WHAT'S IN MY DIRT? – USE OF THE NATIONAL GEOCHEMICAL SURVEY TO DETERMINE ECOREGIONAL BACKGROUND VALUES FOR ELEMENTAL CONSTITUENTS IN ARKANSAS: A PROCESS, DEMONSTRATION, AND EXAMPLE APPLICATION

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Abstract Federal land managers face a variety of challenges while managing the environmental impacts of various land uses. Informed decision-making requires empirically based, locally relevant resource information set in the context of natural background conditions and federal regulatory limitations. Elements, including major, minor, and trace metals, occur naturally in soil and sediment substrates with varying concentrations, but these values can be altered by land uses. Background values are an important frame of reference in environmental analysis and monitoring programs.

This study seeks to determine appropriate background values for 47 element concentrations in soils across the ecoregion divisions in the state of Arkansas. This investigation demonstrates the utility of the National Geochemical Survey (NGS) for determining relevant background values of element concentrations in soil and sediment samples (USGS, 2004). This process incorporates appropriately scaled ecoregion boundaries to filter a national sample to locally relevant measurements. Descriptive statistics and calculated derivatives were then used to produce a set of appropriate background values. The outcome of this assessment can inform monitoring activities, management plans, environmental analysis, and restoration activities.

Data was obtained from the USGS NGS website and edited to eliminate sample locations with erroneous spatial attributes, and to remove irrelevant data. Within a GIS environment, a dataset describing ecoregion boundaries was used to correlate the NGS samples with the ecoregion in which it was collected. This data was exported to Excel™, where descriptive statistics were calculated. Four potential methods of determining background values from this set are discussed and a table was developed which lists these values. A user can view this table and obtain the appropriate background value for 47 different elemental concentrations within the various ecoregions of Arkansas.

An example application is showcased by the construction of a decision support system which incorporates background values to evaluate elemental constituents derived from a post activity sediment monitoring program.