



Regional Geochemistry of Prescott National Forest, Arizona

Scientists from the U.S. Geological Survey (USGS) are studying the regional geochemistry of the Prescott National Forest, Yavapai County, Arizona. They will generate new geochemical descriptions and will provide interpretations of geochemical abundances and unusual enrichments that are needed in USGS and U.S. Forest Service programs, including assessments of undiscovered mineral resources, geochemical hazards, and ecosystem management.

Prescott National Forest is a mountainous area in central Arizona (fig. 1) that has been the domain of extensive mining and associated mineral processing mills and smelters since the 1860's. The mining and milling activities have left numerous dumps and waste piles rich in base metals and sulfide minerals, which are unstable in the surficial environment. Waste from past mining, and potential hazards from future mining, pose risks for nearby areas of housing and ranching and for three of the major watersheds in Arizona.



Figure 1. Location of Prescott National Forest

Work in Progress

The chief geochemical data base for the forest area will contain analytical results for more than 40 elements in stream-sediment samples. Additional data are being generated for other media, such as mineralized rocks, ores, and water at selected sites of interest. Sediment samples collected during the National Uranium Resource Evaluation (NURE) in 1978-1981 were retrieved from the USGS archives of NURE and re-analyzed by modern multi-element techniques to improve and supplement existing results. More than 1,150 samples have been analyzed by USGS chemists using inductively coupled plasma-atomic emission spectrometry (ICP-AES) to determine the concentrations of 40 elements. Additional information on 10 elements of geochemical interest (such as arsenic, antimony, cadmium, silver, and gold) will be provided by methods with improved lower limits of detection.

Preliminary study of the geochemical results indicates that many of the stream-sediment samples have high concentrations of ore-related elements such as arsenic, copper, gold, lead, zinc, and cadmium. The location of the sampled sites and their composition suggest that the high values reflect contamination from mines, mineral processing plants, and altered rocks near mines.

Work Planned

Regional geochemical data and interpretations will be integrated with geologic, geophysical, and mineral resource components of the Prescott National Forest project, expedited by the project geographic information system (GIS). Descriptive geochemical maps will present the geochemical facts in their spatial context. Interpretive maps and investigations will focus on three themes:

- Geochemical anomalies reflecting known mines and prospects;
- Geochemical anomalies reflecting mining infrastructure (mills and smelters);
- Geochemical anomalies reflecting exposed but unmined altered and mineralized rocks.

These themes are pertinent to the goal of environmental hazard assessment as well as metallic mineral resource assessment. An important and complex aspect of the regional geochemistry project will be the definition of geochemical baselines that outline anthropogenic contributions from mines, mills, smelters, and communities as distinct from natural background levels. □

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