

# Kansas Water Plan

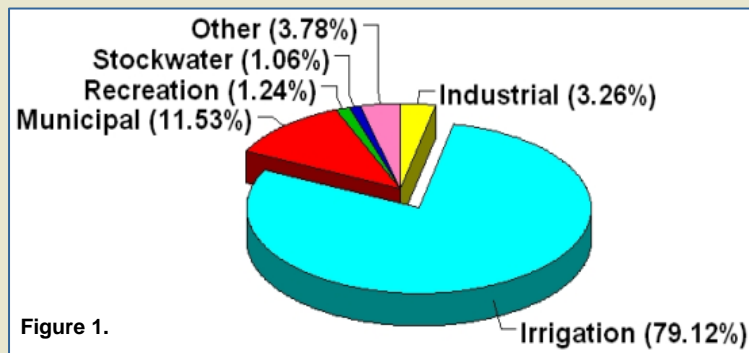
## Water Conservation Policy and Institutional Framework January 2009

This *Kansas Water Plan* Section describes the current policy and institutional framework through which water conservation is addressed in Kansas and provides an overview of progress towards meeting established goals and objectives.

Basin sections of the *Kansas Water Plan* provide additional detail regarding priority basin issues, including water conservation management and public water supply.

### Overview

Due to past water management and development activities, most Kansas cities, towns, and industries generally enjoy an adequate supply of water. In the future, however, the demands for water imposed by a growing population may exceed presently developed water supplies available for municipal and industrial purposes in some areas. Implementing effective water conservation is a critical component of satisfying future water needs of Kansas. Irrigation is the largest user of water in Kansas, accounting for 79 percent (%) of total use (Figure 1).<sup>(1)</sup> Most of that water is from ground water sources. Ground water supplied 96% of reported water used for irrigation in 2006.



Water conservation is essential for the effective management of water resources in Kansas to assure that a sufficient, long-term, supply of water is available for the beneficial uses of the people of the state. Water conservation is defined as careful preservation and protection of water, with attention to the planned management and prevention of exploitation. Reduction of water use or water loss is part of water conservation. Kansas water resource development is moving toward more efficient management and conservation to assure adequate water in the future.

The Kansas Water Authority/Kansas Water Office is responsible for water conservation in state water planning. The State Water Resources Planning Act provides for the formulation of the *Kansas Water Plan* and direction

for water conservation for the state as a whole. The Act also provides for the formation of programs and projects in the interest of effective water resource management, conservation and development; conservation storage in reservoir development; and the regulation of streamflow for the purpose of quality control.

Under the Water Appropriation Act water belongs to the people of Kansas. Not wasting water, in other words using water wisely, is part of the agreement to use water under the Water Appropriation Act. Historically, water conservation efforts in Kansas have encouraged water use efficiency.

Studies have shown that efficiency improvements through technology advancements and water scheduling tools for irrigation improve the benefit from water used, but do not necessarily reduce water consumed.

Changes in regional populations, declining aquifers and streamflows, and a greater awareness of environmental water requirements have increased the pressure on Kansas to not only use the water that is available more efficiently, but to actually conserve water.

It is important to recognize that some conservation practices such as converting from flood irrigation systems to sprinklers may change the dynamics of the hydrologic system, including reduction in the amount of ground water recharge. As irrigation scheduling improves crop production efficiency, less water is available for recharge further reducing ground water levels. As municipalities reuse their wastewater, it is not discharged to streams but may instead recharge ground water or recharge a different location.

Water conservation provides one component through which demand management can be accomplished. Water conservation is the most cost-effective and environmentally sound way to reduce our demand for water. This stretches our supplies farther. For example, the entire U.S. uses less water than it did 25 years ago, even though there are more people. Using less water also puts less pressure on our sewage treatment facilities, and uses less energy for water heating. Saving water also saves energy used for pumping and treating water. Electricity production from fossil fuels and nuclear energy is responsible for 39% of all freshwater withdrawals in the nation.

Kansas has approached water conservation through a combination of education, planning, technical assis-

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tance, financial assistance and regulation. The emphasis is on a combination of education and incentive-based programs. Municipalities, rural water districts, and irrigators learn about the cost-savings that can be realized through water conservation and cost-share available to help them adopt water conservation measures. Voluntary incentive programs directed at irrigation include programs that retire water rights, and movement to non irrigated land use. Incentive programs provide cost-share for many practices related to transitioning to dryland and other water conservation activities. Cost-shared practices, such as terraces, keep water on the land effectively retaining soil moisture for crop use. Buffer strips and no or low till farming also contribute to maximizing the retention of precipitation on the land.

can meet new demands less expensively than developing new supplies or infrastructure.

- **Expanding supplies.** If increased demands can be met from existing supplies of water, then the effect is the same as developing new supplies. Increased economic growth and diversity will not be limited if needs can be met with existing supplies used more efficiently.
- **Environmental protection.** Water conservation can help protect natural systems from both the negative effects of over-withdrawals and the disturbances associated with the development of reservoirs, pipelines, and well fields. Conservation can also improve water quality by reducing wastewater discharges and, in the case of irrigation, by reducing the potential for fertilizer and chemical leaching and runoff.
- **Saving Energy.** Although not a direct water related benefit, energy and water are tied. Less water use reduces the energy costs to withdraw water, deliver water and treat water and wastewater.

Since water conservation is a management tool, it is directly related to two other policy sections of the *Kansas Water Plan*, Public Water Supply and Water Management. Basin priority issues also include related sections including long-term supply, subbasin water balance/streamflow, ground water declines and the role of water reuse in conservation.

Aquifer subunits are defined in the Ogallala-High Plains aquifer to address concerns in each groundwater management district in western Kansas as well as in the associated fringe areas of the Ogallala-High Plains aquifer. Figure 2 shows subunits targeted for management and conservation efforts in western Kansas. The targeted areas have changed, and are expected to change as subunit priorities and goals evolve over time.

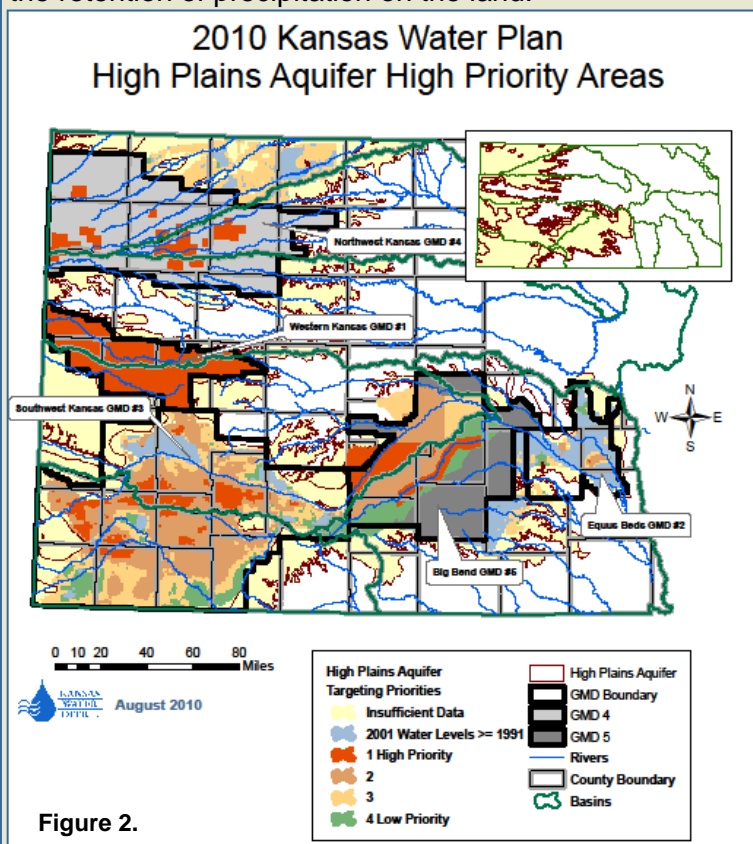


Figure 2.

Conservation efforts work toward a reduction in water use, so efforts are potentially most effective where use is the highest. Critical areas to conserve are where the estimated usable life of the ground water source is short and ground water use is high, or where demand or anticipated demand will exceed the supply.

Put most simply, water conservation is preventing wasteful use of water. Done the right way, water conservation has great potential to deliver multiple benefits:

- **Saving dollars.** Many water conservation measures

### Kansas Water Plan Guidance

The Kansas Water Resources Planning Act provides the statutory authorization for addressing water quantity management in the *Kansas Water Plan*. This Act established long-range goals for the management, conservation and development of the waters of the state, including:

- The prevention of the waste of the water supplies of the state, and
- The protection and conservation of the water resources of the state in a technologically and economically feasible manner.

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The Kansas Water Authority (KWA) approved objectives as part of the *Kansas Water Plan*. Additional objectives were added to the FY 2004 *Kansas Water Plan Update*. An assessment of current conditions related to each objective provides information for targeting of state program resources to areas of greatest need.

### **Kansas Water Plan Objectives**

- Reduce the number of public water suppliers with excessive “unaccounted for” water by first targeting those with 30 percent or more “unaccounted for” water.
- Reduce the number of irrigation points of diversion for which the amount of water applied in acre-feet per acre (AF/A) exceeds an amount considered reasonable for the area.
- All non-domestic points of diversion meeting predetermined criteria will be metered, gaged, or otherwise measured.
- Conservation plans will be required for water rights meeting priority criteria under K.S.A. 82a-733 if it is determined that such a plan would result in significant water management improvement.

### **Tools for Water Conservation**

#### **Irrigation**

Beginning in FY 1994, the Kansas Water Office (KWO) used three approaches to provide irrigators with water conservation education: on-site technical assistance to irrigators who were required to develop water conservation plans; assistance in correcting irrigation water use reports; and education for irrigators on accurate annual water use reporting to the Kansas Department of Agriculture-Division of Water Resources (DWR).

#### **Voluntary Reductions**

Voluntary reduction of water used can occur through crop incentive programs and economic decision making. Federal programs, such as the Environmental Quality Incentives Program (EQIP) Ground and Surface Water Conservation (GSWC) have paid farmers not to produce for a specific number of years. In Kansas, Quick Response Areas (QRAs) are identified by groundwater management districts (GMD) and DWR for areas of the Ogallala-High Plains aquifer as important for reducing consumptive water use (Figure 3). Each QRA is based on various conditions that might include aquifer conditions, withdrawal patterns, and socio-economic considerations.

These areas may change each year. The EQIP-GSWC program then targets these areas. In the period 2002-2005, nearly 18,000 acres had been enrolled.

When acres are enrolled in EQIP or other programs, or an individual simply desires to reduce irrigation, water rights can be entered into the DWR Water Right Conservation Program (WRCP).<sup>(2)</sup> Enrollment protects the water right and irrigation ceases for up to ten years. Economic reasons may also lead a producer to choose not to irrigate or to limit irrigation to lesser quantities.

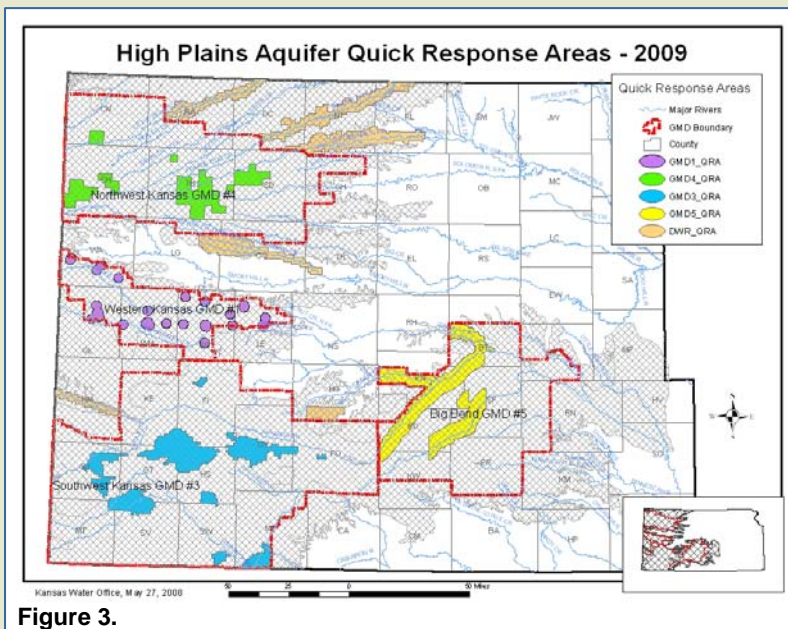


Figure 3.

Incentives to retire a water right can allow water use reduction through retirement of specific water rights. Currently, there is authority for water right buyout under the State Conservation Commission (SCC) Water Transition Assistance Program (WTAP), and using state and federal funds through the Conservation Reserve Enhancement Program (CREP). CREP provides incentives and cost-sharing to participants that enroll their land into eligible conservation practices such as native vegetation establishment or wildlife conservation for a period of 14 to 15 years. The present CREP area lies within 10 counties along the Arkansas River corridor, covering 1,571,440 acres. CREP offers incentives for a producer to sell or retire a water right at a competitive value of the water right. Applications for the enrollment in CREP of nearly 10,000 acres have been received by SCC in less than 2 years (2007-2008).

A voluntary, state incentive-based program to permanently retire water rights, the WTAP<sup>(3)</sup> is designed to restore balance in alluvial aquifers and related stream-

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flows. Passed by the 2006 Kansas Legislature, the WTAP is intended to help stabilize both aquifer resources and landowner income in targeted areas. The program seeks to reduce the overall level of consumptive water use in those aquifers and streams. Prairie Dog Creek and Rattlesnake Creek basins were selected as pilot project areas for 2007 because of their unique water supply issues. Other areas will also be eligible in the future. The pilot project is authorized for 5 years (began July 2, 2007) with an annual budget from federal and state funds not allowed to exceed \$1.5 million. Unexpended fund balances can be carried over to successive fiscal years with the approval of the Legislature. WTAP allows for cooperative cost-sharing from the federal or state government, or private sources, for water right retirement grants. WTAP allows dryland farming after retirement of the water right. As of January 2007, one application was determined eligible and has been approved.

Limited irrigation is another option to help conserve water. The choice of crops and yield goals influence water needs. Choices to reduce irrigation water use include: 1) reducing irrigated acreage; 2) reducing the amount of irrigation water applied to all acres; 3) substituting low-water requirement crops for high-water requirement crops; 4) delaying irrigation until a critical water stage; and 5) managing soil moisture to capture precipitation.<sup>(4)</sup>

Transitioning to dryland agriculture can use the programs and incentives above, and incorporate best management practices (BMPs) to change operations to dryland farming.

Water Banking also has the potential to reduce water use. The Water Bank Act requires consumptive use savings of at least 10% when a water right owner opts to save water for future use. One water bank charter has been approved, for Big Bend Groundwater Management District No. 5.

### ***Irrigation Conservation Plans***

Conservation plans, as currently prepared and implemented, provide a management tool for the individual user that can improve efficiency but may or may not reduce the quantity used. However, most irrigation plans are to keep irrigators within their legal authorized quantities, rather than a conservation goal. It is important to remember that to be most effective the plans must be implemented and maintained.

The Chief Engineer may require water right owners to adopt and implement a water conservation plan. Priority should be given to criteria set out in K.S.A. 82a-733. These are: 1) users that share a common drought vulnerable source; 2) users whose use is significantly higher than their peers, and 3) users who apply for state administered grants, loans or cost-share moneys for water related projects.

All five GMDs have contracted at times with the KWO to provide technical assistance to irrigators, although they did not all choose to contract every year. The GMDs provided assistance in water conservation education, water conservation plan development and water use reporting activities. Annual contracts with the GMDs began in FY 1994 and ended in FY 2002. Most of the GMDs work with the DWR in the development of water conservation plans for irrigators who have been identified for blatant and recurrent over pumping.



As of August 23, 2006, there are 1,430 irrigation water rights in the state with conservation plans. Over 92 percent were required and almost seven percent of these water-right holders submitted plans voluntarily.

Conservation plan activity is centered in western and south central Kansas where irrigation development is more prevalent. The Cimarron and the Upper Arkansas basins had the greatest number of plan requirements and approvals.

The actual effectiveness of irrigation water conservation plans was evaluated by Kansas State University Statistical Laboratory (KSU) based on a comparison of the difference in water use before and after approval of plans

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for each of the five GMDs and for the balance of the state. For plans prepared and approved under both the 1986 and 1993 guidelines, there was a reduction in estimated average water use for water rights located within and outside the boundaries of the GMDs.

Irrigation conservation plan guidelines were revised in 2006 in cooperation with the U.S. Department of Agriculture-Natural Resource Conservation Service (USDA-NRCS) so that state and federal guidelines are consistent.

### Education

Two irrigation water conservation education projects have been funded with *Kansas Water Plan* Funds - the South Central Kansas Irrigation Scheduling and Water Management Project and the Mobile Irrigation Lab (MIL). Both projects were designed to promote the use of irrigation scheduling and water management technology. The south central irrigation project funding ended July 2001. The MIL's purpose is to educate irrigators on management techniques to improve water use efficiency. The MIL provides computer training in irrigation scheduling (KANSCHED) and fuel cost evaluation to county conservationists, crop consultants and irrigators. The Kansas State University (KSU) MIL program provides irrigation seminars, tours and irrigation system analysis. The KANSCHED and Fuel Cost programs are also available online through the MIL website.<sup>(5)</sup>

Educational programs such as the MIL, improve management decisions by providing needed tools and general information to producers. This can result in cropping changes and corresponding water conservation if economically sound for the irrigator. GMDs, KSU Extension, Conservation Districts, Kansas Association for Conservation and Environmental Education and others also provide educational programs or information related to water conservation and water use efficiency.

### Best Management Practices (BMPs)

Also in the Kansas water conservation tool box are agricultural best management practices (BMPs). Through BMP installation, such as terraces, buffer strips and low or no-till practices, irrigators conserve water and reduce costs. BMPs can keep natural precipitation and irrigation water on the land. The state has provided cost-share for BMPs and water application technology as an incentive to adopt water conservation measures.

Tillage methods such as no till, strip till, mulch tillage, and ridge till leave more plant residue on the soil surface year-round. Conservation tillage improves the ability of the soil to hold moisture, reduces the amount of water that runs off the field, and reduces evaporation of water from the soil surface.



K-State Mobil Irrigation Lab

Land surface shaping can contribute to water resource conservation in a number of ways. Contour farming and terracing land help keep water in the fields and reduce ponding on sloped areas by following the contour lines. General grading of agricultural land is used to increase the uniformity with which water is applied to an irrigated field. The leveling work must be designed within the slope limits of the water application method used, provide for removal of excess surface water and control erosion caused by rainfall.

Brush control/management includes the removal, reduction or manipulation of non-herbaceous plants. In Kansas, non-native phreatophytes such as salt cedar utilize a significant quantity of stream and alluvial water. Removal can free up water for other plants and purposes.

### Municipal and Other Public Water Supplies

Municipalities and other public water suppliers can reduce their water needs with an active conservation effort. Household water savings through the installation of low flow plumbing, low water need landscaping and reduction of runoff from watering and car washing should be encouraged. Household water savings can reduce water treatment and sewer costs while allowing growth.

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### **Municipal Conservation Plans**

Conservation plans, as currently prepared and implemented, provide a management tool for the public water supplier that improves efficiency but may or may not reduce the quantity used. To be most effective the plans must be implemented and maintained.

The Kansas Water Office develops and maintains guidelines for water conservation plans and practices.<sup>(6)</sup> In addition to water use conservation plans required by the Chief Engineer, plans are required for anyone: 1) purchasing water from the State Water Marketing Program;<sup>(7)</sup> 2) participating in the Water Assurance District Program;<sup>(8)</sup> 3) sponsoring or purchasing the public water supply portion of a Multipurpose Small Lakes Program project;<sup>(9)</sup> 4) transferring water under the Water Transfers Act;<sup>(10)</sup> or 5) applying for a loan from the State Revolving Fund.<sup>(11)</sup> State agencies that make loans, grants, or cost-share funds available for water related projects may require, prior to approval of funding, the development and approval of a water conservation plan.<sup>(12)</sup>

Technical assistance is provided to municipal water users who are required to adopt and implement conservation plans.

Currently, municipal water conservation goals are based on a system's size and the average water consumption in gallons per capita per day (GPCD) for the region. GPCD calculations do not include municipal water supplied to industries using 1 million gallons per year or more.

The 2007 Municipal Water Conservation Plan Guidelines were developed to assist public water suppliers in preparing a plan. Some public water suppliers are required by Kansas Statute to develop a water conservation plan; however, all public water suppliers, especially those that are drought vulnerable are encouraged to develop and implement a plan as it is a tool for managing both long-term water use efficiency and addressing short-term drought response. Conservation plans assist the public water supplier to focus on long-term water conservation practices, including practices for education; management; and regulation. As part of the water conservation plan, a Water Drought/Emergency Ordinance (for cities) or Resolution (for rural water districts) must also be adopted to allow implementation of the drought response portion of the water conservation plan.

The Chief Engineer may delegate authority to implement and enforce provisions to a municipality that has an ap-

proved conservation plan using the 2007 Guidelines so they can require compliance of private well owners within the city limits. Numerous communities have expressed interest in this concept, as pumping of private wells, when restricted water use is imposed, tends to draw water from the sources of supply that affect the public water supply source. This is in place in at least one community.

### **Technical Assistance**

The Kansas Rural Water Association (KRWA) under contract with the Kansas Water Office provides technical assistance to public water supply operators, managers and local administrators on issues which are critical to public water systems. The program includes on-site technical assistance for rural water districts and municipal water systems. KRWA provides bookkeeping assistance, water rate structuring, water conservation plan development, distribution system and treatment plant reviews/analyses, leak detection, meter testing, well and distribution line cleaning and emergency assistance.

### **Drought Planning**

The Governor has the authority to declare a state of drought when indicators show drought is imminent. When the Governor declares a State of Drought, actions contained within the Drought/Emergency Contingency portions of approved conservation plans at state facilities plans are triggered.<sup>(14)</sup> It is important to recognize the distinction between the county drought stage declarations issued by the Governor and a water system's declaration of a drought stage.

County drought stage declarations provide notice to state and local officials that drought conditions exist and trigger implementation of the Governor's Drought Response Team Operations Plan. This Operations Plan is largely limited to coordination of government actions.

### 2007 Kansas Municipal Water Conservation Plan Guidelines



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County declarations do not trigger implementation of the drought response section of a municipal water conservation plan. However, the county declaration provides a “heads-up” for local water system officials that they should review their system’s drought stage triggers to determine if further action is needed.

Having a state-approved water conservation plan is a public water system’s first line of defense against drought. All public water suppliers are encouraged to develop and implement water conservation plans as a tool for managing for short-term drought response. Public water supply (municipal) conservation plans include phased in, locally determined response to drought triggers. These triggers are developed by and for the local water system. *The 2007 Kansas Municipal Water Conservation Plan Guidelines* provides suggestions for this planning. The Plan Guidelines also include triggers for marketing and water assurance district lakes.

*Emergency Response Planning Guidance for Kansas Public Water Supply Systems*<sup>(15)</sup> from the Kansas Department of Health and Environment also includes planning for drought for public water supplies, as does *Responding to Drought: A Guide for City, County and Water System Officials*<sup>(16)</sup> that was developed by the Governor’s Drought Response Team in 2006.

Municipal Drought Stage Triggers are the signals that water shortage or other conditions indicative of drought have reached certain levels. They act as the signal to begin implementation of the appropriate actions for that stage. A water utility or other municipal water entity should enact the appropriate stage whenever the trigger is reached. Delay in action may lead to a major disruption of the water supply system at a later time.

Every drought response plan is set up in stages, each one more stringent than the one before it. Triggering mechanisms are identified to signal the start of a given stage and specific goals identified as the desired outcome for each stage. Triggers may be capacity, peak demand, or some other utility set condition. Appropriate conservation practices in the areas of education, management and regulation are developed and set under each stage.

Three to four stages are considered appropriate in response to drought to trigger practices or actions. The first three stages; water watch, water warning and water emergency are appropriate for all public water suppliers.

A fourth stage, water rationing is for possible use by public water suppliers in an extreme emergency. Each drought stage has a goal associated with it which describes the desired outcome of the activity under that stage. Goals for a water warning and a water emergency should be quantifiable, specifically describing the water status and targeting water user awareness, reducing overall demand, and reducing peak demand.



Conserving the existing supply through demand reduction is often the most viable action for the public water supplier for drought response. The *Conservation Guidelines* provide options that may be employed by the water utility to reduce demand through education of water customers, management and regulatory actions. Management activities include the utility managing the supply and distribution as effectively as possible (equipment maintenance, pumping schedule, seeking emergency supplies). Regulation puts restrictions on water use. A completed conservation plan allows the utility to take pre-determined actions in a timely manner when a trigger is reached. A city ordinance or a rural water district resolution must be adopted for a conservation plan to be approved by KWO. The ordinance or resolution gives the entity the authority to implement the drought response portion of the water conservation plan.

Drought vulnerable water suppliers are those first impacted by drought due to basic source, distribution system or treatment capacity limitations; or that rely on a single well as a water supply source. Drought planning is most important for these water suppliers. In 2006, 133 of the 800 public water suppliers assessed, or 17% were considered drought vulnerable. A basic source limitation

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was the most common reason for drought vulnerability. The frequency with which each drought limitation category was assigned is summarized in Figure 4. The total exceeds 133 because several public water suppliers had more than one limitation.

The operation of reservoirs and Water Assurance Districts (WADs) generally contain contingencies for drought stages that relate to lake elevations and downstream conditions. A WAD purchases sufficient storage to make assurance water available to support the current needs of all the members of the WAD when natural flows are not available. The KWO coordinates responses to drought for WAD members and Water Marketing customers based on remaining storage in the marketing or assurance district lake(s).

Three water assurance districts are operational: the Kansas River Water Assurance District No. 1, Marais des Cygnes River Water Assurance District No. 2 and Cottonwood/Neosho River Basins Water Assurance District No. 3. The members of a WAD each have a Conservation Plan. The WAD membership includes municipalities, rural water districts and industrial water users.

### Education

Educational programs such as the state supported training for water operators provides tools and general information for those management decisions. GMDs, Extension programs, Conservation Districts, Kansas Association for Conservation and Environmental Education and others also provide educational programs and information related to water conservation and water use efficiency.

Local entities encourage or even require water conservation. Cities and public water suppliers such as WaterOne and the City of Hays are examples of effective water conservation planning. WaterOne, a water purveyor, encourages responsible water use and conservation and has undertaken a number of steps to ensure a dependable water supply for their customers. WaterOne supplies water to more than 375,000 people and has a service area of more than 271 square miles. The primary objectives of WaterOne's conservation plan include the discouragement of wasting water through demand management, analyzing water loss, and customer education on the proper use of the resource.

The City of Hays "Water Allotment and Conservation Ordinance" is a policy to reduce water waste, initiated in the late 1980s. The ordinance includes construction standards and penalizes those wasting water. It has been successful as evidenced by water use figures reported in the annual *Municipal Water Use Report*. From 1987 until 2002, water use, measured in gallons per capita per day (GPCD), was reduced 43%, from 150 GPCD to 95 GPCD.

Between 1987 and 2002 Hays used up to 47% less water than the regional average. The region extends from Phillips County in the north to Comanche County in the south.

The City of Wichita WATER Center offers a hands-on, interactive environmental center dedicated to water education. Basic relationships between the geology and geography of the area, and ground water and surface waters are explored. In addition, water conserving principles of various water-dependent landscapes as well as xeriscapes are demonstrated.

### Reuse

Water reuse is a potentially significant conservation action. Reuse offers an alternate means for managing wastewater that dramatically reduces environmental impacts associated with discharge of wastewater effluent to surface waters. In addition, use of reclaimed water provides an alternative water supply for many activities that do not require potable quality water (such as irrigation, cooling water reuse, and toilet flushing). This conserves available supplies of potable quality water. Some types of reuse offer

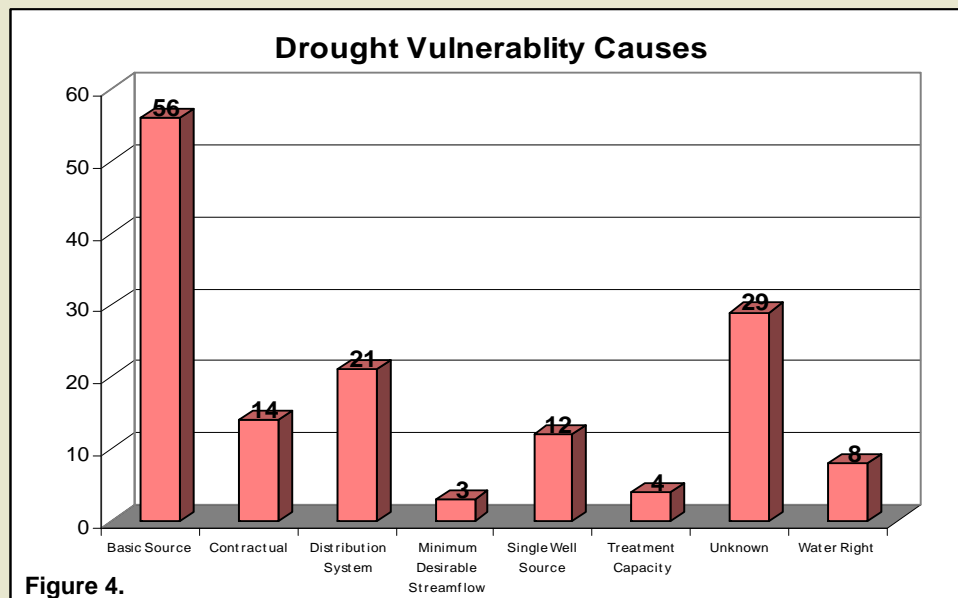


Figure 4.

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the ability to recharge and augment available water supplies with high quality reclaimed water.

Currently there are more than 140 communities and facilities that are authorized to reuse treated wastewater. The reuse of wastewater on applications like golf courses and parks allows these communities to keep the potable water for residential use. In some cases the treated water is used for non-human food crop irrigation.

Protection of human health is the primary concern when developing and implementing a reuse program. The Kansas Department of Health and Environment (KDHE) identifies several standard management practices for reuse of treated wastewater for instances when the wastewater will be applied to public areas such as golf courses or parks. Typical protective practices include an increased degree of disinfection, only applying the treated wastewater when public access is restricted and posting signs warning against swimming in or drinking ponded wastewater. Irrigation of crops produced for direct human consumption is not permitted. Monitoring of the treated wastewater is required using US Environmental Protection Agency (EPA) approved methods and KDHE certified laboratories.

Community involvement and public education is an important component in developing large scale water reuse projects.

### Water Conservation and Utility Rate Structures

The cost of water and the design of utility rate structures can influence water use by customers. Opportunities exist in Kansas to strengthen the economic incentive for utility customers to evaluate more carefully their water use habits. As price increases, water demand tends to decrease. There are four basic utility rate structures:



Wichita WATER Center

- *Flat rate*: the consumer's cost of water for a given billing period is fixed regardless of the level of use.
- *Decreasing block*: comprised of a fixed customer charge per month, plus two or more usage blocks, with the price per unit of water consumed decreasing in each subsequent block.
- *Uniform rate*: comprised of a fixed customer charge per month, plus a constant, uniform charge for each unit of water consumed.
- *Increasing block*: comprised of a fixed customer charge per month, plus two or more usage blocks, with the price per unit of water consumed increasing in each subsequent block. (An example: \$1.25 for the first ten thousand gallons, \$1.50 for the second ten thousand gallons, \$2.00 for the third ten thousand gallons, etc.)

Flat rates and decreasing block rates generally do not provide incentives to use water efficiently. A utility with one of these rate structures that changes to a uniform rate or an increasing block rate is moving toward a water-conserving rate structure. Today, uniform rates are regarded as meeting only the minimum standards for such a rate structure and the trend is toward implementing increasing block rate structures to promote water use efficiency.

### Industrial

The 1986 *Kansas Industrial Water Conservation Plan Guidelines* were prepared for use by industrial water users to assist them in developing a water conservation plan. In addition, an excellent resource for management practices for industrial water use efficiency is the "*Handbook of Water Use and Conservation*".<sup>(13)</sup>

### Other Contributing Tools

#### Information and Data

The ability to manage water relies on good information on the resource, water use and related tools. Management is a key component in the efficient use of water as well as in reducing usage. Many activities and measuring equipment provide data needed to make good management decisions. These include acquiring accurate water use and resource information.

All water right holders are required to file an annual water use report with the Kansas Department of Agriculture -Division of Water Resources (DWR).<sup>(17)</sup> Water use reporting provides data on the individual water right with-

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drawals and is valuable in the assessment of regional and hydrologic system conditions. Many public water suppliers obtain water from others that hold the water right, but voluntarily report water use. Water use is also reported by customers in the Water Marketing and Water Assurance District Programs, although that water use is not included in data distributed by the DWR. Water use report information combined with changes in water level and streamflow, precipitation, evaporation and other factors, are used to analyze the stream or aquifer ability to continue to supply water.

Water meters or other measuring devices are water management tools. The operator can obtain information on well performance and water pumped, contributing to the ability to manage a water appropriation. Water meters have been required for most non-domestic water rights in the state.

Water level measurements collected by the state are essential for determining the impact of water use on the resource.

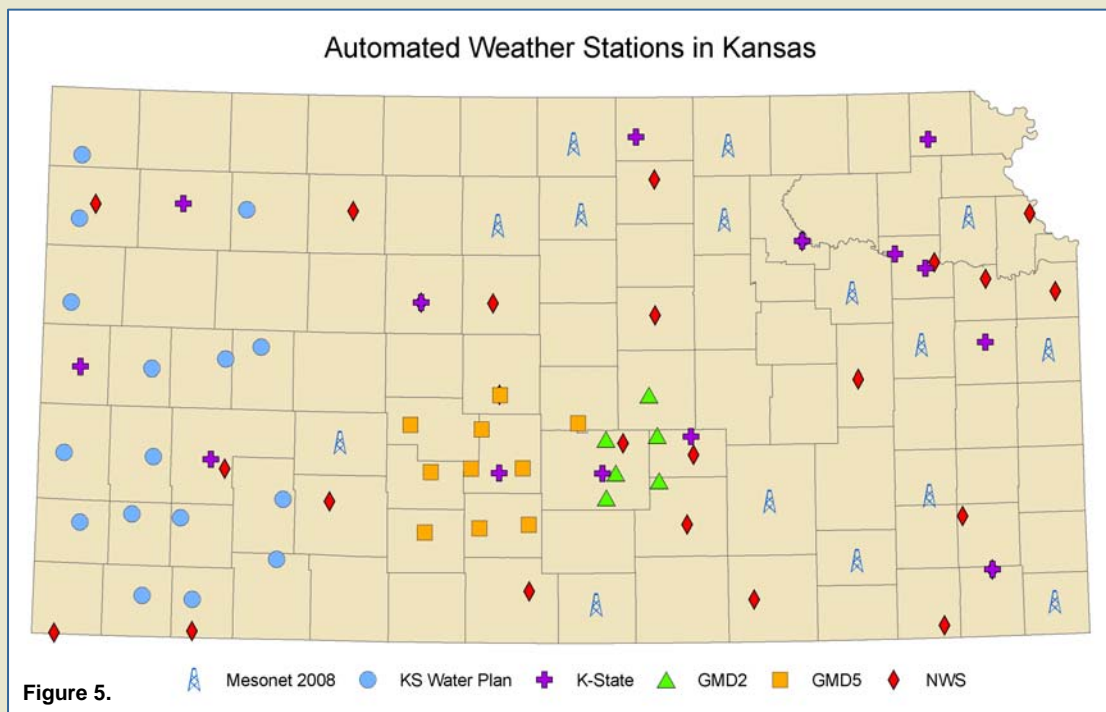
Weather Stations are management tools for irrigation that can provide accurate and useful climate and soil condition observations. State Water Plan Funding was allocated in the mid-1990s to assist several GMDs to purchase automated weather stations. Data from these stations are used for making evapotranspiration (ET) calculations valuable to

farmers in determining when to irrigate their crops. Such irrigation scheduling contributes to efficiency of irrigation water application and reduction of the amount of water withdrawn.

In 2002, the Kansas Water Office began contracting with Kansas State University to operate and maintain 11 of these ET stations in southwest Kansas. Five additional ET stations were installed in northwest Kansas in 2007. Funding for operation and maintenance of these 16 stations in FY 2008 was provided from the State Water Plan Fund. Figure 5 shows the location of these stations.

Development of the Kansas Mesonet, using State Water Plan and other funding sources began in 2008. Weather stations in this network will support ET calculation and other agricultural purposes, but will also have a broader application due to their location and the sensors deployed. Fifteen priority counties, focusing on under-served areas, were identified for initial Mesonet station installation in 2008. Additional stations will be installed in the future as funding permits.

Other automated weather station networks in Kansas that provide data useful for irrigation water management and other purposes include the 14 stations located at Kansas State University Research and Extension facilities and automated stations operated by the National Weather Service (NWS).



### Weather Modification

The Western Kansas Weather Modification Program, a cloud seeding program, has been in operation since 1975 during the growing seasons. The Program currently includes ten western counties. The Program has been shown to reduce hail damage to crops and property. This reduces the waste of water pumped for crop growth, so contributes to water efficiency. Weather modification activities are permitted and operators licensed by the Director of the Kansas Water Office.

### Special Areas

#### Upper Arkansas River Conservation Reserve Enhancement Program (CREP)

Conservation Reserve Enhancement Program (CREP) is a targeted Conservation Reserve Program (CRP), a federal program administered by the US Department of Agriculture's (USDA) Farm Service Agency (FSA), introduced in the mid-1980s. CRP was designed to prevent soil erosion, but also has provided water quality and wildlife habitat benefits. CREP focuses on a state resource concern; in this case, water conservation.

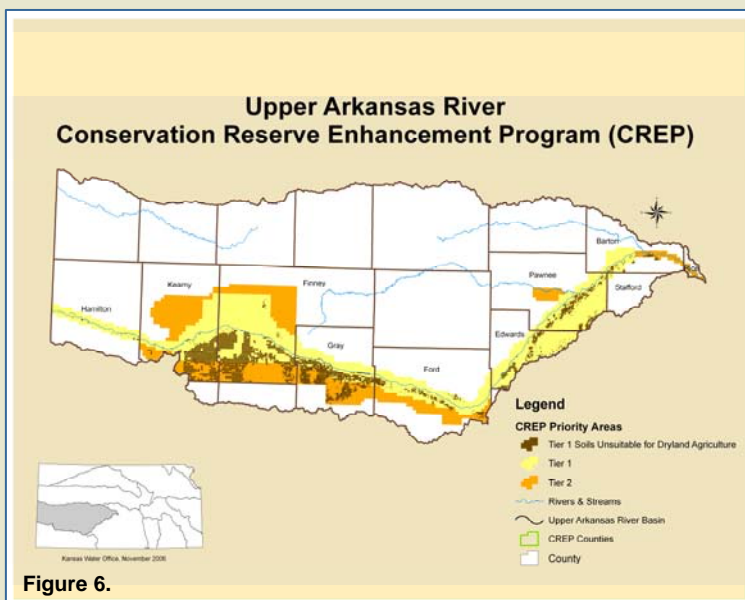


Figure 6.

The Kansas CREP affords potential benefits for farmers, land and water resources in 10 counties along the upper Arkansas River (Figure 6). Landowners who enroll in CREP receive 14 to 15 years of rental payments, a state sign-up bonus, and state, federal and private cost-share dollars. The water rights associated with the land enrolled will be permanently retired.

The program has multiple water resource benefits, reducing irrigation demands on the stream-aquifer system, reducing the spread of saline river water into the aquifer and helping restore stream and riparian health. Among the approved practices eligible for cost-share money are native grass seeding, wildlife habitat establishment, shallow water area construction, wetland restoration and filter strip and riparian buffer installation.

Approximately 1.19 million acre-feet per year is authorized for irrigation in the upper Arkansas River CREP pro-

ject area from 5,078 wells. In March 2008 the total acreage represented under pending offers was 12,876 acres with an estimated annual water savings of 24,273 acre-feet.

#### Upper Arkansas River-Water Conservation Projects Fund

K.S.A. 82a-1801 provides for the disbursement of funds recovered by the State in the litigation against Colorado to resolve disputes under the Arkansas River Compact. The cost to the Attorney General of conducting the lawsuit was first credited to the Interstate Litigation Fund. Of the amount remaining, two thirds are being used for water conservation, water efficiency and related activities in the area in the Upper Arkansas basin directly impacted by violation of the provisions of the Arkansas River Compact (Figure 7). The remaining one third was credited to the State Water Plan Fund for water conservation projects. In August 2008 the unused portion of funds designated for the Upper Arkansas basin were provided to Southwest Kansas Groundwater Management District No. 3 to be administered according to K.S.A. 82a-1803 and the 2008 Kansas Legislature's Senate Bill 534. Identification of projects and evaluation of their management and conservation effectiveness is underway. Reducing losses and making the most efficient use of all water available is an objective in the use of these moneys. Projects that increase surface storage, increase recharge to the ground water system and improve the ability to meet water right allocations are being considered. More information on the Arkansas River Compact can be found in the Water Management Policy Section.

#### Wichita Aquifer Storage and Recovery (ASR)

One of Wichita's primary sources of supply has been ground water pumped from the city's well field completed in the Equus Beds aquifer. After pumping began in the Wichita well field on September 1, 1940, water levels and storage volumes in the aquifer began declining, and the decline generally has continued over the years. In addition, the water quality of the Equus Beds aquifer is threatened by migration of saline water from natural and anthropogenic sources. Artificially recharging the Equus Beds aquifer is a water reuse alternative being employed to meet future demands for water for Wichita and other users in the area.

In 1995, the Equus Beds Ground Water Recharge Demonstration Project was initiated to evaluate recharge techniques and their impact on the water quality of the

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aquifer. The demonstration phase of the project, completed in May 2002, showed the managed diversions of excess Little Arkansas River flows during high flow events could provide benefits to the water resources of the area.

The Equus Beds Aquifer Storage and Recovery (ASR) Project Phase I began in 2006 to inject water into the aquifer for the purposes of storage and later recovery of the water and to form a hydraulic barrier to a brine plume. The project diverted water from the Little Arkansas River through bank storage (diversion) wells, when flow in the river exceeded base flow. The diverted water then was artificially recharged into the Equus Beds aquifer through injection wells and recharge basins. In 2007, over 350 million gallons were recharged into the aquifer through the ASR project.

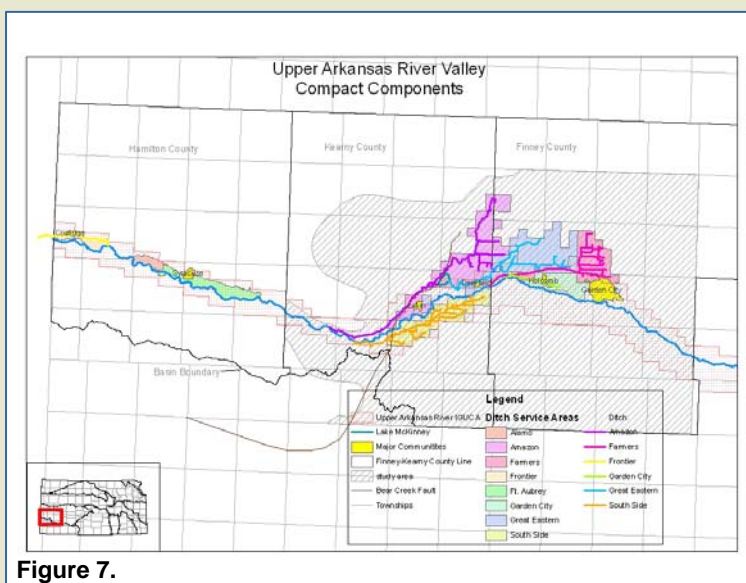


Figure 7.

Phase II of the ASR Project was scheduled to begin design in 2008, with construction initiated in 2009. Phase II design elements will capture and recharge up to 30 million gallons per day (MGD) and will rely on a treatment plant to treat the water before recharging.<sup>(19)</sup>

The ASR Project will store up to 65 billion gallons of water in the dewatered portion of the aquifer and will be a critical component of Wichita's Water Supply Plan. The ASR will restore the water levels of the aquifer to help meet the water supply needs of the City through 2050 as well as help protect the existing water supply from salt-water contamination.

### Rattlesnake Creek Subbasin-Lower Arkansas River Basin

Water banking was proposed as a potential water conservation tool in the Rattlesnake Creek Management Plan. The primary purpose of water banking in the Rattlesnake Creek subbasin is to provide an incentive for water conservation and redistribution of water use within the subbasin. Central Water Bank Charter is the first water banking charter in Kansas. The charter targets the entire Big Bend Groundwater Management District No. 5 area. This water bank charter was approved in 2005. After seven years its operation will be reviewed to determine its effectiveness for water conservation. Leased water must be used in the same basin in which it was deposited.

Water may be deposited in the Central Water Bank on an annual basis for up to five years. Water on deposit may be leased by others or held in safe deposit accounts for use in a subsequent year. A conservation component is calculated to meet the requirement of a minimum of 10% savings in consumptive use. The conservation component for a lease is based on the following hydrologic parameters: 1) decline since predevelopment; 2) total saturated thickness; 3) number of wells within 2-miles of well; and 4) distance from a stream. Both deposits and leases are subject to a conservation component.<sup>(20)</sup>

There is legislative authority for two additional water banks to be chartered.

### Upper and Lower Republican Basins

Substitute for Senate Bill No. 89 was signed by the Governor on April 4, 2008 to address the use of damage payments under the Republican River Compact Agreement. This bill stipulates the distribution of cash damage payments from Colorado and Nebraska. The majority of the payments are to be used for water conservation projects in the upper and lower Republican River basins. More information on the Republican River Compact can be found in the [Water Management Policy Section](#).

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Artificial Recharge Basin

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