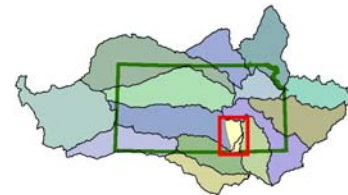


Walnut Basin



- County Seat
- MDS Gage*
- ~ Hydrology
- ~ Interstate Highway
- ~ US Highway
- ~ Kansas Highway
- ~ Federal Lake
- ~ County
- ~ Walnut Basin

* Minimum Desirable Streamflow



10 5 0 10 Miles

Kansas Water Office, February 2008

General Description

The [Walnut River basin](#) covers approximately 2,380 square miles and encompasses most of Butler and Cowley counties, as well as small portions of five other counties in south central Kansas ([HUCs](#) 11030027 and 11030018). The Walnut River rises in the northeastern part of Butler County, joining the Arkansas River at Arkansas City in Cowley County, about 120 miles to the south, and just north of the Kansas-Oklahoma state line.

Other major streams in the basin are the Whitewater River, Timber Creek, Little Walnut River, West Branch Walnut River (all tributaries to the Walnut River), and Grouse Creek. Both the Walnut River and Grouse Creek join the Arkansas River just before it leaves the State of Kansas.

There are two major reservoirs on the river system: [El Dorado Reservoir](#) and Winfield City Lake. El Dorado

Reservoir is formed by damming four headwater tributaries to the Walnut River in the northern part of the basin: Satchel Creek, Durechen Creek, Bemis Creek, and Cole Creek. Winfield City Lake is built on Timber Creek in the southern part of the basin, northeast of the City of Winfield.

Elevations range from 1,625 ft. at the top of the basin to 1,148 ft. in the Walnut River valley. Major cities in the basin include county seat El Dorado in Butler County and county seat Winfield in Cowley County. Other communities in the basin include Augusta and Andover in eastern Butler County and Arkansas City in southern Cowley County.

Population and Economy

There were an estimated 95,925 residents in Butler and Cowley counties in the year 2000.

According to the Kansas Division of Budget, the total [population](#) in these two counties is projected to increase to 129,243 by the year 2040.⁽⁹⁾ This basin illustrates major demographic changes taking place in Kansas. In the past 40 years, two trends have dominated the state and the basin. Rural counties have lost population, sometimes more than 10 percent every decade. While the population of Butler County is projected to increase by 36,756 by 2040, the population of Cowley County is projected to decrease by 3,441 during the same period of time.

The major [crops](#) are wheat, soybeans, cotton, hay, sorghum and corn. Crop value was estimated by the U.S. Department of Agriculture, (USDA) to be \$83,149,500 in 2006. [Livestock](#) production is also an important part of the area's agriculture with beef cattle the predominant livestock raised in the basin. USDA estimates the value of this production to be \$88,236,400.⁽⁵⁾

Farm related employment is a small part of total employment in the basin, even though the majority of the land use is for agricultural purposes. The northern part of the basin, generally in Butler County, is one of the fastest growing areas in the state, with Butler County as a whole ranked ninth in population growth between 2000 and 2005. While the rural farm based population is generally declining, there is continued growth in rural areas of non-farm residences outside of city limits in which residents generally commute to employment in either El Dorado, Wichita, or the surrounding suburban communities.

Although Sedgwick County and Wichita are in the Lower Arkansas River basin to the west, the western part of the Walnut basin is influenced by the Wichita metropolitan area economy and population. The influence of the Wichita Metropolitan area on population in the Walnut basin, especially in Butler County, has been apparent

since the 1950s. Growth in the western parts of the counties can be attributed to an eastward expansion of the Wichita industrial and metropolitan area. This is enhanced by the well developed transportation system shown on the basin map. For more information on this issue, see the [Regional Planning for Urbanization](#) section.

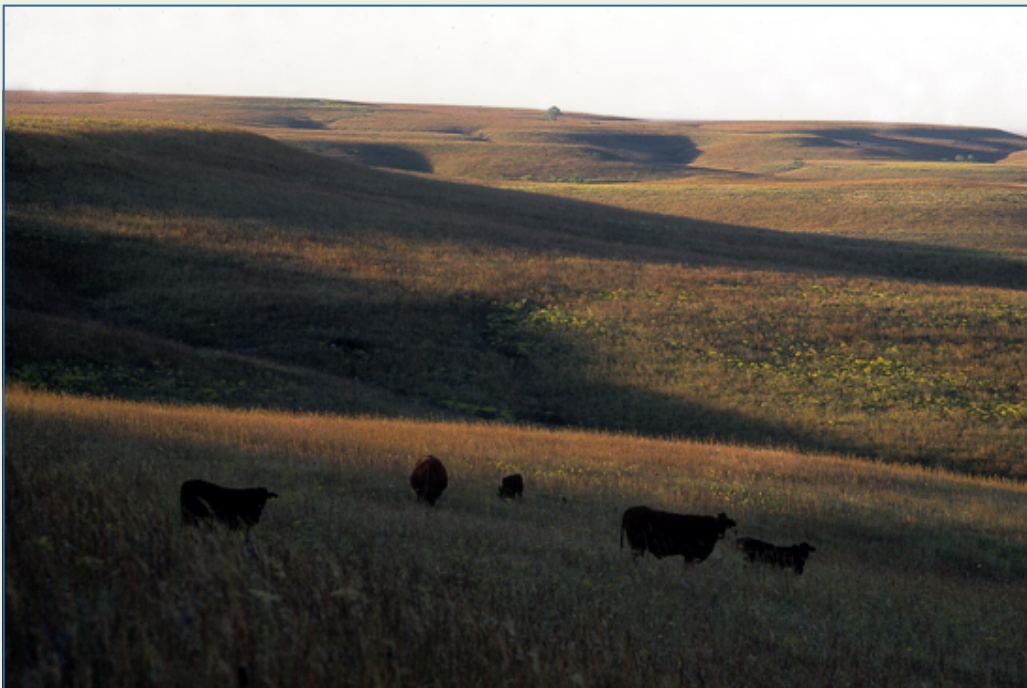
Petroleum production and refining also supports the basin economy. Several pipelines run through the upper area of the basin. The state correctional facilities and light industry are growing segments of the economy. In addition, construction, wholesale trade, retail, finance, insurance, educational and health care services, arts, entertainment and recreation, and the accommodation and food service industries account for major economic growth sectors. Butler and Cowley County Community Colleges provide opportunities for advanced education.

The Walnut and Whitewater rivers are not considered to be navigable under Kansas law and are generally not accessible to the public for water based recreational activities. See the [Recreational Use of the Walnut River Basin Priority Issue](#). However, El Dorado Reservoir provides an important water based economic resource in the upper part of the basin. El Dorado Reservoir was constructed by the U.S. Army Corps of Engineers (Corps) and was completed in June of 1981.

The reservoir consists of approximately 8,000 surface acres of water, 4,500 acres of park lands and 3,500 acres of wildlife

area. The Kansas Department of Wildlife and Parks (KDWP) manages these areas.

Close to one million people visit El Dorado State Park each year. Recreation opportunities include fishing, hunting, camping, boating and observing wildlife.



Open Range on the Flint Hills. Photo courtesy Kansas Geological Survey

Reservoir and park visitors also stop in El Dorado and other Butler County communities and purchase products, goods and services which generates around \$15 million annually, an estimate that is considered to be conservative. Winfield City Lake provides similar economic benefits in the southern part of the basin.

Zebra mussels, an aquatic invasive species, have populated both of these reservoirs in recent years. Zebra mussels have razor sharp shells and upset the ecological balance of the waters. It is not known at this time what impact the presence of Zebra mussels may have on visitation rates and fisheries production at these area reservoirs. The Zebra mussel, *Dreissena polymorpha*, is a bivalve mussel native to freshwater lakes of southeast Russia. Zebra mussels get their name from the striped pattern on their shells, though not all shells bear this pattern. They are usually about the size of a fingernail, but can grow to a maximum length of nearly two inches.

Its native distribution is in the Caspian Sea. Zebra mussels are considered an invasive species in North America and in Sweden.



Zebra Mussel build up on wet well trash rack , El Dorado Lake

Physical Characteristics

Geology and Soils

The topography of the Walnut basin features a series of east-facing escarpments or hills, including the southern section of the Flint Hills belt which bisects the state from the Nebraska to the Oklahoma borders. The limestone beds in the Flint Hills contain large amounts of flint or chert. Where these beds mantle the uplands, erosion of the underlying soft shales has been reduced. The

streams in the Flint Hills upland area characteristically have deep and narrow valleys, lined with outcropping limestone ledges.⁽²⁾

The rocks that crop out at the surface in the basin belong to geologic formations of Permian age that were formed about 200 million years ago. The rocks consist of alternating beds of limestone, cherty limestone and shale. Unconsolidated deposits of more recent geologic age occur locally in the uplands and in the valleys of major streams. Chert gravels were deposited in the uplands by ancient streams that traversed the area before the present drainage pattern was established. The unconsolidated



Limestone cave & spring, Butler Co.
Photo courtesy KGS

valley deposits consist of chert gravel, sand, silt, and clay. Thin, discontinuous deposits of loess or windblown silt also occur locally in the uplands and in the major stream valleys. In most areas, loess deposits are only a few feet thick, but along the Arkansas River in Cowley County east of Arkansas City, the loess is about 30 feet thick.

Soils were developed from the underlying limestones and shales and in most parts of this predominantly hilly area the soils are relatively shallow, making them best suited for native pastures. Upland soils are subject to extensive sheet and gully erosion. This makes the already thin topsoils particularly vulnerable to being washed from the surface contributing to downstream [sedimentation in streams and reservoirs](#).

Conservation treatment of agricultural lands is a major strategy in reducing erosion. Before European settlement, the soils were held in place by deep rooted tall grasses and forbs. Grazing impacts were minimal as the native bison herds moved throughout the expansive grasslands. As a result of more recent intensive cattle grazing, much of the prairie is overgrazed, exposing the soil to erosive forces.

Land Use/Land Cover

West of the Whitewater River, land use is predominately crop land; east of the Whitewater River the land use is predominately grassland except for along the floodplains of the Walnut River and its tributaries. Overall, grassland covers about 66% of the basin, crop land covers about 23% and woodlands cover 5 percent. Subbasins dominated by grassland are the Little Walnut River (82%), Timber Creek (72%), and the Walnut River upstream from El Dorado Lake (81%). Cropland is dominant in the Whitewater River subbasin (65%).⁽³⁾ (USGS). Less than 3 percent of the basin is urban and less than 2 percent is water.

In 2006 there were an estimated 2,310 farms, covering 1,382,000 acres in the two counties. The average farm size was 608 acres.⁽⁵⁾

According to the 2003 Assessment of Riparian Areas Inventory by the Kansas Geological Survey (KGS), of the 14,887 bank miles of riparian area within 100 ft. of the streams in the basin, the dominant riparian cover is pasture/grassland (41%). The second most common cover is forestland (20%) , and third most common cover is crop land (16%). The remaining riparian cover types, in descending order of dominance, are pasture/tree mix, crop land/tree mix, shrubland, urban, urban/tree mix, and barren land.

Climate

The climate is characterized as humid continental with cold winters and hot summers. Annual [precipitation](#) varies from 32 inches in the western part to 34 inches in the eastern part of the basin. Approximately 72% of this precipitation falls between April and September. In an average year snowfall varies between 10 and 15 inches. Table 1 summarizes climate conditions in El Dorado and Winfield for the period between 1971 and 2000.

Table 1					
Climate Summary Walnut Basin					
	Average Annual ¹		Freeze Dates (32 F.) ²		
Location	Precipitation (inches)	Temperature (deg. F.)	Last in Spring	First in Fall	Frost Free Days
El Dorado	35.51	55.5	Apr. 17	Oct. 17	183
Winfield	37.64	56.4	Apr. 14	Oct. 20	189

¹ Source: National Climatic Data Center (1971-2000 data)

² Source: KSU Weather Data Library (1961-1990 data)

Wildlife and Habitat

The basin is home to numerous species of fish and wildlife. Approximately 70 species of butterflies have been identified in Butler County alone. The El Dorado Reservoir watershed is located within the Central Flyway for migratory birds. The entire area is part of the Flint Hills Ecoregion. The Flint Hills Tall Grasslands is the smallest grassland ecoregion in North America and is distinguished from other grassland associations by the dominance of tallgrass species—and from the Central Tall Grasslands to the north by its more limited biota and a thin soil layer spread over distinct beds of limestone. These flinty beds of limestone, from which the name of this ecoregion is derived, rendered large areas unsuitable for corn or wheat farming. Today, the Flint Hills Tall Grasslands is an anomaly—an essentially unplowed (although heavily grazed) remnant of the tallgrass prairie. Historically, fire, drought and grazing by bison and other ungulates were the principle sources of habitat disturbance in this ecoregion.

The dominant grass species in this ecoregion are big bluestem, switchgrass and Indian grass. Like other ecoregions of this section of North America, bison and elk once roamed these tallgrass prairies, where they were hunted by the prairie wolf. These species are now gone, although bison are being reestablished in this ecoregion.

There are 14 threatened or endangered species in the basin. Seven are birds, five are fish, one is a mammal and one is a mussel. Butler County has critical habitat for the bald eagle and Topeka shiner, and Cowley County has critical habitat for the Arkansas darter, the Arkansas River shiner, the Arkansas River speckled chub, and the silver chub. Grouse Creek is considered a reference stream in Kansas meaning that it has geomorphic, biologic, and chemical conditions characteristic of pre-settlement conditions.



Arkansas River Shiner. Photo courtesy Gerald Sneegas

Water Resources

There are no natural lakes in the basin but numerous manmade surface water impoundments have been constructed. Reservoirs in the watershed include Augusta Lake, Winfield City Lake and El Dorado Reservoir. El Dorado Reservoir is operated by the Corps for the primary purpose of [flood control](#). At the top of the conservation pool, the lake is approximately 8,000 acres and has 98 miles of shoreline. Community and other lakes include Fox Lake, Lake Clymer, Rogers Pond, Cowley County Lake, Harvey County East Lake, and Santa Fe Lake. All counties also have state fishing lakes.

The Walnut basin contains 6,830 miles of streams; 5,729 miles of these are intermittent and 1,101 miles are perennial. Stream density in the basin is 2.8 stream miles/square mile area, making it the basin with the highest stream density in the state.

The major streams in the basin are the Walnut River and its tributaries, the Whitewater River and Little Walnut Creek; and Grouse Creek. Grouse Creek is actually a direct tributary of the Arkansas River and is not hydrologically connected to the Walnut River; however, for planning purposes, the Kansas Water Office (KWO) includes the Grouse Creek drainage with the Walnut River basin. Both the Walnut River and Grouse Creek join the Arkansas River just before it leaves the State of Kansas.

Ground water is present in alluvial deposits along major streams. Real-time water level information can be found at the U.S. Geological Survey (U.S.G.S.) website.⁽¹¹⁾

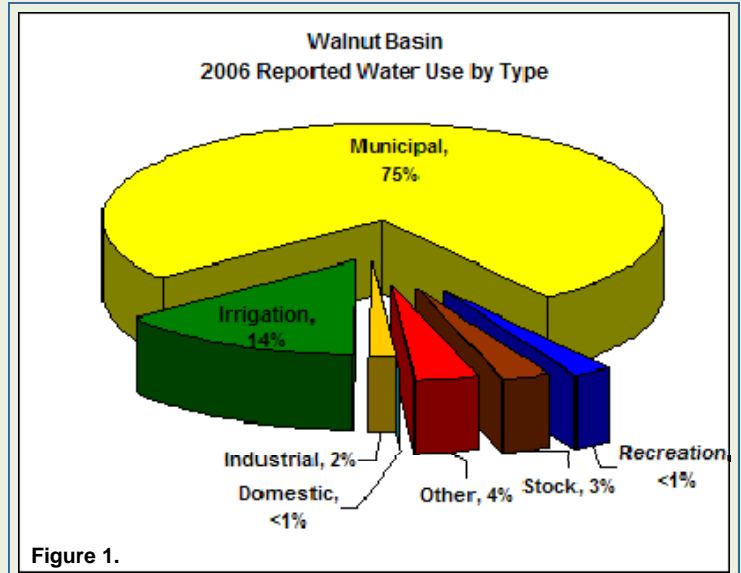
[Surface water](#) makes up over 85% of the water used in the basin. The major [use of water](#) in the basin is for municipal purposes, at over 75% and 96% of this is from surface sources. Irrigation uses about 14% (77% from surface water) and recreation, industrial, stockwater and other uses account for the remaining 11% (Figure 1).

Water Management

[Surface water management and conservation](#) is a priority issue for this basin.

The major streams in the basin are closed to new appropriations during the May to September timeframe. There are two sites where minimum desirable streamflows (mfs) have been set (see [Basin Map](#)).

Significant [water management](#) entities in the basin include the conservation districts in Butler and Cowley counties and eight [watershed districts](#), which cover approximately 95% of the land area of the basin. The



Corps, responsible for the operation of El Dorado Reservoir, is an important water manager in the basin. The City of El Dorado contracts with the Corps for all of the public water supply storage space in El Dorado Reservoir, making the City another important water manager.

Some communities and rural water districts (RWDs) in the Walnut basin get their public drinking water supply from Wichita.

The cities of Winfield, El Dorado and Arkansas City are permitted, since 2004, under the Kansas Department of Health and Environment Stormwater Program. These municipalities are responsible for managing the quality and quantity of stormwater runoff within their boundaries.

[Watershed Restoration and Protection](#) (WRAPS) teams are an emerging water management entity in the basin.

Resources

1. *Kansas Water Plan 2003—Walnut Basin Section*
2. Kansas Water Resources Board Geology and Soils Preliminary Assessment reports; Ecoregion descriptions
3. United States Geological Survey 2000. K. E. Juracek. Report No. 00-4177 "Estimation and Comparison of Potential Runoff Contributing Areas in Kansas Using Topographic, Soil, and Land Use Information.
4. Kansas Water Office. 2008. Reservoir Fact Sheets
5. U.S. Department of Agriculture, Kansas. 2006-2007 County Farm Facts, Agricultural Statistics and Ranking.
6. Wilson, Brownie. 2003. Assessment of Riparian Areas Inventory, State of Kansas. http://hercules.kgs.ku.edu/geohydro/ofr/2003_55/riparian/ofr_2003_55e.htm.
7. Water Rights Information System. Kansas Department of Agriculture-Division of Water Resources, December 13, 2007.
8. U.S. Census Data—2000.
9. Kansas Division of Budget. 2007. County Population Estimates.
10. Kansas Water Resources Board Water Plan Studies. Verdigris Unit Report.
11. <http://waterdata.usgs.gov/ks/nwis/rt>

Walnut River Feasibility Study

A Walnut River Basin Reconnaissance Study and an El Dorado Reservoir Feasibility Study/Watershed Management Plan have recently been completed by the Tulsa District Corps. The Reconnaissance Study was initiated in 2001 and the Feasibility Study was initiated in 2004.

The scope of the Feasibility Study began as an examination of the Walnut River basin and potential ecosystem restoration opportunities that would use the state's established best management practices (BMPs). Eventually, the study was re-focused to evaluate just the area above El Dorado Reservoir and the reservoir operations and processes, and ultimately to develop a Watershed Management Plan. The purpose of the plan is to identify and evaluate solutions to in-reservoir and watershed problems identified by the State of Kansas and the City of El Dorado that could be implemented in small steps all leading toward long term watershed objectives.

Development of the watershed management plan was guided by two long term restoration and protection goals and twelve specific objectives formulated by the state and the city. The goals were: 1. Identify effective reservoir restoration and protection measures to ensure long range availability of storage space for public water supplies in federal reservoirs, using El Dorado Reservoir as a pilot (with 8 objectives); and 2. Identify watershed restoration and protection needs and determine opportunities to implement effective management practices (with 4 objectives).

The Plan provides valuable information for near term restoration and preservation planning and implementation. A software watershed model was developed using the Soil and Water Assessment Tool (SWAT) to satisfy several of the watershed objectives. Additional data were collected as part of the study, such as a bathymetric survey to determine the current storage in El Dorado Reservoir.

For a complete copy of the report, contact the Kansas Water Office at 785-296-3185.

Walnut River Basin Management Categories

January 2009

MANAGEMENT CATEGORIES

The following categories include issues identified in the [Walnut basin](#) plan as items that require attention in addition to the basin priority issues. These issues are addressed within the following management categories:

- Water Management
- Water Conservation
- Public Water Supply
- Water Quality
- Wetland and Riparian Management
- Flood Management
- Water-Based Recreation

These categories also correspond to the statewide management categories and policies of the *Kansas Water Plan* found in [Volume II](#). These documents contain new policy issues and the existing policy and statutory framework that relate to the management categories.

ISSUE: [WATER MANAGEMENT](#)

The major streams in the basin are closed to new appropriations during the May to September timeframe. There are two sites where minimum desirable streamflows have been set. One is on the Whitewater River before the confluence with the Walnut River and the other is on the Walnut River above Arkansas City. ([Basin Map](#))

Applicable *Kansas Water Plan* Objectives

- 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 time of enactment.

Applicable Programs

The following programs help to meet the objectives in the Water Management category. For more information on the programs and associated policies, see the [Programs Manual](#).

- Kansas Water Office: Water Marketing Program
- Kansas Water Office: Water Assurance Program

- Kansas Department of Agriculture-Division of Water Resources: Water Appropriation Program
- Kansas Geological Survey, Kansas Department of Agriculture-Division of Water Resources: Water Well Measurement
- Kansas Water Office: State Water Planning Program
- USDA-NRCS: Environmental Quality Incentive Program

ISSUE: WATER CONSERVATION

Water conservation is essential for the effective management of water resources in the basin to assure that a sufficient, long-term, supply of water is available for the beneficial uses of the people of the state. Conservation is defined as a careful preservation and protection of something, especially the planned management of a natural resource to prevent exploitation or destruction.

[Water usage](#) in gallons per capita per day (gpcd) is calculated for each water system in the state from reported

data on water use and [population](#) served. Average gpcd figures for large, medium and small water suppliers are calculated in eight regions of the State based on similar geographic areas. The Walnut basin is located in region 7. Average gpcd for large, medium and small suppliers in region 7 are: 145,

107 and 100 gpcd respectively. This serves as a reference to indicate if individual supplies are above or below average usage for the region.

Unaccounted for water includes any unmetered uses, such as water used for fire fighting plus water loss in the distribution system. High amounts of unaccounted for water may result from water line breaks, under registering customers, unmetered uses, faulty metering or inaccurate accounting. The statewide average percentage of unaccounted for water use in 2006 was 14%. Technical assistance is available through KWO for systems with more than 30% unaccounted for water.

2007 Kansas Municipal Water Conservation



Kansas Water Office
901 S. Kansas Avenue
Topeka, KS 66612-1249
785-296-3185
www.kwo.org

August 2007

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Walnut River Basin Management Categories

January 2009

Management of unaccounted for water is a fundamental and manageable tool in providing adequate water supply. Some unaccounted for water represents water that has been treated and then has been wasted and lost the potential to be put to beneficial uses.

The KWO develops and maintains guidelines for water conservation plans and practices. The primary goal of water conservation plans is to achieve more efficient use of the limited water resources of the state. The Water Conservation Plan Guidelines were updated in 2007. Of the 33 public water suppliers in the Walnut basin, 25 have approved water conservation plans, but all but four of these need to update the plans to comply with the 2007 guidelines. All other plans were developed based on guidelines from 1990.

The four basic types of water rate structures used in Kansas are described as flat rate, decreasing block rate, uniform block rate, and increasing block rate. Utilities with a flat rate charge each customer a fixed amount per month regardless of the amount of water used. With a decreasing block rate, the unit cost of water decreases as usage increases. The unit cost of water is the same for all levels of usage with a uniform block rate. With an increasing block rate, the unit cost of water rises as usage increases.

The type of rate structure can affect gpcd usage. Systems with flat rates tend to use considerably more water per capita than systems that meter customer use. The other three types of rate structures, in which cost depends on amount of water used, have a less dramatic effect on gpcd. Decreasing block rates are assumed to discourage conservation because customers are charged lower rates for high-volume usage. Increasing block rates are considered an effective way to promote conservation among high-volume users while keeping the cost of moderate use affordable. However, the use of these types of rate structures does not appear to influence usage by individual customers as much as does the total monthly water cost and the geographic area in which they live.

Applicable Kansas Water Plan Objectives

- Reduce the number of public water suppliers with excessive “unaccounted for” water by first targeting those with 30% or more “unaccounted for” water.
- 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.



Tallgrass Prairie, Butler County, Kansas. Photo courtesy KGS.

Applicable Programs

The following programs help to meet the objectives in the Water Conservation management category. For more information on the programs and associated policies, see the [Programs Manual](#).

- Kansas Department of Agriculture-Division of Water Resources: Water Appropriation Program
- Kansas State University Research and Extension: Water Conservation and Management Program
- State Conservation Commission: Water Resources Cost-Share Program
- Kansas Water Office: Water Conservation Program
- USDA-FSA: Conservation Reserve Program

ISSUE: PUBLIC WATER SUPPLY

See [Surface Water Management and Conservation Basin Priority Issue](#).

The primary approach to addressing public water supply issues in the basin focuses on ensuring that there are adequate supplies of [surface](#) and ground water within the basin to meet future water demands, reducing the number of public water supply systems that are vulnerable to drought, and ensuring that systems have the technical, financial and managerial capacity to meet future needs for water quality and quantity.

Walnut River Basin Management Categories

January 2009

There are 33 [public water suppliers](#) in the Walnut basin, of which 16 are rural water districts (RWD). There is one public wholesale water supply district (PWWSD) in the basin. PWWSD #8 was established in 1982 and is operated by Butler County RWD #3 and El Dorado State Park. The district supplies water to members through a water purchase contract with the City of El Dorado. PWWSDs are considered to enhance the long-term availability of water supply in the areas of the basin they serve.

Drought vulnerable water supplies are those supplies most likely to be 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 vulnerable water supplies were surveyed in 2003 and 2006. The number of public water suppliers considered drought vulnerable in the Walnut basin decreased from 14 to 4 between the two surveys (Table 1).

Supplier Name	Limitation
Butler RWD # 04	Contractual
Cambridge	Contractual
Dexter	Contractual
Leon	Basic Source

Drought Stage Triggers (Table 2) are the signals that water shortage or other conditions indicative of drought have reached certain stages or levels. They act as the signal to begin implementation of the appropriate stage. Triggers may be related to supply conditions or demand levels. A given stage should have more than one trigger to confirm that conditions are worsening. A water utility or other municipal water entity should enact the appropriate stage whenever the agreed upon set of triggers is reached. Delay in action may lead to a major disruption of the water supply system at a later time.

Every drought response plan should be set up in stages, each one more stringent than the one before it. Triggering mechanisms should be identified to signal the start of a given stage and specific goals should be identified as the desired outcome for each stage. Finally, appropriate conservation practices in the areas of education, management and regulation should be listed under each stage. Stages are appropriate to implement drought response practices or actions because the impact of conservation practices of a moderate stage may preclude the need for the municipal water entity to enact more severe conservation practices at a subsequent stage.

Table 2.

Drought Stage Triggers used by public water suppliers with surface water sources:

1. Lake level in terms of elevation or capacity.
2. Stream level in terms of flow or stage.
3. Water level in relation to the dam.
4. Peak daily demand levels.
5. Percent capacity of treatment plant operations over a number of days.
6. Capacity of water system storage and ability to recover.
7. The provider for purchased water has issued a drought stage.
8. Emergency conditions related to repairs or water quality.
9. The Kansas Water Office has issued a drought stage based on the remaining water marketing storage in a basin reservoir.

Applicable *Kansas Water Plan Objectives*

- Ensure that sufficient surface water storage is available to meet projected year 2040 public water supply needs for areas of Kansas with current or potential access to surface water storage.
- Less than five percent of public water suppliers will be drought vulnerable.
- Ensure that all public water suppliers have the technical, financial and managerial capability to meet their needs and to meet Safe Drinking Water Act requirements.

Applicable Programs

The following programs help to meet the objectives in the Public Water Supply management category. For more information on the programs and associated policies, see the [Programs Manual](#).

- Kansas Department of Agriculture-Division of Water Resources: Water Appropriation Program
- Kansas Department of Health and Environment: Public Water Supply Program
- Kansas Water Office: State Water Planning Program
- Kansas Water Office: Water Conservation Program

ISSUE: WATER QUALITY

See [Watershed Restoration and Protection Strategy Basin Priority Issue](#)

Water quality and related water resource issues are addressed through a combination of watershed restoration and protection efforts utilizing voluntary, incentive based

Walnut River Basin Management Categories

January 2009

approaches, as well as regulatory programs.

Applicable *Kansas Water Plan Objectives*

- Reduce the average concentration of bacteria, biochemical oxygen demand, solids, metals, nutrients, pesticides and sediment that adversely affect the water quality of Kansas lakes and streams.
- Ensure that water quality conditions are maintained at a level equal to or better than year 2000 conditions.
- Reduce the average concentration of dissolved solids, metals, nitrates, pesticides and volatile organic chemicals that adversely affect the water quality of Kansas ground water.
- Maintain, enhance, or restore priority wetlands and riparian areas.
- Nutrient reduction goals will be included in all WRAPS projects within the basin.
- All public water suppliers will complete and implement a source water protection plan.



Stone Bridge over Badger Creek, Cowley County
Photo courtesy Kansas Geological Survey

Applicable Programs

The following programs help to meet the objectives in the Water Quality management category. For more information on the programs and associated policies, see the [Programs Manual](#).

- Kansas Department of Health and Environment: State Water Plan Program (Contamination Remediation)
- Kansas Corporation Commission: Conservation Division Programs

- Kansas Department of Health and Environment: Local Environmental Protection Program
- Kansas Department of Health and Environment: Watershed Management Program
- State Conservation Commission: Nonpoint Source Pollution Control Program
- State Conservation Commission: Water Resources Cost-Share Program

ISSUE: WETLAND AND RIPARIAN MANAGEMENT

See [Watershed Restoration and Protection Basin Priority Issue](#) for more information.

The primary approach to wetland and riparian management in the basin focuses on providing technical and financial assistance to landowners to protect and restore these resources in priority watersheds through the implementation of best management practices.

Applicable *Kansas Water Plan Objectives*

- Maintain, enhance or restore priority wetlands and riparian areas.

Applicable Programs

The following programs help to meet the objectives in the Wetland and Riparian category. For more information on the programs and associated policies, see the [Programs Manual](#).

- Kansas Department of Wildlife and Parks: Wildlife Habitat Improvement Program
- Kansas Department of Wildlife and Parks: State Parks and Wildlife Areas Planning and Development
- Kansas Forest Service: Forest Stewardship Program and Conservation Tree Planting Program

ISSUE: FLOOD MANAGEMENT

See [Comprehensive Flood Assessment Basin Priority Issue](#)

Applicable *Kansas Water Plan Objectives*

- Reduce the vulnerability to damage from floods within identified priority communities or areas.

Applicable Programs

The following programs help to meet the objectives in the Flood Management category. For more information

Walnut River Basin Management Categories

on the programs and associated policies, see the [Programs Manual](#).

- Kansas Department of Agriculture-Division of Water Resources: Water Structures Program/Floodplain Management
- State Conservation Commission: Watershed Dam Construction Program
- State Conservation Commission: Watershed Planning Assistance Program
- Kansas Division of Emergency Management: Hazard Mitigation Grants Program
- FEMA: National Flood Insurance Program

ISSUE: WATER-BASED RECREATION

See [Recreational Access to the Walnut River Basin Priority Issue](#)

Even though the Walnut basin has a wide variety and fairly high number of public water recreation sites proportional to the area covered, there is a demand for more water based recreation facilities, to meet the needs of a comparatively large population. The approach to enhancing opportunities for recreation is to improve access to water bodies that exist in the basin that are open to the public.

Applicable Kansas Water Plan Objectives

- Increase public recreational opportunities at Kansas lakes and streams.

Applicable Programs

The following programs help to meet the objectives in the Water-Based Recreation management category. For more information on the programs and associated policies, see the [Programs Manual](#).

- Kansas Department of Wildlife and Parks: Rivers and Stream Access
- Kansas Department of Wildlife and Parks: Walk In Hunting Access Program
- Kansas Department of Wildlife and Parks: Fishing Impoundments and Stream Habitats (F.I.S.H.) Program/Walk in Fishing

Walnut Basin High Priority Issue Watershed Restoration and Protection January 2009

Page 1

Issue

The restoration and protection of watersheds, particularly those watersheds above public water supply reservoirs and lakes, is a priority in the [Walnut basin](#). With growing [populations](#) in the northern portion of the basin and a corresponding increase in the demand for water, the restoration and protection of these watersheds and the reservoirs below them are of high importance.

Description

[El Dorado Reservoir](#) and Winfield City Lake are the two major sources of stored water supply in the basin. El Dorado Reservoir is operated by the U.S. Army Corps of Engineers (Corps). The City of El Dorado manages all of the water stored for public water supply. El Dorado Reservoir is used for public water supply programs that serve numerous cities and rural water districts (RWDs) in the basin, primarily in the rapidly growing areas in the northwest portion of the basin influenced by the Wichita metropolitan area. It is also managed by the Corps for [flood control](#) and [recreation](#). Winfield City Lake is owned and operated by the City of Winfield and is also heavily used for recreation.

Reservoir sedimentation and eutrophication are major water supply concerns. As sediment accumulates in a reservoir's multipurpose pool, the capacity for water supply storage is reduced. A recent bathymetric survey of El Dorado Reservoir did not result in a new sedimentation rate for the reservoir due to issues with equipment and accuracy of the original topographic maps. There was also uncertainty about quantities of sedimentation behind the several highway and road bridges, and in borrow pits resulting from dam construction that were not mapped. Future work will involve additional bathymetric surveys and sediment core samples to get a better idea of how capacity in the reservoir has changed since construction. Recent bathymetry in Winfield City Lake indicates that the lake has lost about 713 acre feet of storage to sediment accumulation, leaving approximately 17,921 acre-feet of storage, or about 95% of its original storage capacity, still available.

Zebra mussels

In 2003, the presence of Zebra mussels in El Dorado Reservoir was confirmed, and in 2005 their presence was confirmed in Winfield City Lake. Zebra mussels have also been found in the Walnut River. It is not yet known what the impacts on water quality and recreation in these reservoirs will be. The City of El Dorado, state

agencies including the Kansas Departments of Wildlife and Parks (KDWP) the Kansas Department of Health and Environment (KDHE), and the Corps are closely monitoring to identify affects of the mussels on water quality and biology, and to prevent their further spread throughout the basin and into other basins.

Water Quality Impairments

Water quality and related water resource issues are addressed through a combination of watershed restoration and protection efforts utilizing voluntary, incentive-based approaches, as well as regulatory programs.

Surface waters not meeting surface water quality standards in the basin are included on the 303(d) list. The KDHE has completed the first round of Total Maximum Daily Loads (TMDLs) within the Walnut basin based on the 1998 303(d) list, and an additional round of TMDL development was initiated in 2007. Many of the stream segments, configured in a watershed setting, have a TMDL applied to them as a whole. There are 14 approved TMDLs within the Walnut basin that describe the strategies and goals to reduce pollution to achieve water quality standards.⁽⁶⁾

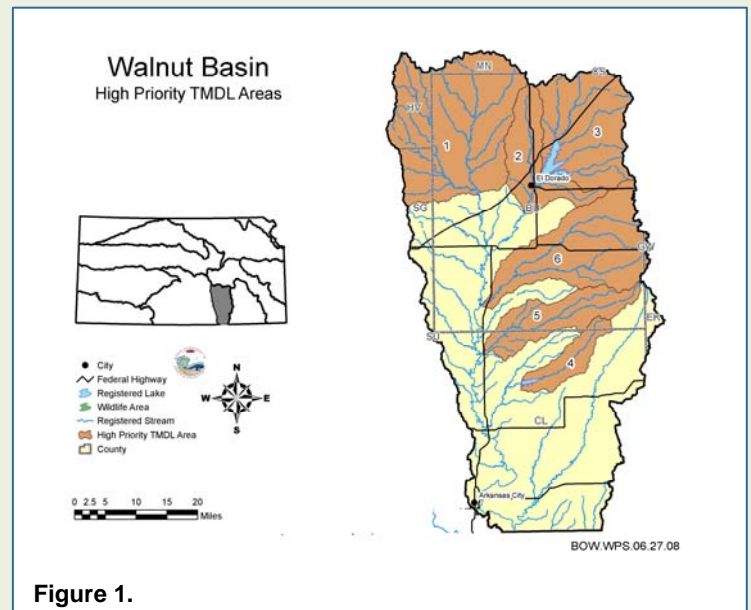


Figure 1.

The 2008 303(d) list submitted to the U.S. Environmental Protection Agency (EPA) identifies watersheds associated with six stream chemistry sampling stations as water quality impaired. There are three lakes in the Walnut basin listed as water quality impaired. Among the streams Atrazine, copper, sulfate and total phosphorus cause impairments. Among the lakes eutrophic conditions indicative of excessive algae production were the

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causes of impairment. Each parameter causing impairment requires a TMDL.

KDHE recently reviewed and revised Walnut basin TMDLs and submitted them to EPA in late summer 2008. A new high priority eutrophication TMDL for Winfield City Lake is proposed. The current El Dorado Reservoir TMDLs were evaluated during this round of TMDL submissions and no changes are recommended at this time. Dissolved oxygen (D.O.) and bacteria TMDLs were reviewed and revision of priorities have also been proposed.

High priority TMDL watersheds (Figure 1) are used to target technical and financial assistance for implementation of nonpoint source pollution management practices that can address designated pollutants. Table 1 describes the impairments in each watershed.

TABLE 1 Walnut BASIN HIGH PRIORITY TMDLS			
MAP ID	WATERBODY	IMPAIRMENTS	HUC 11 WATERSHEDS
STREAM SEGMENTS			
1	Whitewater River	FCB	11030017
2	Upper Walnut River	FCB	11030017
5	Rock Creek	E. coli	11030018
6	Little Walnut River	E. coli	11030018
LAKES			
3	El Dorado Lake	Eutrophication	11030017
3	El Dorado Lake	Silt	11030017
4	Winfield City Lake	Eutrophication	11030018

Key:
 E: Eutrophication, biological community impacts and excessive nutrient/organic loading
 FCB: Fecal Coliform Bacteria
 HUC: U.S. Geologic Survey Hydrologic Unit Code
 Silt: Observed siltation and/or chronic turbidity that impacts development of trophic state
 E. coli: Indicator organism within FCB

A component of the TMDL process is to quantify the cost to implement best management practices (BMPs) and technical assistance necessary to address the impairments. The State Conservation Commission (SCC) has prepared a “needs inventory” to estimate costs associated with reducing nonpoint source pollution in this basin, and guide implementation of BMPs. Programs are targeted at achieving high priority TMDL goals.

See the KDHE TMDL website listed in the resources for additional information.⁽⁶⁾

Surface Water Nutrient Reduction

The impacts of nutrients originating in Kansas have been well documented – Gulf of Mexico hypoxia, excessive productivity in Kansas and downstream reservoirs, and taste and odor problems in drinking water originating from reservoirs. Reduction and control of nutrients is needed to begin mitigating those impacts. The Kansas Surface Water Nutrient Reduction Plan, developed by KDHE, outlines a statewide strategy for reducing the export of total nitrogen (TN) and total phosphorus (TP) in surface waters leaving the state.⁽⁵⁾ This involves additional reductions in nutrients from point source discharges through the National Pollutant Discharge Elimination System (NPDES) Program and reductions in non-point sources through development and implementation of Watershed Restoration and Protection Strategies (WRAPS). The Nutrient Reduction Plan includes Improvement Potential Index (IPI) maps for Kansas counties for TP and TN reductions (see maps in [Water Quality Policy Section](#)). In the Walnut basin, Butler County showed the highest improvement potential for TN. Both Butler and Cowley counties have high potential for improvement for phosphorus.

Nutrient sources within the Walnut basin include both point and nonpoint sources. The major point sources in the basin include large wastewater treatment plants, which are regulated under the NPDES Program (Figure 2).

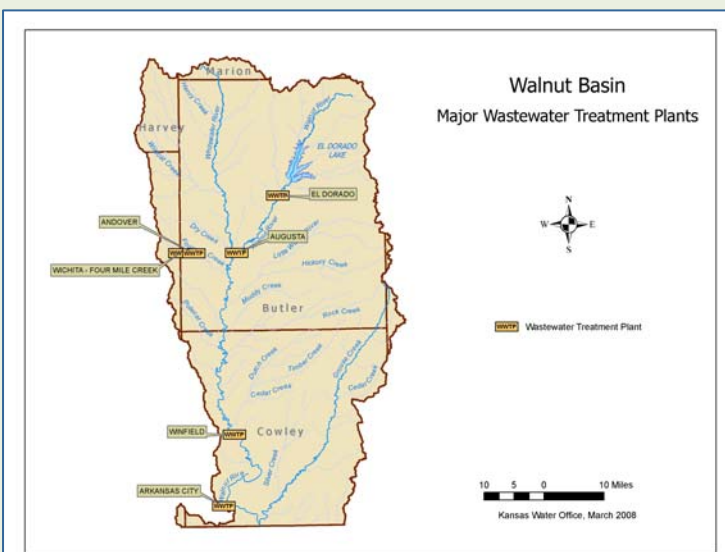


Figure 2. Major Wastewater Treatment Plants in the Walnut Basin

A major component of the Nutrient Reduction Plan involved looking at nitrogen transport to the Gulf of Mexico. In order to calculate the contribution of nitrogen to

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the Gulf, nitrogen concentrations of waters exiting the state borders were collected and estimated. Because the Walnut River confluences with the Arkansas River before leaving the state there are no “exit points” for the Walnut River. All contribution from the Walnut basin is added into the Arkansas basin (Upper and Lower) where the Arkansas River exits Kansas into Oklahoma. Therefore, for the purposes of this Plan, the [Walnut basin](#) contribution is combined with the [Upper](#) and [Lower Arkansas](#) basins.

Nonpoint sources of pollution include both agricultural and urban areas. Table 2 shows the relative contribution of point and nonpoint sources in the Lower and Upper Arkansas and Walnut basins for TP and TN leaving the state.

**Table 2
Walnut Nutrient Reduction Data
Source: KDHE Bureau of Water – February 14, 2006**

Statewide Perspective

Parameter	State Total	UA/LA/WAL	% of State Total
TN Leaving State (Ton/yr)	51,205	6,943	14%
TP Leaving State (Ton/yr)	7,670	1,582	21%
Point Source TN (Ton/yr)	10,600	3,503	33%
Point Source TP (Ton/yr)	2,836	886	31%
Nonpoint Source TN (Ton/yr)	40,605	3,440	8%
Nonpoint Source TP (Ton/yr)	4,834	696	14%

UA/LA/Walnut Basin Perspective

Parameter	Total	PS	PS %	NPS	NPS%
TN (Ton/yr)	6,943	3,503	50%	3,440	50%
TP (Ton/yr)	1,582	868	56%	696	44%

The KDHE Bureau of Water administers programs related to public water supplies, wastewater treatment systems, the disposal of sewage, and nonpoint sources of pollution. Programs are designed to provide safe drinking water, prevent water pollution, and assure compliance with state and federal laws and regulations such as the Clean Water Act and Safe Drinking Water Act. State Water Quality Standards include provisions for alternative disposal of treated wastewater and residue material resulting from the waste treatment process. KDHE’s minimum standards for the design of water pollution control facilities include guidelines for agricultural application of wastewater and sludge. Reuse of treated wastewater may contribute to water conservation within the basin.

Source Water Protection

All public water suppliers in the basin completed Source Water Assessments in cooperation with the KDHE in 2004.⁽³⁾ The next step, which is voluntary, is the development of source water protection plans.

Of the 12 [public water suppliers](#) in the basin which treat raw water, 3 use [surface water](#) and 9 use ground water. Most residents in the basin get water from the Walnut River, one of its major tributaries, El Dorado Reservoir or Winfield City Lake. While more suppliers use ground water than surface water, the populations served by surface water is larger.

Each Source Water Assessment included a susceptibility score which can help communities determine which contaminants pose the most significant threat to their water supply. A susceptibility score was generated from the susceptibility analysis and indicates whether the susceptibility range is low, moderate or high for potential threats of contamination in an assessment area.

KDHE provided public water suppliers susceptibility scores in the following contaminant categories: microbiological, nitrates (applicable for ground water only), pesticides, inorganic compounds, synthetic organic compounds, volatile organic compounds, sedimentation (surface water only), and eutrophication-phosphorus (surface water only).

Fifty-eight percent of the public water suppliers in the [Walnut basin](#) had moderate susceptibility scores. Of the public water suppliers in the basin using ground water, 22% had low susceptibility scores and 78% had moderate scores. All of the public water suppliers using surface water received low susceptibility scores.

The most commonly identified problems with ground water were volatile and synthetic organic compounds, pesticides and microbes. The most commonly identified problems with surface water were volatile and synthetic organic compounds, inorganic compounds, sediment and eutrophication (phosphorus). The highest potential non-regulatory source of contamination is single family housing.

For communities using ground water, development of a wellhead protection program is recommended. For communities using surface water, the development of a Watershed Restoration and Protection Strategy (WRAPS) is the best mechanism to ensure water quality protection

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for their public water supply. The Walnut basin has no completed source water protection plan and none in progress.

Wetland and Riparian Area Management

The primary approach to wetland and riparian area management in the basin focuses on providing technical and financial assistance to landowners to protect and restore these resources in priority watersheds through the implementation of BMPs. Water quality has been a primary focus with implementation efforts targeted to high priority TMDL watersheds (Figure 1). All conservation districts in the basin have developed wetland and riparian protection plans.

An emerging concern is management and maintenance of forested riparian areas to prevent the entry of debris (dead and fallen trees, etc.) into the tributary/river system. Due to recent ice storms and catastrophic flooding, along with unstable streambanks, the potential for woody debris to collect in and clog bridges and culverts has been elevated. Preventing entry of woody debris into the system can help to manage this.

The Kansas Water Office (KWO) has developed a policy that will provide a systematic approach to the assessment, protection and restoration of wetland and riparian areas and for the restoration of stream channels. The [policy](#) promotes a comprehensive evaluation of stream reaches and watershed wetland condition.

Watershed Restoration and Protection Strategies

WRAPS are stakeholder-driven watershed management plans designed to address multiple water resource issues within a specific watershed. The WRAPS process provides a means to integrate objectives from multiple local, state and federal programs into a comprehensive, coordinated strategy for a specific watershed. This can include TMDL attainment, nutrient reduction, source water protection, reduced reservoir sedimentation, riparian and wetland management and other natural resource objectives.^(4, 9)

Two watershed planning studies have been conducted in the Walnut basin by the Tulsa District Corps. The first phase, a reconnaissance study, also called a Section 905(b) analysis, was conducted by the Corps to examine water resources problems and identify measures that would resolve problems. This effort was at full federal expense and covered the entire Walnut basin. Successful completion was realized with the identification of sev-



El Dorado Reservoir

eral potential solutions to water resource problems in the basin.

The second phase was completed in early 2008 and was conducted as a cost shared effort between the Corps, KWO, and the City of El Dorado.⁽⁸⁾ The study area for this phase shifted from the entire basin to the evaluation of the upper Walnut River basin consisting of the El Dorado Reservoir and its watershed. The purpose of the study was to identify and evaluate solutions to reservoir and watershed problems identified by the KWO and the City of El Dorado that could be implemented in small steps all leading toward long term watershed objectives. Two goals guided the study:

1. Identify effective reservoir restoration and protection measures to ensure long term availability of storage space for public water supplies in federal reservoirs, using El Dorado Reservoir as a pilot (eight objectives); and
2. Identify watershed restoration and protection needs and determine opportunities to implement effective management practices (four objectives).

The goals of the project were generally met, but some objectives were either not fully met or were not achievable within the time and budget resources of the study. The watershed management plan provided in the report provides information valuable for near term restoration and preservation planning and implementation. A software watershed model was developed using the Soil and Water Assessment Tool (SWAT) to satisfy several of the watershed objectives. A significant finding of the modeling was the consistent result that installation of

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grass filter strips as BMPs along streams and riparian areas and as field borders has the potential to reduce sediment delivery by 70% to 80%. The results of this effort will allow more strategic targeting of future BMPs.

The entire report is available on the KWO website.⁽¹⁰⁾ This report will serve as the basis for a WRAPS plan to be developed and implemented locally. Plans are under way to apply for funding to accomplish this. The Butler County Conservation District has been implementing BMPs in the watershed for almost 15 years and development of a WRAPS plan, using information contained in the report, will allow more targeted use of resources.

In Cowley County, the City of Winfield provides cost share funds to landowners in the Timber Creek watershed above Winfield City Lake to install BMPs to reduce pollution entering the lake, especially sediment and nutrients. A bathymetric survey completed in 2007 indicates that the lake has lost approximately 4% of its water storage capacity. Raw water from the lake experiences blue-green algae blooms that result in taste and odor occurrences in the finished drinking water. These blooms occur when excess nutrients are present in the water and other environmental conditions exist that lead to algae production.

An important consideration for watershed restoration and protection in this basin, particularly in the northern portion of the watershed, is [urbanization](#). Butler County is growing rapidly due to eastward expansion of the Wichita metropolitan area. This growth is affecting water supply infrastructure, water quality, natural resource conservation, and land use decisions. For example, as the amount of impervious surface in a watershed (i.e. rooftops, roads, parking lots, etc.) increases, water resources can be adversely impacted from increases in runoff volume and additional pollutants associated with urban environments. Efforts made by local governments and urban residents to minimize these adverse impacts through sound land use planning and stormwater management help to address this issue.

Local land use planning and zoning authorities provide cities and counties effective tools to minimize the potential impacts of development on water resources. Urban stormwater management programs can be implemented to manage the amount of impervious surface in urbanizing watersheds and properly control increased runoff. Programs that provide technical assistance and education to urban residents regarding actions that can reduce or eliminate potential pollution sources also play an important role. These programs can be integrated with

WRAPS projects to ensure a comprehensive approach to watershed management in urban areas.

Another consideration for watershed restoration and protection in the basin will be the potential for conversion of Conservation Reserve Program (CRP) acreage back to production agriculture as contracts expire. Contracts on 4,476 acres expired on September 30, 2007 in Butler and Cowley counties. If land is taken out of permanent grass cover, implementation of BMPs will be needed to minimize potential adverse impacts to water resources within the basin.



Stone bridge over Badger Creek, Cowley, County.
Photo courtesy Kansas Geological Survey.

Other Watershed Related Activities

- Both Cowley and Butler counties have adopted local sanitary/environmental codes and participate in the Local Environmental Protection Program (LEPP).
- Butler County has countywide planning and zoning programs but Cowley County does not.
- Both conservation districts in the basin have adopted nonpoint source pollution management plans. A grant under the State Water Quality Buffer Initiative has also been awarded in Cowley County in the basin supporting buffer coordinators and facilitating enrollment of stream buffers in [continuous CRP](#).
- Of cities in the basin, Arkansas City, El Dorado, and Winfield are subject to the Phase II Permitted Municipal Separate Storm Sewer System under the NPDES Stormwater Program.
- As of December 2007, there were six active contamination sites being remediated through the State Water Plan Contamination Remediation Program. Most of

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the contamination is a result of hydrocarbon contamination by refineries.

- There are eight organized watershed districts in the basin.

Recommended Actions

1. Begin formation of a WRAPS group above El Dorado Reservoir. Work with stakeholders to incorporate TMDL implementation, nutrient and sediment reduction, and urban stormwater management goals into the WRAPS project. Coordinate with development of source water protection plans.
2. Continue to provide cost-share funds through the City of Winfield to landowners in the Winfield City Lake watershed to install BMPs to protect water quality.
3. Continue efforts to prevent the spread of Zebra mussels from infected water bodies.
4. Complete assessment of riparian and wetland areas and target resources to restoration or installation of grass filter strips along streams.
5. Coordinate with surrounding counties on urban growth issues.
6. Continue public outreach efforts to educate the public and landowners about the benefits of BMPs. Encourage other agencies and entities in partnerships and participation to support WRAPS initiatives, activities and funding.

and Protection Strategy, www.kdheks.gov/nps/wraps

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6. Kansas Department of Health and Environment. 2007. Bureau of Water, *Watershed Planning and TMDL Program*, www.kdheks.gov/tmdl
7. USDA Farm Service Agency. 2007. *Summary of Active and Expiring CRP Cropland Acres by County*. www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crt
8. U.S. Army Corps of Engineers, Tulsa District. January 2008. Walnut River Basin, Kansas. *Feasibility Report – El Dorado Lake, Kansas Watershed Management Plan*.
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The western part of the Walnut and the eastern part of the Lower Arkansas basins have experienced [population](#) growth at an increasingly high rate over the last few years, resulting in increasing demands placed on existing water supplies. While [surface water](#) and ground water supplies are available to meet current and future (2050) demands in the area and are generally of good quality, supplies are not necessarily located in the immediate area of demand. A complete understanding of the capability of meeting future demand is needed.

For water supply issues, it is necessary to evaluate the above concerns on a regional rather than a basin scale. For this issue, the region is defined as the five-county area that includes Butler, Cowley, Harvey, Sedgwick and Sumner counties. In order to improve sustainability and address the availability of adequate public water supply to meet long-term needs, evaluation of surface and ground water management and conservation, including supply and demand analysis and [aquifer](#) characterization are needed.

Description

Communities in this region have long been aware of potential water shortages in the future and have taken proactive steps to secure supplies for current and future uses. The City of El Dorado manages the public water supply storage capacity in [El Dorado Reservoir](#) and is a regional supplier of raw and potable water. The City of Winfield owns a water supply reservoir, Winfield City Lake, which will be adequate to provide water to the city and surrounding area for many years. Augusta City Lake can serve as a short-term back up supply for the city. Additional small community lakes serve localized areas. The City of Wichita is a major regional water supplier and has adopted a plan of action to ensure adequate supplies to the year 2050. This plan utilizes both surface and ground water sources and includes the innovative aquifer storage and recharge project. See the [Lower Arkansas Basin Section](#) for more description of this project.

Water Supply

Understanding of water supply and demand in the Walnut basin has improved over the last ten years. A study completed by the Kansas Water Office (KWO) in November of 1998⁽¹⁰⁾ found that in the five county region, because of existing water supply in El Dorado Reservoir and Winfield City Lake, the development of additional

water supply storage was not warranted. The study recommended that the focus for water supply planning be the development and improvement of the infrastructure of the public water utilities in the region in order to provide adequate service to their customers.

A January 2000 report, *Butler County Public Wholesale Water Supply District Feasibility Study*,⁽⁹⁾ evaluated the potential for El Dorado Reservoir to serve as a regional supply for the area and concluded that regionalization is both possible and recommended, with modifications to existing delivery infrastructure.



El Dorado Reservoir

In 2004, a proposal was made by a group of private developers to construct a new 7,000 surface-acre reservoir at the confluence of Grouse and Silver Creeks in southern Cowley County. The KWO updated the [population](#) and demand projections and current water supply storage available in that portion of the Walnut basin to determine if a state interest in participating in the proposed project existed. This study found that adequate supplies were available and that the infrastructure to deliver the water where it was needed was the main impediment to providing water supply most efficiently.⁽¹⁾

In 1997, the Regional Economic Area Partnership (REAP)⁽¹¹⁾ was formed that includes nine counties in the region. In addition to the five counties listed above, McPherson, Reno, Harper, and Kingman counties are included in REAP. The South Central Water Coalition was formed in 2003 through an inter-local agreement, to collaboratively engage in regional water studies and planning. This area takes in nearly all the Walnut River basin and generally the east half of the Lower Arkansas

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basin. The area also includes the Equus Beds [aquifer](#) and all of the Wichita Metropolitan Area. This is a geographically and economically integrated area. The Coalition has now been merged into the REAP organization, to be carried on by a special Water Resources Committee of REAP. Through this merger, a paid staff member has been added to assist in the initiatives and work previously undertaken by the Coalition. To address the issue of water supply management and conservation, it is important that public works and planning staffs in the five county area described above, which contains parts of both the Walnut and Lower Arkansas basins, participate in REAP planning efforts. The Water Resources committee of REAP is well positioned to provide leadership in developing a long-term regional water management plan.

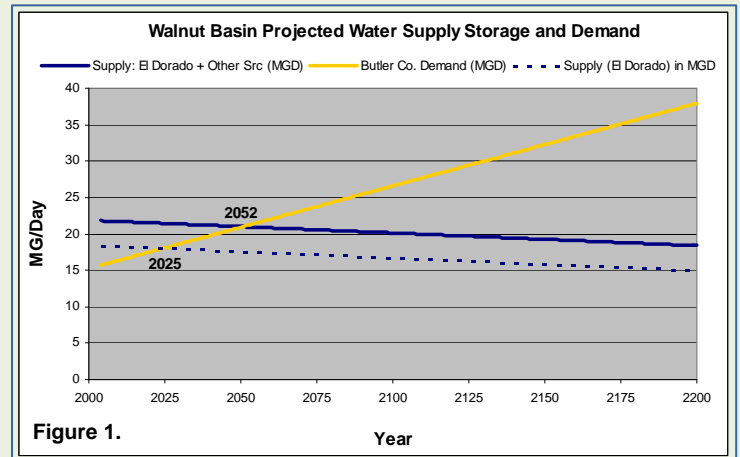
In 2005, the U.S. Department of Interior, Bureau of Reclamation (Bureau), through a Planning Assistance to States grant, began a process of gathering, interpreting and consolidating water supply and demand information throughout the nine county region covered by REAP. In March 2008, the Bureau released a draft report of the study titled *“Walnut and Lower Arkansas River Basins Water Supply Special Study – Kansas”*.⁽⁸⁾ The purpose of the study was to provide information for the formulation of strategies for supply sources and associated water treatment and distribution alternatives to meet the future municipal and industrial demands and usage within the study area. The draft report recommended that local water users explore inter-local efforts to meet future water demands in the most cost effective manner.

The following strategies were evaluated in the report: enhanced water conservation, existing surface water supplies, use of river water while in flood stage, water reuse, desalination of brackish water, development of existing ground water supply sources, and cost sharing opportunities. The report is still draft and is undergoing external review by participating partners; it is expected to be released in the near future.

In 2007, KWO initiated an analysis of water supply and demand in five Kansas river basins. The analysis utilized historic climate and streamflow, along with current census information to predict the total water supply and demand in the basin over time. The preliminary finding in the Walnut basin was that in Butler County, which is primarily served by El Dorado Reservoir, demand could exceed supply during a 2 percent probability drought by the year 2025 (Figure 1). If other sources of water in the basin are included, the projection for shortages in Butler County is in the year 2052. This evaluation did not in-

clude ground water availability from the Wellington formation, or sources from outside of the basin that are or could be used to supply water in the Walnut basin.

The 2007 KWO analysis did not account for water that is used in the Walnut basin that originates in the Lower Arkansas basin and is distributed across basin boundaries by the City of Wichita and rural water districts (RWDs). Because the northern part of the Walnut basin is strongly influenced by regional growth patterns to the west, long-term water supply issues will be best addressed by planning with the cities and RWDs in the eastern part of the Lower Arkansas basin. The groundwork exists to build on the information in these studies to develop long-term water supply plans for the region.



The major sources of surface water storage in the Walnut basin are El Dorado Reservoir, Winfield City Lake, and Augusta City Lake. Cities in the southern part of the basin get their water from the Walnut River and alluvial wells. Numerous watershed dams have been built in the basin for rural flood control and these have not been considered as either back up or primary sources for water supply and no infrastructure is currently in place to distribute water stored in these structures. Another potential source is ground water from the Wellington formation. Preliminary evaluation of this aquifer indicates that it may be suitable for a short-term supply but long-term needs in this area of the basin cannot be met due to limited storage in the aquifer.

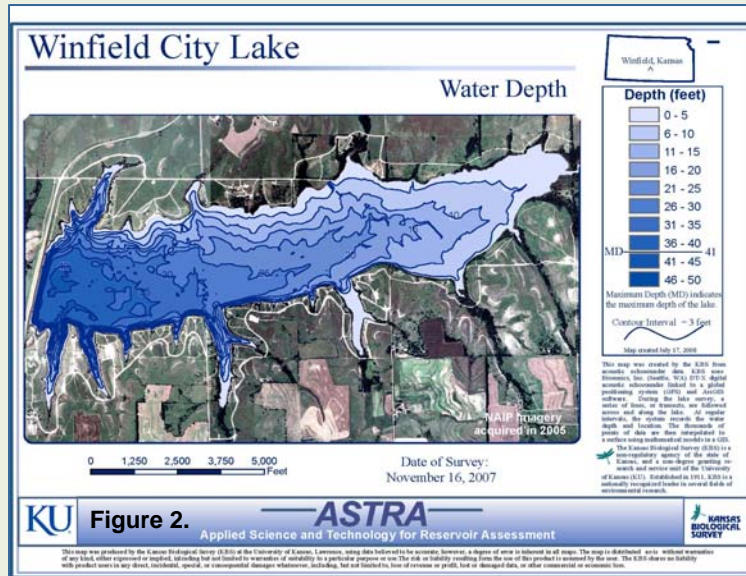
According to the 1981 bathymetric survey⁽⁹⁾ of El Dorado Reservoir, the water supply storage pool had lost about 4 percent of its original storage capacity due to sedimentation. A more recent survey was conducted by the Corps in 2004. Due to changes in technology, it was not possible to compare the two surveys to derive a current sedimentation rate that could be used to project storage

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capacity loss to sedimentation in the future. However, the 2004 survey does provide current baseline information for future evaluations. See the [El Dorado Reservoir Fact Sheet](#) for additional storage information.



A bathymetric survey (Figure 2) was completed for Winfield City Lake in 2007. According to this survey, the lake has lost only approximately 4 percent of its original storage capacity and is projected to be able to continue to supply water to the Winfield area for many years. The city has taken steps to reduce sedimentation and maintain water quality in the lake by providing cost-share funds to land owners in the watershed to install best management practices (BMPs) to reduce nutrients and sediment carried in runoff.

The current status of contracts of water suppliers who sell water to other cities and/or RWDs is summarized in the Bureau feasibility study report cited above.⁽⁸⁾

Water Demand

Understanding of water demand in this basin has grown in the past ten years. The most comprehensive information is available in the Bureau report cited above. Fundamental to the recommendations included in the report is the need to manage demand for water. Managing or reducing demand effectively creates additional supply available for essential uses and extends the life of the supply. Actions taken by individuals can have a positive cumulative effect in reduction of water demand. These include low flush toilets, low flow water faucets, hot water on demand water heaters and other water efficient

appliances, and xeriscaping. City utilities can implement rate structures that encourage water conservation and demand management.

Municipal and Industrial Demand

In the 2007 KWO supply and demand analysis, all population projections were developed from the county level, so entire counties were assigned to the basin based upon predominance of area *and* existence of larger incorporated areas. The Walnut River corridor in the analysis included Butler and Cowley counties. This demand analysis does not include the larger region recommended for water supply planning purposes.

Water demand associated with the population projections is based on municipal [water use](#) as gallons per capita per day (gpcpd) usage reported to the Kansas Department of Agriculture-Division of Water Resources (DWR) for 2000 through 2004 by suppliers in the basin.⁽²⁾ The quantity of water that municipalities sold for non-domestic use is not included in gpcpd calculations and was added to the total. To develop the total projected water use from industry, commerce, agriculture and recreation, all non-municipal surface water points of diversion within five miles of the main stem of each basin were selected.

The projected [surface water](#) demand increase on the Walnut River corridor and El Dorado Reservoir is primarily associated with the anticipated demand increase of Butler County. As discussed above, further evaluation of future water supply and demand should be done in a regional context rather than a basin context.

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Recommended Actions

1. Continue to support collaborative efforts of the REAP to provide leadership in regional planning for water including urban growth issues (see [Regional Planning for Urbanization Basin Priority Issue](#)).
2. Develop inter-basin hydrologic models with location specific supply and demand information.
3. Identify options for supply and demand management including: interconnections between public water suppliers, better use of existing supplies, dredging, development of new supplies, modification of reservoir operations, conservation measures, and individual responsible use of water through residential activities. Refine plans to reflect outcomes of identified options. Implement the most beneficial and cost-effective options.
4. Begin incorporating demand management into utility operations. Demand management should also include education of and interaction with the development community and include existing local authorities.

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Issue

Demographic shifts in the [Walnut basin](#) are influencing [land use](#) patterns, water supply and distribution infrastructure, wastewater treatment and disposal, flood damage management, and natural and biological resources. The Walnut basin is strongly influenced by demographic changes in the eastern portion of the Lower Arkansas basin which is experiencing similar demographic impacts. Municipalities seek to guide development within their boundaries or designated growth areas to maximize efficiency of providing services. Unplanned rural subdivisions can challenge the provision of services when municipal boundaries reach rural water district (RWDs) boundaries.

Description

Since settlement, land use in the Walnut basin has been primarily farming and agriculture, dominated by [beef cattle](#) production. Oil was discovered in the area in 1915 resulting in a rapid increase in population.

The northern part of the basin, generally in Butler County, is one of the fastest growing areas in the state, with Butler County as a whole ranked ninth in population growth between 2000 and 2005. While the rural farm based [population](#) is generally declining, there has been considerable growth of non-farm residences in rural areas outside of city limits in which residents generally commute to employment in El Dorado, Wichita, or the surrounding suburban communities.

Although Sedgwick County and Wichita are in the Lower Arkansas River basin the western part of the Walnut basin is influenced by the Wichita metropolitan area economy, land use patterns, and population. The influence of the Wichita metropolitan area on population in the Walnut basin, especially in Butler County, has been apparent since the 1950s. Growth in the western parts of the counties can be attributed to an eastward expansion of the Wichita industrial and metropolitan area. This is enhanced by the well developed transportation system which makes the area accessible via a network of roads and highways. Several railroad lines and municipal airports, including the Wichita municipal airport, also provide accessibility.

Although these areas are economically and demographically connected, no integrated plan for management of water and wastewater and natural resources has been developed for the area.

Population Trends

Figure 1 shows [population](#) trends and projections in Butler and neighboring counties from 1990 projected to 2020.

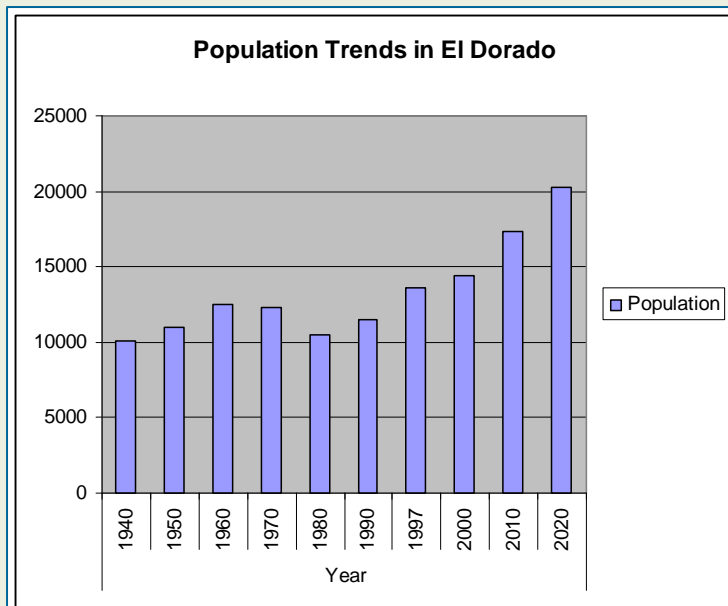


Figure 1. Population Projections for Butler and Neighboring Counties

Regionally, the population of the Wichita Metropolitan Area, which includes Butler, Sumner, Harvey and Sedgwick counties, has been both positive and steady. The population of El Dorado has increased at rates faster than the metropolitan area and the state during the past decade: 17.9% compared to 7.7 percent and five percent. The growth rate in the Wichita metropolitan area was also greater than the growth rate for the State of Kansas between 1980 and 1990.

The population of El Dorado grew by 4,387 persons between 1940 and 2000 (Figure 2). Between 1960 and 1980, El Dorado saw its largest population decrease of the past fifty years as it lost over 2,000 persons, nearly 20% of its population. Since that time, El Dorado's population has steadily increased, growing by 9.5% during the decade of the 1980's. From 1990 to 1997, it is estimated that El Dorado grew by 18%, increasing by 2,064 persons. El Dorado is projected to continue growing. It is in one of the fastest growing counties of the region and is expected to grow by about 5,847 persons in the next twenty years.⁽¹⁾

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Urbanization Impacts

Community officials are interested in growth of their respective communities. Scattered subdivisions outside of municipal service areas in this region often develop around urban centers with little or no long range planning to provide permanent, economical water and wastewater services and to avoid the creation of nuisance conditions and public health problems. Common results include failing onsite wastewater systems, overloaded sewer lines, inadequate water distribution pressure and overloaded or undersized water and wastewater treatment facilities.

Conflicts have arisen between RWDs and municipalities concerning water supply service areas and distribution systems. Availability of utilities outside municipal boundaries supports growth of isolated subdivisions, contributing to unmanaged growth, and the need for enhanced transportation system and other infrastructure development to move people and goods. Impacts on the efficacy of fire protection services have occurred. Unmanaged suburban development has resulted in subdivisions using onsite wastewater systems because municipal wastewater treatment is not available outside of municipal service areas.

Changes in [land use](#) from agricultural use to roads, homes and businesses have resulted in increased runoff and nonpoint source pollution into receiving waters, and fragmented habitat and natural areas. Valuable wetlands and riparian areas that buffer streams from pollutants have been lost.

In the Walnut basin, due to lack of widespread quantities of high quality ground water, development of housing in a non-dense manner is facilitated by the development and presence of rural water systems. Many rural subdivisions could not be viable if they were solely dependent upon ground water supplied water wells. Also facilitating the ability of isolated subdivisions to be viable is the availability of other utilities including electricity and phone service. Due to the remoteness of some of the outlying subdivisions that cannot be served by municipal wastewater systems, onsite systems are sometimes constructed in sensitive alluvial ground water areas, sub-

jecting them to possible pollution from wastewater.

Local Planning Authorities

In the League of Kansas Municipalities publication "Kansas Local Government Law"⁽²⁾, an entire chapter is devoted to Kansas Planning and Zoning Laws. The document states "*The statutory scheme for planning and zoning by local governments in Kansas reflects a smorgasbord of laws that authorize cities, counties, townships, improvement districts, metropolitan planning commissions, regional planning commissions, and airport and port authorities to engage in some form of planning and zoning.*" A cornerstone of city and county planning is development of a Comprehensive Plan. These plans are to provide for the coordinated development of the city or county regarding the use of land, population and building intensity standards, public facilities, public improvement priorities, capital improvement plans, conservation of natural resources, and other elements deemed necessary to the proper development of the area. Plans are implemented by city and county zoning and subdivision regulations. In the counties most influenced by growth patterns in this region, Butler, Harvey, Reno and Sedgwick counties have zoning ordinances. Cowley County does not, except for in a small area around the community of Udall.



Rural Water Tower.
Photo courtesy KGS.

Most counties in the area, and particularly Sedgwick and Butler counties, operate under different regulations for planning and development. Within counties, regulations also vary among cities. Subdivision regulations that could impact water and wastewater, stormwater runoff, and maintenance of valuable or sensitive

open space also differ. Long range comprehensive plans stop at county lines and do not include regional considerations. Cities can control development within a three mile radius of their boundary through inter-local agreements between the city and county. Many rural subdivisions are outside of these boundaries.

Regional Planning

Community leaders recognized the benefits of and need for integrated planning in 1997 when the Regional Economic Area Partnership⁽⁴⁾ (REAP), was formed. REAP is comprised of thirty-four city and county governments in

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nine counties of South Central Kansas, which include Butler, Cowley, Harper, Harvey, Kingman, McPherson, Reno, Sedgwick and Sumner counties. These jurisdictions have voluntarily joined together for two primary purposes: first, to guide state and national actions that affect economic development in the region; and second, to consider and adopt joint actions among member governments that enhance the regional economy. Figure 1 shows the member counties of REAP.

Recognizing that the availability of adequate quantities of good quality water is essential to economic growth, and that comprehensive planning is necessary to protect water and natural resources, a Water Resources Committee was established in 2003. One of the REAP goals for 2008 was to "Review progress of the REAP Water Resources Committee to ensure appropriate action that will encourage collaboration among local governments on regional issues of water quality and water supply."

Goals of the Water Resource Committee for 2008 are established in the annual work plan. These are:

- Serve as a regional conduit for dissemination to members of information and education regarding the various activities, programs, funding and initiatives as to the various federal, state, regional and local agencies involved in water quality and supply issues in the South Central Kansas Region;

- Serve as a regional voice on behalf of the members before federal, state, regional and local agencies and organize member involvement in the activities of those agencies;
- Develop and implement a regional water plan;
- Organize and coordinate collaborative efforts on regional issues of water quality and water supply; and
- Develop or organize services to member water utility operations.

Water Supplies

As land was settled in the past centuries by families and entities that farmed the land, private water wells and location of residences in proximity to reliable surface or ground water were the primary mechanisms of obtaining a safe drinking water supply. Most homesteads were located on a sufficient tract of land to be able to provide enough food for the family and to sell the excess as cash crops, along with livestock production. As time progressed, the rural residents periodically experienced drought conditions which led to dry wells and/or creeks for some period of time. Some wells, if they were capable of reliable production, produced poor quality water. Innovations such as cisterns to store water provided some back up infrastructure during times of scarce water availability. Even so, the reliable availability of adequate water for normal domestic use remained inconsistent.

Kansas state law established the authority of county commissioners to form RWDs in 1941. RWDs were intended to make available safe drinking water throughout the rural landscape, to residences that were typically spaced widely apart. Because the original districts served residences that were not densely located and many miles of delivery lines had to be laid, standards for pipes were less than in more densely populated urban areas.

Once formed, management of the rural water systems is generally performed by the RWD Board

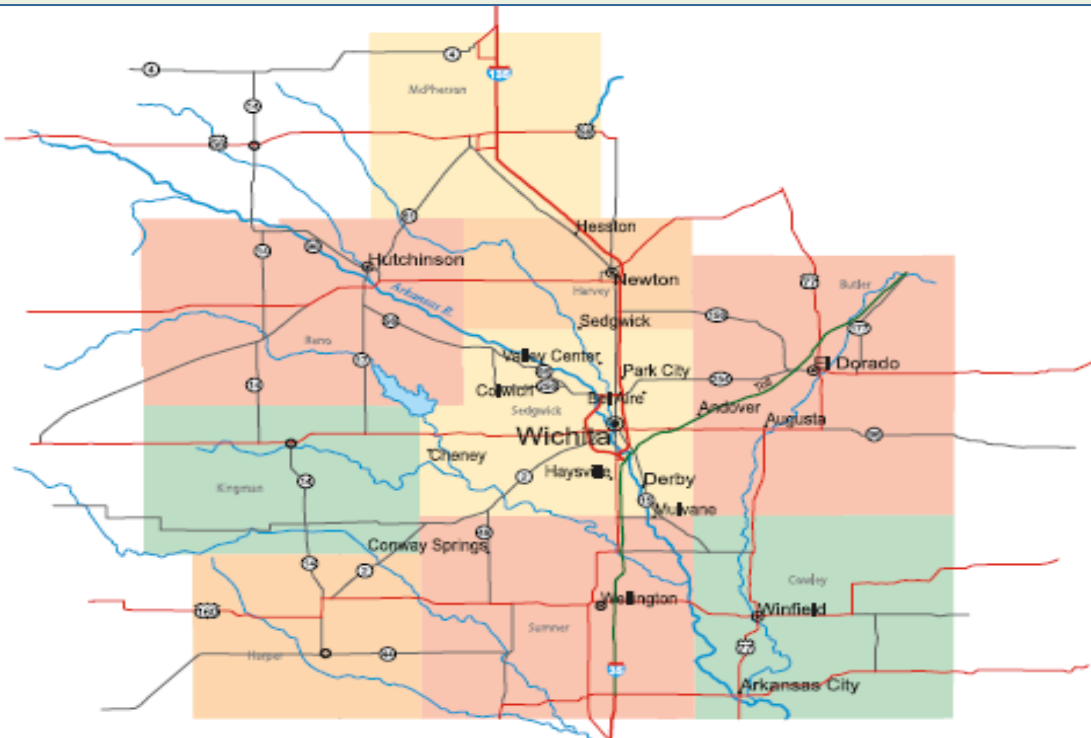


Figure 1. Regional Economic Area Partnership Participating Counties

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of Directors, and the Boards have no mandate for planning; rather they are service agencies that supply water within their territories where there is a need for a reliable supply of safe drinking water for domestic purposes. RWDs were not intended to support urban densities and demands. Building permits, zoning requirements and subdivision regulations are the responsibility of city and county governments. If a development is approved within the boundaries of a RWD, the district simply provides the domestic water supply. Lack of regional comprehensive planning can lead to case by case decision making for approval of rural subdivisions and other development that may not be in the best interest of the water and natural resources of the area.

Federally indebted RWDs have protection from competition from adjacent municipalities under Title 7, United States Code, Section 1926(b)2. Federally indebted rural water districts are those with a federal loan used to finance aspects of the system. The U.S. Congress intended §1926(b) to protect “federally” indebted water districts from competition for two reasons: (1) Congress wanted to better insure that the federal debt would be repaid, and (2) Congress desired to promote the development of rural water systems to make water available to rural residents that is both economical and safe. This federal law protects RWDs from being incorporated into municipal boundaries, If a RWD is incorporated into a municipality, the law requires cities to pay for lost future revenue of the RWD plus the infrastructure that is often incompatible with city standards. A key element of these standards is fire protection and RWDs infrastructure is often inadequate to perform this function.

City boundaries in the region continue to expand to meet the demands of new residents, businesses and industries. Some cities may be unable to expand their boundaries when they intersect RWD territorial boundaries. Municipalities are required to provide fire protection services and standards for pipes and other infrastructure to insure that they have sufficient capacity.

In recent years there has been an increase in rural residences and subdivisions that are not agriculturally based. Some urban residents desire a more rural experience and migrate outside of city limits to tracts of land covering from one acre to ten or more acres. Often the size of rural single family development lots is dictated by county sanitary codes that prescribe a minimum lot size for which onsite wastewater systems can be utilized. These developments are likely to be served by RWDs that are already established, rather than by private water wells. The districts were historically established to pro-

vide water to widely spaced residents, and as agricultural land is sub-divided, the new developments are added to the service lines.

RWDs serve a much needed purpose: to insure that rural residents have access to clean water for domestic purposes. Keeping RWDs viable to fulfill that purpose is



Cowley County Courthouse, Winfield, KS
Photo courtesy Kansas Geological Survey.

vital to rural community health and well being. Municipal water systems are designed to bring the full range of water utility services to urban density and/or commercial/industrial development including water for domestic use, fire protection and high level commercial/industrial demands. In many cases RWDs may not be able to meet those requirements as they were designed to provide basic domestic level services only. Recognizing the difference in the missions of RWDs and municipal utility systems is key to successful resolution of the boundary concerns.

County Water and Wastewater Management Plans ⁽⁵⁾

In 1979, by adoption of Senate Concurrent Resolution No. 1640, the State of Kansas adopted the Kansas Water Quality Management Plan. One of the specific plan elements called for the control of pollutants from municipal and domestic sources and included a program requiring the development of water and wastewater management plans in urban or high growth counties. In 1980, and again in 1981, the Kansas Legislature passed statutes that required counties to develop countywide water/wastewater management plans to address the provision of acceptable wastewater management contingencies in developing areas of the respective counties.

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Counties with populations less than 30,000 could apply to the Secretary of the Kansas Department of Health and Environment (KDHE) for an exemption from preparing a plan. Coordination of water and sewage service was required both by statutes and by regulations developed by the Kansas Department of Health and Environment (K.A.R. 28-16-80). The statutes also included a provision that the plans were required only if federal funds were available to assist local governments in their preparation. In addition to the 75% federal share for plan preparation, the Kansas Legislature provided 12.5% state money to assist the counties, leaving a 12.5% local share.

As a result of the statutory screening process conducted in 1980 which addressed both population and potential water and sewerage problems, 19 counties were identified with immediate needs to prepare plans. Of the counties in the REAP area, Butler, Cowley, Harvey, Reno, and Sedgwick counties were included. Of the 19 counties identified, only eight received federal grants and began their planning efforts. In the REAP area, these included Butler, Cowley and Harvey counties. No planning was started in the others. The 1981 amendments to the Federal Clean Water Act removed the availability of federal planning money from the Act. Therefore, the unavailability of federal funds negated the state requirement to prepare the plans.

The countywide water/wastewater management plans were required to include [population](#) projections for 25 years beginning in 1980, and to define areas where water and wastewater systems would be constructed to meet the population growth. The plans were also to define areas where onsite wastewater systems would not be allowed. The regulations also required that the plans be updated every five years. No permits for discharge of waste and no permits for construction of wastewater facilities would have been issued in the county unless the improvements were consistent with the approved plan. This, in effect, required the county and municipal officials to coordinate provision of water and wastewater services with other county development planning.

In a 1985 policy issue of the *Kansas Water Plan* adopted by the Kansas Water Authority, it is noted that the state statute made the development of countywide water/wastewater management plans contingent upon federal funding. A lack of federal funds essentially stopped the program, but the need for planning still existed. The policy recommended modification of the statute to remove the provision requiring plans only if federal funds are available. It further recommended careful review of the statute and regulations to determine if further revisions were necessary. The final recommendation in the policy was that K.S.A. 65-3308 should be revised by the legislature to require preparation of countywide water/wastewater management plans without federal financial support. All counties with populations greater than 30,000 without a plan would be required to prepare a plan. The state would participate in 50-50 cost sharing with amendment of the statute.

After several unsuccessful attempts at legislative action on amending the statute, the policy section was withdrawn from the Kansas Water Plan in 1993 without being implemented.

Across the country, several examples exist in which comprehensive water and wastewater planning and implementation has been successfully implemented. Two of these are in the Baltimore Metropolitan Area and the Durham

North Carolina Metropolitan Area.

Water Supply and Demand

See the [Surface Water Supply and Conservation Issue](#) in this basin section. In 2005, the Bureau of Reclamation (Bureau), through a Planning Assistance to States grant, began a process of gathering, interpreting and consolidating water supply and demand information throughout the nine county region contained as part of the REAP, which includes Butler and Cowley counties. In March 2008, the Bureau released a draft report of the study titled "*Walnut and Lower Arkansas River Basins Water Supply Special Study-Kansas*."⁽³⁾ The purpose of the study was to provide information for the formulation of



Confluence of Little Arkansas & Arkansas River at Wichita.
Photo courtesy Kansas Geological Survey.

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alternative opportunities to meet the future municipal and industrial demands and usage within the study area by investigating various supply sources and associated water treatment and distribution alternatives and opportunities. Local water users are encouraged to explore inter-local efforts to meet future water demands in the most cost effective manner. The information contained in this report is comprehensive and generally follows the requirements of the County Water and Wastewater Management Plans described earlier.

In 2007, the Kansas Water Office (KWO) initiated an analysis of water supply and demand in five Kansas river basins. The analysis utilized historic climate and flow, and current census information to predict the total water supply and demand in the basin over time. The preliminary finding for the Walnut basin counties is that in Butler County, which is primarily served by El Dorado Reservoir, demand could exceed supply during a 2 percent probability drought by the year 2025. If other sources of water in the basin are included, the projection for shortages is in the year 2052. This evaluation did not include ground water availability from the Wellington formation, or sources from outside of the basin that are or could be used to supply water in the [Walnut basin](#). However, the Bureau study concluded that ground water in the Wellington formation is not of sufficient quality or quantity to provide a reliable long term source of water supply. Groundwater does occur in alluvial aquifers of the basin.

The KWO analysis did not account for water that is used in the Walnut Basin that originates in the [Lower Arkansas basin](#) and is distributed across basin lines by the City of Wichita and RWDs. Because the northern part of the Walnut basin is strongly influenced by regional growth patterns to the west, long term water supply issues will be best addressed by planning with cities and RWDs in the eastern part of the Lower Arkansas basin. The foundation exists to build on the information in these studies to develop long term water supply plans for the region.

Coordination with Priority Issues in the Lower Arkansas Basin

The Lower Arkansas Basin Advisory Committee has also identified water supply as a concern and has developed two issues related to this: *The [Role of Reuse in Water Conservation](#)* and *[Long Term Public Water Supply](#)*. The City of Wichita and Sedgwick County are developing a regional Watershed Restoration and Protection Strategy (WRAPS) to address water quality and natural resource issues in the area. This group can provide additional re-

sources and expertise for development of a regional comprehensive plan to avoid negative impacts of urbanization and preserve the quality and quantity of water supplies and other resources. Coordination with activities, studies, and planning in the Lower Arkansas basin will complement efforts in the Walnut basin.

Recommended Actions

1. The KWO, the KDHE, and other resource agencies should support local stakeholders in providing leadership in developing a comprehensive regional watershed based plan to manage urbanization and minimize impacts on water resources in the area.
2. Plan development should seek consensus among regional stakeholders, including RWDs, on needed changes to local authorities to implement a comprehensive regional watershed based plan.
3. Determine the feasibility of using the model of County Comprehensive Water and Wastewater plans as a template for plan development. Consider recommending modification of existing, or development of new state legislation to provide additional appropriate state oversight in plan development and or implementation.
4. Coordinate planning efforts with the Lower Arkansas basin to assure that these issues are addressed in a comprehensive manner.
5. Include consideration of the impacts of urbanization on water quality, public water supply, inter-basin transfers, flooding, resource protection and related issues.

Resources

1. City of Eldorado. 2001. City of Eldorado Comprehensive Plan. <http://www.eldoks.com/compch5b.html>
2. Michael R. Heim. 2001. Kansas Local Government Law. Second Edition. League of Kansas Municipalities.
3. United States Bureau of Reclamation. 2008. "Walnut and Lower Arkansas River Basins Water Supply Special Study – Kansas."
4. Regional Economic Area Partnership. 2008.

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www.reap-ks.org

5. Kansas Water Authority. 1985. *Kansas Water Plan Quality Section. Sub-section: Countywide Water/Wastewater Management Plans.*
6. KDHE. 2006. *Kansas Source Water Assessment Report*

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Issue

Persistent flood damages in the [Walnut basin](#) indicate a need for a comprehensive evaluation of existing flood control infrastructure and storage to determine current status, mapping funding needs, and opportunities for flood management plans and flood damage reduction actions in the future.

Description

Summer 2007 Flooding

During the weekend of June 30 - July 1, 2007 heavy rains that had been occurring for two weeks caused the Walnut River to overflow its banks from Augusta to Arkansas City, and the Whitewater River from Towanda to Augusta. Rainfall during June in Cowley County totaled 23.17 inches and nine inches fell in just four hours in Winfield on the afternoon of June 29th. The Walnut River crested at 35.79 ft. in Winfield on July 1st, almost 18 ft. above flood stage. Highway 77 was closed in areas and residents in many small communities were affected. Butler and Cowley counties were declared federal disaster areas.

Nearly \$40 million dollars in twenty southeast Kansas counties, including the Walnut Basin, was approved by the Federal Emergency Management Agency (FEMA) and the U.S. Small Business Administration (SBA) to assist the state of Kansas and the Kansas Division of Emergency Management (KDEM) in the recovery from the severe storms and flooding during the summer of 2007. Watershed district flood control structures in the basin sustained a conservative estimate of \$212,500 in damages during the 2007 summer flood.

Although the upstream federal flood control reservoir functioned properly, and numerous smaller watershed dams also detained water, this catastrophic event served as a reminder that even with extensive structural efforts to control flooding, excessive rainfall over successive days will overcome the ability of the system to prevent damage.

Rivers and streams in the Walnut basin have been historically prone to flooding during high rainfall events. Most of the basin [land cover](#) is native prairie with fairly steep slopes and [shallow soils](#) making it unsuitable for crop production. As a result, row [crop](#) agriculture occurs mainly in the fertile floodplains of rivers and streams. Most communities and cities are sited near stream channels and several, including Augusta and Arkansas

City, are located at the confluence of major rivers in the basin, making them vulnerable to flood damage.

Construction of [El Dorado Reservoir](#) by the U.S. Army Corps of Engineers (Corps) began in October 1973 and gates were closed in June 1981 to begin filling. Principal purposes of the reservoir, constructed in the upper part of the basin, are to manage flooding and provide reliable water supply. The eight watershed districts in the basin have constructed 215 water retention structures on tributaries within the basin. Several levees have also been constructed in Butler and Cowley counties.

Expansion of urban development in floodplains increases the potential for flood damage. Future flood damages may be reduced by preventing inappropriate development in flood prone areas and by converting land uses subject to flood damage in existing flood prone areas to other more compatible uses. Local governments can implement floodplain management through use of planning and zoning authority and in some cases through requirements of county sanitary codes. There is no state requirement for local units of government to implement floodplain management. The Kansas Department of Agriculture-Division of Water Resources (DWR) provides technical assistance to local governments and offers the following publication for landowners: Floodplain Management Guide: Floodplain Management in



Flooding in the Walnut Basin, July 2007

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Kansas. Quick Guide.⁽¹⁾ There is a requirement for cities and counties identified as flood prone to be participants in the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) if their residents want access to subsidized flood insurance and to obtain federally backed loans on buildings in flood prone areas.

By minimizing structural development in floodplains, the floodplain area is available to allow flood waters to spread out on the floodplain, slowing the water, allowing sediment to settle out, and reducing its erosive potential.



Flooding in the Walnut Basin, July 2007

Culverts and bridges can be designed to minimize flood damage by allowing adequate space for floodwater conveyance through them which also reduces backwater effects and damage to upstream areas. Design of these structures can consider total anticipated build out flows. Total build out represents the land use that would develop if the county comprehensive plan is fully implemented. Consideration can be given to allowing enough space in stream structures to allow adequate movement of floodwater through them without backing up. Roads can be designed to be at elevations high enough to minimize floodwater encroachment. Increased watershed

storage of floodwater in key areas can also reduce the volume of runoff. This can lessen the amount of time it takes to convey the water through structures, reducing localized flooding.

In 2002 legislation was passed that directed the Secretary of Agriculture and the Chief Engineer, Division of Water Resources (DWR) to evaluate the Department of Agriculture's (KDA) current policies regarding stream obstructions (roads, bridges, culverts, levees) and present a report outlining the strengths and weaknesses of a watershed approach to the permitting of dams and other stream obstructions. The Secretary and the Chief Engineer were to make recommendations to the Legislature with regard to clarifying the obligations of the Water Structures Program to upstream and downstream landowners. A questionnaire was sent to city and county governments, the Kansas Department of Transportation (KDOT) and other interest groups to gather their input on pros and cons of a watershed based approach to permitting of stream obstructions. The approach would have required more rigorous hydrologic and hydraulic modeling to evaluate the effect of structures further upstream and downstream of proposed projects than was currently required. Several alternatives were evaluated that would have imposed various levels of increased requirements.

Two public hearings were held. As a result of the evaluation and public input, the approach was not adopted due largely to concerns of local governments about increased costs and time to process permits. In addition, local governments did not recognize that the current procedures were causing problems and the benefits did not seem to justify the increased cost and work load. Some changes were made to the program including increased notification of upstream and downstream land owners of pending permits. An in-house evaluation was conducted on several streams with permitted structures to determine the downstream flooding impact resulting from the structures.

Accumulation of debris within and behind bridges, culverts and other structures is another concern. These accumulations obstruct the flow of water and can exacerbate the ability of the stream to carry flood water through permitted stream obstructions. It is important that permitted obstructions be kept clear of log jams caused by trees, utility poles and other debris washing into streams during high flows. Management of riparian areas to prevent debris from entering the system and causing blockages is an important part of a preventive and routine maintenance program. Well managed and healthy riparian and wetland areas along streams also benefit flood

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reduction by storing water on floodplains.

Non-structural management measures also include flood forecast and warning systems. The National Weather Service provides river stage and flood forecasts for the basin through its River Forecast Center located at the Arkansas-Red River basin office in Tulsa. The Kansas [Mesonet](#) Steering Committee selected priority counties for new weather stations in 2008. River Forecast Center needs were considered in this process and an additional near real-time hourly precipitation data station is planned for Butler County. This network will become increasingly informative and valuable if the developing trend towards increased frequency of heavy rainfall continues. This information may prove valuable for future design standards for permitted stream obstructions.

Existing Programs and Activities

Federal Emergency Management Act and National Flood Insurance Program

The [Flood Management Policy Section](#) of the *Kansas Water Plan* describes flood related activities of the FEMA and the NFIP. The DWR provides coordination and technical assistance for the NFIP in Kansas.

To be eligible to participate in the NFIP, communities must enact flood control ordinances designed to limit floodplain development and to protect those buildings that are constructed in the floodplain from flood damage. Management of floodplain development is the first priority to prevent flood damage.

The DWR assists communities with the development of flood control ordinances and is responsible for approving them. In the Walnut basin, nine communities (Andover, Arkansas City, Augusta, Dexter, El Dorado, Rose Hill, Towanda, Whitewater and Winfield) and both Cowley and Butler counties have enacted flood plain ordinances. Property owners in these communities are eligible to buy flood insurance through the NFIP program. Table 1 details flood damage claims since 1978.

Butler County is in the top ten list of counties in the state for flood insurance dollars paid from 1978-2007 and has received the most flood insurance money in the basin.

County	Number Policies	Total Coverage	Total Premium	Total Claims Since 1978	Total Paid Since 1978
BUTLER COUNTY	433	\$ 64,007,100	\$ 237,541	394	\$ 7,940,777
COWLEY COUNTY	136	\$ 13,214,300	\$ 85,123	129	\$ 1,540,588

Butler County also shows the highest amount of claims filed.

In 1997, FEMA initiated a plan to modernize the flood mapping program. The plan proposed a seven-year upgrade to the flood map inventory and an enhancement of the associated products and services. Most existing FEMA flood maps were produced using now outdated manual cartographic techniques. The desire was to produce digital maps compatible with computerized geographic information system software. Federal funding to implement the map modernization plan has not been made available as of 2008.

Butler and Cowley counties are in the technical review phase of having FEMA floodplain maps updated. Butler County is the highest priority for these updates.

Kansas Hazard Mitigation Plan

The Kansas Hazard Mitigation Plan (Plan) was updated in 2007 by the KDEM.⁽²⁾ In the prioritization of risk associated with 22 hazards that was conducted as part of the planning process, flooding and winter storms ranked second behind only tornadoes in the degree of risk present. The updated plan contains the following in the Mitigation Action Strategy Summary (Table 4.7, p. 4.53): “Integrate flood mitigation into KDOT construction projects. Lead agency: KDOT; Support Agency: KDA”. This is shown as having a medium planning priority. It is noted that this action applies to all new construction projects and that more coordination with other agencies is needed.

In the Plan, KDEM included a summary of high and significant risk dams. A high hazard dam (Class C Dam) is a dam located in an area where failure could result in any of the following: extensive loss of life, damage to more than one home, damage to industrial or commercial facilities, interruption of a public utility serving a large number of customers, damage to traffic on high volume roads that meet the requirements for hazard class C dams or a high volume railroad line, inundation of a frequently used recreation facility serving a relatively large number of persons, or two or more individual hazards described in hazard class B. A significant hazard dam (Class B) is a dam located in an area where failure could endanger a few lives, damage an isolated home, damage traffic on moderate volume roads that meet the requirements for hazard class B dams, damage low volume railroad

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tracks, interrupt the use or service of a utility serving a small number of customers, or inundate recreation facilities, including campground areas intermittently used for sleeping and serving a relatively small number of persons. Dam hazard ratings are based on the risk for loss of life and/or property damage and are not related to the condition of the structure. DWR requires emergency action plans to be developed for high hazard dams. In May 2007, this requirement was extended to include significant hazard dams.

Development downstream of some small dams has resulted in changes in hazard class and necessitated upgrade of the structures. Since 1983, any dam classified as high hazard is required to have a breach inundation map prepared to identify the extent of downstream flooding that would occur if the dam were breached during a catastrophic event. These maps are available to be used by local governments to limit development of houses or other structures in these inundation zones. In the Walnut basin, there are 23 high hazard dams (Table 2), of which 15 are in need of breach inundation mapping. There are 31 significant hazard dams.

County*	Population	Total dams	High Hazard (w/out plans)	Significant Hazard
Butler	63,147	232	11 (5)	9
Cowley	34,931	128	4 (3)	14
Harvey	33,643	29	3 (2)	3
Marion	12,760	25	1 (1)	1
Sedgwick	470,895	78	4 (4)	4

*Counties either wholly or partly within the Walnut basin

The Plan also includes a summary of known flood control levees in Kansas (Table 3). Levees, along with dams, are engineered to withstand floods with a computed risk of occurrence (100-year flood). The condition of many of these levees is unknown.

Watershed Districts

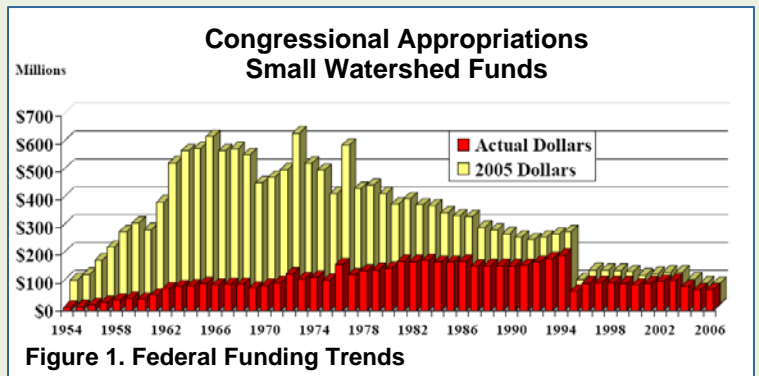
The eight watershed districts in the basin have developed general plans, approved by the DWR, that describe the location and floodwater storage capacity of flood control retention and detention structures recommended to address rural flooding. Most impound water even during non-flood conditions and may have benefits in addition to flood control. Several are available as back up sources of drinking water and some also provide recrea-

County*	Levee Design Standard	Flooding Source	Protected Community	Federal Levee?
Butler	100-yr	West Branch Walnut River	El Dorado	unknown
Butler	unknown	Whitewater River	Augusta	unknown
Butler	unknown	Whitewater River	Unincorporated areas	unknown
Butler	unknown	Walnut River	Augusta	unknown
Butler	unknown	Walnut River	Unincorporated areas	unknown
Cowley	100-yr	Timber Creek	Winfield	yes
Cowley	100-yr	Walnut River	Winfield	yes

* includes only counties subject to flooding by Walnut River and tributaries

tional opportunities. Many are used for [livestock](#) watering and also protect local roads and bridges. General plans include watershed protection actions including construction of terraces, grassed waterways, and grade control structures to control sediment delivery to the structures.

These general plans have been developed, modified and updated over the 55 years since the program was authorized in Kansas in 1953. Modifications to plans generally occur when structures are de-authorized or relocated, or when structures are added to the plan. Funding for construction comes from federal, state and local sources and there has been a downward trend in funding in recent years as shown in Figures 1 and 2.



Construction under the Natural Resource Conservation Service (NRCS) P.L. 566 Program ended in the [Walnut basin](#) in 1994 with 139 structures built that drain 1,286,939 acres. There has been no funding in Kansas under the program since 2006. Fifty one additional

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State Conservation Commission
New Construction, Rehabilitation & Inundation Maps

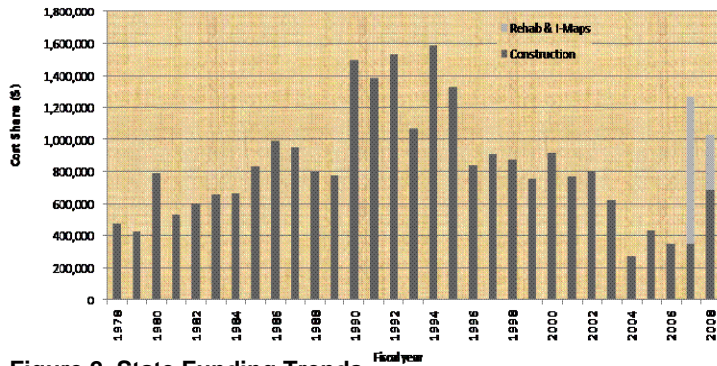


Figure 2. State Funding Trends

structures have been funded with State Conservation Commission (SCC) funding. SCC statewide funding for watershed structures through the Watershed Dam Construction Program peaked in 1994 at about 1.6 million.

Watershed districts have the authority to levee taxes on residents within the district to be used for operating expenses, new structures and routine maintenance of infrastructure. Local funding can also be used to implement best management practices (BMPs) such as wetlands and riparian areas that also provide flood detention benefits. Figure 3 shows the boundaries of existing watershed districts within the basin.

Because of recent changes in permitting procedures for new dams by the Corps, environmental issues have emerged that must be addressed before a permit can be issued. These issues are becoming increasingly challenging to address and construction of new dams has slowed in the past ten years. It is unlikely that all dams proposed in the general plans will be constructed due to these challenges and decreased funding.

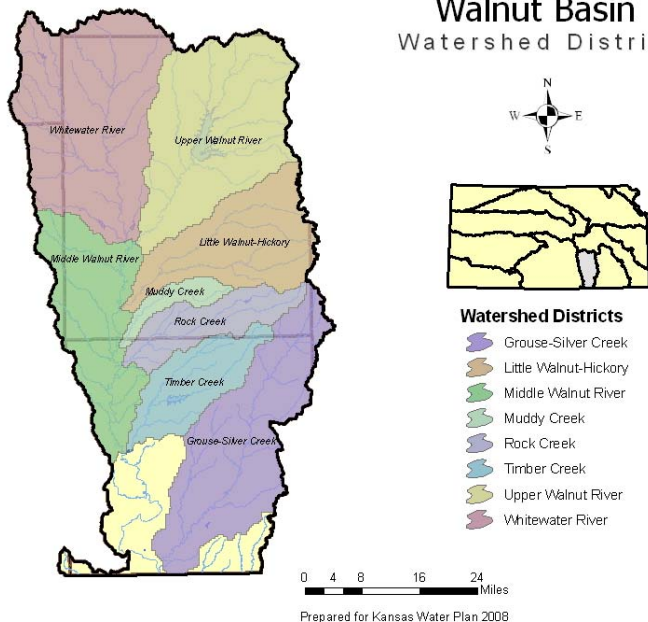
Local Floodplain Development and Management and Watershed Restoration and Protection Coordination

The 2005 Flood Management Policy Section in the *Kansas Water Plan* recommends multi-objective management of flood prone areas. Incorporation of nonstructural measures into watershed district plans can further enhance the reduction of damages from floods while also providing other benefits. The 2007 Kansas Hazard Mitigation Plan also supports incorporating nonstructural measures into watershed plans, such as those being developed as part of the Watershed Restoration and Protection Strategy (WRAPS).

Since 2005, the state has coordinated the development of WRAPS. Local WRAPS groups develop management plans to address locally identified priority issues. Watershed Districts and WRAPS groups can work together to address multiple resource concerns through implementation of BMPs. Actions taken to address total maximum daily load concerns, such as establishing or maintaining healthy riparian areas, can also positively impact flood flows. A one acre wetland has the potential to provide storage for 1.5 million gallons of floodwater, while also filtering pollutants before discharge. Management of riparian areas to prevent debris accumulation can also be address by WRAPS. By sharing resources and expertise, multiple objectives can be achieved.

A WRAPS group has been formed in the Grouse Creek watershed and non-structural activities are being evaluated in their planning. A WRAPS group is being formed in the watershed above El Dorado Reservoir. These efforts present an opportunity to integrate planning efforts.

Walnut Basin
Watershed Districts



Prepared for Kansas Water Plan 2008

Figure 3.

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Recommended Actions

1. Assess the effectiveness of existing flood control infrastructure and develop plans to reduce flood damage to this infrastructure. Ensure that infrastructure is maintained and free of debris accumulation.
2. Complete repairs of damaged flood control structures and deferred maintenance needs.
3. Determine the current floodplain status and promote NFIP participation, model ordinances and best management practices to local units of government. Limit development in the 100 year floodplain using Flood Insurance Rate Maps to delineate prohibited areas.
4. Engage in WRAPS to integrate comprehensive watershed based flood management with existing floodplain and riparian programs. Assess and inventory watersheds to identify potential locations for non-structural flood control measures.
5. Minimize the amount of land owned by the government when purchasing land by involving the private sector and offering the land for sale for appropriate uses.
6. Complete development of emergency plans for high hazard dams.
7. Complete breach zone mapping.
8. Coordinate with the DWR Water Structures Program to determine if increased hydrologic and hydraulic evaluation of stream obstructions should be considered in the Walnut basin or in parts of the basin particularly prone to flooding. Identify and evaluate flood prone areas that may be attributed to permitted stream obstructions. Consider costs to repair damages against costs to implement the program.

Resources

1. Kansas Department of Agriculture, Division of Water Resources. Floodplain Management Guide. 2008. http://www.ksda.gov/includes/document_center/structures/Floodplain/ksqg_web.pdf
2. Kansas Division of Emergency Management Adjutant General's Department. November 2007. *Kansas Hazard Mitigation Plan*.
3. Federal Emergency Management Agency. August 1, 2002. *National Flood Insurance Program: Program Description*.
4. Kansas Water Office. July 2005. *Small Dam Safety and Rehabilitation*. Kansas Water Plan Background Paper No. 76.
5. Kansas Water Office. 2003. The *Kansas Water Plan* Fiscal Year 2005 Update; July 2003. Final Draft. *Flood Management Policy Section*
6. USDA Natural Resources Conservation Service. 2006. *Kansas 2006 Update: Watershed Protection and Flood Prevention Program (PL-566)*. Salina, Kansas: March 23, 2006.

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Issue

Increasing public access to the state's lakes, rivers and streams, and recognizing the associated economic, social, and quality of life benefits to be derived from fishing, boating and other water-related recreational activities is an objective of the *Kansas Water Plan*. The Walnut River is not open for public access under Kansas law. However, the river and its tributaries do present numerous opportunities for recreation including boating, hunting, hiking, fishing, wildlife viewing, and camping. The entire extent of current opportunities and access areas is unknown and opportunities to consolidate areas with access have not been evaluated.

Description

The Kansas State Comprehensive Outdoor Recreation Plan (SCORP)⁽¹⁾ states that evaluation of recreation needs of the [Walnut basin](#) area indicates that there is an historic and current demand for additional water based recreation in the Walnut basin. These include needs for outdoor, water oriented, recreational activities such as swimming beaches, picnicking areas, camping areas, boating (including kayaking and canoeing), fishing, and water skiing. The report documents increasing perception by the public of the value of natural areas. Activities associated with these areas include hiking, horseback riding, recreational walking, birding and other wildlife viewing, and open space experiences. Recently there has been increased interest in canoeing/kayaking on navigable rivers in Kansas.

The FY 2005 *Kansas Water Plan* states that although the Walnut Basin has two major reservoirs on the river system that have recreation components ([El Dorado](#) and Winfield City), there is still a demand for more water-based recreation facilities. The Walnut River and its tributaries are not among the three rivers in the state considered available for public access and use. On tribu-



Walnut River near Arkansas City, Kansas

aries to El Dorado Reservoir, river/stream access does exist in public lands included in the flood control pool. The same is true for Grouse Creek, in the area of the flood control pool of Kaw Reservoir in Oklahoma.

A survey asking why people do not participate more in outdoor recreation, completed during development of the SCORP, found that "not enough time" or "not interested", ranked #1 and #2. Consistently ranking 3rd was the difficulty of gaining access to private areas. When coupled with not enough public facilities, the primary barrier to outdoor experiences that can be addressed by suppliers becomes clear: Inadequate access. The barrier is even more apparent where rivers are not even open to the public whether or not access points are available.⁽²⁾

Despite restricted access due to water laws of the state, canoeing and other float type activities have become increasingly popular in Kansas, with reported participation increasing by 80% in the last decade.⁽¹⁾ Public access is generally provided only on navigable rivers and the upper reaches of public reservoirs. In general the *Stream Access Program of the Kansas Department of Wildlife and Parks*⁽⁴⁾ (KDWP) is used to provide a systematic approach to implementing general access to navigable Kansas streams. The system is developed by identifying candidate sites, prioritizing their potentials, and scheduling development when funding is available. The Walnut River is not considered to be navigable so is not eligible for this program.

Existing Opportunities for Walnut River/Stream Access

The Walnut River and four of its tributaries are impounded to form El Dorado Reservoir in the northern part of the basin. In the flood control pool and the area within it managed for wildlife, the river and three of the tributaries have access for boating on them. Put-in and take-out for access to the Walnut River above El Dorado Reservoir are at the Chelsea Boat Ramp. The round trip distance from the access point is six miles. Cole Creek, Durechen Creek and Satchel Creek all have useable canoe access at their respective bridges on Highway 177. The Cole Creek access provides an eight mile round trip float. The Durechen Creek access point provides a round trip float of four miles. The Satchel Creek access provides a two mile round trip float.

Within the Kaw Reservoir Wildlife area there are four access points on Grouse Creek. From Silverdale to Traders Bend in Oklahoma, the northernmost access points provides a four and a half mile stretch of Grouse Creek that when combined with a float on the Arkansas River

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to Traders Bend in Oklahoma makes a total of 13.5 miles. Intermediate access points are available along the entire stretch. The Silverdale Boat Ramp south of Silverdale provides a float of four and a half miles to the confluence with the Arkansas River. The 2nd Street Bridge Access point provides a float of three miles to the confluence with the Arkansas River. The 3rd Street Bridge Boat Ramp includes two miles to the confluence with the Arkansas River. There is a take out at the Lower Grouse Creek boat ramp.

Depending on the flow conditions within both the river and the impounded water, canoeing/kayaking in these areas can vary from being much like on a still water reservoir with little flow, to high rushing water during high runoff conditions. The canoeing/kayaking experience sought by participants is usually on fast flowing water more typical of un-impounded conditions.⁽³⁾

Kansas Department of Wildlife and Parks Programs

KDWP has developed some innovative programs to enhance public access to private lands.

Walk-in Hunting Access Program⁽⁴⁾ The Walk-in Hunting Access (WIHA) program was established in 1995 in an effort to enhance the strong Kansas hunting heritage by providing hunting access to private property. The program has grown to one of the most successful access programs in the country. By 2004, over one million acres in Kansas were enrolled in the program providing numerous opportunities for sportsmen to pursue their favorite game at no additional charge. Although the majority of the acreage provides good to excellent upland game bird hunting, some areas provide opportunities for deer, waterfowl and squirrel hunting as well.

Landowners receive a modest payment in exchange for allowing public hunting access. Payments vary by the amount of acres enrolled and length of the contract period. Contract dates can be established from September 1 or November 1 through January 31 of each year. In addition, other lands are leased for spring turkey hunting only (April 1- May 31). Land enrolled can be in the Conservation Reserve Program (CRP) native rangeland, wheat or milo stubble and riparian or wetland areas. The area is posted with signs designating it as a WIHA, regularly patrolled, and safety zones are clearly marked. Liability is waived from private individuals who lease land to the state for recreational purposes. State law provides immunity from damages or injuries resulting from ordinary negligence. Maps showing areas enrolled in the

WIHA can be found at the KDWP website listed in the resources.

Fishing Impoundments and Stream Habitats Program.⁽⁵⁾

The Fishing Impoundments and Stream Habitats (F.I.S.H.) program is patterned after the WIHA Program with a goal of increasing public fishing opportunities in Kansas. The F.I.S.H. Program was first introduced to Kansas anglers and landowners in 1998. KDWP leases private waters from landowners for public fishing. Landowners participating in F.I.S.H. receive payments, which vary according to the number of water acres enrolled in impoundments or the length and quality of the streams. Annual payments are based on \$40 per acre for impoundments and from \$500 - \$1000 per stream mile. Waters need to be available for public access from March 1 to October 31.



El Dorado Reservoir

F.I.S.H. provides anglers with a place to fish while leaving the land in private ownership, contributing to the strengthening of rural-urban ties. KDWP officials periodically patrol F.I.S.H. areas. Violators are ticketed or arrested for vandalism, littering or failing to comply with fishing regulations. Access is limited to foot traffic, except on roads designated by the landowner in the case of very large tracts of land.

Each year, the KDWP publishes a fishing atlas outlining each body of water enrolled in the program and anglers are asked not to contact landowners. The atlas also contains information about the species of fish present for each water type. This program is made possible by the Federal Aid in Sport Fish Restoration Act, a federal aid project funded by purchase of fishing equipment. Landowners have the option to withdraw from the program at any time. They will be paid a prorated portion of the agreed payment and provided with signs denoting that

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the water has been removed from the program.

Regulations related to the F.I.S.H. Program area listed in the Resources section of this document.

Liability is a valid concern. However, state law provides that private individuals who lease their land to the state for recreational purposes are immune from ordinary negligence.

Opportunities with the Kansas Department of Transportation

The Kansas Department of Transportation (KDOT) allows river access at some areas on which they own easements and rights of way for bridges and other river/stream structures. While the land upstream and downstream of these public access points is privately owned, if landowner permission could be secured between the points, reasonably large stretches of the river for boating could be developed.

Increasing Access through Private Lands

The Walnut River and tributaries are not open to public use by state law. Landowner permission on both sides of the stream is required for recreational use to be on the water. When canoeing is the preferred activity, canoeists/kayakers like to have reasonable lengths of stream to float to compensate for the effort of getting the boat in the water at sometimes difficult access points. Obtaining

permission on stretches long enough to provide for a reasonable length float trip is difficult, and access is not always readily available even if landowner permission is granted. Many landowners whose land borders the streams have concerns about allowing access due to potential noise, trash, and general degradation of the area. A suggestion has been made that a licensing program be developed for groups or individuals to be authorized to lead groups of people on float trips on private lands. A licensing program would ensure responsibility and include acceptable standards for conduct on public and private lands. Restrictions similar to those related to the F.I.S.H. Program could be part of the license.

Table 1 summarizes publicly accessible water based recreation in the Walnut River basin. Clearly most access is associated with community and state fishing lakes with little available on flowing water in the Walnut basin.

**Table 1
Water Based Recreation Opportunities by Basin and Category
Kansas, December 1999⁽¹⁾**

River Basin	Category	Name of Facility	County	Water Surface Acres	Hunting Acres	Number of Facilities with Selected Activities						
						Boat	Camp	Fish	Hiking Trails	Hunt	Picnic	Swim
WAL	Community Lake	Lake George	Butler	4.0	0		yes	yes	yes		yes	
WAL	Community Lake	Sixth Street Pond	Cowley			yes		yes	yes		yes	
WAL	Community Lake	Winfield City Lake	Cowley	1,130.0	800	yes	yes	yes	yes	yes	yes	yes
WAL	Community Lake	Winfield Island Park Lake	Cowley	7.0			yes	yes			yes	
WAL	Large Reservoir	El Dorado	Butler	8,000.0	4,100	yes	yes	yes	yes	yes	yes	yes
WAL	River Access	Arkansas River at Arkansas City	Cowley					yes				
WAL	River Access	Arkansas River - Kaw Wildlife Area	Cowley				yes	yes				
WAL	River Access	Grouse Creek - upper end of Kaw River	Cowley			yes		yes				
WAL	River Access	Walnut River - upper end of El Dorado Reservoir	Butler					yes				
WAL	River Access	Walnut River at Winfield	Cowley					yes				
WAL	State Fishing Lake	Butler	Butler	124.0	351	yes	yes	yes		yes	yes	
WAL	State Fishing Lake	Cowley	Cowley	84.0		yes	yes	yes			yes	
WAL	State Fishing Lake	Kaw WA	Cowley	14.0		yes		yes				

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Recommended Actions

1. Inventory existing access points along the Walnut River and tributaries outside of authorized public use areas that have access provided by KDOT, WIHA or F.I.S.H. programs. Determine the feasibility of developing additional access points that could be linked together to provide reasonably long float experiences.
 2. Encourage the use of conservation easements by private landowners with stream frontage that would be willing to allow public recreation in target areas to link with access points identified above. Conservation easements on riparian lands have multiple benefits.
 3. Continue to promote participation in the WIHA Program and target areas containing stream segments with potential access development.
 4. Continue to promote the F.I.S.H. program especially on contiguous tracts of land with potential for access development.
 5. Explore the possibility of establishing a stream access program with the KDWP that would provide payment to private landowners who allow boaters to float through their properties.
 6. Explore the possibility of a sponsored licensed tour/float guide to raise confidence in landowners concerned with nuisance and liability issues. The license could have similar restrictions as the F.I.S.H. program to ensure responsible use of the streams.
4. Kansas Department of Wildlife and Parks. 2008. <http://www.kdwp.state.ks.us/news/Other-Services/Private-Landowner-Assistance/Wildlife/Walk-in-Hunting>.
 5. Kansas Department of Wildlife and Parks. 2008. <http://www.kdwp.state.ks.us/news/Fishing/Special-Fishing-Programs-for-You/Fishing-Impoundments-and-Stream-Habitats-F.I.S.H.-Program>.
 6. Kansas Department of Wildlife and Parks Regulations for the F.I.S.H. Program. K.A.R. 115-8-1; 115-8-4; 115-8-5; 115-8-9; 115-8-11; 115-8-12; 115-8-14; 115-8-15; 115-8-18; 115-8-19; 115-8-20.

Resources

1. Kansas Department of Wildlife and Parks. 2008. "State Comprehensive Outdoor Recreation Report". <http://www.oznet.ksu.edu/Stevenson/SCORP.pdf>
2. Wichita State University. 2001. "Water Recreation Needs Assessment."
3. Dave Murphy. 2008. Paddling Kansas. Trails Books.