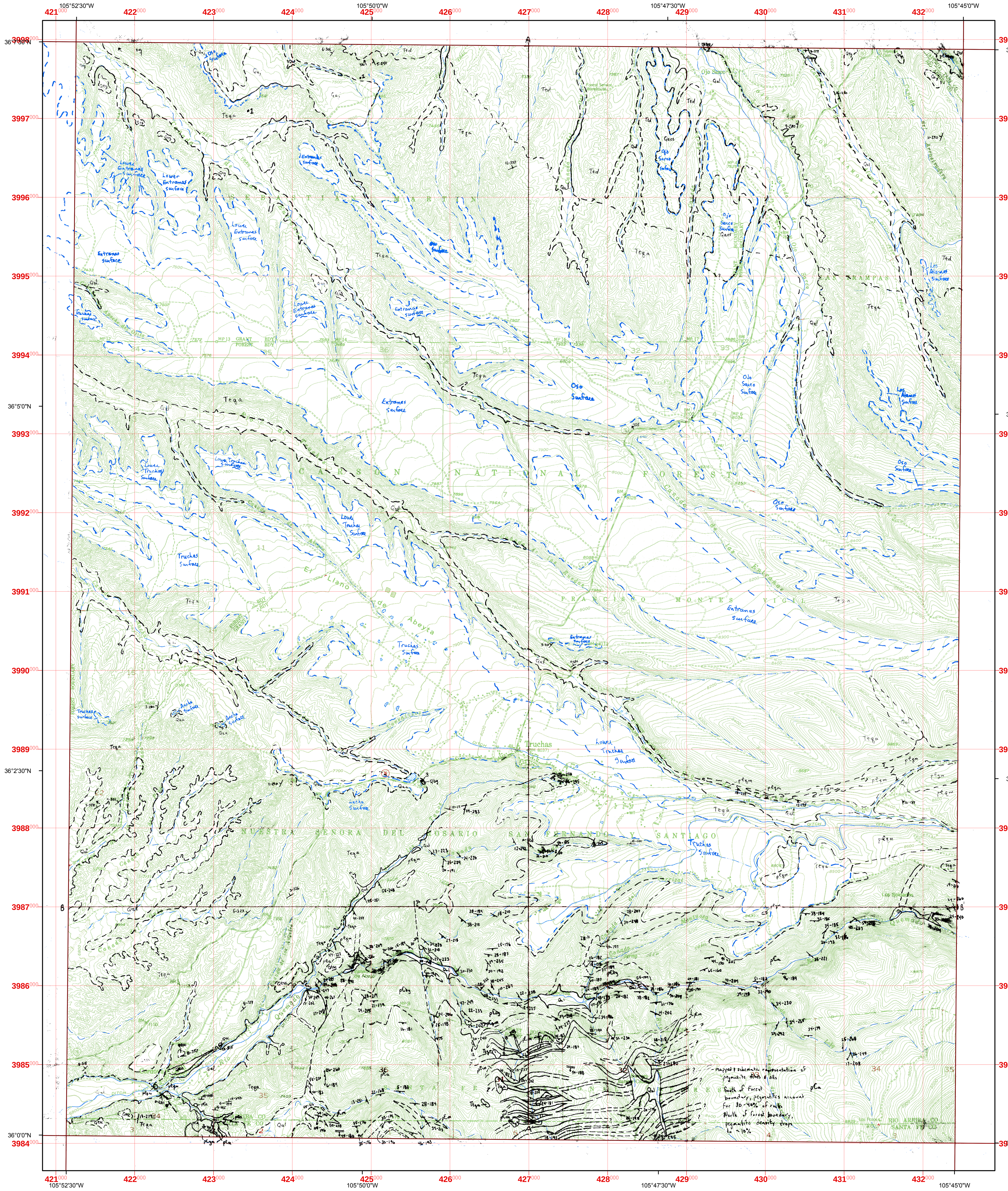
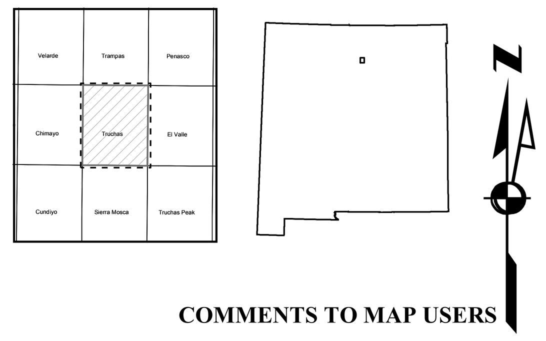


Base from U.S.Geological Survey 1970, from photographs taken 1952 and field checked in 1953.
Revised in 1977 from aerial photographs taken in 1976 (but not field checked).
1927 North American datum, UTM projection -- zone 13N
1000- meter Universal Transverse Mercator grid, zone 13, shown in red



Magnetic Declination
May, 2002
10º 10' East
At Map Center

Geologic Map of the Truchas 7.5 - minute quadrangle

by

Gary A. Smith, J. Michael Timmons, and Michael N. Gaud

May 2004

1:24,000

Miles: 0.4 0.2 0 0.4 0.8 1.2 1.6

Kilometers: 0.5 0.25 0 0.5 1 1.5 2

CONTOUR INTERVAL 20 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

DRAFT

NMBGMR OF-GM 84

This draft geologic map was produced from scans of hand-drafted originals from the author(s). It is being distributed in this form because of the demand for current geologic mapping in this important area. The final release of this map will be made following peer review and redrafting in color using NMBGMR cartographic standards. The final product will be made available on the internet as a PDF file and in a GIS format.

COMMENTS TO MAP USERS

A geologic map displays information on the distribution, nature, orientation, and age relationships of rock and deposits and the occurrence of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross-sections should be used as an aid to understanding the general geologic framework of the map area, and not be the sole source of information for use in locating or designing wells, buildings, roads, or other man-made structures.

The map has not been reviewed according to New Mexico Bureau of Geology and Mineral Resources standards. The contents of the report and map should not be considered final and complete until reviewed and published by the New Mexico Bureau of Geology and Mineral Resources. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.

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Explanation of Map Units
Truchas 7.5' Quadrangle, Rio Arriba, Santa Fe, and Taos Counties, New Mexico
May 2004

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Quaternary Alluvial Deposits and Tephra

Qal - *Alluvium deposited by active streams - upper Pleistocene(?) and Holocene*. Poorly sorted gravelly sand and sandy gravel deposited in channels and minor floodplain areas of perennial and ephemeral streams and arroyos. Includes low, discontinuous terraces within ~3 m of the active channel and colluvium near valley margins. Total thickness is unknown but may be as much as 10-30 m.

Qtg – *Terrace gravel – Pleistocene*. Unconsolidated gravel and sandy gravel, underlying uncorrelated terrace surfaces along the Rio de las Trampas. Thickness of deposit is approximately 5-8 m.

Qtc – *Terrace gravel, Cordova terrace – late(?) Pleistocene*. Unconsolidated gravel and sandy gravel underlying a terrace surface approximately 20 m above the Rio Quemado at and near Cordova. Thickness of deposit is approximately 3 m.

Qtsc – *Terrace gravel, Santa Cruz surface – early or middle Pleistocene*. Unconsolidated gravel and sandy gravel underlying the Santa Cruz surface of Manley (1976), approximately 60 m above the Rio Quemado near Cordova. Alluvial deposits are approximately 6-10 m thick and increase in thickness downstream to the west. Gravel composition is 75-95% quartzite. Eroded hillslope surfaces graded to the Santa Cruz surface are prominent along the north side of Rio Quemado, near and downstream of the confluence with Cañada de los Tanos.

Qaos – *Alluvium, Ojo Sarco surface – late Pleistocene(?)*. Cobble to boulder gravel underlying lower-elevation sections of the Ojo Sarco graded surface, south of Ojo Sarco. Forms a discontinuous terrace approximately 25 m above grade along Cañada de Ojo Sarco. Composition is 90-100% quartzite clasts eroded from Tesuque Formation underlying the Oso surface farther south. Deposit is approximately 2-4 m thick.

Qaj – *Alluvium of Cañada de Jacinto – Pleistocene*. Fine sand and gravelly sand capping hillslopes and filling ravines in the headwaters of Cañada de Jacinto. Appears to be part of an alluvial, and partly eolian, fill of a drainage basin that originally headed farther to the southeast and later pirated by the Cañada de Entrañas. Deposit ranges from approximately 3 to 15 m thick.

Qaa – *Alluvium, Ancha surface – early Pleistocene*. Cobble to boulder gravel and sandy gravel underlying parts of the Ancha surface (see below), west of Truchas. Clasts, as large as 1 m, are 75-90% quartzite. This deposit likely marks the early Pleistocene course of the Rio Quemado. Overlain at one location by Guaje Pumice (Qbg).

Qbg – *Guaje Pumice, Otowi Member, Bandelier Tuff – early Pleistocene*. White pumice lapilli and ash with abundant quartz and sanidine crystals. Correlated to Guaje Pumice on basis of mineral composition and $^{40}Ar/^{39}Ar$ age determination (sample 3 in geochronology table). Deposit consists of 50 cm of massive lapilli-fall deposit (pumice 0.5-1.0 cm across), overlain by 80 cm of stratified lapilli- and ash-fall layers.

Basin-filling deposits of the Rio Grande rift

Tesuque Formation

Miocene strata of the Tesuque Formation comprise the Rio Grande rift basin fill in this quadrangle. These strata are divided into formal members elsewhere in the Espanola basin (Galusha and Blick, 1971), but those members are not recognizable in the Truchas quadrangle. The Tesuque Formation is divided into two informal units based on sediment composition.

Ttd – *Dixon member, middle Miocene*. Conglomerate, sandstone, and minor mudstone consisting of subequal amounts of detritus eroded from Proterozoic quartzite and Paleozoic clastic rocks. Contains a few percent intermediate and silicic volcanic clasts in some outcrops. Strata correlate to the informal Dixon member of Steinpress (1980). Composition of sediment suggests deposition by west-flowing streams draining extensive outcrop of Pennsylvanian clastic rocks east of the Picuris-Pecos fault with contribution of quartzite from the Picuris Range, Truchas Peaks, or both. Base is locally exposed where onlapping older hills of Proterozoic rocks but total thickness is not known.

Ttqa – *quartzitic and arkosic facies, middle to late Miocene*. Conglomerate, gravel, sand, and minor mudstone consisting of variable proportions of detritus eroded from Proterozoic quartzite, granite, and amphibolite. Composition of sediment and sparse paleocurrent measurements suggest deposition by northwest-flowing streams draining the Santa Fe Range and Truchas Peaks. Generally is coarser grained up section and to the east across the quadrangle. Consolidated beds, including ledgy cementation of coarse facies, are restricted to outcrops at low elevations in valleys in the western part of the quadrangle. Exposures below the Oso, Entrañas, and Truchas surfaces and capping hills in the eastern part of the quadrangle are largely composed of unconsolidated sandy, cobble to boulder gravel. Gravel composition ranges from about 45% quartzite at lower stratigraphic levels, to >95% quartzite at the top. This map unit includes 11-12 Ma tephra layers high in the stratigraphic section in the western part of the quadrangle (samples 1 and 2 in geochronology table), but the lower part of the map unit is likely older than 15 Ma based on tentative correlations to better exposed and dated strata in adjacent quadrangles. Total thickness is approximately 500 m.

Precambrian rocks

pЄgm – *muscovite granite, Paleoproterozoic*. Coarse-grained to pegmatitic, white peraluminous granite composed of quartz, orthoclase, muscovite, garnet, and trace opaque minerals. Quartz and feldspar are present as graphic intergrowths at some locations. Rock is typically nonfoliated. This unit is probably co-genetic with nonfoliated pegmatite dikes that cross cut unit pªqm and pªa. Pegmatite dikes and sills are very abundant in the map area, but are only mapped separately in the southern part of the map along the A-A' crossection line to illustrate relative abundance in pªa supracrustal rocks.

pЄqm – *biotite quartz monzonite, Paleoproterozoic*. Medium grained, foliated, brown to red-brown granitoid rocks composed of variable proportions of quartz, plagioclase, and microcline with abundant biotite. K-feldspar grains are typically coarser grained and are dynamically recrystallized. Although the intrusion locally truncates foliation the main foliation preserved in this rock is subparallel to the foliation in the surrounding supracrustal rocks, suggesting that the regional main foliation developed before, after, and possibly during emplacement of the pluton. Locally includes white pegmatites of nonfoliated muscovite granite and amphibolite that are not mapped separately.

pЄbg – *fine-grained biotite gneiss, Paleoproterozoic.* Fine-grained to very fine grained biotite granite gneiss. Composed of quartz, alkali feldspar, orthoclase, and biotite. This rock preserves a well-developed foliation defined by biotite and locally quartz and feldspar. This rock may represent a sheared fine-grained phase of unit pªqm or an older fine-grained granite that was intruded by pªqm.

pЄm – *muscovite schist, Paleoproterozoic*. Muscovite Schist, intimately interbedded with amphibolite and biotite schist. These discrete beds represent a small fraction of the supracrustal package and beds appear to grade into biotite schist both along strike and across compositional boundaries.

pЄa – *amphibolite and biotite schist, Paleoproterozoic*. Intimately intermixed amphibolite and biotite schist. Amphiboles locally define lineation within the biotite-dominant foliation. Amphiboles locally exhibit garbenschiefer texture. Amphibolite and biotite schist are typically associated with white pegmatites of nonfoliated muscovite granite and are mapped in the southern portion of the map along the A-A' cross-section line to illustrate intrusive relationships and relative abundance.

Geomorphic Surfaces

Graded geomorphic surfaces of Pliocene and Pleistocene age are present in many topographic positions in the Truchas quadrangle. Some surfaces were cut by a high-order stream that entered the quadrangle from the southeast, and are attributed to the ancestral Rio Quemado. Other, steeper surfaces were cut along the edges of high surfaces by lower-order streams. It is likely that thin alluvial deposits underlie most of these surfaces but they are not distinguishable from the underlying Tesuque Formation because of identical composition, similar degree of consolidation, and generally similar grain size. Gravel clasts on top of these surfaces are as large as 2 m across, and significantly coarser than those in the underlying Tesuque Formation (which rarely exceed 75 cm), but contacts between coarser-grained surficial alluvium and underlying Tesuque Formation are not exposed.

Surfaces cut by the ancestral Rio Quemado

The Oso, Entrañas, and Truchas surfaces were described and named by Manley (1976) for successively lower-elevation, northwest-sloping graded surfaces that form most of the uplands in the Truchas quadrangle. Longitudinal profiles (Manley, 1976) indicate down slope convergence of the surfaces. All of these surfaces are degraded toward their lateral margins and are underlain by thick petrocalcic soil horizons with stage IV morphology. A fourth, lower, highly degraded surface with scattered patches of recognizable coarse-gravel alluvium is herein named the Ancha surface. The Ancha surface is overlain at one locality by lower Pleistocene Guaje Pumice of the Bandelier Tuff, indicating a Pliocene age for the three higher surfaces. Manley (1976) proposed that the Oso surface formed about 2.8 Ma based on elevation relationships between the surface and basalt flows exposed above the Rio Grande northwest of the Truchas quadrangle.

An additional surface, the Santa Cruz surface, was also named and partly mapped by Manley (1976). The constructional top of thick fill-terrace remnants along the Rio Quemado defines this surface. The extent of this gravel deposit (*Qtsc*), rather than the surface itself, is represented on the map. Remnants of surfaces graded to the Santa Cruz surface are present in the southwest corner of the quadrangle, but are not separately mapped.

Surfaces inset into ancestral Rio Quemado surfaces

The ancestral Rio Quemado surfaces are locally flanked by graded surfaces related to the modern drainage. The Los Alamos and Ojo Sarco surfaces were cut by northward flowing drainages on the north side of the Oso surface. The Ojo Sarco surface is the lower, younger and best preserved of these two surfaces. Gravel (*Qaos*) as much as 2-4 m thick is recognized along northern edges of the Ojo Sarco surface. The lower Entrañas and Truchas surfaces are inset along the edges of the older, and more extensive Entrañas and Truchas surfaces and were cut by the Rio de las Entrañas and Rio de Truchas, respectively. The lower Truchas surface converges upstream with the active floodplain of the Rio de Truchas.

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Geochronology Data

$^{40}Ar/^{39}Ar$ geochronology results obtained by the New Mexico Geochronological Research Laboratory and reported in Peters (2003)

Sample number on map	Field sample number	Sample Location (UTM easting/northing)	Mineral dated	Age
1	GS0206	0423474/3997132	biotite	11.7 +1.1
2	GS0202	0424826/3997501	biotite	11.3 +1.2
3	GS0204	0425662/3988648	sanidine	1.58 +0.02

Correlation of Map Units