Geologic Map of the Cañon Plaza Quadrangle, Rio Arriba County, New Mexico (Year 2 of 2-Year)

By

Scott B. Aby, Kirt A. Kempter, and Karl E. Karlstrom

June 2012

New Mexico Bureau of Geology and Mineral Resources
Open-file Digital Geologic Map OF-GM 221

Scale 1:24,000

This work was supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program (STATEMAP) under USGS Cooperative Agreement 10HQPA0003 and the New Mexico Bureau of Geology and Mineral Resources.

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

DRAFT

Description of units for
Cañon Plaza quadrangle
Rio Arriba County, New Mexico

by

Scott Aby Muddy Spring Geology
Box 488 Dixon, NM 87527
Karl Karlstrom, University of New Mexico
and
Kirt Kempter, New Mexico Bureau of Geology and Mineral Resources

Explanation of descriptive terms.

Descriptive terms (strength, sorting, angularity, grain/clast size, and hand-sample descriptive terms) after Compton (1985); sedimentary terms generally after Boggs (1995). Queries (?) after descriptors indicate uncertainty, generally due to lack of exposure in unconsolidated units.

Quaternary Rocks

Qal
Quaternary Alluvium
Stream channel and valley-floor alluvium, active floodplains, low stream terraces, and tributary mouth 'fans' (Holocene and latest Pleistocene?)-Poorly exposed; light gray-to-pale brown; loose; poorly-to-well-sorted; rounded-to-subangular; thin-to-thick bedded, massive and/or lensoidal; silty sand-to-sandy gravel with rare cobbles/boulders and/or gravelley channel deposits. Light-brownish silty sand, gravelly sand, and sandy gravel with minor gravel, mud and silt underlies modern ephemeral channels. Gravel is generally poorly-to-moderately sorted, subangular to subrounded pebbles. Sand is generally coarse- to-very coarse-grained, poorly to moderately sorted, and subrounded to subangular. Estimated thickness of deposits associated with ephemeral channels is 1-5+ m but is possibly thicker. Thickness in alluvial reaches of the Rio Vallecitos is unknown. To the extent possible Qal contacts have been mapped in the field and mapped deposits are restricted to stream-laid sediments (as opposed to hillslope material deposited by unchannelized flow). The contact with bedrock units is drawn at the "feather edge" of Qal deposits where they often merge with (mostly unmapped) Quaternary colluvium. At 1:12000 scale the practical limit of a mappable unit's width is about 10 meters, so alluvial deposits <10 m wide are not shown. Where the Qal contact is mapped as a solid line it is well defined and was "walked out". Where this contact is mapped as a dashed line it was either not well defined geomorhically or was mapped from a distance or from air photos and topgraphy. Some alluvium in tributary reached is not mapped where it was not directly observed and air photos were inconclusive.

Qc
Quaternary Colluvium
Colluvium is common throughout the quadrangle but is only mapped where it completely obscures relations among older units or where it is relatively thick, extensive, and forms discrete bodies. Poorly exposed, light brown, loose-to-friable, poorly sorted, sub-rounded-to-angular, massive and chaotic gravelly sand and sandy gravel(?). Composition is determined by units underlying individual colluvial bodies.

Qg
Undifferentiated Quaternary gravel deposits. Poorly exposed; variably colored; loose; moderately sorted; subangular-to-well rounded; sandy cobble-to-boulder conglomerate and pebbly sand. This unit consists mostly of terrace gravel of the Rio Vallecitos and other streams. Clast composition dominated by Proterozoic rock types with subordinate Tertiary volcanic clasts locally. Estimated 1-7 m thick.

Qal and Qg
Mixed unit of Quaternary Alluvium and Quaternary stream gravel

Ql Quaternary landslide Landslide deposits defined by presence of small ponds, hummocky topography, and/or 'backtilted' bedding.

Qb Quaternary blockfield Two small blockfields on the slopes of Quartzite Mountain (Burned Mountain Quadrangle) composed of sub angular to rounded 0.1-5m clasts of Ortega Quartzite. Deposit has a somewhat hummocky surface that grades to small Qal deposits (see map).

<u>Qal</u>
Ttoc Quaternary alluvium overlying unit Ttoc (gradational unit between Ojo Caliente Sandstone and Chama-El Rito Member of the Tesuque Formation). Unit Ttoc is not exposed on this quadrangle but is exposed to the east (Aby et al., 2010) on the Las Tablas Quadrangle.

<u>Qal</u>
Tlc Quaternary alluvium overlying the Cordito Member of the Los Pinos Formation

<u>Qal</u>
T Quaternary alluvium overlying uncertain Tertiary unit(s)

<u>Qal</u>
Tr Quaternary alluvium overlying Ritito Conglomerate

QTg Quaternary and/or Tertiary gravel

Tlcl Landslide block composed entirely of Cordito Member sediments Landslide deposits defined by presence of small ponds, hummocky topography, and/or 'backtilted' bedding.

Tertiary Sedimentary Rocks

Tlc
Cordito Member, Los Pinos Formation (uppermost Oligocene-late miocene)
Southern Type:
Table 1 shows that two types of Cordito Member are exposed on this quadrangle. The following description is for the Cordito Member south of Philipito Canyon.
The Cordito Member was named by Butler (1946) for Canon de Tio Gordito (uncle fatty's canyon) south of Tres Piedras on the Petaca Peak Quadrangle.
Very poorly-to-moderately well exposed; light tan-to-whitish; loose-to-moderately strong; moderately well-to-moderately poorly sorted; subrounded-to-subangular; thin-to-thick tabular-to-lensoidally bedded; weakly-to-strongly cemented; sandy conglomerate, gravelly sandstone and silty sandstone dominated by felsic gravel clasts with subordinate intermediate composition clasts and relatively rare mafic and proterozoic clasts. Natural exposures are dominated by well cemented cobble and boulder conglomerate, but the majority of road cut exposures are coarse-to-fine silty pebbly sandstone and sandy pebble conglomerate.

The Cordito is clearly derived from the Latir Volcanic Field based on the presence of abundant silicic volcanic detritus including Amalia Tuff. However, no plutonic rocks from the Latir field are found in the Cordito, although they are abundantly exposed in the Latir Field at present (Lipman and Reed, 1989). The largest clasts in the Cordito are often fine-to-medium grained 'dacite' that may indicate more proximal contributions of this type of material.

The lower contact of the Cordito Member where it overlies the Ritito Conglomerate is not usually exposed due to abundant detritus derived from the Cordito, however, the transition from vocanic-clast dominated to Proterozoic clast dominated float is usually abrupt where it is exposed. An exception to this abrupt transition is in the area west of Jaques Canyon Tank # 1 in the southeastern part of the Quadrangle. Here we have mapped an interbedded and/or gradational contact as rare exposures show that individual beds of Ritito Conglomerate are below Cordito Member beds in this area. We generally place the contact between Cordito Member and Ritito Conglomerate at ~15% volcanic clasts, however, near the contact between these units individual beds containing > 15% volcanic clasts may be included in the mapped Ritito Conglomerate (e.g. in the Western part of section 5 T26N:R7E) where including them would cause unnecessarily(?) abrupt perturbations to the map pattern.
The abundant debris shed by the Cordito Member often makes precise location of the lower contact impossible and some “outlying” polygons of Cordito Member (e.g. in the NE 1/4 of Section 14 T27N:R7E) may be composed of such debris. The lower contact should be considered approximately located in most cases and particularly above ~8500 feet elevation where thick duff commonly covers thesurface and even float is often rare.

Tlc
Cordito Member, Los Pinos Formation (uppermost Oligocene-late miocene)
Northern type:
North of Felipito Canyon the Cordito Member is notably different in clast composition from the southern type described above, although other characteristics are similar. Some of the lowest slopes on the south side of Felipito Canyon have float similar to the northern type of Cordito Member but Hondo Canyon (the next canyon south) does not seem to contain any of the clasts unique to the northern type of Cordito Member and this float may be derived from the underlying Ritito Conglomerate. Table 1 shows that the northern type of Cordito member contains more dacite and Proterozoic rocks than the

southern type. Some of the dacite in the northen type is similar to distinctive dacite of the Esquivel member of the Los Pinos Formation (Aby, 2011), and some of the Proterozoic clasts in the northern type may be Tres Piedras Granite. We believe this unit is a gradational part of the Cordito representing mixing of Esquivel Member sediments, Latir-field debris, and Proterozoic rocks from near Tres Peidras(?). Although a new member could be defined based on these differences we believe it is best at present to include all rocks containing Amalia Tuff in the Cordito Member. Roadcut exposures along FR 42 (count A13 Table 1) contain abundant dacite clasts and relatively common Proterozoic clasts and may be an 'outlying' part of this northern type.

Ta

Tertiary Abiquiu Formation (Oligocen-Miocene(?)) Very poorly exposed; friable(?); light-tan-to-whiteish; moderately well sorted; subrounded-to-subangular; moderately cemented sandy/silty pebble conglomerate and pebbly sandstone(?). Definition of a boundary between the Cordito Member and Abiquiu Formation on this quadrangle is arbitrary because of poor exposure. Float along the lower part of the steep slopes on the western edge of the quadrangle has relatively more pumice and seems to be more fine grained. The Abiquiu/Cordito contact is better defined to the south (Kempter et al, 2008) and our contact is partially projected from there. Relatively pumice-rich beds are found in the Cordito Member in the southwestern part of section 13 T27N:R7E on the hanging wall of the fault found there. These beds could be considered part of the Abiquiu Formation.

Tr

Ritito Conglomerate (lower(?)Oligocene through lower Miocene)

We use the terminology of Barker (1958) for mapping gravel adjacent to and/or derived from Proterozoic paleo-topographic highs. The Ritito Conglomerate was defined by Barker on The Cañon Plaza quadrangle for gravel containing Proterozoic-derived detritus consisting of rounded-to-subangular pebbles to small boulders of quartzite, amphibolite, and metarhyolite. He describes the unit as weakly cemented with a medium-gray color.   Maldonado and Kelley (2009) have recently expanded the use of the term Ritito to include rocks previously included in the Abiquiu Formation. As presently used, this term simply implies sediment in north-central New Mexico derived from Proterozoic sources that is not demonstrably equivalent to the Eocene El Rito Formation or of Pliocene or younger age.

Very poorly exposed; loose-to friable(?); moderately well sorted(?); rounded-to-subrounded; weakly cemented sandy-to pebbly(?) conglomerate. Sediment consists of pebbles and cobbles, with minor boulders, in a sand matrix(?). Maximum clast sizes is usually 50 cm but locally is several meters(?). Dominated by Proterozoic detritus (quartzite, porphyritic metarhyolite, schist, schistose metarhyolite, amphibolite, granite and vein quartz (Table 1). Although the Ritito Conglomerate seems to be 'locally derived' float is usually a mixture of at least two Proterozoic clast types even when nearby basement is monolithologic indicating some mixing/transport of Rititio sediments pior to deposition. This interpretation is supported by the common rounding of clasts in the unit. Near the contact with the Cordito Member in rare good exposures (notably in the southwestern quarter of section 23 T27N:R7E) individual beds of Proterozoic clasts and volcanic clasts are interbedded over about 20-30 m of section but are not extensively mixed.

PALEOPROTEROZOIC ROCKS

Hondo Group (Includes Ortega Quartzite and associated units)

Xoq **Ortega Quartzite –** Coarse-grained, gray to white vitreous cross-bedded quartzite consisting mostly of quartz with minor amounts of muscovite, kyanite, and layers of hematite. Viridine-bearing quartzites occur in the lower Ortega Quartzite on Kiowa Mountain and is a regionally continuous marker horizon.

Xoas **Aluminous schist –** Interlayers within Ortega Quartzite, locally contains kyanite, andalusite, and sillimanite. This unit was previously mapped as qka in the La Madera quadrangle (Bingler, 1965)

Vadito Group (Includes associated metasedimentary and metavolcanic rocks)

Xvmq **Vadito micaceous quartzite –** Tan, grayish white to greenish white micaceous and feldspathic quartzite. This unit is schistose, ranges from fine-to-medium grained with mica content varying between 10-30%. Consists of quartz, muscovite, K-spar, biotite, hematite, and epidote. Locally contains trough crossbeds. This unit is correlated to Xmq in the Ojo Caliente Quadrangle (Koning and others, 2005) and Xmqu in the La Madera Quadrangle (Koning et al., 2007). It is interpreted to be a meta-arkose to meta-litharenite of dominantly fluvial origin (because of the trough cross bedding and immature composition) that represents a gradational transition from the micaceous quartzites of the Vadito Group (Xvmq) to the quartzarenties of the Hondo Group.

Xva **Vadito Amphibolite** – Foliated to massive amphibolite that occurs as pods, dikes, and continuous layers that are interbedded with micaceous quartzites (Xvmq) in the Kiowa Mountain syncline. Consists of hornblende, plagioclase feldspar, as well as chlorite and actinolite; grades into areas rich in tourmaline. Foliation defined by inter-layered amphibole and plagioclase feldspar-rich layers. Primary textures are rare but include amygdaloidal textures. Unit is interpreted to include both metabasaltic flows and hypabyssal intrusive sills and dikes.

Xvpr **Vadito Posos Metarhyolite-** Yellowish orange to orangish tan to pinkish gray in color. Weathers to an orange-reddish orange color. Fine grained foliated metarhyolite containing fine-grained quartz, plagioclase, K-feldspar, muscovite, and iron oxides, with rare biotite, epidote, and garnet. Has distinctive embayed quartz and microcline mm-scale phenocrysts and ribbons. Dark and orange patches on foliation surfaces may represent deformed pumice clasts. Ash flow layering locally preserved and mapped as primary layering (bedding symbol). This unit is correlative to the Cerro Colorado metarhyolite and the Arroyo Rancho metarhyolite (Bishop, 1997), as well as to the Burned Mountain metarhyolite (Barker, 1958). The Cerro Colorado metarhyolite has been dated at ~1.70 Ga based on zircons (Lanzirotti personal communication 1996 to Bishop, 1997); Burned Mountain metarhyolite also has a ~ 1.70 Ga age (Silver, unpublished). This unit has been interpreted by several workers to have originally been ash flow tuffs (Just, 1937; Jahns, 1946; Treiman, 1977). The unit is texturally heterogeneous with interlayers of schistose layers. Unit grades into micaceous quartzites (Xvmq and Xvbrq), schistose metarhyolites (Xvsr), and foliated parts of the Tres Piedres granite (Xtpg) making unique identification in many areas difficult.

Xvbrc and Xvbrq Vadito Big Rock Conglomerate and Quartzite – Stretched and folded pebble metaconglomerate(**Xvbrc**) interbedded with micaceous quartzite and aluminous schists (**Xvbrq**) , conglometate varies from clast-supported to matrix-supported and occurs in lenses within quartzite. Clasts include bluish-grayish quartzite and vein quartz (egg shaped, up to 10 cm), highly stretched felsic volcanic clasts (up to 15 cm long), and chert (moderately ellipsoidal shapes). Clasts are typically flattened and elongated in the main foliation plane (S1). The matrix of the conglomerate varies from quartzite, to quartz-muscovite schist, to metarhyolite. The quartzites contain trough cross bedding. This unit likely correlates with to the conglomerate exposed near Big Rock and in the Ojo Caliente and La Madera Quadrangles. The gradational relationship and the location of trough cross bedded micaceous quartzites both above and below lead to the interpretation that the conglomerate forms channels in a fluvial deposit. Gradation of quartzites to rhyolite and rare occurance of rhyolite as matrix to pebbles suggests the fluvial channel conglomerate was deposited adjacent to rhyolitic calderas.

Xvr **Vadito Group undivided (mainly metarhyolite)–** Similar to Posos rhyolite and Petaca schist but stratigraphically underlying the Big Rick conglomerate and quartzite. Fine-grained foliated rhyolite containing quartz, plagioclase, K-feldspar, muscovite, and iron oxides, with rare biotite, epidote, and garnet. Locally has distinctive embayed quartz and microcline mm-scale phenocrysts and ribbons. Dark and orange patches on foliation surfaces may represent deformed pumice clasts. Ash flow layering locally preserved and mapped as primary layering (bedding symbol). The unit is texturally heterogeneous with interlayers of schistose layers. Unit grades into micaceous quartzites and aluminous schists (Xvbrc, Xvbrq, Xvps, Xvas, Xvpet) making unique identification in many areas difficult.

Xm **Mopin Group undivided (seen only in cross section)**

Greenstone and amphibolite interlayered with immature metasedimentary rocks—interpreted to be volcanogenic basement to the Vadito Group.

Structural symbols

At least three major generations of penetrative Proterozoic deformation have been identified in the Canon Plaza quadrangle.

Bedding and overturned bedding symbol

S_0= bedding and compositional layering, symbols with ball at the end mean that crossbedding was observed indicating direction of younging (disignated with upright or overturned bedding symbols). S_0 is locally accompanied by a layer- parallel foliation with local intrafolial folds of compositional layering likely related to early thrusting.

Foliation symbol (with triangle)

S_1= dominant axial plane foliation to regional folds

dip and strike symbol with two dip ticks

$S_{2=}$ crenulation cleavage

.

We use the term F_1 folds for the macroscopic and mesoscopic tight to isoclinal folds with a well developed axial plane schistosity that forms the dominant fabric in the quadrangle (S1). From north to south macroscopic folds are called: Jawbone Mountain syncline (projected from the north into the cross section), Kiowa Mountain syncline, Posos anticline, Big Rock syncline, MacIntyre Spring anticline, La Jara syncline, Ortega Mountain anticlinorium, and La Madera syncline. They have a strong axial plane foliation such that S_0 and S_1 are commonly subparallel on limbs. S_1 –parallel shear zones and thrusts truncate attenuated limbs of F1 folds (similar to Williams, 1989). From north to south, thrusts are:

Cleveland Gulch thrust, Spring Creek thrust, La Jarita thrust, and Vallecitos thrust.

F_2 folds occur at scales ranging up to macroscopic folds that refold F1 fold axes. The dominant expression of F2 folds is as mesoscopic folds that refold S1 foliation. In many areas, S2 and S1 are subparallel not identifiable as separate fabrics. F2 folds probably formed in association with top-to-the-northeast directed reverse and dextral shear on the Spring Creek and Cleveland Gulch shear zones. D_2 is constrained to have taken place at about 1.4 Ga based on the presence of ca. 1.43 monazites within syn-S_2 porphyroblasts and the boudinaged and weak deformation of ca. 1.4 Ga pegmatites.

References Cited

Aby, S.B., 2008, Preliminary geologic map of the Servilleta Plaza 7.5-minute quadrangle, Taos and Rio Arriba Counties, New Mexico, New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OF-GM-182, scale 1:24,000.

Appelt, R.M., 1998, 40Ar/39Ar geochronology and volcanic evolution of the Taos Plateau volcanic field, northern New Mexico and southern Colorado [M.S. thesis]: Socorro, New Mexico Institute of Mining and Technology, 58 p. plus appendices.

Barker, F., 1958, Precambrian and Tertiary geology of the Las Tablas quadrangle, New Mexico: New Mexico Institute of Mining and Technology, State Bureau of Mines and Mineral Resources, Bulletin 45, 104 p.

Boggs, S., 1995, Principles of Sedimentology and Stratigraphy, New Jersey, Prentice-Hall 774p.

Butler, A.P., 1946 Tertiary and Quaternary Geology of the Tusas-Tres Piedras area, New Mexico., unpublished Phd thesis, Cambridge Massachusetts Harvard University 199p..

Compton, R.R., 1985, Geology in the field: New York, John Wiley & Sons, Inc., 398 p.

Galusha, T., and Blick, J.C., 1971, Stratigraphy of the Santa Fe Group, New Mexico: Bulletin of the American Museum of Natural History, v. 144, 127 p.

Ingersoll, R.V., Cavazza, W., Baldridge, W.S., and Shafiqullah, M., 1990, Cenozoic sedimentation and paleotectonics of north-central New Mexico: Implications for initiation and evolution of the Rio Grande rift: Geological Society of America Bulletin, v. 102, p. 1280-1296.

Kempter, K., Koning, D., and Karlstrom. K., 2008 Preliminary Geologic Map of the Valle Grande Peak Quadrangle, Rio Arriba County, New Mexico, New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OF-GM -180, scale 1:24,000.

Koning, D., Karlstrom, K., Salem, A., Lombardi, C., 2007, Preliminary geologic map of the La Madera 7.5-minute quadrangle, Rio Arriba County, New Mexico, New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OF-GM 141, scale 1:12,000.

Larson, E.S. And Cross, W., 1956, Geology and Petrology of the San Juan region Southwestern Colorado, USGS Professional Paper, 258.

Le Bas, M.J., Le Maitre, R.W., Streckeisen, A., and Zanettin, B., 1986, A chemical classification of volcanic rocks based on the total alkali-silca diagram: Journal of Petrology, v. 27, p. 745-750.

Lipman, P.W., and Mehnert, H.H., 1975, Late Cenozoic basaltic volcanism and development of the Rio Grande depression in the southern Rocky Mountains: Geological Society of America, Memoir 144, p. 119-154.

Lipman, P.W., and Mehnert, H.H., 1979, The Taos Plateau volcanic field, northern Rio Grande rift, New Mexico, *in* Riecker, R.E., ed., Rio Grande rift: tectonics and magmatism: Washington, American Geophysical Union, p. 280-311.

Manley, K., 1981, Redefinition and description of the Los Pinos Formationof north-central New Mexico. Geological Society of America Bulletin, v92 p. 984-989.

Manley, K. and Wobus, R.A., 1982, Reconnaissance Geologic Map of the Las Tablas Quadrangle, Rio Arriba County, New Mexico, New Mexico Bureau of Mines and Mineral Resources Map MF 1408.

Munsell Color, 1994 edition, Munsell soil color charts: New Windsor, N.Y., Kollmorgen Corp., Macbeth Division.

Peters, L., 2009, 40Ar/39Ar geochronology results from Ojo Caliente, Chili, and Las Tablas quadrangles: New Mexico Geochronology Research Laboratory (NMGRL), Internal Report # NMGRL-IR-557, 7 p.

Peters, L. 2010 40Ar/39Ar geochronology results from Las Tablas quadrangle: New Mexico Geochronology Research Laboratory (NMGRL), Internal Report # NMGRL-IR-675.

Smith, G.A., Moore, J.D., and McIntosh, W.C., 2002, Assessing roles of volcanism and basin subsidence in causing Oligocene-lower Miocene sedimentation in the northern Rio Grande rift, New Mexico: Journal of Sedimentary Research, v. 72, p. 836-848.

Table 1 Clast Counts for Canon Plaza Quadrangle
Aby's Clast Counts

SITE NUMBER	A1	A2	A4	A5	A6	A7
Cordito Member of Los Pinos Formation						
Amalia Tuff	31	6	17	45	23	58
'Blue' Rhyolite lava-1	41	1	0	20	11	15
Crystal-poor Rhyolite lava-2	19	80	41	31	13	23
Crystal-rich Rhyolite lava-3	7	7	6	2	3	0
Volcanic breccia	2	0	0	0	0	0
Dacite-4	0	2	20	1	9	0
Mafic-5	0	0	2	1	2	0
Lithic Tuff	0	0	0	0	0	1
Red and Black Rhyolite	0	0	0	0	0	0
Vein quartz	0	3	0	1	4	1
Quartzite	0	1	15	0	31	3
Schist	0	0	0	0	1	0
Granite	0	0	0	0	3	0
Amphibolite	0	0	0	0	1	0
Metarhyolite	0	0	0	0	0	0
Unknown	0	0	0	0	4	0
N=	54	109	101	107	105	101
UTM NAD27	393697	390934	393876	393633	393086	393721
	4041245	4042241	4045955	4042716	4044713	4046158

Notes 1-Some of the crystal poor rhyolite had a distinctive light-blue or blue-grey color; 2-probably same or related to 'Blue" rhyolite; 3-probably amalia tuff

4-Dacite' is any porphyritic-apanitic clast with plagioclase phenocrysts (see Aby, 2011); 5-probably all Jarita basalt (Aby, 2011)

Table 1 (continued) Clast Counts for Canon Plaza Quadrangle

Aby's Clast Counts						
SITE NUMBER	A12	A13	A15	A16	A17	A18
Cordito Member of Los Pinos Formation						
Amalia Tuff	49	4	52	34	65	60
'Blue' Rhyolite lava-1	22	0	41	26	17	27
Crystal-poor Rhyolite lava-2	21	11	5	36	7	12
Crystal-rich Rhyolite lava-3	2	3	0	0	1	0
Volcanic breccia	0	0	0	0	0	0
Dacite-4	1	61	2	1	3	0
Mafic-5	1	1	0	3	6	0
Lithic Tuff	3	1	0	0	2	0
Red and Black Rhyolite		7	0	0	0	0
Vein quartz	0	0	0	0	0	0
Quartzite	0	6	0	0	0	0
Schist	0	1	0	0	0	0
Granite	0	0	0	0	0	0
Amphibolite	0	0	0	0	0	0
Metarhyolite		3	0	0	0	0
Unknown	2	3	0	0	1	1
N=	109	103	99	101	105	102
UTM NAD27	398511	396850	395236	396571	397341	396793
	4048617	4046708	4050812	4046571	4051282	4050111

Notes 1-Some of the crystal poor rhyolite had a distinctive light-blue or blue-grey color; 2-probably same or related to 'Blue” rhyolite; 3-probably amalia tuff

4-Dacite' is any porphyritic-apanitic clast with plagioclase phenocrysts (see Aby, 2011); 5-probably all Jarita basalt (Aby, 2011)

Table 1 (continued) Clast Counts for Canon Plaza Quadrangle

Kempter's Clast Counts

Cordito Member of Los Pinos Formation

	K5	K6	K8	K9	K10
Dacite-1	28	45	6	58	13
Crystal-poor Rhyolite lava-2	17		27	6	15
Crystal-rich tuff-3	21		0		
Quartzite	6	29	2	11	9
Quarts	2	2	0		
Vadito Group-4	4	11	5	11	7
Misc. volcanics	22	13	4	3	9
Crystal-rich Rhyolite lava-5			20	9	15
Amalia Tuff			29	2	18
Mafic/intermediate lavas			6		
UTM NAD27	388225	389218	391410	391002	389191
	4051426	4052801	4050162	4050670	4049355

Ritito Conglomerate

	K2	K3	K4
Pink, rounded qtz porphyroblasts metavolcanic -6	8	0	16
Quartzite	82	86	42
Vadito Group -3	8	8	28
Vein Qtz	2	2	6
Fine-grained volcanic	0	2	0
Misc Volcanics	0	0	8
UTM NAD27	392781	393679	393790
	4052444	4053323	4051027

Notes: 1-'Dacite' is any porphyritic-apanitic clast with plagioclase phenocrysts (see Aby, 2011); 2-this includes both 'Blue' and 'crystal poor' categories of Aby's counts
3-Also possibly Amalia Tuff 4-Primarily shist and metarhyolite; 5-Much of this is probably Amalia Tuff, 6-this rock is a distinct metarhyolite of the vadito group

A8	A9	A10	A11
56	37	36	62
10	33	3	9
30	12	44	28
0	0	2	0
0	0	1	0
1	2	2	0
0	12	0	0
0	1	0	0
0	0	0	0
0	0	3	1
1	2	9	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
2	2	0	0
102	123	107	108
391921	398898	392627	393165
4045705	4044432	4041133	4042523

A19	A20	A21	A22
33	59	59	52
33	21	19	39
34	17	16	10
0	0	1	1
0	1	0	1
0	3	4	8
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	1	0
105	101	100	111
394314	395471	394455	396196
4049216	4047255	4047272	4046146