parties to come to some agreement.

“Fortunately that’s why God created escrow accounts. Cut your deal with Texas and put the money in a savings escrow and eventually figure out later how to divide it.”

Remember we are still just in Hugo. Multiply by five if you fully develop the catchment basin in southeast Oklahoma. Remember, this \$1.2 billion dollars, if you develop the entire catchment basin, is just 50 percent of my original estimate. Imagine the possibility of \$2.5 billion a year if my estimates are correct!

As the classic Washington quote goes, “a billion here and a billion there ... pretty soon you’re talking about real money.”

So how do we do this?

1. *First a Water Development Authority should be created that gives real voice to the stakeholders, the state, tribes, environmentalist, farmers, wildlife conservationists and the activists that oppose this so vehemently.*
2. *We should not depend on Texas to develop the facilities. We should bond a portion of this cash flow stream and build the catchment infrastructure ourselves with Oklahoma companies and talent.*
3. *\$100M to a half-billion dollars of infrastructure development can be funded and paid for, creating a virtual boom in the southeast Oklahoma economy and the state. Contracts to sell this collected water can be flexible and can always, ALWAYS give priority to Oklahoma’s needs. We simply convert the wasted water to cash until we need the water, if ever...*

Now, we can do this ... or ... we can continue to despise Texans and wait for the Federal Courts to transfer our water by permit for nothing.

If we decide to ignore this opportunity, we should at least establish a recreation area at the spillway in Hugo for folks who want to see what it looks like to waste \$1.3 million a day.

Why Not Sell Water to Texas? *Howard Barnett, Jr., Governor’s Chief of Staff* *Keating Administration, 1999-2003*

As much as this good Republican hates to agree with Governor Walters, he is certainly right that if we do not get serious about our water management and either prove that we do not have surplus water (unlikely if we have an objective process) or voluntarily negotiate a sale of water, the federal courts are very likely going to make the decision for us.

As I often stated when we were negotiating the last Texas water sale proposal in 2001 (see my other article in Topic 4 describing that process), do we really think that a court is going to allow Dallas - Fort Worth to go thirsty while we have water available in excess of our needs?

Let me briefly examine some of the objections which were raised about selling water (skipping over those that were hysterical or just based on emotion – I am not discounting them as concerns because the emotions are real and any resolution of this issue in favor of a sale must, from a purely political perspective, confront those issues as well.

But in the interest of helping the Town Hall discuss this issue, I want to focus on some of the more objective arguments): (continued next page)



*The spillway at the Hugo Dam
“a new recreational area?”*

(1) Water should go for the benefit of those in the affected area, not someone else.

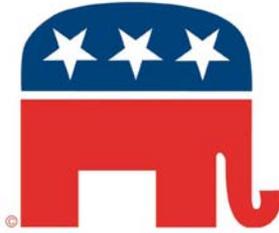
This misses the point that we have always had water transfers in Oklahoma. Tulsa gets its water from Spavinaw several counties away and Oklahoma City gets most of its water from the very areas we would be looking at if we sold water to Texas. In Oklahoma, we have not required in-state users in a water transfer situation such as these to pay any form of compensation for the water taken. Obviously, that would not be the case with a sale to Texas. In the Keating administration we addressed this issue of who should benefit from such a sale by earmarking most of the proceeds of the proposed sale for the benefit of the region from which the water was to have been taken.

(2) What about a drought? How about local use and wildlife management issues?

First and foremost, just as with the question of defining excess or surplus water, we need to have hard facts from which to work. Local use can and should always be protected as should the wildlife needs. But how far you need to go and other similar issues are the subject of negotiation. As I note in my other article, there is an inverse relationship to the value of the water and the restrictions/protections you put on the right to draw it. I think there is a valuable discussion to be had as to where the line is drawn between maximizing value versus protecting against real concerns as opposed to unlikely scenarios. If you want the right to shut off the spigot for any reason the water has little value. Just as in any negotiations, if you demand too much you won't get the deal.

(3) How do we know we are getting fair value?

This is a very valid objection and one that has to be thought through. There is not an open market in water, though people like Boone Pickens have managed to strike deals to buy water rights, so it is not a totally foreign concept. Again, this would



be a negotiation so if the parties reach agreement on a price then, by definition, that is fair market value.

(4) We just can't get the politics done.

Frankly, most thoughtful people who have looked at this objectively have concluded that a sale of water makes sense. Governor Walters and Governor Keating cannot ever be accused of promoting something they didn't honestly believe to be in Oklahoma's best interests. As I point out in my other article, the entire state legislature thought this was a good idea until the heat was turned on.

Oil and Water?

I always found it ironic that Oklahomans think nothing of pumping oil and gas – depleting assets – out of the ground and selling them out of state, but try that with water – a renewable resource – and it becomes the basis for a huge fight.

Bottom Line

We need leadership to get it done right and to take the time to listen to the concerns of the folks affected and convince them of what we need to do. But most of all we need exactly what the State Water Plan is supposed to provide: the facts. We cannot let the politics of hysteria deter us from going where the facts lead us.

If the facts show we have surplus water – as I believe we do in abundance – sell it and use the proceeds to help our poor state and its people.

It's the right thing to do.

A Lawyer Says: Develop and Protect

L. V. Watkins, Attorney at Law, Muskogee

It has now been almost 20 years since the State Of Oklahoma initiated negotiations to sell water to the North Texas Municipal Water Authority. Naturally, that ignited a fire storm from the people of Oklahoma. Since then, the issue has continuously raised its head and has now reached the courts.

As a product of Southeast Oklahoma and a student of water law, I became involved in this issue very early. In fact, I sent a letter to the North Texas Municipal Authority in the early 1990's expressing concern about any sale and advising them of the Indian Tribes' interest in the water.

At the time, my concern was on how it would further complicate state and local economic development efforts. Based on my legal research, I seriously questioned the foundation of the State's Water Laws. It was clear to me that our economic development efforts were in jeopardy if industry allocations were challenged by an Indian Tribe or Riparian Land Owner.

My Legal Research

In brief, my legal research revealed the U. S. Government acquired the full legal ownership of the land and natural resources of Indian Territory via the Louisiana Purchase. Therefore, the Federal Government possessed both the ownership, plenary power and the authority to create, regulate and protect private rights to capture and possess the beneficial use of the water within its territorial jurisdiction.

Relocation of Indians

In 1830, as a response to westward expansion pressures, Congress passed the Indian Relocation Act which authorized Tribes to be ceded full legal title to the new lands and resources in the west. Shortly thereafter, the Five Civilized Tribes entered into treaties with the Federal Government to exchange their existing lands and resources in the east for the full legal title to lands and resources

in the west. The treaties assured the Tribes full governmental jurisdiction over all people and resources within their new tribal boundaries.

More specifically, the U.S. Government withdrew the land and resources from the public domain, reserving them from the future jurisdiction of any state. The Government then ceded to the Tribes full legal title and full governmental jurisdiction over the people, land and natural resources within their newly acquired territory.

Late in the Nineteenth Century, pressure mounted to force the Indians to develop the arts of civilization, allot their lands to individual members of the Tribes, and open their surplus lands for further settlement. However, in the process of passing the General Allotment Act, Congress recognized that the Five Civilized Tribes held the legal title to their lands and only they could allot their lands to tribal members.

The Dawes Commission

In order to address the situation, Congress created the Dawes Commission to negotiate with the Five Civilized Tribes to allot their lands in Indian Territory. When this was not successful, Congress enacted the Curtis Act to force the Tribes to allot their surface lands to tribal members. Unlike the General Allotment Act, the Curtis Act did not address tribal water rights. This left tribal ownership and jurisdiction over water to the Tribes.

Statehood

When accepted into the Union in 1907, the State was limited by the laws and circumstances in existence at the time. The most significant limitations related to the property of the Indian Tribes. In fact, the Oklahoma Organic Act and the Oklahoma Constitution specifically excluded the State's jurisdiction over any interest in Indian land and property. Equally important, the State of Oklahoma did not opt to change the Oklahoma Constitution under PL 280. Therefore, Indian

Water Rights were unaffected by the Oklahoma Enabling Act or any action of the Oklahoma Legislature.

For the State to have plenary power, proprietary ownership and authority to define private rights and regulate their use of the water within tribal boundaries, they would have to produce evidence that Congress specifically delegated the authority to them or that the State acquired such authority from the Tribes. This did not appear possible because Oklahoma is not a Desert Land Act State and the State did not opt to change the Constitution under PL 280. In addition, the U.S. Supreme Court made it clear in the 1960 Grand River Dam Case that the State was unable to show it had received title or authority over water in Oklahoma from the Tribes.

Tribal Compacts

Thus, Tribal Water Rights and Oklahoma State Water Rights did not appear to be reconcilable without a State – Tribal Compact or some other federal, tribal and state arrangement.

Consistent therewith, the Choctaw and Chickasaw Tribes approached the Oklahoma Water Resources Board (“OWRB”) in 1990 and asserted their claim to the water. For 10 years thereafter, they worked with the State to clarify respective positions, establish the compact process and negotiate specific components of a compact to protect everyone’s interest. As negotiated, the State – Tribal Compact:

1. *delegated the administration of water rights and water quality to the State of Oklahoma*
2. *secured existing water rights*
3. *gave priority to the future needs of local residents and Oklahoma*
4. *protected the needs of the area of origin and environmental interests deferred to State Law on groundwater*
5. *provided a vehicle to allocate revenue from the sale of water to develop needed water and sewer infrastructure, and*

6. *required the sale of water to be approved via separate agreements by the State Legislature and the Tribal Councils.*

The Oklahoma Legislature subsequently rejected the proposed compact and imposed a moratorium against the sale and transfer of water out of state. This has resulted in several federal law suits challenging the State’s authority to prevent out of state sale of water.

Altus and Texas

Unfortunately, one of the precedent’s against Oklahoma’s position is the City of Altus case against Texas for their restraint of water transfer to Oklahoma. Altus won that case because Texas action was held to violate the Interstate Commerce Clause of the U. S. Constitution (see Governor’s Walters remarks on previous pages).



Lake Altus-Lugert

The litigation process has verified some of the issues related to the interest of the Indian Tribes. In 2009, the 10th Circuit Court said “Oklahoma does not own any water rights”, and the Northern District of Oklahoma Federal Court determined that the Indian Tribes were indispensable parties in Oklahoma water resource cases.

Time is now of the essence to prevent Texas or Central Oklahoma entities from being able to acquire the water at no cost or benefits to the area of origin. Tribal ownership and control of the water may provide some ability to protect this valuable resource.



However, federal jurisdiction over the Tribes is also governed by the Interstate Commerce Clause. This and the increasing political power of Texas has intensified concern and uncertainty. Therefore, future attempts to legally block the transfer of water are likely to fail in time. To protect and maximize the benefit of Southeast Oklahoma water requires more than noses. It requires positive action.

The most relevant question presently facing the people of Oklahoma is – how do we plan, develop and manage the water resources to maximize the benefits for the local, state and other residents of the region?

Without a well defined and financeable development plan, the water will probably be allocated and transferred outside the area without cost to the receiving parties or benefits to local and state residents. The adequate planning, developing and managing the available water will require a cooperative effort by everyone interested in the maximum preservation and utilization of this valuable resource. This includes:

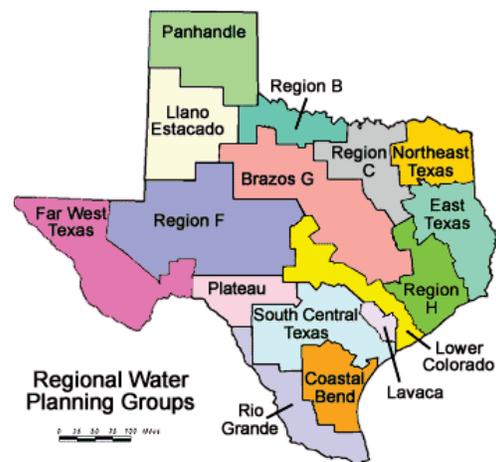
1. *Working with the Indian Tribes to put in place an effective development and management mechanism and program. This will probably require some form of State-Tribal Compact or other mechanism to combine authority and share the benefits.*
2. *Assuring a significant role for local residents to participate in the planning, developing and managing processes. The local people have both legal and social interest in the future of the water resources within their area.*

3. *The long term success of any development and management program requires a full understanding and cooperation of local residents. It cannot be assumed that they cannot act on behalf of the greater needs of their neighbors to the south and west.*
4. *Finding ways to finance the development of the water resources. The maximum development and management of the water resources of Southeastern Oklahoma will require enormous sums of money. These funds are not available from local, tribal and State sources. Therefore, some of the water may need to be sold to North Texas and the Oklahoma City areas to help finance that development and management process.*

It is interesting to note, that no Texas entity seeking the water has every denied the Tribes' rights. It appears they know that in order to finance a water transportation system they will have to address the tribal interest to satisfy bond purchasers.

The people of Oklahoma have debated this issue for nearly 20 years. In the process, they have learned the options are limited. Time is now of the essence.

To ignore this fact will only limit the future benefits to the people of Oklahoma. The failure to act in a positive way will definitely have future effects.



*Texas Water Planning Districts
Dallas-Fort Worth is in Region C*

Two Advocates Say: Don't Sell!

Janet McCoy, Eagletown and Bob Jackman, Tulsa

“It's A Water Grab”

Janet McCoy, Eagletown

Secretary, Southern OK Water Association

Once upon a time, soil was considered to be an “endless resource” by all the scientific experts. This thinking, along with man's desire to profit from it, led to the disastrous “Dust Bowl”, a huge American tragedy. A wise person once said, “If you throw a rock into a pond, there will be a ripple, no matter how big or little the rock or pond.” We cannot afford to manipulate nature; there will be consequences, as in the raping and subsequent destruction of Owen's Valley in California by the taking and transfer of its water to Los Angeles in the 1930's.

We Need to Know More

The surface waters and groundwater of Oklahoma are key public and natural resources supporting important individual, family and industrial livelihoods as well as providing for fisheries and recreational opportunities, habitat for other wildlife and irreplaceable aesthetic values.

All parties in Oklahoma have a stake in conserving, protecting and restoring this vital resource – a responsibility entrusted to our care. The economic, environmental and social benefits derived from the opportunities provided by the judicious use of the waters of the State depend substantially upon the quantity and quality of such waters. More specifically, the study of Oklahoma's water in the Texas Targeted streams MUST have scientific study, with properly placed meters over long periods of time for accuracy.

Currently, the aquifers of Oklahoma are declining. Arbuckle-Simpson Aquifer is the only state aquifer to have a scientific study. Translating this scientific data should include solid business terms---no corporation would proceed without a sound business plan. Oklahoma does not have a sound plan for our water currently in place. Again, this study

should be based on science not politics, on data, not opinions. Currently, there are NO plans for the proper scientific stream or aquifer studies.

Texas

The State of Texas has squandered its resources and has demonstrated itself as a water wastrel and prodigious polluter. The Dallas-Fort Worth metroplex has indulged itself, swimming unsustainably in a dwindling supply of H₂O, using more than 260 gallons per capita, this past summer. In spite of water shortages, the City of Fort Worth is planning a series of urban developments, including water parks, and a river walk.

The politico's of north Texas have alternatives within the State of Texas that may serve as water supplies, but they don't want to cover their farmlands and properties with the creation of multiple dams, nor do they want to drain existing lakes. As predicted in their own studies, it would cause extreme environmental degradation and economic loss. Rather, they are smart to want Oklahoma's water, some of the purest in the world.

Texas A&M

The Texas WATER SALE/GRAB is not a humanitarian issue, it is an economic WATER GRAB!!! Texas A&M reviewed their own state-wide water plan, Senate Bill 1.

The Texas A&M review simply stated, “when water flows from a basin, so goes economic development, tourism and recreation, with the donor basin left with economic and environmental degradation.” Is it smart environmentally and economically for Oklahoma to be a donor state, to fuel growth for Texas? Has any state ever wisely sold water?

Oklahoma can use these great God given resources for it's own benefits. The earliest man understood the value of water to life and chose to live close to water. Nothing has changed. With good stewardship and leadership Oklahoma can become an economic powerhouse with judicious caretaking of our

water. Or by contrast, we can sell water, become the donor and inherit the decimation comparable to Owen's Valley California. Drained by the exploding growth of Los Angeles.

Whiskey is for drinkin' 'n Water is for fightin'

The legal quagmire surrounding water is unbelievable. Is Texas a good neighbor? NO! Texas has a history of legal battles with New Mexico and the steal from Oklahoma through the Palo Duro dam. The State of Texas has affronted the great State of Oklahoma by its audacious action in fining a lawsuit to lay claim to the waters of our state. The State of Texas has insulted the founders of our nation and every other state in the union by treading on the Tenth Amendment to the Constitution of these United States.

What You Aren't Being Told ...

Bob Jackman, Independent Geologist, Tulsa

When all the trees have been cut down, when all the animals have been hunted, when all the waters are polluted, when all the air is unsafe to breathe, only then will you discover you cannot eat money. *Cree Prophecy.*

Storks bring babies, Wall Street works for you and Oklahoma has surplus water.

Let's take a peek behind the Texas magician's water illusions and see how their 'It's a Good Deal' story got floated and bloated. And you are going to read some nasty things the 'Good Dealers' never told you.

In 2007-08 alone, rich Texans hired and turned loose 20 lobbyists to work our Capitol like telemarketers. Bet they did not talk about your jobs lost or health!

More Texas Stuff

Texas TV commercials show videos of flood waters flowing over Oklahoma dams saying, that water was being wasted. But why didn't they show videos of eggs frying on sidewalk during scorching heat of Oklahoma droughts? Or Lake Eufaula's marinas high and dry one quarter mile from water. Ask drought stricken Oklahoma farmers and ranchers their definitions of 'Surplus Water.'

Back to another part of Texas tall water tale: 'Oklahoma Water Wasted Going to the Gulf.' Fifth graders will show you on maps that the Red River leaves Oklahoma and flows through Arkansas and Louisiana and sixty miles north of Baton Rouge it forks and half goes in Mississippi River and half into the Atchatalaya River National Wildlife Reserve. In both states folks use Red River waters to irrigate, for municipal water and water levels for navigation system of locks and dams from Mississippi River up the Red River to Shreveport.

Has anyone gotten permission from the federals to take Oklahoma Red River tributaries' so-called wasted surplus water and sell it to Texas? No. Plus Texas lawyers do not like to hear this technical stuff; it interferes with their legalizing.

What price are the Texas buyers talking about? If someone came to you and said we want to buy your surplus minerals and it is a good deal, first question you ask is what price are you willing to pay, give me a hard number. Then you check around to see if it is a legitimate market price per mineral acre or an attempted rip off. Warnings; if they say 'Trust me it's a good deal' run. If offer price is surprisingly high, then you think - if that's the value why? And can I get a better deal later.

"Texas has large undeveloped water supplies in East Texas, but admits it is cheaper to acquire, if possible, water from Oklahoma. Dallas - Ft Worth metro areas have highest in the nation water consumption, earning them title of 'Water Hog' in recent Wall Street Journal article" on water usage.

Value

In the case of true market value of Oklahoma's water, a proven fact, it is ten times higher than what you have been told. Furthermore its current and future beneficiary uses can increase yearly cash

flow to your local communities by multiples many times the cash amount received if sold. You have not been told the true value of your public owned water; it is your children and grandchildren's water-ladder to lift them out of generational poverty in Southern Oklahoma.

Ask any lawyer except those working for North Texas; how Texas will be legally empowered once State of Oklahoma sells a single bucket of water across state line to them? Name one State with water contacts with its neighboring State, not in expensive litigation, law suits costing more than value of water fought over? None.

No, do not sell water to Texas. We are just now beginning to understand, appreciate the true value of water in Oklahoma. Tell Oklahoma elected officials, 'No. This deal has too many unexplained issues.' Tell Dallas-Ft Worth water suppliers, "Get your gated community's lawn water, your swimming pool water and golf course sprinklers water from your own East Texas backyard."

Boiling Mad in Southern Oklahoma

When Oklahoma lakes are full - so are North Texas lakes and vice-a-versus, when our lakes low so are Texans; we are in same weather patterns. So how are they going to store our and their rainy season's high flow waters?

Answer: Dallas and Ft Worth water suppliers will build in Oklahoma's Kiamichi River Basin, Boggy River Basin and Lawton area's Cashe & Beaver River Basins, new big federal storage reservoirs dedicated to and strictly for North Texas water suppliers use!

The Corps Says ...

This has been confirmed by sources at US Army Corp of Engineers - Tulsa. Texans have already started reviewing Corps of Engineers Southern Oklahoma federal prospective dam sites named Boswell, Tuskahoma, Parker and along pristine Glover and Little Rivers.

Each new reservoir will take estimated 12,000 acres of private lands by federal condemnation and

displace hundreds of families. Federal reservoirs land taken, do not pay county property taxes, so your local school districts will take direct hits and remaining county property taxes could be raised to keep yourschool standards up.

Were You Told?

Why were you not told this by the Pro-Sell-Water to Texas supporters? Many of them knew it? Poor Southern Oklahoma would become Texas owned water plantations for high income, high water consuming Dallas - Fort Worth.

Texas Region C 2005 Regional Water Plan Review

Regional Facts

<i>Major Cities</i>	<i>Dallas, Fort Worth</i>
<i>Population: 2000</i>	<i>5,254,722</i>
<i>Population: 2060</i>	<i>13,087,849</i>
<i>Total Water Use: 2000</i>	<i>1,380,556 AF</i>
<i>Total Water Use: 2060</i>	<i>3,311,217 AF</i>
<i>Annual Precipitation</i>	<i>28-44 Inches</i>
<i>Net Evaporation</i>	<i>24-44 Inches</i>

Basic Plan Facts

- *Population in the 17-county area is projected to increase 250% between 2000 and 2060.*
- *Three new reservoirs are proposed for Region C: Lower Bois d'Arc Reservoir, Lake Ralph Hall, Marvin Nichols I, and Lake Fastrill. In addition, Marvin Nichols I, is proposed in Region D primarily to supply this region's projected needs.*

What's at Issue? *Region C includes 12 of the 20 fastest-growing communities in Texas. This high rate of growth will put increasing pressure on the region's water sources. Another factor driving the high demands and projected needs for water resources is the region's projected high per capita use rates (some of the highest in the state). In addition, the plan currently proposes to supply 20% more than the projected 2060 demand (an excess of 810,000 Acre Feet.) To meet these inflated demands, four environmentally damaging and unnecessary reservoirs are proposed, for a cost of \$4 billion.*



Topic 8

Conflict Resolution

Conflict Resolution

Planning Workgroup Facilitators: David Nowlin and Debbie Sharp

GROUP

Facilitators: David Nowlin and Debbie Sharp.
Experts: Jerry Barnett, Oklahoma Water Resources Board; Ed Rossman, U.S. Army Corps of Engineers; Nicole Rowan, Camp, Dresser and McKee. Participants: Dan Lowrance; LaDonna McCowan-Ferrier; Tim Bartram; Merritt Taylor; Darryl Hunkapillar; Monroe Hannon; Karen Weldin; John Stahl; Kenneth Komiske; Shanon Phillips; Jean Anne Casey; Amy Ford; J.T. Winters; Bill Sims; and Jim Rodriguez.



QUESTION

How should conflicts be handled? Are there alternative dispute resolution procedures to deal with private (non-governmental) conflicts?

Conflict Resolution Center

It is unclear how and where water conflicts are settled currently. It can be very expensive when a conflict elevates to the point it has to be settled in court. As water-related conflicts become more frequent and more complex, it will be important for the parties to have easy, low-cost access to conflict resolution services before going to court. To accomplish this, the State should establish a conflict resolution center.

The Center should provide the public easily understood information on various water laws. The Center also should provide trained independent mediators. If mediation fails, then administrative hearings, using independent hearing examiners, would be held. The administrative hearing rules of the agency under whose jurisdiction the issue falls would be used. As part of the administrative hearing process, a cost/benefit analysis of the economic impact should be considered for all parties. If the losing party of the administrative hearing is not satisfied, then the option remains to file suit in the appropriate district court.

Topic 8: Recorder's Notes

The participants want one central conflict resolution center with one format of how conflicts are handled; however, the agencies' rules should still be adhered to by the Center. Current procedures work okay, but water issues are going to become more complex, involve more agencies and expand beyond just permitting. Some concern also was expressed regarding the cost to the parties. The participants want people to have a couple of options to try before they have to spend money on attorneys. The parties involved could pay a fee for the services of the Center, but the main concern was placing the burden of the cost on the parties and keeping it out of the court system.

It was important to some of the participants that the hearings are done locally when possible, but that the mediators are impartial. For example, the Center could be located in Oklahoma City and mediators could travel to the area where the dispute arose to hear the issue.



Topic 9

***Balancing
Supply and Demand
... in the face of change ...***

Balancing Water Supply and Demand in the Face of Change

Planning Workgroup Facilitators: David Nowlin and Debbie Sharp

GROUP

Facilitators: David Nowlin and Debbie Sharp.
Experts: John Rehring, Camp, Dresser and McKee;
Bob Sandbo, Terri Sparks and Bill Cauthron,
Oklahoma Water Resources Board. Participants:
Dea Kretchmar; Steven Almon; Tom Buchanan;
Mike Spradling; Sue McCoy; Jay Fulton; Dick
Sheffield; Mark Helm; James Fuser; Billy Frazier;
Chester Dennis; Anthony Daniel; Ronn Cupp;
Jerry Pettijohn; Mead Ferguson; Robert Jackman;
Lawrence Allin; and Fred L. Rice

QUESTION

How should the plan ensure that water supply meets demand across the State over the next 50 years given likely changes in population size & distribution, economic conditions, technology, and climate?

1. *Opportunities for actively learning about changes (adaptive management)*
2. *Programs to monitor water supply and demand accurately, and changes in both*
3. *Methods to evaluate the plan to ensure that its goals are being achieved in the real world*
4. *Procedures for review and revision of the plan*
5. *Identification of water supply and demand research needs and funding*
6. *How to design the plan as a living document that can easily deal with changes in water supply and demand*

It appears, based on preliminary supply/demand studies for 2060, there would be, on average, sufficient water available for the state as a whole. However, regional gaps are likely during normal demand and dry periods if existing water use practices continue.

Water Plan Updates

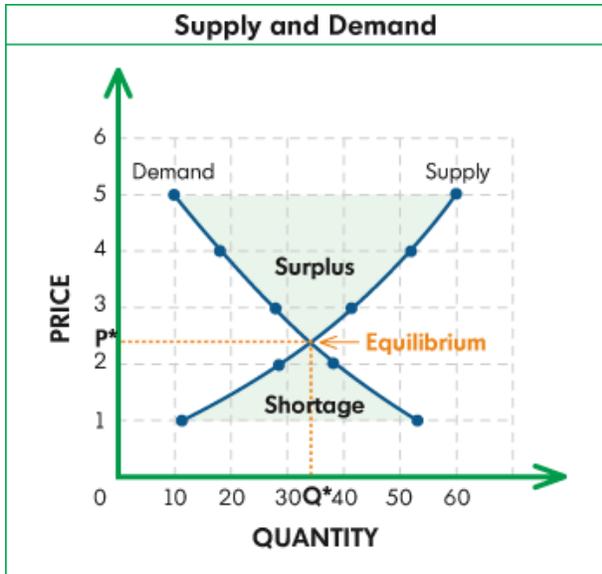
Decision Support System

To ensure supply and demand remain balanced over the long term, technical analyses of water quality and quantity must be conducted, by watershed, on all of the State's surface and ground waters. The analyses should consider water demand changes in, but not limited to, population growth, industrial growth, agriculture uses and practices, recreation, and tourism and wildlife. A decision support tool should be developed, with proper peer review, to perform these analyses. The tool should be flexible enough to allow decision makers to allocate water efficiently and effectively.

It should be able to run varying scenarios incorporating changes in water supply and demand. Examples of scenarios could include retaining additional water within a region, supplementing surface water with groundwater during dry times and then recharging during wet periods, importing water from other regions or out-of-state, increasing the use of treated wastewater, and increasing the use of marginal waters.

The tool also should be flexible enough to allow for decreases in demands through conservation, improved efficiencies and technologies, and economic development restrictions. The tool should be used to prioritize the development of infrastructure to meet the demand for present and future use on a regional and statewide basis.

The Oklahoma H2O tool appears to meet these objectives. Scientists and economists from diverse fields should ensure that information input into the tool is accurate and that geographic information systems (GIS) is used to link water demand and availability over time and area. Water uses and availability should be monitored to help inform the input data. To keep the output from the Oklahoma H2O tool accurate, periodic review of the input data is necessary. These reviews should be done



in-between water plans or when significant change happens. As technology advances, the tool should be updated.

Continuous Funding

Adequate and consistent funding is imperative for the water plan to be successful. Funding for operations must be from a source that does not require a yearly appropriation, for example, by designating a percentage of the gross production tax. Infrastructure funding should be implemented through appropriations, bond issues, grants, etc., but funding for operation and replacement of infrastructure must be continuous.

Planning Horizon

Oklahoma’s current water planning regulations require the OWRB to project the State’s water needs for the next 50 years. To protect Oklahoma’s water, the planning horizon should be changed to 100 years and should be updated every five to ten years.

Topic 9: Recorder’s Notes

It was suggested that plan implementation should be funded through an increase in the gross production tax. It was mentioned that Oklahoma has one of the lowest oil and gas production taxes in the country. The workgroup also commented that funding needs to be continuous and at a level that will work; it should not be done through a yearly appropriation. Education on funding and maintenance is important. It is one thing to secure funding to build infrastructure, but it is another to have money always available for maintaining the infrastructure. Water providers need to keep this in mind.

The technical and scientific information is important. Until studies are completed, major decisions should not be made. Decisions should not be based on politics but on the science and technical work. It was mentioned that when looking at the data the nine climactic areas of Oklahoma should overlay the data set. Information also should include the droughts of record for each area. Studies should be done on the social and economic impacts when water is transferred out of an area.

The workgroup discussed the use of the word metering versus monitoring. It was first suggested that uses should be metered, but some participants thought monitoring would be a better word choice as it is more socially acceptable. Inserting the word sustainability was suggested.

The suggestion on extending the planning horizon came from the workgroup that discussed Water Sales & Transfers. Some in that workgroup wanted the planning horizon extended to 100 years; if Texas is planning on a 100-year horizon, Oklahoma should to the same. They also suggested that revisions should be done every five or ten years and that this will ensure accuracy in the numbers. The workgroup suggested that the planning horizon be changed to cover 100 years for the next plan update.



Topic 10

Stakeholder Involvement

Stakeholder Involvement

Planning Workgroup Facilitators: David Nowlin and Debbie Sharp

GROUP

Facilitators: David Nowlin and Debbie Sharp.
Experts: Ed Rossman, U.S. Army Corps of Engineers; Nicole Rowan, Camp, Dresser and McKee. Participants: Dan Lowrance; LaDonna McCowan-Ferrier; Tim Bartram; Merritt Taylor; Darryl Hunkapillar; Monroe Hannon; Karen Weldin; John Stahl; Kenneth Komiske; Shanon Phillips; Jean Anne Casey; Amy Ford; J.T. Winters; Bill Sims; and Jim Rodriguez.

QUESTION

How should citizens and non-government organizations be involved in implementing water resource management programs and future plan updates and revisions?

1. *Organization of stakeholder advisory groups*
2. *Group responsibilities and authorities in plan implementation*
3. *Stakeholder involvement in plan updates and revisions*
4. *Funding of group activities and education needs*

Four workgroups in addition to the one assigned to the theme of stakeholder participation in the OWRRI Planning Workshops discussed the need for continued grassroots involvement to allow all voices to be heard. On November 3, 2009, OWRRI invited two people from each of these themes to discuss the roles of the various stakeholder participation approaches that had been suggested.

The approach that follows is the outcome of their deliberation. (The “Editor’s Note” below includes descriptions of the other four approaches that were developed.)

Stakeholder Advisory Groups

A three-level arrangement of advisory groups should be established: local, regional, and statewide. Membership on these groups should include, but not be limited to, representatives from local organizations, tribal nations, industry, municipalities, rural water districts, tourism, recreation and individuals based on watersheds, aquifers, or both. These groups should be grassroots driven and all inclusive. Local groups should be established initially. One or more local organizations should be identified that could serve as host to provide administrative support. These local groups should then select representatives to serve on regional groups based on 13 major watersheds in Oklahoma. Citizens selected for the 13 regional groups should be representative of stakeholders in the area, and some, if not all, should be elected to prevent the process from being politically hijacked. Finally, a State advisory board should be formed with representatives selected by the regional watershed groups.

The groups should serve various roles. One role should be to formulate policy advice, funneled through the state group, to the State government on water issues such as water use permits, land use practices, water planning, and water quality protection. Another role, especially of local groups, should be to make decisions to resolve zoning and planning conflicts with an appeals process to the appropriate adjudicative agency

Regional conflicts and trans-local water issues such as infrastructure and water sales and transfers could be mitigated using the regional groups, working through the state group, with the appropriate State agencies or regulatory authorities. A third role should be to participate in educational programs to keep citizens informed about water issues, encourage conservation, and help land users employ best management practices to reduce pollution.

Editor's Note: The following approaches to stakeholder participation were developed by four other workgroups. They are included here to provide a background for the three-level approach described above.

From Topic 3 Workgroup Land Use Practices

Regional Watershed Coalitions, With a State Coordinator

The State should facilitate diverse stakeholder involvement in the planning and implementation of best management practices to address water quantity and quality concerns. To accomplish this, the State should enact legislation to create a statewide framework of 13 watershed-based coalitions with diverse representation, including but not limited to citizens, local, state, tribal and federal authorities, and non-governmental organizations.

Implementation should be coordinated through the Governor's cabinet-level authority, working with several State agencies.

The 13 coalitions should identify local land use practices that affect water quality and quantity and develop action plans and recommendations. These plans should be informed by technologies used to identify and monitor problems such as erosion and invasive species.

Research that develops or improves existing best management practices also should be incorporated into the plans.

The coalitions could identify special local needs that should be addressed by appointing a subcommittee or task group. Tulsa and Oklahoma City would be included in their respective coalitions with any special needs being addressed through the subcommittee structure.

To assist in the implementation of the plans, the State should provide technical water quality experts to local areas and tie grant eligibility to best management practice education and water quality impacts.

Topic 10: Recorder's Notes

The groups should be established with a consistent format so they are coherent statewide. The groups should act in a fair and flexible manner. It will take a massive education effort to make people aware of water resource issues and how they are affected. Concern was expressed that it would be difficult to get people to serve on the groups and that is why the education component is important.

Consideration should be given to representation on the groups. The participants want equal representation of water resource interests, but some concern exists that Tulsa and Oklahoma City could overrun the groups, thereby having greater influence. Other participants pointed out that Tulsa, Oklahoma City and the Native American tribes can be good allies when you educate them on the issues.

One point of discussion focused on what the groups could and could not do. Initially one of the strategies being discussed had listed what the groups could not do. This restriction was a cause for concern for some participants. The language indicated the groups could not make policy, rules, regulation or do enforcement.

Some in the workgroup thought it was important to remove that language since this is a plan for the future, and at some point, it might be important for these groups to have that ability. Therefore, the "cannot make" language was stricken from the strategy to allow for more flexibility in the future.

Another suggestion was that the Councils of Government (COGs) be used as a host or to provide administrative support. Wording was changed to "local entity" because the COGs are political, and it is best to keep the politics out of the groups as much as possible. It was explained that the COGs were only suggested to provide support since they do that for other organizations and are already established; there was no intent that they actually run the groups.

**From Topic 6 Workgroup
Surface and Ground Water Relationship**

Water Management Districts

State law should create water management districts under the jurisdiction of the OWRB. The districts should have the authority to plan, set policy and enforce those policies.

**From Topic 7 Workgroup
Water Sales and Transfer**

Local Planning and Development Authority

Local planning and development authorities should be established in basins-of-origin and importing basins to make decisions regarding investments, infrastructure, and expenditures. These authorities must have the right to provide input into water right permits for sales and transfers within Oklahoma.

They should participate in policy decisions and revenue distribution through a State entity such as the OWRB. Members of local authorities may include representatives of county commissioners, municipalities, State legislators, conservation districts, master conservancy districts, USDA Resource Conservation & Development districts, OSU Cooperative Extension, rural water districts, business owners from Chambers of Commerce, and Department of Wildlife.

**From Topic 9 Workgroup
Balancing Supply and Demand**

Regional Groups

Some authority for management of water resources should remain in each region rather than be centralized in State government. Regional groups should be established to manage water infrastructure and handle other issues, such as information sharing, conflict resolution, and monitoring current and forecasted water supply and demands. These groups could help implement certain provisions of the water plan.

It is important that local people be involved, as they better understand the issues are in each region and have established working relationships local people.



Examples of how these groups could be established include the USDA Resource Conservation and Development districts, or between local governments similar to the association between Bethany and Warr Acres (who have a jointly owned wastewater treatment plant). The organization of these groups could start under an existing organization for the short-term and then develop their own structure over the long-term.

However, the groups should not follow political or geographic boundaries, but rather watershed boundaries. The regional organizations must be broad-based and have local input, but also must communicate with each other.

Members should be selected to represent all interests within the region including water owners, suppliers and users. The State should oversee the groups and provide administrative and technical support.



Topic 11

Local & Regional Planning Issues

... in the state plan ...

Local and Regional Issues in the State Plan

Planning Workgroup Facilitators: Brad Tipton and Kimberly Williams

GROUP

Facilitators: Brad Tipton and Kimberly Williams.
Experts: Joe Freeman, Oklahoma Water Resources Board; John Rehring, Camp, Dresser and McKee.
Participants: Kent Fletcher; Macy Strom; Gene Whatley; Rodney Ray; Tom Hendrix; Chad Trainer; Shawn Geurin; Dick Scalf; Steven Jolly; Bruce Boyd; Cheryl Dorrance; John Swihart; Kevin Murphy; Shawna Turner; John Harrington; Bob Baxter; Cliff Downing; Bill Wilson; Alan Riffel; and Jim Lindsey.

QUESTION

What is the appropriate relationship among local and regional water planning authorities and between local/regional water plans and the State water plan?

- 1. Interface with regional/local planning processes and/or the inclusion of region/local provisions in the State plan*
- 2. Division of planning and implementation responsibilities between state and regional/local authorities*
- 3. Technical assistance in local and regional planning*
- 4. Coordination of access to water supply (reservoirs, aquifers, rivers)*
- 5. Regionalization of infrastructure (shared infrastructure)*
- 6. Funding of local and regional infrastructure (water and wastewater collection, treatment, and distribution)*

State Facilitated Local/Regional Planning

The State should facilitate the establishment of local and regional planning processes. A template or model for these plans should be developed. This template should be based on existing state

frameworks. The State should provide technical assistance and funding that will encourage local and regional cooperation, efficiency, and consistency to meet current and future needs for population growth and economic development.

The plans should include provisions that provide adequate service for population growth and economic development including anticipating uniform density-based requirements that address inadequate fire protection, sub-standard distribution systems, and inconsistent standards. The plans should include recommendations of how regional cooperation in anticipation of regulations will occur, as well as regional cooperation in addressing supply versus demand. Water systems should review water treatment and distribution systems to ensure that they are efficient. These local and regional plans should be included in future statewide planning.

Organic Local/Regional Planning

Incentives for Regional

Cooperation in Conservation and Storage

Incentives and rules should support “organic” associations (bottom-up) built on mutual interest to develop coordinated, cost-efficient water management. Lending and granting agencies should coordinate to avoid funding at cross-purposes. The OWRB should facilitate and incentivize regional cooperation for building water storage and encouraging conservation. Incentives for conservation are necessary; conservation is not just a matter of storing or providing more water but also using less water.

Coordinated Planning Policy

The State should encourage public policy that incentivizes and funds planning assistance, technical assistance, and regional cooperation. The goal of the policy should be to encourage conservation, reduce inefficiencies, prevent

Carrots or Sticks?

Cheryl M. Dorrance, Research Director, Oklahoma Municipal League

Deeply inbred into the Oklahoma psyche are the urges to be independent and self-reliant combined with a will to help neighbors in distress. On the flip side is a “me first” preservation instinct with desire to be a “hog in the manger” and control all of the resources regardless of need and consequences. These later instincts can lead to the water wars as stated in the quote attributed to Mark Twain “Whiskey is for drinking, water is for fighting over.”



higher salaries. In rural Oklahoma an aging work force, limited certified operators, and low pay hinder operations. The surveys for the water plan indicated that most systems do not have 20-50 year plans for water supply or the resources to complete those studies independently.

According to statements by DEQ Executive Director, Steve Thompson in an address to the Governor’s Water Conference, 80 percent of

How will these factors play out in Oklahoma water plan implementation? Which will prevail? A delicate balance is required to allow communities of Oklahoma to guide their futures in consort with the “big picture” of statewide resources provided by the water plan.

Throughout the water planning process participants have been told that regionalization will be essential in the final recommendations. Why?

We can’t afford the current situation.

EPA estimated that \$5 billion in water/wastewater infrastructure improvements will be required in Oklahoma in the next few years. Aging infrastructure, growth, and increasingly stringent federal regulations are driving the costs of improvements beyond the financial abilities of the citizens that own the systems. Currently 37 percent of public water and wastewater systems are out of compliance with Department of Environmental Quality, DEQ, regulations which are driven by federal mandates.

Many systems are unsustainable.

Not only can the systems not afford the infrastructure costs, they are challenged to meet operational demands. Increasingly stringent regulations mean increasingly complex operations and expenses. Water and wastewater operators require higher levels of education and, justifiably,

Plan “B” is Not Enough

Systems need the state water plan to provide viable alternatives for water supply. For example in the 2006 drought, the communities of Cleveland and Pawnee had their own primary water supplies, Plan A. Plan B, in case of shortages, was to turn to Lone Chimney Lake which was impacted by the same drought. Critically low levels at Lone Chimney made it not only unable to supplement Cleveland and Pawnee but to supply its primary users. Talks began about a pipeline to Kaw Lake. The statewide water plan needs to work with local and regional providers to develop viable long-term water supplies.

Oklahoma citizens receive their water from systems that can obtain, treat, and distribute water and meet federal drinking water standards.

Of these, 40 percent are served by the nine largest systems. The remaining 1,450 systems serve the remaining 20 percent of Oklahomans.

Our problems with water in Oklahoma are not so much those of quantity but of distribution. Well-reasoned water law in Oklahoma defines ground water as private property and stream water as belonging to the people of Oklahoma.

The existing system of water rights and permits needs to be complemented by a strategy to provide

adequate supplies to all areas of the state. Local and regional cooperation are means to provide the interoperability and cooperation to address statewide water needs.

So if regionalization is the wave of the future, just how will it develop and who will be in control?

Will it be a top down dictate from the state with geographically static districts that vie with one another for resources like Texas? Water wars can occur between instate districts as easily as between states. Water systems are not defined by watersheds, cogs districts, or other artificial means. Some systems get water from outside of their watersheds and would be restricted by artificially mandated boundaries. Will regionalization be allowed to develop as systems join together for common goals?

What is regional cooperation for public water supply?

System cooperation needs to be based on the particular needs of the area of the state and grow “organically” from the needs of that area. The Arbuckle-Simpson area communities have great concern for protection of streams and springs that are a regional asset but they, also, need reliable public water supplies. Panhandle residents may be more concerned about aquifer depletion and conservation than surface water assets. Local solutions need to be implemented within the context of state law and long-term viability.

Regional cooperation may be as simple as agreements to provide interconnecting system links to provide emergency water to a neighboring system. Or like the Granite example, included in the box (see right), it may be the creation of a regional trust to shoulder the high construction and operation costs of a reverse osmosis system that would be cost prohibitive for individual members.

It could be a number of rural water systems joining together for both water supply and to hire well-trained operations staff. The point is that the solution should be based on the needs of the area not a mandate from the state.

***An Oklahoma Municipal Profile
Cooperation Yields Economy of Scale
Granite area, Population 1,844***

The towns of Granite, Lone Wolf and Martha, along with the Oklahoma State Reformatory, Quartz Mountain Resort and communities of North Shore and Boydville were all under consent orders by DEQ for water quality violations due to high nitrate levels. They formed the Quartz Mountain Regional Water Authority. Each member contributed \$30,000; Granite received a \$500,000 Community Development (CDBG) grant. Then, the members secured \$3.8 million in grants/loans from RDA. The new regional reverse osmosis plant provides high quality water to the partners at a reasonable price saving millions in construction and operation costs.

What are the most successful ways to motivate people to cooperate?

Civic Responsibility - Appeal to the Oklahoma standard to help neighbors in need and work together for a common solution. When the state provides the basic water supply picture, presents options for water supply and information on funding availability this incentive can work in conjunction with other approaches.

Train wreck -drought, fund shortages, pollution (A little train wreck isn't always a bad thing). Crisis promotes change. When times are comfortable the need for efficiencies and long-term planning often seem remote. Whether the driving force is drought, high prices, pollution that makes a current water supply untreatable, or new federal regulations, crisis can be the catalyst for cooperation.

Government mandates and forced solutions - New forced solutions can come in the form of dictated regions with consolidation of systems required along regions with strict boundaries. Like proposals for school consolidation this approach can lead to citizens push back. Federal government mandates can have a similar impact. New federal

water regulations are promulgated at the rate of about one a year. Disinfection Byproducts (DBI), Disinfection Byproducts II (DBII), arsenic, nitrates, Crypto, NPDES, you get the idea. Each year water treatment and wastewater disposal become more costly pushing marginal systems into prohibitively expensive operation and infrastructure costs. The city of Muskogee, by no means a small system had a \$250,000 increase in chemical costs in one year just to address the Disinfection Products II rule. It can become untenable to keep the system running under the new requirements.

Money - Money may be the “root of all evil” but it is a superlative motivator for change. Induced by the need for change, money can be a superlative trigger for regional cooperation. When water & wastewater funding are tied to efficiencies in systems, the incentive is enhanced. In the past the funding programs have been designed to fund systems that have a need and can repay the loans or qualify for the grants.

It’s time to ask some tough questions? Who is taking care of the people at the bottom of the tax chain, the citizens of Oklahoma? Why would the state fund a program when people can be better served with more reliable water with back-up supplies, and at a lower cost? If a system chooses independence over efficiency why should the loan and grant programs subsidize their decision?

What Are You Going to Do on Day Two?
A favorite story of mine comes from Jerry Johnston, long time mayor of Braman, OK, population 244, who served on a national EPA small communities committee. When he asked EPA what they would do when Braman was unable to meet a new proposed requirement the EPA spokesman told him that EPA could fine him up to \$25,000 a day. Mayor Johnston’s response, “What are you going to do on day two?” Many small systems are in the same predicament. Fining them won’t solve a problem that they can’t afford to fix.

If Oklahoma wants to avoid new and costly artificially created bureaucratic structures, what are the options for local and regional cooperation? Actually several legal structures are in place that can be used to allow local systems and citizens to work together for their water future. Options include, but are not limited to trusts, conservation districts, inter-local cooperation agreements, conservation districts, mutual aid agreements, contracts and irrigation districts. These are means currently legal and in use in Oklahoma.

What is the role of the state water planning in regionalization?

First the OWRB should serve as the central clearinghouse for all water planning knowledge. They have the “big picture” of how all of the puzzle pieces fit together. This includes the statewide supply and demand information and the responsibility to assure that resources can be made available for public water supply in all regions of the state.

Secondly, they, along with other state agencies provide the technical assistance to facilitate regional cooperation.

Thirdly, they need to encourage sustainability of Oklahoma’s water supplies. Economic development depends on knowledge that the providing system will have ample water to meet both current and future user demands under all conditions.

Fourthly, and very importantly, they need to help motivate systems toward coordinated, cost efficient water management and conservation.

If regionalization is necessary and desirable, the question is how it will be accomplished? Once a comprehensive water plan is in place with reliable supply and demand information and implementation options, the structure is in place to start. With proper support and incentives the Oklahoma standard can prevail in a community oriented approach to regional supply issues.

A (Very) Basic Glossary

Jeri Fleming, Oklahoma Water Resource Research Institute, Stillwater

Acre-foot (acre-ft) – the volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot. Equal to 325,851 gallons or 1,233 cubic meters.

Aquifer – a geologic formation(s) that is water bearing. A geological formation or structure that stores and/or transmits water such as to wells and springs. Use of the term is usually restricted to those water-bearing formations capable of yielding water in sufficient quantity to constitute a usable supply for people's uses.

Appropriation Doctrine – The system for allocating water to private individuals used in most Western states. The doctrine of Prior Appropriation was in common use throughout the arid west as early settlers and miners began to develop the land. The prior appropriation doctrine is based on the concept of "First in Time, First in Right." The first person to take a quantity of water and put it to Beneficial Use has a higher priority of right than a subsequent user. Under drought conditions, higher priority users receive water. Appropriative rights can be lost through nonuse; they can also be sold or transferred apart from the land. Contrasts with Riparian Water Rights.

CREP (Conservation Reserve Enhancement Program) - A voluntary program of the USDA's Farm Service Agency that offers agricultural producers compensation for keeping land out of production. Goals include protecting environmentally sensitive land, decreasing erosion, restoring wildlife habitat, and safeguarding ground and surface water

Cubic Feet Per Second (cfs) – a rate of flow, in streams and rivers, for example. It is equal to a volume of water one foot high and one foot wide flowing a distance of one foot in one second. One "cfs" is equal to 7.48 gallons of water flowing each second. As an example, if your car's gas tank is 2 feet by 1 foot by 1 foot (2 cubic feet), then gas flowing at a rate of 1 cubic foot/second would fill the tank in 2 seconds.

Desalinization – The removal of salts from saline water to provide freshwater. This method is becoming a more popular way if providing freshwater to populations.

Drainage Basin – Land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large drainage basins, like the area that drains into the Mississippi River contain thousands of smaller drainage basins. Also called a Watershed.

Flood, 100-year – A 100-year flood does not refer to a flood that occurs once every 100 years, but to a flood level with a 1 percent change of being equaled or exceeded in any given year.

Groundwater – (1) water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table. (2)

Water stored underground in rock crevices and in the pores of geological materials that make up the Earth's crust.

Groundwater Recharge – inflow of water to a groundwater reservoir from the surface. Infiltration of precipitation and its movement to the water table is one form of natural recharge. Also, the volume of water added by this process.

Public Supply – Water withdrawn by public governments and agencies such as a city/county water department, and by private companies that is then delivered to users. Public suppliers provide water for domestic, commercial, thermoelectric power, industrial and public water users. Most people's household water is delivered by a public water supplier. The systems have at least 15 service connections (such as households, businesses, or schools) or regularly serve at least 25 individuals daily for at least 60 days out of the year.

Recharge – Water added to an aquifer. For instance, rainfall that seeps into the ground.

Riparian Area - The land bordering a stream, river or other generally flowing bodies of water

Riparian Water Rights – The rights of an owner whose land abuts water. They differ from state to state and often depend on whether the water is a river, lake, or ocean. The doctrine of riparian rights is an old one, having its origins in English common law. Specifically, persons who own land adjacent to a stream have right to make reasonable use of the stream. Riparian users of a stream share the streamflow among themselves, and the concept of priority use (Prior Appropriation Doctrine) is not acceptable. Riparian rights cannot be sold or transferred for use on non-riparian land.

Stakeholder - Anyone interested in or affected by a decision. The management of a state's water resources affects every citizen. Therefore, every citizen is a water stakeholder.

Surface Water - water that is on the Earth's surface, such as in a stream, river, lake, or reservoir.

Wastewater – water that has been used in homes, industries, and businesses that is not for reuse unless it is treated.

Water Quality – as term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Water Table – the top of the water surface in the saturated part of an aquifer.

Watershed - The area that drains into a stream, river or lake.

Wetland - An area that is saturated by surface or groundwater with vegetation adapted for life under those soil conditions such as swamps, bogs, marshes, etc.

Planning for Rural and Small Municipal Water Systems

Ellen W. Stevens, Ph.D., P.E., Civil Engineering Consultant

In providing water to their customers, rural and small municipal systems face planning issues that may differ from those present in more densely populated urban areas. Where previously rural water systems served primarily modest homes and farms, expanding suburban growth has brought consumers with urban expectations.

These new consumers are building larger homes with many water-using appliances and installing lawn sprinklers. This combination of escalating demand and higher expectations has put a strain on many rural water systems. While many urban systems have developed a master plan, this is not the norm for rural and small municipal systems, yet is every bit as necessary and useful.

This paper will look at three issues for rural and small municipal systems – consumer base, the technical challenges to distributing water to the consumers, and funding - and propose how planning and education can help in managing those issues.

Consumer Base:

Slow, Nonexistent, and Unpredictable Growth

Predicting growth and development for rural systems can be more difficult than for urban areas. Typically, unincorporated areas do not have any sort of comprehensive planning or zoning to use as a basis for predicting future population density. A lack of reliable projections of future consumption makes financing infrastructure improvements a risky proposition. Another problem is that growth may, in fact, be negative. During the 1980's, the unincorporated portion of 33 of out of 77 Oklahoma Counties lost population (US Census Data). The 1980's "oil bust" explains some of this, but 17 out of those 33 counties continued to lose population between 1990 and 2000. Maintaining sustainable system finances and debt management depends on having access to realistic population projections.

Technical Challenges:

The Solution is the Problem

A frequent reaction to pressure complaints is to assume that installing larger water lines is the answer. Similarly, when older lines need to be replaced there is a temptation to install a larger line under the assumption that the cost difference is modest and the larger line will serve any future needs. However, another challenge frequently faced in sparsely-populated water systems is water aging which can result in complaints about poor taste and odor and also result in a loss of chlorine residual (which poses a health risk). Chlorine residual dissipates over time and, particularly in low-usage winter months, there is not enough consumption to prevent water from being stored for long periods of time. In a municipal system where there is generally adequate circulation, adding internal loops and looping dead ends is a solution to water aging.

However, in many rural systems, adding loops may just compound the problem. An example is RWC No. 3 in Payne County. Average-day winter demand in this system is about 530,000 gallons and storage within the water lines – not including the standpipes – is about 720,000 gallons. There will be circumstances where adding pipes is productive, such as when the gap to close is short or to provide an alternate feed to a zone fed by a single pipe. The important planning issue is to consider the installation of any new or larger water lines from both the pressure and water quality perspectives.

Another planning issue in rural and small systems is an inadequate number of valves and hydrants. A lack of valves results in having to shut down large portions of a system for repairs and greater waste in the event of line breakages. Flush and fill hydrants are particularly necessary if water aging is present and the system stores more volume than is consumed on a daily basis, as line flushing is about the only way to eliminate aged water.

Replacing old water meters has been demonstrated to be effective at increasing revenues. Payne Co. RWD No. 3 reported a nearly 100 percent increase in revenue was achieved where meters 10 to 30 years old were replaced.

Funding:

Always a Challenge but Help is Available

Negative or very slow population growth represents an obstacle to funding system improvements, as the cost must be borne almost entirely by the existing consumers. Sparse populations also increase the cost of day to day operations for the individual consumers as well.

A classic example of the difference between city and rural water systems can be seen in the Piedmont Municipal Authority, which includes the City of Piedmont and unincorporated areas of Canadian and Kingfisher Counties. The entire system includes about 190 miles of pipe, about 50 percent outside the city limits. However, only about 20 to 25 percent of the accounts are outside the city. Length of pipe to maintain per account averages about 1,000 feet in the rural portion and about 250 feet inside the city.

Fortunately, the value of providing safe drinking water to rural residents has been recognized as sufficiently important that assistance is available, including from the USDA Rural Utilities Service and the Drinking Water State Revolving Fund (DWSRF). In 2009, funding from the American Resource and Recovery Act provided about 20 percent principal reduction for DWSRF loans closed before the end of 2009.

In general, a prerequisite for obtaining funding from these programs is documenting the need for the project (problem to be solved), appropriateness of the project for solving the problem, and that the system has the resources to repay the loan, operate and maintain the project, and continue to support their present O/M and debt obligations.

Education of System Managers:

Planning is Not an Empty Academic Exercise

An awareness on the part of rural water system boards, trustees, and operations personnel of the value of planning studies and of a thorough assessment for all short and long term capital improvements would aid them in dealing with the issues described here, along with others not covered.

Realistic predictions of customer base and future consumption and water sales gives the system information needed to manage current obligations and evaluate any proposed debt.

These predictions also provide a basis for evaluating how far into the future a proposed project will serve before additional capital improvements are needed.

A planning study that includes a hydraulic analysis (network model) lets system operators predict all the impacts of a proposed improvement and avoid solving one problem by creating another. A hydraulic

study can also assist to prioritize and plan a phase-in of multiple proposed projects.

Finally, having a planning study in place and reasonably up to date puts the system one step ahead in obtaining funding through RUS or DWSRF, particularly when time frames are short for completing the application process, as they were with the ARRA funds in 2009. Jim Russell of Payne Co. RWD No. 3 summed it up excellently: "Everyone needs a 30-50 year plan for available water and water lines. Almost no one has done a water budget and generally they can do that themselves. The hardest part is getting started."

Conclusion

We have many rural water systems and thus would be well served by emphasizing planning for rural and small systems and providing educational and financial resources to help them get started.



Pryor, OK

Where to Start? With A Voice!

Amy Ford, President, Citizens for the Protection of the Arbuckle-Simpson Aquifer

When I was asked to write a background paper for The Oklahoma Academy Water Town Hall, as a “water expert”, I was quite humbled. Had you asked me ten years ago my views on water, I would have stared at you blankly and uttered some mindless answer. Today, however, I have a quite different view. Although I am far from being a “water expert”, I have come to have a greater appreciation, not only for this precious resource, but also for the value of the voices of the citizenry in the process of how it is managed.

Our Challenge

First, a little background. In 2002, several citizens in southeastern Oklahoma got wind of a proposed pipeline that would carry water from the Arbuckle Simpson Aquifer to communities west of Oklahoma City. As you might imagine, this proposed pipeline into the Aquifer and the ultimate pumping of as much as 80,000 acre-feet of water per year from the Aquifer, was of great concern. The cities of Ada, Ardmore, Durant, Sulphur, Davis and Tishomingo (as well as a number of smaller towns and rural residents) are dependent on the Aquifer for their water needs. Turner Falls, Chickasaw National Recreation Area, Slippery Falls Boy Scout Ranch, Falls Creek Youth Camp, Camp Classen and others, are but a few attractions that depend on water flowing from the Aquifer to survive. To those of us who rely on the Aquifer not only for our domestic use, but also understand the value of water in our area for agriculture, economic viability and recreation, the pumping of the aquifer, without a full understanding of the consequences of this pumping, would be devastating.

CPASA Formed

It was out of this concern, and a growing number of concerned voices, that The Citizens for the Protection of the Arbuckle Simpson Aquifer (CPASA) was formed. To date, CPASA encompasses a large number of landowners and citizens whose lives are directly affected by the aquifer. We are, by and large, families who have

chosen to live in rural Oklahoma for a number of important reasons. One of which is our water. Whether it is wading in our creeks, swimming in our rivers or fishing in our ponds, those of us who have chosen to buy our land by the acre, instead of by the lot, have a deep understanding of the value of this precious resource.

In 2003, CPASA sought to have legislation introduced with the expressed goal of protecting the springs and streams of the Arbuckle Simpson Aquifer. As a united citizenry, CPASA sought a scientific study that would allow a full understanding of the Aquifer and our impact upon it. Hundreds of CPASA members spent countless hours during the legislative session educating our lawmakers, packing the Senate and House chambers, in order to let our legislative leaders know how important the value of the water is to our area. Farmers, ranchers, business and community leaders, as well as grassroots citizens, spoke with one voice. While CPASA appreciated that there were areas of the state looking at alternative water



Turner Falls in Oklahoma's Arbuckle Region

sources for their citizens, it was vital that our lawmakers understood that the “robbing Peter to pay Paul” mentality was simply unacceptable and ultimately unsustainable. CPASA took great pride in helping get SB288 passed and ultimately signed into law. However, the passing of SB288 was but the first step in this long and tedious process and our work was just beginning.

Having completed the study and coming to terms with its meaning and significance, we, now, are in the implementation phase. The Citizens for the Protection of the Arbuckle Simpson Aquifer has made formal recommendations, based on the science presented, as to how they would like to see the Aquifer managed to provide a sustainable water source well into the future. As communities, individuals, businesses, and every other entity that overlies the Aquifer, work through the terms of implementation, we must remember that the ultimate goal of protection and sustainability is paramount. The science of the Arbuckle-Simpson study has given us a roadmap of how to manage a unique and wondrous natural resource. We must manage it to our maximum benefit and to the benefit of generations to come.

The Challenge Continues

Sadly, challenges to the management of the Aquifer did not end with the passage of SB288. In 2005, an aggregate mining company filed a new application for a groundwater permit for their mining operation near Mill Creek. It was at this time that CPASA learned that water that infiltrates into a mining pit is completely unregulated by any State agency and thus, once again, the troops were rallied. CPASA members and other interested parties protested this new groundwater application on a scale far beyond anything ever seen by the Oklahoma Water Resource Board.

Following weeks of hearings, attended by hundreds of CPASA members, the OWRB issued its ruling. This ruling included the Oklahoma Water Resource Board’s assertion of jurisdiction over the pit water. But, as with most things these days, lawsuits were immediately filed and while common sense would dictate that water that flows into a hole dug

in the ground and used for purposes other than fishing, should fall under the jurisdiction of the Oklahoma Water Resource Board, and thus be subject to regulation, the courts found that there was no provision in the law governing pit water. Now, when we look toward the implementation of SB288, the question is: How can we ask the citizens who overlie the aquifer, the cities who rely on the aquifer for municipal use, the farmers who irrigate their crops and every other permitted user to follow specific guidelines and yet to leave a special carve out for the mining industry is simply incomprehensible!

And so our fight continues.

Summary

Now, as we move forward with the Comprehensive Water Plan, local and regional issues must be addressed on an ongoing basis. It is incumbent upon us all, as citizens of Oklahoma, not only to pay attention to the issues of water management within our own water sheds, but also to hold our leaders accountable and require them all to be good stewards of Oklahoma’s natural resources as a whole.

So, the ultimate lesson learned from all this is that you too can have a voice in the process. The idea that a few citizens cannot bring about a paradigm shift to current policy or law, simply, is not true. But first you must pay attention! The idealist view that “others” will handle the heavy lifting on something as important as our natural resource management, and thus be looking out for your best interests, often does not hold true.

Educating yourself, building rapport with your neighbors, city leaders, legislative representatives and the Oklahoma Water Resource Board, is imperative. Framing disputes in such a way as to offer a clear picture of your objectives is vital.

You need not be a hydrologist, geologist, or an attorney to understand the value of building a collective coalition with a common goal: to protect the value of one of Oklahoma’s most precious resource, water.

Regional Approaches and Partnerships

Suzi Zakowski, Audubon International and Carole Davis, City of Dallas

Reprinted from “Long Term Sustainability Planning: Why a Regional Approach Is Most Effective” by Suzi Zakowski, Sustainable Communities Planning Manager, Audubon International”, February 2010 Journal of the American Water Works Association, page 24. Reprints available from AWWA. Permissions granted by AWWA.



Communities across the country are showing an increased interest in long-term sustainability planning. From reviewing comprehensive plans to taking climate pledges, there is no wrong way to start taking action to address the environmental, economic, and social issues in a community. However, as municipalities begin to navigate the myriad voluntary programs and mandated infrastructure improvements, it is important to keep in mind that the actions (or inaction) in one town will ultimately affect neighboring communities,

The most effective and efficient way to address emerging issues is through a synergistic regional approach.

Many small states, such as Delaware, have mandated regional collaboration, which ensures that every municipality is updating comprehensive plans for long-term sustainability with an eye toward its neighbors. However, larger states would have to create an entire additional department to oversee such a program.

Just as state lines do not stop water or air pollution, neither can sustainability considerations be confined by artificial boundaries. The process of identifying and standardizing requirements for

addressing unique regional issues would be based on geography, and the best option for regional long-term sustainability planning is collaboration within the most basic foundation of communities: the watershed.

What would a long-term watershed community sustainability plan look like, and what is the process? The steps for regional collaboration would be very similar to the steps individual communities take through Audubon International’s Sustainable Communities Program.

First, form a committee and conduct an assessment. Find out what each community is bringing to the process by taking an inventory of everything currently happening in that community. This can be done by looking at 15 key focus areas, or it can be as simple as comparing comprehensive plans.

Next, list all regional entities actively involved in the watershed. These can be anything from the local soil and conservation district to a high school science club. Compiling a list of partners will reveal resources and help paint a clearer picture of who can be assigned which small projects after the goals have been written.

Once you have a clear picture of the current state of the communities in the watershed and the issues of the watershed and individual communities, you can begin to make long-term plans. Many watershed organizations or regional entities already have a long-term watershed plan in place. The goal should be to build on that foundation and to create a set of collective and individual goals for the communities in the watershed.

Such is the case with the small towns on the outskirts of Rochester, N.Y., each of which faces different challenges. Some have more business development, therefore more big parking lots and storm water issues, whereas others are largely residential with nutrient run-off. The goals should

be over-arching for the watershed, with specific roles for each of the communities and specific project assignments for partners. The resulting plan will be unique to the watershed.

Collaborating with neighboring communities that share a common interest ensures that first and foremost the watershed is protected. Collaboration also gives communities a chance to share ideas and resources. With new sources of funding for projects that involve sustainability planning, emerging technologies, and innovative policies, communities should be working on creating long-term sustainability plans as soon as possible.

By collaboration with neighboring towns first, the process will be more efficient and the outcomes more effective.

Reprinted from "Make Regional Partnerships Count" by Carole Davis, Division Manager, Water Conservation, City of Dallas", February 2010 Journal of the American Water Works Association, pages 18-19. Reprints is available from AWWA. Permissions granted by AWWA.

Dallas: As water purveyors strive to meet the needs of a growing population, resource management has become increasingly important. Broad-based legislation, a tough economy, and special interests make it imperative that those entrusted to deliver water supplies work together toward a common goal – reducing wasteful water use. Although the city of Dallas, Texas, Water Utilities (DWU) has had a voluntary water conservation and education plan for a number of years, in 2001 Dallas leaders took the bold step of adopting the first ordinance in the North Texas region to reduce and, it was hoped, eliminate lawn and landscape water waste.

The ordinance serves as a model for many North Texas cities today. The regulations call for no watering during certain hours in the summer, installation of rain and freeze sensors, and regular maintenance of sprinkler systems, among other things. Although these restrictions were enacted

by a stroke of a pen, education and enforcement – as well as implementation of programs later designed to augment the law – would not be easy. However, public and private partnerships alike have contributed in great measure to the region's success in heightening public awareness of water conservation and reducing gallons-per-capita consumption.

Unified Messages Yield Texas-size Results

In 2007 DWU and the Tarrant Regional Water District (TRWD) teamed up to create a "Save Water" linkage across the Dallas/Fort Worth area. The primary goals for this partnership were to stretch ratepayer dollars and unify the conservation messages being delivered to the public.

For more than a decade, TRWD outreach efforts have primarily consisted of school programs, print media, special events, and the Internet. In 2007 the board of directors approved funding for a full-scope public awareness campaign to include radio, TV, print ads, and billboards. This campaign was authorized in an effort to further reduce peak demand and curb water waste. Recognizing the widespread appeal of the Dallas advertising campaign – dubbed "Save Water. Nothing Can Replace It" – officials solicited DWU support in using the tagline in the Tarrant County service area. The award-winning program now serves as the campaign mantra for both agencies.



Although several water providers serve the North Texas area, the region is a single media market. It is the largest metropolitan area in Texas. Seventeen percent of the Texas population – some 4 million people – are served by DWU and TRWD. Sharing a common theme has provided a tremendous opportunity for the water agencies to reach more residents, reduce advertising costs, spur behavioral change, and boost the public image of both organizations.

Since the water conservation ordinance was adopted, Dallas has allocated approximately \$1.3

*Thanks for participating in the
Oklahoma Academy Town Hall*



In the spirit of this cartoon - after this Town Hall you may reflect and say to yourself - "Just think, someday my ideas will be part of Oklahoma's Comprehensive Water Plan."

ACADEMY TOWN HALLS

- 2010 - Municipal Governments in Oklahoma (November 2010)
- 2010 - Water Planning for Oklahoma
- 2009 - Getting Ready for Work: Education Systems and Future Workforce
- 2008 - Oklahoma's Criminal Justice System: Can We be Just as Tough but Twice as Smart
- 2007 - Building Alliances: Tribal Governments, State & Local Governments and Private Sectors
- 2006 - Strategies for Oklahoma's Future
- 2005 - Drugs: Legal, Illegal...Otherwise
- 2004 - Oklahoma's Environment: Pursuing a Responsible Balance
- 2003 - Oklahoma Resources: Energy & Water
- 2002 - The State of Oklahoma Health
- 2001 - Competing in an Innovative World

ACADEMY CONFERENCES

- 2000 - The Oklahoma Constitution: Back to the Future
- 1999 - Technology and Oklahoma's Future: Lighting the Fuse
- 1998 - Technology Applications: Accelerating Toward Prosperity
- 1997 - Education and Training: The Key to a Richer Oklahoma
- 1996 - Crime: Building Safer Communities
- 1995 - Restructuring State, County and Local Government
- 1994 - Entrepreneurial and Small Business Development: Future Economic Growth
- 1993 - Today's Budget Decisions, Tomorrow's Priorities
- 1992 - Oklahoma: Mind Your Own Politics: What Should Oklahoma's Policies Be?
- 1990 - Oklahoma's Future: Choice or Chance?
- 1989 - Oklahoma's Future: Developing our Human Potential
- 1988 - Elementary and Secondary Education: Will Oklahoma Pass or Fail
- 1987 - The Future of Oklahoma
- 1986 - Strategy for Economic Expansion in Oklahoma
- 1985 - Economic Development in Oklahoma



“Moving Ideas Into Action”

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