

Kansas Water Plan

Water Management Policy & Institutional Framework January 2009

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Overview

State policy regarding water management is guided by the Water Appropriation Act⁽¹⁾, which states that water in the State of Kansas is dedicated to the use of the people of the state, with the state charged to manage that resource. As such, surface and ground water can be appropriated for beneficial use of that water, without waste, if that use does not cause impairment of an existing, more senior water right and does not unreasonably affect the public interest. A water right does not constitute ownership of such water. The date of priority of a water right, and not the type of use, determines the right to divert and use water at any time when supply is not sufficient to satisfy all water rights.

Overall, Kansas water resources are mature in development. Efficient management and expanded conservation are necessary to assure an adequate supply of water for the future. The development of new water resources is very limited. Most of the High Plains aquifer, the largest source of ground water in Kansas, and many of the alluvial [aquifers](#) are fully appropriated and restricted from new appropriations, either through a closure order by the Chief Engineer or by rule and regulation. A moratorium on new ground water appropriations from the Ozark and Springfield plateau aquifers in the southeast Neosho Basin is in place until 2010, to allow time to study the amount of development that is sustainable. This study was initiated in response to measured declines in the aquifer, increasing demands particularly in Missouri and water quality deterioration.



Arkansas River near Larned, 2002.
Photo courtesy of Don Whittemore, Kansas Geological Survey

The majority of the state's streams are also fully appropriated, at least during the irrigation season from July 1

to September 30. Only the Kansas, Missouri, Little Blue and Spring rivers are still open to new appropriations for those months. There has also been a trend of reduced runoff and lower streamflow in basins during a multi-year drought, for comparable levels of precipitation, possibly related to changes in land use (an increase in impoundments and terracing) and/or an increase in ground water use. It is foreseeable that Kansas streams will eventually become fully appropriated year round.

In 2006, part of a multi-year drought, a number of Kansas rivers, including the Republican, Smoky Hill, Saline, Solomon, upper Kansas, middle Arkansas and Little Arkansas rivers, along with a number of tributaries, had historic low flows. Three reservoirs, Perry, Milford and Kanopolis, also had historic low water levels. These low hydrologic conditions occurred despite precipitation levels for water years 2000-2006 were above most previous multi-year droughts. Analyses by the U.S. Geological Survey indicate a decline in the median annual runoff during this recent drought.⁽²⁾ Runoff is the amount of precipitation that contributes to stream flow. Watersheds most impacted by the 2000-2006 drought had a steady decline in the runoff to precipitation ratio over the past six drought periods (1938, 1954, 1965, 1979, 1990, 2004). Land use changes that improve the soil retention of precipitation are likely one reason for the reduction in runoff. Further study is planned to determine what the contributing factors may be. The change in the runoff precipitation ratio seen during droughts is a significant issue to address in management.

Minimum desirable streamflows (MDS) were made a part of the Kansas Water Appropriation Act in 1984.⁽³⁾ MDS values were established to help protect flow for in-stream uses relative to fish, wildlife, water quality, recreation and downstream domestic and senior water rights. MDS is set on 23 streams at 33 locations. The Chief Engineer protects streamflows by administration of water rights junior to the MDS priority date of April 12, 1984.

Reservoirs in Kansas are another important component of water management. The state owns storage in 13 of the 24 federal reservoirs in Kansas. Most of the reservoirs are built in the eastern half of Kansas in areas where higher precipitation, increased runoff and lower evaporation rates make the lakes more sustainable. The reservoirs were built to serve multiple purposes, including flood control irrigation, fish/wildlife benefits, recreation, navigation and water quality. The state owned and municipal owned storage in the reservoirs provides pub-

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lic water supply for more than two-thirds of the state's population. State owned storage water is delivered to customers through a [Water Marketing Program](#) and a [Water Assurance Program](#). The state's population growth projections indicate Kansas will be increasingly reliant on the reservoirs. Challenges to using reservoir supplies include finding a method to pay for additional storage and the operation and maintenance costs, protecting the reservoirs from losing storage from sedimentation, increasing storage at key reservoirs to regain storage lost to sedimentation, and reducing or eliminating the U.S. Army Corps of Engineer's (Corps) releases of water for navigation on the Missouri River, a practice of marginal benefit to the nation and detrimental to Kansas.



Kansas River. Photo courtesy of Dennis Schwartz

Sustainable yield management became part of the fiscal year 2004 *Kansas Water Plan*. It is the goal of sustainable yield management to set criteria for development and use of water within a defined hydrologic system that ensures long term stability. It allows for reasonable short term ground water level and stream flow variation that does not exceed the system's natural ability to recover during wet periods, and protects against degradation of the environment.

The Chief Engineer, Department of Agriculture, Division of Water Resources, (DWR), has the authority and responsibility to administer water rights in Kansas. In addition to the authorities outlined in the Kansas Water Appropriations Act, the Chief Engineer also has administrative authorities under the Intensive Groundwater Use Control Act, (IGUCA)⁽⁴⁾, which were authorized by the Legislature in 1978. These authorities allow for additional flexible solutions to address water shortages.

Enforcement of current law and regulations are important and necessary. When possible, the state prefers to use voluntary, incentive based programs and education to increase conservation and reduce water consumption in areas of competition. Public input, through the state water planning process which directs state programs and actions, by local water users within Groundwater Management Districts (GMDs) which develop district management plans, by water assurance districts, and other stakeholder groups are keys to improving management of Kansas water.

Kansas Water Plan Guidance

The Kansas Water Resources Planning Act⁽⁵⁾ provides statutory authority for addressing water 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 sound management both public and private, of atmospheric, surface and ground water supplies of the state.
- The development of sufficient supplies of water for beneficial purposes to meet the anticipated future needs of the people of the state.
- To have efficient, economic distribution of the water supplies of the state; and
- The coordination of water resource development with the development of other resources of the state.

Objectives

- Reduce water level decline rates within the Ogallala aquifer and implement enhanced water management in targeted areas.
- Achieve sustainable yield management of Kansas surface and ground water sources, outside of the Ogallala-High Plains aquifer and areas specifically exempt by regulation. Sustainable yield management would be a goal that sets water management criteria to ensure long term trends in water use will move as close as possible to stable ground water levels and maintenance of sufficient streamflows.
- Meet minimum desirable streamflow at a frequency no less than the historical achievement for the individual sites at the time of enactment.

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Management Categories

Management of Kansas ground and surface water fits into six categories:

- 1) River-reservoir management;
- 2) Stream reaches with established Minimum Desirable Streamflow;
- 3) Streams outside of Minimum Desirable Streamflow protected areas;
- 4) The Ogallala-High Plains aquifer ;
- 5) Ground water outside of the Ogallala-High Plains aquifer; and
- 6) Interstate water management.

1) River-Reservoir Management

Reservoirs are used, in part, to provide dependable water supplies in streams with highly variable flow. There are 24 federally constructed reservoirs within Kansas. The 1958 Federal Water Supply Act allowed storage space for municipal and industrial water supply to be included in federal reservoir projects if a nonfederal entity gave assurances that “expected future demands for the use of such storage will be made within a period of time which will permit payment of the costs allocated to such purposes within the life of the project.” The law also provided for long-term, low interest federal financing. An amendment to the Kansas Constitution, ratified in 1958, allowed the state to take advantage of the provisions of this federal law. Currently, the state owns storage in 13 Corps and U.S. Department of Interior Bureau of Reclamation (Bureau) reservoirs.

In 1985, the State of Kansas and the Corps entered into a memorandum of agreement. That agreement allowed the state to purchase additional storage in certain federal reservoirs. In return, the state agreed to obtain water reservation rights for water quality storage, and protect water quality releases from diversion by water right holders. In addition to marketing water from state owned storage, the state agreed to develop the Water Assurance Program to aide in the operation of the reservoirs as systems.

Management of rivers and associated federal reservoirs is becoming increasingly complex, as more limitations and demands are placed on the river-reservoir systems. To assist with decision making, hydrologic computer modeling has been developed or is underway for several river-reservoir systems: Neosho, Marais des Cygnes, Verdigris, Smoky Hill and Kansas river systems.



Clinton Reservoir. Photo courtesy Kansas Geological Survey.

Right to Store Water

Water reservation rights provide the legal authority to collect and store water in federal reservoirs. The Director of the Kansas Water Office (KWO) has authority to acquire a water reservation right on behalf of the state for water supply or water quality in reservoirs where the state controls storage.⁽⁶⁾ The water reservation right for water supply is to be an amount sufficient to insure a yield from the reservoir for beneficial use, even during a drought having a 2% chance of occurrence with the reservoir in operation.

The water stored under the authority of a water supply reservation right is within the portion of the reservoir owned or controlled by the state and is for subsequent withdrawal or release. This stored water is available for use through the Water Marketing Program, Water Assurance Program or by mutual agreement between the state and federal government.

Water stored as authorized by the water quality reservation right is within the portion of the reservoir owned by the federal government. The use of this stored water is dedicated to maintaining streamflow for instream purposes of water quality; fish, wildlife and aquatic life support; recreation and general aesthetics.

Operations

There are several key factors that control and impact operation of a river-reservoir system. The Corps' regulation manuals dictate procedures in response to extreme conditions and provide the framework for day-to-day op-

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eration. Some manuals allow more operational latitude than others, such as seasonal lake level fluctuations. Lake level management plans, developed annually, have significant and visible effects at the reservoir and downstream. The most crucial component of river-reservoir management, requiring federal and state coordination, is during low flow conditions. State responsibilities include assessment of the downstream flow requirements to meet instream needs and water use demands. Meeting downstream demands requires much more attention than following the minimum release schedules.

Regulation Manuals

An important aspect of the Corps' reservoir regulation manuals is that they are an appendix to a master manual. A master manual contains plans for system regulation of reservoir projects within a specified basin. The portion of the system controlled by the master manual within the state may be affected operationally by conditions outside the state. One of the most troublesome examples of full system operations is the evacuation of storage from reservoirs in the Kansas River basin for navigation purposes on the Missouri River.

During flood conditions the state has little or no involvement in operations. The Corps monitors and manages flood waters in the system according to procedures in the regulation manuals.

Minimum releases specified in the lake regulation manuals also play a significant role in management. Minimum releases, during climatic conditions ranging from normal to drought, affect streamflow and storage. The minimum release schedules were originally designed to meet a downstream flow need that may be insufficient or even unnecessary today. Some reservoirs have release schedules that vary from month to month, while some are constant year round. (Table 1)

Seasonal Lake Level Fluctuations

The KWO is charged in the State Water Resource Planning Act⁽⁷⁾ with negotiating and entering into agreements with the Corps and the Bureau regarding operation or releases of water from federal projects. Seasonal changes to the elevation of the top of the

conservation pool are developed annually and are known as lake level management plans.

Development of these plans includes public and stakeholder input. They are intended to increase the benefits to recreational users and increase wildlife and aquatic habitat while protecting the flood control, water supply and water quality purposes of the lake. It is important to note that the plans are developed for moderate system conditions.

Most plans include additional flood storage for high springtime flows but flood operation procedures are followed as specified in the regulation manual. Drought conditions may also warrant deviation from the plan. Large volumes of water are stored or evacuated as the conservation pool elevation changes and these operations have a significant impact on downstream flows.

Protection of water supply storage is essential and statutory limitations are in place for this purpose. Lack of suf-

| Reservoir | ¹ | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------------|--------------|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|
| Clinton | | 7 | 7 | 7 | 21 | 21 | 21 | 21 | 21 | 21 | 7 | 7 | 7 |
| Milford | c | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Perry | c | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Tuttle Creek | c | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Hillsdale | | 3 | 3 | 8 | 8 | 24 | 24 | 24 | 24 | 24 | 8 | 3 | 3 |
| Melvern | c | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Pomona | c | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Kanopolis | | 10 | 10 | 15 | 20 | 30 | 50 | 50 | 50 | 50 | 25 | 15 | 10 |
| Wilson | | 5 | 5 | 5 | 15 | 15 | 15 | 15 | 15 | 15 | 5 | 5 | 5 |
| Council Grove | | 4 | 4 | 4 | 4 | 5 | 7 | 8 | 8 | 6 | 4 | 4 | 4 |
| John Redmond | | 21 | 21 | 21 | 24 | 30 | 39 | 48 | 48 | 36 | 24 | 21 | 21 |
| Marion | | 1 | 1 | 1 | 2.3 | 6.5 | 9 | 13.1 | 13.1 | 9 | 6.5 | 2.4 | 1 |
| Big Hill | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elk City | c | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Fall River | | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 |
| Toronto | | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 |
| El Dorado | | 5 | 5 | 5 | 7 | 8 | 12 | 13 | 13 | 11 | 7 | 5 | 5 |
| Cheney | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lovewell | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cedar Bluff | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kirwin | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Waconda | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Webster | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Keith Sebelius | c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 1: Monthly minimum releases in cfs as specified by COE manuals to meet low flow or water quality requirements.

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efficient surplus water has resulted in modifications to the desired pool elevations at Elk City and John Redmond lakes. Surplus water is defined as waters within the conservation water supply capacity committed to the State of Kansas, but not required to meet contractual obligations under the Kansas Water Marketing or Water Assurance programs. This storage may be used for pool management, streamflow maintenance or sold under short term contracts if it is found to be surplus. It also must be in the public interest and advance purposes of the State Water Resource Planning Act.⁽⁵⁾

Statute limits the amount of water that can be provided as surplus water in any one calendar year to 10% of the water supply yield capability, unless the Governor has declared an emergency that affects the public health, safety, or welfare. A report is prepared by the KWO each year for the Director to use as guidance in disposing of surplus waters for that calendar year.

value, water rights applied for after that priority date may have pumping restrictions imposed. Administration for MDS has occurred on a number of rivers, particularly during drought periods.

MDS protects flow for instream uses relative to fish, wildlife, water quality, general aesthetics, and downstream domestic and senior water rights. In developing MDS, a consideration was given to instream protection (fish and water quality), water availability, and future economic development. The Water Appropriation Act established MDS values to help protect flows in order to try to maintain the conditions that would have existed in 1984 and prior. When MDS is established on any watercourse the Chief Engineer shall withhold from appropriation that amount of water needed to establish and maintain MDS.⁽³⁾

There are MDS values established at 33 sites on 23 streams, monitored at U.S. Geological Survey gaging stations (Figure 1). The purpose of MDS is to protect flow from depleted conditions as a result of extensive water appropriation. During severely dry conditions, MDS might not be achieved. There are two methods to help alleviate low flow conditions. For streams located below reservoirs that contain state owned storage, releases can be made to supplement low flow, including flows for spring fish spawns if water is held in the flood pool. The second method is MDS administration of water rights "junior" to the April 12, 1984 priority date. When the flow has been below statutory MDS for seven consecutive days, the Chief Engineer will determine if other conditions have been met and, if necessary, initiate ad-

ministration of those junior water rights granted after April 12, 1984.⁽⁸⁾ There have been no new minimum desirable streamflows established since 1989.

3) Streams Outside of Minimum Desirable Streamflow Protected Areas

Most Kansas stream reaches lie outside of minimum desirable streamflow protection. The stream itself may have flow conditions that are too unreliable to establish a minimum desirable streamflow. In all of the state's streams, Kansas has a long term goal of "preserving, maintaining or enhancing baseflow for instream water

Minimum Desirable Streamflow (MDS) Gages

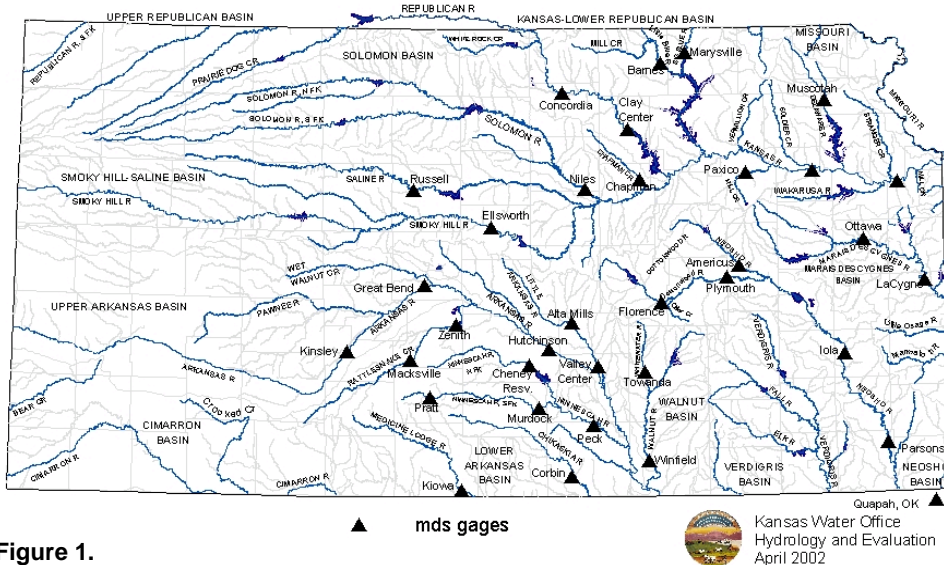


Figure 1.

Further development of triggers and forecasting capabilities to aid in the management of storage during drought is a goal of the KWO. Triggers related to drought severity will be extremely useful for protection of water quality storage and operation of the river-reservoir systems.

2) Stream reaches with established Minimum Desirable Streamflow (MDS)

Although not a water right, MDS is similar in that it has a priority date. That priority date is April 12, 1984, even though some actual MDS values were not established until 1989. When flows drop below an established MDS

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uses relative to water quality, fish, wildlife, aquatic life, recreation, general aesthetics, and domestic uses and for the protection of existing waters rights”.⁽⁹⁾

A number of Kansas streams have had a progressive reduction in median flow over the past four decades. The Cimarron, Upper Arkansas and Smoky Hill-Saline basins have had significant reductions in flow, where the dropping ground water level has resulted in reduced base-flow and land conservation measures have reduced runoff from rain and snowmelt. The streams in eastern Kansas have also had reduced flow, as streams become fully appropriated.

The Verdigris and Neosho basins have been studied for options to protect and enhance instream flow. In 2006, the DWR released the report *Instream Flow Assessment of the Neosho and Verdigris River Basins*. The study attempted to develop and apply a means of evaluating surface water availability in the basins, and to consider management options available to the State of Kansas that could protect and enhance instream flow. Water right appropriations are based on diversion of a specific quantity of water. State law does not support an instream water right. The report contains recommendations for necessary legislation if this concept were to be adopted.

4) The Ogallala-High Plains Aquifer

Vision: Sufficient water resources in western Kansas to support healthy, economically strong communities and rural lifestyles, today and for future generations.

Goal: Conserve and extend the life of the Ogallala – High Plains aquifer.

The High Plains aquifer underlies western and south-central Kansas. It is composed of several hydraulically connected aquifers, the largest of which is the Ogallala. The Ogallala occurs in the western third of Kansas (Figure 2), an area that is semi-arid with limited surface water. The eastern extension of the High Plains aquifer is composed of younger sediments known as the Great Bend Prairie aquifer and the Equus Beds aquifer. Lying above the Ogallala Formation are Pleistocene and younger stream valley deposits that bear water; where these are connected to the underlying aquifer, they are considered part of the High Plains aquifer.

The Ogallala–High Plains aquifer is characterized by its overall low recharge rate. The aquifer is variable in the amount of water in storage as reflected in saturated thicknesses that vary from over 300 feet to less than 50 feet. The rate water moves through the aquifer, the depth to water and other variables also make the aquifer a complex system to manage in western Kansas.

In most locations, the Ogallala–High Plains aquifer is in decline with annual withdrawals far exceeding the average, annual recharge. Some areas of the aquifer are

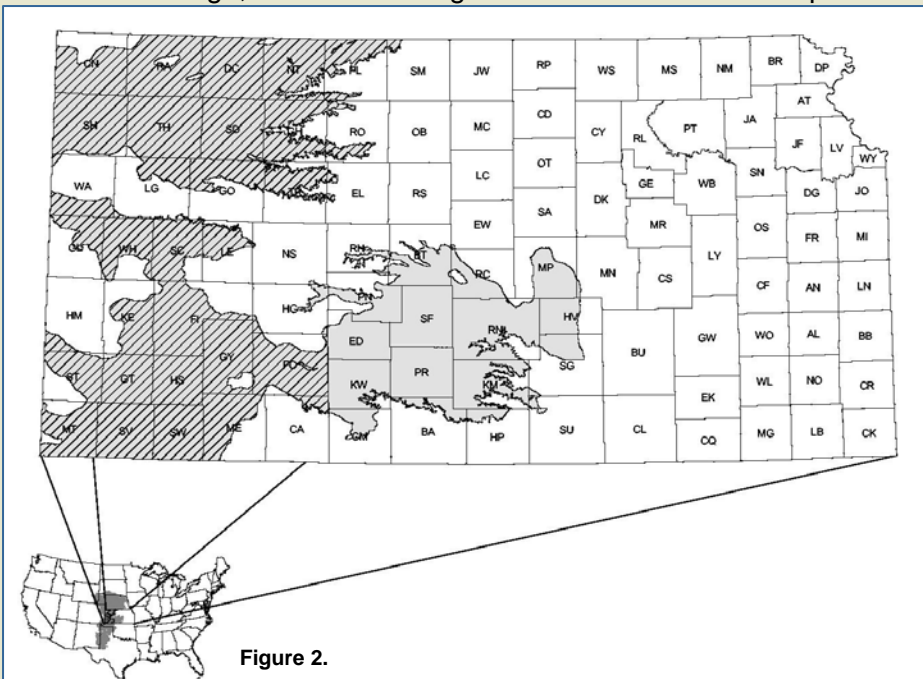


Figure 2.

now, or are projected to be within 25 years, too depleted to support widespread, high volume pumping. The lowering of the water table has resulted in reduced or total loss of baseflow to many reaches of the Arkansas, Solomon, Smoky Hill, Pawnee, and Walnut rivers.⁽¹⁰⁾

The Ogallala-High Plains aquifer is the dominant, often sole, source of water in western Kansas. It supplies over 90 percent of the water needs for cities, industries, domestic users, and irrigators in western Kansas. The Ogallala-High Plains aquifer is a key resource in the economy of western Kansas. Roughly 94 percent of the Ogallala - High Plains aquifer is used for irrigation, which in turns supports the livestock, meat packing, ethanol and other agriculture-related industries in Kansas.

The majority of the Ogallala-High Plains aquifer is under the management of Groundwater Management Districts (GMD):⁽¹¹⁾ Western Kansas GMD1, Southwest Kansas GMD3, and Northwest Kansas GMD4. The aquifer has

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been under intense management by the GMDs for over three decades. Each GMD is a political subdivision of the state, and share authority for managing the ground water with the DWR. The GMDs formed in the early 1970's to comprehensively manage the water resources, which had already been heavily developed.

There have been a number of programs and activities implemented to help conserve the ground water resources. The High Plains aquifer has had a reduction in the rate of decline over the past thirty years due to efforts made at the individual, GMD, state and federal levels. Several of these efforts are shown in Figure 3 and described in the programs segment at the end of the Management Section. Even with the improvements on slowing the decline rate, the aquifer is still declining.

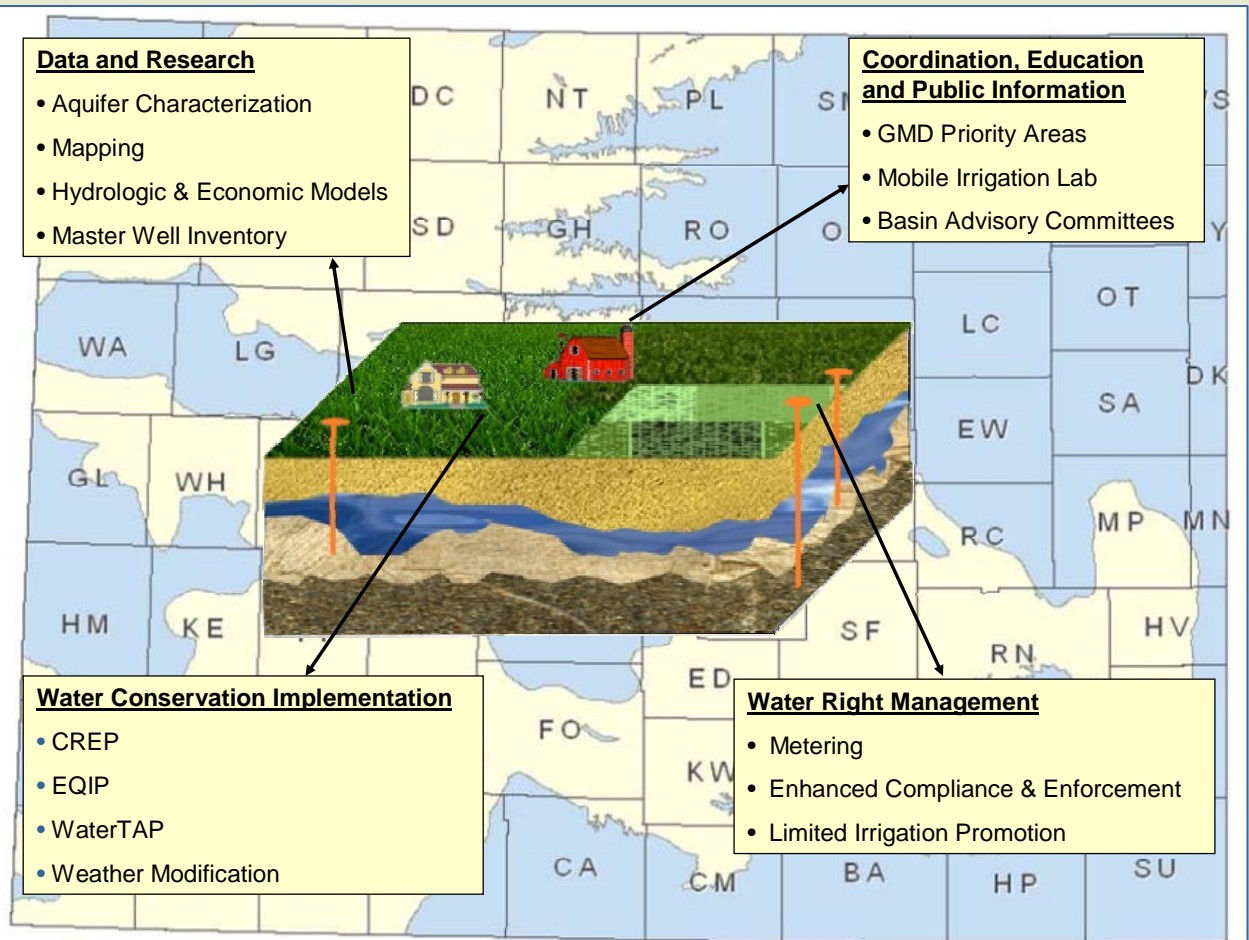


Figure 3.

In 2001, the recommendations for the Long Term Management of the Ogallala Aquifer in Kansas made by the Ogallala Aquifer Management Advisory Committee⁽¹²⁾ were approved into the *Kansas Water Plan*. These are listed in the Active Policy Recommendation box.

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Active Policy Recommendations

- 1. Delineate the Ogallala aquifer into aquifer subunits to allow management decisions in areas of similar aquifer characteristics.** Each Groundwater Management District and the Division of Water Resources for areas of the Ogallala outside of Groundwater Management Districts, should delineate these subunits. The Kansas Geological Survey, Division of Water Resources, Kansas State University and Kansas Water Office should cooperate and assist through the water planning process.
- 2. The Groundwater Management Districts and the Division of Water Resources should identify each aquifer subunit in decline or suspected decline and establish a water use goal to extend and conserve the life of the Ogallala aquifer.** Setting water use goals in aquifer subunits helps define the enormous challenge of managing this large, extremely valuable resource today and into the future. In areas where ample supplies remain, either no reductions will be necessary or modest reductions may be recommended. In a subunit with a rapid decline and a short estimated usable life-time, a more aggressive goal should be set. Assistance programs would be targeted to those areas to help reach the water use goals. Variables to consider in setting the water use goals include the estimated volume of water available, recharge, amount of annual water use, estimated life of the aquifer, public input and others to be determined by the Groundwater Management Districts and Division of Water Resources.
- 3. Identify aquifer subunit priorities to extend the life of the aquifer and sustain the vitality of western Kansas.** Base priority on rate of decline, the estimated time before an area must transition to less water use due to declines and the potential socio-economic impact of the decline and other factors. High priority aquifer subunits should be candidates for acquiring additional information necessary to implement plans, assistance programs and/or other actions deemed necessary by the Groundwater Management Districts and Division of Water Resources. If incentive and voluntary plans are unsuccessful, then strict administration of existing water law should be applied.

- 4. Support and expand programs and activities to extend and conserve the life of the Ogallala aquifer.** Provide a menu of options to extend and conserve the life of the aquifer that are consistent with the prior appropriation doctrine, including the guiding principles that are listed in the full report (see Appendices A and C⁽¹²⁾). In subunits where irrigation is no longer economically feasible, Groundwater Management Districts and Division of Water Resources should identify and implement management strategies to sustain the life of the aquifer in that subunit.
- 5. Support and expand research and education on the Ogallala to extend and conserve the life of the aquifer.** Enhance understanding of the effectiveness of various options and promote voluntary actions for less water use. Develop tools needed to better manage the Ogallala, especially for areas that must transition to less water use. Identify innovative management strategies to be tested in pilot studies that are consistent with the guiding principles (Section III⁽¹²⁾).

5) Ground Water Outside of the Ogallala-High Plains Aquifer

The management focus on ground water outside of the Ogallala-High Plains aquifer is to achieve sustainable yield management. These aquifers are in geologically younger sediments, and generally are closer to the surface and have higher rates of recharge than the Ogallala. Ground water is extensively developed in the Equus Beds and Great Bend Prairie units of the High Plains aquifer (Figure 4). The alluvial aquifers are a major source of water across Kansas. In addition, the Dakota aquifer is spread across roughly the western half of Kansas, although not all of the Dakota is freshwater. Other, more limited aquifers spread across the state .

Equus Beds GMD2 and the Big Bend GMD5 cover the majority of the High Plains aquifer outside of the Ogallala. GMD5 is closed by regulation⁽¹³⁾ of the Chief Engineer to new appropriation except for applications for small uses of less than 15 acre feet. GMD2 reviews and makes recommendations on applications for new appropriation based on a safe yield regulation.⁽¹⁴⁾ This regulation compares the annual recharge of a local area to the amount of water that has been appropriated.

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The majority of ground water outside of the High Plains aquifer is alluvial ground water. Kansas manages surface and alluvial ground water on a conjunctive use basis. A portion of the natural recharge that reaches the alluvial aquifer contributes to streamflow through baseflow. Some stream baseflow is protected through regulation and a percentage of the recharge is not available for appropriation. There is concern that many surface and alluvial ground water systems have been over appropriated.

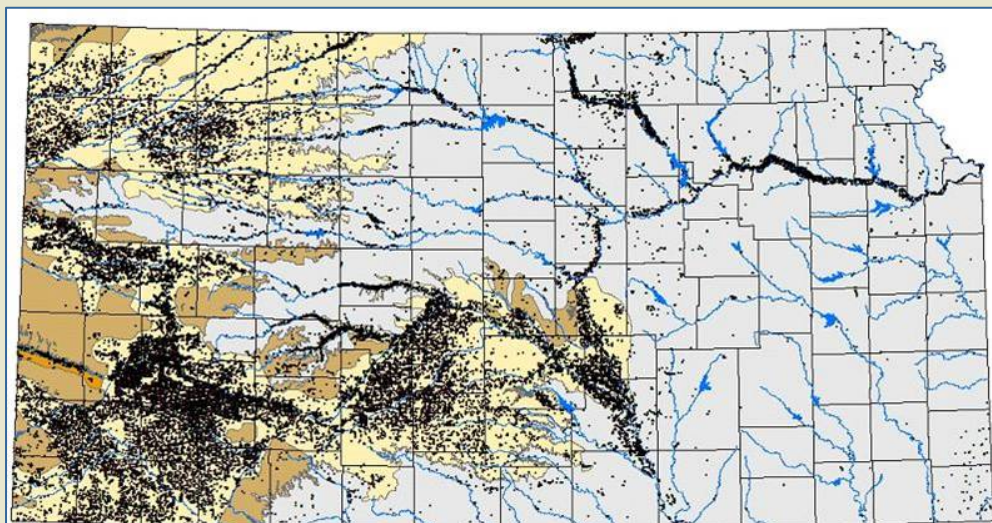


Figure 4. Points of diversion for freshwater wells in Kansas. The High Plains aquifer is highlighted.

In many areas, sustainable yield management is already attained. When a senior water right is impaired, the owner can ask the Chief Engineer to provide relief by curtailing junior water right withdrawals. Another option to meet water needs is special management plans based on voluntary strategies to reduce water use in a subbasin. The Rattlesnake Creek subbasin is implementing a special management plan. Designation of an Intensive Groundwater Use Control Area (IGUCA)⁽⁴⁾ is another option that allows for flexible solutions, but when adopted has the force and function of law. An example is the Wet Walnut IGUCA which includes reduced water appropriations by all the water right holders that are junior to the impaired Cheyenne Bottoms water right, where those reductions help relieve the impairment. The solution utilized in the Wet Walnut IGUCA does not cut any water right holder off completely, although the amount of reduction is weighted based on seniority.

The remaining aquifers outside the High Plains are bedrock or deep confined or semi-confined aquifers. The Dakota aquifer is one important resource underlying southwest to north central Kansas. Another aquifer of

note is the Ozark aquifer in southeast Kansas. This aquifer has experienced declines in water level in recent years due to intense development in southwest Missouri. The KWO has begun discussion with neighboring states on this aquifer and will be evaluating management options.

6) Interstate Water Management

Interstate water management applies to all surface and ground water that flows across the state border. Water compacts provide a legal arrangement between states to equitably divide and apportion the water supply of a river or river basin. Kansas is a member of the Republican River Compact the Blue River Compact, and two Arkansas River Compacts, one with Colorado and one with Oklahoma (Figure 5). Kansas also is a member of the Missouri River Association of States and Tribes.

Kansas has undertaken litigation in recent years on both the Arkansas River Compact with Colorado and the Republican River Compact with Nebraska. The purpose of these lawsuits was to force adherence to the compact

provisions and provide adequate and sustainable water supplies to Kansas. The U.S. Supreme Court ruled in favor of the State of Kansas on the Arkansas River litigation and the Republican River lawsuit was settled out of court. These two actions should ensure that Kansas receives its entitlement under the compacts.

Kansas-Nebraska Big Blue River Compact: The Kansas-Nebraska Big Blue River Compact was ratified in 1971 between Kansas and Nebraska. The compact is to equitably apportion the waters of the Big Blue River basin between the two states, and to encourage an active pollution abatement program in each of the two states. About 75% of the Big Blue River basin is in Nebraska, the rest in Kansas. The Big Blue River is a tributary to the Kansas River. Kansas representatives to the Kansas-Nebraska Big Blue River Compact administration are David Barfield, Chief Engineer, DWR, and Sharon Schwartz, State Representative.⁽¹⁵⁾

Kansas-Colorado Arkansas River Compact: The Kansas-Colorado Arkansas River Compact was negotiated in 1948 between the states of Kansas and Colorado with

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participation by the federal government (Figure 6). Its stated purposes are to settle existing disputes and remove causes of future controversy between the states concerning the waters of the Arkansas River and to equitably divide and apportion between the states of Colorado and Kansas the waters of the Arkansas River as well as the benefits arising from John Martin Reservoir. Chief Engineer David Barfield, DWR serves as one of three Compact Commissioners along with two representatives from western Kansas, David Brenn, GMD1 and Randy Hayzlett, Southside Ditch.

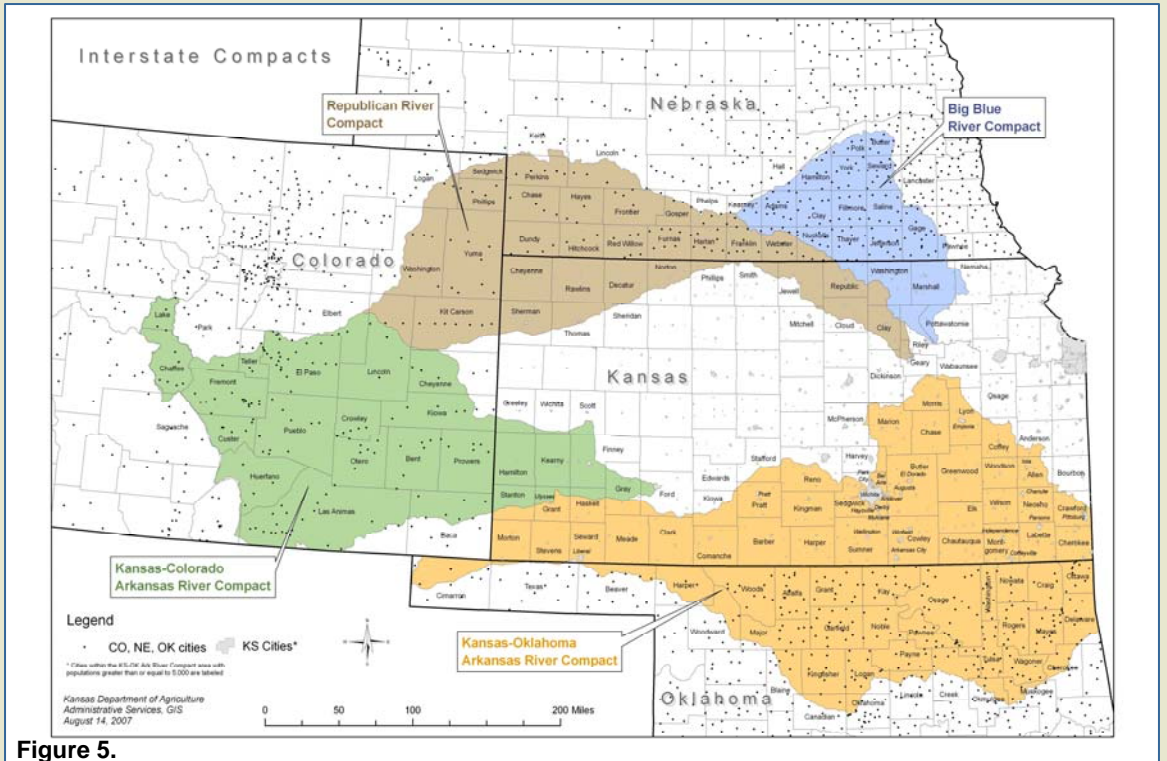


Figure 5.

Kansas filed *Kansas v. Colorado*, No. 105, Original, in 1985 to enforce the terms of the Kansas-Colorado Arkansas River Compact. On May 15, 1995, the United States Supreme Court determined that Colorado had violated the Kansas-Colorado Arkansas River Compact by post-compact well pumping in Colorado. As the result of the damages and remedies phase, Colorado paid Kansas \$34.6 million in damages for Colorado's compact violations during the period 1950 through 1999. In 2006, Colorado paid Kansas an additional \$1.1 million in costs as part of the damages award. This money has been deposited in three funds created by statute.⁽¹⁶⁾ that specify how and where the money may be spent.

In 2005, \$9,684,425 was placed in the Water Conservation Projects Fund, one of the three funds into which the damage award was divided. In 2006, an additional \$739,964 was deposited into that fund. The Water Conservation Projects Fund is to be used for efficiency and conservation projects in the area impacted by past compact violations. The fund was administered by the KWO, with the projects approved by the Director, KWO, in consultation with the Chief Engineer, DWR. The Arkansas River Litigation Funds Committee composed of Irrigation Ditch representatives and other stakeholders have provided advice. Feasibility studies have been completed on various projects using the Arkansas River Litigation Funds. In FY2009, the Water Conservation Projects

Fund was transferred to GMD3, and placed into a Western Water Conservation Projects Fund. It is to be administered by the GMD and the Arkansas River Litigation Advisory Committee. The KWO Director still provides approval of projects for the same purposes of improving water use efficiency and conservation.

In January 2008, Special Master Littleworth submitted his Fifth and Final Report to the United States Supreme Court, including the Judgment and Decree. Kansas filed an exception related to limitation on awarding costs imposed by the Special Master. Colorado has filed a response. In 2008, the Special Master's Fifth and Final Report and the Kansas Exception went before the Court.

The Judgment and Decree was jointly developed by Kansas and Colorado based on decisions by the Special Master and the United States Supreme Court. The Hydrologic-Institutional Model and accounting procedures are included which will be used to determine if Colorado is in compliance. Each year, the accounting for the prior 10-year period will be reviewed. The Special Master found that Colorado was in compliance for its first 10-year compliance period (1997-2006). Based on the data available as of May, 2007, it appears that Colorado will be in compliance for the second full 10-year compliance period (1998-2007), although there are differences which will be reviewed by both states to see if agreement can be reached.

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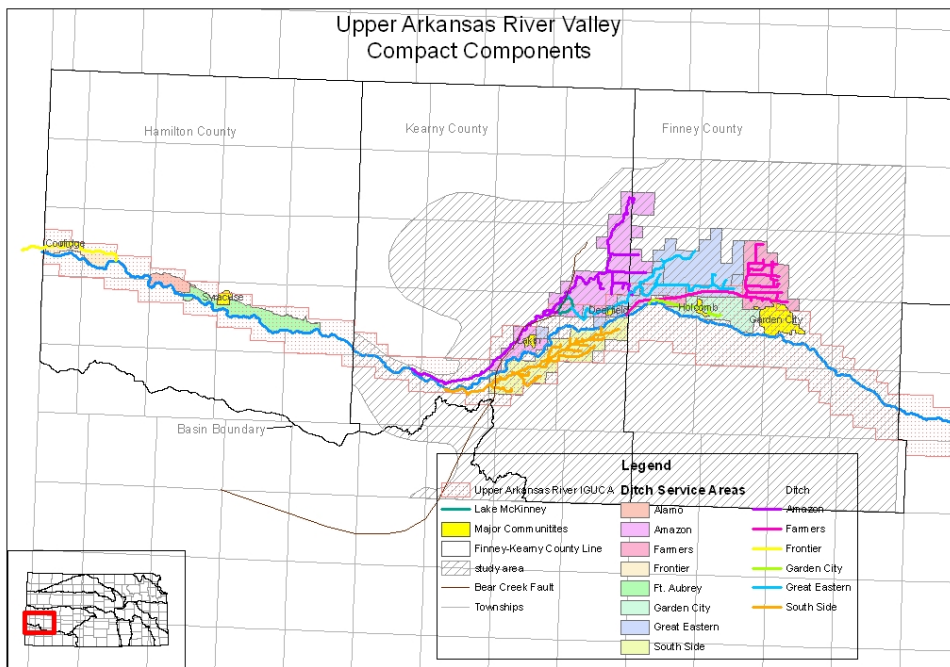


Figure 6.

politan area and other communities of northeast Kansas along the river, including water for cooling at power generation facilities. The reservoir system also provides flood control and navigation benefits to Kansas.

Controversy over the operation of this reservoir system began during the 1980s drought. Upper basin states wanted significantly more drought conservation during such drought periods to reduce reservoir drawdowns and its negative impacts on reservoir recreation. In 1989, after being sued by the upper basin states, the Corps initiated a review of its Master Water Control Manual (Master Manual) governing the operation of these dams. During the course of the Master Manual review, environmental issues, and especially endangered species issues, have become very significant.

Kansas–Oklahoma Arkansas River Compact - Kansas and Oklahoma entered into a compact in 1966 to promote interstate comity and divide and apportion equitably the waters of the Arkansas River basin between the states of Kansas and Oklahoma. The compact is also to maintain an active pollution abatement program in each of the two states. The compact details the storage provisions of the Arkansas River water in Kansas and Oklahoma. The Kansas-Oklahoma Arkansas River Compact Commission was created to administrate the terms of the compact.

Missouri River - The Corps operates a system of six reservoirs on the Missouri River. The original development plan called for a series of reservoirs to be built in order to lessen the effects of flooding in the lower basin and provide flows for navigation below Sioux City, Iowa. Upper basin benefits included irrigation and power generation. Though irrigation never developed as planned, economically important sport fisheries in the reservoirs and below the dams have developed. The upper three reservoirs, Fort Peck in Montana, Garrison in North Dakota, and Oahe in South Dakota are the Corps' three largest reservoirs, with combined conservation storage more than 50 times that of Tuttle Creek, Milford and Perry lakes. The other dams are Big Bend, Fort Randall, and Gavins Point, all in South Dakota. The Missouri River is a significant source of water supply to the Kansas City metro-

In 2004, the Corps published its Final Environmental Impact Statement (FEIS) on the Missouri River Master Manual Review. The FEIS selected alternative included increased drought conservation to better balance the needs of the upper and lower basin states. The Corps stated that endangered species needs are to be addressed through a process it calls a Missouri River Recovery Implementation Committee (MRRIC) and the use of an adaptive management process.

In 2006, the states replaced the Missouri River Basin Association with the Missouri River Association of States and Tribes (MoRAST).⁽¹⁷⁾ MoRAst formed by joint resolution of the Governors of Wyoming, Montana, North Dakota, South Dakota, Nebraska, Iowa and Kansas and the Mni Sose Intertribal Water Rights Coalition. It serves as a forum to foster communication among the member states, tribes and various other governmental units, and to facilitate the management of the natural resources of the Missouri River Basin, including water resources, fish and wildlife while considering the impacts to the economic, historical, cultural and social resources. One of the principle goals of MoRAST is to bring together the representatives of the Governors and to provide for direct participation by the American Indian Tribes in the Missouri River Basin. The Kansas representatives are Mike Hayden, Secretary of Kansas Department of Wildlife and Parks and Tracy Streeter, Director, KWO.

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In 2008, the Corps and the U.S. Fish and Wildlife Service, in coordination with other federal agencies, working with a broadly representative group of Missouri River basin tribes, states, and diverse stakeholder interests, developed a recommended Charter for a MRRIC. The Charter will provide guidance and recommendations to the Secretary of Army on the study of the Missouri River and tributaries, and existing Missouri River recovery and mitigation plan.

Kansas continues to work with the Corps to resolve its concern with the Corps' use of the Kansas basin reservoirs to support Missouri River navigation. Kansas believes the negative impacts of this use far outweigh the benefits. Kansas is looking for a permanent solution to the problem.

Kansas-Nebraska-Colorado Republican River Compact:

The compact was entered into by the states of Kansas, Nebraska and Colorado in 1943, with respect to the waters of the Republican River basin (Figure 7). The major purposes of the compact are to provide for the most efficient uses of the water, to provide interstate comity, to remove all causes which might lead to controversies, to promote joint action in the control of floods and to provide an equitable division of the water. The compact includes provisions related to the federal government's ability to develop projects within the basin. Major federal developments anticipated by the compact were flood control projects and irrigation development.

The Republican River basin begins in the plains of eastern Colorado, flows through northwest Kansas and southwest Nebraska, and, after traversing a good part of southern Nebraska, ultimately returns to Kansas, emptying into Milford Reservoir. Releases from Milford join the Smoky Hill River to form the Kansas River at Junction City.

After congressional consent and presidential approval of the Kansas-Nebraska-Colorado Republican River Compact in May 1943, the Bureau and Corps began planning and developing their projects in the basin. The federal projects in place today include a system of seven Bureau reservoirs, two Corps reservoirs, and six irrigation districts.

In addition to the federal projects, significant ground water development has occurred in the basin. This ground water development was at the heart of the controversy between the states of Kansas and Nebraska. Kansas alleged that Nebraska's significant ground water use, combined with its surface water use, placed it over its compact allocation in many years. In the early 1980s, Kansas and Colorado had stopped allowing ground water development in the basin.

After years of dispute regarding the use of the Republican River, Kansas filed suit against Nebraska in 1998 in the U.S. Supreme Court to enforce terms of the compact. The case was settled December 15, 2002, when

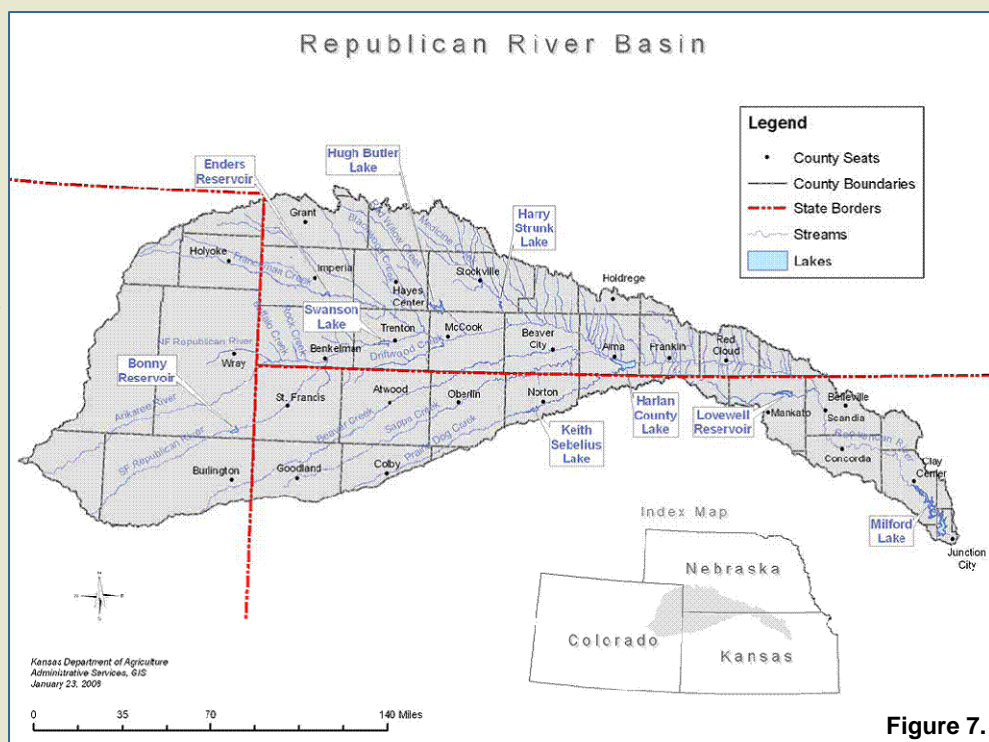


Figure 7.

the final settlement stipulation was signed by the states. The stipulation was later signed by the U.S. Supreme Court.

The settlement includes adoption of the Republican River Compact Administration Groundwater Model, which is used to quantify ground water consumptive use by each state, as part of the compact's accounting procedures. The year 2007 was the first year to measure normal year compliance for a five year period (2003 – 2007) and it was found that Nebraska had overused. During the years of Nebraska's overuse, Kansas has been water short in the Kansas Bostwick Irrigation District and the mainstem lower Republican River.

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The Kansas Chief Engineer has called for action by Nebraska to meet its obligations, including immediate well shutdowns within 2.5 miles of the river and its tributaries, and on wells developed after the year 2000.

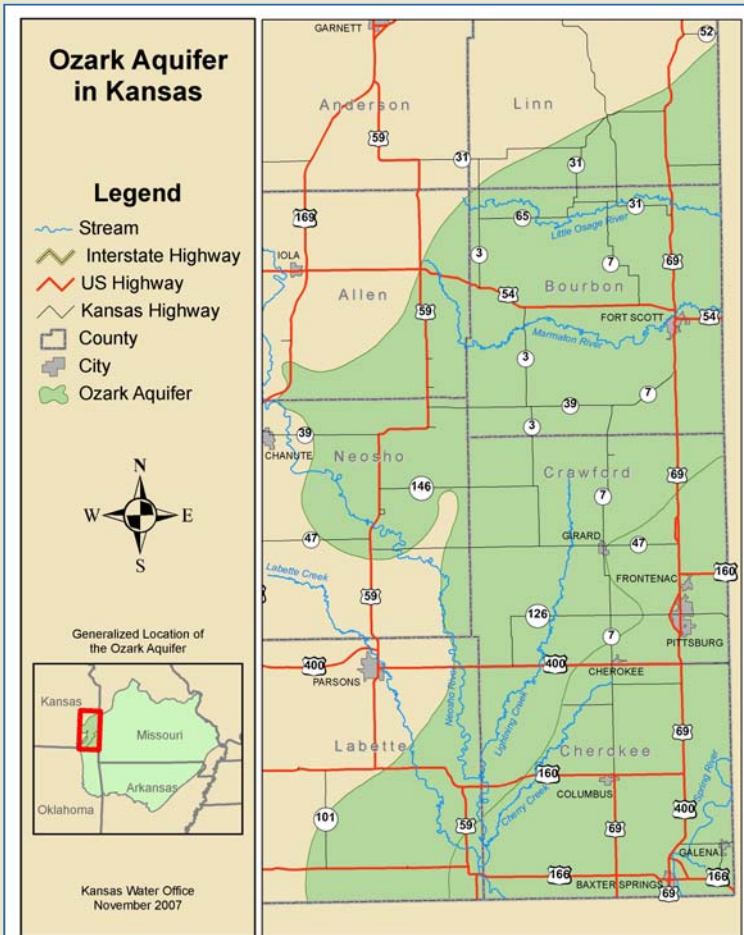


Figure 8.

Colorado's use was also measured to find if it had met its first five year test of normal year compliance ending with 2007. Colorado was also found to have overused and is proposing piping water to the stateline to offset compliance deficits. Where that water would be delivered was under discussion in 2008. Kansas would like to see it delivered to Kansas rather than Nebraska, since Colorado is overusing its South Fork Republican River allocation. Under the settlement terms, all three states must agree to the compliance proposal.

Kansas passed a law in 2008⁽¹⁸⁾ to define where damage award funds from the Kansas-Nebraska-Colorado Republican River Compact disputes are to be deposited, and how they may be used. All funds from both Nebraska and Colorado would be deposited into the Interstate Water Litigation Fund⁽¹⁶⁾, until a balance of \$20 million is reached. Once the cap is reached, the funds are

directed into two funds, one for funds from Nebraska (Republican River Nebraska or RRNE) and one for funds from Colorado (Republican River Colorado or RRCO). These funds will be administered by the KWO Director. A third of each RRNE and RRCO is credited to the *Kansas Water Plan* for water conservation, with conservation projects that enhance the ability of State of Kansas compact compliance as a priority for the RRNE funds. Two-thirds of the RRNE are to be used in the lower Republican counties, and two-thirds of the RRCO are to be used in the upper Republican counties for water conservation, use efficiency, delivery, administrative requirements and similar types of projects.

Ground Water Resources: Kansas has no interstate compacts on ground water, however, there are two aquifers of significant interstate concern: the High Plains aquifer and the Ozark Plateau aquifer system.

Management of the High Plains aquifer is a multi-state concern along Kansas borders with Colorado and Oklahoma. The High Plains aquifer extends under eight states: South Dakota, Nebraska, Wyoming, Kansas, Colorado, Oklahoma, Texas and New Mexico. Information sharing on the aquifer between states had occurred in the High Plains sub-committee of the Western States Water Council, represented by state water agency personnel. Currently, collaborative interstate research between Kansas State University, Texas A&M University and Texas Tech is under the federally funded Ogallala Aquifer Initiative. This effort involves state water management agencies and key stakeholders.

There are concerns on the declining water levels in the Ozark Plateau aquifer system in southeast Kansas (Figure 8). Ground water in the Ozark Plateau aquifer system originates in Missouri and flows into the southeastern corner of Kansas and into Oklahoma. In 2005, the Tri-State Water Resource Coalition was formed by municipalities and rural water districts representatives to determine the region's water needs, better understand available water resources and provide a long term supply of good quality, affordable water. Tri-State Water Resource Coalition members from Kansas include: Baxter Springs, Cherokee Rural Water District No. 3, the City of Pittsburg, the Kansas Rural Water Association and a DWR employee.

Water Management Authorities and Programs

Kansas Groundwater Management District Act

The Groundwater Management District Act⁽¹⁹⁾ establishes the right of local water users to determine their own destiny with respect to the use of ground water, insofar as it does not conflict with the basic laws of the State of Kansas. The GMDs were created, in large part, to address the need to conserve the ground water resources and prevent economic distress.

There are five GMDs (Figure 9): Western Kansas GMD1, Equus Beds GMD2, Southwest Kansas GMD3, Northwest Kansas GMD4 and Big Bend GMD5.⁽¹¹⁾ Each GMD is managed by an elected board of directors. A land owner of at least 40 contiguous acres within a GMD (but not within a municipality) that withdraws or uses one acre foot or more of ground water is an eligible voter. Corporations and individuals that withdraw one acre foot or more ground water within the district are also voting members. All members pay an annual assessment to the GMD based on number of acres owned and water used. The land assessment is 5 cents/acre in each GMD. The water use assessment varies from a low of 10 cents/acre foot in GMD3 to a high of 82 cents/acre foot in GMD2 (as of August, 2008).

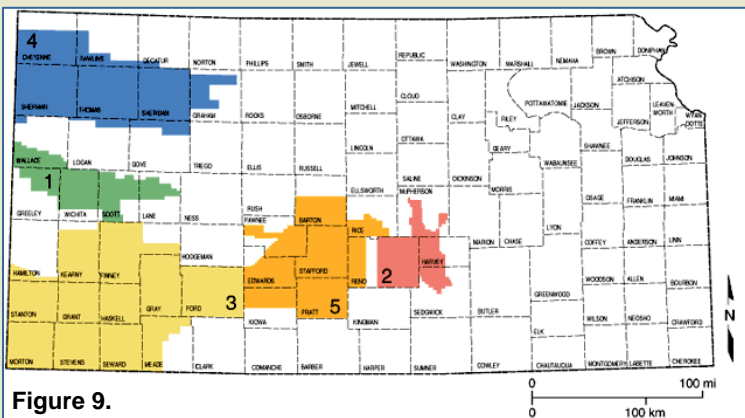


Figure 9.

Intensive Groundwater Use Control Areas (IGUCA)

In 1978, the Kansas Legislature authorized provisions for initiation and designation of IGUCAs. The Kansas Groundwater Management District Act^(4, 20, 21) allows the Chief Engineer to implement additional corrective controls in areas where it is determined, through a public hearing process, that ground water levels are declining excessively, the rate of ground water withdrawal ex-

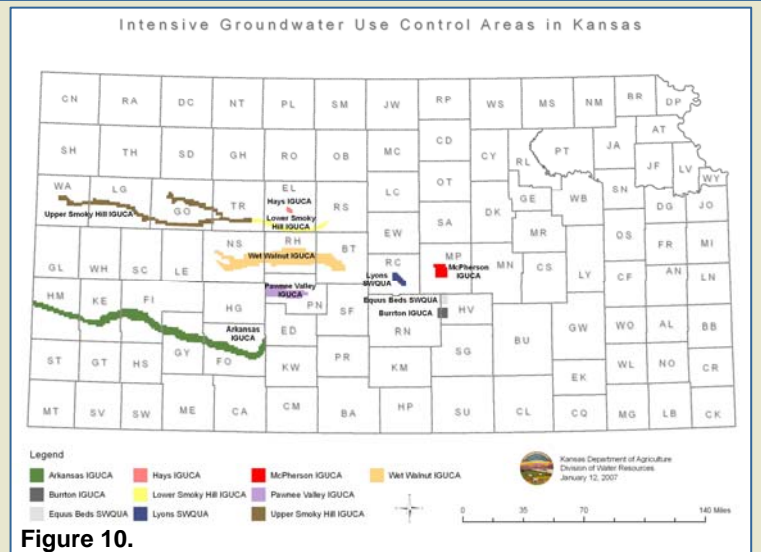


Figure 10.

ceeds the rate of recharge, unreasonable deterioration of ground water quality has occurred or may occur, or other conditions exist warranting additional regulation to protect public interest.

Eight such areas have been designated (Figure 10): McPherson, Pawnee Valley, Burrton, Lower Smoky Hill River, Upper Smoky Hill River, Arkansas River Valley, Hays, and Walnut Creek.

There are ongoing discussions between the Chief Engineer and the GMDs on possible changes to the process of implementation and periodic reviews of IGUCAs.

Water Use Reports

Water use in Kansas is regulated by the DWR. Since 1988, the DWR has required an annual water use report from all non-domestic active water right owners, as a condition of the Water Appropriation Act. The agency also requests water use reports from municipal and industrial users purchasing water from state owned storage in federal reservoirs, through the Water Marketing Program and from water suppliers purchasing water wholesale from entities that have water rights or marketing contracts. The water use report is to have complete and accurate information as requested by the Chief Engineer. There are civil penalties for failure to file a water use report or for filing a report with false information.

Water Marketing Program

The Water Marketing Program, operated under the State Water Plan Storage Act,⁽²²⁾ provides long term contracts (10-40 years) for raw water from state owned storage in

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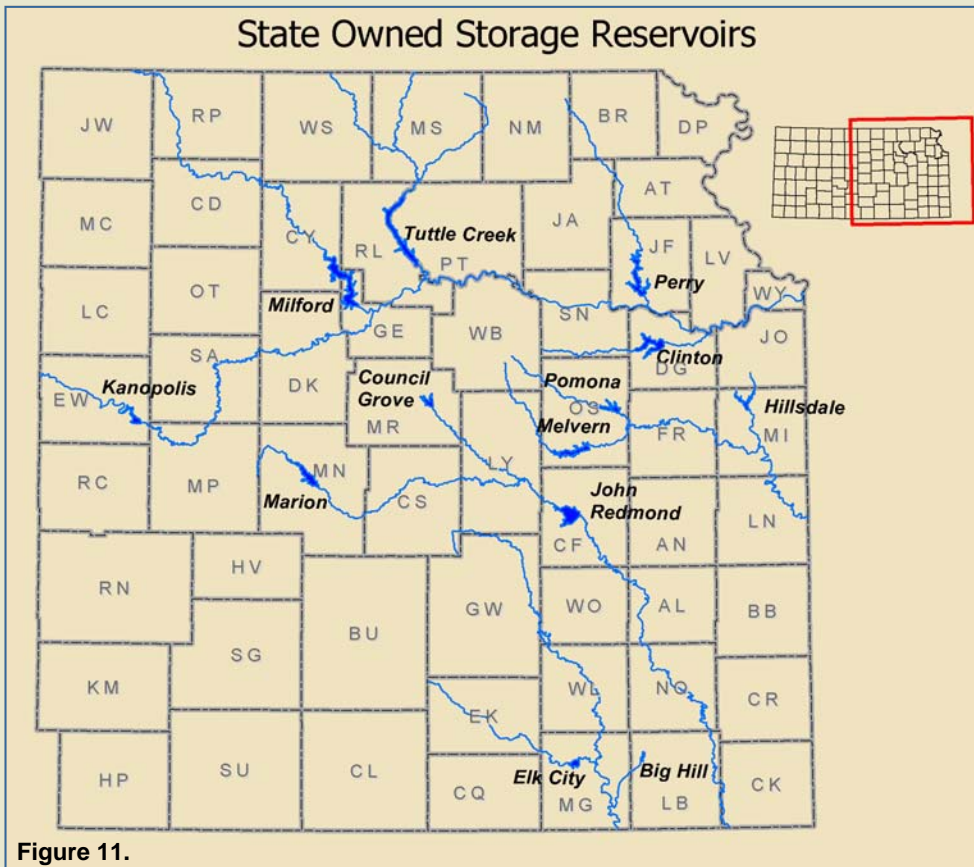
federal reservoirs for municipal or industrial use. The state currently has storage in 10 reservoirs committed to the Water Marketing Program. The Water Marketing Program has a limited, short term option of selling water not under long term contract in one year surplus contracts. Past surplus contracts have been available for irrigation purposes due to special Congressional authorization.

The 1974 Legislature enacted the State Water Plan Storage Act, which authorizes the KWO to contract with water purchasers for sale of water from any reservoir included in the Kansas Water Marketing Program. Water sold from these reservoirs must be used for municipal or industrial purposes.

between the reservoir and point of delivery (customer), continuous monitoring and possible issuance of legal orders by the DWR.

Water Assurance Districts

Access to water in state owned reservoir storage is also available through the Water Assurance Program (Figure 11). The purpose of the Water Assurance Program is to allow for coordinated operation of state owned or controlled water storage space in federal reservoirs to satisfy downstream municipal and industrial water rights during drought conditions. It is a program to provide enhanced flows from a specific reservoir, which may only be needed during low flow periods.



Through this program, municipal and industrial water right holders in the state's major river basins can purchase storage in Corps reservoirs from the state. Among the powers granted to a water assurance district is authority to levy an annual charge against water assurance district members to cover costs to the state in acquiring, operating and maintaining water supply storage needed to satisfy the water assurance district's needs. A contract, specifying arrangements for payment of these costs to the state, must be negotiated between the KWO and the water assurance district. A key element of the contract and the negotiation process is an operations agreement between the KWO; Chief Engineer, DWR; Corps and the water assurance district which describes the manner in which the reservoirs will be operated to increase their efficiency and enhance the benefits to members of the water assurance district. Eight reservoirs contain storage owned by water assurance districts. All

Much of the water sold from water marketing lakes is directly pumped from the lake and requires minimal operational consideration. Water released for downstream customers requires coordination between the Corps, KWO and the DWR.

usage of water in the water assurance district owned portion of storage is from releases made to meet downstream water assurance district members' needs. The releases are protected against diversion by other users.

The use of a natural water course as a conduit to deliver water to a customer requires estimates of transit loss (evaporation and seepage), determination of natural flow gains, notification of water users (water right holders)

Currently, there are three assurance districts: the Neosho and Cottonwood River Basins Water Assurance District, the Marais des Cygnes River Water Assurance District and the Kansas River Water Assurance District.

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Irrigation Districts

Irrigation districts are another form of water management in Kansas. Most of the surface water used for irrigation is within irrigation districts. Water right holders can form an irrigation district with a petition of the Board of County Commissioners by three-fourths of the land owners that would constitute the irrigation district.⁽²³⁾ They also must petition the Chief Engineer, DWR, for the organization, establishment and authority to incorporate an irrigation district. Irrigation districts can cooperate with the Bureau on construction, maintenance or extension of irrigation works.⁽²⁴⁾

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