

**ABSTRACTS
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did not change upon incubation in stream water for up to seven days. However, the ARP of human isolates sampled was markedly different from the ARP of the previous year. The data suggest that differences in antibiotic resistance levels in populations of enterococci may be useful for identifying sources of fecal pollution.

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ASSESSING NONPOINT SOURCE POLLUTION TO GROUNDWATER ON A WATERSHED SCALE: A PILOT PROJECT IN ALBEMARLE COUNTY

David Hirschman¹ and Kristen Godard²

Albemarle County teamed with the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation (DCR-DSWC) to undertake a pilot watershed project to assess nonpoint source impacts on private wells and the presence of any broad-based quantity issues. The North Fork/South Fork Hardware River Watershed was chosen for the project because its inhabitants are exclusively dependent on groundwater. Staff from the Division of Mineral Resources provided a working field map of bedrock geology in the project watershed. Ninety households participated in the project. For participating households, project staff visited the residence, administered a questionnaire on the use of the well and the perceived problems with flow and quality, collected on-site data on landforms and land uses, and collected a water sample. The samples were delivered to the Division of Consolidated Laboratory Services in Richmond for analysis for nine water quality parameters.

The most widespread water quality problem evident from both the resident survey and laboratory results was low pH, or acidic water, which is very common for well water across the Piedmont. Positive total coliform and nitrate-nitrogen levels in excess of 1 mb/L were each present in 24% of raw water (untreated) samples. The most important factors influencing positive results were the age and construction of the water system. Based on the resident survey, several sections of the study area appear to have a higher incidence of low flow problems and wells going dry.

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SIMPLE TECHNIQUES FOR ESTIMATING THE AGE OF GROUND-WATER CONTAMINATION: A CASE STUDY

John W. Donley and Timothy P. Jamison¹

Pollution is dynamic. The instant a contaminant enters the environment, it begins to change both chemically and physically. The processes responsible for this change, the contaminant fate and transport mechanisms, include advection, diffusion, dilution, volatilization,

precipitation/dissolution, sorption, and chemical and biological reactions. We seek to understand the complex interactions between these processes, hoping to design effective remedies and to accurately assess potential threats to human health and the environment.

With the advent of the personal computer, environmental scientists and engineers have come to rely heavily on numerical analysis and theoretical representations of natural systems to develop predictive tools such as expert systems and mathematical models. But we can also learn a great deal by merely observing the changes that a contaminant undergoes in the environment. Empirical data are especially valuable when we are more interested in understanding the past than in predicting the future. For example, by measuring the rate of change in one or more parameters, we may be able to estimate the date of a release. This information may help administrators and attorneys apportion investigation and cleanup costs among two or more potentially-responsible parties.

This paper will present a case study in which various simple methods are used to estimate the age of a ground-water plume. These include both graphical and mathematical methods using data which are routinely generated during environmental investigations. These methods are similar in that they are all based on data obtained through field investigations and they all rely on estimates of the rate of change in one or more parameters. However, each method uses a different type of information or relies on a different mechanism of change. While each method has inherent advantages and limitations, estimates of the age of a ground-water plume varied between most methods by only a few months in the case study.

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***IN SITU* ERODIBILITY MEASUREMENTS OF ESTURINE FINE-GRAINED SEDIMENT IN THE LOWER CHESAPEAKE BAY**

Chang-Hee Lee and Jerome P.-Y. Maa¹

In situ erodibility measurements of fine-grained sediments have been made at Wolftrap and Cherrystone sites in the lower Chesapeake Bay using the VIMS Sea Carousel. All experiments at the Wolftrap site showed the existence of the thin layer of fluffs, which had a negligibly small erosion resistance, on the top of a relatively consolidated sediment bed. Critical shear stress of the sediment bed τ_{cr} were clearly identified and found to be about 0.14 Pa in June and 0.12 Pa in October. Measured initial resuspension coefficient E_0 increased with bed shear stress τ_b and ranged from $6 \times 10^{-7} \sim 4 \times 10^{-5}$ g/cm²/sec for $\tau_b = 0.2 \sim 0.7$ Pa (N/m²). The E_0 showed little seasonal change at this site.

At the Cherrystone site, the February experiment showed the relatively thick layer of fluffs. This layer is in its early stage of consolidation and possibly newly deposited from the sediment plumes generated from the adjacent shelf by winter storm waves. A relatively thin fluffy layer was observed in the May and September experiments. Measured τ_{cr} of the sediment bed was 0.11 Pa in May, but it was not apparent in February because of the continuous resuspension with an increasing τ_b . Measured E_0 during the May experiment