Water Quality of Reclaimed Mountaintop Removal Valley Fill Mine Site 15 Years After Final Reclamation – An Unexpected Remedy[1]

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Abstract: Mountaintop removal valley fill (MTR-VF) mining operations conducted for many years in Central Appalachia coal fields, the legacy and long-term impact of which on stream water quality were deemed irreversible (Palmer 2010, Science, DOI: 10.1126/science.1180543). In this paired-watershed study, conducted in South Central WV, we compared stream hydrology and water quality of MTR-VF watershed 25 years after mining ended and 15 years after final reclamation bond-release stage completed to that of adjacent non-disturbed watershed of similar size and aspect (ca. 140 acre each, SW aspect). In-situ stream water measurements of pH, dissolve oxygen, oxidation-reduction potential, temperature, and electrical conductivity (EC) were conducted every two weeks during grab-samples collection at selected longitudinal locations upstream and downstream from the VF toe, and at the outlet of the non-disturbed watershed. Water samples were further analyzed for alkalinity, dissolved carbon, and major ionic and metal content. In addition, a weather station was installed on the connective ridge and the two streams were instrumented with flumes, pressure transduces, and multiparameter sondes for continuous (15 min interval) monitoring of meteorological conditions and stream water flow and quality. Fifteen years after final reclamation MTR-VF was found to still drastically impact stream water quality. Significant longitudinal and temporal variation and elevated levels of all measured parameters were observed upstream along the MTR-VF watershed compared to the non-disturbed watershed. With EC, for example, exceeding regulatory threshold (300 µS cm^{-1}) during much of the growing season (annually fluctuating from 229 to 592 µS cm^{-1}). Yet, a beaver-restored sediment pond into wetland seemed to alleviate both the seasonal fluctuations and the levels of measured parameters; with EC, for example averaging 169 µS cm^{-1} (fluctuating between 93 to 284 µS cm^{-1}) downstream from the pond. It is noteworthy that 'removal' of sediment ponds upon final reclamation is expected and indeed encouraged by regulatory agencies in order to regain pre-mining stream flow patterns… Results are discussed with respect to on-going practices and regulations amid the apparent invaluable role of the (beaver-) conversion of sediment ponds into wetlands in regulating MTR-FV water quality, years after such ponds concluded their perceived and intended role.

Additional Key Words: TDS, Electrical conductivity, wetland, sediment pond

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