

Water Quality and Freshwater Mussel Status in Mining-Influenced Virginia-Tennessee Rivers¹

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Abstract: The Clinch and Powell Rivers of southwestern Virginia and northeastern Tennessee support diverse aquatic communities that include imperiled species of fish and freshwater mussels. Forty-five mussel species, including at least 20 federally endangered species, are extant in these two rivers despite the surface coal mining that has affected water quality in both rivers. Freshwater mussel communities have declined in sections of both rivers over multiple decades, while total dissolved solids (TDS), an indicator of mining influence, has increased in concentration over those time periods. In both rivers, mussel community declines have been most severe in the river sections where TDS-concentration increases have been greatest. In laboratory bioassays, *Villosa iris* juveniles were exposed to waters with environmentally relevant major ion concentrations, but no impairments of survival or growth were observed. In an effort to identify water contaminants responsible for mussel decline, an intensive water monitoring program is being conducted in the Clinch River and at one location in a mining- and urban-influenced tributary, the Guest River. First-year results indicate that total dissolved solids, specific conductance, several major ions (K^+ , Na^+ , and SO_4^{2-}), and several metals (total Cu, Fe, Mn, Ni, and Sr) are elevated in the Clinch River reach that has experienced severe mussel declines, relative to other river sections; and are even greater in the Guest River relative to the Clinch River mainstem. Trace metals, polycyclic aromatic hydrocarbons, and major ions have been identified as potential stressors that may be contributing, either individually or synergistically, to mussel declines; but cause and effect relationships and current environmental exposures are poorly understood.

Additional Key Words: aquatic ecology; conductivity; major ions; metals.

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