



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003DE32B

Title: Fate and Transport of Arsenic in Poultry Litter Amended Delaware Soils: Impacts on Water Quality

Project Type: Research

Focus Categories: Water Quality, Geochemical Processes, Toxic Substances

Keywords: arsenic, animal manures, drinking water, human health, soil chemistry

Start Date: 07/01/2003

End Date: 02/28/2005

Federal Funds: \$19,510

Non-Federal Matching Funds: \$39,020

Congressional District: At large

Principal Investigator:

Donald L. Sparks

Abstract

There are increasing concerns about surface and ground water quality in the Mid-Atlantic Region of the USA. The primary pollutants of concern on the Delmarva Peninsula have been nutrients such as N and P, but there are ever increasing concerns about trace metals derived from industrial, municipal, and particularly, agricultural sources. Arsenic (As) is a ubiquitous metalloid in soil/water environments due to natural geological processes and anthropogenic inputs. Over the past few decades, environmental health has been jeopardized by As contaminating soil and water in the U.S. because of its high carcinogenic, phytotoxic and biotoxic characteristics. Arsenic is a major concern for the health of plants and crops, microorganisms, farm animals, wildlife, and humans. Long-term human exposure to As in drinking water can result in bladder, lung, skin, kidney, immunological, neurological, and endocrine effects. The USEPA announced that it was lowering the maximum contaminant level (MCL) for As in drinking water from 50 ppb to 10 ppb, and all water systems must comply by January 2006. The Delmarva Peninsula is one of the most concentrated poultry production areas in the US. Poultry litter is generally applied at the rate of 8.96-20.16 Mg ha⁻¹ on agricultural lands, and its total annual As inputs on the Delmarva Peninsula are estimated between 20 and 50 metric tons of total As. The As in the PL is initially primarily organic (3-nitro-4-hydroxyphenyl-

arsonic acid, Roxarsone, abbreviated ROX), which is the form fed to the poultry to control coccidiosis disease, to enhance growth and to improve feed conversion. Annual total metal(oid) inputs on agricultural lands via PL amendments are not specifically regulated at either the federal or state levels, and continuous PL amendment effects on As contamination in Mid-Atlantic soil and water environments are not known. Data are needed to understand the impacts that PL amendments have on the fate and transport of As in sandy, Mid-Atlantic soils and resultant effects on water quality. Accordingly, the objectives of this study are (i) To determine the As status, retention, and release in Delaware soils that have been amended and unamended with poultry litter (PL) and the effects of competitive sorbates such as phosphate; (ii) To determine the transport of As in PL amended and unamended soils as it impacts water quality.