

Carbon Cycling and the Quality of Watersheds in Letcher County, Kentucky

Nikki Byrd, Lincoln Memorial University

Faculty Mentors: Alice L. Jones (Eastern Kentucky University) James F. Fox (University of Kentucky)

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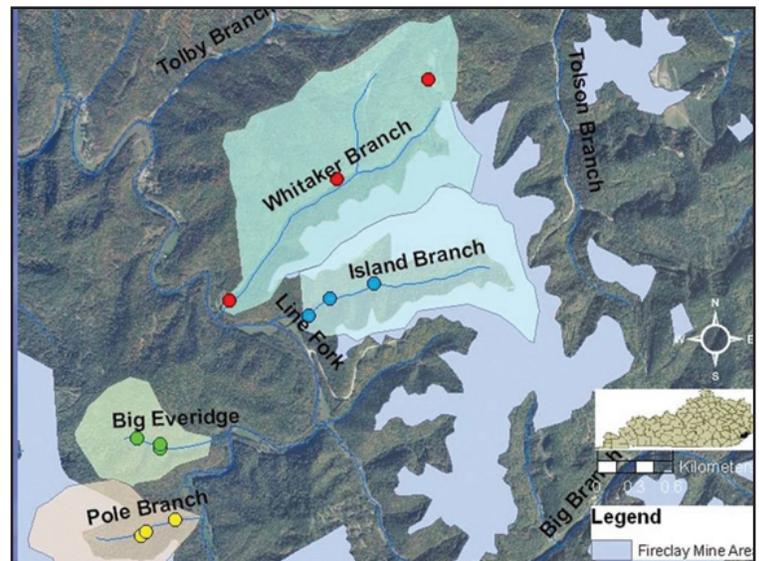
Introduction

This study analyzes the correlation between watershed health and carbon enrichment in areas affected by the surface mining of coal and other materials. Observations for this study include overall water quality, habitat assessment, and the analysis of sediment data for isotope enrichment. These results are compared in order to establish if there is an overall effect on watershed health, associated with change in headwater land use - and specifically mining and reclamation.

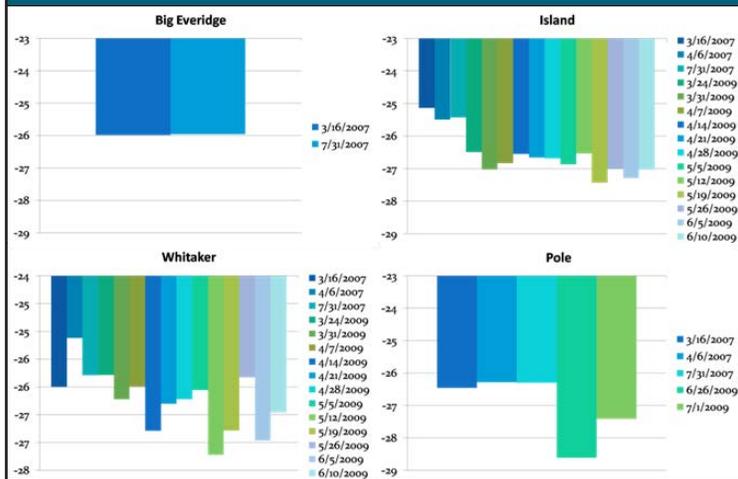
Study Sites

Watersheds sampled were located in Letcher County, Kentucky, near the southeastern border. These watersheds were selected for their wide variety of habitat. Big Everidge, the control site, is an old growth forest untouched by surface mining practices. Island Branch is a current mining site. Whitaker Branch is a site mined between the years 1998 and 2003 and is the only watershed with residential activity. The final site, Pole Branch, was mined and reclaimed in the early 1970s, prior to the implementation of the Surface Mining Control and Reclamation Act (SMCRA).

Sampling Sites in Letcher County



Carbon Enrichment



Methods and Analysis

Water and soil samples were taken from each watershed site. A YSI 556 Multisonde meter was used to measure levels of dissolved oxygen, pH, temperature, and conductivity in the water. An ICS2500 chromatograph was used to establish the amount of phosphates, sulfates, and nitrates/nitrites in the soil. The stable carbon isotope ($\delta^{13}C$) was used to track the effects of surface mining in these sites.

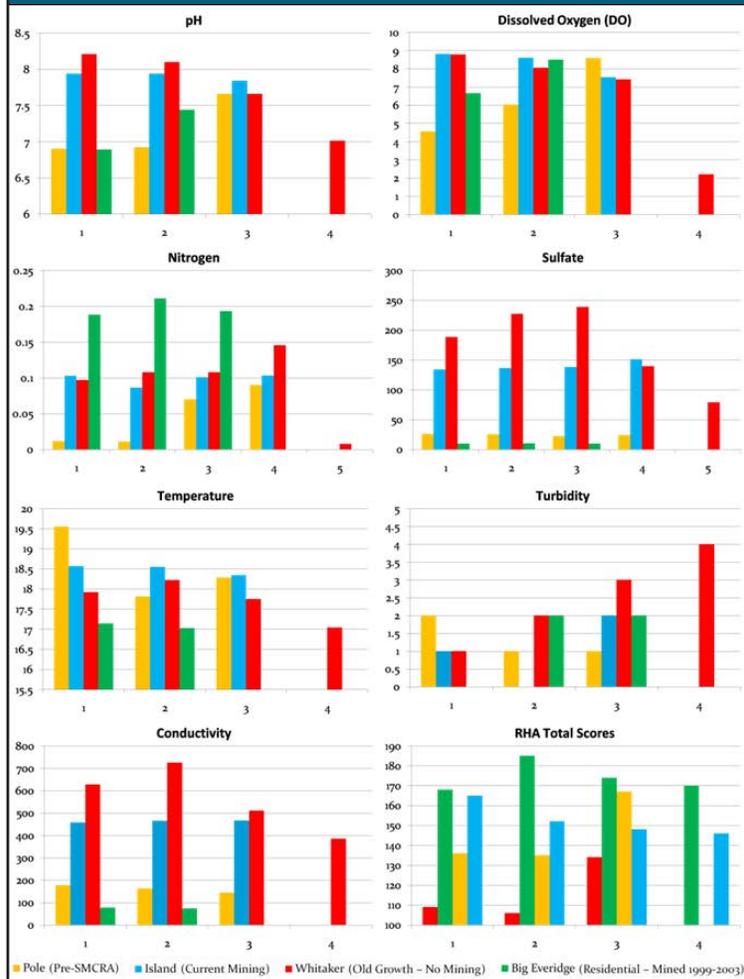
Overall Trends

Significant differences were found in all chemical parameters, including sulfates, nitrates, and conductivity. The habitat assessment also identified high levels of sediment deposition, channel alteration, and erosion. Enriched levels of carbon were present in the Pole, Island, and Whitaker watersheds, while the levels of the control forest, Big Everidge, remained steady.

Conclusions

Watersheds with current or previous surfacing were found to have lower water quality measurements and habitat scores. This indicates that the overall quality and health of these watersheds are less desirable than that of the control forest, which is unaffected by surface mining. Watersheds with current or recent surface mining showed similar trends with respect to carbon enrichment. The $\delta^{13}C$ levels in these sites began around -25ppm and decreased to -28ppm during the study.

Data Measurements



NIKKI BYRD is a senior majoring in Chemistry at Lincoln Memorial University.

ALICE JONES is an associate professor of environmental planning in the Department of Geography & Geology at Eastern Kentucky University and co-director of the Appalachian Headwaters Summer Research Program.

JAMES F. FOX is an assistant professor of water resources in the Department of Civil Engineering at the University of Kentucky and co-director of the Appalachian Headwaters Summer Research Program.



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