

SHOULD THERE BE AN AQUATIC LIFE WATER QUALITY CRITERION FOR CONDUCTIVITY?¹

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Abstract: There are a number of state and federal agencies calling for development of aquatic life criteria or thresholds for conductivity, including a field data-derived benchmark of 300 $\mu\text{S}/\text{cm}$ that was recently proposed for central Appalachian streams chemically dominated by sulfate and bicarbonate salts. Such directives are based on observed correlations between conductivity and benthic macroinvertebrate community composition. However, development of a true aquatic life criterion for a composite variable like conductivity is made difficult by a number of factors. For example, consistent stressor-response data are typically required to derive regulatory thresholds using species sensitivity distributions – i.e., organisms should have a consistent response to a toxicant, only differing in sensitivity. In addition, other states have evaluated this issue and determined that a composite variable, like conductivity or TDS, is not appropriate for criteria development, as toxicity varies strongly as a function of specific ion composition and is potentially mitigated by elevated hardness. Finally, our independent statistical analyses of the West Virginia Watershed Assessment Branch Database (WABbase) used to create this benchmark indicate there is a real possibility that observed patterns of invertebrate community composition versus conductivity may, in fact, be related to a combination of abiotic (ionic composition, habitat, temperature, flow, channel form, etc) and biotic (competition, predation, life history patterns) factors – potentially adding an insurmountable level of confounding. We conclude that the relationships between conductivity and changes in benthic macroinvertebrate community composition are not strong, consistent, or reliable enough to warrant derivation of a criterion at this time.

Additional Key Words: benchmark, West Virginia, Benthic Macroinvertebrates, species-sensitivity distributions.

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