



Cooperative mine land reclamation operations & comprehensive managed watershed planning

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Extended Abstract

Reclamation efforts in the vicinity of the small historical coal town of Ernest, in Indiana County, Pennsylvania have resulted in substantial environmental improvements and have enabled a reinvigorated approach to eliminate remaining effects of legacy mining. This presentation illustrates the contributing factors to initial environmental impact, subsequent restoration, and planned perpetual management strategy.

Coal reserves were heavily mined for over 61 years in the vicinity of Ernest, PA from 1904 to 1961, which resulted in two predominant pollution contributors. Over 21 mi² (53 km²) of linked underground mine workings of the Ernest No. 2 and 3 mines were developed in which an estimated 1.5×10^9 gal (5.6×10^9 L) mine pool had accumulated after termination of mining. Additionally, coal refuse extracted from these workings were disposed of within an approximately 94-ac (38-ha) area, accumulating more than 10×10^6 yd³ (7.6×10^6 m³) of material in an unlined valley fill that lay atop shallow, flooded underground mine workings. These features not only resulted in uncontrolled surface infiltration and runoff to the receiving streams of the watershed, but also produced two major mine pool discharges, known as the Ernest Mine Portal and the Fulton Run Shaft. Unabated, these discharges effectively eliminated the environmental value of the aquatic habitats and resources of the watershed, spilling some 928×10^6 gal (3.5×10^9 L) per year into the receiving stream, Crooked Creek. The former Pennsylvania Department of Environmental Resources (PADER) attempted to address the underground discharges with an active chemical treatment plant as part of “Operation Scarlift” in the late 1970s, but ultimately that acid mine drainage (AMD) treatment plant failed due to excessive operational costs and improper geological controls which resulted in recirculation of the re-injected treatment sludge.

The Ernest Refuse Pile was permitted as a reprocessing operation for use as local cogeneration power plant fuel in 1996. Removal of coal refuse and surface channel reconstruction at the Ernest Refuse pile site resulted in drainage control that impeded infiltration into the shallow cover atop the Ernest Mine Complex and delivered shallow groundwater to base level via constructed flow paths, having been treated prior to discharge. In addition to refuse removal, alkaline ash placement resulted in drastic improvements in chemical composition of the underlying mine pool. Time-series monitoring data illustrate that decades-long pollution loading trends were superseded by remarkably improved water quality from 2011–2014 (84.6% lower iron and aluminum loading rates) and have continued to stabilize since. In 2018, unprecedented flash flood conditions and sedimentation affected the abandoned Ernest Mine Portal and displaced the flow to the down-dip artesian Fulton Shaft, albeit without overall compositional detriment, demonstrating important mine pool connectivity and dynamics.

The change in mine pool chemistry has enhanced concurrently developing cooperative plans for active chemical treatment of the improved mine pool, elimination of the remaining abandoned mine discharges via pumping controls and is planned to

far exceed previously established loading reduction goals set forth in Crooked Creek's total maximum daily loading (TMDL) plan/protocol by augmenting the pollution reduction to over 97% elimination of mining metals loading. This work highlights the complexly inter-related pre- and post-regulatory mining and how the completed coal refuse reclamation will provide an annual mine discharge water treatment cost savings multiplier of 2.9. Furthermore, the current plan would rely on the private sector cooperatively operating and funding plant operations for 10–15 years prior to permanently transferring the facility to the Commonwealth. The overall cooperative team contributing to this ongoing project includes Title V operators, the Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation, and non-government organizations (NGOs), making this an exemplary case example for the planning and management of future similar reclamation efforts.

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