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TVA Kingston Fly Ash Release: Environmental Studies in Progress

Abstract Title:

Fish health and bioaccumulation studies for evaluating fly ash exposure and effects in aquatic ecosystems

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Abstract:

As a major component of the biological monitoring and assessment project related to the TVA Kingston fly ash release, we conducted a comprehensive health and bioaccumulation study for the purposes of evaluating possible effects of fly ash exposure on fish health and determining possible relationships between levels of metals in fish and various indicators of fish health. Three species of fish, representing different trophic levels and home ranges, were sampled at sites in the immediate vicinity of the fly ash release and at sites upstream and downstream of the spill. Muscle and liver tissue for individual fish were analyzed for 25 metals and an in-depth health profile, based on the multiple bioindicator approach, was conducted for each fish including indicators of physiological function, electrolyte homeostasis, tissue damage (histopathology), bioenergetic status, organ dysfunction, and reproductive integrity. Results of these studies, conducted 2-4 months after the spill, indicate that (1) no obvious patterns or relationships between levels of metals in fish and fish health, (2) for some measures of fish health and bioaccumulated metals, there is a downstream gradient of responses with some variables increasing and others decreasing along the spatial gradient of the river and, (3) based on EPA's three- tiered approach for assessing effects of selenium on wildlife, future studies will be focused at the Tier 2 level because of slightly elevated levels of selenium in some fish and in ovarian tissue. Results of this study to date have also emphasized the importance of the weight-of-evidence approach for assessing potential relationships between multiple environmental factors and the health of biological systems. Since elevated selenium is known to cause reproductive failure in fish, current studies are focused on assessing the relationship between reproductive competence of fish and levels of selenium in target organs such as liver and ovary.