WINTER 2023

THE OTTER

Newsletter of Friends of the Big Sioux River

Do You Know Where Your Drinking Water Comes From?

Sioux Falls is one of the fastest-growing cities in America today, and with a growing population comes a greater demand for water. We sat down with Chris Myers, Water Superintendent for the City of Sioux Falls, to discuss the city's current water usage and the future of water in Sioux Falls. Whether you live in Sioux Falls or another community in the Big Sioux River watershed, this case study applies to everyone. Towns across Eastern South Dakota continue to balance population growth with water usage, drought, water quality issues, and the need for infrastructure improvements.

In 2012, Sioux Falls received its first allocation of water from the Lewis and Clark Regional Water System, a system that, when complete, will deliver water from the Missouri: Elk Point Aquifer to 20 members in South Dakota, Minnesota, and Iowa. Prior to 2012, the city relied on three sources of water: the Big Sioux River Aquifer, the Middle Skunk Creek Aquifer, and Big Sioux River surface water. The water from Lewis and Clark has been instrumental in the city's ability to grow at a rapid pace. "We heavily rely on Lewis and Clark today and know that the investment that we made in them has an amazing impact on sustaining the growth that Sioux Falls is experiencing and will experience into the future," Myers said.

> "THE WATER FROM LEWIS AND CLARK HAS BEEN INSTRUMENTAL IN THE CITY'S ABILITY TO GROW AT A RAPID PACE."

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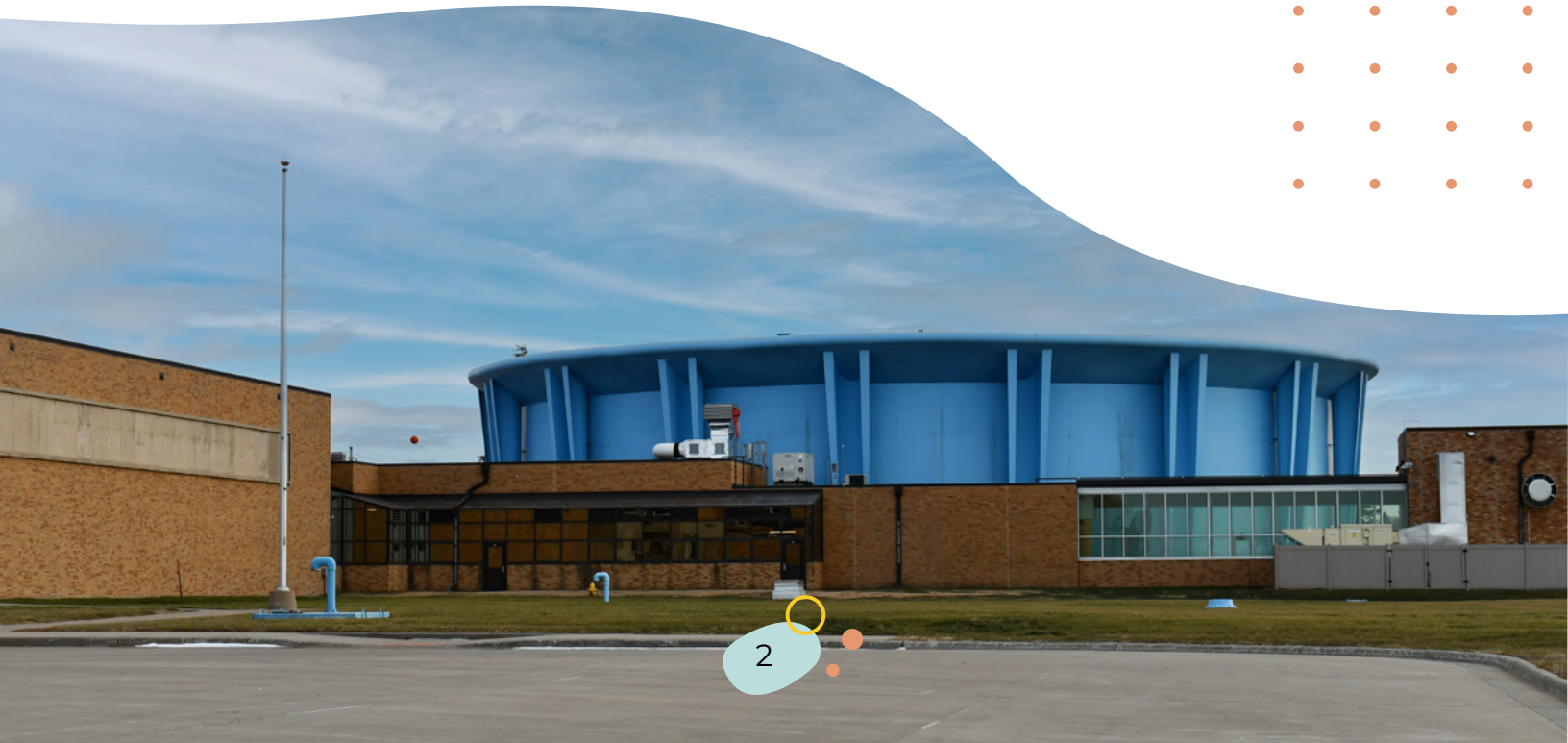
How much water does Sioux Falls use? In 2022, the city used 8.2 billion gallons of water, with 56% (4.6 billion gallons) coming from Lewis and Clark, 41% (3.4 billion gallons) from the two aquifers, and 3% (0.2 billion gallons) from Big Sioux River surface water. On average, Sioux Falls residents use 22.4 million gallons of water per day. This number increases in summer to around 32.27 million gallons and decreases in winter to 16.3 million gallons. Myers noted that "despite a growing population, our water consumption has not escalated proportionally." He attributes this to the City's proactive approach to implementing technological advancements and conservation programs that decrease per capita daily water usage.

At the Water Purification Plant, the City monitors influent raw water and effluent finished water for more than 250 substances to ensure safe drinking water. Nitrates, a contaminant that we test for at Friends of the Big Sioux River, are included in this list of substances. Nitrates are naturally present in the environment. However, they are often found in excess due to runoff from fertilized soil, animal feedlots, and septic systems. Excess nitrates in drinking water can cause Blue Baby Syndrome, cancer, and other unwanted health effects.

Recent data from across the watershed show that nitrate levels continue to rise gradually in the Big Sioux River but remain within the safe levels set by the EPA through the Safe Drinking Water Act. Other cities in the Midwest, such as Des Moines, regularly see nitrates above the safe level in their raw source water. As a result, they must run their nitrate removal facility to ensure the finished drinking water remains within safe levels. This facility can cost up to $10,000 a day to run, a cost incurred by the ratepayers. At present, the City of Sioux Falls does not have a nitrate removal facility and does not foresee the need for one in the near future. However, it is up to us as watershed citizens to continue reducing our fertilizer usage, picking up pet waste, and reducing runoff to ensure that nitrate levels do not continue to rise.

You may be wondering what the future holds for drinking water in Sioux Falls. According to Myers, the future is bright. The City is in the process of completing a master plan that examines current supply data against the needs of the estimated population growth. "We feel we have enough water today to provide for the next 25-plus years of growth and development," Myers said. In addition to the master plan, the City has begun work on a new horizontal collector well that will replace a current well built in 1952. This well, located by I-90 and Ditch Road, is expected to be completed by the 2025 peak season. The existing well pulls water from the Big Sioux River Aquifer, pulling about 180 gallons per minute or 0.26 million gallons per day. The new well will pull about 2,776 gallons per minute or 4 million gallons per day. Infrastructure updates such as these are all part of the City's work to ensure that we have enough water to sustain the future growth of our community for the next 25, 50, and even 100 years.

For more information on the Water Purification Plant and the City's comprehensive water quality monitoring, visit siouxfalls.gov/water.



Board Member Profile

Madeleine Titze

"I HOPE WE CAN REALIZE A FUTURE WHERE THE RIVER IS RESPECTED AND PROTECTED FOR ALL ITS MANY USES AS WELL AS ITS OWN INTRINSIC VALUE."

Meet our newest board member at Friends of the Big Sioux River, Madeleine Titze! Madeleine grew up in Las Cruces, New Mexico, and graduated from Gonzaga University with degrees in biology and environmental studies. Today, she lives in Sioux Falls with her husband, Thad, daughter, Sophie, and naughty rescue beagle, Pepper. Titze is an organizational consultant and executive coach at Bridges Consulting, working with individuals, teams, and companies across the country to improve leadership and organizational effectiveness. Since joining the board, Madeleine has been instrumental in using her skills to help FBSR create an employee handbook and other procedural documents.

Madeleine considers herself an outdoor enthusiast who has grown to develop a deep appreciation for the landscape of South Dakota. "Having grown up in New Mexico near the (almost always dry) Rio Grande, it pains me to think about further degradation of the Big Sioux," Titze said. As an FBSR board member, Titze wants "to make a positive difference in our watershed and do whatever I can to ensure our success as an organization." Madeleine's favorite part about being on the board is seeing people from all walks of life come together to volunteer and support the FBSR mission.

Like everyone at Friends of the Big Sioux River, Titze wants all community members across Eastern South Dakota to feel confident and safe enjoying the river. "Ultimately, I hope we can realize a future where the river is respected and protected for all its many uses as well as its own intrinsic value," Titze said. Thank you, Madeleine, for joining the FBSR board! You are a wonderful asset to have on our team.

You can say hi to Madeleine and all our board members at the Big Sioux Film Festival on February 8, 2024. Mark your calendars now—more information is coming soon!

Question:

RIVER QUIZ

Can you identify this historic Big Sioux River location from 1951?

See page 7 for the answer.

River photos courtesy of Siouxland Heritage Museums

A Story About Sioux Quartzite

By Pete Carrels

Components comprising Sioux Quartzite were present on Earth's surface 2.5 billion years ago, when magma rose from the planet's volatile inner oven. This scorching liquid rock thrust upward through the mantle and crust before erupting into the air and across the land. It was there, freed from the confines of passable vents and fissures, that molten rock transformed into lava. Volcanoes oozed or forcefully expelled gas, ash, and magma. During a time of frequent volcanic eruptions, the world was shaken by gassy explosions and fiery chaos. Subterranean continental plates shifted. Some plates collided. Others slipped farther apart. The force of these geological activities was colossal. The land trembled. Mountains shattered or grew. This process of earth discharging earth continues today, though contemporary ejections seem like rare events.

Varying types of magma are mixtures of different minerals and dissolved gases, and most magma contains silicon dioxide, a primary constituent of quartz. Lava very slowly deteriorates through erosional processes. Solid rock becomes grains of sand.

An enormous inland sea pooled where eastern South Dakota and other parts of the Northern Plains are now. During its lengthy lifespan, that sprawling, fluctuating body of water generated shifting shorelines, and quartz sands carried by waterways or blown by winds accrued at the ever-changing, shallow-watered edges of that sea.

Over millions of years, more and more of those sands settled into that sea, and were transported to downstream locations. Sands at the base of the concentrated deposits were compacted by overlying sediment. That process - the downward force of heavy overburden- squeezed excess liquid from the sand, like pressing down on a water-soaked sponge. The compressed sand grains were then locked together by silica. At this juncture, those sands first delivered by wind and ancient streams had been compacted into sandstone, a loosely grained, sedimentary rock.

About 1.7 billion years ago, that sandstone was subjected to one or more high-pressure tectonic plate events that sank and buried the stone. After weighty pressure lasting five million years, the sandstone was pressed into quartzite. Tinted red, pink, or purple by iron oxide, Sioux Quartzite possesses a texture that is tightly interlocked. In other words, it is a rigid, exceptionally hardened stone. Classified as a bedrock, this particular type of quartzite is visible in few places throughout its range.

In 1867, a scientist named C.A. White visited a quiet hamlet in Dakota Territory named Sioux Falls. A small

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military post and a handful of settlers huddled there. White, a Massachusetts native, had studied geology at the University of Michigan and medicine at Rush Medical College. He moved his family to Iowa City to open a medical practice but soon realized his real passion was geology and natural history, so he switched careers. It didn't take long for him to attain recognition and respect. In 1866, the Iowa legislature named him to direct the state's geological survey. White rose to become one of the nation's most esteemed scientists, publishing over two hundred papers and books, with affiliations to the U.S. Geological Survey, the National Museum [the original name for the Smithsonian Institution], and the U.S. Department of Agriculture.

White and five companions had earlier departed Sioux City and headed north, following the east side, the Iowa side, of the Big Sioux River. White soon noted the appearance of red boulders "embedded in the deep, rich soil."

In the northwest corner of Iowa, White encountered "ledges of the red quartzite…" And as the group neared Sioux Falls, they found "quartzite exposed at frequent intervals along the valley." In Sioux Falls, White studied the cascades of the Big Sioux River and the prominent quartzite formation observable there. In an article published by *The American Naturalist*, White enthusiastically described the setting. "…we find a magnificent exposure of the same rock extending across the river and causing a series of falls of sixty feet in aggregate height, within the distance of half a mile, which for romantic beauty are seldom surpassed."

White had a special interest in the red stone. "This quartzite," he wrote, "is of a nearly uniform brick-red color, intensely hard, quite regularly bedded, the bedding surfaces sometimes showing ripple markings as distinct as any to be seen upon the sea-shore of the present day, and which were made in the same manner untold ages ago, when this hard rock was a mass of incolterent sand, the grains of which are even now distinctly visible. In a few localities, it presents the characters of conglomerate, the pebbles being as clearly silicious as the grains of sand."

White spent several days at the falls before continuing northward to study the rock at Pipestone, the fabled Native American quartzite excavation site. He is now recognized as the first person to use the expression, *Sioux Quartzite*.

Eighty-two years after White's scientific mission to Sioux Falls, another geologist, Brewster Baldwin, released a report about Sioux Quartzite. Baldwin, employed by South Dakota's Geological Survey, was precise in his description of the stone. "The color of the quartzite," he wrote, "is commonly red or pink, but it can vary over a considerable range. Some exposures are gray or white, with only a faint pinkish cast, and otherwise nearly black. A dark reddish purple is common, and in some places, the fresh rock has an orange tint." Baldwin also explained the variety of colors: "…the color of the quartzite is due to the presence of thin films of iron oxides coating the grains of quartz." He noted that iron comprises less than three percent of the rock and, more commonly, one or two percent. Most quartzite surrounding and flooring the cascades is colored a reddish purple. When wet, the rock glistens.

Quarrying the region's unique, native stone near the falls and in the Sioux Falls area has been commercially pursued since the 1850s. Many of Sioux Falls' earliest and finest buildings were proudly constructed using Sioux Quartzite. At one point, during the city's early years, a short-lived and unsuccessful crusade would have required quartzite to be used in all major buildings. For many decades, the emphasis on utilizing local quartzite for structural or ornamental purposes faded, but a welcome renaissance is underway. Especially striking examples of the stone are now commonly used to decorate local architecture.

This story is excerpted from Peter Carrels' upcoming book, tentatively titled *Cascades of the Big Sioux River, A Cultural Geography.* He served on FBSR's board of directors from 2016 to 2021.

Flood Control Practices in the Big Sioux River Watershed

The Big Sioux River flows through the heart of many communities in Eastern South Dakota. While settlement along a river provides innumerable benefits, it also has its pitfalls, namely destruction following flooding events. Many cities, including the City of Sioux Falls, have installed flood control systems to mitigate these issues. Driving north of the Sioux Falls Regional Airport, you can see the diversion channel, a flood control project started in April 1956 and completed in January 1961. Designed to bypass excess flood flows from the Big Sioux River and Silver Creek, the channel flows around the city to the north and east. The undiverted water continues through Sioux Falls, combining with Skunk Creek and Willow Creek water near Louise Avenue and 26th Street. The river flows on, roaring over the Falls and reconnecting with the diversion channel just north of Smithfield Foods.

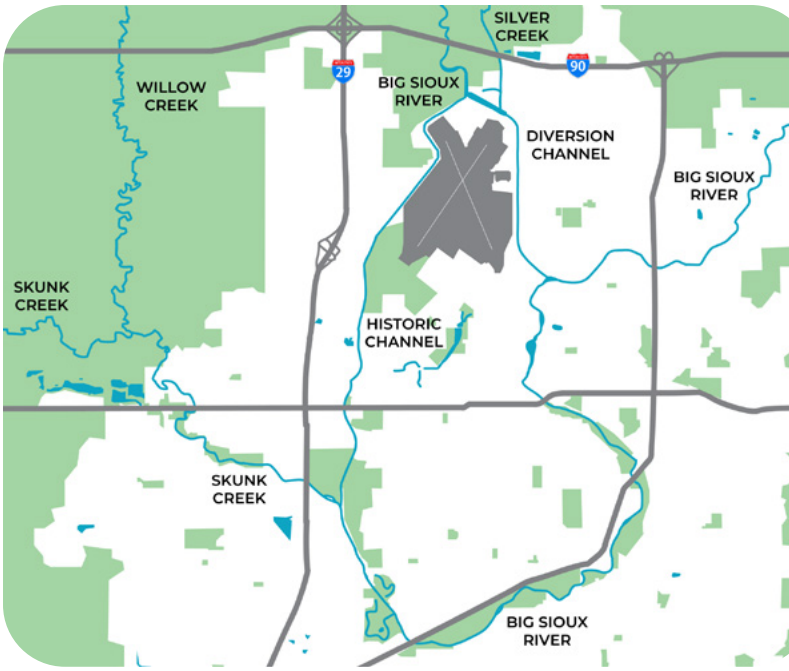
According to Andy Berg, City Engineer for the City of Sioux Falls, the amount of water flowing through Sioux Falls proper from the Big Sioux River and Skunk Creek depends on several factors, including rainfall amounts in each watershed, drought conditions, and maintenance activities. In summer, approximately 90% of the water entering the city proper comes from the Big Sioux River and 10% from Skunk Creek. Of the 90% of Big Sioux River water, 70+% of that flow is passed through the diversion dam and into the historic channel. The other 30% is sent to the diversion channel east of the city. However, during flood events or other special circumstances, this water allotment is adjusted to decrease the likelihood of severe flooding. In the summer of 2023, the City sent most of the Big Sioux River water through the diversion channel to decrease the amount of water flowing through the 6th Street bridge construction work area.

In addition to the diversion channel, the City has a variety of other flood management controls in place. There are 26 miles of levee system located along the historic river channel, the diversion channel, and Skunk Creek, along with two dams, the diversion dam and the confluence dam. Just downstream of the confluence, there is one stormwater lift station. “We have numerous outfall structures along the system that have flap gates and/or

(Continued on page 7)

sluice gates that keep water from backing up through the levee into the protected areas," Berg said. Although Sioux Falls does see occasional flood events, such as in 2019, the flood management controls greatly help to diminish the likelihood of severe flood damage. As you walk, bike, or drive through cities and towns in the Big Sioux River watershed, we encourage you to keep an eye out for flood control infrastructure and consider how it impacts a community's ability to thrive in flood-prone areas.

"WE HAVE NUMEROUS OUTFALL STRUCTURES ALONG THE SYSTEM THAT HAVE FLAP GATES AND/OR SLUICE GATES THAT KEEP WATER FROM BACKING UP THROUGH THE LEVEE INTO THE PROTECTED AREAS."



Answer:

RIVER QUIZ

It's the oxbow lake at The Outdoor Campus and Sertoma Park in Sioux Falls! In 1956, levees were created for flood control management. The levees redirected the Big Sioux River, cutting off the water around Sertoma Park and creating the oxbow lake. A levee is a structure, often made of earth, that runs parallel to a river to keep the river's course and help protect against flooding. Today, the oxbow lake is a hidden gem within the city, teeming with flora and fauna. We recently teamed up with Kids in Parks, South Dakota Game, Fish and Parks, the National Wild Turkey Foundation, and the City of Sioux Falls to create an interactive kids brochure about the oxbow lake, complete with a five senses scavenger hunt. Check it out the next time you're at The Outdoor Campus!

The oxbow lake and rerouted Big Sioux River, circa 1956.

In Otter News

1 State's Riparian Buffer Initiative Slow to Take Hold

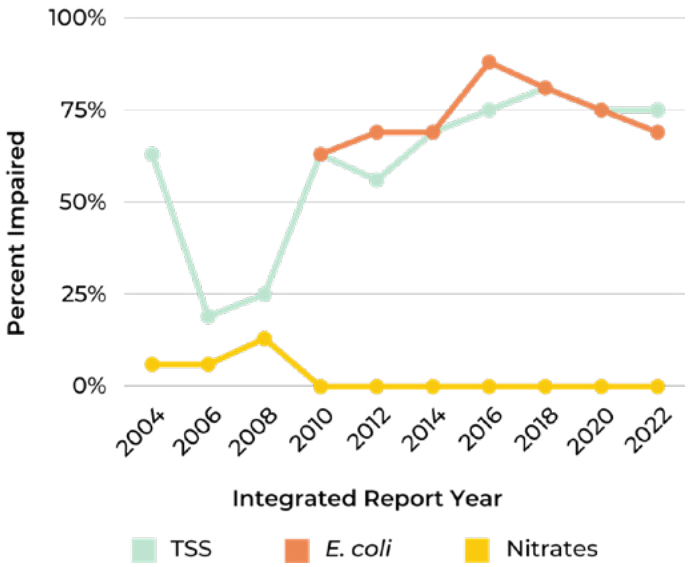
In 2021, the South Dakota Legislature passed a bill to provide $3 million in funding to help improve water quality in the Big Sioux River. The money was incorporated into a new South Dakota Department of Agriculture and Natural Resources (DANR) buffer strip program called the Riparian Buffer Initiative (RBI). The program is designed to provide financial incentives to landowners willing to put their riparian areas into a termed buffer strip ranging from 50 to 120 feet wide. The program has had a slow start. Because of this, DANR has adjusted the RBI program to attract more landowners. The annual payments for buffer strips have increased, up to $575/acre for cropland and $157/acre for pastureland. Additionally, animal waste management systems have been added to the program, and the geographic footprint updated. As of this writing, four buffer strip projects are enrolled, totaling 78 acres for $71,456. There are currently 22 additional buffer strip projects in the works, and $63,000 has been allocated for a waste management system. The majority of the $3 million is still available and scheduled to sunset in 2025. If you are interested, visit the DANR website or visit with local DANR staff to learn more.

2 2004-2022 Integrated Report

Every two years, the South Dakota Department of Agriculture and Natural Resources (DANR) produces an Integrated Report for Surface Water Quality Assessment for all waterbodies in the state. DANR has split the Big Sioux River into 16 segments, each with a list of beneficial uses. A waterbody is considered impaired when it does not meet its beneficial use criteria.

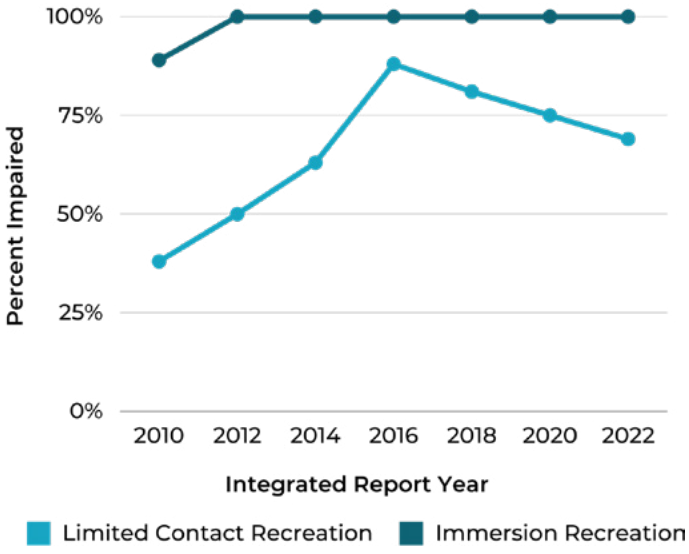
Before 2010, DANR tested for total coliform and fecal coliform. *E. coli*, a sub-group of fecal coliform with stricter standards, was added to the report in 2010. As a result, we have only included *E. coli* data in our analyses.

2004-2022 Big Sioux River Impairment Status



We analyzed the Integrated Reports from 2004 to 2022 for the percentage of impaired river segments for three contaminants in the Big Sioux River—Total Suspended Solids (TSS), *E. coli*, and nitrates. The graph indicates a spike in TSS and *E. coli* in the mid-2010s, with a slight decline beginning in 2018. Nitrate impairment has been at 0% since 2010. Overall, these data show an improvement in water quality in the Big Sioux River over the last five years. The 2024 Integrated Report will be crucial in determining whether these numbers continue to trend downward.

2004-2022 Big Sioux River E. coli Beneficial Use Status



SD DANR lists *E. coli* as having two beneficial uses: Limited Contact Recreation and Immersion Recreation. Of the 16 segments of the Big Sioux River, nine are designated for Immersion Recreation (235 CFU/100mL) and 16 for Limited Contact Recreation (1,178 CFU/100 mL). Immersion Recreation includes swimming and submersion, while Limited Contact Recreation includes fishing, boating, etc. Due to the disease risk posed by *E. coli*, we believe it is important to inform the public of the river's *E. coli* impairment status.

Since 2012, all nine Immersion Recreation segments have been considered impaired or unsafe for swimming. Limited Contact Recreation impairment peaked in 2016, but it has been steadily declining ever since. These data indicate that *E. coli* levels in the river are improving year over year. As the less strict Limited Contact Recreation numbers continue to decline, we hope to see the more stringent Immersion Recreation numbers follow, with the eventual goal of the Big Sioux River being safe for swimming.

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From river clean-ups to water sampling to community education, it has been an extremely busy year at Friends of the Big Sioux River. These images are just a few examples of the work we have been doing throughout the watershed, and we look forward to engaging with the watershed community even more in 2024!

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