

## **USE OF NITROGEN-15 NATURAL ABUNDANCE METHOD TO IDENTIFY NITRATE SOURCES IN KANSAS**

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### **Abstract**

Nitrogen isotopes have been used as a tool for identifying sources of nitrate contamination in groundwater for almost 30 years. The method is used most successfully in areas with thin, permeable vadose zones with a shallow groundwater table and in rock units such as fractured limestone. However, the geology of Kansas shows some additional effects on observed nitrate concentrations and nitrogen-15 signatures. Alluvial and deep aquifers can have altered nitrogen-15 values because geochemical or biogeochemical processes occur in the vadose zone.

Known ranges of nitrogen-15 values are associated with different sources: fertilizer from < 0 to +8 per mil and animal waste > +10 per mil with associated high nitrate-N values (Heaton, 1986). However, denitrification and volatilization can also result in nitrogen-15 values > +10 per mil but nitrate-N values are frequently below background level of 2 mg/L (Mueller and Helsel, 1996).

Site assessment, complete water chemistry analyses for major ions plus iron and manganese, dissolved oxygen and dissolved organic carbon, soil-core descriptions, and land-use descriptions of the study area are necessary information to apply the method in a useful manner. Several case studies from Kansas will be presented to demonstrate the strengths and weaknesses of the method. In addition, information concerning the location and costs of laboratories will be provided.

**Key words:** nitrogen-15, vadose zone, natural abundance method