Geologic Diversity and Ceramic Provenance in the Greater Upper Gila Region

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We examined pottery production in the greater Upper Gila region through two techniques, Neutron Activation Analysis (NAA) and petrography. Neutron Activation Analysis determines the elemental composition of the clay and temper in a sample. Petrography entails visual identification of the mineral inclusions and their geologic origin in a sample using special microscopy (see *Archaeology Southwest Magazine* Vol. 26, No. 2). These techniques provide us with complementary sources of information about where pottery might have been made, or its provenance.

Successful use of each technique depends, in part, upon geologic diversity within the study area. While there is some geologic similarity in our regions of interest, there are also notable differences. Volcanic outcrops dominate the geology of southwestern New Mexico. Predominantly Tertiary in age (65 million to 2.6 million years old), these outcrops are composed of andesite, latite, and rhyolite, with some basalt. Sedimentary and metamorphic rocks are conspicuously rare, but there are several areas with granitic intrusions. Oligocene (about 34 million to 23 million years old) Gila Group deposits of conglomerate, sandstone, and basalt cover most of the area, contributing greatly to the Quaternary (2.6 million years ago to the present) surfaces where most of our sampled sites are found. Southeastern Arizona also has prevalent volcanic outcrops that vary in composition between rhyolite and basalt, but with more dacite and a few diabase outcrops. In addition, there are notable areas of granite, particularly around Safford. The river drainages that cut southwestern New Mexico and southeastern Arizona create readily available sources of fine-grained sand for pottery production.

Mary Ownby working at a petrographic microscope. PHOTO: ROBERT B. CIACCIO

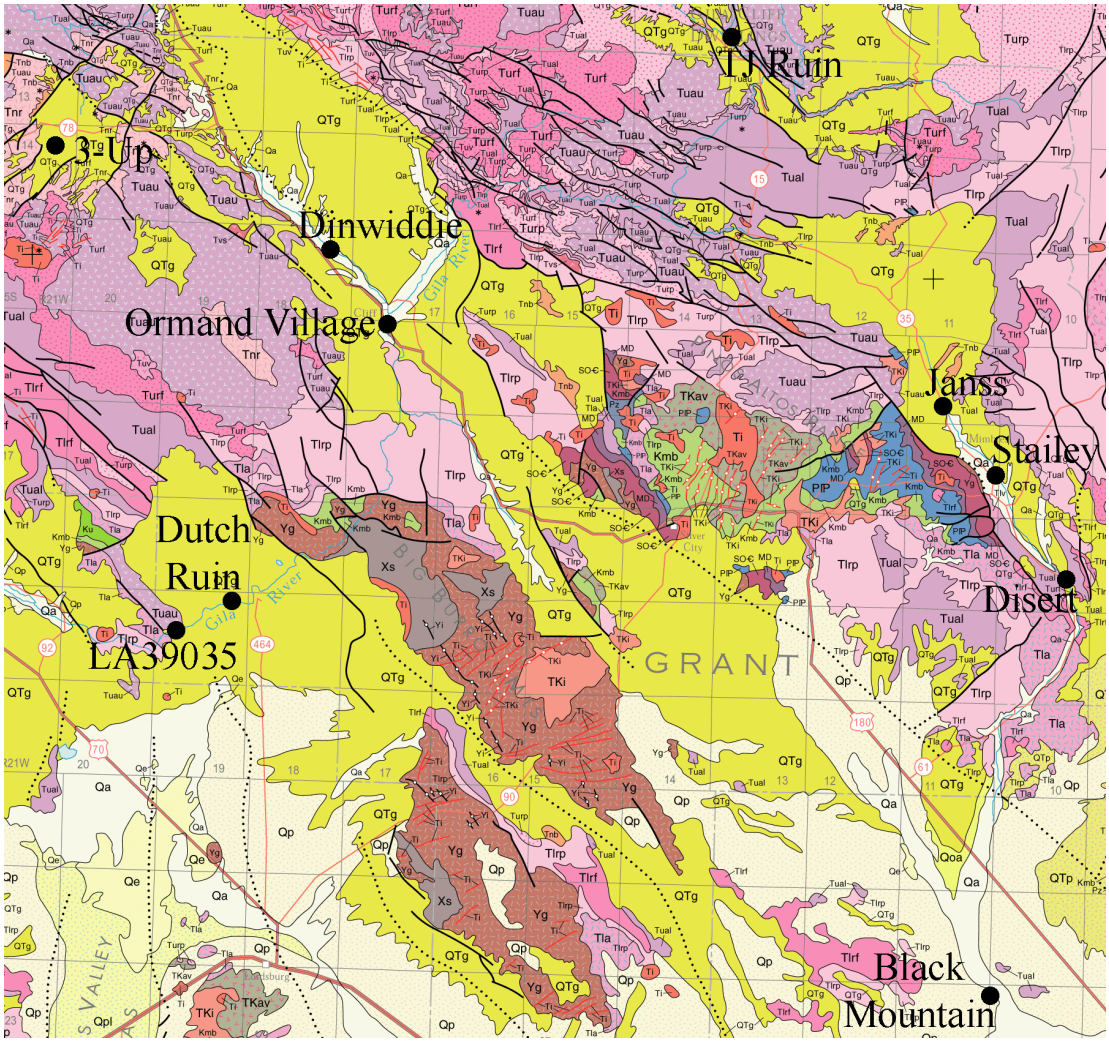
We acquired NAA data for nearly 500 Maverick Mountain Series, Salado polychrome, and utility ware sherds from sites in the greater Upper Gila region. We also used a standard binocular microscope to make preliminary temper identifications in these samples. For comparison, we analyzed a smaller set of sherds from southeastern Arizona's Safford area, the Sulphur Springs Valley, and Gila Pueblo. All of the sherds contained some variety of sand temper.

Statistical analysis of the NAA data highlighted several large chemical compositional groups, a number of smaller groups, and some compositional outliers. As we would expect, the southeastern Arizona sherds are compositionally distinct from the greater Upper Gila samples.

Petrographic samples selected from each site in our

study area, as well as from each major chemical compositional group, helped us refine the binocular temper sorting and evaluate our NAA groups. In most cases, petrographic samples assigned to the same NAA group were mineralogically similar, supporting our group assignments. The geological similarity of outcrops in southwestern New Mexico made it difficult to link some of the chemical compositional groups with specific villages, but particular valleys do appear to have unique compositional and mineralogical signatures. For example, we can differentiate sand temper from the Mimbres Valley from that of the Cliff area, because the former contains less rhyolitic tuff and more andesite. Sand temper in the Upper Gila west of Mimbres also has more granite and metamorphic rock fragments.

Taken together, the NAA and petrographic data indicate that the Mule Creek, Cliff, and possibly Redrock valleys were likely production locations for Maverick Mountain Series and Salado polychrome vessels. We argue that potters made polychrome pottery at several villages using similar suites of resources, and that people traded this pottery within and between valleys. It is less likely that Mimbres Valley potters made Salado polychromes; such vessels found there may have come from the Cliff Valley.



Geologic map of the greater Upper Gila region. The base map is the GEOLOGIC MAP OF NEW MEXICO, 1:500,000, PETER A. SCHOLLE, 2003, NEW MEXICO BUREAU OF GEOLOGY AND MINERAL RESOURCES.