Unit Descriptions

Qal – Alluvium. Late Pleistocene to Holocene. Alluvial deposits in modern drainage bottoms and elevated basins. Deposits include conglomerates, sands, and silts. Holocene terrace deposits less than 2 meter above drainage bottoms are included. Alluvium in mesa El Alto contains abundant crystals of Bandelier Tuff while alluvium in Rio del Oso canyon is dominated by fluvial clasts of Tschicoma dacite (Tt) and Lobato basalt (Tlb). Obsidian fragments common. Maximum thickness can exceed 4 meters.

Qtal - Undifferentiated terraces and alluvium in modern stream drainages. Obsidian fragments common. Late Pleistocene to Holocene.

Qc/Qclb – Colluvium. Late Pleistocene to Holocene. Poorly sorted talus, debris, and colluvium in wedge-shaped deposits on hill slopes. Numerous hill slopes beneath mesas of Lobato basalt (Tlb) are covered by basalt colluvium (obscuring the underlying bedrock); mapped only in a few locations (Qclb) but relatively extensive on the flanks of elevated Lobato mesas. Similar colluvial deposits occur along the edges of Tschicoma dacite flows (Tt). Thickness can locally exceed 5 meters.

Qt/Qtg – Terrace deposits. Late Pleistocene to Holocene. Alluvial deposits near the margins of modern streams or older perched floodplain deposits. Mapped only in a few locations. Most are fill terrace deposits of sand, silt and gravel < 10 m above modern drainages. Coarser gravel terraces along Rio del Oso canyon are mapped as Qtg. Maximum thickness is <5 meters.

Qe – Eolian deposits. Late Pleistocene to Holocene. Poorly bedded fine-grained sand and silt preserved sporadically on terraces, in broad valleys and on mesa tops. Although no sedimentary structures could be identified, these deposits appear to be primarily eolian in origin, capping older alluvial deposits. Generally less than 1 meter in thickness.

Qav – Rock avalanche deposits. Late Pleistocene to Holocene. Chaotic, angular debris emplaced during a single detachment event from a steep slope or cliff, generally lacking a sedimentary matrix. Mapped only in a few locations. Thickness can exceed 10 meters.

Ql – Landslides. Pleistocene to Holocene. Unsorted, chaotic debris emplaced during a single detachment event from a steep slope or cliff, generally containing a sediment matrix. Also, slump or block slides, especially along the flanks of high mesas where Lobato basalts cap older Santa Fe Group sediments. Fan-shaped deposits occur where debris spread out on valley floor. Thickness can exceed 20 meters.

Qbt – Upper Bandelier Tuff, Tshirege Member. Quaternary. White to orange non-welded to welded ash-flow tuff containing abundant phenocrysts of quartz and sanidine. Ash-flow tuff beds consist of multiple flow units in a compound cooling unit with thin surge beds (less than 0.5 meters thick) locally exposed. Exposures in the field area are limited to outcrops on the Santa Clara Reservation north of Santa Clara Canyon. Erupted at approximately 1.22 Ma during the formation of the Valles Caldera (Spell et al., 1996). Maximum thickness is approximately 40 meters.

Qoa – Old Alluvium. Quaternary. Older alluvial deposits of gravel, sand and silt that may coincide with Cerro Toledo (Qct) interval deposits in adjacent quadrangles. Dominant clast lithology varies on location, but is typically Tschicoma dacite (Tt) or Lobato basalt (Tlb). These deposits typically contain obsidian clasts, presumably originating from the Toledo embayment or domes of El Rechuelos rhyolite from the Polvadera Peak quadrangle to the west. Quartz and feldspar crystals of Bandelier Tuff are also common, especially in ant mounds capping these deposits. Maximum thickness is approximately 10 meters.

Qct – Cerro Toledo interval. Alluvial deposits of gravel and sand containing abundant clasts of obsidian. Mapped only where overlain by the Tshirege Member of the Bandelier Tuff (Qbt). Maximum thickness is 5 meters.

Qbp – Bandelier Tuff pumice deposits. Quaternary. Mounds and poorly-exposed strata of reworked Bandelier Tuff pumices. The lack of primary Bandelier Tuff deposits in the area make it difficult to identify which member these pumices belong to. Most likely they represent reworked Guaje tephra, due to their association with thin Otowi tuff deposits (see above). Maximum thickness is approximately 6 meters.

Qbo – Bandelier Tuff, Otowi Member. Quaternary. White to beige poorly-welded ash-flow tuff containing abundant pumices with phenocrysts of quartz and sanidine and sparse mafic phenocrysts. Moderate to abundant lithic fragments (5-15%), primarily of andesitic or mafic lavas. These deposits occur only as isolated, thin exposures in Mesa El Alto west of Lobato Mesa. Although no primary exposures of the basal Guaje Pumice were observed in the quadrangle, mounds of pumice (Qbp) typically occur adjacent to these thin tuff deposits. Erupted at approximately 1.61 Ma during the formation of the Toledo Caldera (Spell et al., 1996). Maximum thickness is approximately 4 meters.

QTg – Alluvial deposits that range from sandy gravels to coarse boulder conglomerates. Late Tertiary to Early Quaternary. These deposits may correspond with Puye Formation fanglomerates (Tp), but where mapped are of uncertain age. Dominant clasts are typically Tschicoma dacite (Tt) or Lobato basalt (Tlb). Deposits mapped along the western flank of Lobato Mesa (mixed with Lobato basalt colluvium) may represent a basin fill maximum (~8100 foot elevation). Locally, dacitic tephra (QTp) is found within these deposits, although outcrops are rare. Obsidian fragments are rare if present at all. Maximum thickness is 5 meters.

QTp – Dacitic pumice deposits, slightly reworked. Late Tertiary to Early Quaternary. Phenocrysts include biotite and hornblende. Mapped in a small region adjacent to QTg deposits at the south end of Vallecitos de los Chamisos. Maximum thickness is 1 meter.

Tp/Tpb – Puye Formation fanglomerates. Pliocene to Early Pleistocene. Sands, gravels and conglomerates derived from nearby highlands of Tschicoma dacite (Tt) and Lobato basalt (Tlb). Also includes massive boulder debris flows (Tpb) east of Polvadera Peak (10-15 meter thick). Individual blocks can exceed 10 meters across. Locally, dacitic tephras and thin pyroclastic flow deposits (less than one meter thick) occur within the sediments. Reworked tephras, silts and fine- to medium-grained sands of this unit occur beneath the Gallina flow (Ttg) in Gallina Creek (along FR-144). In general, however, Puye Formation deposits are poorly exposed in the quadrangle, and often occur as rounded fluvial clasts of surface colluvium. Maximum thickness is approximately 25 meters.

Tt/Tth/Ttp/Ttg – Tschicoma Formation. Late Miocene to Late Pliocene. Light gray to dark gray, moderately to coarsely porphyritic lavas, primarily of dacitic composition but also including andesites and rhyodacites. This Formation includes thick, overlapping flows and high-aspect ratio domes. Age analyses for Tschicoma lavas in the northern Jemez Mountains range from ~ 7 to 3 Ma with most domes/flows emplaced between 5 to 3 Ma. Most of the flows in the quadrangle were undifferentiated, mapped as Tt. A few of the larger flows characterized by abundant phenocrysts (20-35%) including hydrous mafic minerals biotite and hornblende were mapped as Tth. Other flows that lack these distinctive hydrous minerals are typically dominated by plagioclase phenocrysts, often including plagioclase megacrysts that exceed one cm in length. Only a few of these flows were mapped (Ttp). One of the largest single flow units of the entire Tschicoma Formation occurs in the southwest corner of the quadrangle where a broad, northeast-sloping surface known as Mesa de la Gallina represents the surface of this massive flow, covering more than 102 kilometers. The Gallina flow, informally named the Gallina flow (Ttg) is dated at 3.90±0.15 Ma (Goff et al., 1989) and originated from the northeast side of Tschicoma Peak. Forest Road 144 traverses the upper surface of the flow as it ascends Tschicoma. The flow contains abundant phenocrysts (25-35%), including biotite and hornblende. Plagioclase phenocrysts are abundant but typically small to medium in size (less than 0.5 cm). The flow is often highly flow-banded, including spectacular flow contortions along its margins. To the north the Gallina flow overlies older plagioclase-rich, mafic-poor Tschicoma flows and is bordered by the Rio del Oso. To the west, the Gallina flow overlies fine- to medium-grained fluvial deposits of the Puye Formation, exposed along FR 144 in Gallina Creek. The maximum thickness of Tschicoma lavas in the quadrangle occurs in upper Gallina Creek, exceeding 500 meters.

Tog – Near source alluvial and colluvial deposits, possibly corresponding with older Puye Formation. The deposits include angular to subrounded blocks of Lobato-age dacitic and mafic lavas and are perched at higher elevations than other Puye fanglomerates (up to 8100 feet). Maximum thickness is approximately 50 meters.

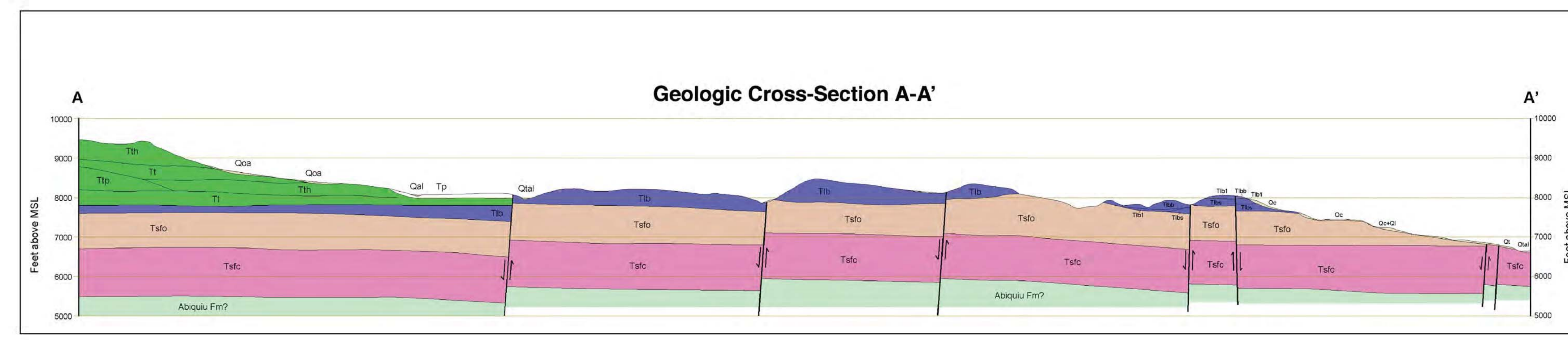
Tlb/Tlbi/Tlbc/Tlbs/Tlb1/Tlbb/Tlbp/Tlbo – Lobato mafic lavas. Miocene. These deposits represent a wide variety of mafic lava flows and associated deposits. Undivided flows (Tlb) represent the majority of this unit in the quadrangle. These lavas are black to gray, sparsely to moderately porphyritic, containing phenocrysts of plagioclase, olivine, ± clinopyroxene in a variety of groundmass types. Flows are typically massive and flow banded with brecciated lower and upper surfaces. Thin fluvial sandstones that occur locally between mafic lavas across Lobato Mesa may correspond with the Ojo Caliente sandstone member (Tsfo) described below. Intrusive facies (Tlbi) occur as fine- to medium-grained dikes and crystalline gabbroic sills or plugs. One of these gabbros is well exposed along Forest Road 144 as it first enters the quadrangle from the east. In Cañada Almagre along the eastern boundary of the quadrangle a spectacular combination dike/sill intrudes the Chama-El Rito member (Tsfc), the sill forming a resistant floor in part of the valley bottom. Scoria and cinder deposits (Tlbc) occur in several places in the quadrangle but are only mapped in a few areas where nearby vents are suspected. Mafic lavas on the west side of Lobato Mesa are differentiated based on phenocryst content. Those with abundant olivine phenocrysts (typically altered to iddingsite) are identified as Tlbo, while a younger series of olivine-poor, plagioclase-rich lavas are mapped as Tlbp. A prominent dike flanked by cinder deposits of this later unit is located immediately south of Cerrito del Chibato (mapped as Tlbi and Tlbc). On the eastern flank of Lobato Mesa, three groups of mafic lavas are distinguished that overlie undifferentiated Tlb lavas. These include olivine-phyric basalts of La Sotella shield (Tlbs) that contain 2-15% 1-8mm euhedral plagioclase phenocrysts overlain by basaltic lavas containing 2-10% phenocrysts of 1-3mm mafic phenocrysts (olivine±pyroxene) mapped as Tlb1. The youngest lavas occur at the southern portion of the mesa, erupted from a vent near La Bentolera. These distinctive lavas (Tlbb) have a crystalline matrix and are nearly aphyric, containing 0-2% phenocrysts (and xenocrysts) of pyroxene, pyroxene-olivine aggregates, quartz and potassium feldspar. Rare granitic xenoliths also occur in this unit. Maximum thickness exceeds 200 meters.

Tld1/Tld2 – Lobato dacite lavas. Miocene. At least two large volume dacitic lavas were erupted during Lobato-age volcanic activity in the quadrangle. The younger lava, Tld1, was erupted from a vent source at Los Cerritos in the southwest area of the quadrangle and covers at least 3 km2, flowing in a northeasterly direction. The lava is beige in color, fine-grained with 2-6% phenocrysts of plagioclase and minor hornblende. A brecciated, block and ash-flow horizon is locally exposed in lower and distal portions of the flow. This flow caps all Lobato mafic lava flows erupted from the Los Cerros shield to the east. An age of 9.6±0.15 Ma (Goff et al., 1989) for this unit provides an upper age limit for Lobato-age volcanic activity in this area of the quadrangle. The flow also provides a superb stratigraphic marker for a major down-to-the-east fault that offsets the flow by at least 100 meters along its eastern edge. Older dacitic flow(s) (Tld2) are intercalated with Lobato mafic lavas. These flow(s) are similar in appearance to younger Tschicoma dacite lavas (Tt), moderately to coarsely porphyritic with 20-25% phenocrysts of plagioclase (up to 0.7 cm), biotite and hornblende. Three isolated exposures of these lavas are exposed near Los Cerritos with another group of exposures in Rio del Oso at the south end of Lobato Mesa. In this area Lobato mafic lavas underlie and overlie the porphyritic dacite. Maximum thickness of Tld1 is exceeds 100 meters, Tld2 is approximately 75 meters.

Tsfo – Ojo Caliente Member, Tesuque Formation of the Santa Fe Group. Miocene. Light brown to light pink fine- to medium-grained sand, subround to rounded, moderately to well sorted. Planar sand sheets to high-angle crossbeds of eolian origin (suggesting a prevailing paleowind direction to the northeast. Thin fluvial layers occur in the upper portions, containing rounded pebbles of various volcanic lithologies and lesser quartzite and granite. This unit is generally weakly consolidated and seldom outcrops where overlain by Lobato mafic lavas. Its presence often indicated by tan quartz sand amongst basalt colluvium, along with occasional fluvial pebbles. On Lobato Mesa, fluvial sandstones containing abundant clasts of Lobato mafic lavas may correspond to Ojo Caliente sandstone. The age of the Ojo Caliente sandstone is interpreted to range from 12 to 5 Ma (Koning and Manley, 2003). However, deposits in the quadrangle are not younger than the youngest Lobato-age lavas, approximately 9 Ma. Maximum thickness in the quadrangle (along the eastern margin of Lobato Mesa, is approximately 275 meters.

Tsfc – Chama-El Rito Member, Tesuque Formation of the Santa Fe Group. Miocene. Light pink to reddish brown floodplain deposits of siltstone, mudstone, fine-grained sandstone and thin channels of low-angle crossbedded channel gravels. In contrast to the Ojo Caliente member which tends to have massive, poorly-consolidated eolian sandstone beds, the Chama-El Rito sediments tend to be moderately consolidated, with alternating planar to low cross-stratified beds of varying shades of pink to brown. Fluvial channels contain rounded volcanic pebbles of intermediate and felsic composition, poorly to moderately sorted. These channels are typically cemented by calcium carbonate. Maximum thickness of the deposit, approximately 100 meters, is exposed in the northeastern corner of the quadrangle.

Tsf -- Undifferentiated Santa Fe Group deposits (most likely Ojo Caliente Member)



Geologic contact. Solid where exposed, dashed where inferred

Normal fault with ball and bar on the downthrown side. Arrow shows trend and plunge of slickensides.

Strike and dip of sedimentary bedding

Strike and dip of volcanic bedding

Channel trend

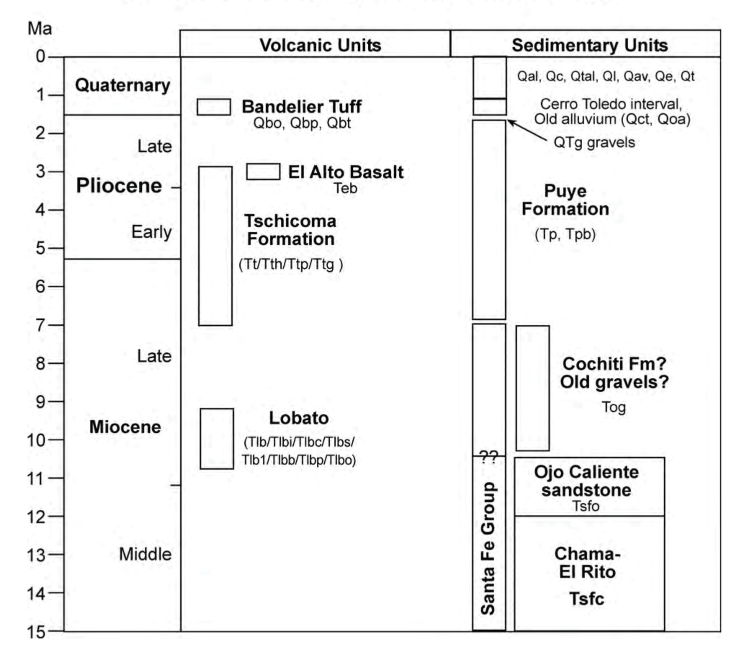
Clast imbrication direction

Ash layer in sediments

Chert layer in sediments

Flow boundary

Vallecitos Stratigraphic Correlation Chart



Geologic History

The basic stratigraphy for rock units in the Jemez Mountains was established by Bailey et al. (1969) and Smith et al. (1970). Further refinement of the volcanic stratigraphy was presented by Gardner et al. (1986) and Gardner and Goff (1996). Structural studies relevant to the Vallecitos quadrangle include Aldrich (1968) and Aldrich and Dethier (1990).

The oldest rocks in the quadrangle belong to the Chama-El Rito and Ojo Caliente members of the Tesuque Formation. These two members underlie most of the Abiquiu embayment (Kelley, 1978) and represent Rio Grande Rift-fill sediments during the Miocene. The Chama-El Rito member consists of siltstones, mudstones and fluvial gravels indicative of a relatively low energy floodplain environment of deposition. Volcaniclastic pebbles and gravel occur throughout the unit, possibly derived from the Latir volcanic field – or from sources now buried beneath the southwestern Taos plateau (Koning, pers. comm). The age of the Chama-El Rito is considered to span from 18-12 Ma (Dethier and Aldrich, 1991). The overlying Ojo Caliente sandstone member consists primarily of massive medium-grained sand of eolian origin, representing a vast erg that covered much of the northern Jemez area between 12-10 Ma (Tedford, 1981). Thin lenses of fluvial gravel occur in the upper Ojo Caliente sandstone, dominated by volcanic clasts of uncertain provenance (possibly early volcanic rocks of the Jemez Mountains), and lesser amounts of quartzite and granite most likely derived from areas to the north, including the Tusas Mountains.

A strong episode of mafic volcanism then affected the area between ~11-9 Ma, forming Lobato Mesa and the Clara Peak center south of Rio del Oso. This episode of mafic volcanism appears to have affected a broad region, extending south to basalts of Chamisa Mesa in the southern Jemez Mountains. Interlayered with Lobato basalt flows are thin sediments of fluvial origin that may represent continued Ojo Caliente deposition in the area during Lobato volcanism. Most of the Lobato vents and dikes in the area are aligned roughly north-south, parallel to structural trends. Some of these structures appear to have been active during this time period, as some basalt flows dramatically thicken in paleovalleys adjacent to fault scarps. A sequence of mafic lavas at La Sotella on Lobato Mesa range in age from 10.1±0.3 at the base to 10.8±0.3 at the top (Goff et al., 1989).

Dacitic volcanic activity, though less voluminous, also affected the area during this time. At least one large dacitic flow is interbedded with mafic lavas (exposed in Rio del Oso Canyon), although its source vent is unknown. This flow (along with a few other isolated exposures) are strikingly similar in appearance to later Tschicoma-style volcanism, including similar porphyritic textures with large phenocrysts of plagioclase and lesser amounts of biotite ± hornblende. Capping the Lobato sequence is a large dacite center south of Rio del Oso Canyon (Cerritos). This eruptive center issued a fluid, low-aspect ratio lava that flowed to the northeast, capping a thick package of mafic lavas and lapping onto the Los Cerros basaltic cone to the east. This dacite is fine-grained with few phenocrysts (plagioclase and hornblende), unlike later Tschicoma-age dacites. A brecciated horizon occurs in several areas, possibly represented a widespread block and ash flow event during the eruptive process. Locally, a few old gravel deposits occur in the Vallecitos quadrangle, including a crater-like feature at Los Cerritos. These coarse gravels are perched at a much higher elevation that the subsequent Puye Formation, and are comprised of angular to sub-rounded Lobato mafic and dacitic lavas.

The next important phase of volcanic activity began with Tschicoma-style volcanism, beginning approximately 7 Ma in the northern Jemez Mountains. Although predominantly dacitic in composition, andesites, dacites, rhyodacites and rhyolites were all erupted in the northern Jemez between ~7-3 Ma (Goff and Gardner, 2004). Accompanying this volcanic activity were fanglomerate sediments of the Puye Formation. Most of the Tschicoma lavas in the Vallecitos quadrangle represent distal flows from major vents just to the west, including the highest and third highest peaks in the Jemez Mountains (Tschicoma and Polvadera Peaks). These flows were primarily erupted between 5-3 Ma. The largest single flow in the quadrangle (and one of the largest dacite flows in all of the Jemez Mountains, covering at least 10^2 km), was erupted from the northeast side of Tschicoma Peak at 3.9±0.15 Ma (Goff et al., 1989). The northeastward-sloping surface of this flow (named Mesa de la Gallina) spread across the post-Lobato surface. As the flow fanned out, it covered older Tschicoma lavas, Lobato basaltic lavas, and early Puye Formation sediments.

Puye Formation sediments are preserved in many areas of the quadrangle, especially adjacent to the steep flow margins of the Tschicoma lavas. Much of their aggradation was post-Gallina Mesa flow, as this is a common component in many of the sediments. Adjacent to Lobato highlands, however, clasts of Tschicoma dacites decrease significantly, replaced by clasts of mafic lavas. In Mesa El Alto (Vallecitos), at least 30-40 meters of Puye Formation is preserved. Along the southwestern flank of Lobato Mesa, remnants of old QT gravels (possibly Puye) can be found at elevations up to 8100’, suggesting that sediment fill in the valley was once much greater than at present. However, this perched elevation can be partly the result of Pliocene-Pleistocene faulting along the western margin of Lobato Mesa. Near the abandoned village of Rechuelos, a major fault juxtaposes Puye Formation sediments with Lobato mafic lavas, showing an estimated 20 meters of displacement post-Puye.

Intercalated with the Puye gravels are thin (typically less than one meter thick) tephra and pyroclastic flow deposits related to Tschicoma volcanism, containing dacitic pumices with biotite and hornblende. The coarsest Puye deposits in the quadrangle, including massive boulder conglomerates (individual boulders up to 5 meters across) occur near the top of the present day Puye surface where Rio del Oso exits the Tschicoma highlands and just east of Vallecitos Corrales east of Loma Parda. The depositional mode of emplacement of these massive boulder conglomerates is difficult to interpret. Possibly they represent large scale debris flows off the adjacent Tschicoma highlands, although there is very little matrix material within the deposit. More detailed studies of these deposits is needed to better understand their true origin.

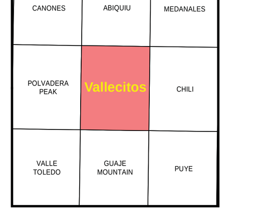
Capping the Tschicoma lavas in Mesa El Alto is the El Alto basalt, erupted from a series of vents near RincÛn de Mora and Los Cerritos. This pulse of basalt volcanism occurred between 3.2-2.8 Ma (Baldridge et al., 1980) in the northern Jemez, although only one eruptive phase is interpreted for the Vallecitos area. The basalt flowed northwards, filling the ancestral Abiquiu Creek valley and capping Ojo Caliente sandstone (preserved now along Mesa de Abiquiu).

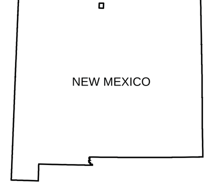
The youngest volcanic rocks in the quadrangle are related to the eruptions of the Bandelier Tuff. Both Otowi and Tshirege members occur in the quadrangle, although no primary deposits of Tsirege were found north of Rio del Oso. Thin (less than one meter thick), isolated exposures of Otowi ignimbrite occur in Mesa El Alto (Vallecitos). These patchy remnants of tuff are white to beige, highly pumiceous and contain a moderate amount of lithics. The tuff is typically moderately welded, containing abundant quartz and sanidine phenocrysts. Still, the overall appearance of the tuff is unlike typical Bandelier Tuff. Most likely, very distal clouds of the Otowi pyroclastic flow settled in this valley, forming only thin layers of tuff in locally conducive environments. For the Tshirege member, however, normal voluminous flows traveled down the ancestral Santa Clara Canyon, and are now preserved on mesas just north of the canyon on the Santa Clara reservation. To our knowledge, no Tshirege tuff is preserved in Mesa El Alto, although well preserved Tsankawi tephra and Tshirege tuff is preserved just a few kilometers east of the quadrangle boundary on Forest Road 27 (south side of Cerro Pelon).

A variety of young alluvial deposits are preserved in Mesa El Alto, and further study of this area is recommended to better understand the unique history of deposition and erosion in this valley. Besides remnant Otowi tuff exposures, numerous mounds and poorly-exposed strata of pumice occur in the valley. Several occur in the vicinity of the tuff outcrops, suggesting a connection between the two (most likely Guaje pumice). In many places old Quaternary alluvium caps Puye deposits. These deposits are at least post-Otowi age, containing abundant crystals of Bandelier Tuff and obsidian fragments that are likely related to Cerro Toledo obsidian domes prior to the Valles Caldera eruption. Without Tshirege member tuff preserved in the valley, however, the age of these alluvial deposits is unclear. If they are older than Tshirege then they could be classified as Cerro Toledo interval deposits.

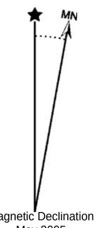
One unsolved mystery is the omnipresent obsidian found throughout the Mesa El Alto valley. Though likely of human distribution, its abundance as fragments on the surface is extraordinary. In many places, the distribution pattern seems random and ubiquitous, atypical of an archaeological origin. In these areas the fragments are highly angular yet appear unworked (by human hands/tools), and display no significant evidence of fluvial transportation. They occur predominantly at the surface and are especially abundant capping old Quaternary gravels and Puye gravels adjacent to Tschicoma flow margins. A more detailed study of the obsidian throughout Mesa El Alto is highly recommended. What is the true distribution of obsidian in the valley? What are the obsidian sources (Rechuelos domes, Cerro Toledo domes)? Can sediment packages be distinguished by the composition of obsidian clasts? Was the obsidian distributed by human or geologic processes - or both?

Base map from U.S. Geological Survey 1953, from photographs taken 1951, field checked in 1953, revised in 1977.
1927 North American datum, UTM projection -- zone 13N
1000-meter Universal Transverse Mercator grid, zone 13, shown in blue





QUADRANGLE LOCATION



Magnetic Declination
May 2005
9º 54' East
At Map Center

1:24,000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

New Mexico Bureau of Geology and Mineral Resources
New Mexico Tech
801 Leroy Place
Socorro, New Mexico
87801-4796

[575] 835-5490

This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

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DRAFT

NMBGMR OF-GM 108

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.

New Mexico Bureau of Geology and Mineral Resources
Open-file Geologic Map 108

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act, administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, (Dr. Peter A. Scholle, *Director and State Geologist*, Dr. J. Michael Timmons, *Geologic Mapping Program Manager*).

Geologic map of the Vallecitos quadrangle, Rio Arriba County, New Mexico

May 2005

by
Kirt Kempter [1], Shari Kelley[2], Dan Koning[3],
Charles Ferguson [4], Bob Osburn[5], and Linda Fluk[5]

[1] *2623 Via Caballero del Norte, Santa Fe, NM, 87505*
[2] *New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM 87801*
[3] *Arizona Geological Survey, Tucson, AZ, 85701*
[4] *Washington University, Campus Box 1169, 1 Brookings Dr. Saint Louis, MO, 63130*
[5] *160 County Raod 113, Santa Fe, NM 87506*

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.