OVERVIEW OF IRRIGATED AGRICULTURE IN SPOKANE COUNTY

Abstract

As the greatest consumer of water supplies in Washington State, irrigation plays an essential role in the state's economy and natural resources. Good irrigation management saves water and energy and increases crop yield and farm profitability. Given the impact of climate change and competing demands on the irrigation water supply of Spokane County, irrigation system efficiency is vital for robust agriculture. WSU WISE (Water and Irrigation Systems Efficiency) is a project funded by a United States Department of Agriculture Conservation Innovation Grant (USDA CIG) to evaluate irrigation system efficiency for five counties across Washington State. This publication is part of a series resulting from WISE and provides an overview of irrigated agriculture in Spokane County. Most of the data analyses provided are based on data published by the USDA National Agricultural Statistics Service (USDA-NASS) and the Washington State Department of Agriculture (WSDA).

Geographical Introduction

Spokane County is located in eastern Washington, bordering the Idaho Panhandle (Figure 1), where the Columbia Plateau meets the northern Rocky Mountains. Three major peaks are found along the eastern edge of the county, namely Mount Spokane (the highest point in the county at 5,890 ft), Mica Peak, and Tekoa Mountain. The county is located within several watersheds in the Columbia River Basin: the Lower and Middle Spokane River Watersheds, and those of the Spokane River's two main tributaries, the Little Spokane River and Hangman Creek Watersheds. The centrally located Spokane Valley is the largest valley in the county. Other geographic features include prairies, the eastern edge of the Columbia Plateau, and channeled scablands.

Figure 1. Spokane County, Washington.

Loess, which originated on the Columbia Plateau, "is dominant in most of the southeastern part and some of the northwestern part of the Spokane County area. The soils that formed in loess have high agricultural value. Loess also has influenced the upper part of most of the soils" (USDA NRCS 2016). Volcanic ash is common to northeastern Washington and was deposited "by prevailing winds, from the volcanoes of the Cascades [notably Mt. Mazama], St. Helens, Baker, [and] Glacier Peak" (Steury 2011). North of the Spokane River, the Green Bluff, Cedonia, and Hunters series are prime agricultural soils consisting of ashy silt loams formed in silty, calcium carbonate-rich sediment remaining from confined glacial meltwater and glacial lakes.

There are several soil characteristics in Spokane County which limit agriculture and crop growth. For example, " . . . some of the well-developed silt loam soils have a dense clay layer that restricts water movement through the profile. Deep silt loam soils that are well developed and have a slope of 0 to 30 percent or more are primarily in the eastern part of the survey area. Shallower silt loam soils underlain by basalt are in the western part of the survey area that receives less precipitation. Very shallow soils and soils that have a restrictive layer are commonly used as native rangeland" (USDA NRCS 2016).

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Low rainfall and rocky soil made agriculture above the Spokane Valley—Rathdrum Prairie (SVRP) Aquifer (Figure 2) difficult at the turn of the 20th century, but the creation of irrigation canals and the installation of electric pumps that drew from the aquifer allowed for the proliferation of apples in the Spokane Valley by the early 1920s. However, due to weather, fruit and vegetable production ended on the eastern edge of the SVRP plains by the 1950s and was replaced with industry and urbanization. Much of the agricultural land was replaced with other industry and urbanization. As of 2015, most large-scale agriculture over the SVRP Aquifer occurs on the Rathdrum Prairie (ID) while "most commercial agriculture in the Spokane Valley occurs in greenhouses" (Boese et al. 2015). The Little Spokane Watershed (Figure 3), also referred to as Water Resource Inventory Area (WRIA) 55, is located in the northern part of the county, neighbors Pend Oreille and Stevens Counties, and serves as another source of irrigation for agriculture. According to the Washington State Department of Ecology, "The availability of groundwater from bedrock in this WRIA is very limited by climate and geology. Groundwater withdrawals also directly affect flows in the [Little Spokane] river. In the lower reaches of the Little Spokane Watershed, the aquifers for the Spokane Valley Rathdrum Prairie (SVRP) and the Little Spokane overlap. The shallower aquifer is connected to the Little Spokane River and the deeper aquifer, the SVRP, is connected to the main stem Spokane River" (Washington State Department of Ecology 2021b).

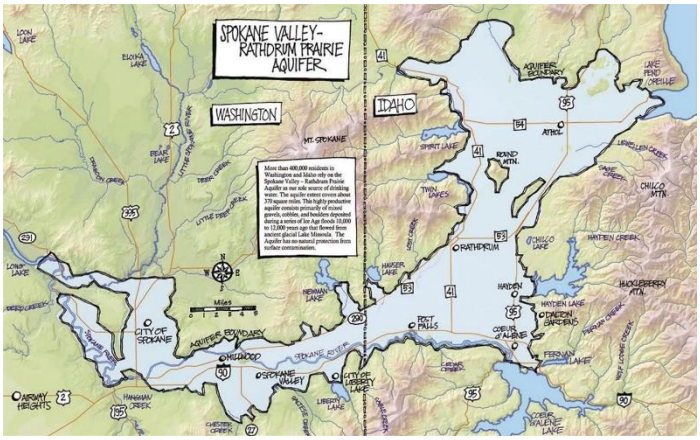

Figure 2. Map of Spokane Valley—Rathdrum Prairie Aquifer (Spokane Aquifer Joint Board 2021).

Weather Summary

Spokane County has a semi-arid climate in the western and central areas with more precipitation in the northern and eastern areas. Data spanning 2000–2020 was downloaded from the National Oceanic and Atmospheric Administration's National Centers for Environmental Information at Deer Park (NOAA 2021), a northern location in the county with a concentration of irrigated land. The data analysis shows the air temperature ranged between 21 and 85°F and average annual rainfall was 22 inches. Figure 4 shows the monthly average air temperature and precipitation (excluding snowfall) over 2000–2020. In the Little Spokane Watershed, "the annual precipitation . . . ranges from 17 inches per year in the area where it joins the Spokane River to 40 inches in the higher mountainous areas. Most of the precipitation arrives during the winter months, when water demands are the lowest. During the summer, the snowpack is gone, there is little rain, and naturally low stream flows are dependent on groundwater inflow. Only a fraction of this precipitation becomes available for human and economic uses. This means that water is least available when water demands are the highest" (Washington State Department of Ecology 2021b).

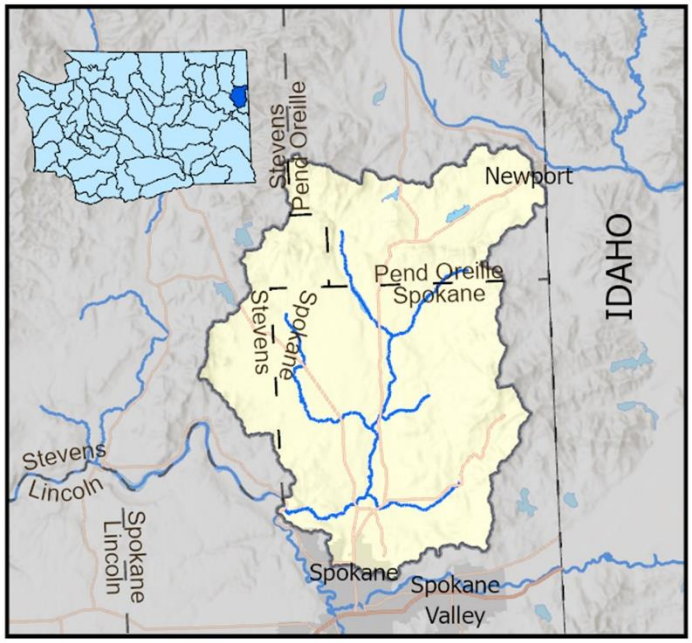

Figure 3. Little Spokane Watershed (Washington State Department of Ecology 2021a). Unlike other areas of eastern Washington, in three of Spokane County's watersheds irrigation demands are exceeded by municipal demands, which are expected to increase between 8 and 26% by 2035 (Washington State Department of Ecology 2016). In most of the county's watersheds, irrigation demands are expected to increase for most months of the year, assuming constant irrigated acreage. Some summer months are projected to have irrigation demands increase based on climatic changes or remain constant based on cropping system changes. The uncertainty of the water supply in the region and expected increases in demand underscore the importance of irrigation efficiency measures.

Irrigated Land Survey

In 2017, Spokane County ranked second statewide in number of farms per county at 2,500 (USDA-NASS 2017a), a 3% decrease from 2012. In 2017, there were 550 irrigated farms with a total irrigated land area of 12,742 acres, equal to 2% of land in farms (Table 1). The total irrigated land area and the number of irrigated farms grouped by farm size is shown in Figure 5. The average farm size in 2017 was 226 acres. The majority of the irrigated acres were located on farms greater than 2,000 acres. In 2017, irrigated land in orchards was estimated at a total of 385 acres across 146 farms (USDA-NASS 2017b).

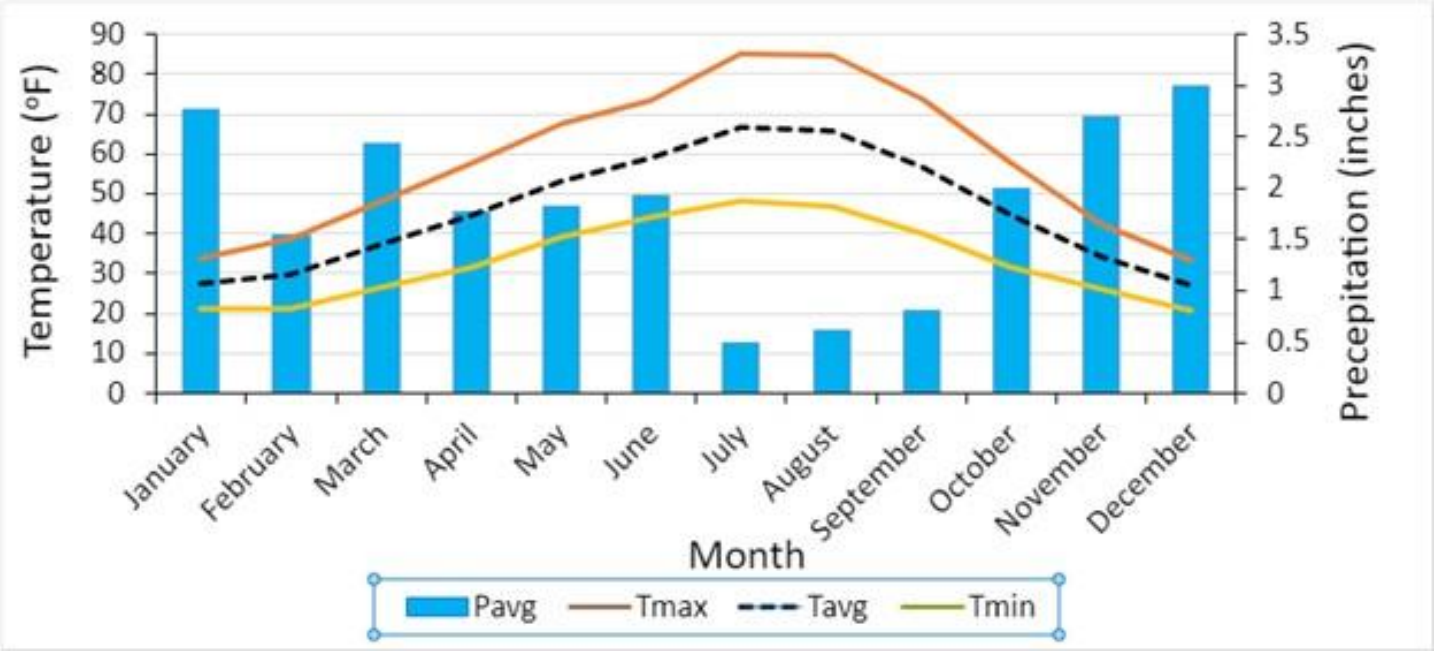

Figure 4. Monthly average air temperature and precipitation, Deer Park, Spokane County, 2000–2020.

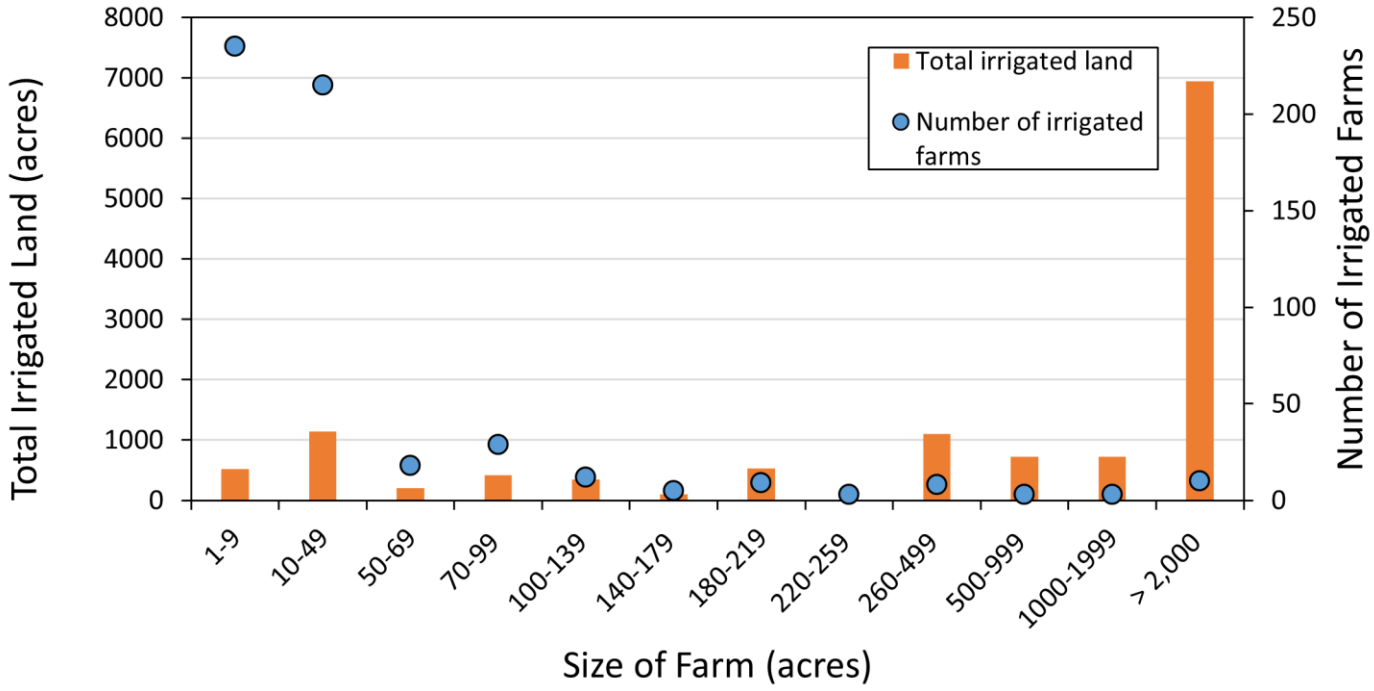

Figure 5. Total irrigated land and number of irrigated farms by farm size, Spokane County, 2017 (USDA-NASS 2017b).

Table 1. Spokane County total and irrigated farmland acreage in 2017.

		% of total land in farms
Total land in farms	548,535 acres	-
Irrigated farmland	12,742 acres	2.32%
Harvested cropland	11,927 acres	2.17%
Pastureland and other land	815 acres	0.15%

Source: USDA-NASS (2017b).

Crop Status

In 2017, the total cropland in Spokane County was estimated at 378,778 acres, equal to 70% of the total land in farms (Figure 6). A detailed list of the crops grown and the corresponding acreage in 2020 is shown in Table 2 (WSDA 2021). In 2020, the major crop by acreage was wheat (grain) at 149,540.4 acres. Other major crops included bluegrass seed, alfalfa hay, grass hay, lentils, canola, dry peas, and barley (grain). Most of the grain grown is dryland farmed. Additionally, as of 2016, about 80 percent of orchard crops, vineyard crops, nursery crops, and specialty vegetables are irrigated and grown on farms that are 0 to 15 acres in size (USDA NRCS 2016).

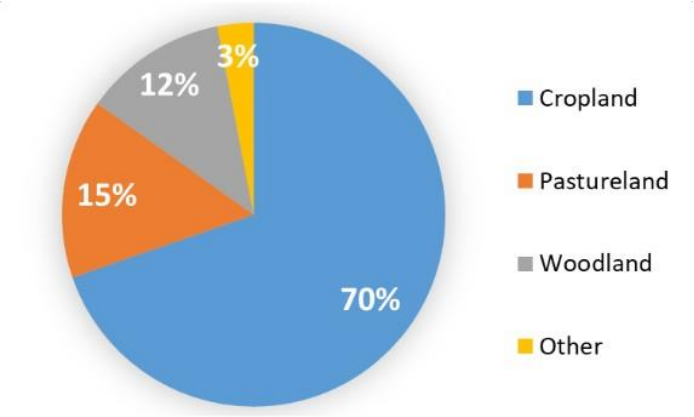

Figure 6. Land in farms by use in Spokane County, 2017 (USDA-NASS 2017a).

Table 2. Crops grown in Spokane County, 2020.

Crop	Acres
Wheat	149,540.4
Bluegrass Seed	22,055.6
Alfalfa Hay	21,889.0
Grass Hay	21,104.4
Wheat Fallow	20,586.3
Lentil	16,284.4
Canola	12,427.3
Pea, Dry	10,857.7
Alfalfa/Grass Hay	9,971.3
Barley	9,624.2
Bean, Garbanzo	5,143.1
Oat Hay	2,856.5
Grass Seed	1,533.6
Barley Hay	1,424.2
Oat	1,237.9
Sunflower Seed	1,001.4
Buckwheat	404.2
Flax Seed	347.0
Potato Seed	330.9
Corn, Field	275.3
Triticale Hay	257.1
Wildlife Feed	215.0
Christmas Tree	190.4
Sod Farm	142.6
Apple	133.3
Market Crops	111.7
Triticale	108.1
Silviculture	80.8
Pumpkin	63.5

Source: WSDA (2021).

Market Value of Crops

In 2017, Spokane County ranked 18th statewide in total sold agriculture products at a total of $117,043,000, a 22% decrease from 2012. The top category of crops produced in Spokane County in 2017 in terms of sales was grain, oilseeds, dry beans, and dry peas at $52,009,000. Table 3 shows the market value of crops sold by Spokane County in 2017.

Table 3. Market value of crops sold by Spokane County, 2017.

Crops	Sales
Total	**$97,489,000**
Grain, oilseeds, dry beans, dry peas	$52,009,000
Vegetables, melon, potatoes, sweet potatoes	$7,687,000
Fruits, tree nuts, berries	$3,303,000
Nursery, greenhouse, floriculture, sod	$14,894,000
Cultivated Christmas trees, short-rotation woody crops	$526,000
Other crops and hay	$19,070,000

Source: USDA-NASS (2017a).

Irrigation Systems

According to a U.S. Geological Survey report, in 2015 the total withdrawal for irrigated crops in Spokane County was 7.07 Mgal/d (million gallons per day), of which 6.02 Mgal/d was groundwater (primarily from the Spokane Valley—Rathdrum Prairie Aquifer) and 1.05 Mgal/d was surface freshwater. The total consumptive use of water for irrigated crops was estimated at 5.7 Mgal/d (Dieter et al. 2018). Zero reclaimed wastewater was reported for agricultural use in Spokane County in 2015. The main irrigation systems in Washington State can be categorized under three groups: sprinkler, micro-irrigation, and surface (flood irrigation). Sprinkler is the largest and most common irrigation system used in irrigated agriculture in Spokane County, accounting for 9,300 irrigated acres in 2015. Within sprinkler systems, center pivot (Figure 7) is the most common type at 5,937.6 acres in 2020, followed by wheel line and other sprinkler systems (Figure 8; Figure 9). There is minimal drip, rill, big gun, hand-move, and flood irrigation in the county (WSDA 2021).

Figure 7. Center pivot system. Photo: A.Z. Mohamed.

Figure 8. Sprinkler system. Photo: A.Z. Mohamed.

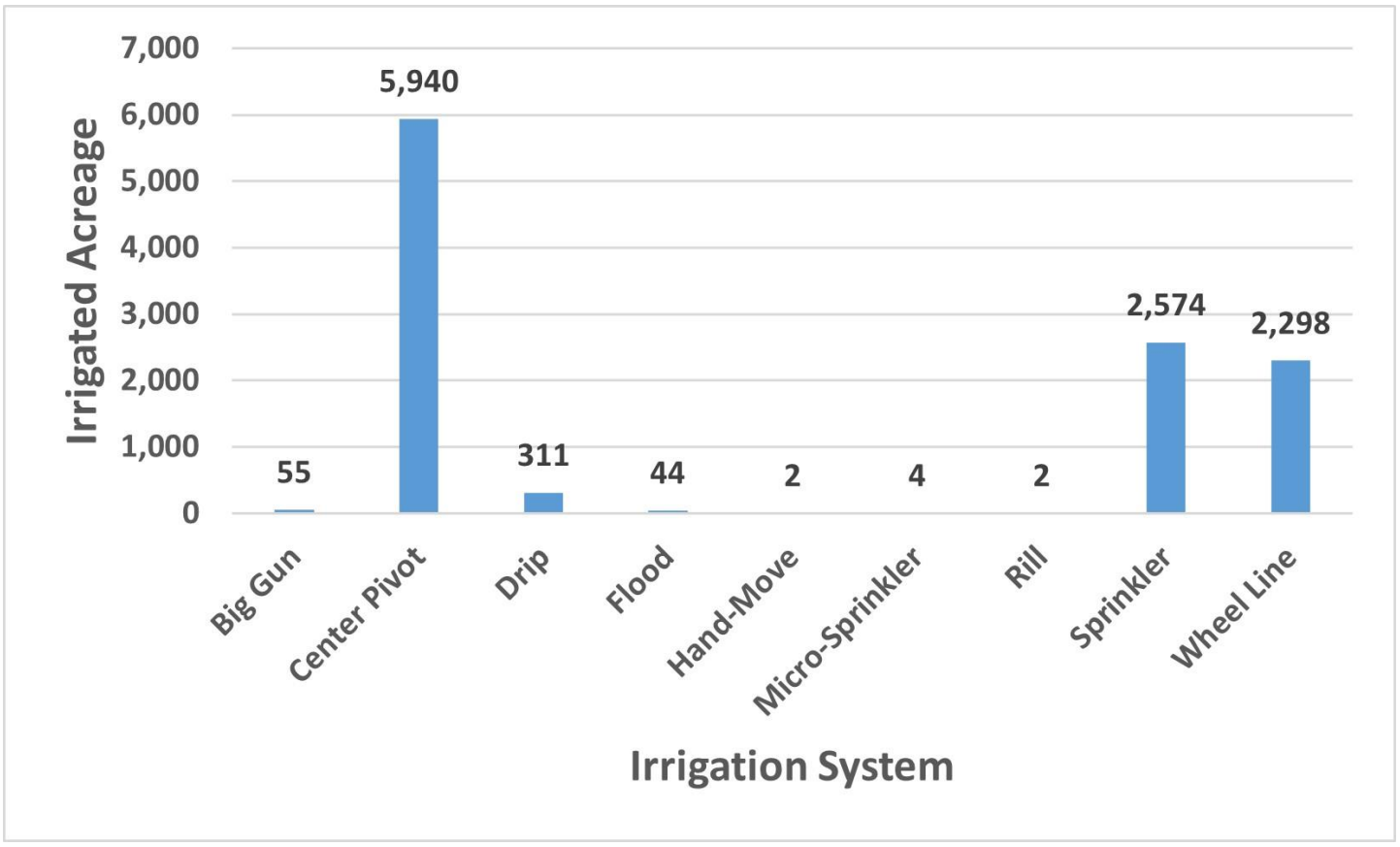

Figure 9. Irrigated acres by irrigation system type, Spokane County, 2020 (WSDA 2021).

Acknowledgements

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