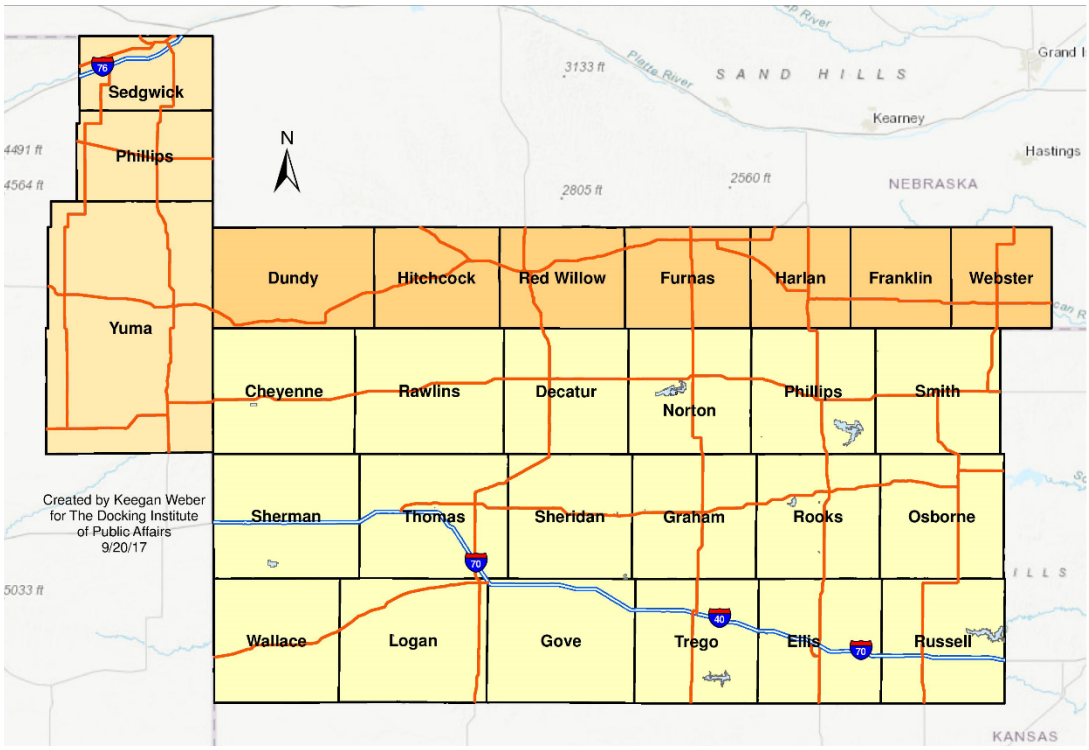
Keith Sebelius Reservoir, Prairie Dog State Park, and Norton Wildlife Area Economic Impact Study 2018 Report



Prepared For

Kansas Water Office

Topeka, Kansas

and

Norton City/County Economic Development

Prepared By

The Docking Institute of Public Affairs

Fort Hays State University

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Keith Sebelius Reservoir, Prairie Dog State Park, and Norton Wildlife Area Economic Impact Study 2018 Report

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Executive Summary

The purpose of this study is to determine the approximate magnitude of the economic impact of the Sebelius Reservoir and adjoining Prairie Dog State Park and Norton Wildlife Area on the local economy. Sebelius Reservoir was authorized and constructed to meet several purposes, including flood control and recreational uses. Rights to the water in Sebelius Reservoir are held by the City of Norton and the Almena Irrigation District #5. The Bureau of Reclamation reserves capacity in Sebelius Reservoir for flood control as needed. The water held in Sebelius Reservoir is also used by recreational users and wildlife. The Almena Irrigation District #5 has contracted to not use some of their water right in the past and is contracted to not use some water for the next ten years. This study provides estimates of the value of water in Sebelius Reservoir for each of these uses.

Five regions are examined in this study. The three region in Kansas are concentric, with each one larger than the previous. The smallest region is Norton County, the next is a six-county region made up of Norton County and five adjacent counties, and the largest region contains 18 counties in northwestern Kansas. Two regions outside Kansas are also considered: a seven-county region in Nebraska and a three-county region in Colorado.

A summary of the research follows. Further discussion is presented in the remainder of the report:

- The total economic impact on Norton County, Kansas, of the 172,300 (as reported in the Prairie Dog State Park annual report) recreational users of Sebelius Reservoir is estimated to be $4,848,000 annually.
- The direct economic impact to Norton County from recreational users from Nebraska and Colorado is estimated to be $761,000.
- Kansas sales tax revenue attributed to recreational users from Nebraska and Colorado is estimated to be $70,500.
- Local sales tax (including Norton County sales tax (.75%) and Norton City sales tax (1.25%)) and revenue attributed to recreational users from Nebraska and Colorado is estimated to be $21,600.
- The gross economic value of the Norton Municipal Water Right (1,600 acre-feet) is slightly more than $1,777,000.
- The estimated economic value of the water in Sebelius Reservoir for irrigation (water right held by Almena Irrigation District #5) is $11,500,000.
- The estimated economic value of the irrigation water in Sebelius Reservoir subject to the current lease is $2,397,086.

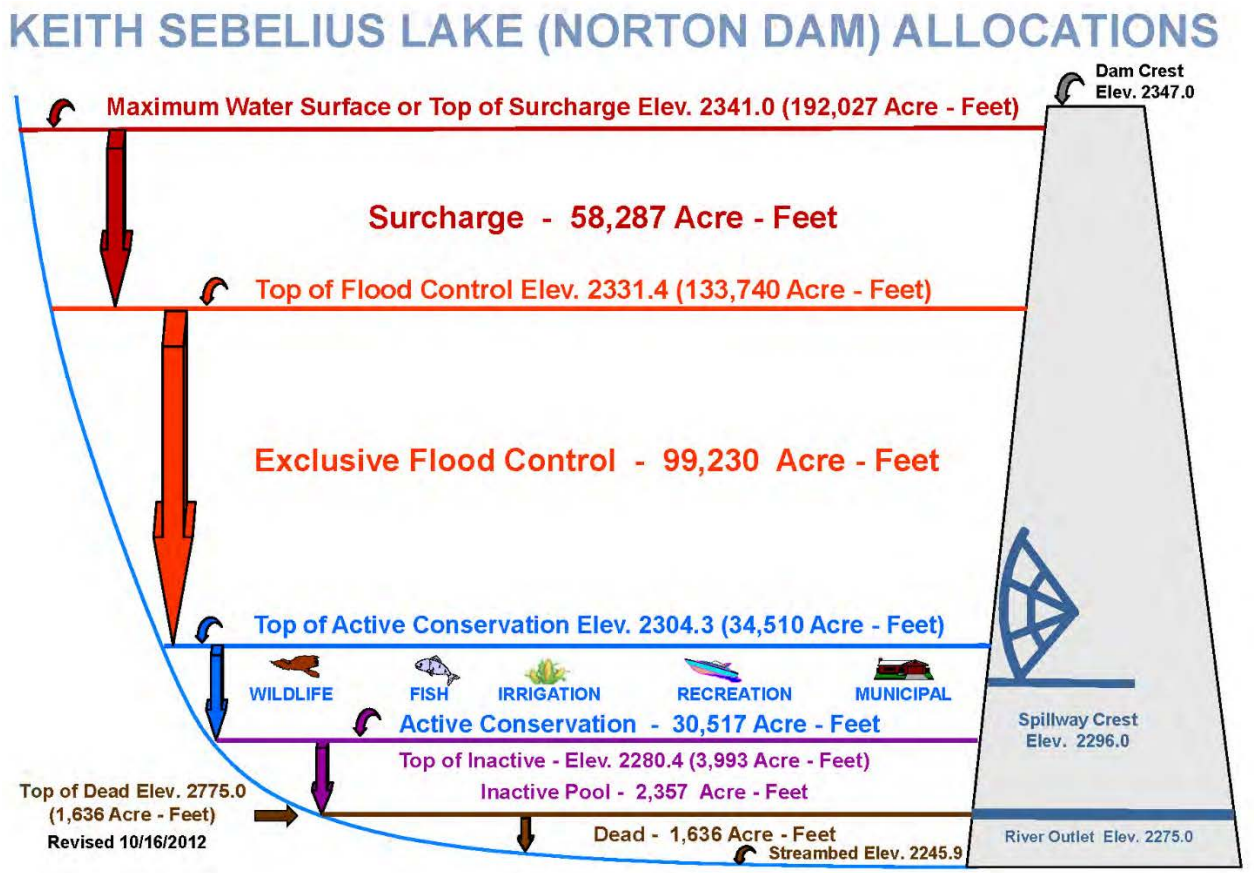
Introduction

This study focuses on the economic impact that arises from users of the Keith Sebelius Reservoir, Prairie Dog State Park, and the Norton Wildlife Area. For brevity and simplicity "Sebelius Reservoir" is used throughout this report to include both of the adjacent land areas, Prairie Dog State Park and the Norton Wildlife Area. Recreational users will often use two or more of the three areas during the same trip.

Sebelius Reservoir (Lake) was authorized in the 1940s and was constructed in the early 1960s, at a cost of $5.6 million, as a response to the cycles of floods and droughts that had occurred from the settling of the area in the Nineteenth Century.[1] Two primary purposes of the reservoir at that time were flood control and irrigation for agriculture. A third purpose was to provide municipal water supply for Norton City, and a fourth was to provide water for recreational uses, as well as maintaining wildlife and fish. This can be seen from the allocation of the capacity of the reservoir. Figure 1 (next page) shows that the largest allocation of capacity (157,517 acre-feet) is for flood control. Since 2004, these allocations have been slightly adjusted (between irrigation for agriculture and water for recreational use) through the use of contracts with Almena Irrigation District #5 that limit the quantity of water available for irrigation. Those contracts valued the water between 2,280.4 feet elevation and 2,288.4 feet elevation (6,038 acre-feet of water) at approximately $104,000 a year. The current contract (for 10.5 years) is for $100,000 per year. The estimated economic value of the irrigation water in Sebelius Reservoir subject to the current lease is $2,397,086. The return on investment is 4.17% ($100,000 / $2,397.086)

[1] The Almena Unit is located along the valley of Prairie Dog Creek in north-central Kansas. The unit consists of Norton Dam and Keith Sebelius Reservoir (formerly Norton Reservoir), Almena Diversion Dam, Almena Main and South Canals, and a system of laterals and drains to serve 5,763 acres of project lands. In addition to storing water for irrigation, the unit provides water for use in the city of Norton; protects the valley downstream from floods; and offers opportunities for recreation, conservation, and the development of fish and wildlife resources.

Figure 1 Sebelius Reservoir Water Allocations, 2012



Source: Bureau of Reclamation website

Fifty years later, the values of those allocations have changed. Some of the change can be attributed to newer technology and a greater understanding of hydrology. Other changes reflect demographic shifts and how we use our leisure time. The primary purpose of this study is to establish the value of water left in the reservoir due to the irrigation contract.

The right to most of the water in the active conservation pool is held by the Almena Irrigation District #5. A portion of this right has been leased for the recreational use of Sebelius Reservoir for approximately 13 years. A one-year agreement was signed between the Kansas Water Office (KWO) and the Irrigation District in 2004 reimbursing the Irrigators $120,000 for not releasing water below 2,288.5 (msl). In 2005, another contract was signed for $240,000, however, this was a two-year agreement with annual payments of $120,000. In 2007, a 10-year contract with an upfront payment of $1,000,000 was signed with KWO funding the contract. In

July of 2017, a 10.5 year contract was put in place allowing no irrigation releases below 2,288.5 (msl) in exchange for $100,000/year payments to the Irrigation District by the Kansas Department of Wildlife, Parks and Tourism (KDWPT) and the Norton County Community Foundation.

Historical Perspective

The year 1956, approximately halfway between the authorization of the project and its construction, provides a good starting point for considering the state of technology from the perspective of those earlier decision makers. Construction of the Kansas Turnpike was started in 1956, and it was built with a designed speed of 70 to 75 mph. At that time, most US Highways in rural settings had a speed limit of 60 mph or less. It was quite common for drivers to drive at 55 mph or less because of the condition of their vehicles and/or because vehicles were designed for such speed. In addition, poor highway conditions, relative to our own today, necessitated slower speeds. Thus, most recreational trips were of considerably less distance than they are today. On the farm in 1956, the John Deere 420 boasted 29 horsepower. The IH McCormick 141 SP combine had a cutter head that was 10 feet wide. You could buy a Mercury Marine Mark 55 outboard motor that was rated 40 horsepower for your boat. And, we 'liked Ike'. This was the world where construction plans were being developed for the "Almena Unit" on Prairie Dog Creek.

The world has changed since the mid-1950s. Decision-makers use contracts to adjust water usage from Sebelius Reservoir to reflect the current demands for that water.

Value of Water by Usage Classification

Figure 1 (page 3) shows the allocations of space in Sebelius Reservoir. The Inactive Pool and the Dead Pool lie at the bottom of Sebelius Reservoir. They are necessary but have no economic value, as water lies below the bottom of the reservoir's outlet.

Value of Reservoir Capacity for Flood Control

The largest allocation (99,230 acre-feet) is for flood control usage, with an additional 58,287 acre-feet available as surcharge if needed. These allocations are at the top of the reservoir and usually contain no water. The economic value of this unused reservoir capacity lies in the avoidance of the costs associated with flooding. The costs are difficult to quantify in advance, but are generally quite substantial, as several recent flooding events in other parts of the country have shown. At the time the Sebelius Reservoir was constructed, those costs were judged to exceed the cost of constructing the dam and reservoir ($5.6 million, 1965 dollars).[2]

Although Figure 1 does not show the water released downstream as an allocation, there is a required quantity of water that must flow to Nebraska due to the Republican River Compact – a water compact between Colorado, Kansas, and Nebraska.[3] This quantity is quite small and is regularly met through normal precipitation below the dam and other water releases from the Sebelius Reservoir. However, in the event of a prolonged severe drought, this requirement could affect the other allocations of water in Sebelius Reservoir. Table 1 (next page) shows the annual river discharge in acre-feet for 1996 through 2017.[4]

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[2] Rucker, Kevin E. Almena Unit: Pick-Sloan Missouri Basin Program. Reedited by Brit Storey December 2009

[3] For additional information consult the Republican River Compact Administration's website www.republicanrivercompact.org

[4] The year runs from October through September rather than the calendar year.

Table 1: Annual River Discharge, 1996 – 2017

Year	Acre-feet
1996	4,283
1997	10,855
1998	5,099
1999	5,277
2000	5,039
2001	5,296
2002	5,869
2003	4,801
2004	929
2005	794
2006	809
2007	1,953
2008	2,824
2009	1,725
2010	2,468
2011*	3,071
2012*	4,531
2013*	3,480
2014	2,602
2015	714
2016	738
2017	1,826

*Years of Drought

Table 2: Mean, Minimum, and Maximum Acre-Feet, 1976-2017

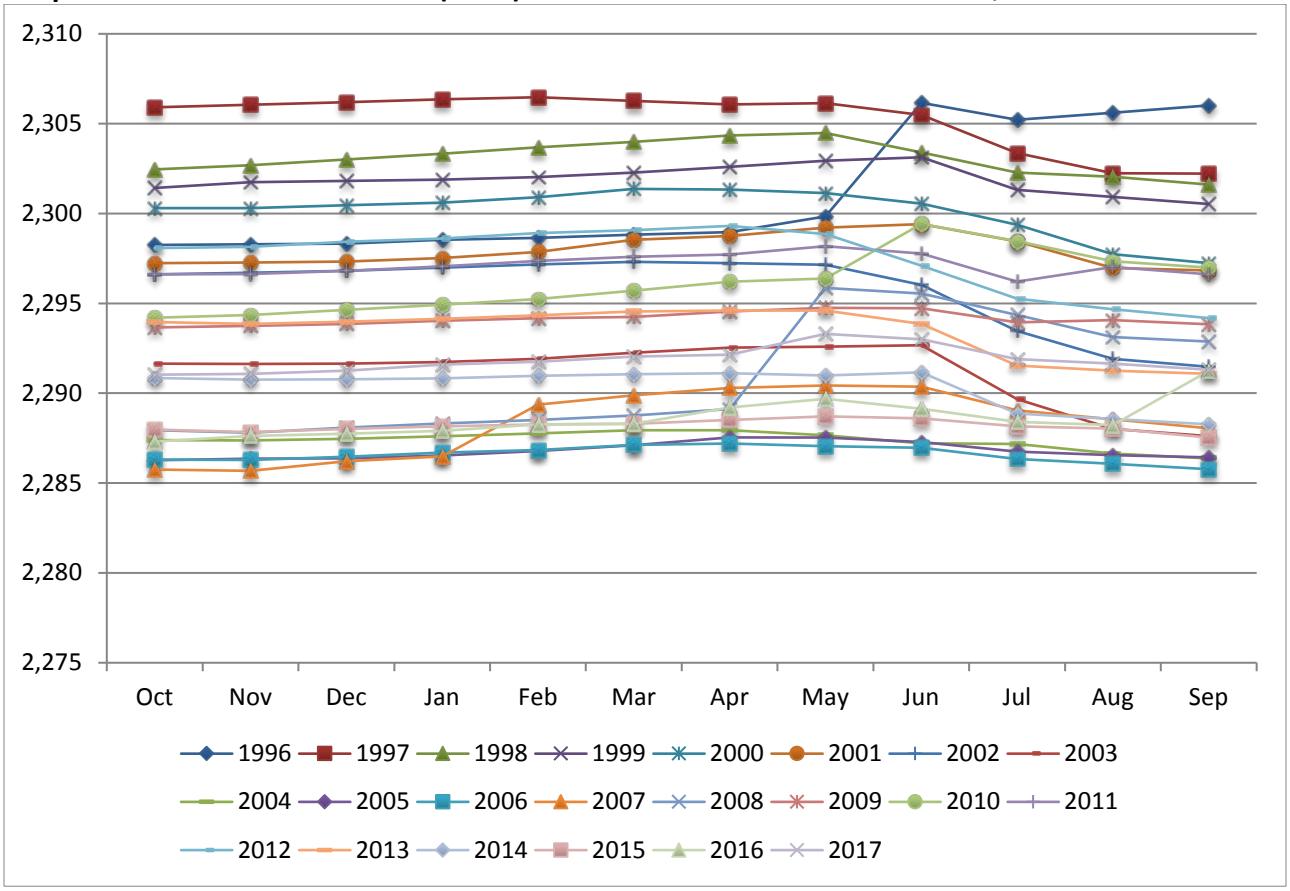
Value	Acre-Feet
Mean	3,265
Minimum	714
Maximum	10,855

Source for Table 1 and Table 2: AF.QRD Bureau of Reclamation. The file name AF.QRD is determined by the Bureau of Reclamation. AF.QRD = AcreFeet.QuantityRiverDischarge.

The variation in the annual river discharge reflects, in part, the variability of water inflows and demands for water due to varying amounts of precipitation in the watershed over time. Part of the justification for Sebelius Reservoir was the need to “smooth out” these variations in precipitation.

The Active Conservation allocation is further divided to a variety of uses. The largest allocation is to the Almena Irrigation District #5. Other allocations are for the Norton Municipal Water Supply and various recreational activities. The Active Conservation allocation starts at 2,280.4 feet and ends at 2,304.3 feet. It contains 30,517 acre-feet of water. Graph 1 shows that over the past 22 years, the End of Month (EOM) Elevation has varied by only 20.82 feet. The largest month-to-month change was an almost 8 foot increase in May of 2008.

Graph 1 End of the Month (EOM) Sebelius Reservoir Elevation Levels, 1996 - 2017



Source: Data from Bureau of Reclamation website

Value of Water for Irrigation

Almena Irrigation District #5 has rights to the water between 2,304.3 feet and 2,280.4 feet (a depth of 23.9 feet or approximately 27,800 acre-feet of water). The Almena Irrigation District #5 canals and laterals supply water to 5,763 acres. A portion of this right has been leased for the recreational use of Sebelius Reservoir for approximately 13 years under several different agreements, as previously discussed.

The irrigation system consists of earthen canals (a main canal and a south canal) and laterals. This was a common method at the time and a relatively inexpensive way to create the system, but it does result in substantial leakages and is quite labor intensive. During the 1970s and early 1980s most farmers in the irrigation district drilled wells and went to less labor intensive distribution systems.[5] Now, many farmers use either pipe systems to distribute irrigation water to their fields or low pressure drop heads to more accurately control the amount of water applied to their crops. As moisture sensing technology and global positioning system (GPS) equipped systems continue to develop and become more affordable, one can expect farmers to use these greater efficiencies in their irrigation techniques.

One of the ways to measure the value of water used for agricultural irrigation is to compare the value of cropland with irrigation to cropland without irrigation. This approach is more direct than attempting to anticipate the cropping decisions of the land owner, future prices of crops, farming methods and costs, the source of the irrigation water, and the method of irrigation employed. There are still, however, some issues to address. The information presented in both Graph 2 and Graph 3 are estimates published by KSU. The sources of the data and the methodology for doing the estimating changed following 2009.[6] Additionally, the limited

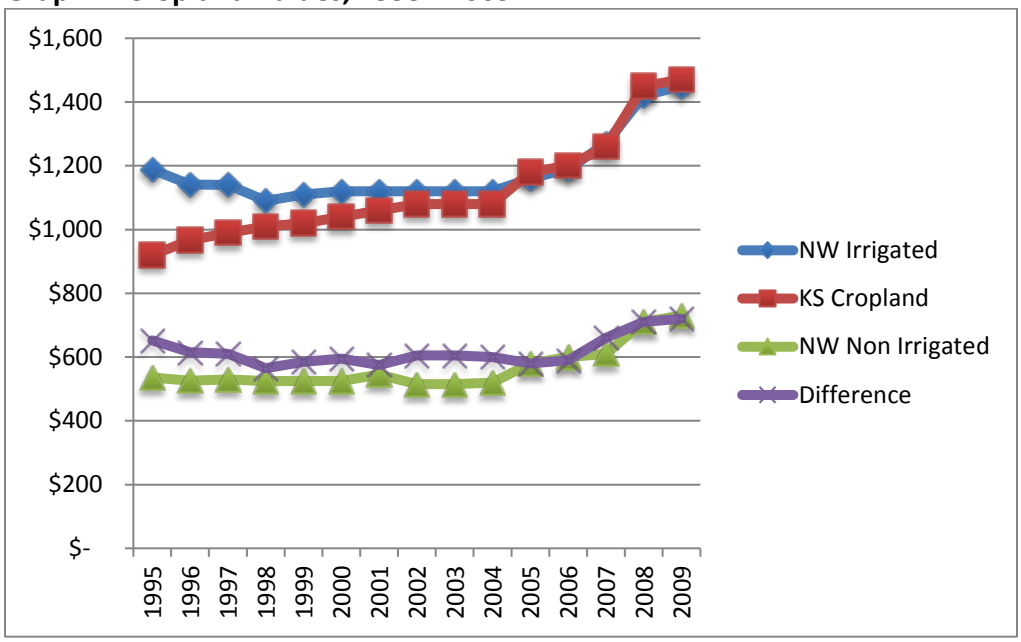
[5] Telephone conversation with Mr. Craig Ingram, President Almena Irrigation District #5. Multiple communications with Mr. Kelly Stewart, Kansas Department of Agriculture.

[6] The interested reader is directed to KSU Department of Agricultural Economics Publication AM-MRT-2013.1 for a more technical discussion. The earlier methodology is known as the KAS/KSU method and utilizes National Agricultural Statistics Service data. The later methodology is known as the PVD/KSU method and utilizes Kansas Property Valuation Department data.

number of “arms-length” sales at the county level is usually too small and so sales are consolidated to the Crop Reporting District (CRD) level. The northwest Kansas (NW) CRD consists of Cheyenne, Decatur, Graham, Norton, Rawlins, Sheridan, Sherman, and Thomas counties in Kansas.

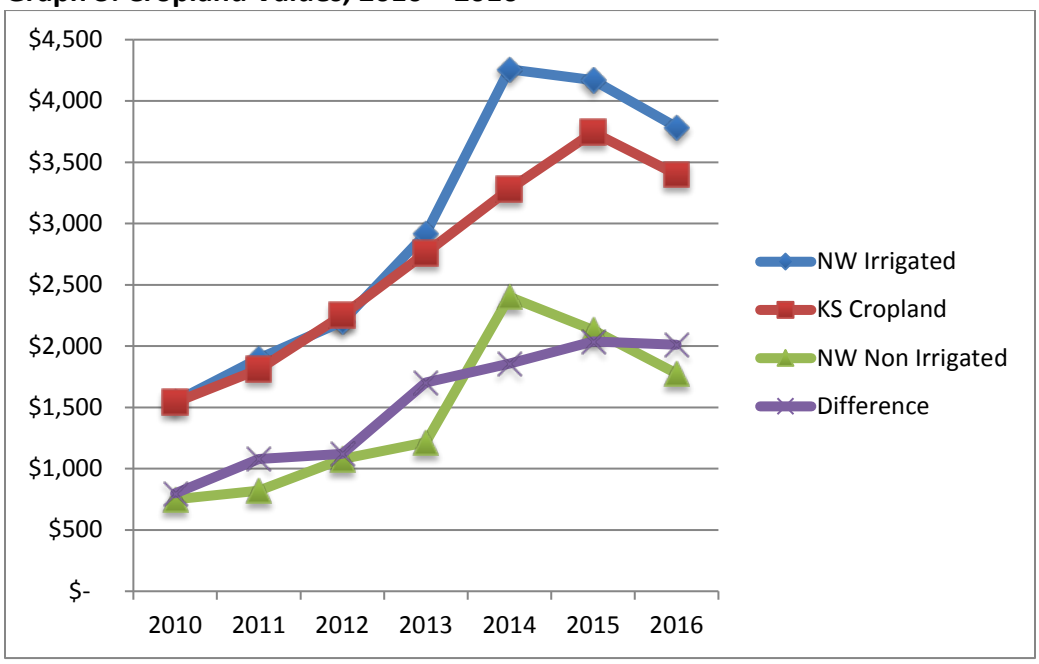
For the purposes of this study, the first important observation is that there is a strong sense of consistency between the value of irrigated cropland in the NW CRD and the value of cropland for all of Kansas. The second important observation is that the value of non-irrigated cropland in the NW CRD is very similar to the difference in value between irrigated and non-irrigated cropland in the NW CRD. That means that for the NW CRD, irrigated cropland is worth about twice as much as non-irrigated cropland, regardless of the data and methodology used.

Graph 2: Cropland Values, 1995 - 2009



Source: www.AgManager.info

Graph 3: Cropland Values, 2010 – 2016



Source: www.AgManager.info

Given the relatively short time span shown in Graph 3 and the apparent volatility of land prices, a conservative approach is to assign a top value of $2,000 per acre as the increased value (or premium) associated with irrigated cropland in the NW CRD. At the same time, it seems prudent to note that in 2010 that premium was less than $1,000 per acre.

The value of the 29,051 acre-feet in Sebelius Reservoir available for irrigation in 2009 was estimated at $143 per acre-foot. In 2016, the value of the water was estimated at $397 per acre-foot. This is a 178% increase over a seven-year period. Given the total 29,051 acre-feet of water in Sebelius Reservoir earmarked for irrigation and the estimated value of $397 per acre-foot, all this irrigation water is worth slightly more than $11,500,000. If the 2009 estimate of value is used, then the estimated value of the irrigation water is slightly more than $4,100,000.

Table 3 (next page) shows the quantity of water starting at the bottom of the conservation level, 2,280.4 feet above mean sea level, and measuring up in one-foot increments. The value of the water at each elevation level is calculated by multiplying the cumulative acre-feet of

water times the value of $397 per acre-foot. For example, the 6,038 acre-feet of water between 2,280.4 msl and 2,288.4 msl is worth $2,397,086.

Table 3: Value of Sebelius Reservoir Water at Various Elevations

Elevation	Acre-feet/foot	Cumulative Acre-feet	Value of water
2,280.4	-	-	
2,281.4	602.0	602.0	$238,994
2,282.4	655.0	1,257.0	$499,029
2,283.4	627.0	1,884.0	$747,948
2,284.4	809.0	2,693.0	$1,069,121
2,285.4	772.0	3,465.0	$1,375,605
2,286.4	806.0	4,271.0	$1,695,587
2,287.4	855.0	5,126.0	$2,035,022
2,288.4	912.0	6,038.0	$2,397,086
2,289.4	985.0	7,023.0	$2,788,131
2,290.4	1,063.0	8,086.0	$3,210,142
2,291.4	1,135.0	9,221.0	$3,660,737
2,292.4	1,208.0	10,429.0	$4,140,313

Source: ACAP92 Keith Sebelius Reservoir – Almena Unit, Kansas 2000 Area-Capacity Tables, Additional calculations by Preston Gilson, Ph.D.

Value of Water for Municipal Use

The City of Norton has a right to 1,600 acre-feet (69,696,000 cubic feet) of water from Sebelius Reservoir for its municipal water supply. The "quality" of this water before processing is higher when the reservoir is fuller and its level is more constant. The irrigation leases help maintain a more consistent level for Sebelius Reservoir. Norton also has water rights from wells. Norton has a basic water charge of $27.32 per month for meters less than 2 inches in size and $32.49 per month for meters that are 2 inches or larger in size. The basic water charge includes 200 cubic feet of water per month. Water users outside the corporate city limits of Norton pay $41.79 per month. However, all users pay the same $2.55 per hundred cubic feet after they have consumed the 200 cubic feet per month included in the basic fee. The basic fee covers the cost of maintaining the water system and administering it, plus up to 200 cubic feet of water per month. Thus, the additional fee of $2.55 per 100 cubic feet represents the marginal price of water in Norton. The 1,600 acre-feet of water in Sebelius Reservoir that is allocated to the City of Norton for its municipal water supply has a potential gross value[7] of slightly more than $1,777,000 per year. The net value of this municipal water is not calculated as that analysis must consider the operational costs to bring the water up to standards and maintain the City of Norton's distribution system. Additionally, the City of Norton uses only a small portion of its water right for its municipal water system. Table 4 (next page) shows that the maximum annual water release for municipal water use was just over one-fourth of Norton's water right.

[7] The potential gross value is the value of the entire water right from Sebelius Reservoir for municipal water times the marginal price that Norton charges its water customers. In fact, Norton does not have enough demand for municipal water to use its entire water right.

Table 4: Annual Municipal Water Release from Sebelius Reservoir, 2007 – 2017

Year	Acre-Feet
2007	400
2008	223
2009	398
2010	333
2011	348
2012	408
2013	363
2014	347
2015	353
2016	375
2017, through June	236
Value	Acre-feet
Mean	344
Minimum	223
Maximum	408

Source: AF.QZD Bureau of Reclamation

The remaining water in the conservation level at Sebelius Reservoir is for recreational use. This water is used by the humans who visit the reservoir, as well as wildlife and fish.

Value of Water for Recreational Use

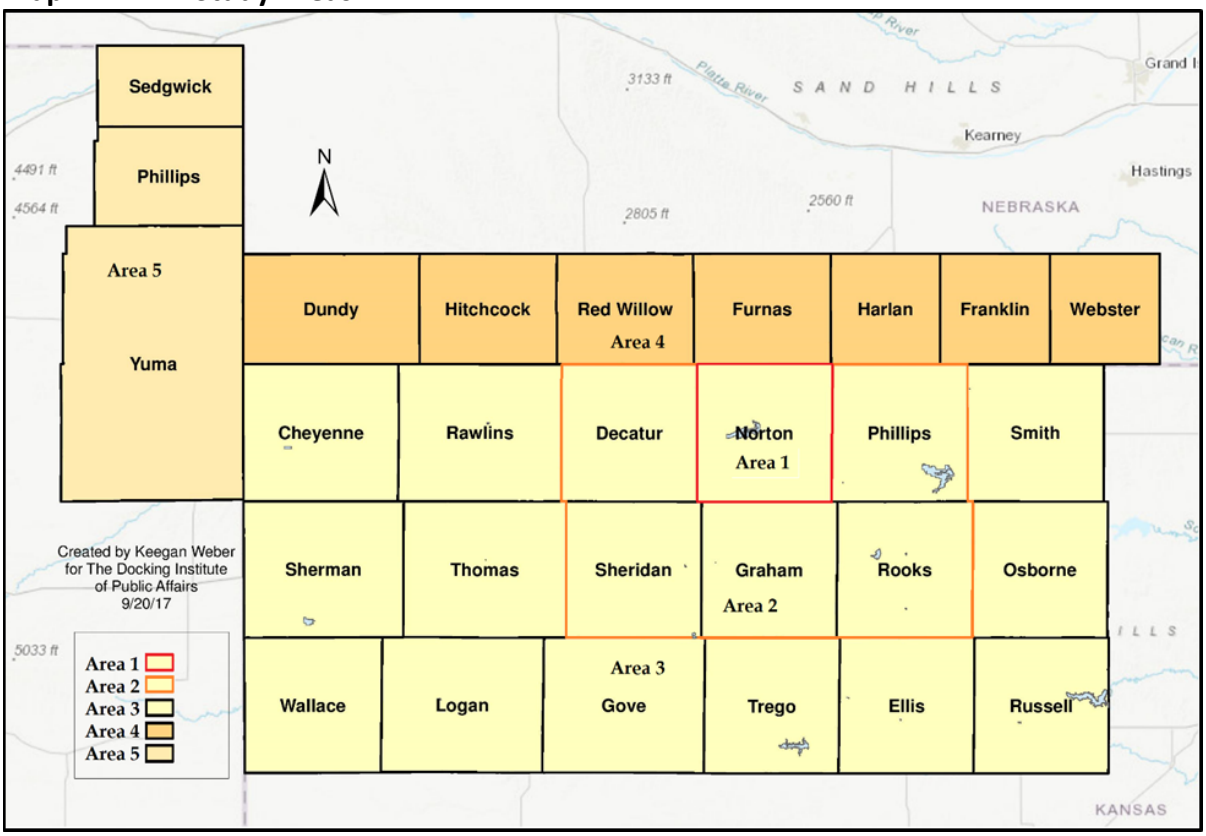
The economic value of Sebelius Reservoir and the Prairie Dog State Park and Norton Wildlife Area as a recreational facility consists of three different economic impacts. 1) The direct economic impact is a measure of the local spending by those who visit the lake for any reason (the usual reasons are fishing, boating, hunting, and recreation). 2) The indirect economic effect is a measure of the secondary effects generated by those businesses that then purchased additional goods and services from other businesses within the region because of the direct economic impact on their own business. In other words, the indirect effect multiplier reflects the level of business-to-business spending. Finally, 3) the induced economic effect measures the secondary economic effects generated by household spending derived from the direct economic impact effects within the area of the study. IMPLAN econometric software was used to model these effects in each of study areas. An expanded discussion of IMPLAN and economic impact analysis is in Appendix B.

Study Areas and Economic Impact by Sector

This report provides information about three concentric regions in Kansas as well as areas in Nebraska and Colorado (see Map 1, below).

Study Area 1 is Norton County, Study Area 2 includes six counties in Kansas (Decatur, Norton, Phillips, Sheridan, Graham, and Rooks). Study Area 3 includes the 18 northwestern most Kansas counties. Study Area 4 includes seven counties in Nebraska (Dundy, Hitchcock, Red Willow, Furnas, Harlan, Franklin, and Webster). Study Area 5 includes three counties in Colorado (Sedgwick, Phillips, and Yuma).

Map 1: Study Areas



Study Area 1 is Norton County. The portion of the economy that is directly affected by recreational users of Sebelius Reservoir in Study Area 1 is retail trade. Within the retail trade sector the study focuses on seven subsectors: 1) Motor vehicle and parts dealers; 2) food and beverage stores; 3) health and personal care stores; 4) clothing and clothing accessories stores; 5) sporting goods, hobby, musical instrument and book stores; 6) general merchandise stores; and 7) miscellaneous store retailers.

Tables 5 through 7 (starting below) show the economic effects of the three increasingly larger regions in Kansas. The Direct Effect does not change as the regions become larger because the Direct Effect is measured in Norton County which is a part of all three regions. However, the Indirect Effect and the Induced Effect do change as the regions increase in size. This is because these are calculated on the basis of relationships between all businesses or individuals in the specified region.[8]

Table 5: Study Area 1, Norton County

IMPLAN Retail Sector	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Vehicles and parts	$300,957	$46,947	$42,949	$390,854
Food and beverage	$775,962	$146,831	$130,606	$1,053,398
Health and personal	$271,949	$44,260	$55,314	$371,523
Clothing	$123,284	$25,978	$14,080	$163,342
Sporting goods	$159,544	$26,272	$28,426	$214,242
General	$1,689,711	$222,364	$318,088	$2,230,164
Miscellaneous	$304,583	$58,807	$61,664	$425,054
Total	$3,625,990	$571,459	$651,127	$4,848,576

Source: IMPLAN. Additional calculations by Preston Gilson, Ph.D. (rounding errors are possible)

[8] The definitions of the economic effects are discussed at the beginning of this section and in Appendix B.

Table 6: Study Area 2, Six NWKS Counties

IMPLAN Retail Sector	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Vehicles and parts	$300,957	$39,777	$41,651	$382,385
Food and beverage	$775,962	$130,022	$123,735	$1,029,719
Health and personal	$271,949	$48,261	$41,898	$362,108
Clothing	$123,284	$23,119	$14,100	$160,503
Sporting goods	$159,544	$28,251	$22,655	$210,450
General	$1,689,711	$185,706	$267,873	$2,143,290
Miscellaneous	$304,583	$69,336	$32,475	$406,394
Total	$3,625,990	$524,472	$544,387	$4,694,849

Source: IMPLAN. Additional calculations by Preston Gilson, Ph.D. (rounding errors are possible)

Table 6 shows that in Study Area 2 both the Indirect Effect and the Induced Effect are decreased as a larger amount of business-to-business and individual spending is outside the specified counties. Given the increases in these effects for Study Area 3 (Table 7), it is likely that the spending is occurring in the regional trade centers along I-70.

Table 7: Study Area 3, Eighteen NWKS Counties

IMPLAN Retail Sector	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Vehicles and parts	$300,957	$42,934	$70,013	$413,904
Food and beverage	$775,962	$154,706	$191,182	$1,121,850
Health and personal	$271,949	$58,675	$67,292	$397,917
Clothing	$123,284	$28,108	$20,554	$171,946
Sporting goods	$159,544	$35,151	$35,768	$230,463
General	$1,689,711	$317,339	$380,663	$2,387,713
Miscellaneous	$304,583	$80,487	$64,783	$449,853
Total	$3,625,990	$717,400	$830,257	$5,173,647

Source: IMPLAN. Additional calculations by Preston Gilson, Ph.D. (rounding errors are possible)

Tables 8 and 9 (next page) show the portion of the Direct Impact that is attributed to residents of Nebraska (Study Area 4) and Colorado (Study Area 5) who are recreational users of Sebelius Reservoir. This is new money that is coming into the Kansas economy. In essence, Kansas is exporting the recreational experience to users in these two states.

Table 8: Study Area 4, Seven Nebraska Counties

IMPLAN Retail Sector	Direct Effect
Vehicles and parts	$26,514
Food and beverage	$68,362
Health and personal	$23,959
Clothing	$10,861
Sporting goods	$14,056
General	$148,863
Miscellaneous	$26,834
Total	$319,449

Source: IMPLAN. Additional calculations by Preston Gilson, Ph.D. (rounding errors are possible)

Table 9: Study Area 5, Three Colorado Counties

IMPLAN Retail Sector	Direct Effect
Vehicles and parts	$36,657
Food and beverage	$94,512
Health and personal	$33,123
Clothing	$15,016
Sporting goods	$19,432
General	$205,807
Miscellaneous	$37,098
Total	$441,645

Source: IMPLAN. Additional calculations by Preston Gilson, Ph.D. (rounding errors are possible)

At the current state sales tax rate (6.5%) the economic activity (measured by the Direct Effect) of Nebraska and Colorado residents who use Sebelius Reservoir generates $49,470 in sales tax revenue for Kansas. Adding in the secondary effects from the direct economic activity attributed to Nebraska and Colorado users raises the revenue estimate from sales taxes to approximately $70,500 per year.

For sales in Norton the city sales tax is 1.25% and the county sales tax is 0.75%.[9] This adds about $15,200 in local sales tax revenue from the direct economic effect of spending by these non-residents ($9,500 for the City of Norton and $5,700 for Norton County). When the

[9] Kansas Department of Revenue, publication pub17001017.xls

secondary economic effects are added, the local sales tax revenue estimate increases to about $21,600 per year.

Summary of Findings

- The total economic impact of the 172,300 recreational users of Sebelius Reservoir on Norton County, Kansas, is estimated to be $4,848,000.

- The total economic impact of the 172,300 recreational users on the six-county region around Sebelius Reservoir is estimated to be $4,694,000. The total impact on the six-county region is less than on Norton County alone because of reduced Indirect and Induced Impact (as business-to-business and individual spending filter out to areas beyond the six counties).

- The total economic impact of the 172,300 recreational users on the 18-county region in NWKS on Sebelius Reservoir is estimated to be $5,173,000.

- The direct economic impact to Norton County from recreational users from Nebraska and Colorado is estimated to be $761,000.

- Kansas sales tax revenue attributed to recreational users from Nebraska and Colorado is estimated to be $70,500.

- Local sales tax (including Norton County sales tax [.75%] and Norton City sales tax [1.25%] and revenue attributed to recreational users from Nebraska and Colorado is estimated to be $21,600.

- The gross economic value of the Norton Municipal Water Right (1,600 acre-feet) is slightly more than $1,777,000.

- The estimated economic value of the water in Sebelius Reservoir for irrigation (water right held by Almena Irrigation District #5) is $11,500,000.

- The estimated economic value of the irrigation water in Sebelius Reservoir subject to the current lease is $2,397,086.

Appendix A: Study Regions

The regions studied are based on vonThünen's concentric ring theory and the realities of how data is collected and reported in the United States. Concentric ring theory suggests that effects spread out from a center point in identifiable rings. However, in the western Midwest, most counties are roughly rectangular. Thus, rather than circular areas around a center point the study uses areas that are squarish rectangles.

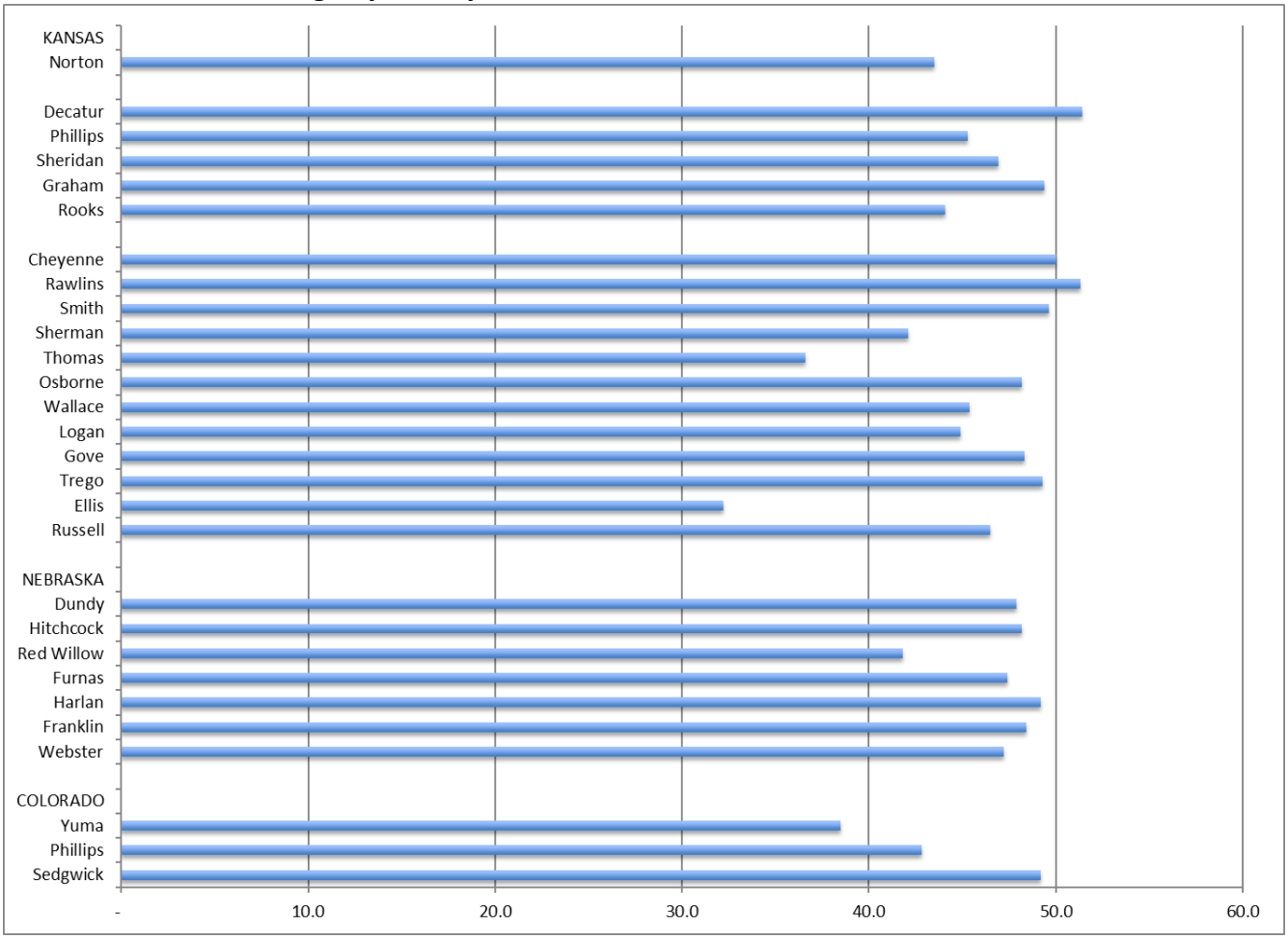
The center of the study is Norton County and Norton County is the first region that is examined.[10] Because the study focuses on Kansas, the second area consists of the five Kansas counties that are contiguous with Norton County, as well as Norton County. These counties include: Decatur, Phillips, Sheridan, Graham, and Rooks counties. The third study area consists of 18 Kansas counties, the previous six counties and Cheyenne, Rawlins, Smith, Sherman, Thomas, Osborne, Wallace, Logan, Gove, Trego, Ellis, and Russell counties.

The study also considered seven Nebraska counties and three Colorado counties. The Nebraska counties are Dundy, Hitchcock, Red Willow, Furnas, Harlan, Franklin, and Webster. The Colorado counties are Phillips, Sedgwick, and Yuma.

All these counties have similar economies and demographics to the Kansas counties in the study, as shown in Charts 1 and 2 on the following pages. The Census Bureau counts people where they reside; therefore, large numbers of transient individuals (for instance, inmates at the Norton Correctional Facility or college students at FHSU) have an effect on both the median age and the per capita income of the relevant county.

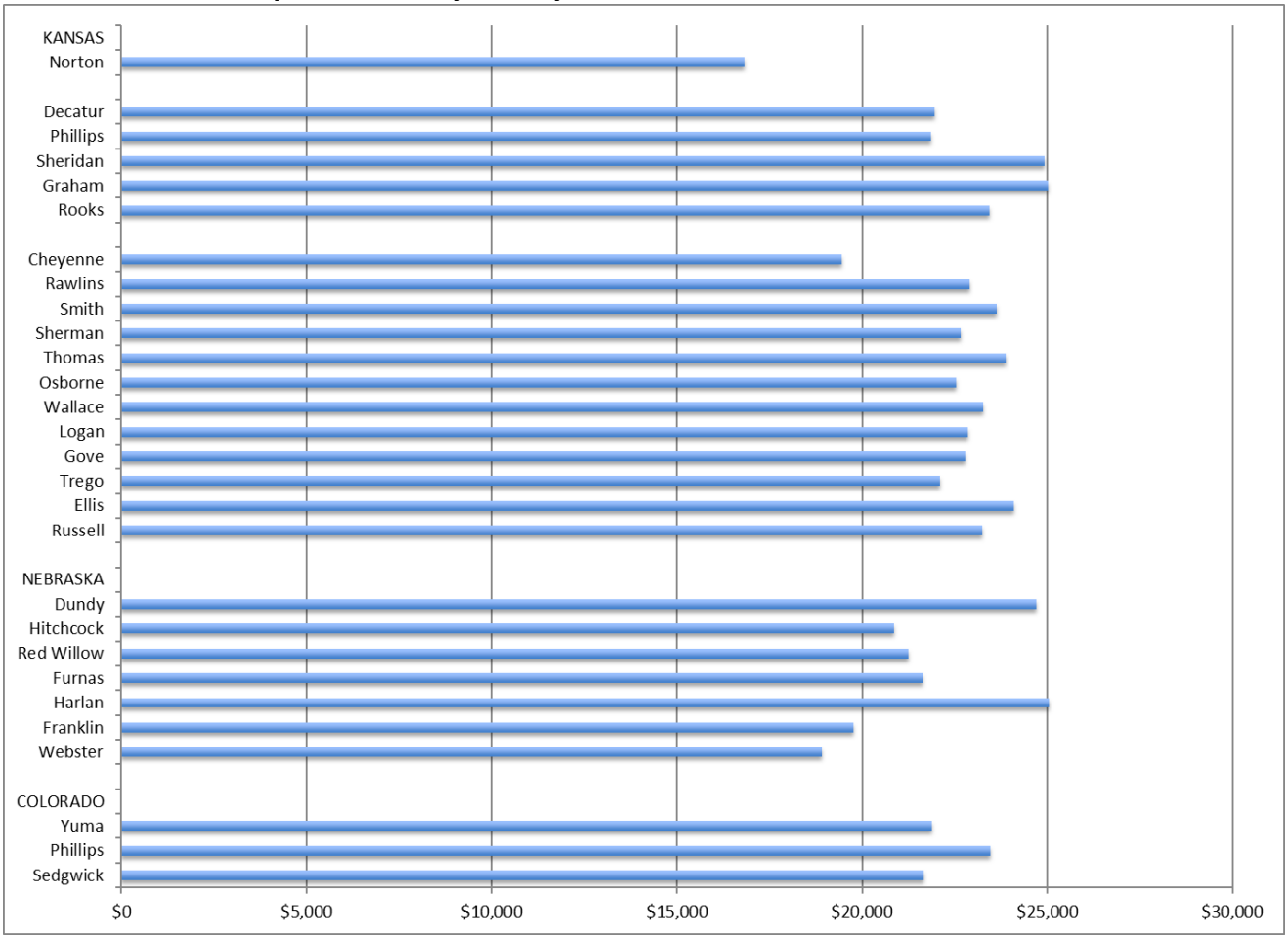
[10] The U.S. Census Bureau counts incarcerated persons at their location of incarceration. Thus, the population of Norton County includes inmates at the prison. The Norton Correctional Facility can house about 835 males. This decreases both the median age and per capital income for Norton County.

Chart 1: Median Age by County



Source: Data from U.S. Census Bureau

Chart 2: Per Capita Income by County



Source: Data from U.S. Census Bureau

Appendix B: Research Notes

The purpose of this study was to determine the approximate magnitude of the economic impact of the Sebelius Reservoir and adjoining Prairie Dog State Park and Norton Wildlife Area on the local economy. The economic impact was measured through the users of the reservoir and its water. Five regions were examined in this study. The three region in Kansas were concentric, with each one larger than the previous. The smallest region was Norton County, the next was a six-county region made up of Norton County and five adjacent counties, and the largest region contained 18 counties in northwestern Kansas. Two regions outside Kansas were also considered: a seven-county region in Nebraska and a three-county region in Colorado.

The model used in this study is based on the work of Wassily Leontif. Leontif's input-output models attempt to quantify the interdependences between various sectors of an economy. The model used for this analysis is the IMPLAN software model. The IMPLAN software and its database calculate appropriate industry level multipliers at the county level or a multi-county, regional level. The source data for this model comes from a wide variety of sources that are collected and published by the U.S. Government. Additional data specific to this analysis comes from the various Kansas agencies and the City of Norton.

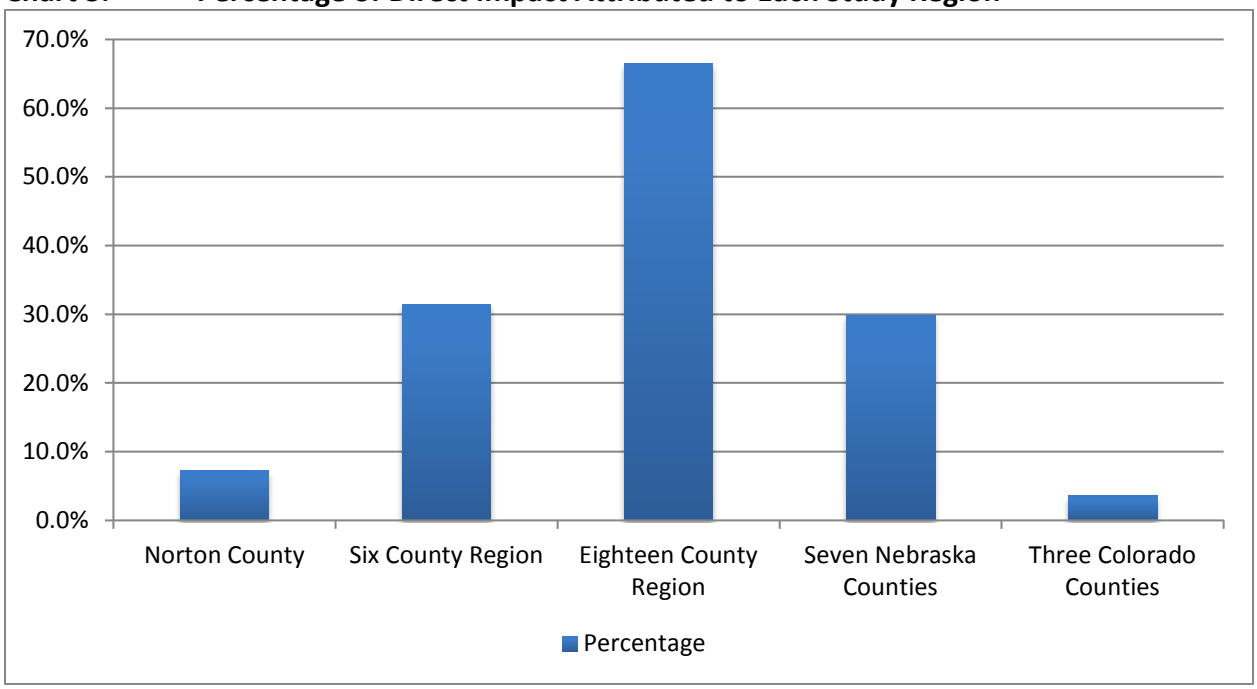
How an economy responds to changes in economic activity can be quantified based on the buy-sell relationships among the economic agents (businesses, governmental entities, and households) located within the studied economy. Input-Output (I-O) models estimate the inter-industry relationships in an economy (or region) by measuring the distribution of inputs purchased and outputs sold by each industry. Through the use of I-O models, it is possible to calculate how the impact of one dollar flows or "ripples" through a regional economy. As this economic activity (measured by the dollar) flows through the economy, it causes additional economic activity (expenditures and employment). This is the multiplier effect: a quantitative measure of the ripple effect that an initial expenditure has on its economy.

The total economic impact on an economy is the sum of the initial economy activity (the Direct Effect) plus all of the secondary effects (the Multiplier Effect). The Multiplier Effect consists of both Indirect Effects and Induced Effects. The Indirect Effects are the results of business-to-business transactions indirectly caused by the direct effects. Businesses initially benefiting from the direct effects will subsequently increase spending at other local businesses. The Indirect Effect is a measure of this increase in business-to-business activity. Induced Effects are the results of increased personal income caused by both the direct and indirect effects. Businesses that experience increased revenue from the direct and indirect effects will then increase payroll expenditures by hiring more employees, raising salaries, or increasing payroll hours. Households will then increase spending at local businesses. The Induced Effect is a measure of the increase in household-to-business activity.

When the geographic region is changed, the IMPLAN model recalculates the Indirect and Induced Multipliers for each economic sector. These changes reflect the relationships that exist among entities in the changed region. Although the change is usually positive, it can be negative. For example, if businesses (and/or households) at the edges of the expanded area have most of their commerce with businesses outside the expanded area, then the amount of commerce conducted within the expanded area on a per business (or household) basis will actually decrease. The multipliers for the 18-county region are larger than those for the Norton County region, but these multipliers are smaller for the six-county region than they are for the Norton County region. The reason for this is that many of the suppliers/distributers for retailers are located in larger communities that are some distance from Sebelius Reservoir and Norton County rather than in the contiguous counties of the six-county region.

Chart 3 (below) shows the percentage of the Direct Impact that is attributed to recreational users living in each of the study regions.

Chart 3: Percentage of Direct Impact Attributed to Each Study Region



Source: Calculated by Preston Gilson, Ph.D.

To assess impact, the population of each region was determined. Then, the percentages in Chart 3 (above) were calculated based on the percentage of each regions residents who participate in outdoor recreation and the distance of the county seat from Sebelius Reservoir. As the distance increases in approximately one-hour increments, the number of likely visitors decreases. These estimates differ from the Creel Survey, see Table 10 on next page, because these regions are subsets of each state. The Creel Survey includes the entire state of residence.

Table 10: State of Residence and Percentage of Anglers Who Fished at Sebelius Reservoir, March 1 to October 31, 2014.

State	Percentage
Arizona	0.26
California	0.26
Colorado	12.18
Illinois	1.30
Kansas	75.37
Louisiana	0.39
Missouri	0.39
Nebraska	8.81
New Mexico	0.13
Oklahoma	0.13
Pennsylvania	0.13
South Dakota	0.13
Texas	0.52

Source: Table 13, Kansas Reservoir Creel Survey Summary, April 2015[11]

Table 11 (below) shows the intensity of use for these four Kansas reservoirs. Although Sebelius Reservoir is the smallest reservoir, it is the most intensively used. High usage by anglers may be due to the quantity of water held in the Sebelius Reservoir.

[11] Table 11 from the Kansas Reservoir Creel Survey Summary reported results from four reservoirs in Kansas. The variations between in-state versus out-of-state users points to the importance of location from the users' perspective. It also emphasizes the role of alternative destinations, or the lack thereof. The anglers interviewed at all reservoirs were generally Kansas residents; ninety-five percent (95%) of anglers at Elk City were Kansans, while 89% at Cedar Bluff, 75% at Norton, and 62% at Glen Elder were from Kansas. Twenty-six percent (26%) of anglers at Glen Elder were from Nebraska. At Norton, 12% were from Colorado and 9% were from Nebraska.

Table 11: Estimated Angler Pressure at Four Kansas Reservoirs, March 1 to October 31, 2014.

Reservoir	Size (Acres)	Total Anglers	Anglers Per Acre	Total Hours	Hours Per Acre
Cedar Bluff	2,500	32,084	12.83	94,865.84	37.95
Elk City	4,450	15,415	3.46	31,265.12	7.03
Glen Elder	12,586	75,010	5.96	243,670.82	19.36
Norton	1,500	33,206	22.14	74,111.54	49.41

Source: Table 1, Kansas Reservoir Creel Survey Summary, April 2015

Tables 12 and 13 (below) provide insight into the number of business engaged in retail trade and the number engaged in the accommodation and food services sector in the six-county region. Table 12 suggests that retail businesses in Norton County are larger based on the average annual payroll per establishment. Table 13 suggests that businesses in the accommodation and food services sector are also larger based on the average annual payroll per establishment. This is an expected result given the large number of recreational users of Sebelius Reservoir.

Table 12: Number of Establishments and Average Annual Payroll per Establishment, Retail Trade 2015

County	Number	Payroll
Norton County, Kansas	28	$157,500
Graham County, Kansas	17	$138,765
Rooks County, Kansas	28	$134,464
Decatur County, Kansas	16	$105,438
Sheridan County, Kansas	17	$102,765
Phillips County, Kansas	36	$100,944

Source: U.S. Census Bureau

Table 13: Number of Establishments and Average Annual Payroll per Establishment, Accommodation and Food Services 2015

County	Number	Payroll
Norton County, Kansas	14	$138,071
Graham County, Kansas	15	$72,000
Rooks County, Kansas	7	$61,571
Decatur County, Kansas	6	$60,500
Sheridan County, Kansas	6	$46,667
Phillips County, Kansas	14	$45,500

Source: U.S. Census Bureau

Another way of examining retail economic activity at the county level is through the use of county trade pull factors. Trade pull factors larger than 1.00 are associated with counties that have more robust retail economic activity, as measured by state sales tax collected, than the state wide average. A trade pull factor greater than 1 means that the county is pulling consumers into its businesses. Those counties with values less than 1.00 have less retail economic activity. That is, people in the county are leaving the county to purchase items.

Table 14 shows the trade pull factors for the counties in the 18-county region. The counties with the highest values are generally located along the I-70 corridor. These counties are marked with an asterisk in Table 16. Among the remaining counties, Norton County has one of the higher values. Again, this reflects the impact of recreational users of Sebelius Reservoir.

Table 14: Kansas County Trade Pull Factors, 2015

County	Trade Pull Factor
Norton	0.87
Decatur	0.60
Phillips	0.70
Sheridan	0.86
Graham	1.13
Rooks	1.02
Cheyenne	0.64
Rawlins	0.83
Smith	0.68
Sherman*	1.25
Thomas*	1.61
Osborne	0.79
Wallace	0.77
Logan	1.17
Gove*	1.24
Trego*	1.01
Ellis*	1.59
Russell*	0.91

Source: Institute for Policy & Social Research, The University of Kansas; data from Kansas Department of Revenue

Table 15 shows the number of registered watercraft per 1,000 people in the 18-county region. The counties with the largest number of watercraft per 1,000 have a second destination within a relatively short distance. This is most noticeable for Trego County with Cedar Bluff Reservoir. The tax rate for watercraft is the same in all counties so there is no advantage to registering in a particular county. An owner may store the watercraft either where he/she lives or where the watercraft is primarily used and the tax is the same. So, for example, an owner living in Ellis County might prefer to store the watercraft near Cedar Bluff in Trego County. Since Trego County has a low population of people and a reservoir the number of watercraft per 1,000 people is larger.

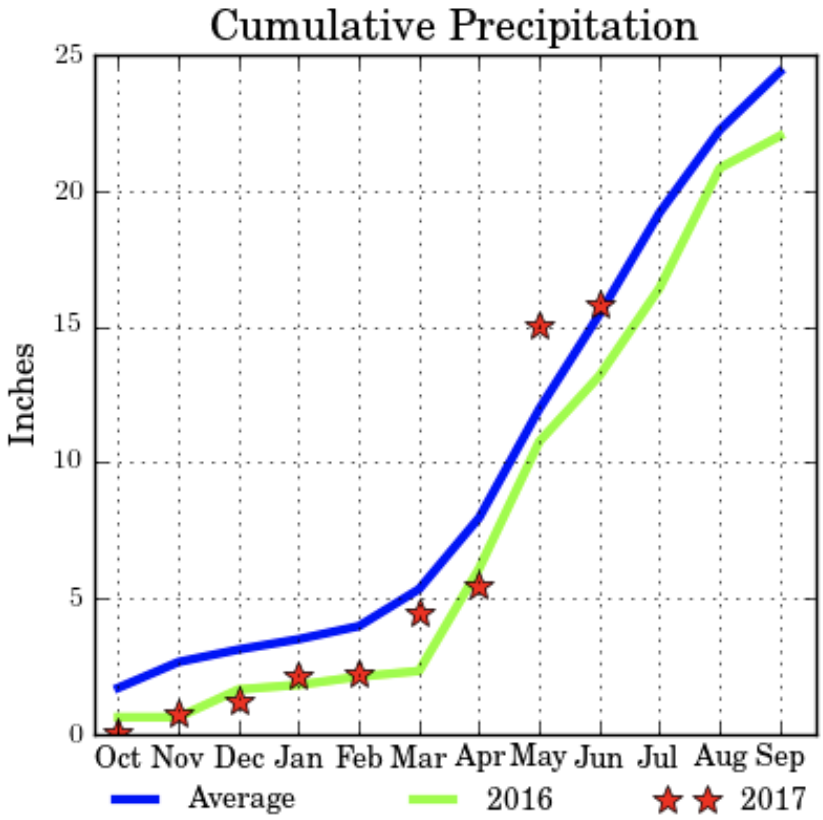
Table 15: Watercraft Registrations

County	Watercraft per 1,000 people
Norton	39
Decatur	39
Phillips	48
Sheridan	61
Graham	62
Rooks	54
Cheyenne	41
Rawlins	47
Smith	43
Sherman	31
Thomas	37
Osborne	54
Wallace	35
Logan	38
Gove	52
Trego	129
Ellis	32
Russell	60

Source: Kansas Department of Water, Parks, and Tourism

Graph 4 shows the 30-year average, monthly, cumulative precipitation at Sebelius Reservoir, highlighting 2016 and 2017. The graph shows that precipitation for 2016 and 2017 was below the 30-year average, except for May and June of 2017.

Graph 4: Precipitation at Sebelius Reservoir



Source: Bureau of Reclamation

Table 16: Sebelius Reservoir Selected End of Month Elevations, 1997 - 2005

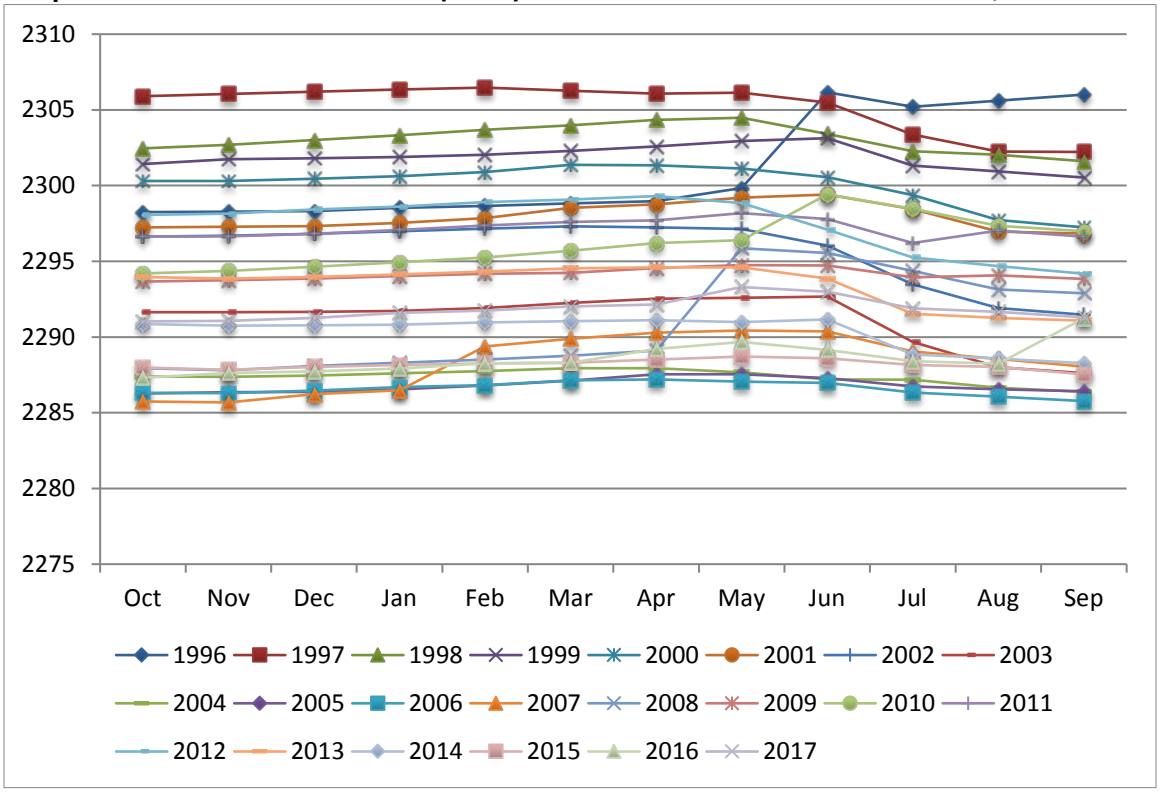
Year	Feb	Aug	Change in elevation end of February to end of August
1997	2,306.47	2,302.24	-4.23
1998	2,303.68	2,302.04	-1.64
1999	2,302.03	2,300.93	-1.10
2000	2,300.90	2,297.73	-3.17
2012	2,298.91	2,294.68	-4.23
1996	2,298.65	2,305.61	6.96
2001	2,297.86	2,296.97	-0.89
2011	2,297.36	2,297.02	-0.34
2002	2,297.16	2,291.92	-5.24
2010	2,295.25	2,297.34	2.09
2013	2,294.33	2,291.25	-3.08
2009	2,294.17	2,294.06	-0.11
2003	2,291.92	2,288.01	-3.91
2017	2,291.75	2,291.65	-0.10
2014	2,290.97	2,288.57	-2.40
2007	2,289.37	2,288.55	-0.82
2008	2,288.52	2,293.13	4.61
2015	2,288.26	2,288.03	-0.23
2016	2,288.26	2,288.23	-0.03
2004	2,287.76	2,286.65	-1.11
2006	2,286.83	2,286.07	-0.76
2005	2,286.79	2,286.55	-0.24

Source: Bureau of Reclamation, FB.EOM

Table 16 shows the end of month elevations of Sebelius Reservoir for February and August from 1996 to 2017. It also shows the change in elevation between February and August. On average, about 18 inches of precipitation falls on the reservoir during this six-month period (see Graph 4). This is also the period when water is released for irrigation and when evaporation is greatest.

Graph 5 shows that the end of the month (EOM) elevation level of Sebelius Reservoir tend to generally decline from June through September. Summer's heat and winds increase the rate of evaporation from the water surface, and there is increased use of water by both irrigators and municipal users.

Graph 5 End of the Month (EOM) Sebelius Reservoir Elevation Levels, 1996 - 2017

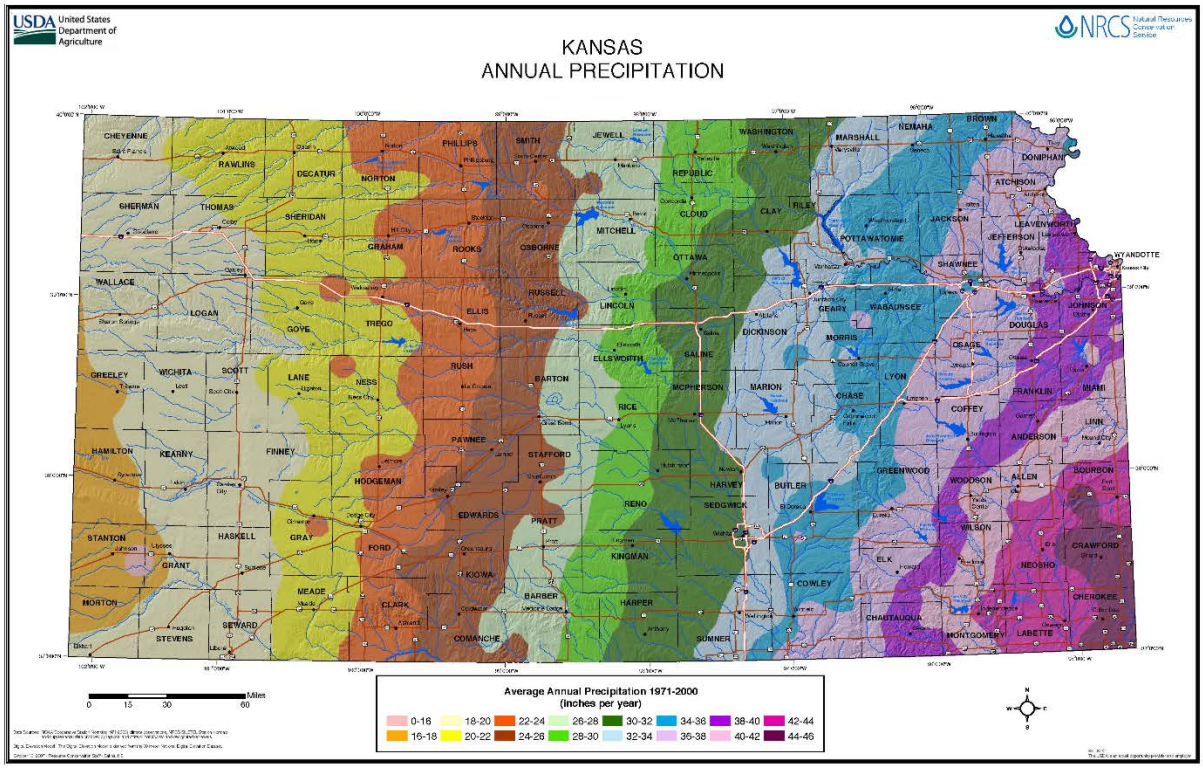


Source: Data from Bureau of Reclamation website

Map 2 shows the average annual precipitation across Kansas. Both of these point to one of the major issues for Sebelius Reservoir: the limited natural recharge of its watershed. Therefore, maintaining a relatively constant reservoir level becomes important to all users.

Kansans, particularly in western Kansas, have responded to this issue in several ways. Modern farming methods utilize a variety of techniques that were developed in the last 50 years. Both terracing and no till methods reduce the amount of run off from fields. Global Positioning Systems (GPS) promise more precise planting, growing, and harvesting of crops. Low pressure irrigation systems are becoming the norm for irrigated fields. In homes and business, low-flow fixtures are now required. Finally, effluent water from waste disposal systems is returned to the environment. All of these changes affect how and how much water we use.

Map 2: Kansas Annual Precipitation



Source: USDA

Sebelius Reservoir is the most northwestern reservoir in Kansas. There are larger reservoirs to the east and south (Kirwin, Wilson, and Cedar Bluff) as well as in Nebraska to the north and west (Harlan County, Harry Strunk Lake, Red Willow/Hugh Butler, and Swanson Reservoir).

Map 3 shows the "constellation of lakes" in the study area (with the inclusion of Frontier County, Nebraska). The lakes and reservoirs similar to Keith Sebelius Reservoir include four lakes in Nebraska (Hugh Butler, Harry Strunk, and Harlan County), Swanson Reservoir, and three reservoirs in Kansas: Kirwin, Wilson, and Cedar Bluff.

Map 3: Constellation of Lakes

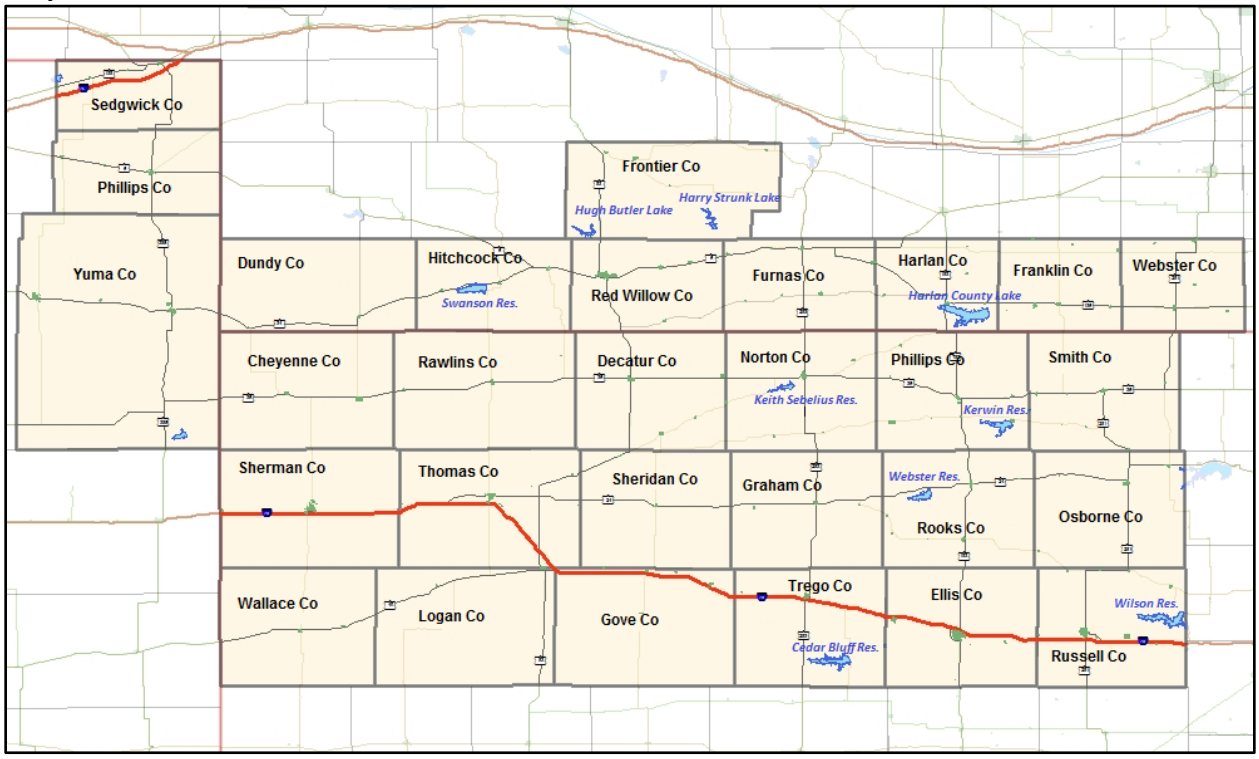


Table 17 (next page) shows annual visitation to the lakes, reservoirs, and parks as well as the source of information.

Table 17: Annual Visitations to Lakes and Reservoirs (2016)

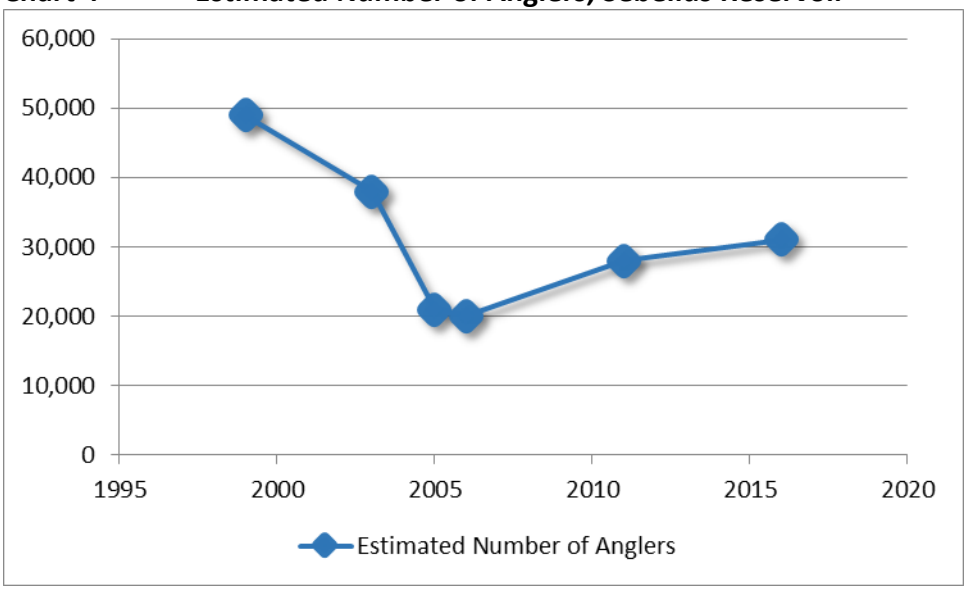
Location	Annual Visitation	Source
Keith Sebelius Reservoir	172,314	2016 Annual Report, Prairie Dog State Park
Kirwin Reservoir	90,000*	Phone Call - KDWPT
Wilson Reservoir	214,698	Email - KDWPT
Cedar Bluff Reservoir	175,573	Email - KDWPT
Harlan County Lake	500,000*	Phone Call – US Army Corps of Engineers
Harry Strunk Lake	Info. Not Avail.	Phone Call – NE Game & Parks, Cambridge
Hugh Butler Lake	62,625	Phone Call – NE Game & Parks, McCook
Swanson Reservoir	68,075	Phone Call – NE Game & Parks, Stratton

*These numbers are rounded estimates.

These other lakes and reservoirs provide both competition and alternatives that may encourage recreational users in the surrounding area to invest in durable goods (watercraft, recreational vehicles, sporting equipment) and to spend more time using these venues.

Chart 4 shows the estimated number of anglers at Keith Sebelius Reservoir from 2005 to 2016. About 49,000 anglers visited the reservoir in 1999, while about 20,000 visited in 2006. The most recent year of available data (2016) shows that about 31,000 visited that year.

Chart 4 Estimated Number of Anglers, Sebelius Reservoir



Source: Kansas Department of Water, Parks, and Tourism

Table 18: Sebelius Reservoir Elevation, Selected Years

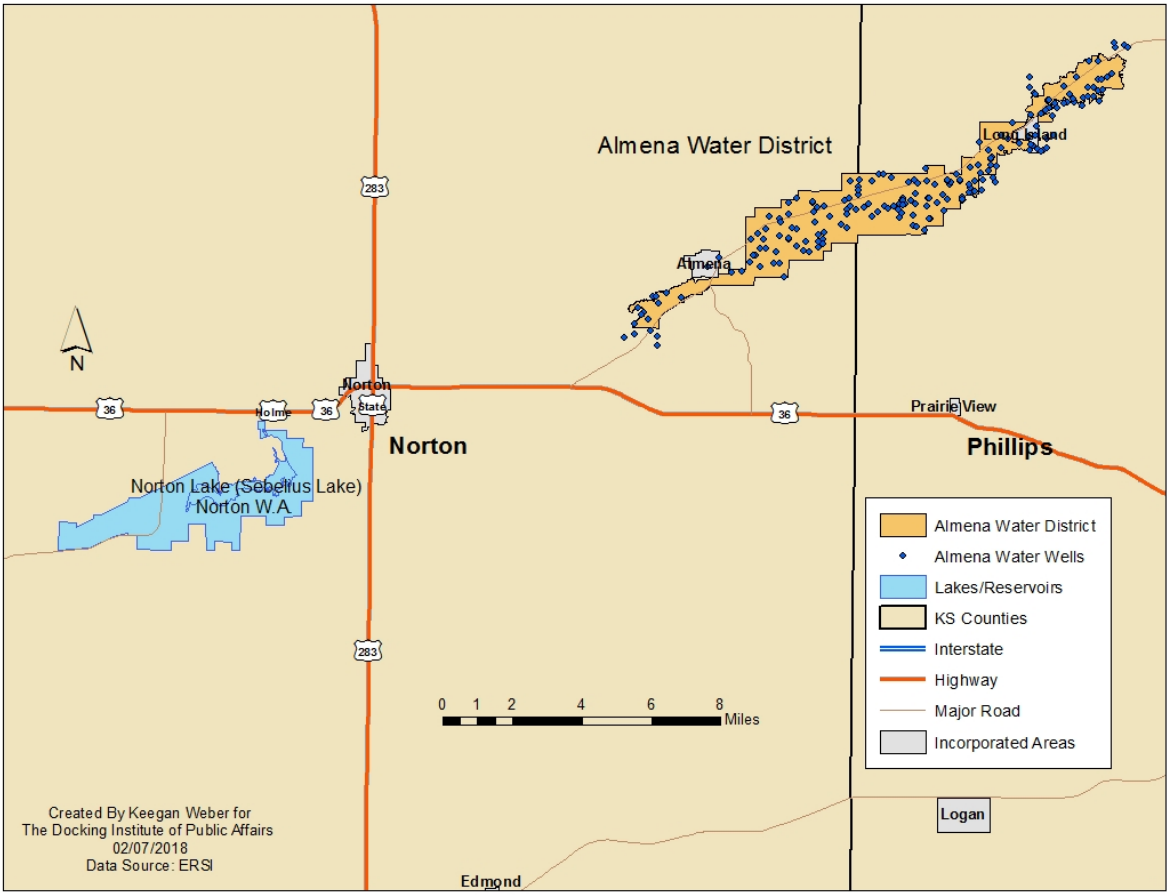
Year	February	change in elevation end of February to end of August
1999	2,302.03	-1.1
2003	2,291.92	-3.91
2005	2,286.79	-0.24
2006	2,286.83	-0.76
2011	2,297.36	-0.34
2014	2,290.97	-2.4

Source: Data from Bureau of Reclamation website

Table 18 shows the elevation of Sebelius Reservoir at the end of February for the years that angler numbers are shown in Chart 4. It also shows the change in elevation from the end of February to the end of August for each of those years.

Map 4 shows the locations of irrigation wells and pumping locations along Prairie Dog Creek that are located in or within 0.5 miles of the Almena Irrigation District #5. The rights were established after the authorization of the Keith Sebelius Reservoir and reflect the utilization by land owners and farmers of improved techniques for irrigation.

Map 4: Almena Irrigation District #5



Source: Data from Mark Billinger, Assistant Water Commissioner, Stockton Field Office, Division of Water Resources, Kansas Department of Agriculture