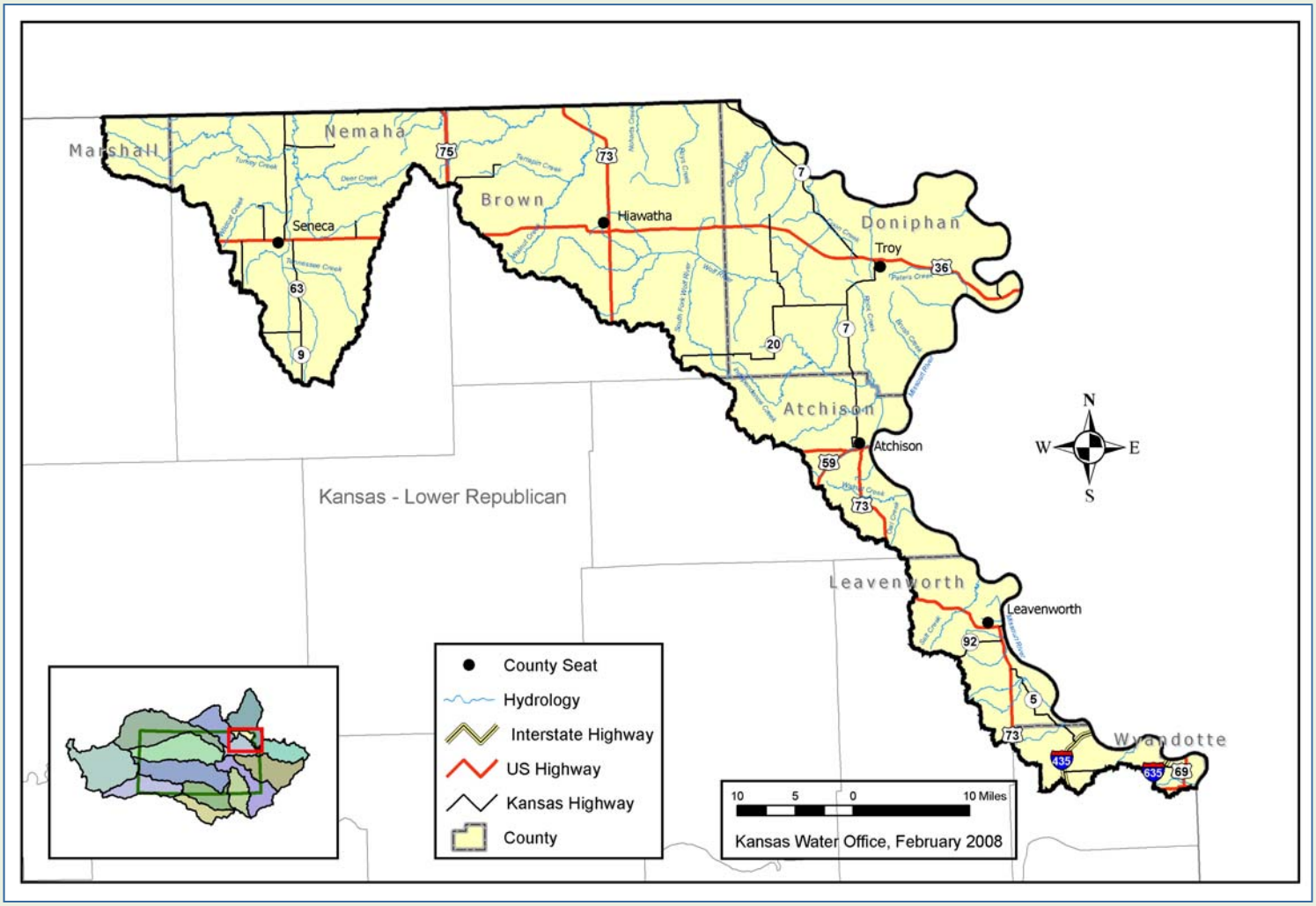
Missouri River Basin



General Description

The Missouri basin covers about 1,600 square miles of the northeastern corner of Kansas including Hydrologic Unit Codes 10240007, 10240008, 10240005 and 10240011. This represents a small fraction of the entire Missouri River watershed which covers all or part of ten states and extends into Canada. The basin covers all or part of Marshall, Nemaha, Brown, Doniphan, Atchison, Leavenworth and Wyandotte counties in Kansas and is the smallest of the 12 major basins in the state, accounting for about two percent of the total land area.

Tributary streams include the South Fork of the Big Nemaha River which along with other tributaries in Washington, Nemaha and part of Brown County drains northward into Nebraska as part of the Big Nemaha River watershed which enters the Missouri River just upstream of the Kansas border. Tributaries of the Missouri River in Kansas include the Wolf River and numerous smaller creeks. There are no federal reservoirs in the basin. Ground water sources available in the region include alluvial and glacial deposits. For planning purposes, that portion of the Blue River drainage in Johnson County, which joins the Missouri River in Jackson County, Missouri is included in the Kansas-Lower Republican basin.

Elevations in the basin range from 1,340 feet above mean sea level (MSL) near Corning at the headwaters of the South Fork of the Big Nemaha River to 706 feet at the confluence with the Kansas River in Kansas City. The basin contains the cities of Leavenworth, Atchison, Troy, Hiawatha, Seneca and Kansas City, Kansas along with many smaller communities.

Population and Economy

There were an estimated 143,000 residents in the basin in the year 2000 (KWO estimate). According to the U.S. Census Bureau, the total population of the seven counties that are contained in whole or in part within the Missouri basin had a population of 284,011 in 2000.(1) By 2040, the population of these counties is projected to increase by about 16% to 330,470. However, nearly all this increase is projected to occur in Wyandotte and Leavenworth counties. The population in the remainder of the basin is projected to decrease by approximately eight percent.

This illustrates major demographic changes which are 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% every decade. Urban counties are gaining population, particularly Leavenworth which is projected to grow 36% by 2040. Every predominately rural county in the basin is expected to lose population except Brown and Marshall counties which are expected to grow by 694 people by 2040.

Confluence of the Missouri and Kansas Rivers. Photo courtesy KGS.

Wyandotte County is one of the most heavily developed areas of Kansas with little agricultural land. Expanding retail, entertainment and residential development in the western portion of the county will likely result in conversion of any remaining open land in the coming years and affect adjoining areas of southern Leavenworth County. Fort Leavenworth and the Leavenworth Federal Penitentiary along with the Lansing State Prison are major economic drivers in Leavenworth County. Private colleges are located in Leavenworth and Atchison and public community colleges are located in Highland and Kansas City, Kansas.

In the remainder of the basin, agricultural production is the primary economic activity. Corn, wheat, soybeans and grain sorghum are the primary crops with the highest quantity of harvested acres in the northern tier of counties. Beef cattle and hog production are also concentrated in the northern counties with significant dairy production in Leavenworth and Nemaha counties. The value of crops grown in the seven counties either wholly or partly within the Missouri basin exceeded $324 million in 2006 while livestock and dairy production topped $94 million.

While the basin lacks large federal reservoirs and associated wildlife areas, there are two State Fishing Lakes and a number of county and city lakes which support public recreation. Waterfowl hunting along the Missouri River and associated riparian areas attracts sportsmen to both private (with permission) and public lands.

Physical Characteristics

Geology and Soils

The topography of the Missouri basin is influenced by glacial deposits of the Pleistocene age. The area is part of the glaciated region physiographic province and is also described as the Dissected Till Plains section of the Central Lowlands. In the upland areas between major streams, the land surface is flat to undulating with rounded hills and resembles the unaltered drift topography left after the last period of glaciation. The valleys of the smaller streams tend to be narrow and deep. Adjacent to the Missouri River, loess deposits replace the glacial drift and later erosion of this material created hilly terrain and steep bluffs.

Over much of the basin, glacial drift covers bedrock of Pennsylvanian and Permian systems which consist primarily of alternating layers of limestone and shale with some local sandstone. Glacial material is composed of unconsolidated till and outwash and reaches a thickness of up to 250 feet. Rock outcrops occur where principal streams have cut through the glacial drift.

Four major soil associations occur in the basin. The Monona and Marshall silt loams along the Missouri River bluffs are derived from loess and are productive for agriculture but prone to erosion. Further west, the Sharpesburg silty clay loam along with the Shelby and Marshall silt loams are less steep but still erodible. The western third of the basin contains the Grundy and Pawnee silty clay loams and the Burchard and Shelby silt loams. The clay loams are relatively level but have low permeability. The silt loams occupying the steeper slopes are more permeable. The alluvial soils which occupy the floodplains of the Missouri and larger streams are deep and productive.

Loess Hills, Doniphan County Photo courtesy KGS

Land Use/Land Cover

The predominant features in the basin are the crop land in the Missouri River floodplain and urbanized areas of Atchison, Leavenworth/Lansing and Kansas City, Kansas. Cropland (56%) and grassland (24%) are the most widespread land cover classes covering nearly 81% of the basin. In 2006 there were an estimated 4,920 farms containing 1,968,900 acres in the seven counties either partly or wholly within the basin, with the average farm about 400 acres. Within the 100-foot corridor along each bank of streams within the Missouri River basin, 39% of the land is forested followed by cropland (18%) and mixed trees and crops (15%).

The basin contains many important highway and rail transportation corridors. U.S. Highways 73, 75 and 159 cross the basin from north to south while U.S. 36 crosses from east to west. The Union Pacific Railroad services most of the basin. The Missouri River as it borders Kansas is also maintained for barge traffic by the U.S. Army Corps of Engineers although activity has been reduced in recent years by extended drought in the upper basin.

Climate

The climate of the Missouri River basin in Kansas is classified as humid continental with cold winters and hot summers. Normal mean temperature generally increases from northwest to southeast across the basin. The average annual mean temperature of the basin is 54 deg. F. Most of the precipitation falls in the growing season with June typically being the wettest month with a basin-wide average precipitation of 38 inches. Flood events, such as in July 1993 and the drought experienced from 1952-1956, underscore the variability in precipitation.

	Average Annual[1]		Freeze Dates (32 F.)[2]		
Location	Precipitation (inches)	Temperature (deg. F.)	Last in Spring	First in Fall	Frost Free Days
Atchison	38	54	Apr. 13	Oct. 21	192

[1] Source: National Climatic Data Center (1971-2000 data)
[2] Source: KSU Weather Data Library (1961-1990 data)

Wildlife and Habitat

The Missouri basin encompasses a variety of wildlife habitats ranging from cultivated bottomland to rolling uplands with a mixture of crops and grasslands. The Missouri River serves as a corridor for many migratory bird species. Habitat loss due to urban development is an issue, particularly in the lower basin.

Nineteen state or federally listed threatened or endangered species of wildlife share a probable or historic range within the basin. A total of nine fish, seven birds, two reptiles and one insect are listed as threatened or endangered in the Missouri basin, including designated critical habitat for ten species.

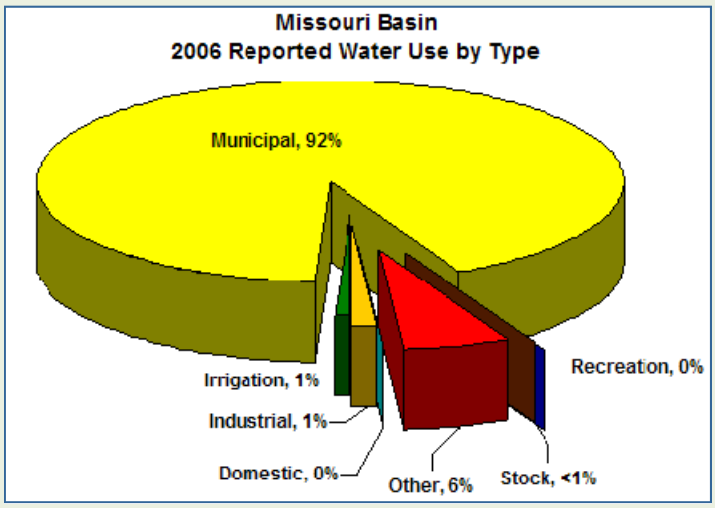
Water Resources

There are 3,341 stream miles in the Missouri basin. About 1,038 miles of these streams are considered perennial and 2,303 intermittent. Stream density is 2.3 stream miles per square mile which is typical for the eastern part of Kansas.

The Missouri River as it borders Kansas is greatly influenced by water releases from the six federal reservoirs located in Montana, North Dakota, South Dakota and Nebraska. Water releases from these reservoirs support commercial navigation and other downstream uses. After eight consecutive years of drought in the Missouri basin, reservoir storage in the upper reservoirs has been significantly reduced resulting in shortened navigation seasons. The maximum daily discharge for the Missouri River at Kansas City for the period of 1958-2001 was 529,000 cubic feet per second (cfs). Mean daily flow at this location is 42,100 cfs and target flow for full navigation services is 41,000 cfs.

There is one state Multipurpose Small Lake, Pony Creek, in the basin which serves as the water supply for the City of Sabetha. Water is piped to the city which is located just south of the Missouri basin watershed divide.

Surface water is the primary source for the 33 public water suppliers in the basin, accounting for more than 93% of the use in 2006. Ground water sources available in the basin include alluvial and glacial deposits. Ninety-two percent water use in the basin is for public water supply.



Water Management

There are six watershed districts in the basin primarily engaged in flood control. Watershed districts are formed to construct, operate and maintain structures and improvements for water management. Each county also has a Conservation District dedicated to improving water quality and reducing soil erosion. Much of the basin is covered by the Glacial Hills Resource Conservation and Development Program.(6)

Watershed Restoration and Protection Strategies (WRAPS) are stakeholder-driven management plans designed to address multiple water resource issues within a specific watershed. A basin-wide Missouri River WRAPS is currently being developed.(5) It is anticipated that WRAPS projects in the basin will encompass priority areas for water quality improvement, source water assessment areas and priority areas for wetland and riparian protection.

Pony Creek Reservoir

Resources

1. U.S. Census Data, 2000.

2. USDA. *Kansas 2006-2007 Farm Facts, Agricultural Statistics and Ranking*.

3. Wilson, Brownie, 2003. *Assessment of Riparian Areas Inventory, State of Kansas*

4. Kansas Department of Agriculture-Division of Water Resources. 2007. Water Rights Information System (WRIS).

5. Kansas Department of Health and Environment. Accessed Jan. 2009. Watershed Restoration and Protection Strategies (WRAPS) www.kswraps.org

6. Natural Resources Conservation Service. Accessed Jan. 2009. Resource Conservation and Development Information. www.ks.nrcs.usda.gov.partnership.rcd/

The Missouri River Mitigation Project

The Missouri River Mitigation Project is designed to mitigate, or compensate, for fish and wildlife habitat losses that resulted from past channelization of the Missouri River. Managed by the U.S. Army Corps of Engineers, the Project extends from Sioux City, Iowa to the mouth of the Missouri River near St. Louis, a distance of 735 river miles.

Restoration will be accomplished by means of land acquisition from willing sellers, dredging filled-in areas, reopening historic chutes, bank stabilization, dike notching, pumping, dike/levee construction, vegetative plantings, and vegetation and land management.

In Kansas, three bottomland tracts have been acquired or are in the acquisition process. The project includes the 2,112-acre Benedictine Bottoms area which is managed by the Kansas Department of Wildlife and Parks for three habitat types that existed in the area before development: timber, native grass and wetlands.

Constructed Wetland, Benedictine Bottoms
Photo courtesy of the Corps of Engineers