

# Anna S Mine: A Century of Mining, Acid Mine Drainage, and Remediation<sup>1</sup>

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**Abstract:** The Anna S Mine (Tioga County, Pennsylvania) has supported underground and surface coal mining activities in the Bloss coal seam since the 1890's. The mining is in poorly buffered net acidic strata located above the regional drainage. The mine drainage is low pH with elevated concentrations of Al, Fe, and Mn. In the 1970's surface mining along the crop daylighted portions of the underground workings. The effects of the surface mining on water quality were documented by a USGS investigation, followed by monitoring associated with the surface mining permit. Daylighting activities significantly worsened the chemistry of the mine drainage, caused severe water quality problems in Babb Creek, and degraded water quality downstream in Pine Creek, a nationally recognized cold water fishery. The degradation prompted the formation of the Babb Creek Watershed Association (BCWA) who lobbied aggressively for remediation actions. In 2003/04 two passive treatment systems were installed to treat mine water discharging from the Anna S mine at a total cost of \$2.5 million. The systems, which utilize vertical flow ponds and constructed wetlands, are the largest passive treatment project ever undertaken by a non-profit organization in Pennsylvania. Since their installation, the systems have continuously produced net alkaline effluents, which has contributed to restoration of good water quality in Babb Creek. In 2010, both Babb Creek and Pine Creek were removed from the degraded stream list and reclassified as high quality cold water fisheries. The BCWA has managed the operation of the systems since their installation. This responsibility includes sampling, routine maintenance, and major maintenance projects in 2014 and 2016 when the organic substrates in the VFPs were replaced. The presentation will present the 45-year record of chemical and hydrologic characteristics of mine water discharges from the Anna S mine. The presentation will highlight the degradation caused by the daylighting operations, natural improvements in water chemistry in decades since completion of mining, benefits realized by the passive treatment, and the full cost of the passive systems.<sup>3</sup>

**Additional Key Words:** Passive Treatment, Babb Creek, Pine Creek.

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3. Work reported here was conducted near 41°37'18"N, 77°18'05"W.