

**Prepared in cooperation with the Kansas Department of Agriculture,  
Division of Water Resources**

# **Irrigation Water Use in Kansas, 2013**

Data Series 981



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By Jennifer L. Lanning-Rush

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**U.S. Department of the Interior**  
**U.S. Geological Survey**

**U.S. Department of the Interior**  
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**U.S. Geological Survey**  
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## Conversion Factors

U.S. customary units to International System of Units

<b>Multiply</b>	<b>By</b>	<b>To obtain</b>
<b>Length</b>		
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
<b>Area</b>		
acre	4,047	square meter (m <sup>2</sup> )
acre	0.004047	square kilometer (km <sup>2</sup> )
square mile (mi <sup>2</sup> )	259.0	hectare (ha)
square mile (mi <sup>2</sup> )	2.590	square kilometer (km <sup>2</sup> )
<b>Volume</b>		
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m <sup>3</sup> )
gallon (gal)	3.785	cubic decimeter (dm <sup>3</sup> )
million gallons (Mgal)	3,785	cubic meter (m <sup>3</sup> )
acre-foot (acre-ft)	1,233	cubic meter (m <sup>3</sup> )

# Irrigation Water Use in Kansas, 2013

By Jennifer L. Lanning-Rush

## Abstract

This report, prepared by the U.S. Geological Survey in cooperation with the Kansas Department of Agriculture, Division of Water Resources, presents derivative statistics of 2013 irrigation water use in Kansas. The published regional and county-level statistics from the previous 4 years (2009–12) are shown with the 2013 statistics and are used to calculate a 5-year average. An overall Kansas average and regional averages also are calculated and presented. Total reported irrigation water use in 2013 was 3.3 million acre-feet of water applied to 3.0 million irrigated acres.

## Introduction

Agriculture is the largest land use in Kansas, accounting for approximately 88 percent of all Kansas land (National Agricultural Statistics Service, 2014). Irrigated agricultural land is by far the largest use of water in Kansas, typically representing about 3 million acres in the State (Kenny and Juracek, 2013). Kansas supports a variety of crops and consistently ranks in the top 10 nationally in wheat, grain sorghum, grain corn production, total acres irrigated, and total acres in cropland (Kansas Department of Agriculture, 2015). Irrigation is most prevalent in western Kansas where average annual rainfall is less than 20 inches and sufficient groundwater can be pumped to compensate for the lack of precipitation (High Plains Regional Climate Center, 2015). Groundwater-based irrigation water use is less in eastern Kansas, where precipitation is greater.

Kansas has two State agencies with responsibilities related to water-quantity planning: the Kansas Department of Agriculture, Division of Water Resources (DWR) and the Kansas Water Office. The DWR administers the Kansas Water Appropriation Act (Kansas Statutes Annotated § 82a–701 to 82a–726), which governs how water is allocated and used within the State through water rights and collects annual information on amounts of water used. The Kansas Water Office issues the State water plan, which is used to manage, conserve, and develop the water resources of the State. Data

on irrigation water use have been published annually since the late 1980s and are a key component for the evaluation of conservation planning (Kansas Department of Agriculture, Division of Water Resources, 1989–2012).

## Purpose and Scope

This report, prepared by the U.S. Geological Survey in cooperation with DWR with partial support from the State Water Plan Fund, presents reported water use, acres irrigated, and derivative statistics of 2013 irrigation water use in Kansas. Average application rates are calculated as a function of total irrigation withdrawals and total irrigated acres. Tabular statistics in this report are aggregated geographically by the Kansas irrigation water-use analysis regions (fig. 1), Kansas regional planning areas (fig. 2), and all 105 counties in the State (fig. 2).

## Annual Irrigation Water-Use Reporting

A provision of the DWR's water appropriation program requires all irrigation water right owners to submit an annual water-use report on a paper form (an example is provided in the appendix). Data submitted on the water-use reports are stored in the DWR's Water Rights Information System (WRIS) (Kenny, 2014). The WRIS is the primary record-keeping and reporting mechanism for water rights and water-use information. Information is reported by point of diversion (the point from which water was obtained) and includes the quantity of water diverted each calendar year, type of crops irrigated, number of acres irrigated, and type of irrigation system (Kansas Department of Agriculture, Division of Water Resources, 2015). Each acre is counted only once regardless of the number of times it was irrigated or harvested. DWR staff send follow-up letters and make phone calls to obtain missing data and to confirm or correct anomalous data.

2 Irrigation Water Use in Kansas, 2013

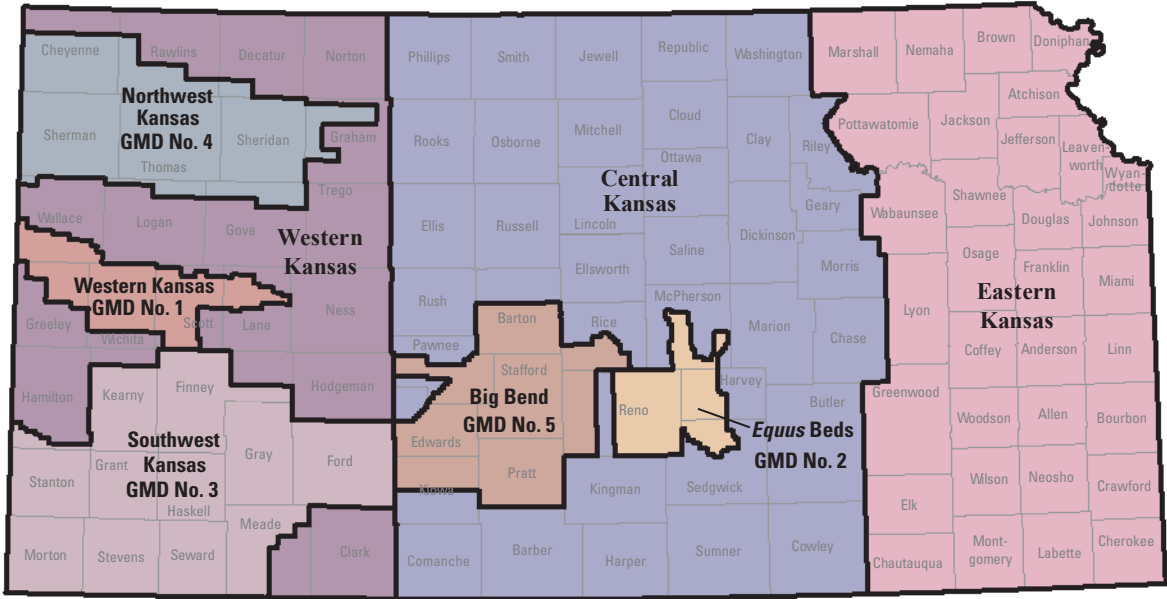


Figure 1. Kansas irrigation water-use analysis regions [GMD, groundwater management district].

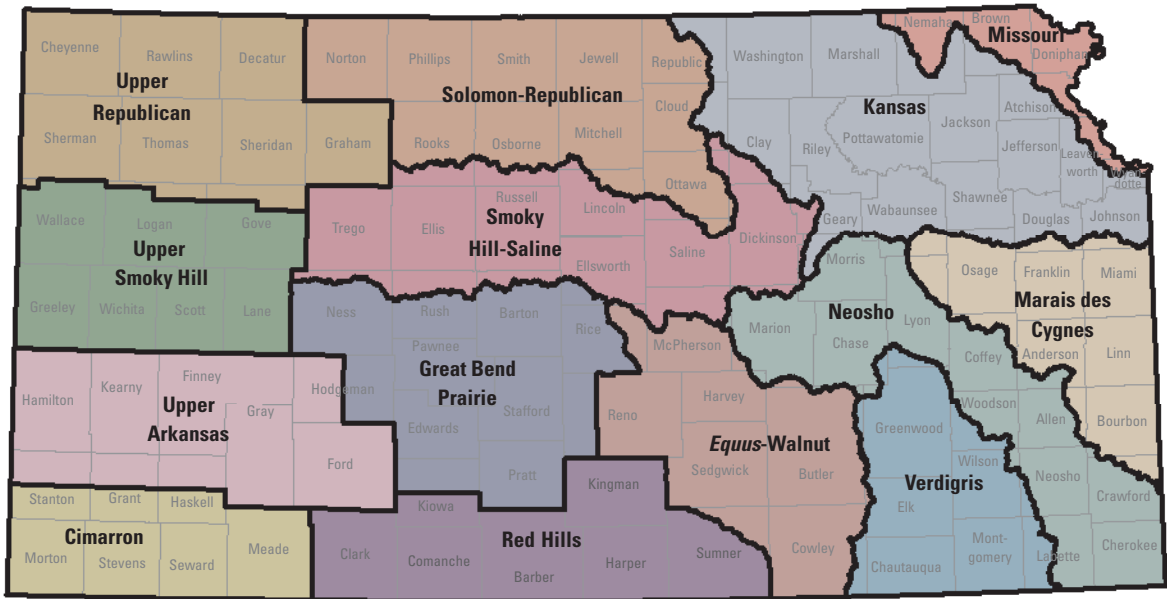


Figure 2. Kansas regional planning areas used in the Kansas Water Plan.



## Description of Irrigation Water-Use Statistics Calculated

### Application Rate

Water used for irrigation is often described in terms of application rate, which is the amount of water used per acre of land irrigated. Application rate is often expressed as acre-feet per acre. Irrigation application rates can vary from year to year and are affected by precipitation, soil permeability, temperature, wind, crop type, length of irrigation season, and irrigation system type (Perry, 2006). Application rate is utilized in this report as a method of comparing irrigation water use intensity among regions and counties. Published statistics from the previous 4 years (2009–12) (Kansas Department of Agriculture, Division of Water Resources, 1989–2012) are also shown with the 2013 statistics and are used to calculate a 5-year average for Kansas irrigation by regions and counties. Because 2013 is the first year that statistics have been computed for the regional planning areas, there are no statistics published from previous years with which to calculate a 5-year average. An overall Kansas average and regional averages also are calculated and presented. Although most of the irrigated lands in Kansas are in crops, some counties may have additional irrigation water use for golf courses, nurseries, and recreational areas.

### Precipitation Data

Reported irrigation water withdrawals vary substantially from year to year as affected primarily by climatic fluctuations (Kenny and Juracek, 2013). Historically, Kansas has experienced large year-to-year variations in precipitation. At the beginning of 2013, the entire State of Kansas was categorized to be in severe drought, and over one-third of the State was classified in exceptional drought conditions (U.S. Drought Monitor, 2014). The persistence of the drought resulted in record-low 7-day average discharge measurements at five U.S. Geological Survey streamflow-gaging stations with more than 30 years of record (Peters and Rasmussen, 2014). By the end of 2013, there were no areas of extreme drought left in the State and only 33 percent were classified to be in any level of drought condition.

In this report, area-weighted statistical summarizations were performed on gridded precipitation data for 2013 annual total precipitation and the current 30-year climatic normal (based on 1981–2010) for the irrigation water-use analysis regions and regional planning areas in this report. Gridded precipitation data came from Oregon State University's Parameter-elevation Regressions on Independent Slopes Model (PRISM) (PRISM Climate Group, 2015). PRISM is an analytical model that generates gridded estimates of annual precipitation from point data at National Weather Service climatological stations and a digital elevation model (Di Luzio and others, 2008). The 2013 annual total precipitation and the

current 30-year climatic normal (based on 1981–2010) for the 105 Kansas counties are from the Kansas statistical abstract 2013 (Institute for Policy and Social Research, 2014).

### Tabular Statistics

Irrigation water-use statistics in this report are summarized by Kansas irrigation water-use analysis regions, Kansas regional planning areas, and the 105 counties within Kansas. Regional application rate averages for the years 2009, 2010, 2011, 2012, and 2013, as well as the 5-year average, are provided in table 1 by water-use analysis region. The 2013 average annual precipitation and the 30-year normal precipitation, as well as the number of reporting and active points of diversion by water-use analysis region, are also shown on table 1. The application rate for the year 2013 is provided in table 2 for the 14 regional planning areas along with the acres irrigated, water used, 2013 average annual precipitation, 30-year average annual precipitation, and the number of reporting and active points of diversion. The information in table 3 is identical to table 1 but aggregated to the county level.

Metered and nonmetered statistics are provided in table 4 by water-use analysis region (fig. 1). The instructions on the 2013 irrigation water-use report (see appendix for blank report) request that a beginning meter reading, an ending meter reading, a metered quantity, and the unit of measure be provided for water use if a water meter was installed. If a water meter had not been installed or the water meter did not work properly, then the irrigator is instructed to provide the number of hours pumped and the pumping rate for each point of diversion. In this report, it was assumed that all water is metered except where hours and pump rates are provided and meter trouble was not indicated on the report. The percent metered is computed and provided along with a count of the points of diversion reporting metered and nonmetered water use in 2013. The same statistics, aggregated by regional planning areas (fig. 2), are shown in table 5.

Application rates are further grouped by crop type. The instructions on the 2013 irrigation water-use report (see appendix for blank report) request that crops that were irrigated in 2013 be listed using the crop codes for each point of diversion. The crop codes are integer values for the following crops: alfalfa, corn, grain sorghum (milo), soybeans, wheat, oats, barley, rye, dry beans, sunflowers, golf course/sports fields, truck farm, orchard, nursery, other, more than one type of crop, double crop, cotton, and grapes. The amount of water used, irrigated acres, and application rates for 2013 are provided in table 6 for alfalfa; corn; grain sorghum (milo); soybeans; wheat; combination of alfalfa, corn, grain sorghum, soybeans, or wheat; more than one type of crop specified; other; and those crops not specified on 2013 water-use report for the water-use analysis regions (fig. 1). Because it is common to irrigate multiple crop types with single points of diversion during a 12-month period, many irrigators list more than one of the crop-code values on their water-use report. For tabular statistics purposes, when an irrigator specified combinations of alfalfa, corn, grain sorghum (milo), or soybeans on a point of diversion, they were combined under the column

**Table 1.** Water-use and precipitation statistics by Kansas irrigation water-use analysis regions, 2009–13.

Kansas irrigation water-use analysis regions (fig. 1)	Total number of active points of diversion reporting water use in 2013	Total number of active points of diversion	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	Application rate, in acre-feet per acre				2009–13 average application rate, in acre-feet per acre	2013 average annual precipitation, in inches <sup>3</sup>	1981–2010 average annual precipitation, in inches <sup>3</sup>	
					2009	2010	2011	2012				2013
Western Kansas GMD No. 1	1,631	2,493	185,893.54	199,392	0.88	0.89	1.04	1.15	0.93	0.98	17.33	18.78
Southwest Kansas GMD No. 3	7,837	9,621	1,870,822.44	1,463,090	1.18	1.26	1.58	1.46	1.28	1.35	17.75	19.36
Northwest Kansas GMD No. 4	3,154	3,438	460,555.30	387,735	0.78	0.96	1.12	1.39	1.19	1.09	18.09	20.09
Remainder of Western Kansas	1,506	2,034	105,184.40	106,398	0.84	0.97	1.13	1.21	0.99	1.03	18.67	20.79
Equus Beds GMD No. 2	1,597	1,805	79,581.90	128,275	0.77	0.89	1.30	1.14	0.62	0.94	41.40	31.81
Big Bend GMD No. 5	4,046	4,390	424,769.38	441,659	0.98	1.11	1.45	1.28	0.96	1.16	31.35	26.75
Remainder of Central Kansas	3,316	4,950	139,476.16	232,461	0.61	0.64	0.81	0.98	0.60	0.73	31.88	29.98
All Eastern Kansas	1,018	1,540	38,141.63	85,591	0.21	0.34	0.58	0.69	0.45	0.45	41.41	39.20
<b>State Total</b>	<b>24,105</b>	<b>30,271</b>	<b>3,304,424.75</b>	<b>3,044,601</b>	<b>0.99</b>	<b>1.08</b>	<b>1.36</b>	<b>1.32</b>	<b>1.09</b>	<b>1.17</b>	—	—

<sup>1</sup>Water use does not include surface water withdrawn under ditch irrigation water rights and by irrigation districts (table 12).

<sup>2</sup>Acreage does not include land irrigated under ditch irrigation water rights and irrigation districts (table 12).

<sup>3</sup>PRISM Climate Group, 2015.

**Table 2.** Water-use and precipitation statistics by Kansas regional planning areas, 2013.

[-, none reported]

Regional planning area (fig. 2)	Total number of active points of diversion reporting water use for the year 2013	Total number of active points of diversion	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	2013 application rate, in acre-feet per acre	2013 average annual precipitation, in inches <sup>3</sup>	1981–2010 average annual precipitation, in inches <sup>3</sup>
Cimarron	2,879	3,347	884,302.61	668,044	1.32	16.67	18.90
<i>Equus</i> -Walnut	2,148	2,487	92,464.76	153,222	0.60	41.85	34.36
Great Bend Prairie	4,640	5,198	459,144.04	481,477	0.95	29.05	25.56
Kansas	1,478	1,979	64,880.46	133,251	0.49	34.10	34.86
Marais des Cygnes	54	156	2,756.15	5,981	0.46	43.74	40.69
Missouri	102	120	3,834.34	8,377	0.46	35.44	35.45
Neosho	106	226	3,033.63	8,855	0.34	43.90	39.59
Red Hills	429	577	32,026.70	38,961	0.82	30.68	28.87
Smoky Hill-Saline	490	880	13,920.45	26,129	0.53	29.17	27.20
Solomon-Republican	1,221	1,881	50,627.48	74,151	0.68	24.22	26.13
Upper Arkansas	5,174	6,567	1,014,351.63	819,594	1.24	17.59	19.68
Upper Republican	3,528	3,901	483,556.42	408,959	1.18	17.96	20.49
Upper Smoky Hill	1,820	2,838	198,586.22	214,329	0.93	18.15	19.06
Verdigris	36	114	939.86	3,271	0.29	47.31	40.60
<b>State Total</b>	<b>24,105</b>	<b>30,271</b>	<b>3,304,424.75</b>	<b>3,044,601</b>	<b>1.09</b>	–	–

<sup>1</sup>Water use does not include surface water withdrawn under ditch irrigation water rights and by irrigation districts (table 12).<sup>2</sup>Acreage does not include land irrigated under ditch irrigation water rights and irrigation districts (table 12).<sup>3</sup>PRISM Climate Group, 2015.

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**Table 3.** Water-use and precipitation statistics by county, 2009–13.

[–, none reported]

County	Total number of active points of diversion reporting water use for the year 2013	Total number of active points of diversion	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	Application rate, in acre-feet per acre					2009–13 average application rate, in acre-feet per acre	2013 average annual precipitation, in inches <sup>3</sup>	1981–2010 average annual precipitation, in inches <sup>3</sup>
					2009	2010	2011	2012	2013			
Allen	4	11	30.02	240	0.42	0.36	0.61	0.49	0.13	0.40	43.73	43.38
Anderson	12	23	765.77	1,963	0.33	0.32	0.59	0.45	0.39	0.42	34.06	40.00
Atchison	15	18	270.36	766	0.29	0.27	0.26	0.70	0.35	0.37	33.39	36.97
Barber	49	80	3,534.19	4,186	0.95	1.00	1.60	1.27	0.84	1.13	25.01	28.51
Barton	363	434	27,193.40	34,601	0.85	0.98	1.33	1.29	0.79	1.05	37.35	26.62
Bourbon	4	10	64.62	235	0.00	0.00	0.12	0.17	0.27	0.11	46.63	44.14
Brown	63	73	1,728.26	4,421	0.27	0.36	0.28	0.57	0.39	0.37	34.53	36.92
Butler	25	38	669.94	1,556	0.62	0.58	0.55	0.79	0.43	0.59	40.45	34.08
Chase	1	15	1.53	11	0.03	0.03	0.00	0.09	0.14	0.06	38.85	34.91
Chautauqua	2	12	0.86	120	0.00	0.00	0.24	0.55	0.01	0.16	44.60	38.42
Cherokee	9	21	280.89	1,112	0.30	0.37	0.53	0.51	0.25	0.39	44.84	44.47
Cheyenne	474	554	68,575.27	47,439	0.90	1.00	1.18	1.54	1.45	1.21	14.18	18.35
Clark	38	49	3,910.72	4,604	0.76	0.94	1.26	1.21	0.85	1.00	21.02	23.18
Clay	245	298	13,961.13	24,929	0.45	0.35	0.42	0.85	0.56	0.53	28.91	30.29
Cloud	283	332	11,888.98	23,359	0.56	0.43	0.48	0.87	0.51	0.57	26.43	30.03
Coffey	11	29	224.07	559	0.27	0.29	0.52	0.44	0.40	0.38	31.22	37.91
Comanche	62	93	6,696.07	7,084	1.09	1.18	1.51	1.29	0.95	1.20	24.64	25.32
Cowley	54	70	893.73	2,401	0.51	0.57	0.94	0.83	0.37	0.64	41.33	34.49
Crawford	14	21	993.57	2,144	0.21	0.27	0.41	0.36	0.46	0.34	52.51	45.60
Decatur	202	236	13,395.66	11,190	0.75	0.85	0.92	1.35	1.20	1.01	14.55	22.12
Dickinson	78	148	2,320.70	4,392	0.49	0.51	0.74	0.95	0.53	0.64	37.65	34.38
Doniphan	19	21	1,229.53	2,812	0.15	0.06	0.06	0.52	0.44	0.25	37.55	37.43
Douglas	40	54	1,539.55	2,957	0.18	0.40	0.55	0.74	0.52	0.48	30.86	39.33
Edwards	855	929	97,623.39	93,781	1.03	1.11	1.43	1.28	1.04	1.18	23.64	26.75
Elk	1	1	2.45	4	0.00	0.00	0.00	0.01	0.61	0.12	43.63	38.91
Ellis	54	124	1,307.95	1,750	0.81	0.89	1.02	1.14	0.75	0.92	19.73	23.06
Ellsworth	11	27	175.71	499	0.22	0.49	0.54	0.63	0.35	0.45	37.07	27.99
Finney	1,461	1,733	298,826.84	213,246	1.17	1.35	1.62	1.59	1.40	1.43	17.23	19.90
Ford	666	847	88,907.55	84,816	1.08	1.06	1.43	1.27	1.05	1.18	23.11	22.93
Franklin	15	48	1,070.98	2,465	0.67	0.86	0.96	0.72	0.43	0.73	29.15	38.28
Geary	46	74	2,355.23	4,787	0.47	0.50	0.64	0.89	0.49	0.60	31.49	32.54
Gove	245	348	20,119.26	20,597	0.73	0.90	1.05	1.23	0.98	0.98	17.24	22.92
Graham	157	214	15,878.77	14,287	0.68	1.03	0.85	1.29	1.11	0.99	14.97	21.90
Grant	516	701	133,110.04	104,733	1.19	1.32	1.55	1.46	1.27	1.36	15.41	17.39
Gray	1,134	1,437	194,516.16	165,065	1.12	1.21	1.52	1.35	1.18	1.28	14.99	23.05
Greeley	163	266	20,609.66	24,002	0.97	0.88	1.04	1.23	0.86	1.00	15.81	17.44
Greenwood	5	13	152.58	142	0.50	0.43	0.45	0.69	1.07	0.63	37.60	36.71

**Table 3.** Water-use and precipitation statistics by county, 2009–13.—Continued

[-, none reported]

County	Total number of active points of diversion reporting water use for the year 2013	Total number of active points of diversion	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	Application rate, in acre-feet per acre					2009–13 average application rate, in acre-feet per acre	2013 average annual precipitation, in inches <sup>3</sup>	1981–2010 average annual precipitation, in inches <sup>3</sup>
					2009	2010	2011	2012	2013			
Hamilton	202	238	42,886.49	32,919	1.13	1.34	1.50	1.45	1.30	1.34	12.83	16.62
Harper	36	55	792.74	1,321	0.51	0.79	1.13	1.00	0.60	0.81	31.26	31.67
Harvey	383	439	20,056.58	33,043	0.73	0.89	1.27	1.13	0.61	0.93	40.62	31.52
Haskell	816	991	202,884.54	185,975	1.05	1.17	1.46	1.30	1.09	1.21	14.91	19.22
Hodgeman	320	408	23,678.03	26,600	0.81	0.93	1.27	1.05	0.89	0.99	15.80	21.86
Jackson	9	15	184.30	562	0.58	0.39	0.44	0.54	0.33	0.46	25.44	36.73
Jefferson	69	90	2,555.52	5,787	0.12	0.30	0.57	0.78	0.44	0.44	31.43	37.79
Jewell	40	75	2,283.45	3,847	0.42	0.53	0.40	0.80	0.59	0.55	23.06	26.87
Johnson	76	94	2,951.32	3,836	0.45	0.71	0.88	1.14	0.77	0.79	33.38	40.33
Kearny	647	778	136,385.62	97,407	1.28	1.45	1.65	1.66	1.40	1.49	13.23	18.58
Kingman	181	228	12,362.52	16,424	1.01	1.11	1.51	1.30	0.75	1.14	37.63	30.33
Kiowa	409	431	58,446.84	51,981	1.11	1.21	1.54	1.32	1.12	1.26	27.87	25.49
Labette	5	22	111.42	449	0.21	0.37	0.54	0.38	0.25	0.35	48.60	43.99
Lane	184	238	15,682.77	18,214	0.93	0.88	1.17	1.29	0.86	1.03	20.06	21.47
Leavenworth	20	31	786.85	1,632	0.17	0.29	0.46	0.70	0.48	0.42	28.40	39.51
Lincoln	20	45	661.16	1,283	0.27	0.28	0.41	0.65	0.52	0.43	27.03	28.57
Linn	4	4	134.42	283	0.24	0.68	0.66	0.86	0.47	0.58	40.03	40.98
Logan	99	124	7,785.11	8,634	0.53	0.72	1.01	1.12	0.90	0.86	17.86	18.80
Lyon	4	11	111.74	252	0.35	0.31	0.64	0.79	0.44	0.51	31.26	35.96
Marion	50	94	1,190.96	3,670	0.32	0.46	0.72	0.78	0.32	0.52	43.33	32.92
Marshall	47	93	1,402.55	4,043	0.38	0.47	0.41	0.71	0.35	0.46	30.97	33.16
McPherson	383	528	18,689.68	36,384	0.68	0.73	1.18	1.08	0.51	0.84	38.01	31.96
Meade	620	636	187,246.99	128,272	1.34	1.35	1.82	1.65	1.46	1.52	19.80	22.19
Miami	4	18	247.74	238	0.19	0.42	0.37	0.67	1.04	0.54	33.50	39.64
Mitchell	79	160	3,777.56	8,072	0.87	0.74	0.64	0.97	0.47	0.74	26.34	26.85
Montgomery	13	36	295.73	1,607	0.29	0.19	0.27	0.24	0.18	0.23	57.22	43.46
Morris	7	15	114.93	335	0.18	0.63	0.75	0.39	0.34	0.46	23.10	34.13
Morton	264	363	54,845.66	55,527	1.03	1.10	1.36	1.27	0.99	1.15	14.44	17.89
Nemaha	14	23	604.37	1,186	0.39	0.65	0.38	0.52	0.51	0.49	35.92	34.61
Neosho	3	7	41.82	125	0.37	0.46	0.74	0.59	0.33	0.50	44.11	41.25
Ness	69	130	3,800.69	4,672	0.92	0.86	1.40	1.02	0.81	1.00	17.68	22.42
Norton	294	351	11,436.52	11,839	0.68	0.85	0.59	1.21	0.97	0.86	17.10	22.62
Osage	7	26	131.56	442	0.22	0.28	0.30	0.57	0.30	0.33	30.23	37.26
Osborne	66	175	3,044.86	3,894	0.84	0.47	0.83	1.22	0.78	0.83	21.57	26.12
Ottawa	54	122	1,558.30	3,971	0.43	0.38	0.56	0.77	0.39	0.51	32.09	30.97
Pawnee	703	809	68,154.65	75,086	0.84	1.02	1.25	1.16	0.91	1.04	20.66	23.99
Phillips	173	247	6,992.18	7,597	0.72	0.69	0.81	1.16	0.92	0.86	16.29	23.44

## 8 Irrigation Water Use in Kansas, 2013

**Table 3.** Water-use and precipitation statistics by county, 2009–13.—Continued

[–, none reported]

County	Total number of active points of diversion reporting water use for the year 2013	Total number of active points of diversion	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	Application rate, in acre-feet per acre					2009–13 average application rate, in acre-feet per acre	2013 average annual precipitation, in inches <sup>3</sup>	1981–2010 average annual precipitation, in inches <sup>3</sup>
					2009	2010	2011	2012	2013			
Pottawatomie	188	254	7,762.71	17,904	0.13	0.25	0.61	0.71	0.43	0.43	31.24	34.97
Pratt	697	715	80,194.42	83,203	1.10	1.11	1.55	1.29	0.96	1.20	20.86	27.85
Rawlins	219	250	20,921.63	18,835	0.70	0.82	0.96	1.30	1.11	0.98	18.82	21.75
Reno	787	890	36,501.69	49,884	0.89	1.01	1.40	1.21	0.73	1.05	38.40	30.32
Republic	341	432	19,288.28	30,308	0.58	0.59	0.52	0.90	0.64	0.65	24.98	30.89
Rice	336	356	12,770.13	17,276	0.72	0.96	1.37	1.27	0.74	1.01	40.91	28.25
Riley	67	117	2,653.54	6,298	0.17	0.31	0.65	0.67	0.42	0.44	29.90	32.41
Rooks	39	73	1,798.65	2,000	0.43	0.62	0.80	1.12	0.90	0.77	19.91	23.86
Rush	185	282	9,634.29	11,464	0.83	0.82	1.20	1.14	0.84	0.97	18.59	23.63
Russell	6	13	4.42	15	0.36	0.41	0.59	1.13	0.29	0.56	22.23	25.96
Saline	104	168	1,344.53	3,804	0.38	0.66	0.95	1.06	0.35	0.68	22.38	31.34
Scott	467	756	44,191.84	49,455	0.88	0.86	1.05	1.08	0.89	0.95	17.70	20.70
Sedgwick	584	680	24,197.37	40,852	0.68	0.85	1.21	1.07	0.59	0.88	42.61	31.20
Seward	560	592	189,145.13	128,101	1.25	1.30	1.73	1.51	1.48	1.45	9.84	19.73
Shawnee	218	256	7,715.02	16,846	0.12	0.33	0.57	0.72	0.46	0.44	31.90	36.20
Sheridan	683	731	74,133.80	77,530	0.76	1.01	1.01	1.26	0.96	1.00	17.55	20.80
Sherman	824	873	152,399.21	117,492	0.87	0.97	1.23	1.50	1.30	1.17	16.58	19.84
Smith	71	168	2,002.97	3,462	0.50	0.43	0.45	0.85	0.58	0.56	21.40	25.97
Stafford	708	740	77,462.12	81,885	0.94	1.17	1.56	1.31	0.95	1.19	36.22	26.03
Stanton	400	715	118,503.83	110,284	1.12	1.17	1.36	1.29	1.07	1.20	14.49	14.60
Stevens	680	758	245,210.92	173,490	1.30	1.26	1.72	1.55	1.41	1.45	14.62	18.43
Sumner	173	192	4,267.02	8,809	0.43	0.70	1.12	1.10	0.48	0.77	36.52	32.46
Thomas	745	787	116,499.56	100,884	0.68	0.89	1.12	1.35	1.15	1.04	16.87	20.43
Trego	91	117	4,946.31	5,652	0.83	1.02	1.17	1.30	0.88	1.04	15.88	22.24
Wabaunsee	95	134	3,883.56	8,474	0.13	0.31	0.62	0.74	0.46	0.45	25.28	36.49
Wallace	330	527	55,398.72	48,855	0.90	0.95	1.17	1.35	1.13	1.10	14.07	20.11
Washington	152	238	5,030.65	13,016	0.42	0.31	0.28	0.71	0.39	0.42	28.29	31.62
Wichita	556	835	56,551.38	65,874	0.82	0.85	0.90	0.98	0.86	0.88	10.77	18.44
Wilson	15	52	488.24	1,398	0.26	0.23	0.74	0.49	0.35	0.41	40.51	40.69
Woodson	1	1	38.08	114	0.00	0.42	0.82	0.64	0.33	0.44	40.16	42.12
Wyandotte	13	17	341.17	473	0.48	0.46	0.80	1.09	0.72	0.71	34.01	38.70
<b>State Total</b>	<b>24,105</b>	<b>30,271</b>	<b>3,304,425</b>	<b>3,044,601</b>	<b>0.99</b>	<b>1.08</b>	<b>1.36</b>	<b>1.32</b>	<b>1.09</b>	<b>1.19</b>	–	–

<sup>1</sup>Water use does not include surface water withdrawn under ditch irrigation water rights and by irrigation districts (table 12).

<sup>2</sup>Acreage does not include land irrigated under ditch irrigation water rights and irrigation districts (table 12).

<sup>3</sup>The 2013 annual total precipitation and the current 30-year climatic normal (based on the period 1981–2010) for the 105 Kansas counties are from the “Kansas statistical abstract 2013” (Institute for Policy and Social Research, 2014).

**Table 4.** Comparison of water use and acres irrigated by meter status and Kansas irrigation water-use analysis regions, 2013.

[GMD, groundwater management district]

Kansas irrigation water-use analysis regions (fig. 1)	Metered				Nonmetered				Total number of active points of diversion reporting water use for the year 2013	Percent metered
	Total number of active points of diversion reporting water use for the year 2013	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	2013 application rate, in acre-feet per acre	Total number of active points of diversion reporting water use for the year 2013	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	2013 application rate, in acre-feet per acre		
Western Kansas GMD No. 1	1,387	161,971	173,562	0.93	244	23,923	25,830	0.93	1,631	85.0
Southwest Kansas GMD No. 3	7,822	1,868,181	1,460,525	1.28	15	2,642	2,565	1.03	7,837	99.8
Northwest Kansas GMD No. 4	3,146	459,669	386,913	1.19	8	886	822	1.08	3,154	99.7
Remainder of Western Kansas	1,477	102,038	104,147	0.98	29	3,147	2,251	1.40	1,506	98.1
<i>Equus</i> Beds GMD No. 2	1,483	71,334	113,352	0.63	114	8,247	14,923	0.55	1,597	92.9
Big Bend GMD No. 5	4,036	423,933	440,410	0.96	10	836	1,249	0.67	4,046	99.8
Remainder of Central Kansas	3,204	134,016	221,814	0.60	112	5,461	10,647	0.51	3,316	96.6
All Eastern Kansas	866	32,042	74,278	0.43	152	6,099	11,313	0.54	1,018	85.1
<b>State Total</b>	<b>23,421</b>	<b>3,253,184</b>	<b>2,975,001</b>	<b>1.09</b>	<b>684</b>	<b>51,241</b>	<b>69,600</b>	<b>0.74</b>	<b>24,105</b>	<b>97.2</b>

<sup>1</sup>Water use does not include surface water withdrawn under ditch irrigation water rights and by irrigation districts (table 12).<sup>2</sup>Acreage does not include land irrigated under ditch irrigation water rights and irrigation districts (table 12).**Table 5.** Comparison of water use and acres irrigated by meter status and regional planning area, 2013.

[-, none reported]

Regional planning area (fig. 2)	Metered				Nonmetered				Total number of active points of diversion reporting water use for the year 2013	Percent metered
	Total number of active points of diversion reporting water use for the year 2013	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	2013 application rate, in acre-feet per acre	Total number of active points of diversion reporting water use for the year 2013	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	2013 application rate, in acre-feet per acre		
Cimarron	2,876	883,519.99	667,024	1.32	3	782.62	1,020	0.77	2,879	99.9
<i>Equus</i> -Walnut	1,958	80,551.46	131,455	0.61	190	11,913.30	21,767	0.55	2,148	91.2
Great Bend Prairie	4,626	458,040.69	479,965	0.95	14	1,103.35	1,512	0.73	4,640	99.7
Kansas	1,324	58,989.46	121,298	0.49	154	5,891.00	11,953	0.49	1,478	89.6
Marais des Cygnes	42	1,828.97	4,743	0.39	12	927.18	1,238	0.75	54	77.8
Missouri	99	3,665.25	7,912	0.46	3	169.09	465	0.36	102	97.1
Neosho	104	3,030.50	8,840	0.34	2	3.13	15	0.21	106	98.1
Red Hills	428	31,980.04	38,826	0.82	1	46.66	135	0.35	429	99.8



**Table 5.** Comparison of water use and acres irrigated by meter status and regional planning area, 2013.—Continued

[-, none reported]

Regional planning area (fig. 2)	Metered				Nonmetered				Total number of active points of diversion reporting water use for the year 2013	Percent metered
	Total number of active points of diversion reporting water use for the year 2013	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	2013 application rate, in acre-feet per acre	Total number of active points of diversion reporting water use for the year 2013	2013 water use, in acre feet <sup>1</sup>	2013 reported irrigated acres <sup>2</sup>	2013 application rate, in acre-feet per acre		
Smoky Hill-Saline	478	13,266.59	25,081	0.53	12	653.86	1,048	0.62	490	97.6
Solomon-Republican	1,218	50,576.90	74,007	0.68	3	50.58	144	0.35	1,221	99.8
Upper Arkansas	5,152	1,010,424.58	816,859	1.24	22	3,927.05	2,735	1.44	5,174	99.6
Upper Republican	3,518	482,557.46	408,050	1.18	10	998.96	909	1.10	3,528	99.7
Upper Smoky Hill	1,562	173,812.11	187,670	0.93	258	24,774.11	26,659	0.93	1,820	85.8
Verdigris	36	939.86	3,271	0.29	—	—	—	—	36	100.0
<b>State Total</b>	<b>23,421</b>	<b>3,253,183.86</b>	<b>2,975,001</b>	<b>1.09</b>	<b>684</b>	<b>51,240.89</b>	<b>69,600</b>	<b>0.74</b>	<b>24,105</b>	<b>97.2</b>

<sup>1</sup>Water use does not include surface water withdrawn under ditch irrigation water rights and by irrigation districts (table 12).

<sup>2</sup>Acreage does not include land irrigated under ditch irrigation water rights and irrigation districts (table 12).

heading, “Combination alfalfa, corn, grain sorghum, soybeans, or wheat.” When an irrigator specifies the code for “more than one type of crop” or “double crop” then the water used, irrigated acres, and application rates for 2013 are combined under the column heading “More than one type of crop specified” in table 6. The “Other” column in table 6 is a combination of the following crop types: oats, barley, rye, dry beans, sunflowers, golf course and (or) sports fields, truck farm, orchard, nursery, cotton, grapes, or other. Any water-use report where the crop code was left blank is listed under the column heading “not specified on 2013 water-use report.” The same statistics, aggregated by regional planning area (fig. 2) and county, respectively, are shown in tables 7 and 8.

Water use by irrigation method for 2013 is summarized by water-use analysis region (fig. 1) in table 9. The instructions on the 2013 irrigation water-use report (see appendix for blank report) request that a code be entered for the type of irrigation system used by each point of diversion in 2013. The irrigation system codes are integer values for the following system types: center pivot with drop nozzles; center pivot sprinkler; center pivot and flood; flood; drip (subsurface irrigation); drip and other system; sprinkler other than center pivot; and other. The “Subsurface drip, and combination of drip and other system” column in table 9 is a combination of (1) the drip (subsurface irrigation) system type and (2) drip and other system types. The 2013 water use by irrigation method by regional planning area (fig. 2) is provided in table 10. The 2013 water use by irrigation method by county is provided in table 11. Water-use efficiency can differ dramatically by irrigation method.

## Surface-Water Ditch Companies and Irrigation Districts

A number of private ditch companies with irrigation water rights are in the southwest part of Kansas in the counties of Hamilton, Finney, and Kearny. Irrigation districts with water rights are in the north-central part of Kansas in Cloud, Jewell, Mitchell, Norton, Osborne, Ottawa, Phillips, Republic, Rooks, and Smith Counties. Reports filed by these systems contain total water use and total acres irrigated and are tabled separately from the other water rights because the amount of water applied to irrigated acres cannot be accurately associated with the point of diversion (table 12). Frequently, these acres are irrigated by both ditch water and individual water rights; therefore, the number of acres listed in table 12 should not be combined with the State totals.

## Summary

This report documents 2013 irrigation water use in Kansas. The tables provided in this report were prepared using self-reported data from irrigation reports filed for the year 2013 with the Kansas Department of Agriculture, Division of Water Resources. The published regional and county-level statistics from the previous 4 years (2009–12) are shown with the 2013 statistics and are used to calculate a 5-year average. An overall Kansas average and regional averages also are calculated and presented. Total reported irrigation water use in 2013 was 3.3 million acre-feet of water applied to 3.0 million irrigated acres.



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## Tables 6–12

An Excel file containing the tables is available at <http://dx.doi.org/10.3133/ds981>.

**Table 6.** Water use, acres irrigated, and average application rate by crop and Kansas irrigation water-use analysis region, 2013.

**Table 7.** Water use, acres irrigated, and average application rate by crop and regional planning area, 2013.

**Table 8.** Water use, acres irrigated, and average application rate by crop and county, 2013.

**Table 9.** Water use, acres irrigated, and average application rate by type of irrigation system by Kansas irrigation water-use analysis regions, 2013.

**Table 10.** Water use, acres irrigated, and average application rate by type of irrigation system by regional planning area, 2013.

**Table 11.** Water use, acres irrigated, and average application rate by type of irrigation system by county, 2013.

**Table 12.** Water use and acres irrigated by ditch companies and irrigation districts in Kansas, 2013.

## Appendix

The Kansas Department of Agriculture’s Division of Water Resources water-use report can be downloaded at <http://dx.doi.org/10.3133/ds981>.

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