AQUATIC RESOURCE DELINEATION REPORT

Project Name: Shush Kin Fen Wetland Restoration

Date: 5/26/2026

Purpose for Delineation

The purpose of this delineation is to determine the type, amount, and extent of aquatic resources at the Shush Kin Fen Wetland Restoration project site that may be subjected to U.S. Army Corps of Engineers (USACE) regulation. Data to support this delineation was collected in accordance with established regulatory standards, guidance, and protocol found in the 1987 Corps of Engineers Wetlands Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008).

Description of the Proposed Project

Phase I of the Shush Kin Fen Wetland Restoration project was initiated in 2021 on the Mt. Taylor Ranger District of the Cibola National Forest. To date, the project has mainly included fencing of a severely degraded histosol fen and nearby springs to exclude livestock grazing. Grazing has significantly reduced riparian vegetation, caused erosion along the two small creeks in this area, and led to severe hummocks along the creeks and throughout the fen. The project also included the installation of 2 new cattle guards and reconstruction of a pasture fence that was once in place but removed many years ago for grazing. The pasture fence is crucial for proper management of livestock grazing and protection of the Shush Kin Fen, nearby springs, and riparian habitats in the adjacent tributaries leading into Bluewater Creek. The pipe fences around the fen and springs have been installed, the cattleguards are now in place, and the pasture fence is currently being constructed and expected to be complete in fall of 2026.

The Cibola National Forest is now planning Phase II of this project, which involves erosion control and hummock repair in the fen. Phase III will involve erosion control, invasive weed treatments, and riparian vegetation planting at the springs and along the connected tributaries. Livestock grazing has severely impacted the vegetation, soils, and hydrology of these ecosystems. A variety of in-stream erosion control structures have been proposed to address these issues. The wetland delineation and resulting jurisdiction determination for this area are needed for the Forest to comply with the USACE's regulatory requirements for discharge of dredged or fill material into "waters of the United States" pursuant to Section 404 of the Clean Water Act and structures in or affecting "navigable waters of the United States" pursuant to Sections 9 and 10 of the Rivers and Harbors Act of 1899. This report is meant to assist the USACE in conducting or verifying the identification and delineation of aquatic resources at this permit evaluation site and/or to determine which of the aquatic resources are or are presumed to be subject to federal jurisdiction under one or more USACE authorities. No prior delineation has been conducted, and no permits have been issued for this project or other projects in this area.

Prepared by:

Andrea Chavez
Wildlife, Fish, and Rare Plants Program Manager
Cibola National Forest and National Grasslands
2113 Osuna Rd. NE, Albuquerque, NM 87113
(505) 346-3900
andrea.chavez@usda.gov

Prepared For:

Cibola National Forest and National Grasslands
Supervisor's Office
2113 Osuna Rd. NE, Albuquerque, NM 87113
(505) 346-3900

And

Cibola National Forest and National Grasslands
Mt. Taylor Ranger District
1800 Lobo Canyon Rd., Grants, NM, 87020
505-287-8833

1. General Background and Site Information

Land Ownership and Contact Information

The Shush Kin Fen and tributaries to Bluewater Creek included in this wetland delineation are public lands managed by the U.S. Department of Agriculture, U.S. Forest Service (USFS), Cibola National Forest and National Grasslands (hereafter referred to as 'the Cibola'). These lands fall under the jurisdiction of the Mt. Taylor Ranger District of the Cibola. This delineation was completed by program managers and staff from the Wildlife, Range, Watershed, and Planning programs on the Cibola. Below is the contact information for the jurisdictional offices.

Cibola National Forest and National Grasslands	
Supervisor's Office	**Mt. Taylor Ranger District**
Forest Supervisor: Heidi McRoberts Address: 2113 Osuna Rd NE, Albuq., NM 87113 Phone: 505-346-3900 Email: heidi.mcroberts@usda.gov	District Ranger: Ryan Washam Address: 1800 Lobo Canyon Rd., Grants, NM, 87020 Phone: 505-287-8833 Email: ryan.washam@usda.gov.

The field investigators who completed this field assessment and report are listed in Table 1 below. The watershed program manager played a role in reviewing the report for quality.

Table 1. Contact information for Cibola staff conducting this wetland delineation.

Name	**Title**	**Office**	**Email**
Andrea Chavez	Wildlife, Fish, and Rare Plants Program Manager	Cibola National Forest and Grasslands, Supervisor's Office	andrea.chavez@usda.gov
Jack Williams	Range Program Manager	Cibola National Forest and Grasslands, Supervisor's Office	jack.williams@usda.gov
Paige Handley	Wildlife Biologist	Cibola National Forest and Grasslands, Supervisor's Office	paige.handley@usda.gov
Hector Alvarez	Planner	Cibola National Forest and Grasslands, Supervisor's Office	hector.alvarez@usda.gov
Barbara Cisneros	Watershed Program Manager	Cibola National Forest and Grasslands, Supervisor's Office	barbara.cisneros@usda.gov

Site Location

There is no physical address of the review area as it is located in the heart of the Zuni Mountains in Cibola County, New Mexico. The area can be accessed by exiting I-40 in Milan, NM North on Horizon Blvd to U.S. Route 66 West to Post Office Flats Rd South. Pass the Cibola County Transfer Station and proceed along Post Office Flats Rd until it turns into Forest Service Road 180 (FSR-180). Turn South at Diener Canyon Road (FSR-178) to FSR-480 West. The project area can be found by taking FSR-50 to FSR-50P. There is no site manager at the location and no locked access points. This area is comprised of USFS lands open to the general public. No Right-of-Way entry documentation is needed for U.S. Army Corps of Engineers (USACE) personnel to access the site. Roads may be inaccessible during times of high precipitation and during winter

months (Nov-Mar). The Mt. Taylor Ranger District Office should be contacted for current road conditions in this area (phone number above).

The approximate center point for the Shush Kin Fen locality is 35.183162 N, -108.231066 W (WGS 1984). The fen currently encompasses ~2 acres and the associated pipe fence around the degraded fen contains ~4.73 acres. The fen is headwater to a short unnamed tributary to Bluewater Creek (Agua Medio – Bluewater Cr. HUC 12: 130202070201). The Lower Reach of the unnamed tributary is ~3,200 ft long. The Granite Canyon Reach of the unnamed tributary is ~8,671 ft long. These three sites are evaluated in this report.

Site Overview

The Zuni Mountains have been inhabited by humans for thousands of years. They have served as a vital landscape for several indigenous populations, who have used these lands for agriculture, grazing, natural resources, and building settlements. The mountains were mined for copper, fluorite, and other minerals in the early 20th century. In the early 1900s, the mountains were heavily logged for timber. Modern day management of the forest includes prescribed thinning and burning to reduce overly dense timber stands in an effort to restore a more natural vegetative condition, improve habitat for wildlife, and reduce the risk of stand-replacing wildfire. Native peoples still use and have various interests in natural resources and other features of the Zuni Mountains, including the Shush Kin Fen.

Other land uses in the surrounding area include recreation including but not limited to hiking, mountain biking, camping, hunting/angling, birdwatching, etc. Three species that are listed under the Endangered Species Act occur on the district. Management activities have been ongoing in habitat for the Mexican spotted owl (Threatened bird) (USFWS 1993), the Zuni bluehead sucker (Endangered fish) (USFWS 2014), and the Zuni fleabane (Threatened plant) (USFWS 1985), aimed at recovery of these imperiled species. Critical Habitat for the owl also occurs in the areas surrounding the Shush Kin Fen and associated springs/creeks. Two Species of Conservation Concern (SCC) occur in the two creeks – the Rio Grande sucker and the Rio Grande chub (USFS 2022).

The Shush Kin Fen and associated springs and creeks are located in the central portion of the Zuni Mountains. They fall within the Rio San Jose HUC8 watershed (HUC 13020207). The Shush Kin Fen is a histosol fen that has historically been a water source for the Agua Fria livestock grazing allotment and supports local and migratory wildlife in the area. The fen is a unique and important ecological component of the surrounding area that has been severely degraded and reduced by overgrazing. Other water sources associated with and adjacent to the fen include several springs, a perennial tributary between the fen and Bluewater Creek, and an intermittent creek with perennial ponding upstream of the springs. All three of these systems have been negatively impacted by overgrazing. Large hummocks have formed in the fen and throughout all of the Lower Reach and throughout much of the downstream half of the Granite Canyon Reach (Appendix B Photos 1, 2, 3, 11, and 12). Erosion is occurring throughout these

systems (e.g., bank incision, channel scouring, headcuts). Bluewater Creek is on the Clean Water Act Section 303(d) list of impaired waters.

Since pipe fences were installed around the springs in 2024, the vegetation has significantly recovered due to the exclusion of livestock grazing. However, these fences only cover a relatively small portion of the riparian habitat, and soil erosion is still a major factor affecting water retention and the health and vigor of the riparian plant community. The fen was fenced in 2025 and has begun to recover as is evidenced by the difference in vegetation growth in and outside of the fenced area (Photo 19). However, the hummocks are large and extensive. Erosion control is recommended for faster recovery of the fen and both creeks. Non-native invasive species are also present, as are non-native naturalized species (e.g., bluegrass). Weed treatments may be needed followed by native riparian vegetation augmentation.

The Serna pasture fence is currently being constructed and should be completed in summer of 2026. Completion and continued maintenance of this pasture fence will allow the Cibola to limit/control the timing and intensity of or exclude livestock grazing in this portion of the Agua Fria allotment so that the riparian ecosystem can recover and restorative actions can take effect.

2. Field Data Collection Methodology

Approach

Field work was conducted in the early portion of the growing season due to an urgency to complete the delineation and consult with USACE to comply with applicable statutory regulations needed for planned in-stream project work in 2026-2027. Despite surveying early in the growing season, vegetation in waterways was either green or starting to green up after an unseasonably dry and warm winter. Not all vegetation could be identified, and identification was challenging due to heavy grazing (stubble height 1” or less). Appendix C includes a list of species that were identified at these sites in 2021.

The approach used for this wetland determination was routine Level 3, which uses a combination of Levels 1 and 2. The project area was divided into 3 units: the Shush Kin Fen, the Lower Reach, and the Granite Canyon Reach (Figure 1). All three units are hydrologically connected but have distinct boundaries based on flow patterns, vegetation communities, and soils. A baseline was established for each reach and used to determine the number of transects to record. All reaches were under 2 miles, and therefore 3 transects were established for each (Figures 2, 3, and 4). The identification and delineation of wetlands in the review area was conducted in accordance with the USACE Wetlands Delineation Manual (USACE 1987). The USACE Arid West Regional Supplement (USACE 2008) was used along with the Wetland Determination Data Sheet – Arid West Region (ENG FORM 6116-1, SEP 2024).

Figure 1. Transect locations for all reaches included in this delineation. Springs in the area and Forest Service Roads are also displayed.

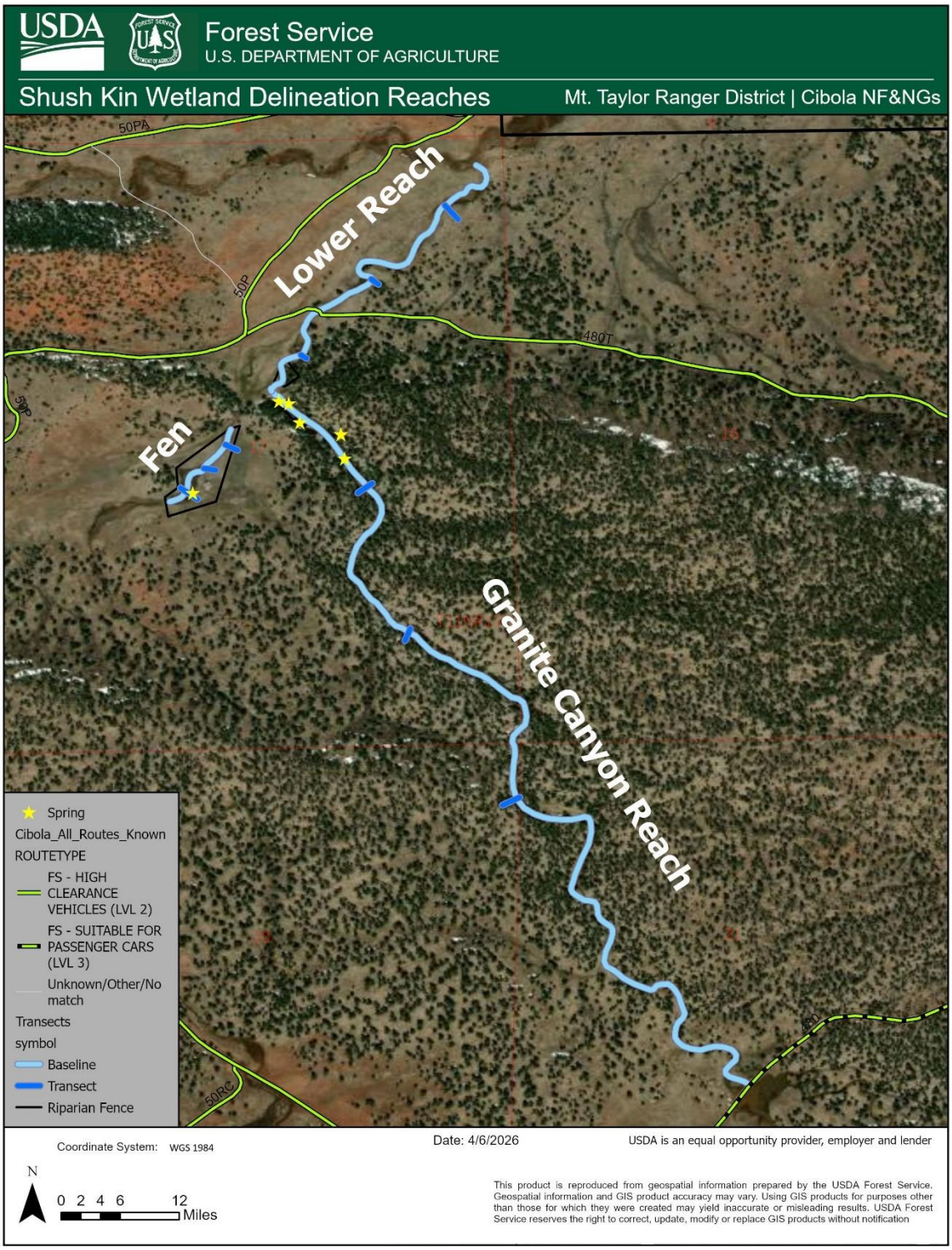


Figure 2. Shush Kin Fen reach baseline, transects (1-3), and vegetation plot locations.

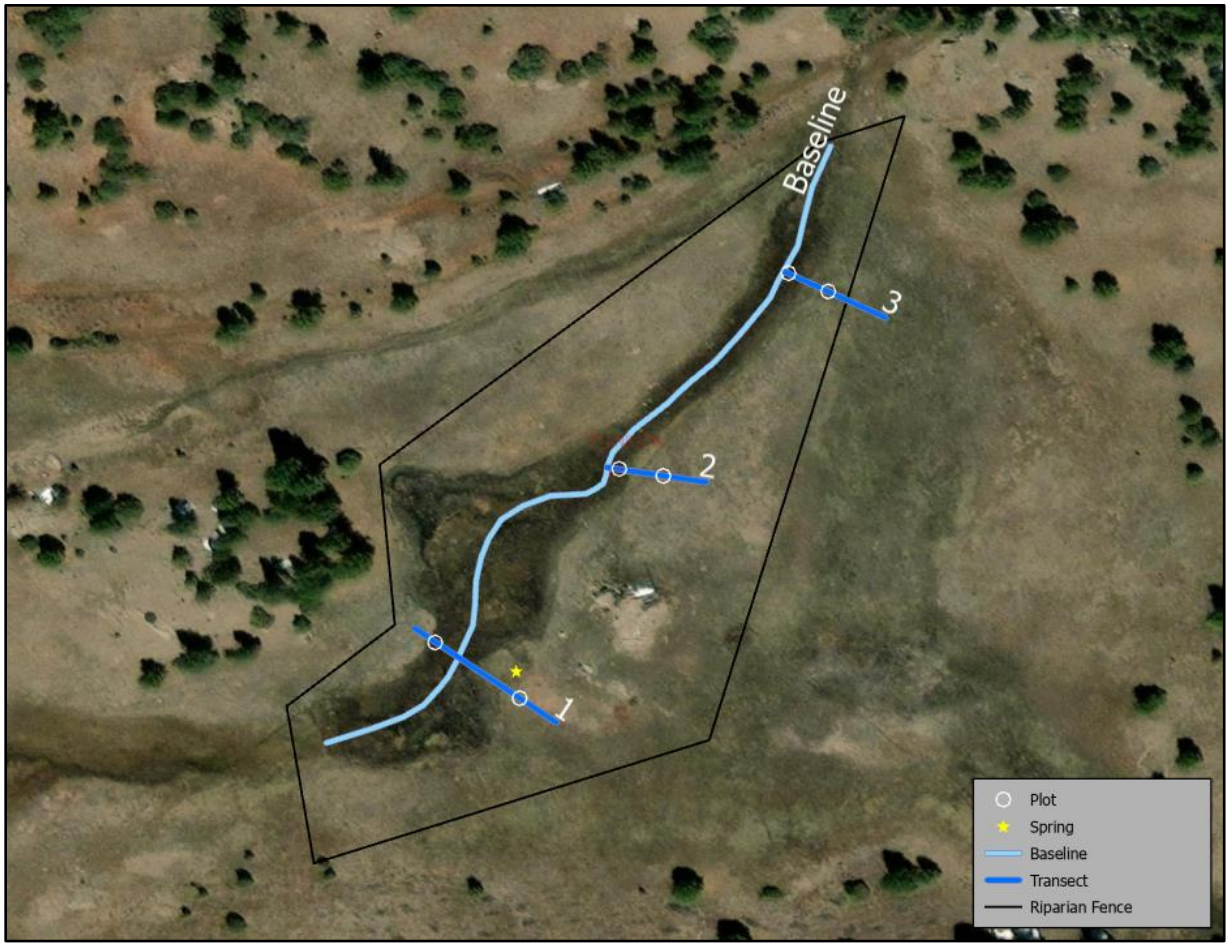


Figure 3. Lower Reach baseline, transects (4-6), and vegetation plot locations.

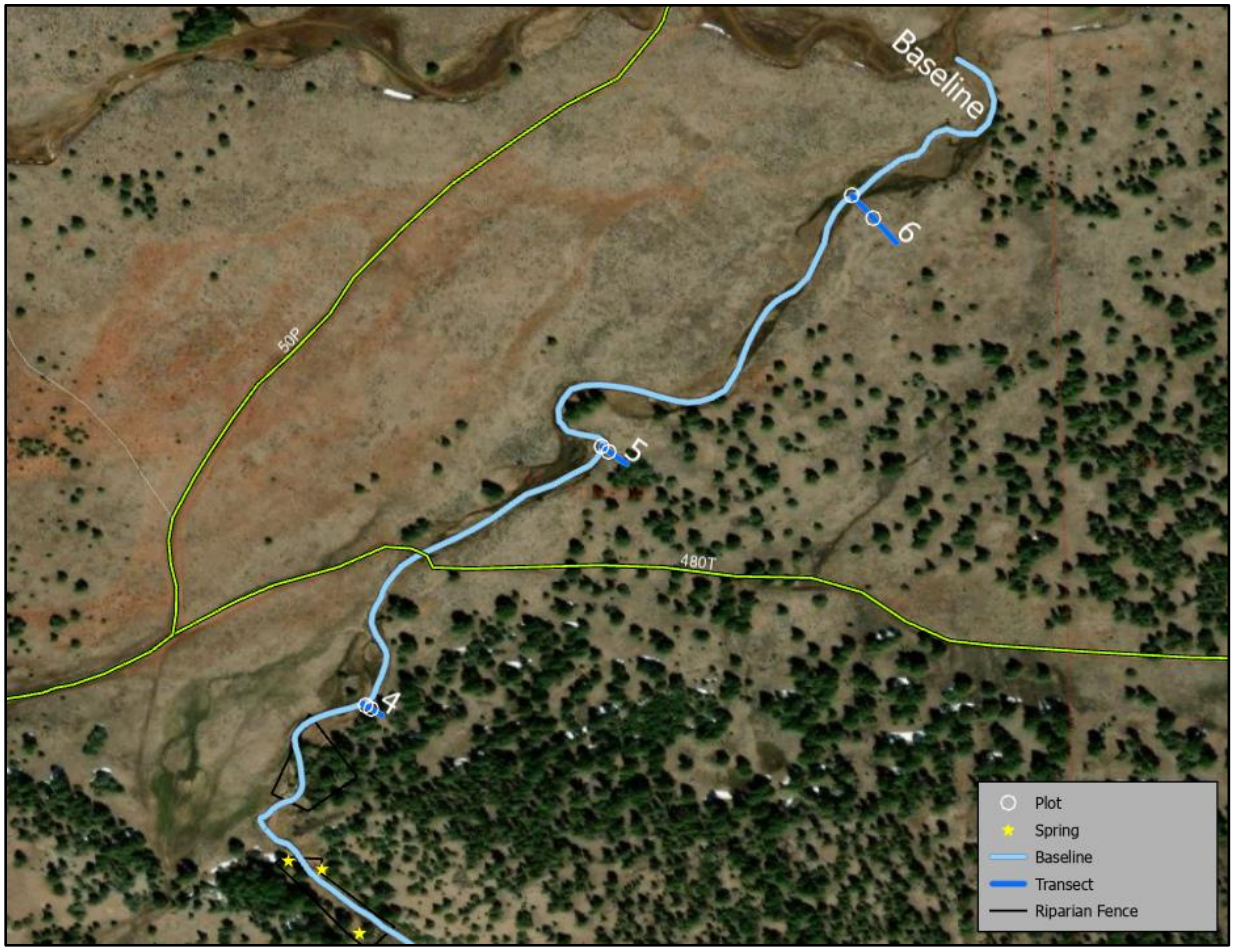
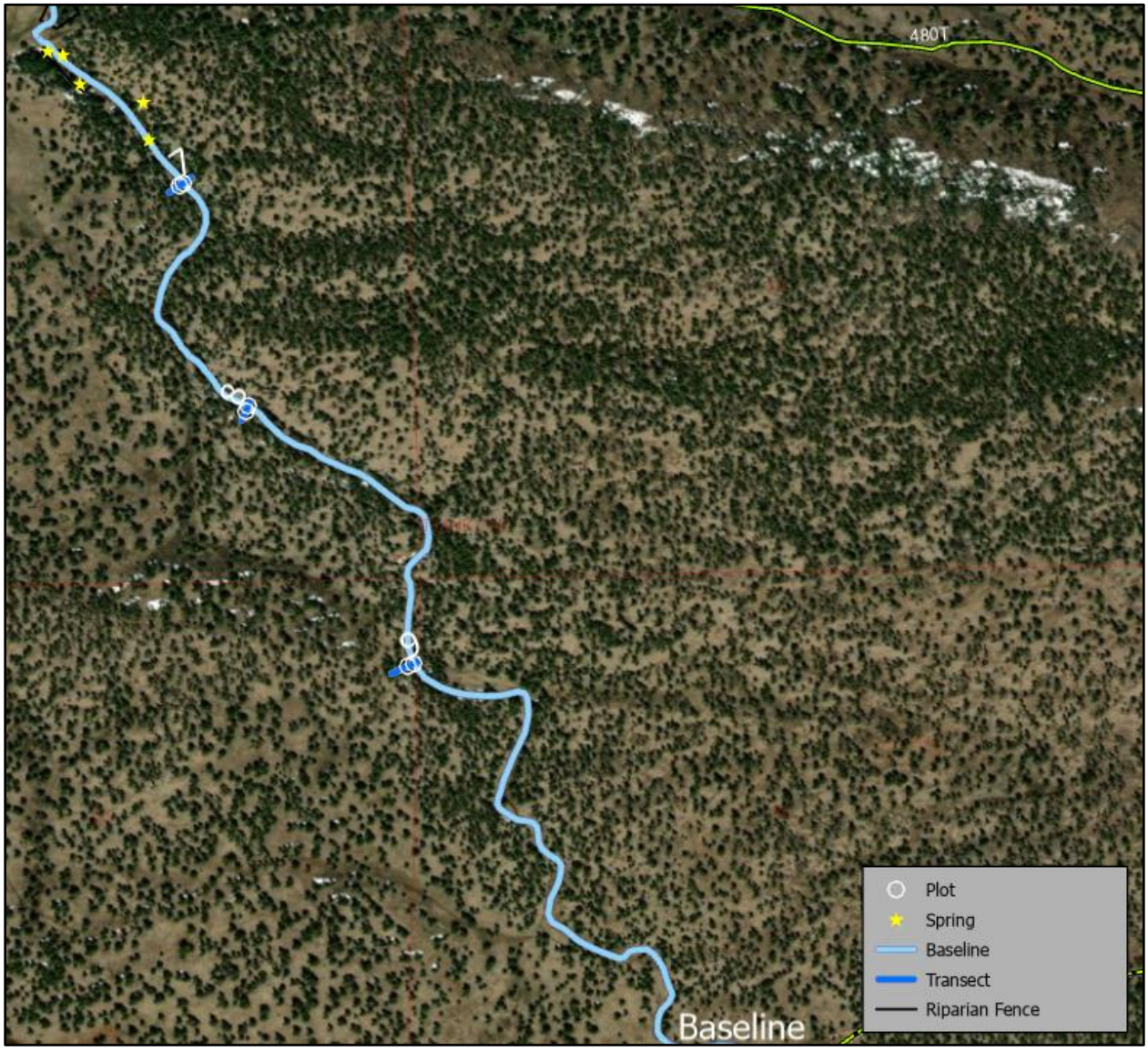


Figure 4. Granite Canyon Reach baseline, transects (7-9), and vegetation plot locations.



Field Data Collection

A series of field data collection trips to the review area were taken by Cibola staff from the Wildlife, Range, and Planning programs. Below is a brief description of each field trip. Spatial data was collected using the Avenza Maps (version 5.5) mobile application, which typically provides 5-10 meter GPS accuracy using the standard iPhone sensors. Accuracy in the fen area is expected to be high due to the lack of signal obstructions. Accuracy may be slightly lower in the Lower Reach and Granite Canyon Reach segments due to more complex topography and some canopy cover that may cause slight signal obstruction. Data was collected using the World Geodetic System (WGS) 1984 coordinate system. Photos were taken of all areas reviewed (Appendix B).

3/16/2026: Field trip to Shush Kin Fen by Andrea Chavez, Jack Williams, and Paige Handley to complete U.S. Army Corps of Engineers Wetland Determination Data Sheet – Arid West Region (ENG FORM 6116-1, SEP 2024). During this trip, data transects and plots were established for the fen wetland itself, and data was collected for Transects 1-3. Soil cross-sections originally measured by River Source (Figure 17) were monumented with rebar posts (Table 2). Weather was sunny with broken/scattered and passing clouds, temperature 48-64°F, winds mostly SW 5-10, gusts 15-20 mph in the afternoon.

Table 2. Coordinates (WGS 1984) of soil elevation transects, measured by River Source, monumented by Cibola staff with rebar markers.

Transect	Latitude	Longitude
1a	35.182673	-108.231279
1b	35.182626	-108.231079
2a	35.183162	-108.231066
2b	35.18304	-108.230834
3a	35.183579	-108.230621
3b	35.183432	-108.230393

3/19/2026: Field trip to the Lower Reach (tributary to Bluewater Creek between the fen and Bluewater Creek) by Andrea Chavez, Paige Handley, and Hector Alvarez to complete U.S. Army Corps of Engineers Wetland Determination Data Sheet – Arid West Region (ENG FORM 6116-1, SEP 2024). During this trip, data transects in the lower tributary reach between the fen and Bluewater Creek were established. Data was collected for Transects 5 and 6. Weather conditions on 3/16/2026 included a temperature of 75-90° F, winds mostly N 3-10 mph, up to 10-15 mph in the afternoon. Sky was sunny with scattered and passing clouds throughout the day.

3/25/2026: Field trip to Shush Kin Fen Lower Reach (tributary to Bluewater Creek between the fen and Bluewater Creek) and to Granite Canyon Reach (upstream tributary from springs) by Andrea Chavez, Hector Alvarez, Paige Handley, and Jack Williams. During this trip, data was collected for Transect 4 in the Lower Reach as well as Transects 7 and 8 in the Granite Canyon Reach. Weather conditions on 3/25/2026 included a temperature of 81-88° F, winds variable 3-7 mph. Sky was sunny with some scattered clouds.

4/1/2026: Field trip to Granite Canyon Reach to record the extent of the wetted channel by Andrea Chavez and Paige Handly. Collected vegetation and hydrology data for Transect 9. Recorded numerous ponds along the creek. Weather conditions included a temperature of 56°F, winds variable 10-15 mph, with moderate rainfall.

3. Site Conditions

Recent Human Activities & Natural Events

The vegetation and soils within the review site have been altered by human activities. Livestock grazing has been active in this area for hundreds of years and has historically included goats, sheep, cattle, and horses. Over time, grazing practices in the Zuni Mountains have ranged from traditional small-scale sustainable subsistence agriculture by native peoples to intensive commercial ranching starting with Spanish colonialism and continuing into the modern era. With the enactment of the Taylor Grazing Act of 1934, public land grazing began being managed by the federal government to prevent overgrazing, ensure orderly use, and stabilize the livestock industry by implementing a permit system. Under the management of the USFS, the land has been managed under multiple sustainable use policies including the National Forest Management Act and the National Environmental Policy Act.

The arrival of the railroad in the 1880s brought an influx of settlers and commercial ranching operations into the Zuni Mountains. These mountains were heavily logged during the late 19th and early 20th centuries, aided by the railroad system. A railroad historically ran along-side the Shush Kin Fen (~ 25 feet) to the northwest and crosses the confluence of where the fen, Lower Reach, and Granite Canyon Reach meet. This is a historic site that has been documented by the Cibola and registered with the New Mexico State Historic Preservation Office. Livestock grazing continues today in the review area (cattle only) and is managed by the Cibola as the Agua Media allotment. For decades, the fen and tributaries that feed into Bluewater Creek have been impacted by overgrazing as cattle tend to congregate in and heavily use these riparian ecosystems, particularly during times of drought which have been increasingly frequent and longer in duration in the past ~20 years due to the changing climate.

Overgrazing in the Shush Kin Fen and adjacent stream channels has caused extensive erosion by heavy and frequent hoof action and severe vegetation reduction (≤1” stubble height). The grazing pressure is present year-round. This has resulted in the reduction of the wetted extent of these wetlands, reduced vegetation vigor, lower species richness, and soil and bank erosion (incision, headcuts) throughout the system. Based on vegetation plots, it is evident that upland vegetation is encroaching into previously wet areas, likely due to extensive drying of the system. Large and severe hummocks now occur throughout the fen, along the majority of the Lower Reach banks, near the spring outflows, and intermittently throughout the downstream 1/2 to 2/3 of the Granite Canyon Reach.

The springs that were fenced in 2023 have recovered significantly based on vegetation growth and re-establishment. Soil depressions where hummocks occur along banks are still present but recovering. The fen was fenced in 2025 to exclude livestock, and the soils and vegetation have begun to recover. Elk still graze in the fen. To allow a swifter recovery, the Cibola is planning to

temporarily raise the height of this fence to exclude elk until the fen has recovered and can sustainably support grazing/browsing by native ungulates.

"Normal circumstances" were not present in several of the wetland plots based on these historical and current pressures on the ecosystem. If livestock grazing were not present, more ponding, larger ponds, higher riparian plant vigor and species richness would be prevalent. The system would retain more perennial water and have a more robust riparian gallery with dominant wetland obligates. Currently, the vegetation is consistently grazed down to 1", and introduced and upland grasses and herbaceous weeds are common and often dominant in the wetland vegetation plots. Furthermore, the Zuni Mountains have experienced severe recurring droughts from the period 2000-2021, marking the driest two decades in the past 1,200 years (Williams et al. 2022). Winters have been consistently warmer, and models by Williams et al. (2022) suggest this change has been significantly amplified by anthropogenic climate change. If human-caused climate change (global warming) were not occurring, the persistent and severe drought trends in this region would likely not be occurring or would not be occurring to the degree they have been.

The most recent actions taken by the Cibola in the immediate area include livestock exclusion fences around the fen and springs. In the larger landscape, two new cattleguards were installed, and the Serna pasture fence is currently being reconstructed (scheduled completion in summer 2026) to implement improved grazing practices aimed at preventing degradation of the riparian ecosystems in the review area. The most severe erosion in the fen and both tributary reaches has been preliminarily mapped for project planning purposes.

Weather & Climate Conditions

Field Trip Weather Conditions

Below are the weather conditions noted during all field trips taken to the review area for data collection.

3/16/2026: Weather was sunny with broken/scattered and passing clouds, temperature 48-64°F, winds mostly SW 5-10, gusts 15-20 mph in the afternoon.

3/19/2026: Weather conditions on 3/16/2026 included a temperature of 75-90° F, winds mostly N 3-10 mph, up to 10-15 mph in the afternoon. Sky was sunny with scattered and passing clouds throughout the day. Note unseasonably warm temperatures for this time of year.

3/25/2026: Weather conditions on 3/25/2026 included a temperature of 81-88° F, winds variable 3-7 mph. Sky was sunny with some scattered clouds. Note unseasonably warm temperatures for this time of year.

4/1/2026: Weather conditions included a temperature of 56°F, winds variable 10-15 mph, with moderate rainfall.

Antecedent Precipitation

Antecedent precipitation conditions were calculated for the period 90 days prior to conducting the delineation field work using the Antecedent Precipitation Tool (APT) (Sparrow et al. 2025). A report was generated for each date of data collection at a set of coordinates within the Shush Kin Fen (4 reports) (Appendix A). We determined this location was adequate to represent the review area due to its relatively small size. All reports unsurprisingly produced similar results. The dates of data collection fell within the transition period from wet to dry season. The first three dates, all occurring in March, were in the wet season. The last date of data collection on 4/1/2026 was considered the dry season. The APT outputs suggest that for the 90 days prior to data collection, the area was in extreme drought, which is the most extreme descriptor on the Palmer Drought Severity Index (PDSI) (adapted from Palmer 1965). They produced Antecedent Precipitation Scores of 7 and 8, which both indicate the site has been drier than normal compared to historic precipitation data. This score serves as a measurement of normalcy that is described by the Antecedent Precipitation Condition (e.g., normal, wet, or dry conditions) for the observation point and date. The 30-year normal rainfall ranges can be seen in these reports (Appendix A).

Precipitation, Temperature, and Snowpack

We accessed climatic and hydrologic normals data from the period 1991 – 2020 via the National Water and Climate Center (NWCC) Interactive Map (iMap), produced by the Natural Resources Conservation Service (NRCS). Figures were generated using the iMap and show precipitation accumulation, temperature, and snow water equivalent for the current year in context of the 30-year normal (data compiled from 1991-2020). The Rice Park Snow Telemetry site (Snowpack Telemetry Network (SNOTEL) site ID: 933) is a high-altitude monitoring station focused on tracking snowpack and temperature. It is the closest weather station to the review area (approximately 35.23°N, 108.27°W; ~7 miles NW of Shush Kin Fen).

Precipitation accumulation is the total amount of water (rain, melted snow, or ice) that falls and collects over a specific period at a given location. It is measured in inches or millimeters, and it represents the sum of all precipitation rather than the intensity and informs monitoring of water levels, flood risk, and weather patterns. Figure 5 shows the precipitation accumulation throughout the year from 1991 – 2020 for Rice Park, NM. These data suggest that precipitation accumulation in this area for the ~90 days prior to our 2026 data collection has been below values considered normal from the period 1991-2020 (i.e., last 30 years) (using the Median value as the metric per NWCC).

The SNOTEL sites also provide real-time air temperature data from automated remote mountainous stations in the Western U.S. Air temperatures for the Rice Park SNOTEL site are shown in Figure 6. Daily median temperatures for 2026 appear to be mostly above the 30-year normal with the exception of five short and drastic dips since January. In late March of 2026, temperatures spiked well above the 30-year maximum (~10° F above the max).

Snowpack conditions in the Zuni/Bluewater River Basin have now dropped effectively to zero. Figure 7 shows the snow water equivalent from the Rice Park SNOTEL for 2026 overlaying the 30-year normal. This metric is defined as the amount of liquid water contained within a snowpack, representing the depth of water that would result if the entire snowpack melted instantly. Since December 2025, the snow water equivalent has been mostly flatlined at zero or well below the 30-year (median) normal. The data show 0.0 inches of snow water equivalent as of March 4. The median for this date is 5.6 inches while the basin's median seasonal peak is 5.9 inches, typically occurring in early March.

Nearby at Bluewater Lake, data show a continuing gradual decline in surface water elevation. These data are provided by the U.S. Geological Survey (USGS) National Water Information System provisional data for USGS 08341400 Bluewater Lake near Bluewater, NM. The lake measured 7,367.52 feet in elevation on 4/16/2026, down from 7,368.25 feet on 1/1/2026, continuing a slow but consistent downward trend (Figure 8). While week-to-week changes are small, the lake has shown no measurable response to winter precipitation events, reflecting the limited snowpack available to feed the reservoir.

Figure 5. Precipitation accumulation data for Rice Park SNOTEL (site ID: 933), accessed via the NRCS NWCC iMap 4/15/2026.

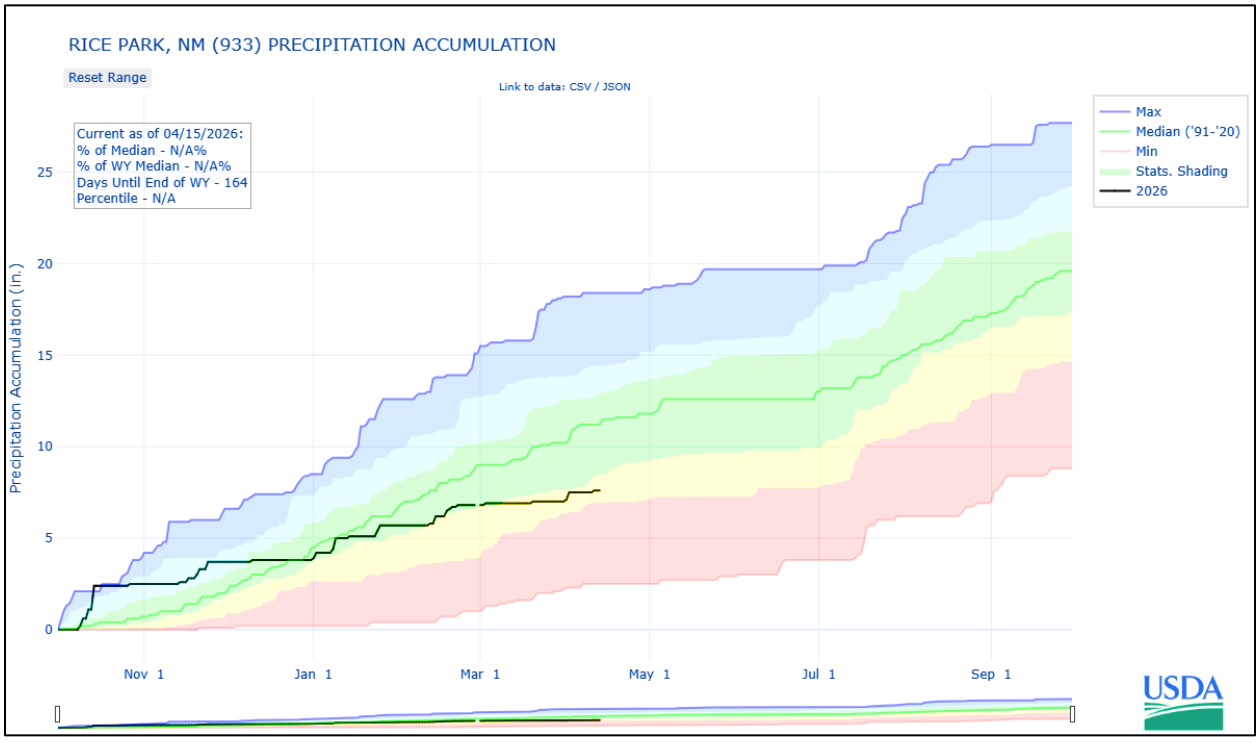


Figure 6. Daily temperature for Rice Park SNOTEL (site ID: 933), accessed via the NRCS NWCC iMap 4/15/2026.

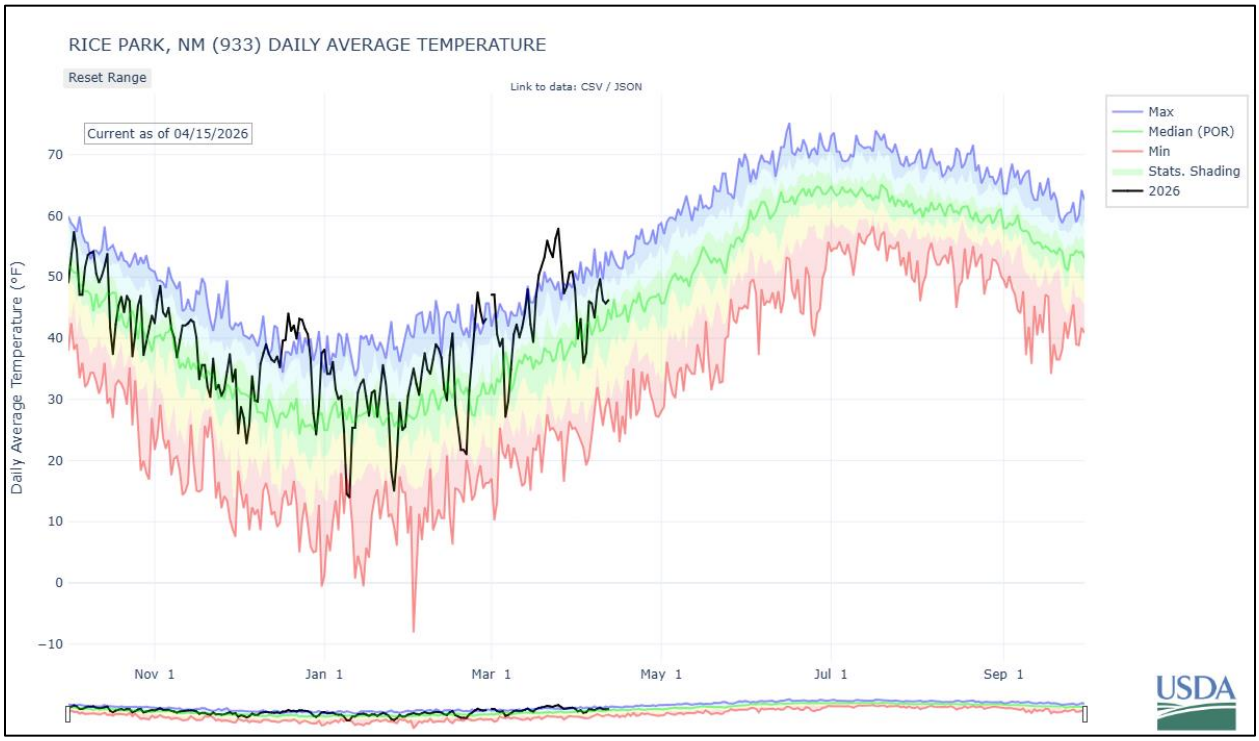


Figure 7. Snow water equivalent for Rice Park SNOTEL (site ID:933), accessed via the NRCS NWCC iMap 4/15/2026.

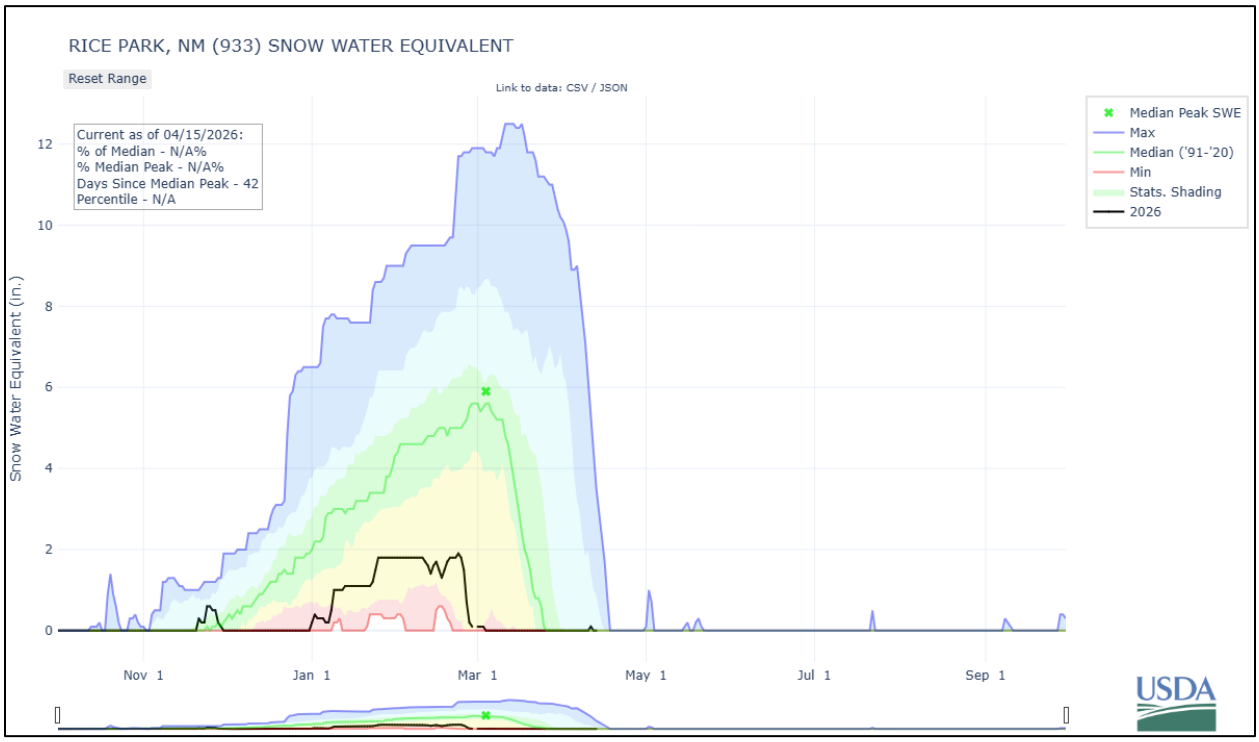
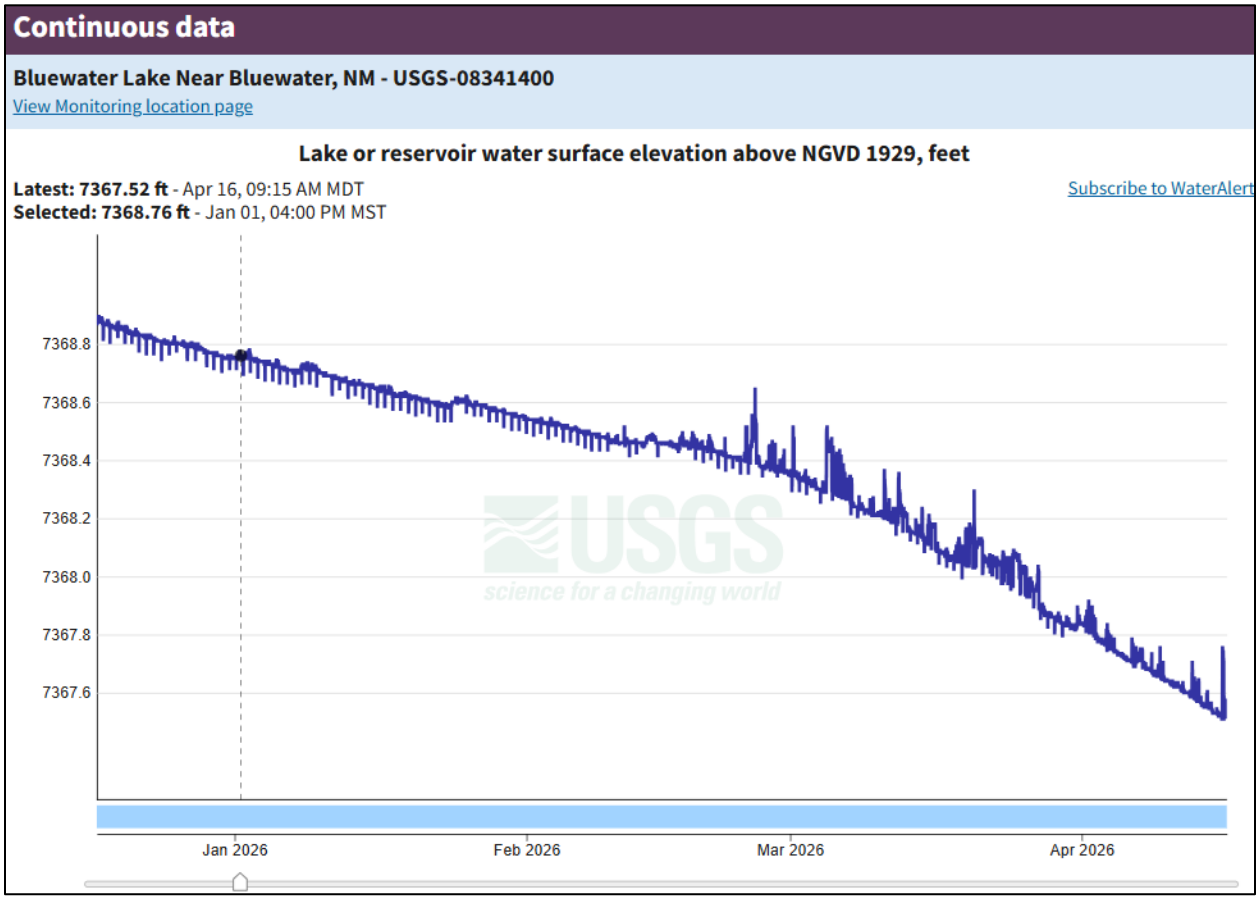


Figure 8. Lake water surface elevation trend at Bluewater Creek from December 2025 to April 2026, measured in feet.



4. Aquatic Resources Inventory

Review Area

The aquatic resources in the review area have been described as 1) Shush Kin Fen, 2) the Lower Reach, and 3) the Granite Canyon Reach. They are described in detail in this section based on field data collection as well as other available information. They can be seen in context of the hydrographic flowlines in the general area in Figure 9 (USGS 2019). Table 3 below describes their approximate size, as estimated by digitizing aerial imagery, collecting GPS data in the field, and visually estimating average stream width in lotic reaches.

These reaches are connected to surrounding watershed features that were not part of this review. Agua Media lies approximately 2 miles south of the Granite Canyon reach on private land. It has been mapped in high resolution and is classified as an intermittent lake/pond in the National Hydrographic Database (NHD) (NHD Reach Code 13020207001782) (Figure 9, Figure 10). A smaller unnamed lake/pond has also been mapped approximately ¾ mile south of the Granite Canyon Reach (NHD Reach Code 13020207008596) (Figure 10). This lake/pond is traversed by Forest Service Road 480 where there is a large culvert in place to allow flow to cross the roadway unimpeded. A series of man-made earthen tanks also occur approximately half a mile south of the unnamed lake/pond on private land. All of these features discharge into the Lower and Granite Canyon Reaches analyzed in this review.

Alluvial runoff funnels into Shush Kin Fen from uplands via ephemeral drainages. The ~3-acre area immediately upslope of the Shush Kin Fen does not currently hold surface water but may have in the past. The NWI classifies it as a Cowardin PEM1B wetland (Palustrine System). However, it is largely dominated by introduced upland grasses and shrubs, but rushes are present, which indicate this area may occasionally retain water. Aerial imagery of this area suggests that it becomes inundated at times and may have been a part of the fen in the past. However, it is heavily grazed by livestock and shows evidence that it may be drying and consequently functioning as more of an ephemeral drainage rather than a wetland. Persistent drought in the last 30 years may have also contributed to its current condition. It does not exhibit the ‘marshy’ conditions of a Palustrine System. This area was not included in this review.

The three reaches in this review form a confluence immediately downstream of the Shush Kin Fen (~900 ft) and subsequently flow into Bluewater Creek (NHD Reach Code 13020207000633, Permanent Identifier 53267566) (Figure 9). Bluewater creek then flows into Bluewater Lake approximately 8.5 miles northeast of the review area (NHD Reach Code 13020207001710, Permanent Identifier 120030631) (Figure 10). Bluewater Lake is the largest water body in the Rio San Jose watershed and is primarily fed by Bluewater Creek from the southwest and Cottonwood creek from the west. Several springs near the confluence of the three reaches are also hydrologically connected to parts of this system and have been described by Collis (2020).

Table 3. Summary of all aquatic resources in the review area and their Cowardin classification (Cowardin et al. 1979), as described in the U.S. Fish and Wildlife Service National Wetland Inventory. Datum: WGS 1984.

Name	Cowardin Classification	Estimated Size	Approx. Center Point Coordinates
Shush Kin Fen	Palustrine (PEM1D, PEM1B)	~2 acres	108.2307160° W 35.1832416° N
Lower Reach	Palustrine & Riverine (PEM1B & R3UB1F)	0.6 mile (26,022 ft^2, 0.6 acre)	108.2268698° W 35.1877489° N
Granite Canyon Reach	Riverine (R3UB1F)	1.6 mile (9,387 ft^2, 0.22 acre)	108.2232634° W 35.1760548° N

Figure 9. Wetland reaches in the review area in context of the NHD hydrographic flow lines.

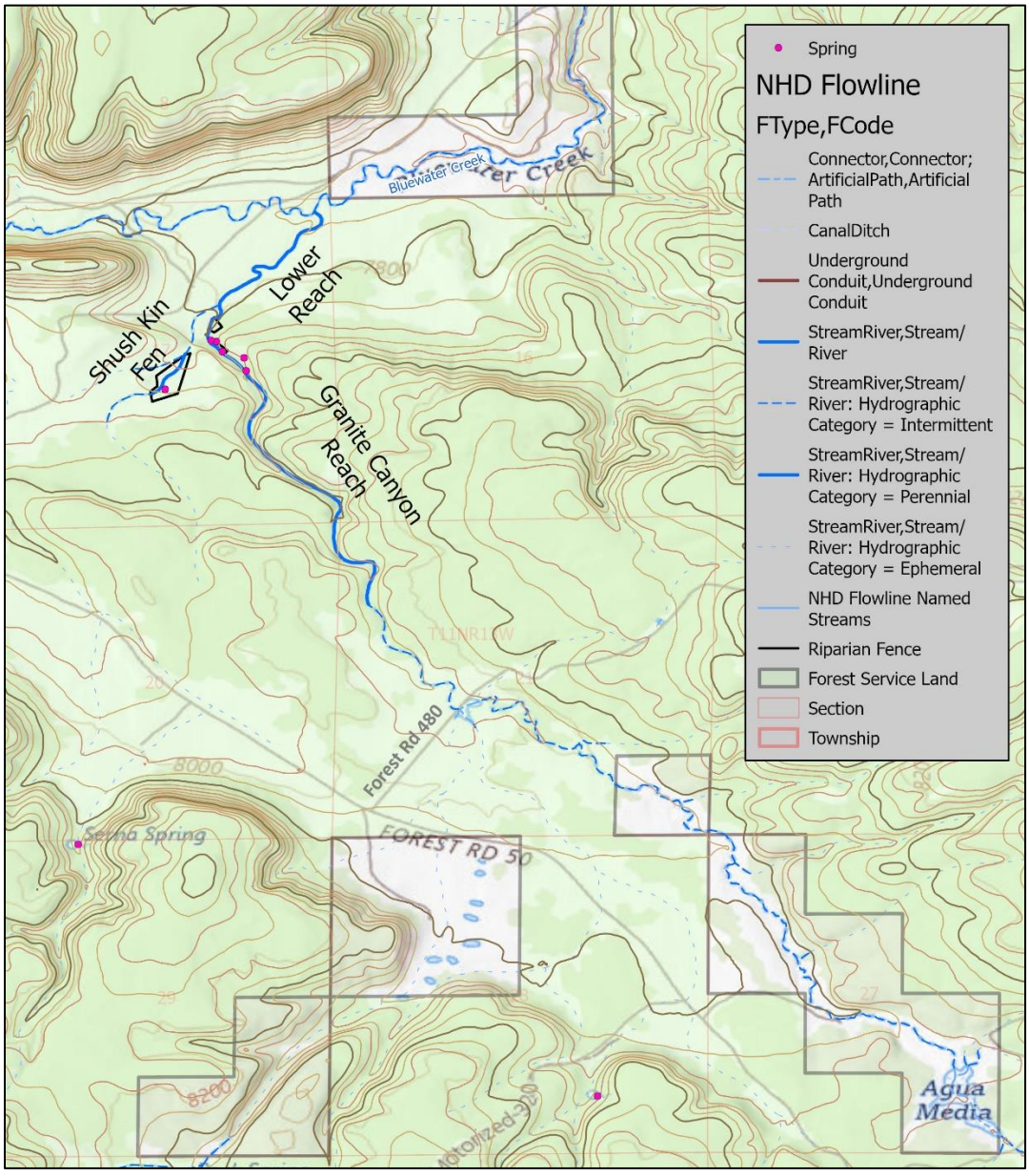


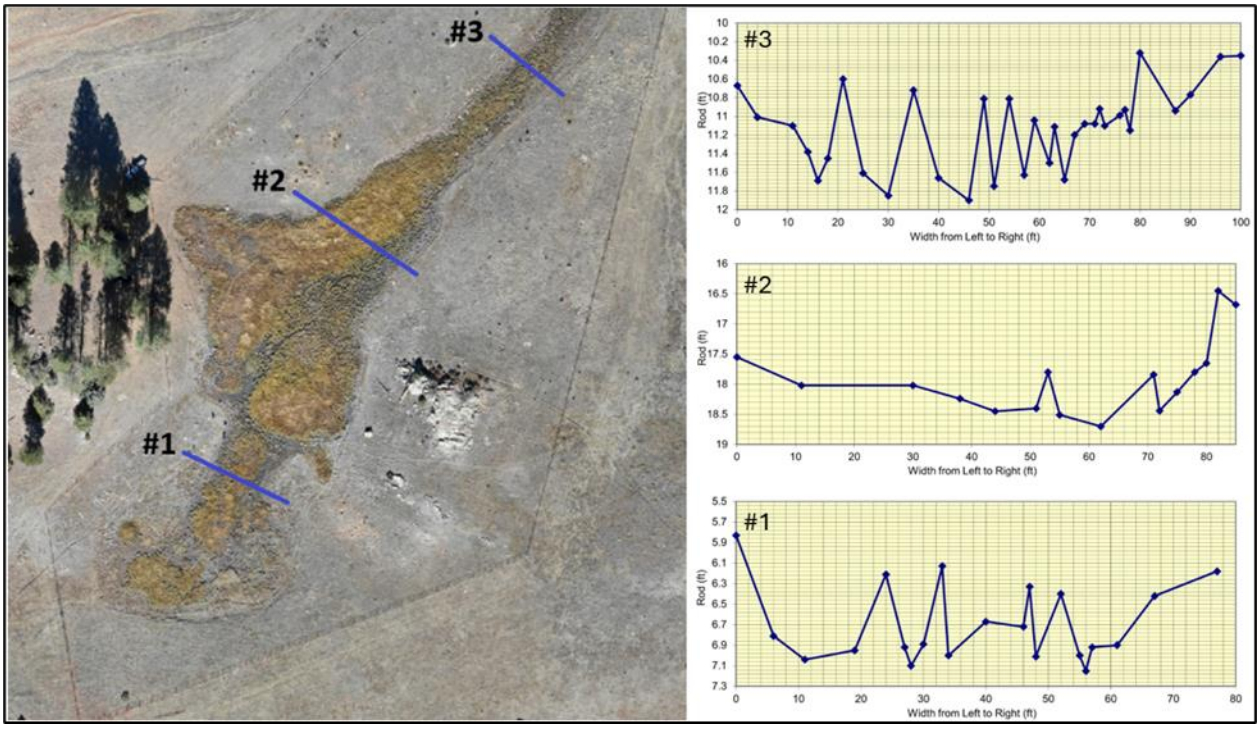
Figure 10. Wetland reaches included in this review, shown in context of nearby water bodies.

Shush Kin Fen

A preliminary wetland determination was made for the Shush Kin Fen based on information in Cibola records characterizing it as a histosol fen. Additionally, according to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), the fen has been classified as PEM1D throughout the majority of the fen and PEM1B at the downstream edge of the fen (Figure 11). Transects were also established and data collected using the Arid West worksheet (not including soil pits). The length of the fen is approximately 1,000 ft (end to end) and 3 transects were sufficient to adequately represent this site (#s 1 – 3; Figure 2). Each transect included 2 vegetation plots – one in each vegetation community (fen and upland).

Three soil elevation cross-sections were also established in the fen and measured in 2025 by a partner group, River Source. The data illustrate the uneven surface of areas within the fen due to the presence of hummocks and trailing/soil disturbance by ungulates (Figure 17). This provides evidence that the vegetation that should be more of a floating mat has become extremely fragmented. It can also be seen on the aerial image in Figure 17 below.

Figure 17. Soil cross-sections along three transects in the Shush Kin fen.



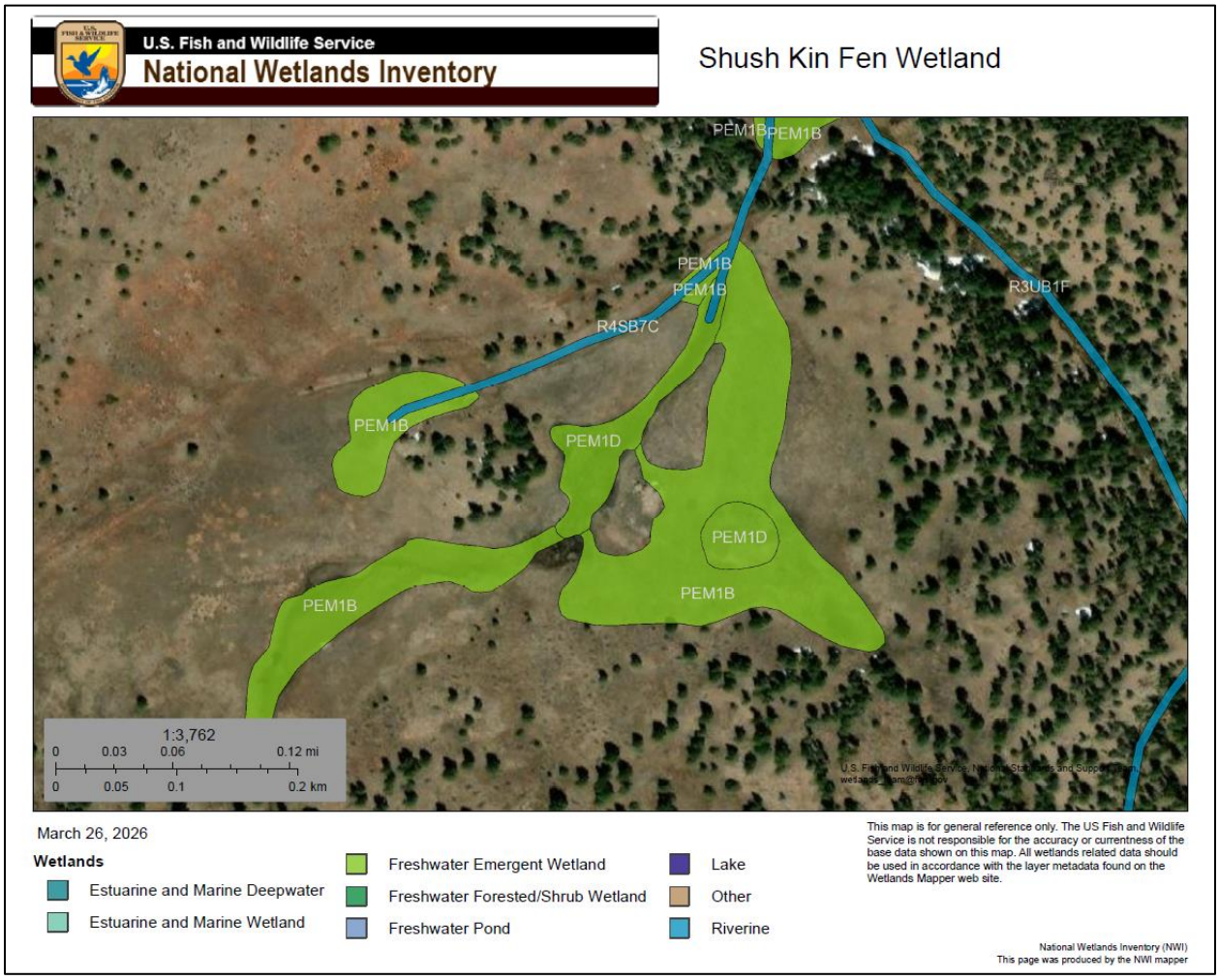
The majority of the fen is classified as a PEM1D palustrine system. The palustrine system includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt.

The fen falls within the emergent class, characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. It falls within the persistent subclass, dominated by species that normally remain standing at least until the beginning of the next growing season. This subclass is found only in the Estuarine and Palustrine systems. The water regime is continuously saturated (code D), and the subgroup is nontidal, meaning the substrate is saturated at or near the surface throughout the year in all, or most, years. Widespread surface inundation is rare, but water may be present in shallow depressions that intersect the groundwater table, particularly on a floating peat mat.

The very downstream portion of the fen is classified as a PEM1B palustrine system (Figure 11). It falls in the emergent class and persistent subclass. The water regime in this area is seasonally saturated (code B) and falls in the nontidal water regime subgroup.

Based on data collected along transects in the fen using the Arid West datasheet, the plots located in the fen possessed hydrophytic vegetation, hydric soil, and wetland hydrology and were therefore all determined to be within a wetland (Appendix D). *Carex* spp. and *Juncus* spp. were dominant at the two downstream vegetation plots, while upland grasses were dominant in the most upstream plot (T-1A). All plots had high amounts of bluegrass, indicating a drying trend as the wetland has receded due to persistent grazing and drought. Vegetation plots were established where the vegetative community dramatically changed. These three plots (labelled ‘B’ for each transect) were determined to be in the upland, and upland vegetation was dominant with small amounts of facultative wetland species. Hydric soils and hydrophytic vegetation were not present. The boundary of the fen was clearly discernable (Photo 2). The fen soils appear to be saturated year-round with surface water present. Soil disturbance from ungulates was most severe between hummocks where soil has eroded and along portions of the fen boundary where trailing occurs and grazing is heaviest (Photo 2). Numerous invasive plants were documented in the fen (e.g., musk thistle, dandelion) (Appendix C).

Figure 11. NWI map for Shush Kin Fen produced by the NWI online wetland mapper (USFWS 2026).



Lower Reach

The Lower Reach lies between the downstream end of the fen and the confluence with Bluewater Creek. The length of this reach is ~3,000 ft. Three transects were adequate to represent this site (#s 4 – 6) with two vegetation sampling plots each (one wetland, one upland) (Figure 3). The NWI classifies a large portion of the downstream 2/3 of this reach as a PEM1B Palustrine System (Figure 12). It falls within the emergent class, characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. It falls within the persistent subclass, dominated by species that normally remain standing at least until the beginning of the next growing season. The water regime is seasonally saturated (code B), and the subgroup is nontidal.

The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent

mosses, or lichens, and (2) habitats with water containing ocean-derived salts of 0.5 ppt or greater. A channel is an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water. The subsystem is classified as upper perennial, characterized by a high gradient. There is no tidal influence, and some water flows all year, except during years of extreme drought.

The substrate consists of rock, cobbles, or gravel with occasional patches of sand. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water (fish are present), and there are few or no planktonic forms. The gradient is high compared with that of the Lower Perennial Subsystem, and there is very little floodplain development. It falls in the Unconsolidated Bottom class, which includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%. The subclass is gobble/gravel. The unconsolidated particles smaller than stones are predominantly cobble and gravel, although finer sediments may be intermixed. The water regime is semi-permanently flooded, and it falls in the nontidal subgroup. Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.

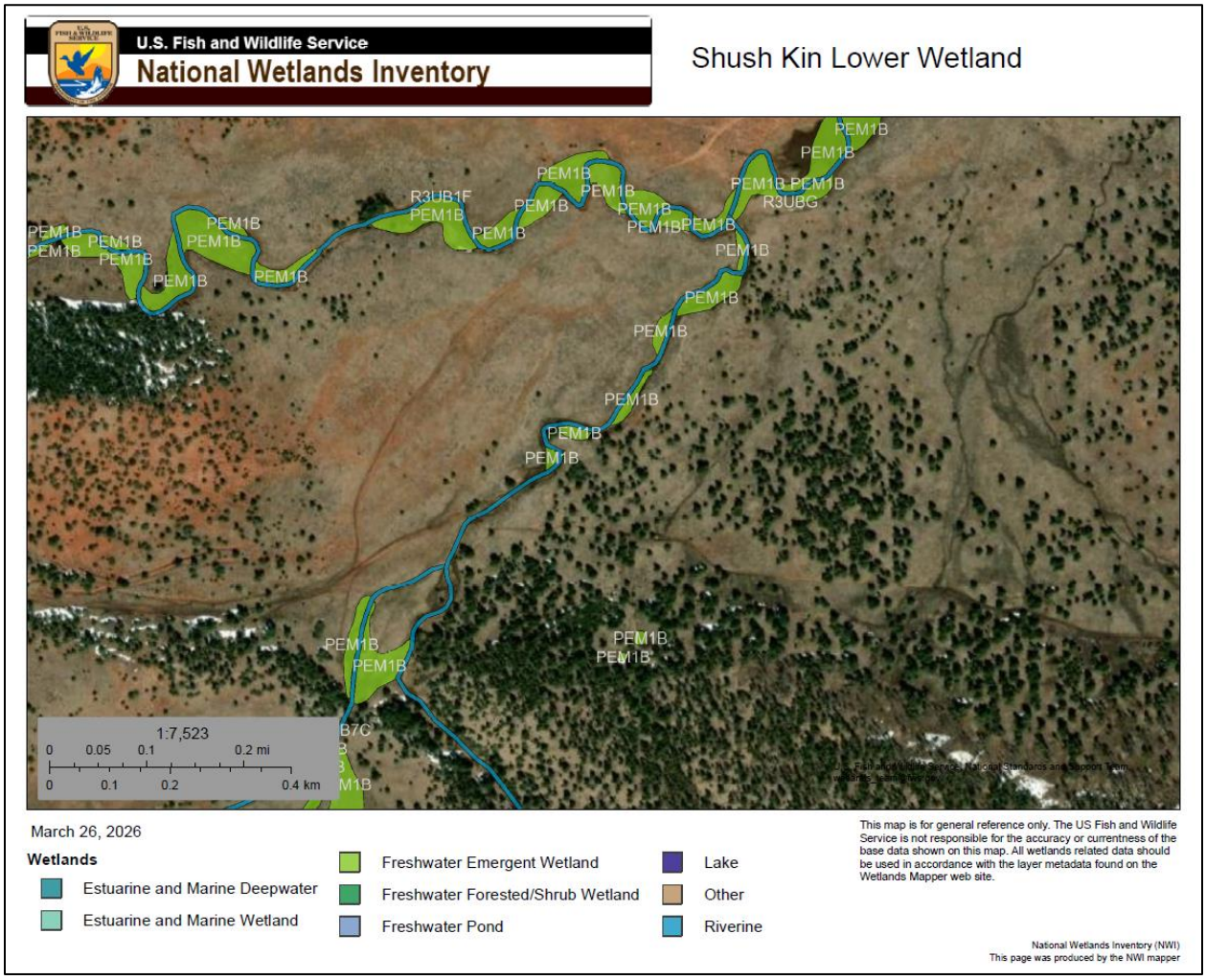
During the time of data collection, the riparian habitat around this stream was grazed down to ≤1 inch stubble height. Hummocks have formed along at least half of the reach on both banks (Photo 3, Photo 5). In many places, headcuts are starting to form or have become moderate to severe. The channel ranged from 1 ~ 6 feet in width but was on average 2-3 feet wide. This reach is perennial and forms pools that support native fish Species of Conservation Concern – the Rio Grande Chub (*Gila pandora*) and the Rio Grande Sucker (*Catostomus plebeius*). There was also evidence of invasive crayfish, which have been reported by various observers throughout the past decade or more. Analysis of soil pits at each transect (one wetland, one upland pit) found the following:

Wetland Soil Pit	**Upland Soil Pit**
T-4A: Silty clay with redox features (0-18”)	**T-4B:** Sandy clay, no redox (0-18”
T-5A: Clay loam with redox features (0-16”)	**T-5B:** Clay loam, no redox (0-16”)
T-6A: Clay loam with redox features (0-12”)	**T-6B:** Clay loam, no redox (0-12”)

The wetland plots possessed hydric soil, wetland hydrology, and hydrophytic vegetation and were determined to be in a wetland (Appendix D). The upland plots did not have any of those features and were confirmed to be in the upland. The soils and vegetation in most of the reach are heavily impacted by grazing. Upland grasses and shrubs are encroaching into riparian habitat, and riparian species seem to be receding except in the portion of this reach that has been fenced to exclude livestock. Many species could not be identified at the time of data collection due to growth suppression by grazing. Previous inventory of plants in this reach found a rich assemblage of riparian wetland obligates and facultative wetland species (Appendix C Table D2).

Hummocks are naturally repairing in the enclosure, and riparian vegetation is dominant and exhibiting high vigor.

Figure 12. NWI map for the Lower reach, produced by the NWI online wetland mapper (USFWS 2026).



Granite Canyon Reach

This reach begins as an ephemeral drainage approximately 1.5 miles south of the fenced springs. The stream is intermittent for approximately 1.25 miles with subsurface flows. Three transects were established (#s 7 – 9), each with two vegetation sampling plots (one wetland, one upland) (Figure 4). This reach has been classified as a R3UB1F Riverine System (see Lower Reach section for description of Riverine System) (Figure 13). The subsystem is classified as upper perennial, characterized by a high gradient. There is no tidal influence, and some water flows all year, except during years of extreme drought. The substrate consists of rock, cobbles, or gravel with occasional patches of sand. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water (fish, amphibians, and crustaceans are

present), and there are few or no planktonic forms. The gradient is high compared with that of the Lower Perennial Subsystem, and there is very little floodplain development. It falls in the Unconsolidated Bottom class, which includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%. The subclass is gobble/gravel. The unconsolidated particles smaller than stones are predominantly cobble and gravel, although finer sediments may be intermixed. The water regime is semi-permanently flooded, and it falls in the nontidal subgroup. Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.

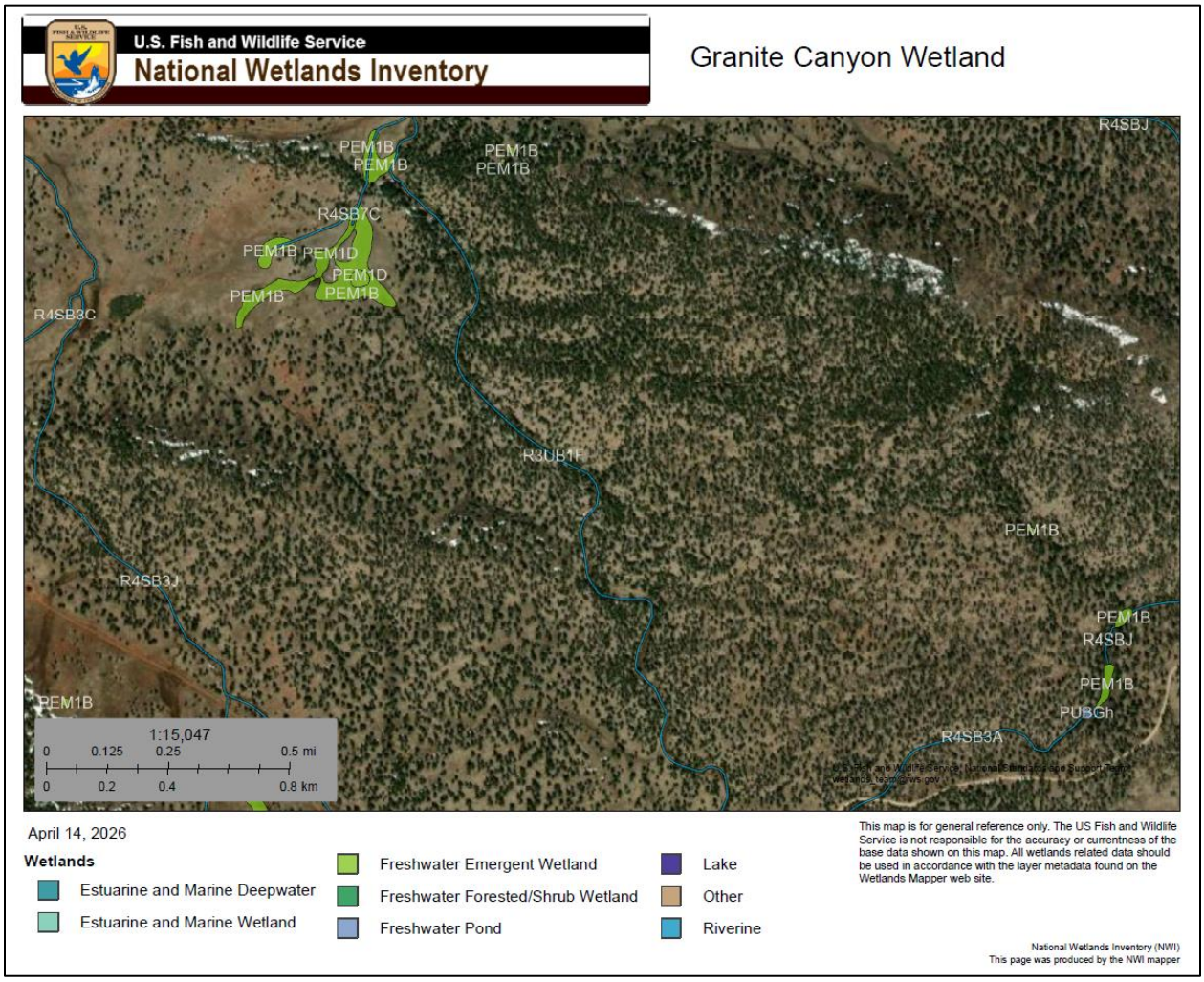
This reach is located in a relatively shallow and narrow rocky canyon bottom with a high granite component. It is characterized by intermittent stream segments likely connected by subsurface flows and has many large deep pools (Photos 6, 7, 8, and 9). Canyon tree frogs and Rio Grande suckers were observed during data collection in large pools. The upland vegetative community is mostly ponderosa pine with some pinyon and juniper intermixed. It is significantly rockier than the other reaches. The canopy cover is also much higher in this reach and the vegetative community is more diverse and includes more shrubs and woody species as well as species typically avoided by cattle (sleepy grass, Wood's rose). Analysis of soil pits at each transect (one wetland, one upland pit) found the following:

Wetland Soil Pit	**Upland Soil Pit**
T-7A: Clay with redox features (0-3"), Sandy clay loam with redox ((3-11"), and loamy sand without redox under water.	T-7B: Clay loam without redox from 0-3", Sandy clay loam without redox from 3-18"
T-8A: Sandy clay without redox from 0-3", Sandy loam with redox from 3-10", and Loamy sand without redox from 10-12"	T-8B: Sandy clay loam from 0-6", Sandy clay from 6-10", and rock from 10-18, all without redox

No soil pits were dug along transect 9 due to the weather conditions (rain/wind) during data collection. As expected, the wetland plots in this reach had hydric soils (evidenced by the vegetation present) whereas the upland plots did not. Many of the pools appeared to be bound by rock (Photos 7, 8, 9, 10, 13, and 14). Again, heavy grazing pressure and time of year impeded plant identification. A previous inventory in 2021 of the largest pool in this reach (Photos 7 and 8) found a variety of wetland obligate and facultative wetland plants (Appendix C Table D3).

It should be noted that the upstream ~1/3 of this reach and small intermittent pieces of the downstream 2/3 are classified as a R3UB1F Riverine System. The upstream ~1/3 of the reach has fewer smaller intermittent pools, all appearing to be contained by rock (Photo 13, Photo 14), and much of it looks more like an ephemeral drainage with a wider floodplain (Photo 15, Photo 16). This segment of the reach is still grazed heavily (low stubble height) but there doesn't appear to be evidence of concentrated hoof action other than game trails outside the channel.

Figure 13. NWI map for the Granite Canyon reach, produced by the NWI online wetland mapper (USFWS 2026).



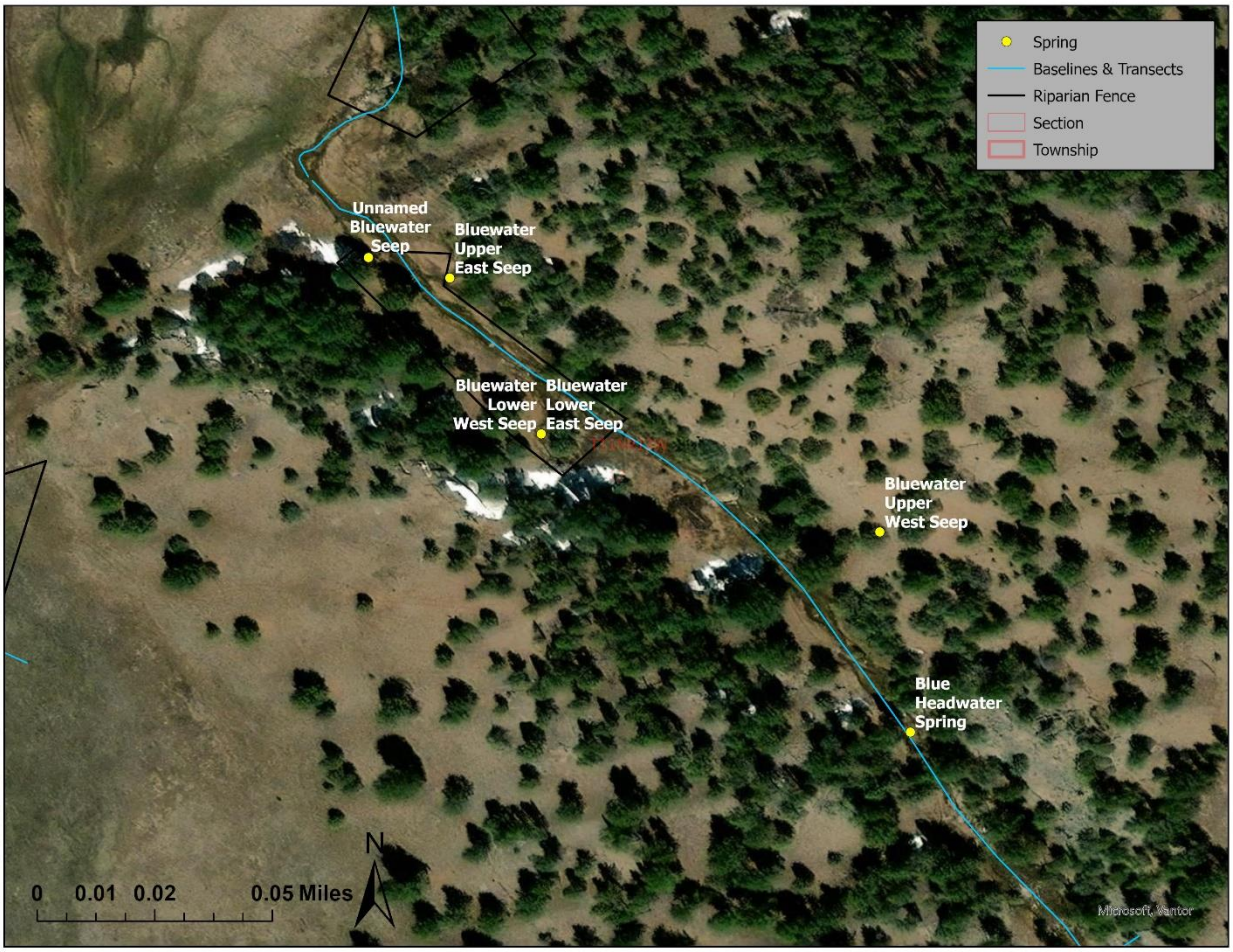
Springs

Several springs have been documented in the fen area and along both the Lower and Granite Canyon reaches in the vicinity of their confluence (Figure 14). The Springs Stewardship Institute (SSI) has conducted spring inventories across the Cibola since 2019. In 2019, they documented the Shush Kin Fen Spring (6/15/2019; Cibola Co.; 2247 m elevation; 35.18256, -108.231, WGS84). They conducted an intensive (level 2) inventory and noted the following management recommendations:

"Surveyors recommend long-term monitoring of this site on a regular basis since the overall conditions seems to be in decline. This site has a "floating fen" that is rare in this area and should be monitored and protected. The old fencing remnants should either be removed or replaced. The uppermost section of Shush Ken Fen will benefit from less livestock/ungulate trampling and grazing. This will allow the regrowth of wetland vegetation and the microhabitats to recover. This site receives a lot of use from wildlife, so ensuring it is perennial is important."

The SSI also documented 5 other springs along the Granite Canyon Reach: Blue Headwater Spring, Bluewater Lower East Seep, Bluewater Upper East Seep, Bluewater Lower West Seep, and Bluewater Upper West Seep. The Bluewater Lower and Upper West Seeps were documented at the same coordinates. These two are hereafter referred to as the Lower East Seep in this report because the water chemistry and discharge data were taken under that name.

Figure 14. Map of springs occurring near the northern end of the Granite Canyon Reach in the review area.



Connection Between Aquatic Features

The aquatic features in the review area fall within the Bluewater Creek HUC 10 watershed (1302020702). Upstream of the Granite Canyon Reach lies the Agua Media lake/pond (NHD reach code 13020207001782). This flows downstream into a smaller unnamed lake/pond (NHD reach code 13020207008596) that forms where the Granite Canyon Reach meets FSR 480, then enters the reach and flows northwest. The channel flows adjacent to the springs described in the section above. Immediately downstream of the springs, the channel turns sharply to the northeast and becomes what this review refers to as the Lower Reach, feeding into Bluewater Creek.

Bluewater Creek then flows northwest through the Zuni Mountains and into Bluewater Lake (Figure 9, Figure 10).

We defined the reach boundaries in this report based primarily on their visual distinction in the field. The fen has a boundary on the surface that appears distinct from the other reaches. This can be seen on the ground and from ariel imagery. The Lower Reach initiates along on the edge of a large meadow where it meets a moderately steep northwestern slope with a stark vegetative transition to a mix of ponderosa pine and pinyon juniper. As it moves northeast, the channel moves away from the trees out into the open flatland where it cuts through a shrub/grassland mix and eventually meets Bluewater Creek. The Granite Canyon Reach occurs in a canyon where the microclimate, soils, and plant community are visually distinct from the other reaches.

The hydrology of these reaches and spring sources is complex. Collis (2020) confirmed the hydrological connection of the Shush Kin Fen wetland and the adjacent springs to the Lower Reach. He suggests the spring waters originate from the same source of the San Andres-Glorieta aquifer. However, based on his analysis of stable isotopes, major ions, and physiochemical parameters, he determined that recharge mechanisms vary among these reaches and springs. Recharge to the fen and a west bank spring that he studied (west side of Granite Canyon Reach) come from both winter snowpack and local precipitation, while recharge to an east bank spring (east side of Granite Canyon Reach) came only from winter snowmelt (i.e., the aquifer) which has limited interaction with the atmosphere. This east side spring is discharging into the Lower Reach, providing a constant supply of water during all seasons. Collis (2020) determined that the features to the west (the fen and west bank spring) are connected to those of the east by seasonal alteration to the water chemistry from local precipitation and the fen's association with the alluvium.

Wetland Health Indicators

The SSI calculated risk scores for Shush Kin Fen in 2019 (SSI 2019) and collected water chemistry and discharge measurements on springs in the review area in 2021 (SSI 2022) (Figure 15, Figure 16). They noted in 2019 that issues contributing to impaired habitat conditions at Shush Kin Fen include encroachment by upland vegetation, and the geomorphic, chemical, and biological impacts of intensive livestock use (e.g., hummocks, channel headcuts, poor water quality, and profusion of certain weedy plant species). This is consistent with our field observations in 2026.

Figure 15. Springs ecosystem assessment protocol (SEAP) ecological condition and risk scores for Shush Kin Fen, surveyed in 2019 (SSI 2019).

	Ecological Condition						Risk	
Site Name	Aquifer & Water Quality	Geomorphology	Habitat	Biota	Natural Resources Average	Freedom from Human Influence	Natural Resources Average	Freedom from Human Influence
Shush Ken Fen	2.7	2.4	3.3	4.0	3.1	3.6	3.5	2.9

Figure 16. Water chemistry and discharge measurements at four springs surveyed in 2021 (SSI 2022).

Site Name	Discharge (L/sec)	Water Temp (°C)	pH	Specific Conductance (µS/cm)	Dissolved O_2 (mg/L)	Comments
Zuni Mountains						
Blue Headwater Spring	0.26	25.6	7.8	295	7	
Bluewater Lower East Seep	1	10.6	7.5	381	---	
Bluewater Upper East Seep	0.07	15.5	7.4	381	4	
Bluewater Upper West Seep	0	---	7.0	763	---	Standing water only

5. Conclusion

Based on the findings in this report, the Shush Kin Fen, Lower Reach, and Granite Canyon Reach exhibit sufficient hydrologic, soil, and vegetative characteristics to be classified as wetlands. A more comprehensive inventory and analysis of the vegetation in all reaches is recommended during the growing season and when cattle are not grazing within the review area. If this cannot be accomplished, a survey of the vegetation within the enclosures during the growing season would add insight into the species richness and relative abundance of the species occurring in this system. It may also shed light on the site potential.

During field data collection, several wetland monitoring devices were found (piezometers). We could not confirm the data associated with these devices. They may have been used by Collis in 2020. In the future, use of piezometers or other geotechnical instruments could provide data on water pressure, groundwater level, and seepage, which can inform the need for and design of restoration actions. Additional water quality monitoring (e.g., temperature, turbidity, discharge, dissolved oxygen, pH, nutrients, and contaminants) would be useful to evaluate aquatic health and pollution levels.

This ecosystem is currently supporting two fish Species of Conservation Concern – the Rio Grande Chub and the Rio Grande Sucker. These species have been observed using pools in the Lower and Granite Canyon Reaches in recent years. Conservation efforts for these fish should focus on restoring habitat connectivity, managing water flows, and removing non-native competitors to reverse population declines caused by habitat degradation. In this particular system, actions that would benefit the fish include 1) building an aquatic organism passage where the road crosses the Lower Reach, 2) resting the riparian zone from livestock grazing and subsequent improved grazing management in the Agua Fria Allotment, 3) erosion control, and 4) non-native invasive species removal (flora and fauna). Arresting erosion is crucial to prevent further soil and vegetation loss, retain more water in pools, restore connectivity between pools, moderate/dissipate energy during high-flow events, and restore/maintain channel sinuosity.

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