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Clint McMaine
Eastern Kentucky University

Walter S. Borowski
Eastern Kentucky University

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PATTERNS OF HEAVY METAL CONCENTRATION IN CORE SEDIMENTS, WILGREEN LAKE, MADISON COUNTY, KENTUCKY

Clint McMaine and Walter S. Borowski

521 Lancaster Avenue
Dept. of Geography & Geology
Eastern Kentucky University
Richmond, KY 40475-3102
(859) 622-1277
w.borowski@eku.edu

Accumulation of heavy metals in ecosystems is a known environmental problem, and several possible industry sources occur within the watershed of Wilgreen Lake, which is fed its two major tributaries, Taylor Fork and Old Town Branch. Elevated levels of cadmium, copper, lead, and nickel were found within the waters of Wilgreen Lake during a preliminary survey in 2007. A possible source of these contaminant occurrences is diffusion from lake sediments, which record past and present activities within their drainage basins.

To obtain a history of anthropogenic practices within the drainage basin, we took 1-meter-long cores of lake sediment in each major tributary to see if metal concentrations changed with depth. The cores were taken from prominent levees that are relatively easy to sample and contain thick sediments with a good record of watershed history. We sub-sampled the core, freeze-dried the samples, and extracted metals from the sediments using hydrogen peroxide and trace-metal-grade nitric acid according to established U.S. Environmental Protection Agency (EPA) protocols. Samples were sent to Activation Laboratories and analyzed for a host of metals using ICP/OES.

Most trace metals (Sb, As, Cd, Co, Se, Ag, Tl, Th) show no pattern with core depth or between the Taylor Fork and Old Town Branch coring sites. Moreover, there was no correlation between core lithology and heavy metal content for any of the measured metals. Antimony, cadmium, and thallium show concentrations at or just above the method blank ($\leq$0.1 mg/L). Arsenic, cobalt, nickel, selenium, silver, thallium, and thorium show background concentrations of 5, 12, 17, 1.5, <0.1, 1.5, and 6 mg/L, respectively. Chromium, copper, and nickel within the Taylor Fork core respectively increase 43%, 25% and 19% in the upper 10 to 30 cm of the core from deeper baseline values, perhaps due to diagenetic precipitation. Lead increases markedly downcore within Taylor Fork sediments peaking at ~ 53 mg/L, or about 40% above a background concentration of 23 mg/L observed at Old Town Branch. Copper increases slightly downcore with a higher background level at Taylor Fork (18 versus 12 mg/L). Taylor Fork sediments thus display more lead and copper, consistent with industrial sites existing within this tributary's watershed. These elevated concentrations perhaps reflect industrial releases in the past.

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