United States Department of Agriculture
Natural Resources Conservation Service

Spring River Sub-basin

HUC # 11070207

R A P I D W A T E R S H E D A S S E S S M E N T

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Spring River Sub-basin

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A rapid watershed assessment (RWA) evaluates resource conditions and needs on an 8-digit hydrologic unit (HU) basis. The assessment identifies the primary resource concerns for the watershed being profiled and provides estimate as to where conservation investments would best address the concerns of landowners, conservation districts, stakeholders, and others. The RWA provides information on which to base decisions about conservation priorities, allocation of resources, and funding for implementation.

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Introduction[1]

The Spring River Sub-basin covers 2,271 square miles in southwestern Missouri and drains portions of 8 counties. The Spring River exits Missouri and passes through southeastern Kansas before it is ultimately received by the Grand Lake O' The Cherokees in Oklahoma. The sub-basin is unevenly split by two physiographic regions. Eighty-five percent of the drainage unit is within the Springfield Plain. Fifteen percent of the sub-basin transitions into the Cherokee Plains. There are no landscape features marking the boundary between these plains and the slight decrease in elevation moving from the Springfield Plain onto the Cherokee Plain is difficult to detect. Landscape ecologists have distinguished the difference based on soils with the Springfield Plains having more limestone based soils and the soils of the Cherokee Plains containing more shale and sandstone.

Major tributaries within the basin are the North Fork of the Spring River, Center Creek, Turkey Creek, and Shoal Creek. Most of the land cover in the sub-basin is grassland to support livestock operations; however significant amounts of cropland are also present. Livestock operations are mainly poultry and cow-calf operations. Primary crops include soybeans, wheat, corn, grain sorghum, grass seed, and vegetables. Forest lands are fragmented and located along stream drainages. Several losing stream reaches and numerous springs exist, especially where the limestone parent material of the Springfield Plain is prevalent.

Scope and Purpose

Rapid watershed assessments (RWA) provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals. The information contained in this RWA summarizes readily available data and provide a snapshot of natural resources, concerns, and conservation opportunities.

Major Realizations

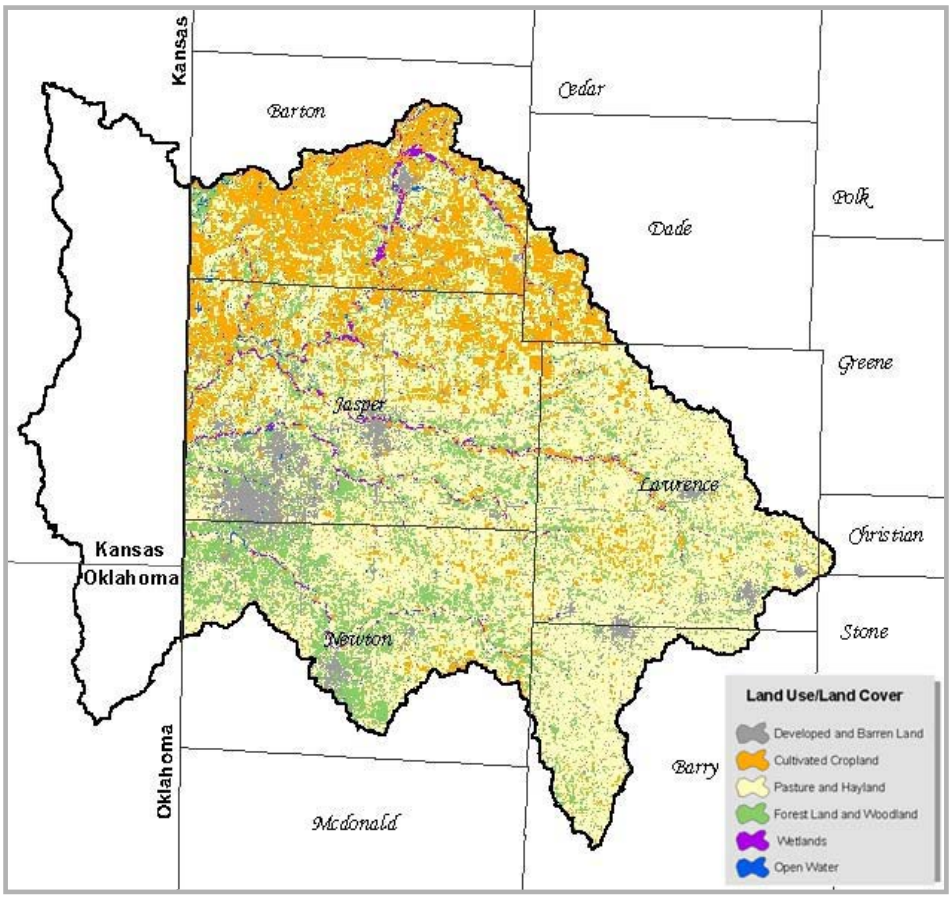
The Spring River Sub-basin has both water quality and quantity concerns. Sedimentation in this watershed degrades aquatic habitat and originates primarily from agricultural grasslands and croplands. Many cropland producers practice tillage at some point in the crop rotation sequence, and in the absence of conservation measures, results in the loss of soil to field ditches and streams. Sediment loss also occurs on grasslands where continuous or unmanaged grazing is allowed.

Harmful bacterial levels within Spring River exceed established limits, especially following storm events. In Lamar, taste and odor problems in a surface water drinking reservoir have been attributed to algal blooms stimulated by nutrients from agricultural non-point sources. Water quantity concerns are present in Joplin, the fourth largest metropolitan area in Missouri, where continued population growth has been sustained for several years and water use exceeds groundwater recharge.

Physical Description

A. Land Use/ Land Cover[2]

Figure 1



Land Use/Land Cover	Acres	Percent of Area
Urban	103,600	8%
Cultivated Cropland	234,400	18%
Conservation Reserve Program	56,400	4%
Non Cultivated Cropland	96,600	7%
Pastureland	532,300	42%
Forestland	210,100	16%
Minor Land	42,800	3%
Water	11,300	1%
Federal Land	400	0%
Rangeland	16,000	1%
Total	741,700	100%

Land Cover / Land Use Definitions

- Urban – This map category corresponds to the tabled category called Developed Land. Developed Land is a combination of the NRI land cover/use categories large urban and built-up areas, small lbuilt-up areas and rural transportation land. Rural transportation land consists of all highways, roads, railroads and associated right-of-ways outside urban and built-up areas and also includes private roads to farmsteads, logging roads and other private roads.

- Barren – This map category is typically, the surface of sand, rock or exposed soil with less than 5 percent vegetative cover. Barren land acreage is included in the tabled NRI Minor Land category. Minor land is a miscellaneous grouping of land covers and uses that includes farmsteads and farm structures, field windbreaks, and barren land.

- Cropland – This map category most closely corresponds to the tabled category called Cultivated Cropland. Cultivated Cropland comprises land in row crops, close-grown crops and hayland or pastureland in rotation with row or close-grown crops.

- Grassland – This map category includes 4 tabled NRI land cover/use categories:
  Non-cultivated cropland; Conservation Reserve Program (CRP) lands; Pastureland; Rangland. on-cultivated cropland includes permanent hayland and horticultural cropland. The CRP is a federal program established under the 1985 Food Security Act to convert highly erodible cropland to vegetative cover (primarily grass) under 10 year contracts. Pastureland is land managed primarily for the production of introduced forage plants for livestock grazing. Rangeland is land on which the climax or potential plant cover is composed principally of native grasses, grass-like plants, forbs or shrubs suitable for grazing and browsing and introduced forage species that are managed like rangeland.

- Forestland and Woodland – A majority of the acreage for these map categories is captured by the tabled NRI Forestland category, defined as land that is at least 10 percent stocked by single-stemmed woody species of any size that will be at least 4 meters tall a maturity. Ten percent stocked, equates to an areal canopy cover of 25 percent or greater.

- Wetlands – Acreage for this mapped category is not reflected in any of the NRI tabled acreage estimates. The wetland map category is a combination of satellite derived wetland classes, National Wetland Inventory (NWI) acres and Wetland Reserve Program (WRP) acres. (See Wetlands Section for NWI acreage estimates)

- Water – This map category closely corresponds to the NRI table acreage estimate representing water bodies and streams that are permanent open water.

B. Public Land[3]

In Missouri, approximately1% of the Spring River sub-basin is comprised of public lands. The majority of these public lands are managed by the Missouri Department of Conservation with fourteen conservation areas, one nature center and numerous accesses. The Missouri Department of Natural Resources manages three sites that include one state park and two historic sites.

Figure 2

Public Land Ownership (acres)					
	Missouri Department of Conservation	Missouri Department of Natural Resources	The Nature Conservancy	National Park Service	U.S. Fish & Wildlife Service
Total Acres	12,980	3,952	467	209	148
Pecent of Public Lands	73.1	22.3	2.6	1.2	0.8

C. Soil Capability

Land Capability[2]

Land Capability is a classification system used to identify the erosion potential of farmland. For over forty years the USDA has used land capability classification as a planning tool in laying out conservation measures and practices to farms without serious deterioration from erosion or other causes. The current system includes eight land classes designated by Roman numerals I through VIII. The first four classes are arable land suitable for cropland in which the limitations and the need for conservation measures and management increase from I through IV. The remaining four classes, V through VIII, are not to be used for cropland, but may have uses for pasture, range, woodland, grazing, wildlife, recreation, and aesthetic purposes.

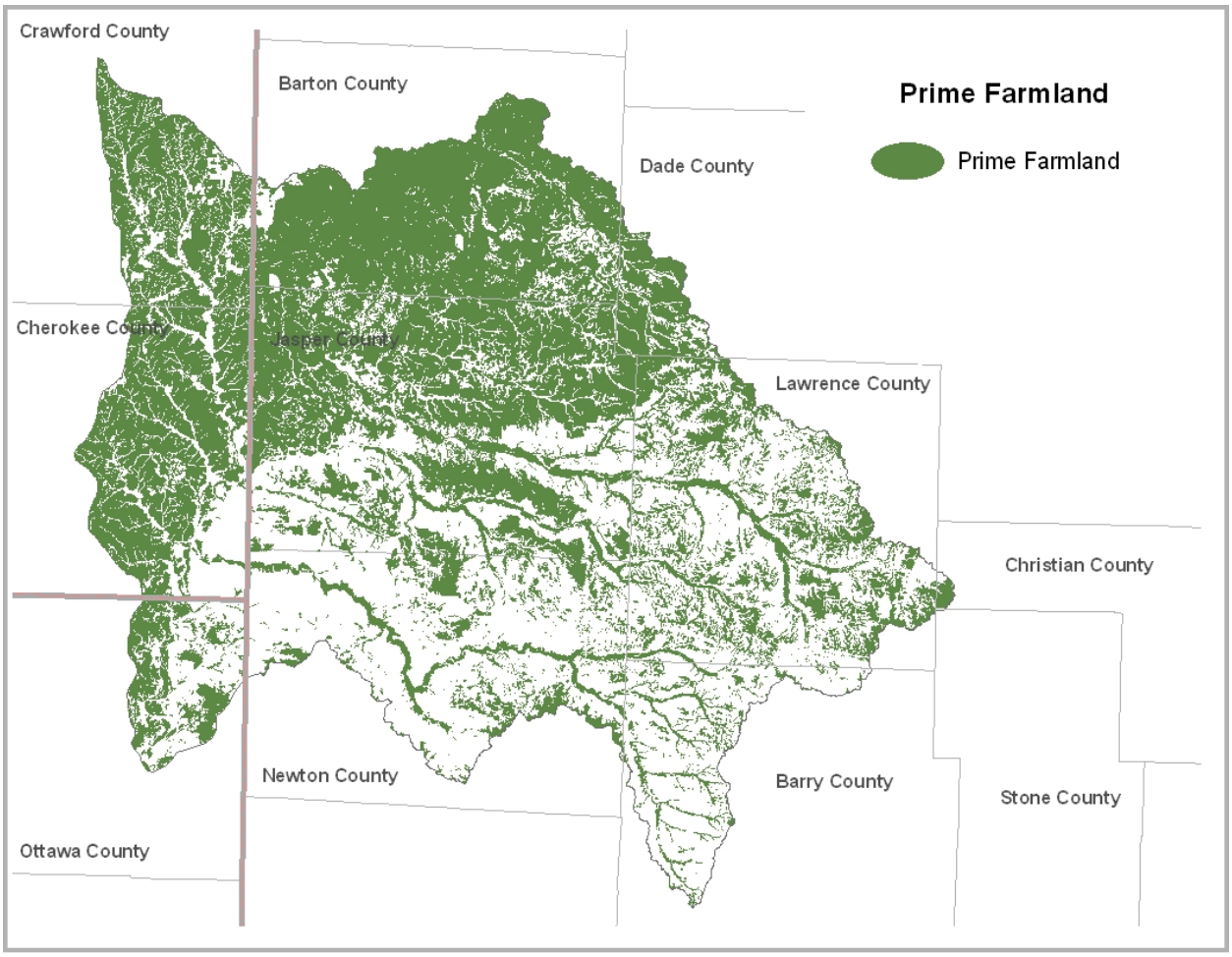
Figure 3

Land Capability Class	Cultivated cropland (acres)	Non-cultivated cropland (acres)	Pastureland (acres)
I - slight limitations	-	-	-
II - moderate limitations	149,400	39,200	163,100
III - severe limitations	70,200	39,000	215,400
IV - very severe limitations	10,000	18,400	125,800
V - no erosion hazard, but other limitations	2,800	-	1,300
VI - severe limitations, unsuited for cultivation, limited to pasture, range, forest	2,000	2,400	16,500
VII - very severe limitations, unsuited for cultivation, limited to grazing, forest, wildlife	-	1,500	7,700
VIII - misc. areas have limitations, limited to recreation, wildlife and water supply	-	-	2,500
Total	**234,400**	**96,600**	**532,300**

Prime Farmland[4,5]

Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

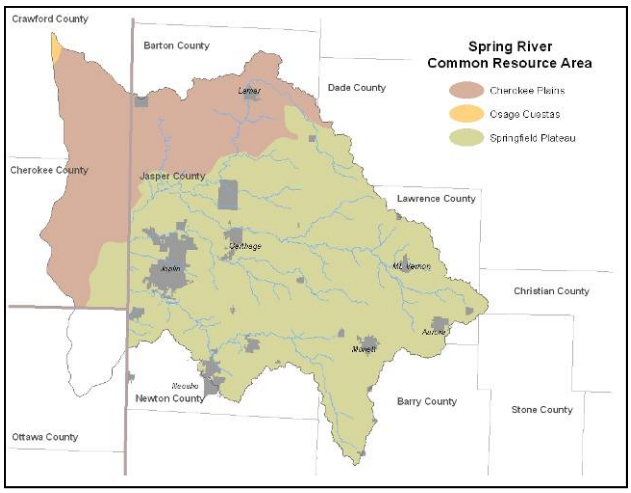
Figure 4

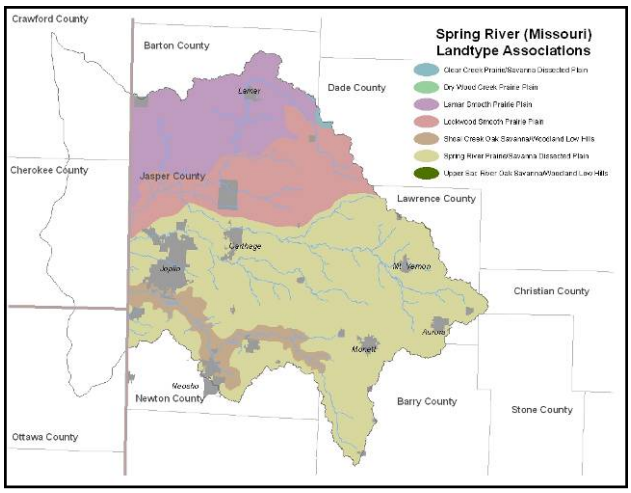


D. Common Resource Areas[6]

NRCS has divided the Nation into ecological type land regions called Major Land Resource Areas (MLRA). MLRAs are defined by their agricultural potential and soils capabilities and provide a spatial framework for addressing national and regional agricultural issues. A Common Resource Area (CRA) is a geographic and ecologic subdivision of an MLRA within which there are similar resource concerns and treatment requirements. Each Missouri CRA is a grouping of Land Type Associations (LTA) taken directly from the state's ecological classification system (ECS). Missouri's LTAs are primarily differentiated on the basis of local climate, landforms and topography, geologic parent materials, soil types and potential vegetation.

Figure 5.





Cherokee Plains Description

The Cherokee Plains is one continuous plain of very low relief (usually less than 80 feet) mostly on Pennsylvanian sandstones and shales, but with associated thin-bedded limestones and coal. Streams have hardly dissected the surface, and valleys are topographically subdued. Wetlands are abundant throughout the wide, flat alluvial plains. Claypan soils add further distinction to this area. Pre-settlement vegetation was both upland and wet prairie, with timber confined to narrow strips along the stream courses. Most of the land is in farms, both pasture and cropland, with local areas of extensive strip mines. Substantial prairie remnants occur, many in conservation ownership.

Springfield Plain Description

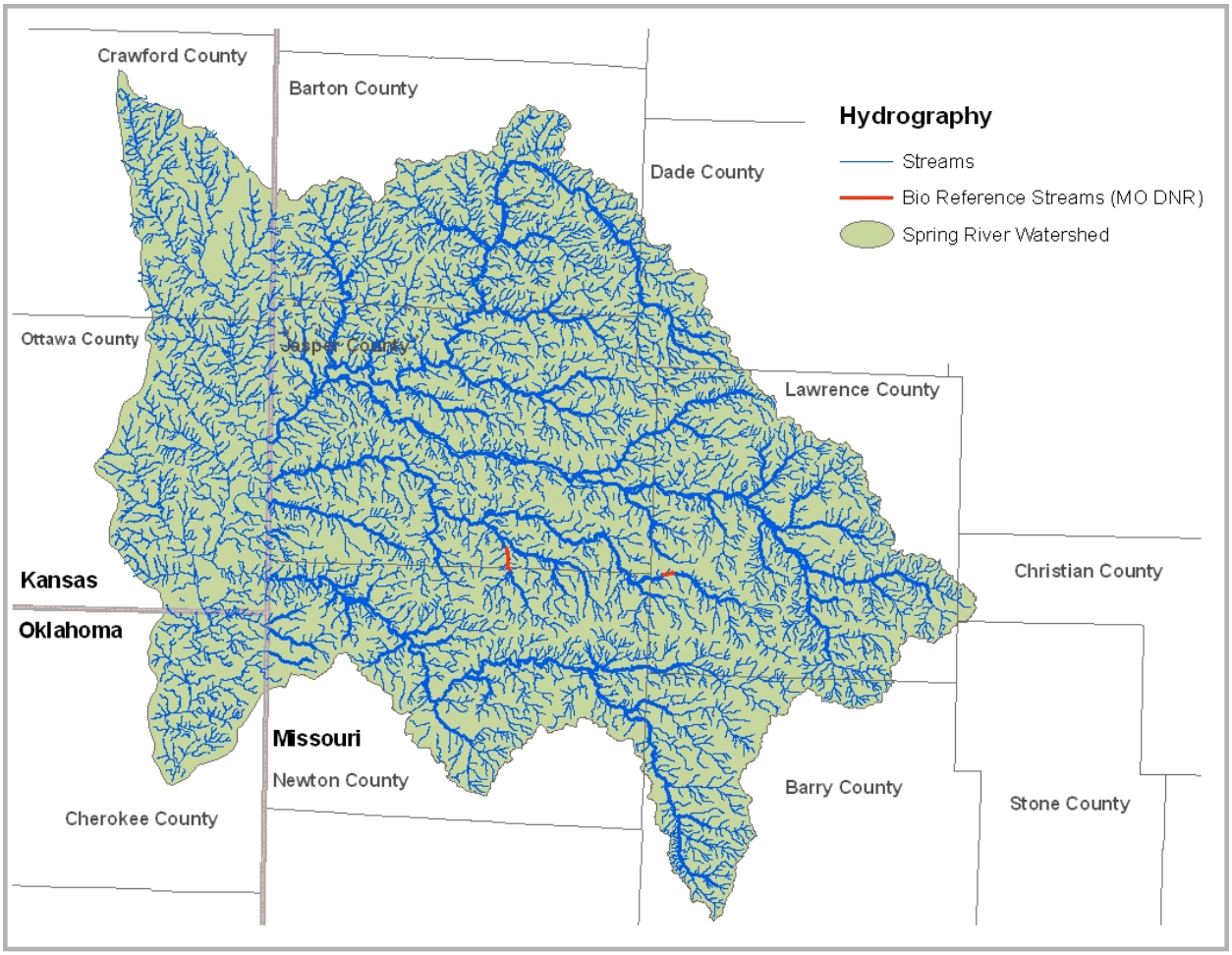
The Springfield Plain is a large smooth plain in the southwestern Missouri Ozarks. Relief is generally less than 150 feet, which account for by slight dissection along streams. The plain is underlain by Mississippian cherty limestones that are responsible for several well-developed karst and numerous springs. Pre-settlement vegetation was mostly prairie, with timber along stream courses and in the more dissected border regions. Most of the subsection is cleared land, with pasture dominating, but forests occur in hillier portions. Urbanization pressures are great in the Springfield metropolitan area and at Joplin.

E. Streams

National Hydrography Dataset (NHD) with Gaining Streams and Biological Reference Streams [7 & 13]

High-resolution (1:24,000-scale) streams from the National Hydrography Dataset total 2,736 miles of intermittent and perennial streams in this sub-basin. In Missouri, Center Creek and Clear Creek are two tributaries designated as a biological reference streams which signifies these waterbodies as having outstanding water quality and biologic conditions.

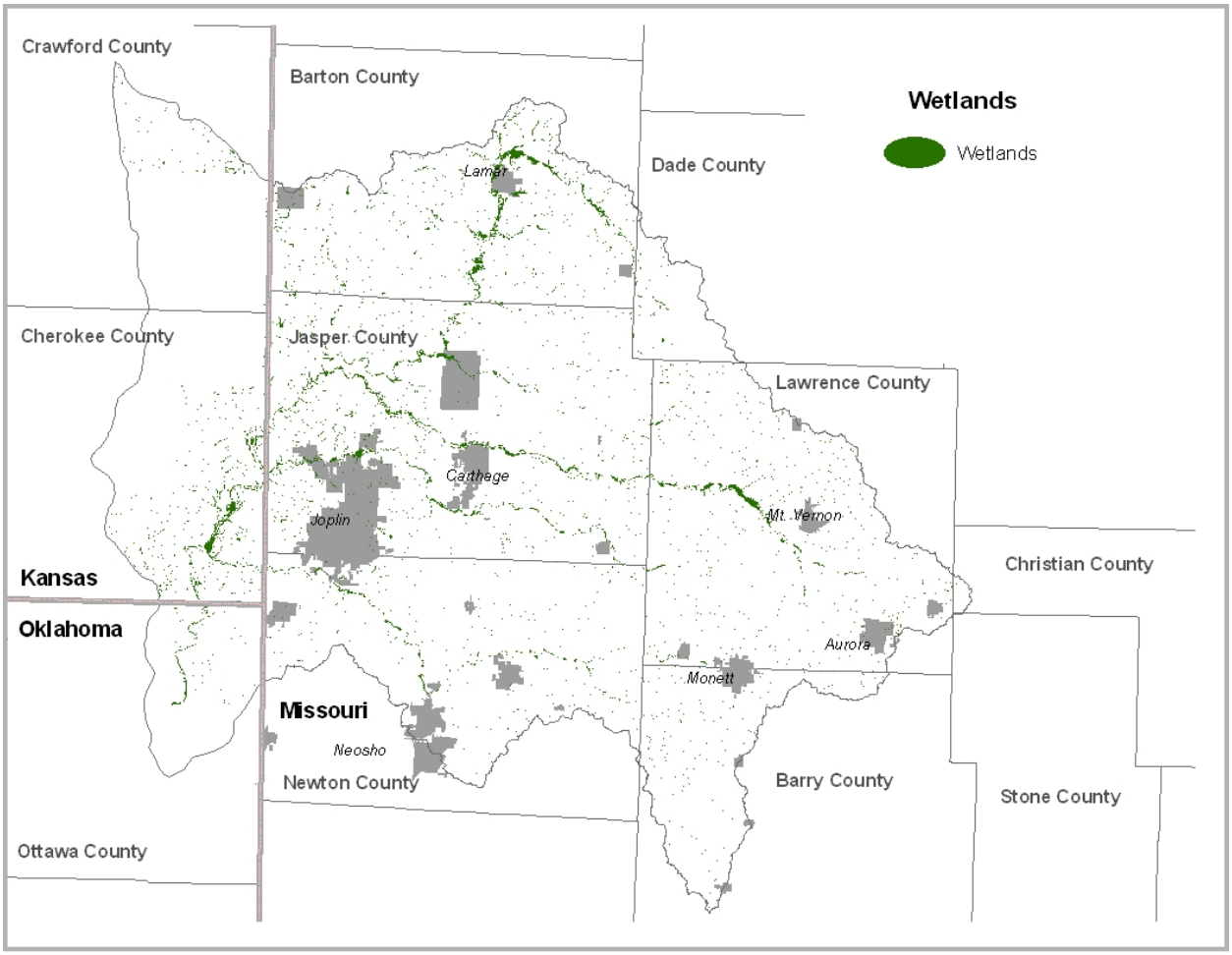
Figure 6



F. Wetlands[8,9]

The National Wetland Inventory delineates and records wetland information through the U.S. Fish and Wildlife Service. Some quadrangles in Kansas and Oklahoma were not available thus the Kansas information is incomplete.

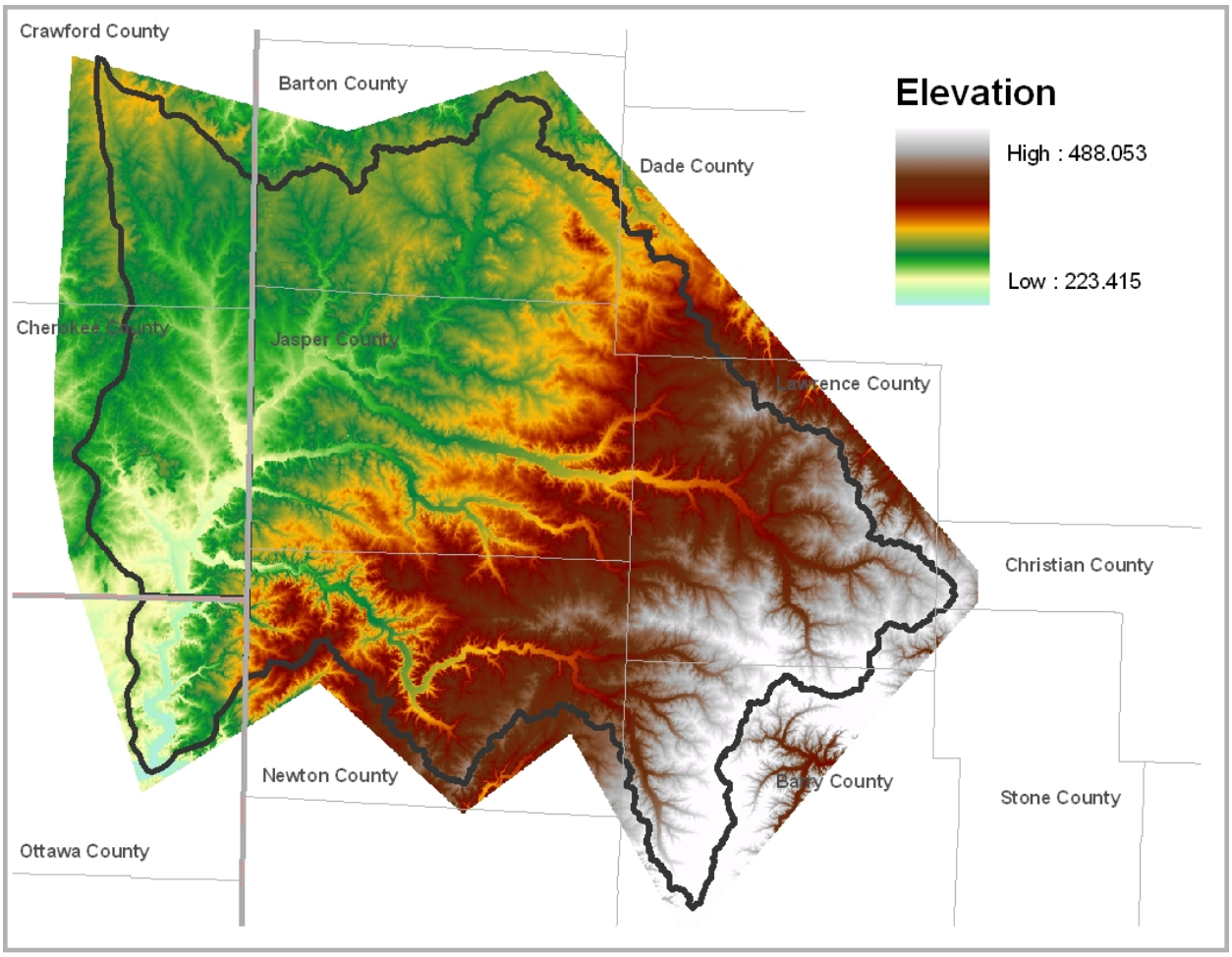
Figure 7



G. Relief Map[10]

The shaded relief and elevation values of the Spring River sub-basin are derived from digital elevation models generated from the United States Geological Survey 7.5 minute elevation contours. The relief of the Spring River watershed is nearly 265 feet ranging from its highest areas in Barry County, Missouri to where the Spring empties into the Lake of the Cherokees in Oklahoma.

Figure 8



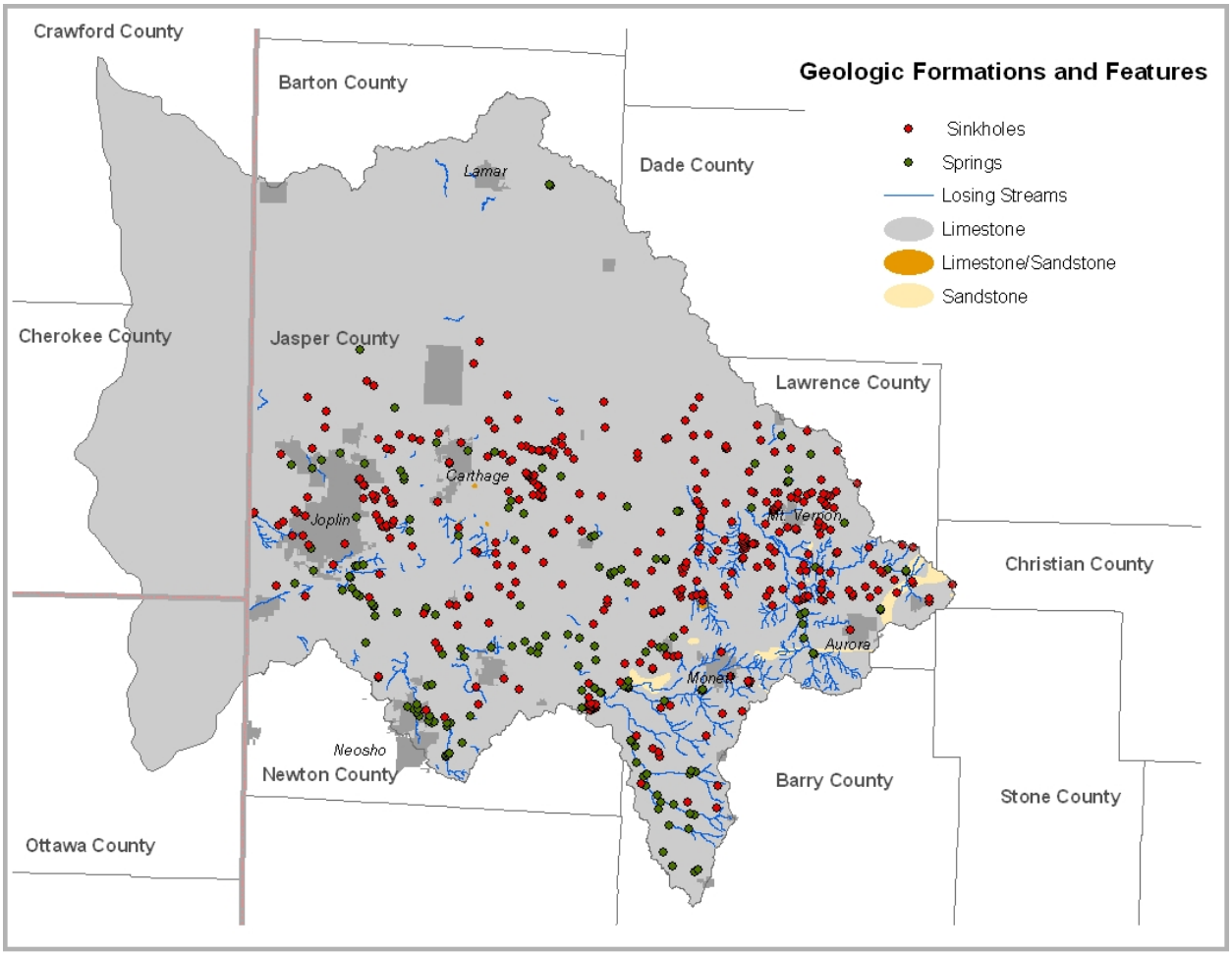
H. Geology[11,12,20,21]

Geologic and Karst Features

The Spring River sub-basin has a karst landscape indicative of caves, sinkholes and losing streams. These features are found in limestone and dolomitic formations which dominate the Ozark geologic regime. Since limestone and dolomite formations are soluble, the interaction between surface and groundwater resources is great.

Attribute data for springs, sinkholes and losing streams were not found for the Oklahoma and Kansas portions of this watershed.

Figure 9



Resource Concerns

A. Water Quality

303d Listed Waters[14,20,21]

Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses as whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

Figure 10

Water Body, State	Size	Pollutant	Source	Impaired Use(s)*	Beneficial Use(s)*	Priority
Center Creek, Missouri	11 miles	Zinc	Abandoned Mines	2	1,2,3,5,6,7	Medium
Clear Creek, Missouri	3 miles	BOD, NFR, NH3	Monett WWTP	2	1, 2, 3	High
Douger Branch, Missouri	2 miles	Zinc	Abandonde Mines	2	1,2,3	Medium
Lamar City Lake, Missouri	180 acres	Nutrients	Algae, Ag NPS	8	1,2,3,8	Medium
North Fork (Spring), Missouri	51.5 miles	Sediment	Ag NPS			Medium
Shoal Creek, Missouri	13.5 miles	Fecal Coliform	Unknown Ag NPS	5	1,2,3,5,6,7	Medium
Turkey Creek, Missouri	8.5 miles	Zinc	Abandoned Mines	2	1,2,3,5	High
First Cow Creek, Kansas	760 sq. miles	Chlordane	Sediment	6k	1k-8k	Low
Second Cow Creek, Kansas	760 sq. miles	Sulfate	Geology NPDES Sites	5k	1k--8k	Low
Little Shawnee Creek, Kansas	60 sq. miles	Dissolved Oxygen	Non-Point Sources	2k	2k,4k,6k	High
Shawnee Creek, Kansas	60 sq. miles	Dissolved Oxygen	Non-Point Sources	2k	2k,4k,6k	High
Spring River, Kansas/ Oklahoma	2,830 sq. miles	Zn, Pb, Cu, Cd	Point Sources, Non-Point Sources	1k	1k-10k	High

Missouri Impaired and Beneficial Uses:

1 Livestock and Wildlife Watering
2 Protection of Warm Water Aquatic Life
3 Human Health associated with Fish Consumption
4 Boating and Canoeing
5 Whole Body Contact
6 Secondary Contact Reaction
7 Irrigation
8 Drinking Water Supply
9 Industrial

Kansas Designated Uses:

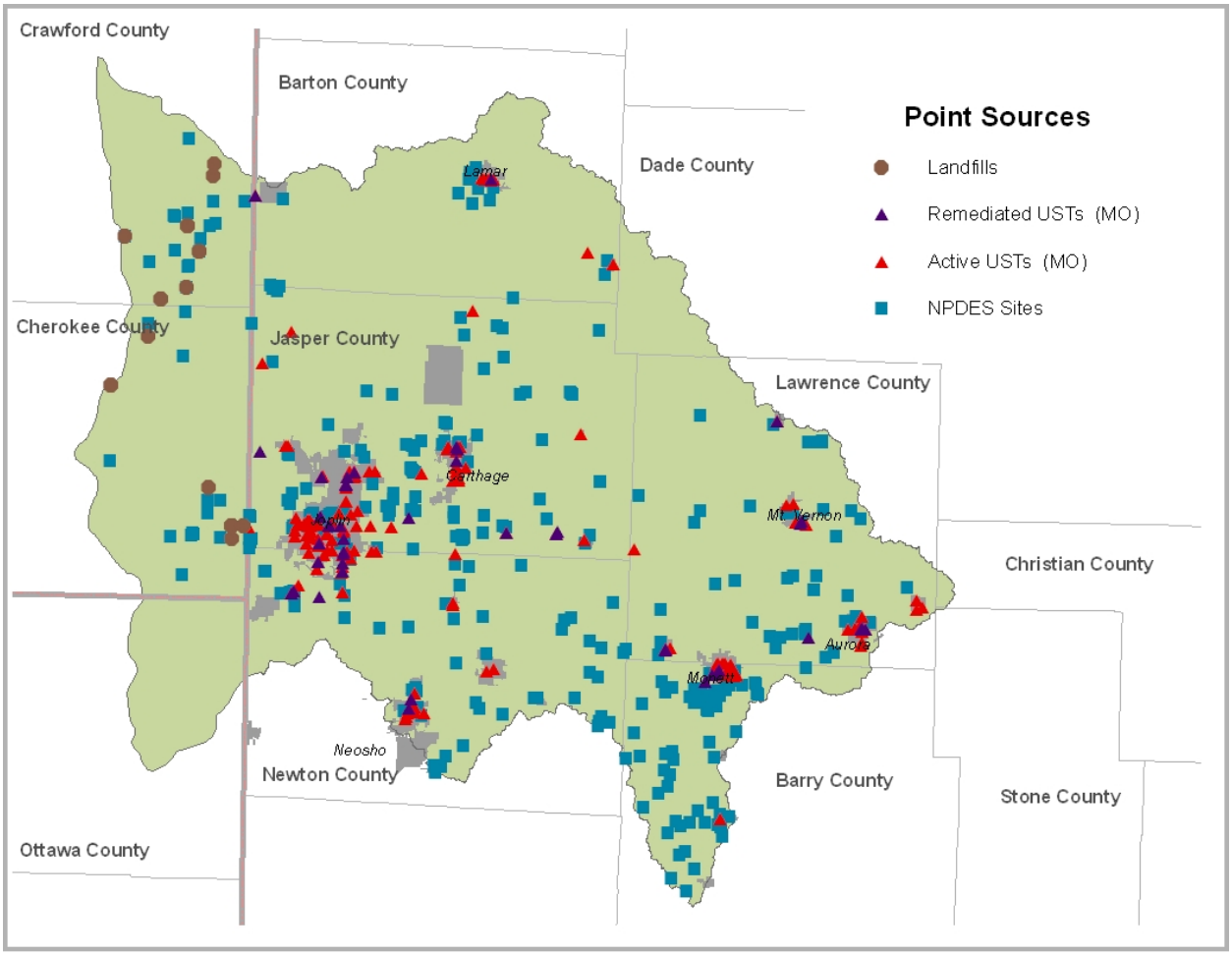
1k Special Aquatic Life Support
2k Expected Aquatic Life Support
3k Primary Contact Recreation
4k Secondary Contact Recreation
5k Domestic Water Supply
6k Food Procurement
7k Groundwater Recharge
8k Industrial Water Supply Use
9k Irrigation Use
10k Livestock Watering Use for Main Stem Segment

Point Sources[15,20,21]

Point sources of water pollution are regulated discharges permitted by state or federal agencies. In the State of Missouri, underground storage tanks (USTs) typically holding fuel for gas stations are permitted by the Missouri Department of Natural Resources.

The National Pollutant Discharge Elimination System (NPDES) permits commercial and industrial facilities that discharge treated waste water into local streams or waterways. In the Spring River sub-basin, a portion of these sites are agriculturally related. No landfills were identified to be located in Missouri, however there are permitted landfills in Kansas. Due to the lack of geographic data, no information was gathered for Oklahoma.

Figure 11



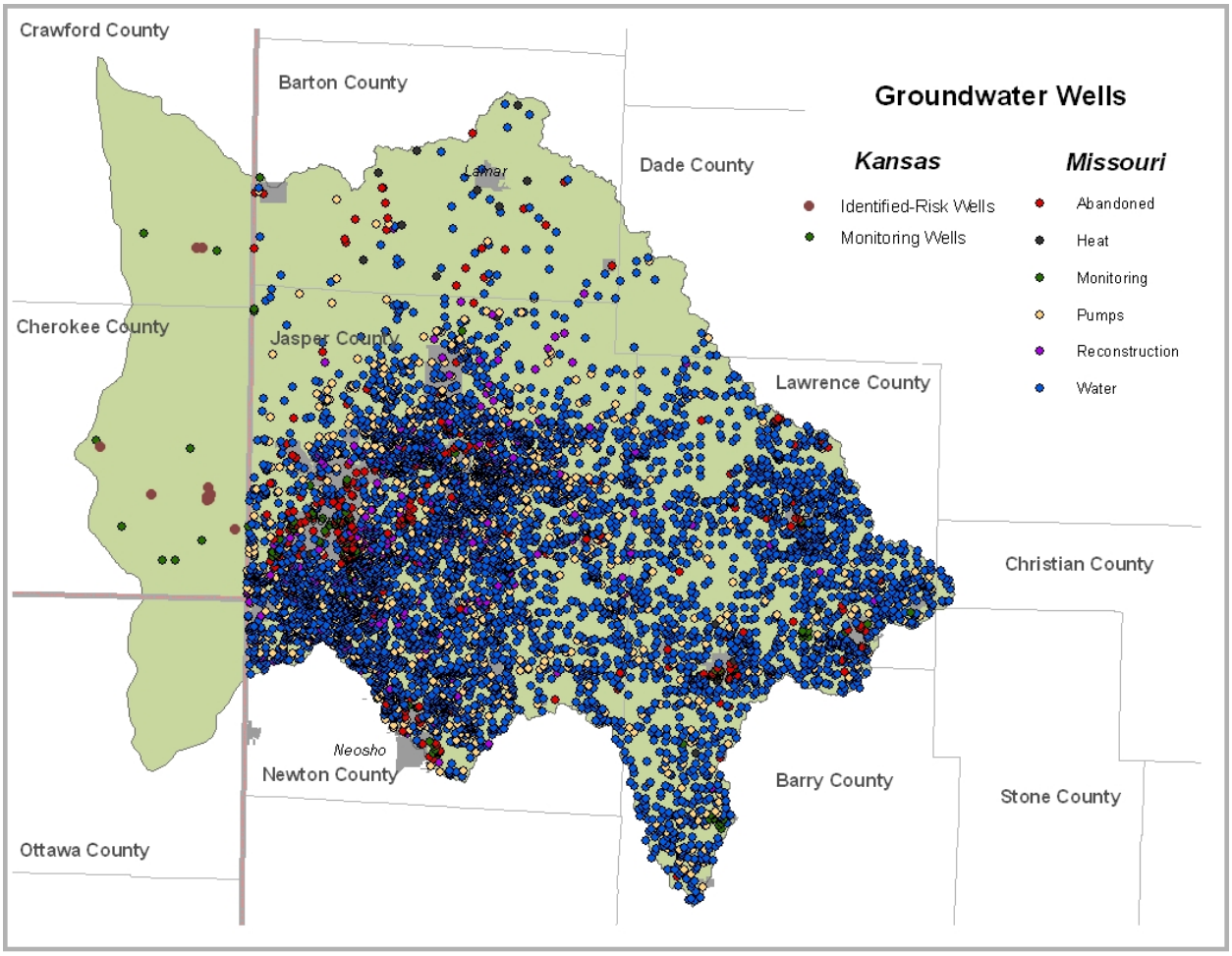
Wells[19]

The Missouri Well Driller's Law (Section 256.600-256.640 RSMo.) established minimum construction standards and state certification requirements of wells constructed after October, 1987. The law as created to protect Missouri groundwater from contamination due to improperly constructed wells. Contaminated groundwater exposes Missourians of all ages to serious health risks that can result from waterborne diseases. This law is administered through the Department of Natural Resources

In the Spring River sub-basin, the majority of wells are for residential and drinking water purposes. This includes residences and businesses located outside of a water district. The second highest uses for wells are for domestic or irrigation pumps. Abandoned wells are those wells which are no longer in use and have been correctly remediated as to pose on threat of contamination or health hazards.

In Kansas, the wells identified are monitoring wells used to gauge conditions in the groundwater aquifer system. Some of these wells have been identified as potential risks. No well data was found or gathered for Oklahoma.

Figure 12



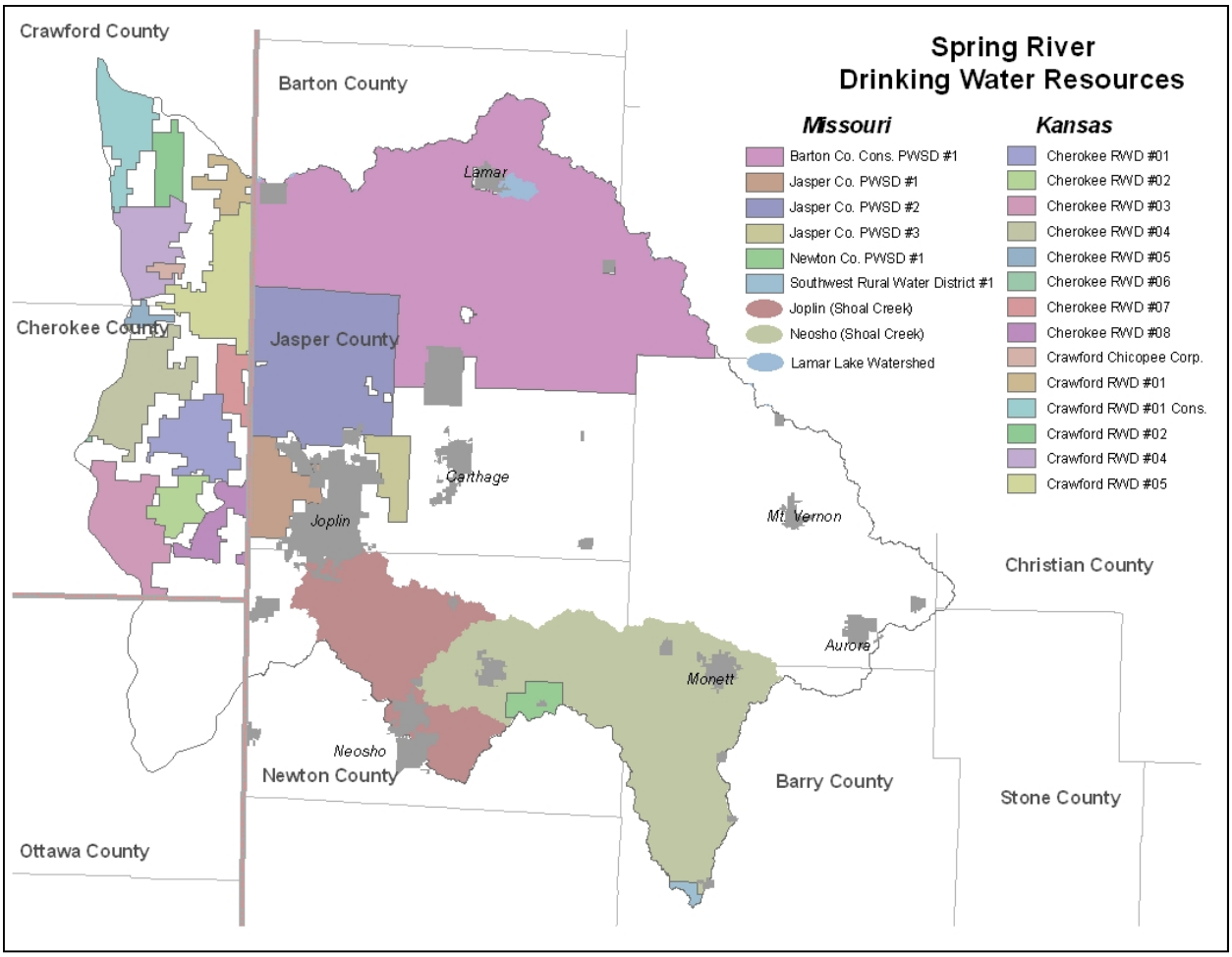
B. Water Quantity

Drinking Water Resources[16,20,21]

Drinking water resources are an important factor in watershed management. In the Spring River watershed, a majority of drinking water resources are generated from groundwater and distributed through rural water districts or municipal organizations. However larger municipalities such as Joplin, Neosho and Lamar are supplied by surface water sources.

In the State of Missouri, all public drinking water sources are regulated by the Missouri Department of Natural Resources Public Drinking Water Program and in Kansas, the Kansas Department of Health and Environment. Both states comply with the federal Safe Drinking Water Act in which facilities are responsible for providing a Source Water Assessment Plan (SWAP) that includes an inventory of potential contamination sites located within a delineated one-mile wellhead zone. This plan also entails measures utilized to deter potential contamination problems as well as an annual consumer confidence report sent to facility consumers detailing water quality conditions.

Figure 14



C. Threatened and Endangered Species

The Missouri, Kansas and Oklahoma Natural Heritage databases store locations, population status and habitat information about species and communities of conservation concern. The table below is a subset of the Heritage records that occur in the Spring sub-basin, restricted to federally threatened, endangered or candidate and state threatened or endangered species. While Heritage data can not prove the absence of a species in an area, it is the best collection available of known locations of sensitive species and is used to assess potential impacts of various land management activities in the region.

Figure 14

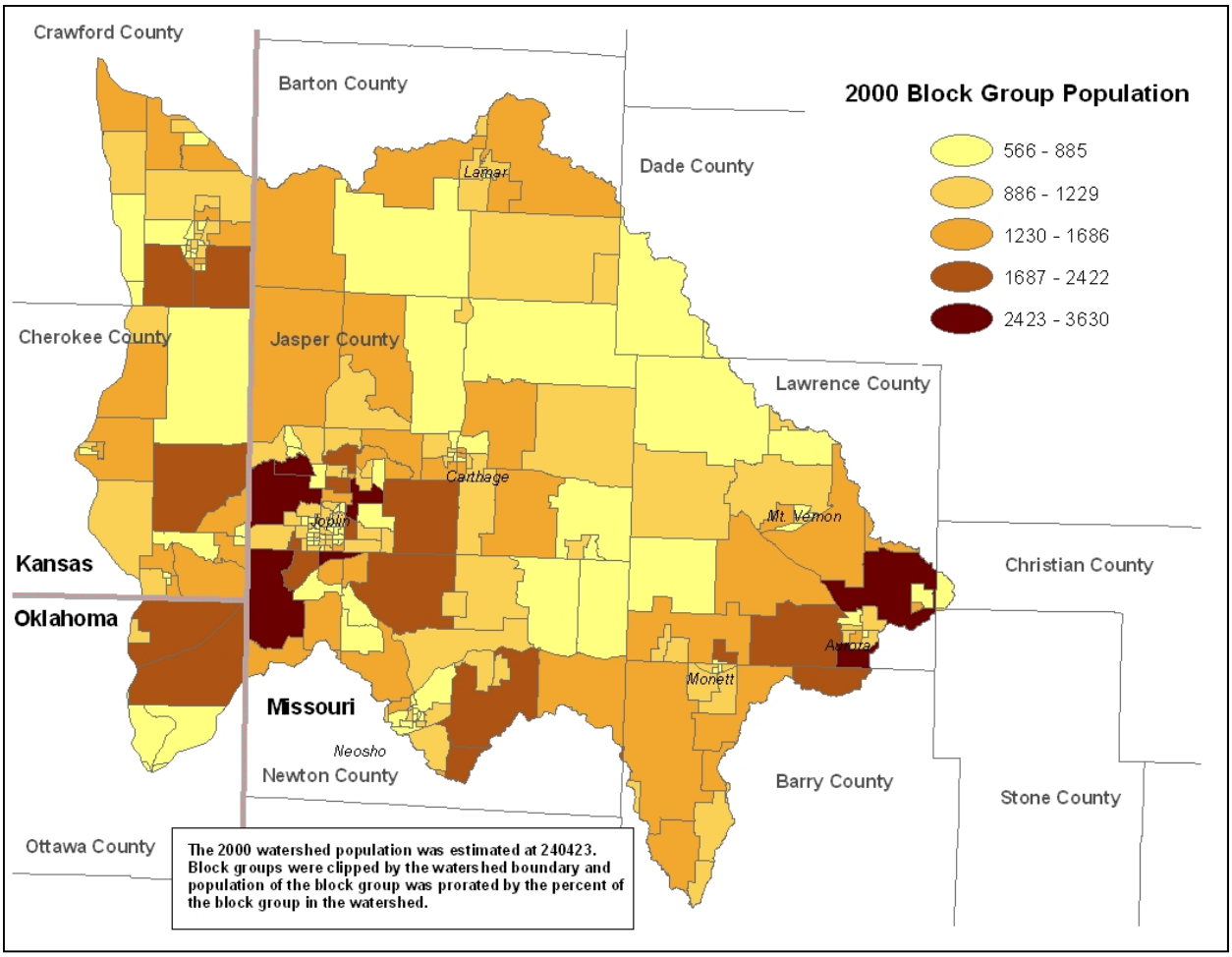
Missouri [17]	Kansas
Northern harrier *Circus cyaneus*	Arkansas Darter *Etheostoma cragini*
Ozark cavefish *Amblyopsis rosae*	Green Frog *Rana clamitans melanota*
Redfin darter *Etheostoma whipplei*	American Burying Beetle *Nicrophorus americanus*
Neosho madtom *Noturus placidus*	Bald Eagle *Haliaeetus leucocephalus*
Black-tailed jack rabbit *Lepus californicus*	Broadhead Skink *Eumeces laticeps*
Gray bat *Myotis grisescens*	Common Map Turtle *Graptemys geographica*
Plains spotted skunk *Spilogale putorius intemipta*	Eastern Newt *Notophthalmus viridescens*
Rabbits foot *Quadrula cylindrica cylindrica*	Eastern Spotted Skunk *Spilogale putorius*
Prairie false foxglove *Agalinis heterophylla*	Eskimo Curlew *Numenius borealis*
Green false foxglove *Agalinis viridis*	Gray Myotis *Myotis grisescens*
Mead's milkweed *Asclepias meadii*	Green Frog *Rana clamitans*
Marsh bellflower *Campanula aparinoides*	Least Tern *Sterna antillarum*
Lake-bank sedge *Carex lacustris*	Peregrine Falcon *Falco peregrinus*
Alabama lip-fern *Chalanthes alabamensis*	Piping Plover *Charadrius melodus*
Joint grass *Coelorachis cylindrica*	Redbelly Snake *Storeria occipitomaculata*
Tansy mustard *Descurainia pinnata*	Snowy Plover *Charadrius alexandrinus*
Geocarpon *Geocarpon minimum*	Spring Peeper *Pseudacris crucifer*
A wild pea *Lathyrus pusillus*	Butterfly Mussel *Ellipsaria lineolata*
Pinnate dog shade *Limnosciadium pinnatum*	Cave Salamander *Eurycea lucifuga*
A lipocarpha *Lipocarpha drummondii*	Eastern Narrowmouth Toad *Gastrophryne carolinensis*
Water hyssop *Mecardonia acuminata*	Elktoe Mussel *Alasmidonta marginata*
Mudbank paspalum *Paspalum dissectum*	Ellipse Mussel *Venustaconcha ellipsiformis*
Western prairie fringed orchid *Planthera praeclara*	Flat Floater Mussel Anodonta suborbiculata
Slender pondweed *Potamogeton pusillus var pusillus*	Flutedshell Mussel *Lasmigona costata*
Kansas arrowhead *Sagittaria ambigua*	Grotto Salamander *Typhlotriton spelaeus*
Running buffalo clover *Trifolium stoloniferum*	Longtail Salamander *Eurycea longicauda*
Yellow-eyed grass *Xyris torta*	Many-ribbed Salamander *Eurycea multiplicata*
	Neosho Madtom *Noturus placidus*
	Neosho Mucket Mussel *Lampsilis rafinesqueana*
	Ouachita Kidneyshell Mussel *Ptychobranchus occidetalis*
	Rabbitsfoot Mussel *Quadrula cylindrica*
	Redspot Chub *Nocomis asper*
	Western Fanshell Mussel *Cyprogenia aberti*
Oklahoma	
American burying beetle *Nicrophorus americanus*	Neosho madtom *Noturus placidus*
Gray bat *Myotis grisescens*	Ozark cavefish *Amblyopsis rosae*
Ozark big-eared bat Plecotus *townsendii ingens*	Piping plover *Charadrius melodus*
Winged mapleleaf mussel *Quadrula fragosa*	Arkansas darter *Etheostoma cragini*
Bald eagle *Haliaeetus leucocephalus*	Neosho mucket mussel *Lampsilis rafinesqueana*

Census and Social Data

Census Bureau[18]

Block group-level GIS data files from the 2000 Census were used to illustrate population. County block group spatial files were merged and clipped by the sub-basin boundary. The percent of the block group falling in the watershed was calculated, and population figures were prorated by this value. Although this technique erroneously assumes even distribution of the population, it is a more accurate population count for the sub-basin than including the entire block group population.

Figure 15. 2000 Population—The 2000 estimated population of the sub-basin was 240,423.



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