LINKING TEMPORAL PATTERNS OF DISSOLVED SOLIDS IN CENTRAL APPALACHIAN COALFIELD STREAMS TO MINING SOURCES[1]

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Abstract: Headwater streams influenced by coal mining often exhibit elevated levels of dissolved solids relative to minimally disturbed, or reference, streams. Elevated levels of dissolved solids have been associated with aquatic life effects in mining-influenced streams. In addition, in-stream salt levels have been observed to vary over time, though the cause and consequence of such variability are not fully understood. Although some variability may be explained by the seasonal precipitation cycle, non-seasonal patterns may be explained by the nature of the source of dissolved solids. The extent to which aquatic life is affected by a stressor is a function of the magnitude, duration, and frequency of exposure to that stressor. To date, efforts to quantify the stressor of dissolved solids have typically focused on magnitude, measuring dissolved solids and/or specific conductance during discrete sampling events at fixed dates and times. Such efforts may fail to fully capture the temporal variability of dissolved solids, thus prohibiting full characterization of aquatic organism stressor exposure. To address these issues, we have employed in-stream conductivity monitors to record specific conductance continuously in Central Appalachian headwater streams with elevated dissolved solids where other stressors are not evident. Continuous conductivity data were supplemented with monthly measurements of total dissolved solids and constituent ions. For each stream, the nature and extent of the mining activity influencing the catchment was determined from reviewing permit information. Examination of these data reveals temporal variability of dissolved solids that can be used for high-resolution characterization of the magnitude, duration, and frequency of aquatic life salt exposure. In addition, distinct patterns of dissolved solids can be linked to mining type and operational patterns. Understanding the influence of mining practices on in-stream temporal patterns of dissolved solids will allow operators to better mitigate the aquatic life impacts from such practices.

Additional keywords: biomonitoring, benthic macroinvertebrates, water quality

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