

U.S. Geological Survey Proposal

D. Soil Near Deer Trail, Colorado

Base Program: Monitor Soil Quality—Average composition per field

Questions:

How does the application of biosolids affect soil chemistry? Is there short-term and/or long-term build-up of metals caused by the application of biosolids? Is this build-up, if any, within acceptable limits for soil quality as established by Federal and state agencies?

Concerns:

Biosolids are known to contain elevated concentrations of certain heavy metals. The use of biosolids as a soil amendment for agricultural purposes will, in principal, cause the content of heavy metals within the soil to increase and may cause crops raised on this soil to have elevated concentrations of these metals.

Objective:

To monitor the soil for concentrations of arsenic, bismuth, cadmium, copper, lead, mercury, molybdenum, nickel, nitrogen (total), phosphorus (total), selenium, sulfur (total), uranium, and zinc and to compare these concentrations with state and Federal standards for soil quality, where applicable.

Approach:

One "application field" will be monitored in the northern part of Metro's property and one "application field" will be monitored in the southern part. The two "application fields" will receive biosolids routinely. One "control field" will be maintained up-gradient from each "application field" and one down-gradient from each "application field". These four "control fields" will never receive biosolids throughout the course of the project, but will otherwise be farmed in exactly the same manner as the "application fields".

Each of the six "fields" (two "application" fields and four "control fields") will be geochemically characterized to determine the "average" concentration of the elements of interest before biosolids application. The characterization will consist of collecting approximately 30 subsamples of soil (upper 12 inches) and compositing into one sample per "field". Each sample will be analyzed for arsenic, bismuth, cadmium, copper, lead, mercury, molybdenum, nickel, nitrogen (total), phosphorus, selenium, sulfur, uranium, and zinc.

Each "application field" will be sampled once during the 6-year study. The "control fields" will be sampled each time the applied "fields" are sampled. Samples will be prepared and chemically analyzed by the USGS using appropriate analytical methods and quality control protocols.

Data will be evaluated after 6 years to determine how the elements of interest vary with time.

Benefits:

This approach will yield high-quality data useful for determining changes in soil quality over time.

Limitations:

This approach provides the “average” composition of soil in a given field at a given time. Spatial variability of an element of interest within a given field cannot be determined by this sampling design. This approach does not allow us to distinguish different geochemical characteristics of multiple soil types within a given field.