



**SOUTH DAKOTA** DEPARTMENT OF  
AGRICULTURE & NATURAL RESOURCES

Thank you for reviewing this draft report entitled “*Report to the Water Management Board On Reexamining James River management.*” Please note this version of the report is subject to modification based on submitted comments or other information that may become available.

The Water Management Board will be provided a final draft report and any submitted comments approximately ten days prior to their December 4, 2024 Board meeting. This will provide the Board the opportunity to review the final draft and comments in advance of their December 2024 meeting.

You may either send a comment by emailing [DANRmail@state.sd.us](mailto:DANRmail@state.sd.us) Attn: Brittan Hullinger or by using [this link for an online comment form](#). Comments may also be mailed to: SD DANR Water Rights Program, 523 E. Capitol Ave, Pierre SD 57501 and need to be received by **Wednesday, November 20, 2024**. If you are seeking a response from DANR to your comment, please indicate so in the comment.

At the meeting, the Board may adopt the final draft, modify and adopt the final draft, not adopt, or take no action. The final draft report being considered by the Board will be available at this same link - <https://danr.sd.gov/public/jamesriver.pdf>.

A link to listen to a livestream of the December 4, 2024 meeting will be available at <https://www.sd.net/>. If you wish to address the Board, you may participate by attending the meeting in Pierre or connecting remotely. The Board agenda and other details will be made available on the SD Boards and Commission Portal at <https://boardsandcommissions.sd.gov/> and then searching for “Water Management Board.”

If you have any questions about the draft report, please call 605.773.3352 and ask to speak to Brittan Hullinger.

Thank you again for reviewing the report and providing any comments you may have.

*Report to the Water Management Board  
On Reexamining James River Management*

*November 21, 2024*

Introduction

The James River in South Dakota has been through numerous investigations and management changes through the decades to place the waters of the state to maximum beneficial use, while at the same time maintaining enough flow for existing rights and domestic uses. River systems in South Dakota pose a challenge for water management because streamflow and weather are unpredictable and often change quickly. The best policies in water management are those that can adapt to a wide range of water availability and water use scenarios.

There is currently a set appropriation threshold of 300 cubic feet of water per second on the James River set by the Water Resources Commission in 1965. A recent influx of water permit applications has prompted the Water Rights Program to investigate James River management once again because, since the late 1990's, there has been a near 300% increase in mean annual James River streamflow compared to previous streamflow records.

This report will investigate the history of James River management in South Dakota, the amount of streamflow required for existing rights and domestic use, the probabilities of available flows using daily discharge data dating back to 1946, possible causes to the increasing streamflow and the likelihood of increased flow continuing in the future, the determination of possible new methods of managing appropriations and qualifications for any new Water Permits that may be established on the James River, and how existing rights and domestic water use can be protected given the variability of streamflow in the James River.

South Dakota Codified Law (SDCL)

In general, South Dakota Codified Law (SDCL) Chapter 46-1 provides that the waters of the state belong to the people of the state, shall be placed to maximum beneficial use, and that water will not flow to waste. This chapter also provides the Water Management Board (WMB) with authority to issue water right permits, rules, and qualifications for water right permits, as well as to modify any qualifications. The pertinent statutes to this report are listed in full in the Appendix as **Attachment A1**.

Review of the James River

Originating in North Dakota, the James River flows southward across South Dakota and discharges into the Missouri River east of Yankton. In South Dakota, the river occupies a relatively flat plain between the highlands of the Coteau du Missouri to the west and the Coteau des Prairies on the east (Benson, 1983).

The James River is extremely meandering and has very little vertical gradient. The river is estimated to have approximately one inch of drop per mile in southern Brown County. This is one of the flattest slopes of any river of similar length in North America (Benson, 1983). Downstream of Redfield, the channel capacity and the slope increase, although the average gradient of the river in South Dakota is still only approximately 0.7 feet of drop per mile. Water

in the James River moves slowly, and travel times of water are measured in weeks, rather than by hours or days (USACE, 2018). The natural channel is shallow and wide, with low banks that often overtop during high flows. The river has been said to “belly up” during these events, when water widely covers the flat, low plain around the channel. Extended periods of no flow during late summer and winter can also be expected (Benson, 1983). Due to the flat gradient of the James River, the river occasionally flows backwards, creating negative discharge values in the northern reach of South Dakota at the confluence of tributaries during high flow events (USACE, 2014).

Primarily, to the extent that James River flows are controllable, Jamestown and Pipestem reservoirs in North Dakota and the operation of the impoundments on Sand Lake National Wildlife Refuge in South Dakota affect flows in the river in South Dakota (James River Technical Committee Model Studies, 1985). During high flow periods, the primary objective at Pipestem and Jamestown is to evacuate both pools as quickly as possible, following the spring runoff. The dams also conserve water during the spring of low flow years and water is released as constantly as possible during June, July, and August from the two reservoirs to sustain fish, irrigation, recreation, and wildlife (USACE, 2014). Two low head dams are located on the mainstem of the James River near Huron. They are the James Diversion Dam and the Third Street Dam. Several other smaller dams were privately constructed, and some serve primarily as recreation areas on the river (James River Technical Committee Model Studies, 1985).

The United States Geological Survey (USGS) operates a streamflow gaging station network in the United States, collecting realtime streamflow data, and retaining historical records (USGS, 2019). Stream gaging stations located on the James River are listed in **Table 1**. The records are usually continuous, although missing data or zero flow years may be present. These data were used to construct flow frequency curves for certain streamgages on the James River.

**Table 1.** Current streamflow data stations on the James River mainstem (USGS, 2019).

Station Number	Station Name	Years of Daily Discharge Data
06468170	James River near Grace City, North Dakota	56
06468250	James River above Arrowwood Lake near Kensal, North Dakota	39
06470000	James River at Jamestown, North Dakota	96
06470500	James River at LaMoure, North Dakota	74
06470878	James River at North Dakota/South Dakota State Line	43
06471000	James River at Columbia, South Dakota	79
06472000	James River near Stratford, South Dakota	74
06473000	James River at Ashton, South Dakota	79
06475000	James River near Redfield, South Dakota	74
06476000	James River at Huron, South Dakota	81
06477000	James River near Forestburg, South Dakota	74
06478000	James River near Mitchell, South Dakota	71
06478500	James River near Scotland, South Dakota	96
06478513	James River near Yankton, South Dakota	43

Prior Actions of the Water Resources Commission and Water Management Board

In 1965, the Water Resources Commission (a predecessor to the Water Management Board) set a provisional 300 cfs threshold on appropriations from the James River. James River appropriations up to 300 cfs were to have an August 10<sup>th</sup> cutoff date with the possibility of several hundred additional cfs being approved with a July 1<sup>st</sup> cutoff date (Water Resources Commission, 1965). The basis for setting the threshold and cutoff dates was a significant number of pending applications resulting in a report prepared for the Water Resources Commission entitled “James River; Stream Flows and Water Right Permits.” The report stated that flow records indicate that there was usually more than sufficient water in the early spring and early summer and little or no flow in the late summer. The report concluded with a recommendation to approve the existing applications with an August 10<sup>th</sup> cutoff date; permits do not authorize diversion of water at any time when the river flow is obviously low; diversions to be in accordance with any written orders issued by the Commission or its representative; a combined diversion of 200 cfs of water could be approved above Huron; and that a combined diversion of 300 cfs could be approved above the Yankton-Hutchinson County line. The report included that when 300 cfs was reached, several hundred additional cfs could be approved with a July 1<sup>st</sup> cutoff date (Water Resources Commission, 1965).

Water permits continued to be approved from the James River until May 1968 when 300 cfs was reached. Despite the mention in the 1965 report to the Water Resources Commission of allowing issuance of permits in excess of 300 cfs, all applications for the James River were deferred until September 1975 when staff reported that some permits were not fully developed, and others could be cancelled, allowing new permits to be considered. Consequently, further permits were issued at that time to bring the total permitted appropriations up to 300 cfs. Additional applications received after November 1975 were deferred and then advertised for the January and March meetings in 1979. The Water Resources Commission decided in March 1979 to withdraw the James River from further appropriation for one year until additional study was conducted to determine if there was unappropriated water available. In July of 1980, based on the studies conducted by the Water Rights Program, the Water Management Board adopted Findings of Fact, Conclusions of Law and a Final Decision to issue water permits on the James River beyond a 300 cfs threshold. Two of those decisions were: 1) Based on such studies of actual irrigation development and use, it is projected that a maximum of 50 percent of permitted acres will be irrigated at any one time, and 2) Those permits applying beyond a 300 cfs threshold could be approved with a July 15<sup>th</sup> cutoff date (Water Management Board, 1980).

Inspections of water rights/permits in the spring of 1985 found that the total water appropriation from the James River was 254.07 cfs. Previously, the total James River water appropriation had been 443.92 cfs based on existing records. The WMB meeting in May 1987 approved a recommendation that all James River water rights/permits with July 15<sup>th</sup> cutoff dates be amended to replace the July 15<sup>th</sup> cutoff date with the August 10<sup>th</sup> cutoff date (Duvall, 1987).

Appropriations on the James River have not exceeded 300 cfs since inspections during the spring of 1985 found the total water appropriation to be 254.07 cfs.

In 2007, the WMB adopted standardized qualifications for the James River (Beck, 2007). The James River was divided into three river reaches: 1) ND-SD border to the USGS gage at Ashton, SD; 2) USGS gage at Ashton, SD to USGS gage at Huron, SD, and 3) USGS gage at Huron, SD to the Yankton-Hutchinson County line. Existing water rights/permits were amended to include standardized qualifications with the intent of using the same qualifications on future James River water rights/permits. To address times when water availability is scarce, the WMB placed the following qualifications on certain James River permits: 1) Permits do not authorize diversion of water from the James River after August 10<sup>th</sup> of each calendar year, unless written orders have been issued by the Chief Engineer. Diversions are subject to senior water rights and any written orders issued by the Chief Engineer, and 2) Permits do not authorize diversion from the James River when there is less than 20 cfs bypassing the USGS streamgage where the closest downstream gage is at Ashton, at Huron, or near Scotland.

Since 1965, appropriations from the James River have been issued both within, and in excess, of 300 cfs with certain cutoff dates. The James River has undergone multiple studies by the Water Rights Program to evaluate existing permits/rights, amendments to qualifications, and the availability of water.

This year multiple new permit applications have requested to place to beneficial use water from the James River. These applications, if approved, would result in excess of 300 cfs being appropriated from the river in total, and excess of 200 cfs appropriated for the reach of the river between the ND-SD border and the USGS gaging station at Huron SD. This report intends to be an updated study by the Water Rights Program to determine under what conditions, if any, appropriations beyond a 300 cfs and 200 cfs thresholds can be approved and, if approved, what qualifications need to be attached to protect domestic users and existing water right/permit holders from unlawful impairment. The James River is the only river in South Dakota where a specific cfs value (200/300 cfs) is associated with the amount of water appropriated from the river and what qualifications get assigned to permits depending on whether the permit is issued within a total of 200/300 cfs or in excess of 200/300 cfs.

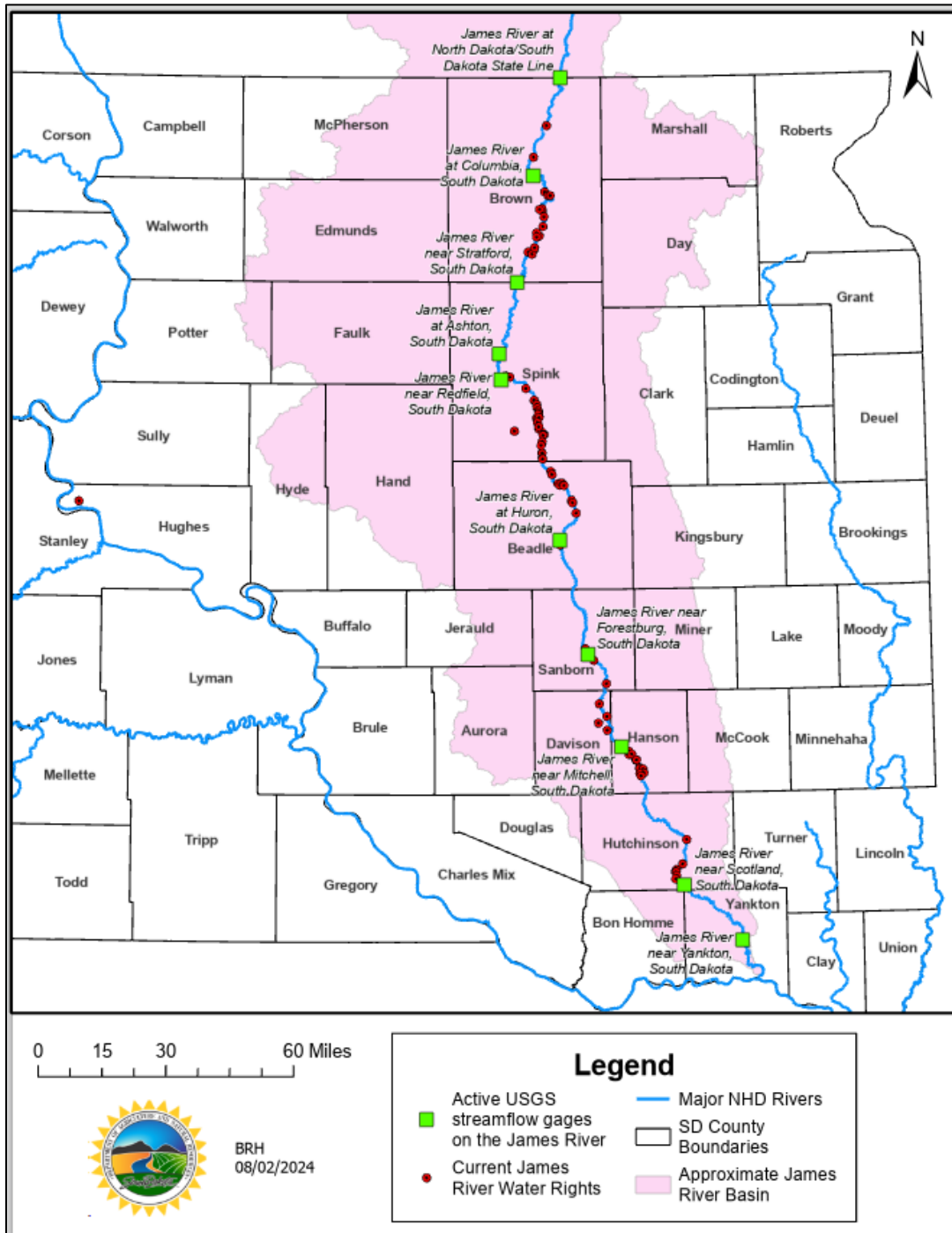
#### Review of Existing Water Rights/Permits

Currently there are 116 water rights/permits and two future use permits appropriating or reserving 298.92 cfs of the 300 cfs appropriation threshold between the ND-SD border and the Yankton-Hutchinson County line. Of those 116 water rights/permits, 77 are appropriating 199.19 cfs of the 200 cfs appropriation threshold between the ND-SD border and the USGS gaging station at Huron, SD (Water Rights, 2024a).

Future Use Permit No. US594-3 held by the U.S. Bureau of Reclamation reserves 500 cfs from the James River and other sources. The majority of the water reserved by this permit and attributed to the James River would have come from Missouri River return flows created by the defunded and non-constructed Oahe Project. Originally, the reservation of water was by Future Use Permit No. 1067-3 held by the Oahe Conservancy Sub-District, but the permit was transferred to the Bureau of Reclamation under Future Use Permit No. US594-3 in 1974. The remainder of Future Use Permit No. 1067-3 was cancelled by the Water Management Board in 2012. Since the source of the majority of the water reserved by US594-3 was to be from a federal

irrigation project that was never constructed and has been defunded, the status of the reservation is uncertain (Water Rights, 2024a).

**Attachment A2** in the Appendix lists the active water rights/permits and future use permits on the James River. **Figure 1** shows the locations of existing water rights/permits and USGS streamgages on the James River in South Dakota. The water right marker located on the Missouri River in Hughes County is Future Use Permit No. US594-3.



**Figure 1.** Map of existing James River water rights/permits between the ND-SD border and the Yankton-Hutchinson County line, active USGS streamgages on the James River in South Dakota, and an approximate boundary of the James River basin (USGS, 2019; Water Rights, 2024a).

### Review of Deferred Water Rights/Permits

There are currently 14 deferred water permit applications to appropriate from the James River. Water Permit Application Nos. 8821-3, 8822-3, 8823-3, and 8824-3 for Jim or Colin Klebsch along with Water Permit Application No. 8835-3 for Nick & Scott Bebo were deferred at the May 8<sup>th</sup> 2024 WMB meeting until completion of this review on the James River. Since then, there have been nine new water permit applications for the James River, also submitted by Klebsch and Bebo. Those are Application Nos. 8859-3, 8860-3, 8861-3, 8862-3, 8863-3, 8867-3, 8868-3, 8869-3, and 8870-3, which were all deferred by the WMB at the July 10, 2024 meeting. In total, these applications are requesting 34.38 cfs to irrigate 2,603 acres from the James River, all located near Redfield, SD. Full descriptions of these applications are listed in the Appendix as **Attachment A3**.

If Water Permit Application No. 8821-3 had been approved, it would have exceeded 200 cfs in the river stretch between the ND-SD border and Huron and left 0.27 cfs below 300 cfs (Water Rights, 2024a). All of the other deferred James River applications are also located in the 200 cfs stretch of the river. This report addresses whether new applications can be approved with qualifications that protect existing water permits/rights and domestic water uses. To this end, the WMB deferred all James River applications until the Fall/Winter 2024 pending completion of this review for WMB consideration.

### Current James River Appropriation

Currently, 199.19 cfs of the 200.00 cfs is appropriated on the James River between the ND-SD border and the USGS gaging station at Huron, and 298.92 cfs of the 300.00 cfs is appropriated between the ND-SD border and the Yankton-Hutchinson County line (Water Rights, 2024a).

According to the Findings of Fact and Conclusions of Law from the July 1980 WMB meeting, it is projected that a maximum of fifty percent of permitted acres will be irrigated at any one time based on studies of actual irrigation development and use. This conclusion was reached after Water Rights staff conducted detailed hydrographic surveys of the availability of water in the river and studies of the anticipated effects of approving water permits based on projected development and use by appropriators. The review to estimate maximum pumping at any given time was redone using irrigation questionnaires from 1996 to 2006 (Beck, 2007). The maximum number of acres irrigated at any given time in each river reach was as follows:

ND-SD border to USGS gage at Ashton	<b>52%</b>
USGS gage at Ashton to USGS gage at Huron	<b>42%</b>
USGS gage at Huron to Yankton-Hutchinson Co. Line	<b>29%</b>

Future Use Permit No. 8512-3 for the City of Aberdeen is assumed to be fully developable. James River water rights/permits that are limited only by an annual volume, i.e., storage dams, have not historically been included in the 300/200 cfs appropriation budget and will not be

included here (**Attachment A2**) (Water Rights, 2024a). Future Use Permit No. US594-3 will also not be included in the budget since the basis for the water being available at a future date no longer exists. Since reporting for use other than irrigation is limited, 100% pumping is assumed at any given time. Additionally, 20 cfs is budgeted for domestic use for each stretch. **Table 2** shows the current appropriated water in each of the three river stretches, and the estimated flow required for each stretch of the James River to satisfy current appropriations and domestic use.

**Table 2.** Estimated flow required for current appropriations and domestic use (Water Rights, 2024a; Beck, 2007)

River Stretch	Total Permitted (cfs)	Irrigation use (cfs)	50% Irrigation (cfs)	Non-Irr (cfs)	Domestic (cfs)	Flow Required (cfs)
ND-SD Border to Ashton gage	39.14	24.14	12.07	15	20	<b>47.07</b>
Ashton gage to Huron gage	160.05	141.02	70.51	19.03	20	<b>109.54</b>
<b>TOTAL (200 cfs limit)</b>	<b>199.19</b>					
Huron gage to Yankton-Hutchinson Co. Line	99.73	95.95	47.975	3.78	20	<b>71.76</b>
<b>TOTAL (300 cfs limit)</b>	<b>298.92</b>					

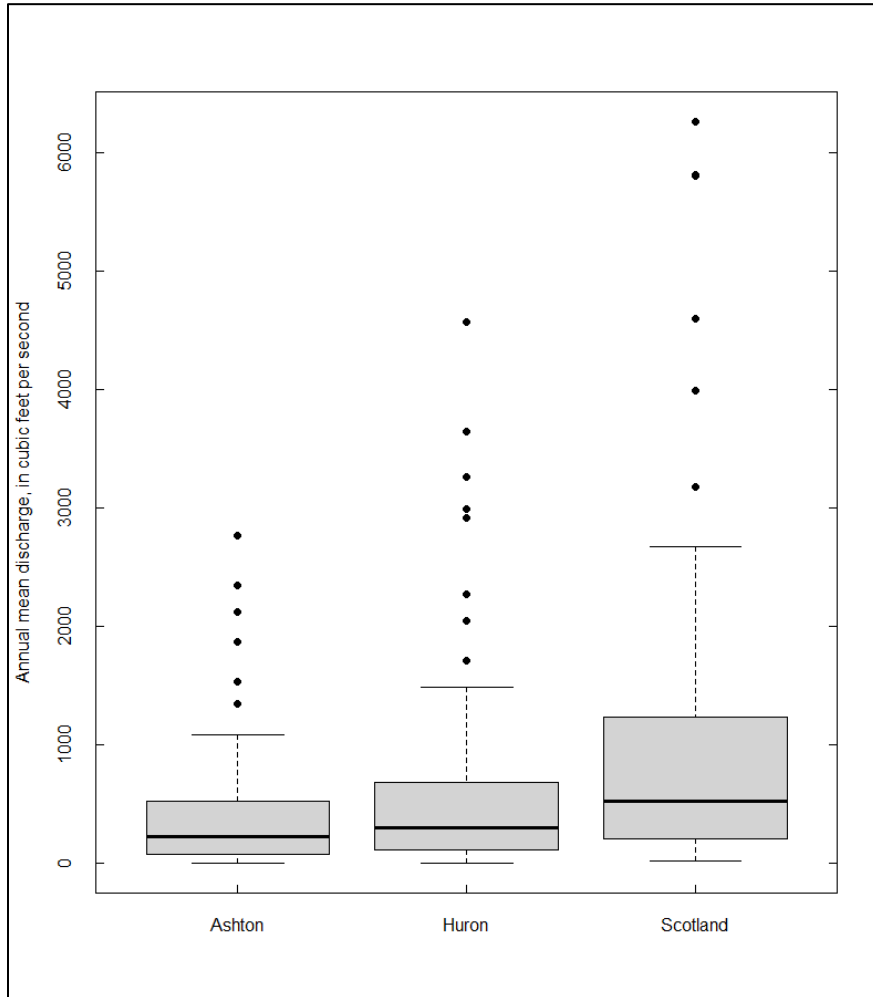
### James River Flow Characteristics

A dataset is a collection of measurements that are used to learn about a population. The population in this case is James River streamflow in South Dakota. USGS gages for the James River at Jamestown, ND and near Scotland, SD have 96 years of daily discharge data available (**Table 1**). While 96 years is a long time, those daily discharge data are still a sample, and using those available data to try and characterize the overall population can be a challenge (Helsel, et al., 2020). When the appropriative threshold was set in 1965, flows were only analyzed for the years 1950 to 1963 (Water Resources Commission, 1965).

A sample dataset needs to correctly characterize the population to avoid arriving at incorrect conclusions, which can be significant. The implications of a sample dataset not correctly characterizing the population are huge. For example, it is known today that the Colorado River Compact of 1922—the water allocation compact that divides Colorado River flows between the upper and lower Colorado River basin states—was signed during a period of relatively high annual flows. The first streamgages for the Colorado River were established in the 1890’s, and the compact was written in the 1920’s. There was an assumption that the river had a single, mean value of annual flow, and that annual variations occurred around this long-term, fixed average. This fixed average was based on the climate and hydrology of the late 1890’s and of the early 1900’s, which was an exceptionally wet period. It is known now that the gaged record of the Colorado River streamflow covers only a small subset of the range of natural hydroclimatic variability present over several centuries (National Research Council, 2007). Assuming that 20, 30, 40, or even 96 years of streamflow observations give a full representation of flow variability is incorrect, although the longer the period of record, the better when performing an analysis.

One method to help characterize the population of sample data is to use box plots. The boxplots are annual mean discharge data for each of the three gages of interest, for the years 1946-2023,

and can be seen in **Figure 2**. In order to correctly interpret the data between stations, records examined in a multiple station study must be concurrent (Helsel et al., 2020); for example, the streamgauge near Scotland has daily mean flow data going back to 1928, while the Ashton gage only has data available from 1945 to the present.



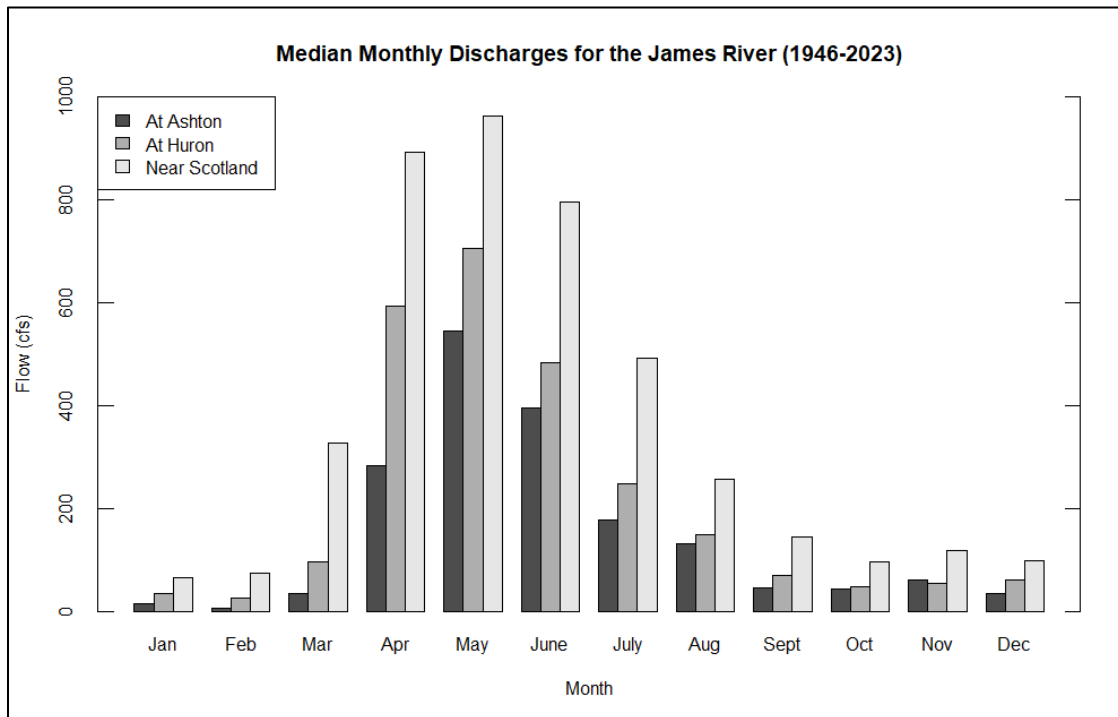
**Figure 2.** Three boxplots of annual mean discharge data for USGS gages James River at Ashton, at Huron, and near Scotland, South Dakota, for the water years 1946-2023 (Hirsch and De Cicco, 2015; USGS, 2019). A water year is defined as the 12-month period of October 1, for any given year through September 30, of the following year.

A boxplot is a way of displaying data based on the minimum, the first quartile (the median of the lower half of the dataset), the median of the whole dataset, the third quartile (the median of the higher half of the dataset), and the maximum. The box itself represents the middle 50% of the data (the interquartile range), with the bottom of the box being the first quartile and the top of the box being the third quartile. The minimum and maximum of the dataset are the lines at the end of the dashes (called whiskers) and are within 1.5 times the interquartile range. The outliers are the single points outside of the whiskers. Looking at **Figure 2**, the annual mean discharge data for those three sites are positively skewed, which is common in hydrologic data and represents

periodic high flows that are far from the center of the distribution. This makes the mean of the data greater than the median, as the mean is strongly affected by the magnitude of any single observation (Helsel et al., 2020). The median is the central value of the distribution based on rank, with an equal number of data points above and below. The median is the solid black line within the box. In a positively skewed boxplot, the median is shifted towards the first quartile. The positive skew is also indicated by the longer whiskers on the top of the box, and because the distance between the maximum and the box is larger than between the minimum and the box. For these James River gages, there are extreme high flow data extending beyond the whiskers, and the further downstream the gage, the greater the magnitude of high flow, and the outliers are further spread out. The Ashton gage has more tightly clustered data, since its box is shorter, compared to the Scotland gage, which has more dispersed data. All of this suggests that the available discharge data for James River streamflow has a non-normal distribution, and it is preferable to use statistical techniques that work over a wide range of situations.

### Water Availability at Current Appropriation

In order to determine water availability on the James River, it is important to know the general distribution of flow during the year. **Figure 3** was constructed by finding the median flow for each month of the year using daily discharge data for each of the years 1946-2023, for three James River streamgages at Ashton, at Huron, and near Scotland. Then, the median for each of the 78 years was found for a particular month.



**Figure 3.** Bar graph of median monthly discharges for the James River at Ashton, at Huron, and near Scotland using daily mean discharge data for the years 1946-2023 (Hirsch and De Cicco, 2015; USGS, 2019).

Flows on the James River increase downstream, as seen in **Figure 3** where median monthly flows near Scotland are greater than median monthly flows at Ashton. Contributing factors include a larger drainage basin, a higher capacity channel, a larger gradient, and generally more annual precipitation in southern counties in the basin. The river has potential for relatively high flows during spring from snowmelt and during early summer from thunderstorms. Flows begin decreasing uniformly after May and then levels out from September through December. Since approximately 87% of total flow appropriation on the James River mainstem is for irrigation use (**Table 2**), the bulk of the analysis will focus on the months of May, June, July, August, and September since these months are the typical irrigation season in South Dakota.

Flow duration curves, or flow exceedance probabilities, are a cumulative frequency curve that show the percent of time that discharges were equaled or exceeded during a given period (Benson, 1988). Small flows have a high likelihood of being exceeded, and large flows have a low likelihood. These curves provide context about the range of discharge values that are common and those that are extreme. There are factors of safety built into the analysis to assess water availability. All of the exceedance probabilities for each gage were calculated using flow data collected from the James River during years where pumping occurred. This means that using those flows to estimate the water availability based on current flow requirements (**Table 2**) upstream of a gage is an underestimation of the flow available, because pumping had already occurred in the upstream stretch of river before flows reached a downstream gage. To calculate required flow, 50% simultaneous irrigation pumping was assumed, and it was also assumed that 100% of all other uses will be pumping at the same time with 20 cfs added to account for domestic use between each stretch.

**Tables 3 through 7** show annual exceedance probabilities for flows at gaging stations at Ashton, at Huron, and near Scotland for the months of May, June, July, August, and September. For example, there is an 80% chance that daily flow in May for the gage at Huron will exceed 110 cfs, calculated using all daily data for that month, for the years 1946 to 2023. The exceedance probabilities were calculated using the Weibull plotting position. By using all the daily data for a certain month, for every available year of data to calculate exceedance probabilities, all recorded low-flow and high-flow scenarios for that month are included in the flow probabilities, providing a well-rounded view of James River flows.

**Table 3.** Exceedance probabilities of daily mean flows (cfs) during May at streamflow gaging stations on the James River in South Dakota for the years 1946 through 2023 (USGS, 2019).

Station Name	Years	80%	75%	50%	20%	10%	4%	1%
At Ashton	(1946-2023)	91	132	573	1440	3130	4330	6820
At Huron	(1946-2023)	110	173	650	2060	4520	6370	9050
Near Scotland	(1946-2023)	208	260	917	2250	4560	6700	9130

**Table 4.** Exceedance probabilities of daily mean flows (cfs) during June at streamflow gaging stations on the James River in South Dakota for the years 1946 through 2023 (USGS, 2019).

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Station Name	Years	80%	75%	50%	20%	10%	4%	1%
At Ashton	(1946-2023)	71	101	378	1170	2100	2930	3750
At Huron	(1946-2023)	80	112	496	1680	2980	4410	6320
Near Scotland	(1946-2023)	164	235	810	3040	4170	5600	8320

**Table 5.** Exceedance probabilities of daily mean flows (cfs) during July at streamflow gaging stations on the James River in South Dakota for the years 1946 through 2023 (USGS, 2019).

Station Name	Years	80%	75%	50%	20%	10%	4%	1%
At Ashton	(1946-2023)	44	61	224	1150	1770	2410	5200
At Huron	(1946-2023)	45	68	268	1450	2140	3330	7350
Near Scotland	(1946-2023)	78	105	479	1900	3160	5590	8880

**Table 6.** Exceedance probabilities of daily mean flows (cfs) during August at streamflow gaging stations on the James River in South Dakota for the years 1946 through 2023 (USGS, 2019).

Station Name	Years	80%	75%	50%	20%	10%	4%	1%
At Ashton	(1946-2023)	9	14	122	1060	1420	1940	4120
At Huron	(1946-2023)	8	24	151	1170	1950	2610	5560
Near Scotland	(1946-2023)	38	51	279	1290	2030	3770	8290

**Table 7.** Exceedance probabilities of daily mean flows (cfs) during September at streamflow gaging stations on the James River in South Dakota for the years 1946 through 2023 (USGS, 2019).

Station Name	Years	80%	75%	50%	20%	10%	4%	1%
At Ashton	(1946-2023)	0	0	46	687	1210	1680	2760
At Huron	(1946-2023)	0	0	71	789	1520	1990	3710
Near Scotland	(1946-2023)	22	30	137	898	1670	2500	4640

One observation from looking at **Tables 3 through 7** is that flows increase exponentially after 50% probability. This is because the sample data are positively skewed, and not normally distributed (**Figure 2**). Flows on the James River do not increase linearly, and this is why the flow magnitudes increase more in the lower exceedance probabilities than the higher. This is also why the median is a better indication of typical flow than the mean, because it is based on rank rather than magnitude.

The 50% exceedance probability, or the flow likely to be exceeded 1 of every 2 years, will be used for this analysis. This has been used in previous Water Rights Program reports when assessing the availability of streamflow (Water Rights, 2024a), and the current appropriation thresholds were made using “average streamflow” for the years 1950-1963 (July 1965 Findings of Fact). **Table 8** lists the current required flow upstream of each gage, the chance that the required flow will be equaled or exceeded, and the available flow at each gage based on the 50% exceedance probabilities.

**Table 8.** Summary of flow exceedance probabilities from **Tables 3 through 7**, required flow upstream of each gage (**Table 2**) and the available flow upstream of each gage.

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Gage	Required Flow to satisfy current upstream appropriation (cfs)	Chance that the required flow will be equaled or exceeded in May, June, July, August, and September	Flow at 50% Exceedance Probability for May, June, July, August, September (cfs)	Available Flow (cfs) (Flow at 50% - Required Flow)
At Ashton	47	85%, 82%, 79%, 65%, 49%	573, 378, 224, 122, 46	526, 331, 177, 75, 0
At Huron	109	80%, 75%, 67%, 56%, 42%	650, 496, 268, 151, 71	541, 387, 159, 42, 0
Near Scotland	71	92%, 85%, 74%, 64%, 54%	917, 810, 479, 279, 137	846, 739, 408, 208, 66

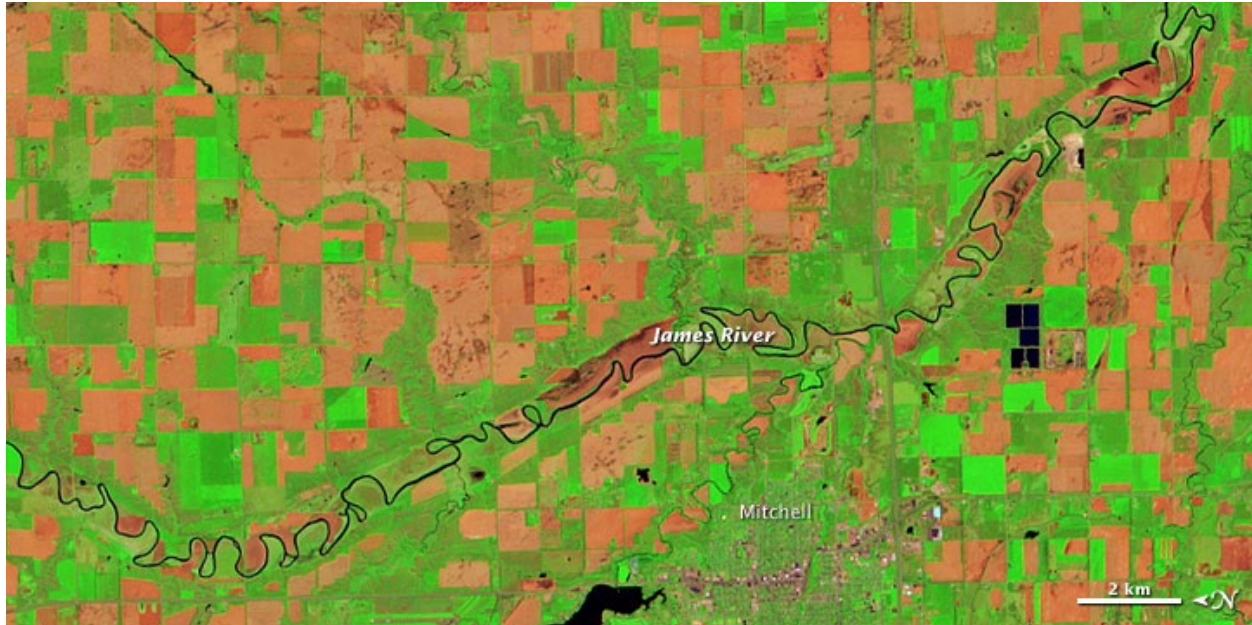
The 200/300 cfs thresholds themselves are likely to be exceeded 50% of the time for May, June, and July, while the required flows at any given time in a stretch of river to satisfy existing rights and domestic use are less than the 200/300 cfs threshold. It should be noted again that these numbers are the flow available after the river has already been pumped in the upstream stretch. Consequently, the data used in **Tables 3 through 7** to calculate the likelihood of available flow for diversions already reflects removal of those diversions from the dataset, resulting in quite conservative estimates of available flow.

Considering the flow probabilities in **Table 8** during the lower flow month of August, between Huron and Scotland, there is 279 cfs of flow at the 50% exceedance probability in August, and at least a 64% chance that the required flow between Huron and Scotland would be satisfied. As for the stretch of river with the 200 cfs threshold on it (ND-SD border to Huron gage), there are 122 and 151 cfs of flow at the 50% exceedance probability in August at the Ashton and Huron gage respectively (**Table 8**), indicating that during normal years there would be approximately 75, 42, and 208 cfs available between each respective stretch. Flows in September decrease significantly, however, the river during normal years still has greater than 20 cfs of flow.

The chances that there will be enough flow for current diversions during the months of May, June, July, and August, between all three streamgages, are at least 56%. For the gage in Ashton and near Scotland, there is at least a 64% chance that the current required flow upstream of the gage would be exceeded for those four months. The gage at Huron has slightly less probability of flow being exceeded to satisfy current upstream appropriation in August, because the stretch of river between the Ashton gage and the Huron gage is the most heavily appropriated. Considering the existing August 10<sup>th</sup> shutoff date, that removal of diversions is already accounted for in the flow data, as well as the greater amount of water available during May, June, and July during normal years, there is a reasonable probability that water is available for appropriation above the current diversion rate thresholds.

Increased Streamflow on the James River

One of the largest flooding events in South Dakota on record was the 1881 flood at the confluence of the James and Missouri Rivers. Major flooding (based on NWS major flood stages) at any one of the gages at Ashton, at Huron, or near Scotland, occurred in 1922, 1950, 1952, 1960, 1962, 1969, 1978, 1984, 1986, 1987, 1993, 1994, 1995, 1997, 2001, 2007, 2008, 2009, 2010, 2011, 2019, 2020, 2022, 2023, and in June of 2024 (NWS 2023 and 2024; USGS, 2019). **Figures 4 and 5** below show the James River near Mitchell during times of regular to low flow, and during times of major flooding.



**Figure 4.** Landsat 5 Satellite Image of the James River on May 19, 2005, near Mitchell, SD (NASA Earth Observatory).

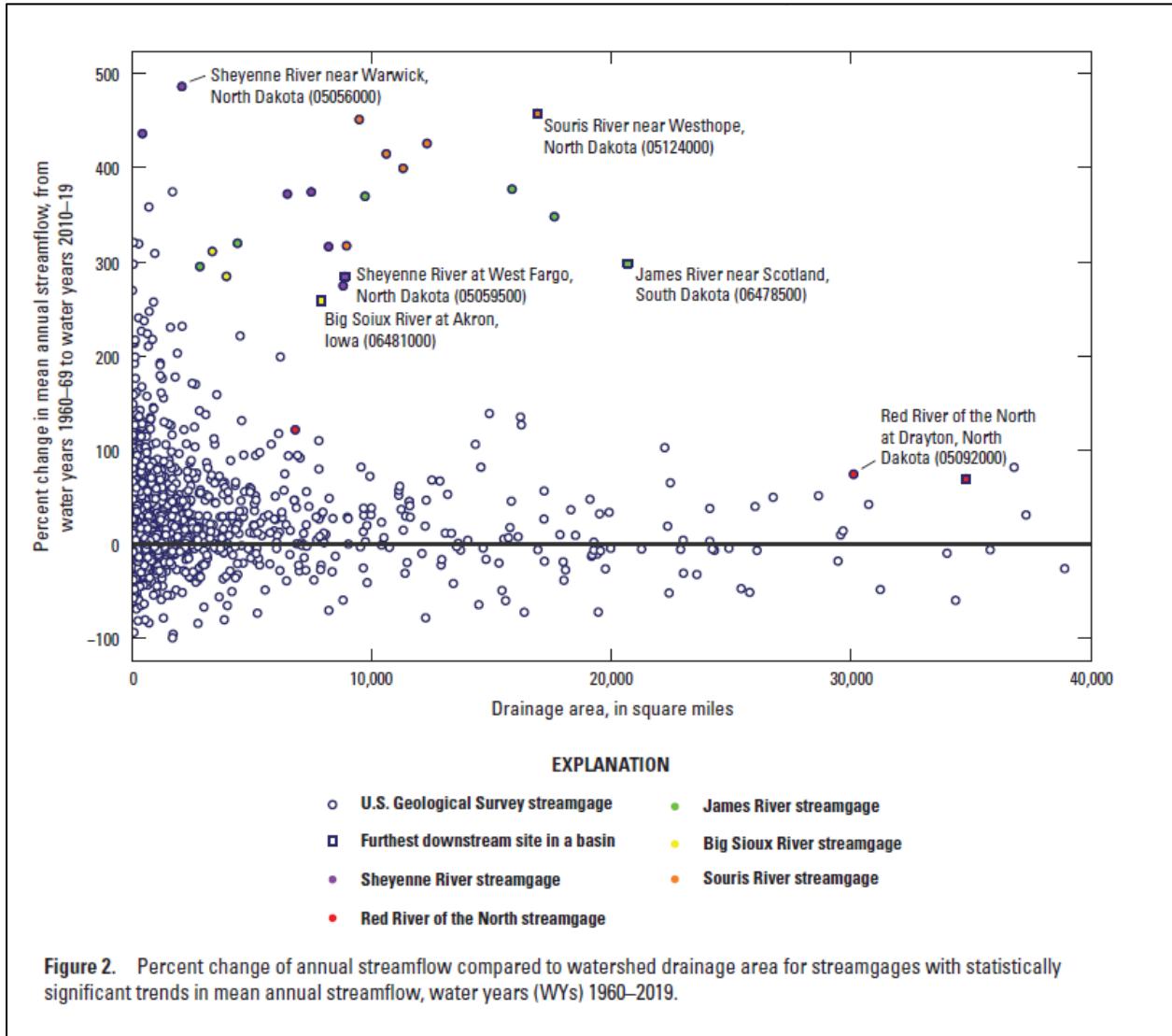


**Figure 5.** Landsat 5 Satellite Image of the James River on June 5, 2011, near Mitchell, SD (NASA Earth Observatory).

The James River has seen a history of flooding, but persistent flooding began in the early to mid-1990's. In 1993, there were approximately 1.2 million acres affected by the flooding in the counties that the James River passes through. In 1994, it was 1.8 million acres. In 1995, flooding affected 2.7 million acres (Water Rights, 2024b). Due to the flooding, there were long-term consequences. This includes the installation of more tile drainage, changes to reservoir

management, and the reconstruction of infrastructure in the floodplain (Norton et al., 2022; Water Rights, 2024b).

Since the flooding in the 1990's, there has been an increasing trend of streamflow in the James River (Hirsch and De Cicco, 2015; USGS, 2019). Streams in the eastern Dakotas have experienced the greatest increases in streamflow during the last 60 years in comparison to any other USGS gaged stream in the United States (Norton et al., 2022). **Figure 6** from Norton et al., 2022 highlights the increased streamflow in the eastern Dakotas compared to other gaged locations in the U.S.

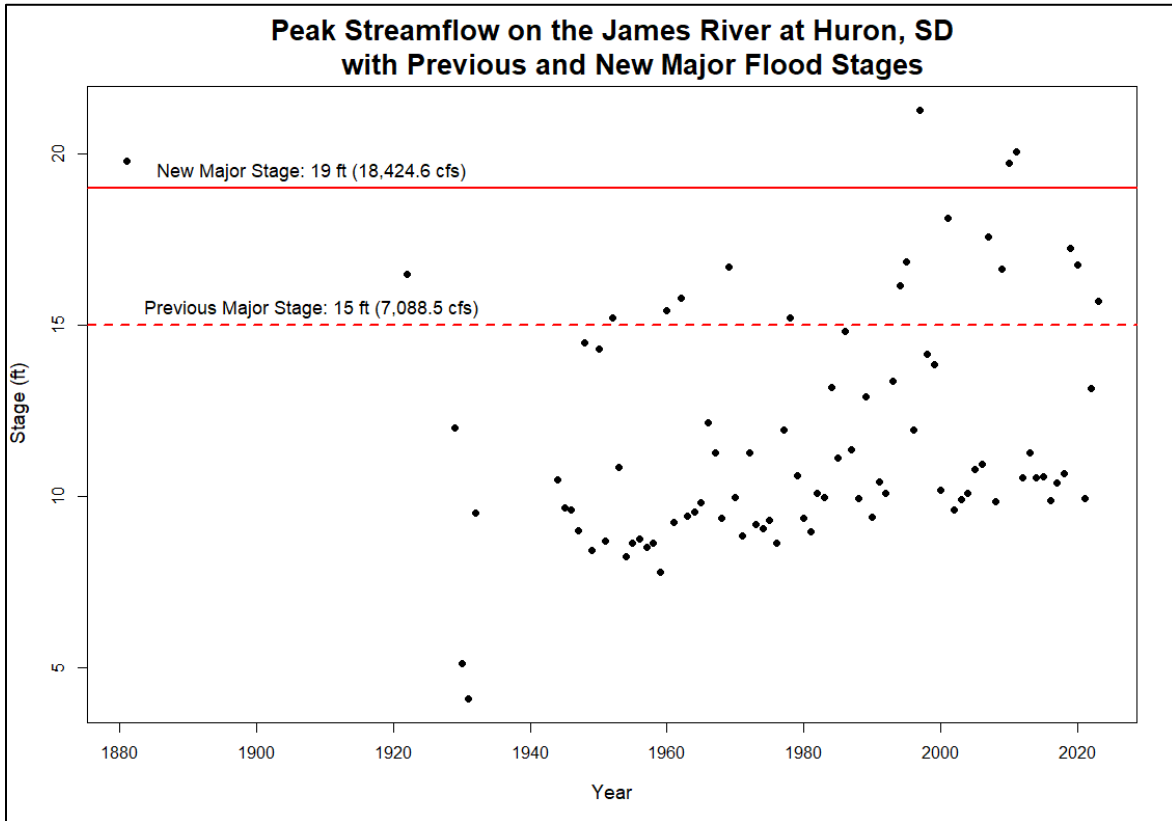


**Figure 6.** Graph from Norton et al., 2022 showing percent increases in streamflow compared to watershed size for statistically significant trends in mean annual streamflow. The green dots are James River streamgages, and any colored dots represent streamgages in the eastern Dakotas.

In 2020, the USGS Gage No. 06471000 James River at Columbia, was measured above flood stage for more than 518 consecutive days (Norton et al., 2022). Since then, the National Weather

Service has updated its flood severity categories to reflect flow changes to the James River (NWS, 2023). **Figure 7** shows peak streamflow on the James River at Huron, and the previous and new National Weather Service (NWS) major flood categories. Note that the peak streamflow is not a continuous record until 1944, and that the data from 1881 to 1944 are historical floods that occurred before the period of systematic data collection at this location.

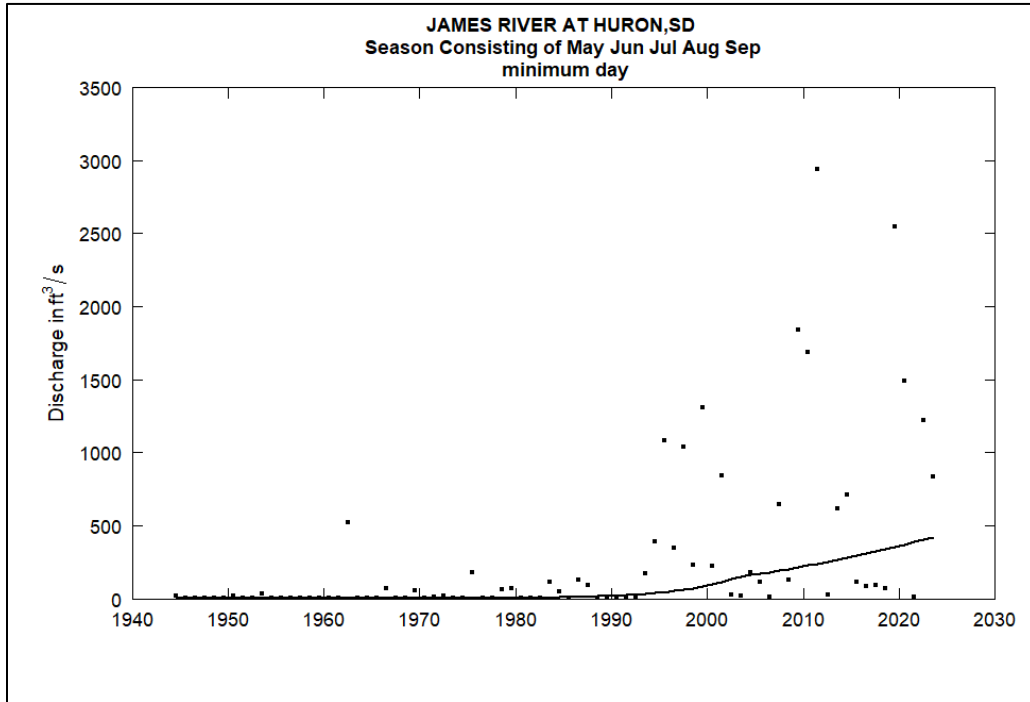
Flooding on the James River has always occurred, even during extended-year low flow conditions. Extended periods of low flows known from recorded observations occurred in the 1950's through the mid 1960's, sporadically in the 1970's, and the late 1980's to early 1990's (USGS, 2019). There was still occasional flooding during these times on the James River (**Figure 7**).



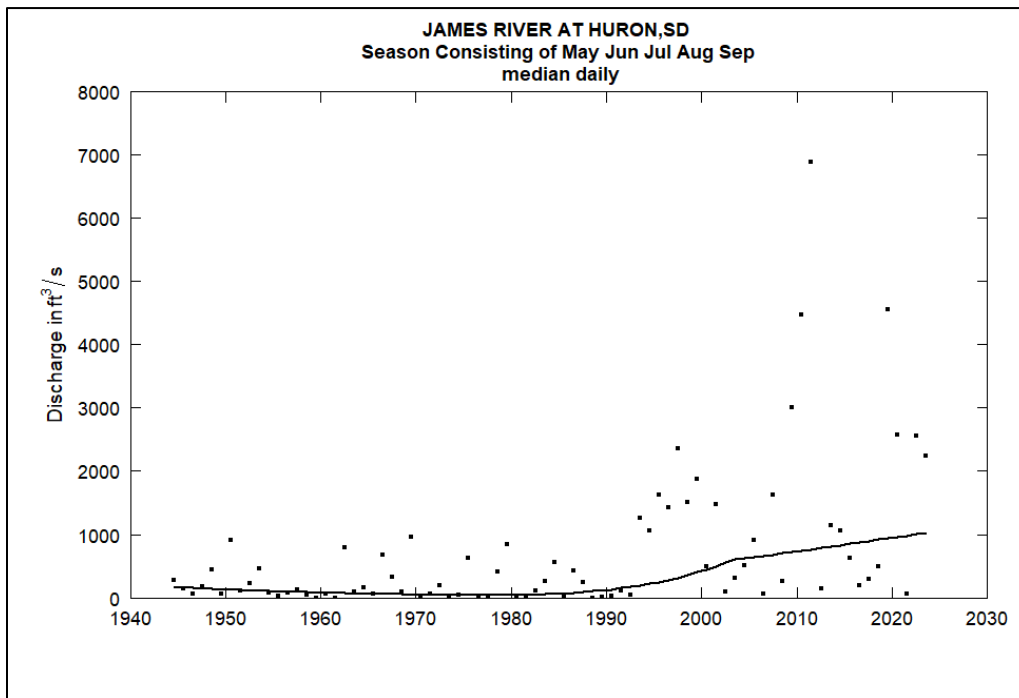
**Figure 7.** Peak discharges on the James River at Huron, and the stage levels of new and previous NWS major flood categories (NWS, 2023; USGS, 2022)

**Figures 8 and 9** show two different discharge statistics and their smoothed values for the streamgauge at Huron. The smoothing method used is based on locally weighted scatterplot smoothing (Lowess), and the curves are resistant to the influence of one or two years with extremely high or low flows (Hirsch et al., 2015). The Lowess smoothing in the graphs show the increasing flow volumes on the James River. The streamgages at Ashton and near Scotland show similar trends, and the mean annual streamflow volume at the gage near Scotland from 1960-1969 compared to 2010-2019 increased by 298%. That equates to 1,269,679 acre-feet more water being transported downstream each year. Most of the streamgages in the Norton et al.

(2022) study with the greatest increases in mean annual streamflow are on rivers in the eastern Dakotas, regardless of basin size (Norton et al., 2022).

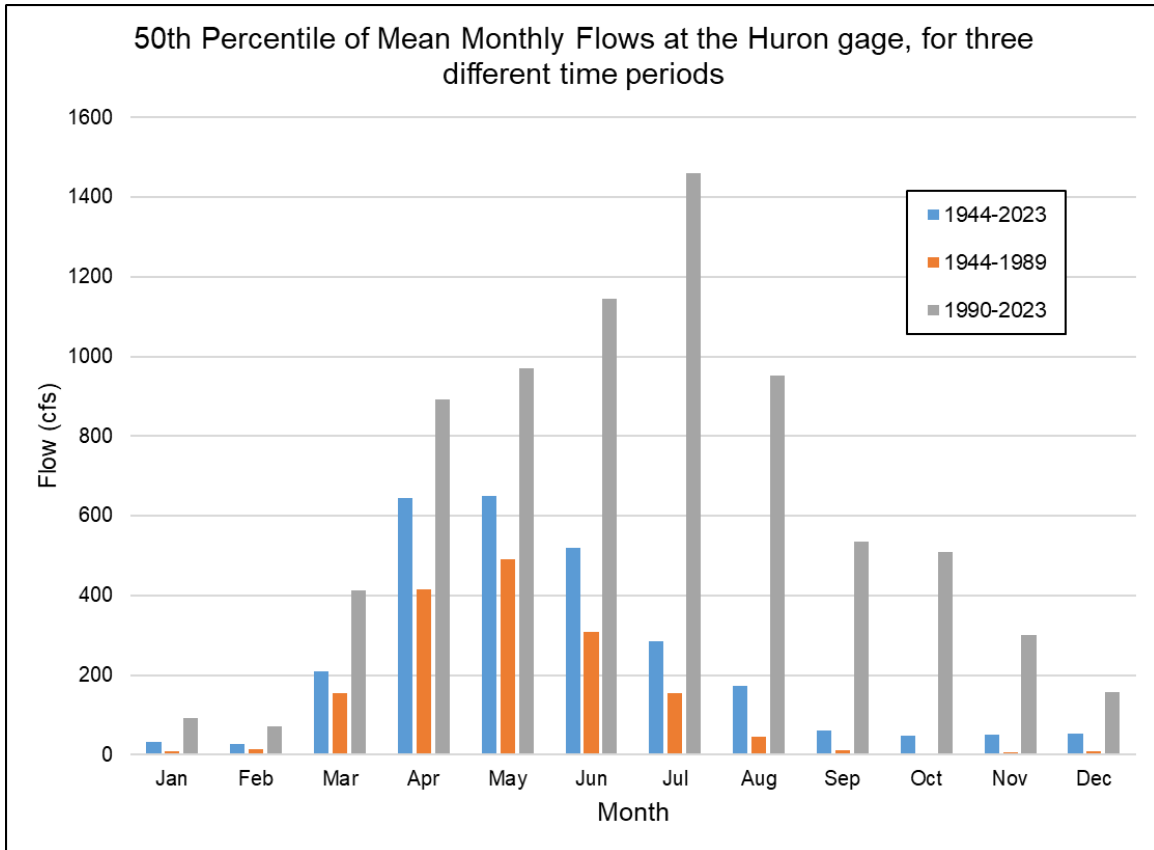


**Figure 8.** Minimum daily flow for the gage James River at Huron, SD during the months of May, June, July, August, and September for the years 1944 to 2023 (Hirsch et al., 2015; USGS, 2019).



**Figure 9.** Median daily flow for the gage James River at Huron, SD during the months of May, June, July, August, and September for the years 1944 to 2023 (Hirsch et al., 2015; USGS, 2019).

The bar graph (**Figure 10**) below shows the 50<sup>th</sup> percentile of mean monthly streamflow at the Huron gage for the years 1944 to 2023 during three different time periods to illustrate the increasing flow. Ice is assumed to be zero flow.



**Figure 10.** Bar Graph showing the 50<sup>th</sup> Percentile of mean monthly streamflow data for the years 1944-2023, for three different time periods (USGS, 2019).

### Rise of Lake Levels in NE South Dakota

The effects of increased streamflow magnitudes and flooding is also seen in the rise of lake levels in closed basins in the northeast Dakotas—the Devils Lake Basin in North Dakota and the Waubay Lakes complex in South Dakota. The lake system is located on the Coteau des Prairies, a dominant highland in the eastern part of the state. These rising water levels have led to greater connectivity of the lakes in those basins, providing more paths for runoff to rivers and have contributed to flooding and increases in annual streamflow in rivers and streams (Norton et al., 2022; Water Rights, 2024c). For the Waubay Lakes chain, the net increase in water has resulted in flooding which has not been observed in the modern instrumental record, which generally begins in the mid-1920's with scattered discontinuous data, and then becomes continuous for most lakes for the years 1960 to the present (Water Rights, 2024c; USGS et al., 1999).

Lake levels were also high during the General Land Office meander survey of 1868-77, similar in size to the lakes in 1994. By 1998, the surface area of Waubay Lake was 1.3 times larger than it was during the years 1868 to 1877. Waubay Lake levels rose by almost 19 feet and more than

doubled in area from 1993 to 1999. Regardless of whether the climate is wet or dry in the next few years, flooding problems will persist in this region. It would take at least a decade of drought similar to the 1930's conditions to return the lakes back to the conditions that existed prior to 1992 (USGS et al., 1999). Since the publishing of USGS et al. (1999), several lakes in the basin have continued to rise beyond the levels in the late 1990's (Water Rights, 2024c).

### Predicting Future Flow Conditions

Annual peak flow, and the minimum and median James River flows during the irrigation season have significantly increased since approximately 1993, with low-flow years interspersed within that timeframe (Hirsch et al., 2015; Norton et al., 2022; Ryberg et al., 2022). A basic assumption within the federal guidelines for peak-flow frequency analyses assumes that the statistical properties (mean, variance, and skew) of the distribution of peak flows do not change over time, and are stationary (England et al., 2018).

The common methodology is to perceive river flows as annual random fluctuations around a constant mean—this is stationarity, that flows vary within a window around a long-term mean (Koutsoyiannis, 2005; Ryberg et al., 2020), and that physical influences affecting streamflow do not change. This assumption has been called into question in recent years, and multiple publications have been researching whether the traditional stationarity assumption in peak streamflow analysis should be modified (Koutsoyiannis, 2003; Razavi et al, 2015; Sando et al., 2022; Ryberg et al., 2020; Ryberg et al., 2024).

In the past few decades, there has been a better understanding about potential climate change and land-use change, which have been prompting the study of nonstationarity in streamflow.

Nonstationarity assumes that the long-term distributional properties (mean, variance, or skew) of the distribution of streamflow may change either one or more times, either gradually or abruptly. The study by Ryberg et al. (2024) is an on-going study in the north-central region of the United States to investigate the potential of assuming nonstationarity in flood-frequency methodologies.

Trend analysis is commonly used for detecting change in hydrologic time series and is used to determine if a certain variable has changed its central tendency over a period of years. The Mann Kendall trend test is a non-parametric trend test (based on rank, not magnitude) to detect falling or rising monotonic trends (where the variable in question either never decreases or never increases). The null hypothesis of the Mann Kendall test is that the data are independent and randomly ordered. Normality in a time series is not required for a Mann Kendall test, but there can't be any serial correlation (also called autocorrelation). Correlation measures the relationship between two variables—while serial correlation measures the relationship of a variable with lagged values of itself. The issue with serial correlation is that it can cause Type 1 errors, which is the false acceptance of a trend as statistically significant, when actually no trend exists. There are two types of serial correlation: short-term and long-term (Helsel et al., 2020).

Short-term persistence can be understood by thinking of a monthly river flow series, where a month with very high flow is likely to be followed by another month of high flow. Short-term persistence is when past measurements affect the subsequent measurements in a short timeframe. Long-term persistence can be conceptualized as a tendency for droughts and floods to cluster

together in periods of time. Long-term persistence is also called the Hurst phenomenon and induces serial correlation into the time series and lags greater than 1 year (Koutsoyiannis, 2003; Ryberg et al., 2024). Hydrologic time series show persistence at all time scales, and consecutive values are dependent to each other. Long-term persistence implies that there is a dependence between the present and *all* points in the past. These long-term fluctuations increase uncertainty—as the observed record is only a small portion of a longer cycle whose characteristics are difficult to infer. For a Mann Kendall trend test, these fluctuations are ignored, as the test is only looking for monotonic trends, thus decreasing uncertainty.

Using a Mann Kendall test, streamgauge data on the James River have a statistically significant upward trend (Norton et al., 2022; Hirsch and De Cicco, 2015). There are methods to reduce autocorrelation in a time series, or to measure the long-term persistence in a time series before the Mann Kendall test is applied. The results for South Dakota streams using these methods to determine peak streamflow trends and relations to changes in climate have not yet been published (Ryberg et al., 2024).

The increasing streamflow trend on the James River may be a misleading way to understand the long-term behavior of the stream, because a complete picture of the series may suggest that the trend is part of a decadal or centennial fluctuation, and that maintaining stationarity in the time series would better model those fluctuations (Koutsoyiannis, 2005 and 2006; Koutsoyiannis and Montanari, 2015). Characterizing James River flows by an increasing trend reduces uncertainty—when long term persistence increases uncertainty. Regardless, as time series get longer, it is important that analyses reveal nonmonotonic trends, so that the timing and magnitude of the reversals can be better identified (Helsel et al., 2020).

Research has shown that the Red River Basin, the James River Basin, and surrounding areas in the north-central U.S. and southern Manitoba and Saskatchewan experience distinct periods of hydroclimatic persistence, alternating between wet and dry periods (Razavi et al., 2015; Ryberg et al., 2014; Ryberg et al., 2016; Ryberg et al., 2020; Shapley et al., 2005). The James River Basin stands out in national and regional flood and streamflow magnitude trend studies as an area of increasing magnitude (Norton et al., 2022); however, the magnitude trend may represent long-term persistence of the recent wet period (Ryberg et al., 2014).

If increased streamflow in the James River can be characterized by deterministic terms—that is, possible drivers that can be attributed to the increasing streamflow without randomness—then the future should be adapted to the most recent past (Koutsoyiannis and Montanari, 2015). This would include human-driven climate change or land-use changes. However, if the increasing streamflow trend on the James River is a manifestation of long-term persistence, then uncertainty is also increased, and there is no real ability to forecast flows into the future, because “the drivers of the phenomena could just as easily continue at their current levels, or reverse themselves tomorrow” (Helsel et al., 2020).

Several factors may be owing to the rising lakes, flood events, and increases in streamflow in the eastern Dakotas, but there is no *obvious* cause that can be related to water or land management actions. Some factors could include short-term or long-term climatic variation, geologic makeup

of the subsurface, and land-use changes (Norton et al., 2022). For water resources management, understanding the reasons for these changes and the potential of long-term wet or dry periods is undoubtedly important.

### Land-Use Changes and Climate

The extent of land-use change contributing to increased flow in the James River is not known—but research has suggested that land-use change is not the dominant driver. There is still academic debate between land-use changes or climate as being dominant drivers of increasing streamflows and flooding. The number of drain tile projects have increased in eastern South Dakota in the 2000's (Werner et al., 2016). Only a handful of counties in eastern South Dakota have a drain tile permit program, meaning there is not a temporal or spatial record of tile drainage in the state and thus difficult to determine the extent to which tiling may have increased flow. As human manipulations increase over time, it becomes impossible to say that any hydrologic or climatic variable is free of their effects (Helsel et al., 2020).

The James River basin has high agricultural land use, and increased streamflow is frequently linked to land-use and land-cover changes, such as tile drainage, cultivation of prairies, and the increased planting of soybeans and corn, which reduces evapotranspiration. However, several studies that have associated land-use changes with higher streamflows had flawed methodology and additional analysis has shown that increased precipitation is the main driver of increased streamflows (Gupta et al., 2015). Further studies would need to be done to determine the extent of land-use change by humans and how these changes affect the increasing multi-decade streamflow in the James River.

Natural climate variability drives long-term climatic persistence and nonstationarity in streamflow, whereas “climate change” is driven by anthropogenic effects on climate (Ryberg et al., 2020). Another analysis by Ryberg et al. (2014) shows that climate explains the majority of long-term, multi-decade variability in flooding in the north-central U.S, although a portion of unexplained variability may stem from land-use change. A study by Sando et al. (2022) attributes long-term precipitation (a driver of multidecadal climate variability) increases as the primary driver to the change points in peak streamflows in the high plains region.

Runoff changes for the James River basin region are comparable to fluctuations in global ocean temperature and atmospheric pressure anomalies, indicating a relationship between runoff and climatic variability. However, for the James River basin group in the study by Ryberg et al. (2014), land-use changes contributed about equally to the increase in runoff, especially in the earlier part of the year. **Table 9** shows the changes in runoff from dry (1953-64) years to wet (1982-93 and 1998-2009) periods for two different seasons, January-June and July-December in the James River basin group. The study hypothesized that if changes in runoff do reflect land-use change, the changes likely occurred from the 1950's to the 1980's before stabilizing and remaining constant during recent decades. The dominant land-use change during this time was likely the conversion from perennial vegetation to seasonal row crops (Ryberg et al., 2014).

**Table 9.** Average runoff for dry and wet periods for two different seasons, for the James River basin group (Ryberg et al., 2014).

<b>Season</b>	<b>Average Runoff, 1953-1964 (mm)</b>	<b>Average Runoff, 1982-1993 (mm)</b>	<b>Average Runoff, 1998-2009 (mm)</b>
Jan-June	27.4	59.0	57.4
July-Dec	14.5	36.8	28.0

It is well established that runoff increases exponentially with an increase in rainfall, resulting in an exponential increase in streamflow (Gupta et al., 2015). Increased precipitation in September-October has consequences on surface runoff the following May-June. Much of the increase in rainfall in the eastern Dakotas has been occurring between September and November, and is more concentrated (Shapley et al., 2005). For watersheds with fine-textured soils, increased soil water storage from greater precipitation in September-October will be carried over to next spring which will result in more runoff, even if there is slightly less rainfall in May-June. This is primarily because wet soils have less infiltration capacity (Gupta et al, 2015). Nevertheless, if there is an increased intensity of precipitation, which is one anticipated impact of climate change, and the intensity exceeds the rate of infiltration, runoff occurs whether or not the soil is saturated (Ryberg et al., 2014).

During 1980-1999, many regions in the central and southern Great Plains experienced the longest and strongest increase in average annual precipitation of the century. The size of the increases ranged from 6 to 12% of mean annual precipitation, and from 25 to 60% of interannual precipitation variability (Garbrecht and Rossel, 2002). In the upper midwestern U.S., the National Climate Assessment showed a greater than 15% increase in precipitation amounts from 1991 to 2011 relative to 1901-1960 (Melillo et al., 2014). Generally, the amount of precipitation in very wet years increased less than in average and dry years. The probability of occurrence and severity of dry years was greatly reduced compared to earlier in the century, whereas the probability of average years remained about the same and the probability of wet years increased (Garbrecht and Rossel, 2002).

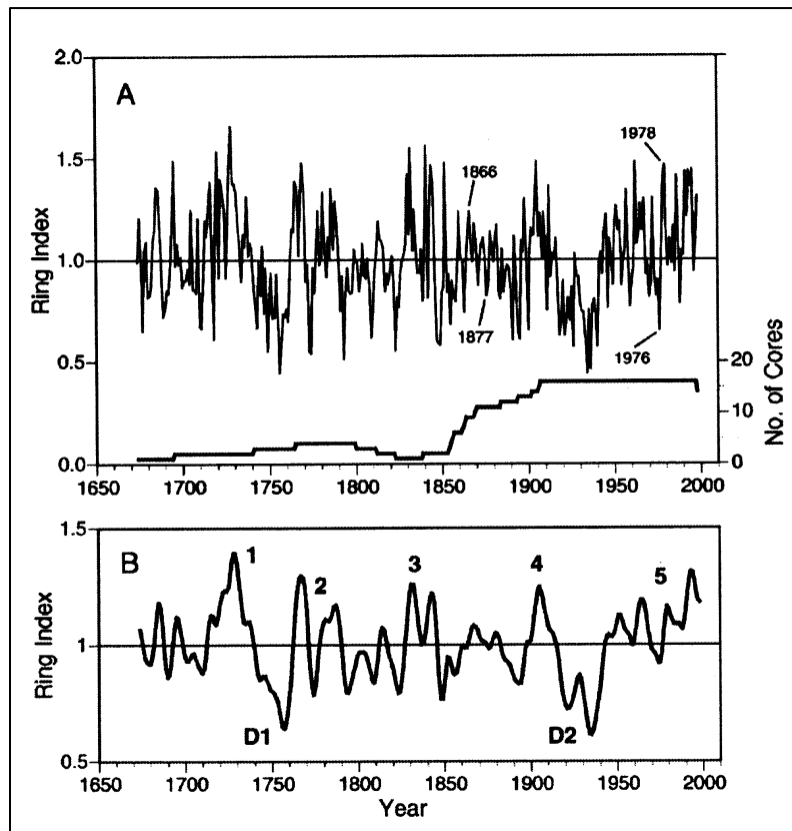
**Table 10.** Mean precipitation (inches) for the years 1991 to 2023 compared to 1901 to 1960 in Brown, Spink, Beadle, Sanborn, Davison, Hanson, Hutchinson, and Yankton Counties (NOAA, 2024).

<b>County</b>	<b>Mean Precipitation (in) (1901-1960)</b>	<b>Mean Precipitation (in) (1991-2023)</b>	<b>% Increase</b>
Brown	20.2	21.9	8.4
Spink	19.7	22.1	12.2
Beadle	19.8	23.1	16.7
Sanborn	20.7	23.8	15.0
Davison	21.4	24.7	15.4
Hanson	21.9	24.9	13.7
Hutchinson	23.3	25.7	10.3
Yankton	24.8	27.0	8.9

The study by Ryberg et al. (2014) hypothesized that the changes between wet and dry climatic conditions occur on a time scale greater than decadal. The conclusions of the study indicated that upward trends in precipitation “appear to result from transient, abrupt, and highly persistent shifts in precipitation with durations of up to a few decades.” Overall, the current research suggests that climate variability is the dominant driver of streamflow and runoff increases in the north-central United States, while land-use change is the less dominant driver (Ryberg et al., 2014; Ryberg et al., 2016; Sando et al., 2022; Ryberg et al., 2024).

### Tree Ring Chronologies

Long-term persistence, or the Hurst phenomenon, is a manifestation of irregular climate fluctuations on several scales—and has been verified in tree-ring width studies, which are indicators of past climate. Tree-ring chronologies demonstrate significant correlations with streamflows (Razavi et al., 2015; Koutsoyiannis, 2003). In the early 2000’s, a tree-ring width study was done on trees in the Waubay Lakes complex in eastern South Dakota to reconstruct past climate. **Figure 11** shows two graphs: a time series of the bur oak core chronology in the Waubay Lake area, and a 10-year spline (smoothing) highlighting wet and dry periods in the record. The effect of slower growth with age was removed using detrending curves (Shapley et al., 2005).

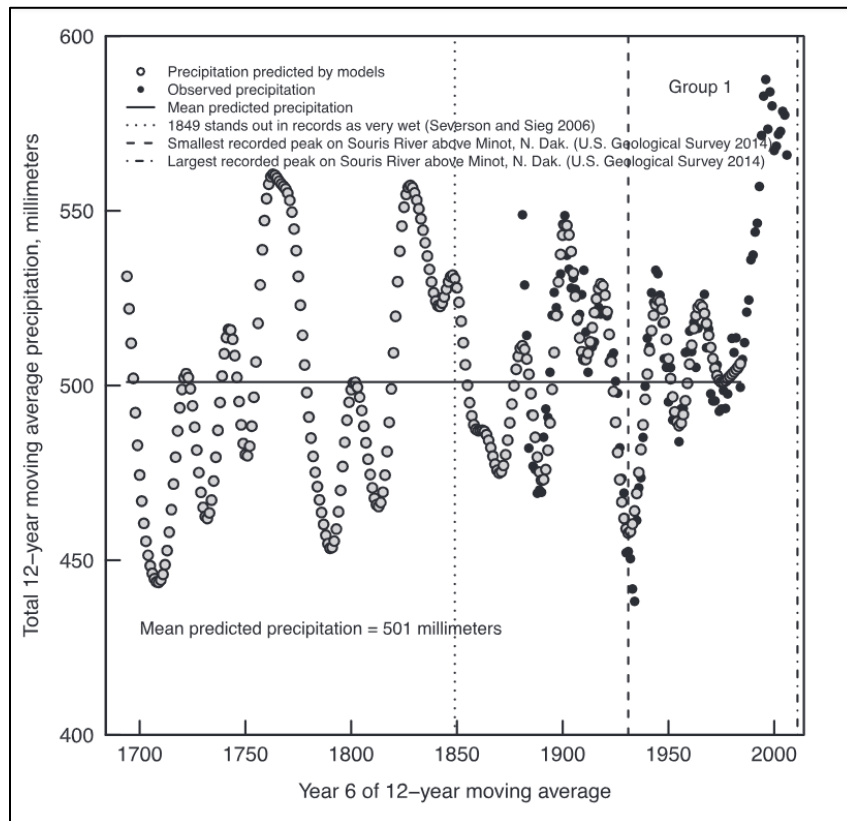


**Figure 11.** Complete chronology of sampled trees, covering the years 1674 to 1998, a total of 325 years, and a 10-year spline of the time series, highlighting extended wet (1-5) and dry periods (D1, D2) in the Waubay Lakes chain area. Graph from Shapley et al., 2005.

The tree-ring index time series in **Figure 11** indicates the occurrence of five wet periods over the 325-year period. The wet peaks are nearly evenly spaced, averaging 65 years in recurrence. The wet peaks are broken by the occasional dry years but were not reversed by the dry-year interval.

Other paleo-climatic studies from eastern North and South Dakota on tree rings and lake sediments indicate that similar transitions to wet periods have occurred several times in the past 1,000 to 2,000 years. There were floods documented on the upper Red River in 1726, 1727 and 1741, while 1753-1762 was quite dry in parts of the northern Great Plains, based on a 12-year moving average (Ryberg et al., 2016). Dry conditions were reported from 1861 to 1880 in the Missouri River basin, and in the early 1880's, there was another shift from dry to wet. Flooding at this time was well documented in the eastern Dakotas (SDPB, 2019). These wet/dry years from Ryberg et al. (2016) and from historical documentation match well with the time series in **Figure 11** for the Waubay Lakes climate reconstruction.

The research done by Shapley et al. (2005) provides evidence that there is a cycle of repeated and sustained wet periods punctuated by periods of notable drought. The recurrence frequency of these wet periods average approximately 140 years, prior to AD 1800, with the past two centuries having more frequent wet periods, with recurrences around 60 years. **Figure 12** shows a plot of 12-year moving average of past climate reconstructions for a study area comprising of eastern North Dakota and northeast South Dakota made in the study by Ryberg et al. (2016).



**Figure 12.** Twelve-year moving average annual precipitation for the southeast group of the study area defined by Ryberg et al. (2016).

The study area in the Ryberg et al. (2016) report includes the northeast portion of South Dakota, which is within the James River Basin. **Figure 12** highlights the 60-year-long pattern of increasing precipitation since the 1930's. The recent wet period starting in the mid-1970's may be similar to the wet period in the 1800's, and in the early 1900's, and is part of natural variability on a very long time scale (Ryberg et al., 2014 and 2016). The intervals between extreme wet or dry periods seem to be random rather than periodic, indicating "nonlinear dynamical behavior rather than predictable cycles" (Ryberg et al., 2014). Based on the history of repeating wet and dry periods, any decision on James River water management should assume that the current multi-year wet period on the James River will likely not continue indefinitely.

### Discussion

This report is intended to assess whether there is available flow on the James River to approve applications in excess of the current 200/300 cfs thresholds. Historically, the James River has undergone numerous reports by the Water Rights Program to determine water availability and determine appropriate bypass flows for existing and new appropriators.

The best available information shows that the James River has undergone multi-year wet and dry periods on a long-time scale, and that these fluctuations are likely due to global water-land-atmosphere oscillations. Evidence suggests that increasing long-term precipitation has led to the 30-year increasing trend of streamflow and flooding events on the James River since the mid 1990's. The shifts in precipitation are likely occurring on a scale of multiple decades, and tend to begin and end abruptly. The likelihood of long-term persistence causing the increasing streamflow trend in the James River, and not deterministic causes, leads to the conclusion that incorporating uncertainty into water management is the best practice until research demonstrates increasing flows will persist due to a more fixed cause-and-effect relationship.

Despite there being uncertainty about the longevity of the past 30 years of increasing streamflows, it is recommended the 200/300 cfs thresholds be replaced with a management system allowing more water to be placed to beneficial use, when available, while still protecting existing rights and domestic uses. Without a pre-set appropriation threshold, new applications can individually be evaluated to determine whether water is available and what qualifications are needed to protect existing users during low flow years, or if the wet cycle being experienced by the James River basin begins to wane. By analyzing incoming applications on a case-by-case basis, this allows for the inclusion of new daily discharge data in the analysis, and any new research or methodologies that may be available at the time the application is filed.

According to the July 1980 Findings of Fact, Conclusions of Law, and Final Decision, the streamflow rates in **Tables 3 through 7** are post-withdrawal, and the assumption could be made that 50 percent of authorized irrigation water rights are pumping at any given time upstream of the gage's location during the normal irrigation season. The present total appropriations are at 298.92 cfs, near the 300 cfs threshold set by the Water Resources Commission in 1965. The current 14 deferred Water Permit Applications, if approved, would increase James River appropriations by 34.38 cfs in the stretch of river between Ashton and Huron.

Since there is currently an automatic August 10<sup>th</sup> shutoff date on the river, August is the last month that pumping will occur unless written orders to continue pumping are issued by the Chief Engineer. The flow that is likely to be exceeded 50% of the time (1 of 2 years) in August will be used to determine if more water can be appropriated. The safety factors built into this analysis explained in the Water Availability at Current Appropriation section of this report, as well as using predicted August flows while upholding the automatic August 10<sup>th</sup> shutoff date, are all conservative methods when analyzing the availability of unappropriated water. The available flow between the Ashton and Huron stretch is currently 42 cfs by subtracting the required flow at the Huron gage from the August flow at a 50% exceedance probability (**Table 8**). The proposed appropriation by the deferred permits (34.38 cfs) is less than 42 cfs.

#### Proposed Action for Consideration by the Water Management Board

Based on the following, it is recommended the Water Management Board allow James River appropriations in excess of either the 300 cfs threshold above the Yankton-Hutchinson County line, or the 200 cfs threshold for the reach of the river between the ND-SD border and the USGS gaging station at Huron SD, or both, and manage those applications on an application-by-application basis:

- Managing surface water appropriations on an application-by-application basis is consistent with how every other watercourse is managed in South Dakota;
- There is precedent of the Water Management Board allowing appropriations in excess of 200/300 cfs with appropriate qualifications to protect existing water rights and domestic uses (Water Management Board, 1980);
- There has been a 30-year increase in streamflows in the James River, in both low and normal flow years, whether due to increased precipitation by a changing climate or changes in land-use practices, or both;
- Conservative measures were taken to analyze the availability of water in three stretches of the James River with existing permitted uses included in the streamflow analysis;
- SDCL 46-1-2, SDCL 46-1-4, and SDCL 46-1-14 dictate that water should be placed to beneficial use to the fullest extent possible while protecting the public interest; and
- The public interest, including existing water rights and domestic uses, can be protected from unlawful impairment by including appropriate qualifications on new permits.

To protect current existing rights and domestic uses, it is recommended that any new appropriations on the James River have bypass qualifications stricter than the 20 cfs bypass which is required of certain current senior rights. The current required flow in each stretch of river is listed in **Table 2**, assuming 50% pumping at any given time for irrigation, 100% pumping at any given time for non-irrigation, and adding 20 cfs for domestic use. To protect existing water rights/permits and domestic flow, the conditions attached to any new permits should protect both the amount of time that senior users are able to pump during low flow years, and bypass the required downstream flow. The amount of time senior users can use water can be protected by assigning an earlier cutoff date for junior users, as well as a strict flow that must be bypassed regardless of the date.

The purpose of the strict bypass flow for junior users would be to cover the amount of flow required for both domestic use and existing users. A 75 cfs bypass flow is the average flow required between all three gages (**Table 2**). A 50 cfs bypass flow at the Ashton gage protects the required flow (47 cfs, **Table 2**) above that gage, while increased flows further downstream will accommodate downstream users. These two flows will be evaluated to see how often it may be expected for shutoff orders to be issued during dry times, and whether a bypass flow is too large, preventing reasonable use of the river during most years. **Tables 11 through 13** below list the years that James River flows were less than 20 cfs, 50 cfs, and 75 cfs at any time between May 1<sup>st</sup> and August 10<sup>th</sup> during 1946-2023, and also shows what percentage of the time (percent occurrence) that those flows were reached in the 1946-1990 timeframe and the 1991-2023 timeframe.

**Table 11.** Number of years and percent occurrence that 20 cfs was reached between May 1<sup>st</sup> and August 10<sup>th</sup> for the years 1946-2023 at the Ashton, Huron, and Scotland streamgages (USGS, 2019).

Time Frame	Station	No. of years where flow was less than 20 cfs between May 1st and August 10th	Years	Percent occurrence
1946-2023 (78 yrs)	Ashton	25	1946, 1951, 1955, 1956, 1957, 1958, 1959, 1961, 1963, 1964, 1970, 1971, 1973, 1976, 1977, 1980, 1981, 1985, 1988, 1989, 1990, 1991, 1992, 2006, 2021	84% (years 1946-1990), 12% (years 1991-2023)
	Huron	26	1946, 1949, 1951, 1955, 1956, 1957, 1958, 1959, 1961, 1963, 1964, 1965, 1970, 1971, 1973, 1976, 1977, 1980, 1981, 1985, 1988, 1989, 1990, 1992, 2006, 2021	88% (years 1946-1990), 9% (years 1991-2023)
	Scotland	12	1955, 1959, 1961, 1970, 1973, 1976, 1977, 1980, 1981, 1988, 1989, 1992	92% (years 1946-1990), 8% (years 1991-2023)

**Table 12.** Number of years and percent occurrence that 50 cfs was reached between May 1<sup>st</sup> and August 10<sup>th</sup> for the years 1946-2023 at the Ashton, Huron, and Scotland streamgages (USGS, 2019).

Time Frame	Station	No. of years where flow was less than 50 cfs between May 1st and August 10th	Years	Percent occurrence
1946-2023 (78 yrs)	Ashton	35	1946, 1949, 1951, 1952, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1963, 1964, 1965, 1968, 1970, 1971, 1972, 1973, 1976, 1977, 1980, 1981, 1982, 1985, 1988, 1989, 1990, 1991, 1992, 2002, 2006, 2017, 2021	64% (years 1946-1990), 18% (years 1991-2023)
	Huron	35	1946, 1949, 1951, 1952, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1963, 1964, 1965, 1968, 1970, 1971, 1973, 1974, 1976, 1977, 1980, 1981, 1982, 1985, 1988, 1989, 1990, 1992, 2002, 2006, 2012, 2017, 2021	64% (years 1946-1990), 18% (years 1991-2023)
	Scotland	22	1949, 1955, 1958, 1959, 1960, 1961, 1964, 1965, 1970, 1973, 1974, 1976, 1977, 1980, 1981, 1985, 1988, 1989, 1990, 1992, 2002, 2006	42% (years 1946-1990), 9% (years 1991-2023)

**Table 13.** Number of years and percent occurrence that 75 cfs was reached between May 1<sup>st</sup> and August 10<sup>th</sup> for the years 1946-2023 at the Ashton, Huron, and Scotland streamgages (USGS, 2019).

Time Frame	Station	No. of years where flow was less than 75 cfs between May 1st and August 10th	Years	Percent occurrence
1946-2023 (78 yrs)	Ashton	39	1946, 1949, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1963, 1964, 1965, 1968, 1970, 1971, 1972, 1973, 1974, 1976, 1977, 1980, 1981, 1982, 1985, 1988, 1989, 1990, 1991, 1992, 2002, 2003, 2006, 2012, 2017, 2021	69% (years 1946-1990), 24% (years 1991-2023)
	Huron	35	1946, 1949, 1951, 1952, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1963, 1964, 1965, 1968, 1970, 1971, 1973, 1974, 1976, 1977, 1980, 1981, 1982, 1985, 1988, 1989, 1990, 1991, 1992, 2002, 2006, 2012, 2021	64% (years 1946-1990), 18% (years 1991-2023)
	Scotland	30	1946, 1949, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1963, 1964, 1965, 1970, 1971, 1973, 1974, 1976, 1977, 1980, 1981, 1982, 1985, 1988, 1989, 1990, 1991, 1992, 2002, 2006, 2021	56% (years 1946-1990), 15% (years 1991-2023)

A notable observation from **Tables 11 through 13** is that the percent occurrence for the Ashton and Huron gage to hit 75, 50, or 20 cfs during 1946-1990 are similar, while the Scotland gage has a lower percent occurrence for all three bypass flows during 1946-1990. This means that for the Ashton and Huron gages, shutoff orders would have been issued during mostly the same years, regardless of whether the bypass flow was 50 or 75 cfs. The Ashton gage has the greatest chance of hitting low flows compared to any other gage as more water enters the system further downstream. Users above the Ashton gage are the most susceptible to being shutoff, even though the stretch between the ND-SD border and the Ashton gage has the least amount of appropriation (**Table 2**). This indicates that bypass flows are the most critical at the Ashton gage.

For the Ashton gage, 39 years from 1946 to 2023 were dry enough where flows dropped to 75 cfs between May 1<sup>st</sup> and August 10<sup>th</sup>. Of those 39 years, 25 years had flows drop to 20 cfs after an average of 17 days. Once flows drop to 75 cfs, there is approximately a 64% chance that the flows will go from 75 cfs to 20 cfs before August 10<sup>th</sup>. For the Ashton gage, 35 years from 1946 to 2023 were dry enough where flows dropped to 50 cfs between May 1<sup>st</sup> and August 10<sup>th</sup>. Of those 35 years, 25 years dropped to 20 cfs after 50 cfs after an average of 12 days. This is approximately a 70% chance that flows will go from 50 cfs to 20 cfs before August 10<sup>th</sup>.

After 1992, the river tends to have random, sporadic years that are dry instead of multiple-year droughts. During years where the river recovers after an initial drop below the bypass flow, it typically isn't for long, and the river usually goes back to below that bypass flow before August 10<sup>th</sup> of that year. Another trend for streamflow on the James River during low flow years is that flows will not gradually decline but will bottom out relatively quickly when flows begin to wane.

To protect the amount of time that senior users would have to pump on the James River, a July 15<sup>th</sup> cutoff date is recommended for junior appropriators with a conditional bypass that needs to be met at that date for those junior users to continue pumping until August 10<sup>th</sup>. This cutoff flow was determined using the Ashton gage data to find the average flow on July 15<sup>th</sup> for years where flow reached 50 cfs but did not get to 20 cfs before August 10<sup>th</sup>. All junior appropriators will still have an automatic August 10<sup>th</sup> cutoff date. The average flow on July 15<sup>th</sup> for those years at the Ashton gage is approximately 100 cfs. Comparatively, the average flow on July 15<sup>th</sup> for those years where 50 cfs was reached but not 20 cfs at the Huron gage is also approximately 100 cfs. This is the flow that is recommended to be the required bypass for junior users to pump after July 15<sup>th</sup>, to protect the amount of time that senior users may be able to pump before flows reach 20 cfs.

### Conclusions

- Based on studies and evidence presented in this report, there is unappropriated water available in the James River during the spring and through August 10<sup>th</sup> of normal years.
- The determination that there is unappropriated water available is based strictly on flows naturally occurring in the James River and is not based in any way upon anticipated flows into the James River by Jamestown, Pipestem, or impoundments at Sand Lake Wildlife Refuge, though the reservoirs may supplement the river during low flow periods.
- The James River is an unreliable source of water during dry times, and the increasing streamflows may not continue into the future.
- There is a reasonable probability that unappropriated water is currently available in the James River to allow additional appropriations beyond either the 300 cfs threshold above the Yankton-Hutchinson County line, or the 200 cfs threshold for the reach of the river between the ND-SD border and the USGS gaging station at Huron SD, or both. In order to place to beneficial use the waters of the state to the fullest extent to which they are capable, either the 300 cfs or 200 cfs appropriation thresholds, or both, can be exceeded with appropriate qualifications included on new permits to protect existing appropriations and domestic uses from unlawful impairment. Managing the river using the streamgaging stations, which provide real-time streamflows, is an effective way to maximize use of the resource while protecting existing water users.

### Recommended Action by the Water Management Board


Based on the best available information and the full record of discharge data on the James River, it is recommended that the Water Management Board adopt a motion allowing James River appropriations in excess of either the 300 cfs threshold above the Yankton-Hutchinson County line, or the 200 cfs threshold for the reach of the river between the ND-SD border and the USGS gaging station at Huron SD, or both, to maximize beneficial use of the resource with the following qualifications to protect existing water users from unlawful impairment:

- a. Any application approved between the North Dakota-South Dakota border and the USGS gaging station at Ashton, SD contain the following, streamgage specific, qualifications:

- This permit does not authorize diversions from the James River any time when there is less than 50 cfs bypassing the USGS gaging station at Ashton, SD, after pumping.
  - This permit does not authorize diversion of water from the James River after July 15<sup>th</sup> of each calendar year when there is less than 100 cfs bypassing the USGS gaging station at Ashton, SD, after pumping, unless written orders have been issued by the Chief Engineer.
- b. Any application approved between the USGS gaging station at Ashton, SD and the USGS gaging station at Huron, SD contain the following, streamgage specific, qualifications:
- This permit does not authorize diversions from the James River any time when there is less than 50 cfs bypassing the USGS gaging station at Huron, SD, after pumping.
  - This permit does not authorize diversion of water from the James River after July 15<sup>th</sup> of each calendar year when there is less than 100 cfs bypassing the USGS gaging station at Huron, SD, after pumping, unless written orders have been issued by the Chief Engineer.
- c. Any application approved between the USGS gaging station at Huron, SD and the USGS gaging station near Scotland, SD contain the following, streamgage specific, qualification:
- This permit does not authorize diversions from the James River any time when there is less than 50 cfs bypassing the USGS gaging station near Scotland, SD, after pumping.
- d. In addition to the streamgage specific qualifications, any application approved between the North Dakota-South Dakota border and the Hutchinson County-Yankton County border, also contain the following qualifications:
- The permit does not authorize diversion of water from the James River after August 10<sup>th</sup> of each calendar year unless written orders have been issued by the Chief Engineer.
  - Diversions under the permit are subject to senior water rights and any written orders issued by the Chief Engineer.
  - This permit is approved subject to the irrigation water use questionnaire being submitted each year. [modify qualification, as needed, to require reporting when the use is not irrigation]
  - The Water Management Board retains jurisdiction in the event that additional information shows that changes need to be made to protect domestic uses or senior water rights.

Further, that the Board include in their motion that the SD DANR, Water Rights Program conduct a review in five years for Board consideration to determine whether any modifications are needed to this James River management plan.

The effect of the Water Management Board adopting this motion will be to revise the 1965 decision of the Water Resources Commission by applying the above qualifications to any applications to appropriate water from the James River resulting in excess of either the 300 cfs threshold above the Yankton-Hutchinson County line, or the 200 cfs threshold for the reach of the river between the ND-SD border and the USGS gaging station at Huron SD, or both.

  
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## **Attachment A1. List of pertinent statutes**

### SDCL 46-1-2

“It is hereby declared that the protection of the public interest in the development of the water resources of the state is of vital concern to the people of the state and that the state shall determine in what way the water of the state, both surface and underground, should be developed for the greatest public benefit.”

### SDCL 46-1-4

“It is hereby declared that, because of conditions prevailing in this state, the general welfare requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable method of use of water be prevented, and that the conservation of such water is to be exercised with a view to the reasonable and beneficial use of the water in the interest of the people and for the public welfare. The right to water or to the use or flow of water in or from any natural stream or watercourse in this state is limited to an amount of water reasonably required for the beneficial use to be served, and such right does not extend to the waste or unreasonable use or unreasonable method of diversion of water.”

### SDCL 46-1-14

“The Water Management Board may issue any permit or license subject to terms, conditions, restrictions, qualifications, quantifications, or limitations on perpetuity consistent with this chapter which it considers necessary to protect the public interest and which are related to matters within the jurisdiction of the board. Water rights issued pursuant to this section may be amended by the board and priority is retained upon amendment. Upon amendment the board may alter terms, conditions, restrictions, qualifications, or quantifications consistent with this chapter.”

### SDCL 46-2A-2

“Within sixty days of receipt of a completed application, the chief engineer shall recommend in writing approval, disapproval or deferral until further notice and shall schedule the application for hearing by the Water Management Board. The recommendation shall include any terms, conditions, restrictions, qualifications, quantifications, or limitations on perpetuity which are consistent with this chapter, necessary to protect the public interest and related to matters within the jurisdiction of the chief engineer or the board.”

### SDCL 46-5-6

“In the issuance of permits to appropriate water for irrigation or in the adjudication of rights to the use of water for such purpose, the amount allowed may not be in excess of the rate of one cubic foot of water per second for each seventy acres, or the equivalent thereof, delivered on the land for a specified time each year. The Water Management Board may allow a greater diversion, in volume or rate or both, if the method of irrigation, any time constraints on diversion of water, or the type of soil so requires. However, no annual volume may be greater than three acre-feet per acre delivered to the land. The above rate of one cubic foot per second for each seventy acres does not apply in cases of flood water at such times when the flow of the stream is much in excess of the total recorded and approved rights on the stream.”

**Attachment A2.**

<b>Permit No.</b>	<b>County</b>	<b>Name</b>	<b>Priority Date</b>	<b>Status</b>	<b>Primary Use</b>	<b>Diversion Rate (cfs)</b>	<b>Annual Volume (ac-ft)</b>
8512-3	BN	CITY OF ABERDEEN	04/27/2021	FU	MUN	8.5	6,154
US594-3	HU/SP/BN	US BUREAU OF RECLAMATION*		FU	DOM/MUN/IND/ FWP		500
7888-3	BN	SVARSTAD	08/22/2013	PE	IRR	1.89	
6427-3	BN	GRASSE	06/26/2003	PE	FWP	6.00	50
8460-3	BN	SUELTZ	11/30/2020	PE	IRR	3.56	
8240A-3	BN	SVARSTAD	09/26/2016	PE	IRR	1.91	
8241-3	BN	SVARSTAD	09/26/2016	PE	IRR	1.91	
7890-3	BN	SVARSTAD	08/29/2013	PE	IRR	1.91	
8044-3	BN	ROSSOW	08/29/2014	PE	IRR	3.30	
US1-3	BN	US FISH/WILDLIFE SERVICE	10/16/1934	LC	FWP	0.00	
5516-3	BN	US FISH/WILDLIFE SERVICE*	03/08/1991	LC	FWP	0.00	295
27-3	BN	TACOMA PARK ASSOC	03/31/1941	LC	FWP	0.50	
1817-3	BN	GAME FISH & PARKS*	01/01/1935	LC	REC	0.00	60
5924-3	BN	THUROW*	04/03/1996	LC	FWP	0.00	180
1125-3	BN	SPERRY	08/19/1964	LC	IRR	1.98	
1491-3	BN	SPERRY	01/15/1968	LC	IRR	1.94	
5925-3	BN	LOCKEN	08/28/1975	LC	IRR	2.00	
5277-3	BN	LOCKEN	01/25/1989	LC	IRR	2.30	
2629-3	BN	LOCKEN FARMS	11/17/1975	LC	IRR	1.44	
1841-3	BN	GAME FISH & PARKS*	01/01/1935	LC	REC	0.00	21
1172-3	SP	BEBO	03/08/1965	LC	IRR	1.50	
1421-3	SP	FISHER GROVE COUNTRY CLUB	06/15/1967	LC	IRR	0.67	
2129-3	SP	BINDENAGEL	10/10/1974	LC	IRR	1.69	

Permit No.	County	Name	Priority Date	Status	Primary Use	Diversion Rate (cfs)	Annual Volume (ac-ft)
6589A-3	SP	GLENDALE HTRN BRTH	02/16/1970	LC	IRR	3.83	
6587-3	SP	GLENDALE HTRN BRTH	11/04/1968	LC	IRR	5.68	
6590-3	SP	GLENDALE HTRN BRTH	11/04/1968	LC	IRR	7.46	
1450-3	SP	GLENDALE HTRN BRTH	10/12/1967	LC	IRR	4.44	
1538-3	SP	SPINK HTRN BRTH	03/19/1968	LC	IRR	4.00	
2396-3	SP	SPINK HTRN BRTH	10/10/1975	LC	IRR	1.88	
5737-3	SP	SPINK HTRN BRTH	12/17/1992	LC	IRR	1.78	144
6375-3	SP	BIXLER FARMS	01/02/2003	LC	IRR	5.35	
6738-3	SP	ENANDER	07/05/2006	LC	IRR	1.78	
6398-3	SP	WOLLMAN	09/24/1975	LC	IRR	1.89	
1979-3	SP	COLLINS HUTTERIAN BRETHREN INC	03/27/1973	LC	IRR	3.76	
6182-3	SP	OSCAR INC	02/22/2000	LC	IRR	7.03	
7183-3	SP	OSCAR INC	06/06/1959	LC	IRR	1.89	
7234-3	SP	OSCAR INC	03/01/2011	LC	IRR	1.78	
6183-3	SP	OSCAR INC	02/22/2000	LC	IRR	7.83	
1027-3	BD	US BUREAU OF RECLAMATION *	01/01/1936	LC	MUN	0.00	4,875
7395-3	BD	HURON HTRN BRTH	03/31/2005	LC	IRR	7.13	
2390A-3	BD	HURON HTRN BRTH	09/26/1975	LC	IRR	1.89	
5651-3	BD	HURON HTRN BRTH	04/01/1947	LC	IRR	0.18	

<b>Permit No.</b>	<b>County</b>	<b>Name</b>	<b>Priority Date</b>	<b>Status</b>	<b>Primary Use</b>	<b>Diversion Rate (cfs)</b>	<b>Annual Volume (ac-ft)</b>
2387-3	BD	KLEINSASSER	12/12/1966	LC	IRR	3.50	
5027-3	BD	LAKE BYRON WATERSHED DIST	06/14/1984	LC	REC	12.00	3,400
1276-3	BD	RIVERSIDE HTRN BRTH	01/01/1949	LC	IRR	2.22	
4866-3	BD	RIVERSIDE HTRN BRTH	01/01/1949	LC	IRR	1.56	31
2643-3	BD	KLUDT	02/06/1976	LC	IRR	1.62	
1022-3	BD	CITY OF HURON*	01/01/1936	LC	MUN	0.00	2,320
5321-3	BD	GOSCH	04/27/1989	LC	COM	0.03	
755-3	BD	CITY OF HURON*	12/23/1960	LC	MUN	0.00	600
9-3	BD	CITY OF HURON	04/22/1914	LC	MUN	5.00	
2049A-3	BD	CITY OF HURON	10/04/2021	LC	MUN	2.00	90
8523-3	SP	BEBO	07/02/2021	PE	IRR	1.10	
8292A-3	SP	GLENDALE HTRN BRTH	05/30/1972	PE	IRR	1.89	
8385-3	SP	GLENDALE HTRN BRTH	12/12/2018	PE	IRR	1.45	
8292C-3	SP	GLENDALE HTRN BRTH	09/11/2012	PE	IRR	0.00	
8292E-3	SP	GLENDALE HTRN BRTH	09/11/2012	PE	IRR	0.59	
7479-3	SP	GLENDALE HTRN BRTH	10/25/2012	PE	IRR	3.56	
8352-3	SP	OSCAR INC	04/26/2018	PE	IRR	6.86	
8292D-3	SP	GLENDALE HTRN BRTH	09/11/2012	PE	IRR	0.59	
7425-3	SP	SPINK HTRN BRTH	09/11/2012	PE	IRR	6.67	
7427-3	SP	SPINK HTRN BRTH	09/11/2012	PE	IRR	8.18	

<b>Permit No.</b>	<b>County</b>	<b>Name</b>	<b>Priority Date</b>	<b>Status</b>	<b>Primary Use</b>	<b>Diversion Rate (cfs)</b>	<b>Annual Volume (ac-ft)</b>
7424-3	SP	SPINK HTRRN BRTH	09/11/2012	PE	IRR	3.84	
7444A-3	SP	OSCAR INC	09/12/2012	PE	IRR	0.47	
8353A-3	SP	OSCAR INC	04/26/2018	PE	IRR	2.28	
7839-3	SP	OLSEN	03/07/2013	PE	IRR	0.51	
7444-3	SP	OSCAR INC	09/28/2012	PE	IRR	1.46	
7619-3	SP	OSCAR INC	01/04/2013	PE	IRR	0.00	
8604-3	SP	PETERSON	02/14/2022	PE	IRR	2.29	
8605-3	SP	PETERSON	02/14/2022	PE	IRR	2.29	
8350-3	SP	PETERSON	04/20/2018	PE	IRR	2.28	
8123-3	BD	HURON HTRRN BRTH	02/17/2015	PE	IRR	0.00	
7906A-3	BD	HURON HTRRN BRTH	09/10/2013	PE	IRR	0.00	
7906-3	BD	HURON HTRRN BRTH	09/10/2013	PE	IRR	0.00	
7905-3	BD	HURON HTRRN BRTH	09/10/2013	PE	IRR	1.78	
8498-3	BD	WIETING	03/17/2021	PE	IRR	0.41	
8473-3	BD	WIETING	01/14/2021	PE	IRR	1.78	
7186-3	BD	RIVERSIDE HTRRN BRTH	02/23/2010	PE	IRR	6.62	
8006-3	BD	RIVERSIDE HTRRN BRTH	04/25/2014	PE	IRR	1.78	
8785-3	SA	UPLAND HUTTERIAN BRETHREN	07/27/2023	PE	IRR	2.15	
7697-3	HS	ROSEDALE HTRRN BRTH	02/08/2013	PE	IRR	16.94	
7697A-3	HS	ROSEDALE HTRRN BRTH	02/08/2013	PE	IRR	2.63	

<b>Permit No.</b>	<b>County</b>	<b>Name</b>	<b>Priority Date</b>	<b>Status</b>	<b>Primary Use</b>	<b>Diversion Rate (cfs)</b>	<b>Annual Volume (ac-ft)</b>
7696-3	HS	ROSEDALE HTRN BRTH	02/08/2013	PE	IRR	6.34	
8047-3	HS	ROCKPORT HTRN BRTH	09/04/2014	PE	IRR	2.96	
8046-3	HS	ROCKPORT HTRN BRTH	09/04/2014	PE	IRR	5.17	
8048-3	HS	ROCKPORT HTRN BRTH	09/04/2014	PE	IRR	2.48	
8048A-3	HS	ROCKPORT HTRN BRTH	09/04/2014	PE	IRR	2.37	
8447-3	HS	SHANNON HTRN BRTH	09/18/2020	PE	IRR	4.23	
8305A-3	HS	ROCKPORT HTRN BRTH	09/16/1971	PE	IRR	0.43	
8305B-3	HS	ROCKPORT HTRN BRTH	09/16/1971	PE	IRR	0.43	
8048B-3	HS	ROCKPORT HTRN BRTH	09/04/2014	PE	IRR	0.50	
8448-3	HS	ROCKPORT HTRN BRTH	09/18/2020	PE	IRR	2.00	
8449-3	HS	ROCKPORT HTRN BRTH	09/18/2020	PE	IRR	5.14	
7339-3	HS	ROCKPORT HTRN BRTH	03/20/2012	PE	IRR	6.68	
7973-3	HS	ROCKPORT HTRN BRTH	02/19/2014	PE	IRR	1.23	
8045-3	HS	ROCKPORT HTRN BRTH	09/04/2014	PE	IRR	2.45	
1902A-3	HS	ROCKPORT HTRN BRTH	09/16/1971	PE	IRR	3.64	
8305C-3	HS	ROCKPORT HTRN BRTH	09/16/1971	PE	IRR	0.49	

Permit No.	County	Name	Priority Date	Status	Primary Use	Diversion Rate (cfs)	Annual Volume (ac-ft)
7834-3	HT	NEUHARTH	04/15/2013	PE	IRR	1.78	
550-3	BD	SCHNABEL	09/10/1958	LC	IRR	0.60	
5357-3	SA	CASSENS*	01/01/1936	LC	REC	0.00	370
5500-3	SA	BEEDLE	03/06/1991	LC	IRR	0.25	7
1917-3	DN	MORRISON	12/22/1971	LC	IRR	1.74	
5207-3	DN	JIM-REC-AG CORPORATION	04/20/1957	LC	IRR	5.58	
5022-3	DN	DAVISON RWS	06/19/1984	LC	RWS	2.90	
699B-3	DN	PUETZ LEGACY TRUST	03/02/1960	LC	IRR	1.63	
5121-3	HS	MITCHELL QUARRY	01/28/1987	LC	IND	0.88	
1900-3	HS	MILLBROOK HTRN BRTH	09/16/1971	LC	IRR	1.55	
436-3	HS	ROSEDALE HTRN BRTH	04/05/1945	LC	IRR	1.05	
4656-3	HS	ROSEDALE HTRN BRTH	09/16/1971	LC	IRR	3.88	
4717A-3	HS	ROCKPORT HTRN BRTH	09/16/1971	LC	IRR	1.67	
2411-3	HS	ROCKPORT HTRN BRTH	10/20/1975	LC	IRR	2.00	
2385-3	HT	BAUER	09/23/1975	LC	IRR	1.30	
6131-3	HT	NEUHARTH	03/22/1999	LC	IRR	0.77	
6506-3	HT	RAMES	04/26/2004	LC	IRR	0.00	
5392A-3	HT	NICOLAI	03/01/1990	LC	IRR	1.34	
6132-3	HT	ULMER	03/22/1999	LC	IRR	0.85	
2631A-3	HT	SPENCER QUARRIES INC	11/25/1975	LC	IRR	1.70	

\*Not included in budget for flow appropriation (Table 3); BN: Brown; HU: Hughes; SP: Spink; BD: Beadle; SA: Sanborn; HS: Hanson; HT: Hutchinson; DN: Davison; PE: Permit; LC: License; MUN: Municipal; DOM: Domestic; IND: Industrial; FWS: Fish & Wildlife Propagation; IRR: Irrigation; REC: Recreation; COM: Commercial; RWS: Rural Water System

### Attachment A3. Descriptions of Deferred James River Applications

1. **Application No. 8821-3** for Jim or Colin Klebsch proposes to appropriate 0.81 cubic feet of water per second (cfs) from the James River located in the NW  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 13, for the irrigation of 100 acres located in the SE  $\frac{1}{4}$  of Section 13, all in T117N-R64W. This site is located approximately 4.5 miles northeast of Redfield, South Dakota in Spink County.
2. **Application No. 8822-3** for Jim or Colin Klebsch proposes to appropriate 5.34 cubic feet of water per second from the James River located in the NW  $\frac{1}{4}$  NE  $\frac{1}{4}$  of Section 31 for the irrigation of 250 acres located in the NW  $\frac{1}{4}$ , NE  $\frac{1}{4}$ , SE  $\frac{1}{4}$  of Section 31, all in T117N-R63W. The applicant is requesting a diversion rate greater than the statutory limit of 1 cfs per 70 acres. This site is located approximately 3 miles northeast of Redfield, South Dakota in Spink County.
3. **Application No. 8823-3** for Jim or Colin Klebsch proposes to appropriate 1.56 cubic feet of water per second from the James River located in the NE  $\frac{1}{4}$  SW  $\frac{1}{4}$  of Section 24 for the irrigation of 100 acres located in the SE  $\frac{1}{4}$  of Section 23 and the N  $\frac{1}{2}$  SW  $\frac{1}{4}$ , SW  $\frac{1}{4}$  SW  $\frac{1}{4}$  of Section 24, all in T117N-R64W. The applicant is requesting a diversion rate greater than the statutory limit of 1 cfs per 70 acres. This site is located approximately 3.5 miles northeast of Redfield, South Dakota in Spink County.
4. **Application No. 8824-3** for Jim or Colin Klebsch proposes to appropriate 0.75 cubic feet of water per second from the James River located in the NW  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 13 for irrigation of 100 acres located in the SE  $\frac{1}{4}$  of Section 13, all in T117N-R64W. This site is located approximately 4.5 miles northeast of Redfield, South Dakota in Spink County.
5. **Application No. 8835-3** for Nick & Scott Bebo proposes to appropriate 6.65 cubic feet of water per second (cfs) from the James River at a point located in the NW  $\frac{1}{4}$  SW  $\frac{1}{4}$  of Section 28 for the irrigation of 466 acres located in the NW  $\frac{1}{4}$  of Section 28, S  $\frac{1}{2}$ , NW  $\frac{1}{4}$  of Section 21; all in T117N-R63W. This site is located in Spink County, approximately five miles northeast of Redfield, South Dakota.
6. **Application No. 8859-3** for Nick & Scott Bebo proposes to appropriate 3.0 cubic feet of water per second (cfs) from the James River located in the NE  $\frac{1}{4}$  SW  $\frac{1}{4}$  of Section 34 for the irrigation of 305 acres located in the N  $\frac{1}{2}$  of Section 27, all in T117N-R63W. The site is located in Spink County, approximately six miles northeast of Redfield, South Dakota.
7. **Application No. 8860-3** for Nick & Scott Bebo proposes to appropriate 2.6 cubic feet of water per second (cfs) from the James River located in the NW  $\frac{1}{4}$  NE  $\frac{1}{4}$  of Section 12 for the irrigation of 260 acres located in the NE  $\frac{1}{4}$ , E  $\frac{1}{2}$  SE  $\frac{1}{4}$ , SW  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 12, all in T117N-R64W. The site is located in Spink County, approximately six miles northeast of Redfield, South Dakota.
8. **Application No. 8861-3** for Nick & Scott Bebo proposes to appropriate 2.2 cubic feet of water per second (cfs) from the James River located in the NE  $\frac{1}{4}$  SW  $\frac{1}{4}$  of Section 34 for the irrigation of 220 acres located in the S  $\frac{1}{2}$  NW  $\frac{1}{4}$ , SW  $\frac{1}{4}$  of Section 34, all in T117N-R63W. This site is located in Spink County, approximately five and one-half miles northeast of Redfield, South Dakota.
9. **Application No. 8862-3** for Nick & Scott Bebo proposes to appropriate 1.10 cubic feet of water per second (cfs) from the James River located in the SE  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 20 for the irrigation of 110 acres located in the SE  $\frac{1}{4}$  of Section 20, all in T117N-R63W. The

site is located in Spink County, approximately five miles northeast of Redfield, South Dakota.

- 10. Application No. 8863-3** for Nick & Scott Bebo proposes to appropriate 0.80 cubic feet of water per second (cfs) from the James River located in the SE  $\frac{1}{4}$  NE  $\frac{1}{4}$  of Section 29 for the irrigation of 80 acres located in the E  $\frac{1}{2}$  NE  $\frac{1}{4}$  of Section 32, all in T117N-R63W. This site is located in Spink County, approximately five miles northeast of Redfield, South Dakota.
- 11. Application No. 8867-3** Jim or Colin Klebsch proposes to appropriate 1.56 cubic feet of water per second (cfs) from the James River located in the SW  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 13 for the irrigation of 80 acres located in the NE  $\frac{1}{4}$  of Section 24, all in T117N-R64W. The applicant is requesting a diversion rate greater than the statutory limit of 1 cfs per 70 acres. This site is located in Spink County, approximately four and one-half miles northeast of Redfield, South Dakota.
- 12. Application No. 8868-3** Jim or Colin Klebsch proposes to appropriate 1.56 cubic feet of water per second (cfs) from the James River located in the SW  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 13 for the irrigation of 80 acres located in the S  $\frac{1}{2}$  SE  $\frac{1}{4}$  of Section 24, all in T117N-R64W. The applicant is requesting a diversion rate greater than the statutory limit of 1 cfs per 70 acres. This site is located in Spink County, approximately four and one-half miles northeast of Redfield, South Dakota.
- 13. Application No. 8869-3** Jim or Colin Klebsch proposes to appropriate 2.57 cubic feet of water per second (cfs) from the James River located in the E  $\frac{1}{2}$  SE  $\frac{1}{4}$  of Section 11 for the irrigation of 180 acres located in the E  $\frac{1}{2}$  NE  $\frac{1}{4}$ , NE  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 14, the N  $\frac{1}{2}$  NW  $\frac{1}{4}$  of Section 13, the SW  $\frac{1}{4}$  SW  $\frac{1}{4}$  of Section 12, the SE  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 11, all in T117N-R64W. The site is located in Spink County, approximately five miles north of Redfield, South Dakota.
- 14. Application No. 8870-3** Jim or Colin Klebsch proposes to appropriate 3.88 cubic feet of water per second (cfs) from the James River located in the NE  $\frac{1}{4}$  SE  $\frac{1}{4}$  of Section 11 for the irrigation of 272 acres located in the W  $\frac{1}{2}$  of Section 2, all in T117N-R64W. The site is located in Spink County, approximately five and one-half miles northeast of Redfield, South Dakota.