NONPOINT SOURCE SUCCESS STORY

utah

Installing Management Practices Improves the North Fork Virgin River

Waterbody Improved

Flood-irrigated pastures grazed by cattle and wildlife contributed to *Escherichia coli* exceedances in the North Fork Virgin River watershed. As a result, the Utah Department of Environmental Quality (DEQ) included the upper North Fork Virgin River on Utah's Clean Water Act (CWA) section 303(d) list of impaired waterbodies in 2010 for failing to meet the *E. coli* standard for frequent primary contact recreation (2A). The lower watershed was listed in 2012. Landowners and agencies collaborated to implement recreational area improvements and best management practices in 2011–2017, and water quality has improved. *E. coli* data have not exceeded the standard since 2015. The DEQ Division of Water Quality (DWQ) will continue to collect data, and if no exceedances are observed, the North Fork of the Virgin River could be delisted for *E. coli* as early as 2020.

Problem

The North Fork Virgin River watershed drains approximately 360 square miles (230,390 acres) on the Colorado Plateau in southwest Utah (Figure 1). The river emerges as a spring at Cascade Falls and flows for 16 miles before entering Zion National Park. The North Fork Virgin River continues through the park for several miles and combines with Deep Creek, Kolob Creek, and several other tributaries to flow through the famous Zion Narrows. The river flows for 25 miles from Cascade Falls to the confluence with the East Fork Virgin River in the town of Springdale.

Monthly *E. coli* data were collected at multiple sampling sites in May through October, 2010–2017. *E. coli* is an indicator of fecal contamination in a waterbody. Exceedances of the standard were primarily driven by return flows from flood-irrigated pastures grazed by cattle and wildlife. Addressing the impairment by developing a total maximum daily load (TMDL) was a priority for DWQ due to the many people recreating in the river in and near Zion National Park. Every year thousands of people wade and swim in the river when they hike the Zion Narrows trail.

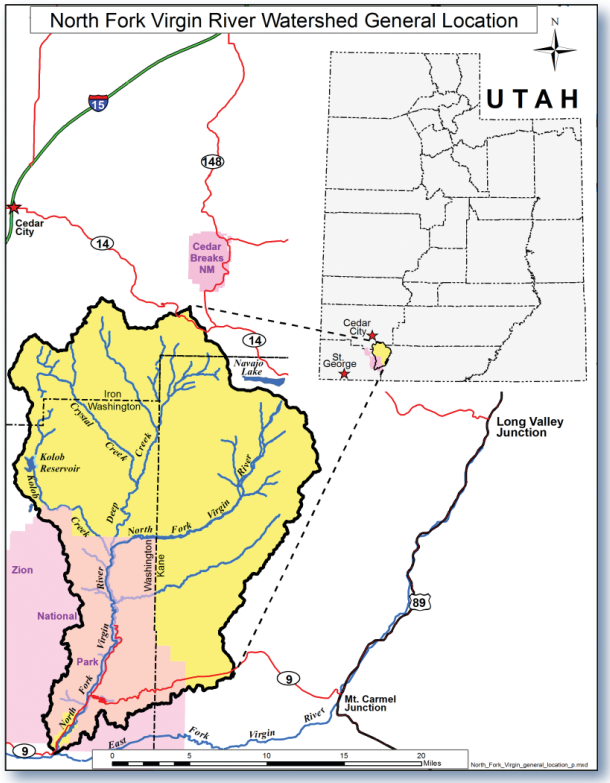

Figure 1. The North Fork Virgin River is in southern Utah.

Story Highlights

Various agencies and landowners began working to improve water quality by implementing best management practices (BMPs) before the North Fork Virgin River *E. coli* TMDL was completed in 2018. DWQ awarded a nonpoint source grant to the Kanab Bureau of Land Management (BLM) field office in 2011 to install a vault toilet at the Chamberlain Ranch trailhead, where the popular 16-mile Zion Narrows hike begins. As a result, the amount of human waste scattered about the trailhead has decreased and the overall conditions at the trailhead have greatly improved.

Figure 2. A flow measurement device was added to this irrigation diversion.

In an attempt to reduce *E. coli* loading from flood-irrigated pastures in the upper watershed, a prescribed grazing management plan was implemented on 45 acres on private lands during the 2015 grazing season. This plan helped identify how many animals could graze on each individual pasture without overusing the feed that was available in each pasture. It also coordinated the timing of the grazing and irrigation. Allowing the feces to dry for a period of days to weeks before irrigation water was applied decreased the amount of *E. coli* that was mobilized and entered the stream.

The grazing management plan helped improve the riparian area. Although no attempt was made to quantify the increase in riparian vegetation, improvements were visibly noticeable throughout the season. The increase in riparian vegetation acts to slow overland flow and reduce the pathogens entering the river from the pastures during irrigation and precipitation events. As part of the plan, approximately 200 feet of fences and gates along several pastures were improved to allow ease of hiker access while discouraging trespass cattle from grazing on pastures that were being actively irrigated.

Many of the pastures in the upper watershed are irrigated through wild flood irrigation. Historically, the landowners would divert the maximum amount of water that their system would hold. This excess of water increases the potential for bacteria-laden irrigation return flows to enter the river. Irrigators throughout the watershed have been encouraged to install measurement devices, and some already have (Figure 2).

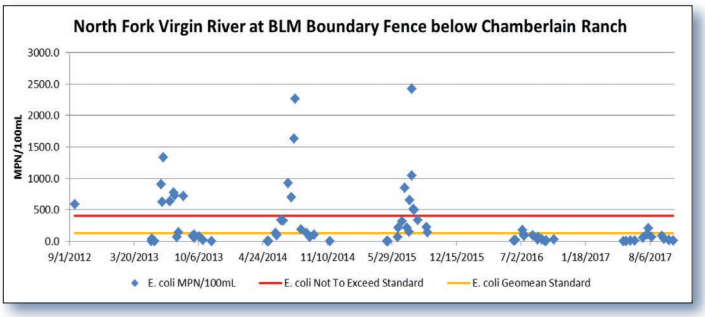

Figure 3. *E. coli* concentrations have dropped in the North Fork Virgin River.

Results

Through a collaborative effort between the DWQ, Zion National Park and BLM, the North Fork Virgin River watershed has been intensively monitored for *E. coli* during the recreational season. The results show that eliminating grazing, managing human waste and improving irrigation water management has led to improved water quality. As seen in Figure 3, *E. coli* levels have not exceeded water quality standards since BMPs were installed. DWQ will continue to collect data, and if no exceedances are observed, the North Fork of the Virgin River could be delisted for *E. coli* as early as 2020.

Partners and Funding

Stakeholder participation was achieved through multiple meetings and site visits over the past few years. Approximately $30,000 has been spent on improvements in the watershed, with funding coming from state, federal and private sources: BLM ($1,600 for water measurement devices and gates/fencing), Utah DWQ ($18,365 for installing a vaulted toilet), and Utah Department of Agriculture and Food ($10,000 for grazing management plan development). Other partners included local landowners, Zion National Park, Utah Association of Conservation Districts, and Utah Division of Water Rights.

The most effective component has been the change in land management by eliminating grazing, which was accomplished by educating the landowners and developing proper management plans. This is a water quality success story that highlights the importance of proper land use management, without a large amount of funding needed to install expensive BMPs.

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