FRESHWATER SALINIZATION: MULTI-YEAR STUDY REVEALS NATURAL SEASONAL SALINITY PATTERN, IMPLICATIONS FOR MACROINVERTEBRATE LIFE-CYCLE EXPOSURE

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Salinization of freshwaters is of growing concern globally. In many regions of the world, and in coal-mining-influenced streams of Appalachia USA, specific conductance (SC; a salinity surrogate) has been linked to decreased diversity of benthic macroinvertebrates. Effective management of salinization requires accurately linking salinity with biological effects while accounting for temporal variability. Toward that end, we sampled high-frequency SC and seasonal benthic macroinvertebrates for 4.5 years in 25 Appalachian headwater streams spanning a gradient of salinity. A sinusoidal model of the annual cycle of SC revealed that on average, salinity naturally deviated ± 20% from annual mean levels, with minimum SC occurring in late winter and maximum SC occurring in late summer. Community structure diverged from reference condition as salinity increased, with stronger relationships in Spring than in Fall. Non-Baetidae Ephemeroptera in Spring samples were most sensitive to salinity, with declines in richness and abundance predicted when Spring SC was > 200 uS/cm and when SC during the prior Fall was > 250-300 uS/cm. This study demonstrates transferable tools that can account for natural temporal variability and allow characterization of life-cycle exposures when assessing biological effects in salinized waters.