



NONPOINT SOURCE SUCCESS STORY

Arizona

Private Landowners Partner with the State to Clean Up Abandoned Mine Area Affecting the Hassayampa River

Waterbody Improved

An abandoned mine site was releasing pollution into the upper Hassayampa River in central Arizona. As a result, the Arizona Department of Environmental Quality (ADEQ) added the river (from its headwaters to its confluence with Copper Creek) to the 1992 Clean Water Act section 303(d) list of impaired waters for zinc, cadmium, and copper. ADEQ and local landowners worked to remediate multiple sources of mine waste in 2021–2022, and the levels of in-stream cadmium, copper, and zinc have dropped.

Problem

The headwaters of the Hassayampa River are south of Prescott, Arizona, in the Bradshaw Mountains. The river is approximately 11.2 miles long and lies above 5,000 feet of elevation. The Hassayampa River basin is part of the Middle Gila watershed and is contained within the Prescott National Forest. Recreational and agricultural usages predominate. The river runs through the small mountain community of Potato Patch, with a population of about 700.

Elevated levels of metals from an abandoned mine site prompted ADEQ to add a segment of the Hassayampa River—from its headwaters to its confluence with Copper Creek (HUC# 15070103-007A)—to its 1992 list of impaired waters for zinc, cadmium, and copper. The upper portions of the reach are on private land, and the water flows through sections of the Prescott National Forest. Designated uses for this segment of the Hassayampa River are aquatic and wildlife cold water, full body contact, fish consumption, agricultural irrigation, and agricultural livestock watering. In 2002, ADEQ completed a total maximum daily load (TMDL) for the river, which identified the McKinley Mill abandoned mine site (Figure 1) as a source of metals contamination (Table 1). In 2006, ADEQ also listed the reach as impaired for pH.

Spring snowmelt and monsoon and fall rains drive the high flows in the Hassayampa River. During low-flow episodes, groundwater is the primary source of the Hassayampa River. On the McKinley Mill site, a waste pile covering approximately a half-acre was deposited at a steep grade, situated above the stream channel and wetland area (Figure 2).

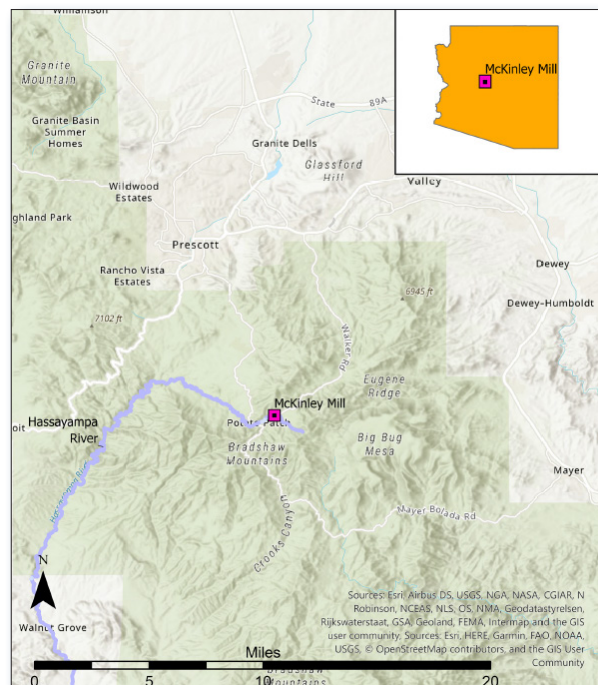


Figure 1. The McKinley Mill location on the Hassayampa River in central Arizona.

The toe of the waste pile was in the channel; the high flows from rains and seasonal snowmelt would wash mine waste into the channel, where it was then carried downstream (Figure 3). At low flows, sulfide in the waste material contributed metal contamination to the stream and visually impacted plant communities in the adjacent wetland. Of particular concern was a small lake downstream from the waste pile that is used for recreation by the residents.

Table 1. Metal loads at the McKinley Mill site, per the 2002 Hassayampa TMDL

Q (CFS)	Hardness (mg/L)	Dissolved metals	Natural background		Downstream of wetlands		Measured load (kg/day)
			Load (kg/day)	Conc. (µg/L)	Load (kg/day)	Conc. (µg/L)	
0.15	108	Cadmium	2.5	0.001	3	0.001	0
0.15	108	Copper	7.5	0.003	35	0.013	0.01
0.15	108	Zinc	20	0.007	130	0.046	0.039
3.97	28	Cadmium	2.5	0.024	2.5	0.024	0
3.97	28	Copper	7.5	0.073	38	0.369	0.296
3.97	28	Zinc	20	0.194	40	0.388	0.194

Notes: Q = Peak rate of runoff; mg/L = milligrams per liter; kg = kilogram; µg/L = micrograms per liter

Story Highlights

In 2021, in cooperation with conscientious private landowners and contractors, ADEQ removed the old mill's hopper structure from the property. Between October and December 2022, the waste pile was regraded, and it was capped to prevent water from infiltrating. At the same time, a gabion wall was constructed along the toe of the waste pile (Figure 4). Consistent communication with stakeholders in this small, tight-knit community was critical to the success of this project. Neighboring property owners also contributed by sharing their local knowledge and insights from living in and visiting Potato Patch.

Results

The remediation of the McKinley Mill site is expected to improve surface water quality in this section of the Hassayampa River. Data collected for effectiveness after construction is ongoing. The initial sampling efforts show a decreasing impact from the mine area over time for dissolved cadmium, copper, and zinc. Efforts will continue to identify and resolve other contamination sources in this watershed with the goal of removing this river segment from the impaired waters list.

Partners and Funding

The primary partners on this project were the private landowners who formed Mountain Girl, LLC. They purchased the property and used Arizona's Prospective Purchaser's Agreement program to limit liability associated with acquiring the abandoned mine, and they allowed ADEQ site access to perform the remediation. Tetra Tech, Inc., and their subcontractor, Environmental Response, Inc., were valuable partners in the remediation. Overall, the project cost close to \$500,000 and was supported by CWA section 319 funds.



Figure 2. McKinley Mill mining waste pile.



Figure 3. Mine waste in the stream channel.



Figure 4. Regraded and capped waste pile with new gabion wall at the toe.



U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-24-001B
February 2024

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