Evaluating Reclaimed Mines and Heavy Metal Soil Contamination

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Introduction

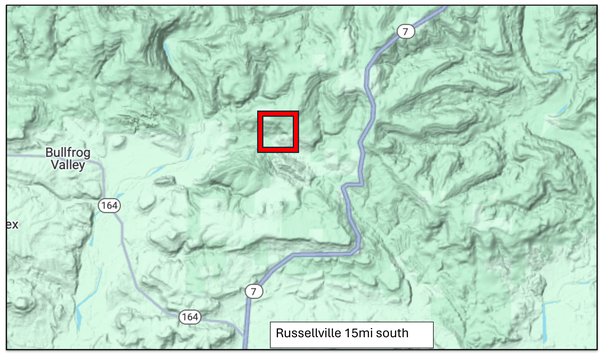

Figure 1: Location of Brewer-Robin Prospect

Abandoned and historical mine sites present a potential environmental hazard by way of acid mine drainage and mobilization of heavy metals. Preliminary data from an abandoned lead-zinc mine show little evidence of heavy metals in the watershed.

The Brewer-Robin prospect is an abandoned lead/zinc mine east of Old Hwy 7 (Fig. 1). The abandoned mine's proximity to the tributaries of Levi Branch (stream) was convenient for our evaluation of leaching material from the mine.

Methods

The exact location of the mine was unclear, so we sampled both streams for comparison of anomalous concentrations of heavy metals in sediments.

Nine sediment samples were collected at different areas of the two forks and the confluence area of the site (Fig. 2). The samples were dried in a low temperature oven. Then, the samples were sieved to focus on the silt and clay sized fraction. Each sample was tested with a portable x-ray fluorescence (pXRF) device to collect geochemical data.

Results

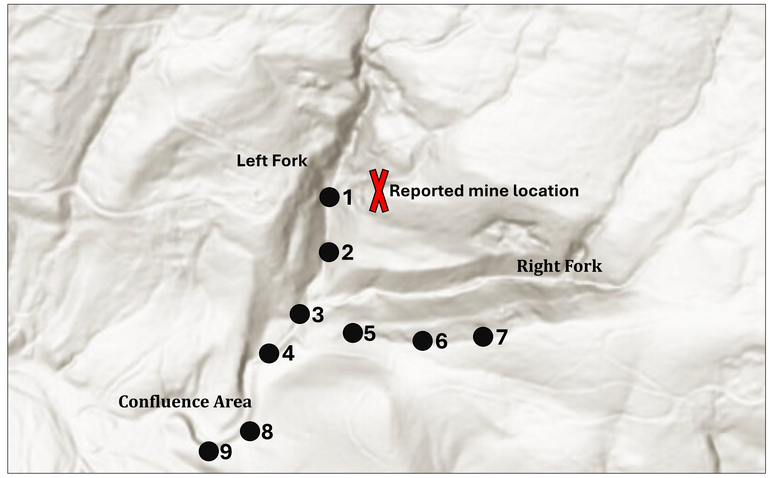

Figure 2: LIDAR image of Brewer-Robin prospect

We found five hand samples of galena on rocks in the stream (Fig. 3). We also found boxworks, which are typical of the weathering of sulfide minerals, indicating the past presence of sulfide minerals in the location (Fig. 4).

Figure 3 (left): Weathered boxworks structure

Figure 4 (right): Galena vein found in sandstone sample.

The results for the sediment analysis are presented in Table 1 below.

	Cr (PPM)	Ni (PPM)	Cu (PPM)	Zn (PPM)	As (PPM)	Pb (PPM)	Sample ID
Left Fork	69	36	100	89	21	20	BR-S-1A
	66	27	31	76	21	24	BR-S-2A
	83	31	23	84	18	23	BR-S-3A
	79	44	16	97	19	25	BR-S-4A
Right Fork	64	67	38	130	15	28	BR-S-5A
	32	36	17	89	15	24	BR-S-6A
	76	31	24	74	16	20	BR-S-7A
Confluence	86	30	12	101	17	26	BR-S-8A
	207	41	30	108	15	20	BR-S-9A
Error	±11	±3	±2	±2	±1	±1	
C253664	49	30	9	78	12	24	

Table 1: Sediment Geochemical Analysis

Conclusions

The few hand samples of galena were found in the upper portion of the left fork in the stream; however, the exact location of the mine was unclear, suggesting that there was sufficient burial of the minerals to inhibit leaching and the formation of acid mine drainage.

Geochemical analysis reported in Table 1 showed lead and zinc concentrations like existing sediment data for the same rock formation (Middle Bloyd Formation). The reported location for the Brewer-Robin prospect is on the left fork, however, compared to the right fork, which is separated by a ridge, there is no significant difference in the geochemical data.

Based on these observations, there is no indication of leaching of heavy metals into the downstream environment of the Brewer-Robin prospect.

Figure 5: Torin Matthews next to the right fork of the stream.

References

1. USGS Geochemistry Database Sample C253664 submitted in 2005.
2. Arkansas Geological Survey Mineral Commodity Search/Map Location 4543.