

Using GIS to Develop a Framework for Basin-fill Aquifers in the Southwest

Tim McKinney
USGS Water Resources

ABSTRACT

Areas in the southwest United States are experiencing rapid population growth with an increasing demand on water resources. The effects of this increased demand on the water quality in basin-fill aquifers in the region is being studied by the U.S. Geological Survey's National Water-Quality Assessment Program

A framework of recent natural and anthropogenic factors that may affect ground-water quality in the basin-fill aquifers of the southwest United States is being developed as part of this study. This framework is a flowchart or decision tree that guides the user through a series of steps to arrive at the likely influence factors. The framework is based on physical characteristics of the region such as geology, elevation and precipitation as well as anthropogenic factors including population, land use, and water use. This framework will lay the foundation for evaluating ground water-quality data for selected constituents in relation to the framework factors across the Southwest.

A geographic information system (GIS) is being used to distribute the framework variables across the region. Large detail GIS raster data layers representing the spatial extent of alluvial basins, their drainage areas, population density, land use types, and water use estimates have been developed for the entire Southwest. GIS raster data represent variables as a matrix of cells in a continuous space. Overlay analysis involves combining one or more raster layers to create a new raster with new cell values. Overlaying these variables will show areas with similar natural and human influenced factors.

Framework overlays will be used to identify areas of low, medium, and high potential for influence factors that affect ground water in basin-fill aquifers. This new approach enables water managers and planners a nearly real time assessment of the limited ground-water resources in a particular basin.