Geologic map of the Valles caldera, Jemez Mountains, New Mexico

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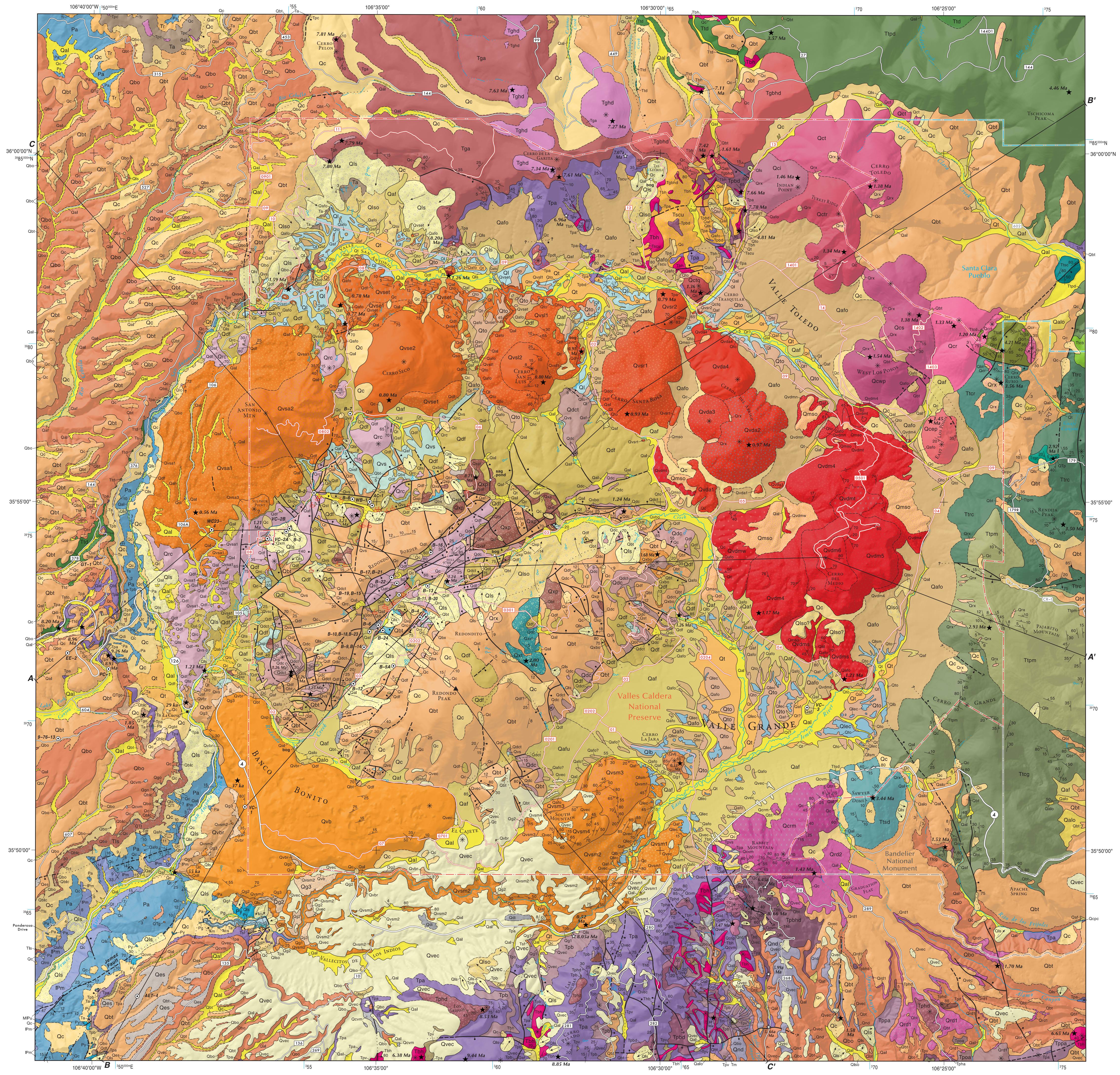
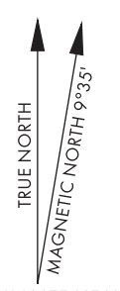
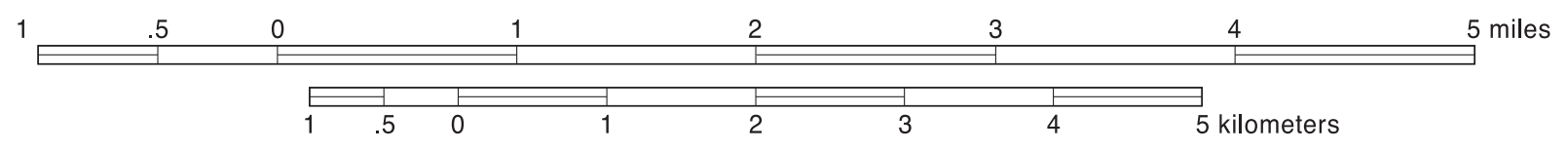
New Mexico Bureau of Geology and Mineral Resources
A DIVISION OF NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY
Peter A. Scholle, *State Geologist*
2011


106°40′00″W
106°35′00″
106°30′00″
106°25′00″
36°00′00″N
35°55′00″
35°50′00″
C
B′
A
A′
B
C′
Cerro Pelon
Cerro de la Garita
Cerro Toledo
Indian Point
Turkey Ridge
Tschicoma Peak
Santa Clara Pueblo
Valle Toledo
Cerro Trasquilar
West Los Posos
East Los Posos
Cerro Rubio
San Antonio Mtn
Cerro Seco
Cerro San Luis
Cerro Santa Rosa
Cerros del Abrigo
Cerro del Medio
Sulphur Point
Redondo Border
Redondito
Redondo Peak
Rendija Peak
Pajarito Mountain
Cerro Grande
Valles Caldera National Preserve
Valle Grande
Cerro La Jara
Banco Bonito
El Cajete
South Mountain
Sawyer Dome
Rabbit Mountain
Bandelier National Monument
Apache Spring
Graduation Flat
Vallecitos de los Indios
Jemez Fault
Ponderosa Drive

1927 North American datum, UTM projection – zone 13S

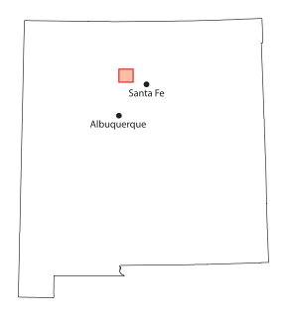

TRUE NORTH
MAGNETIC NORTH 9°35′

APPROXIMATE MEAN DECLINATION, 2008


1
.5
0
1
2
3
4
5 miles
1
.5
0
1
2
3
4
5 kilometers

1:50,000

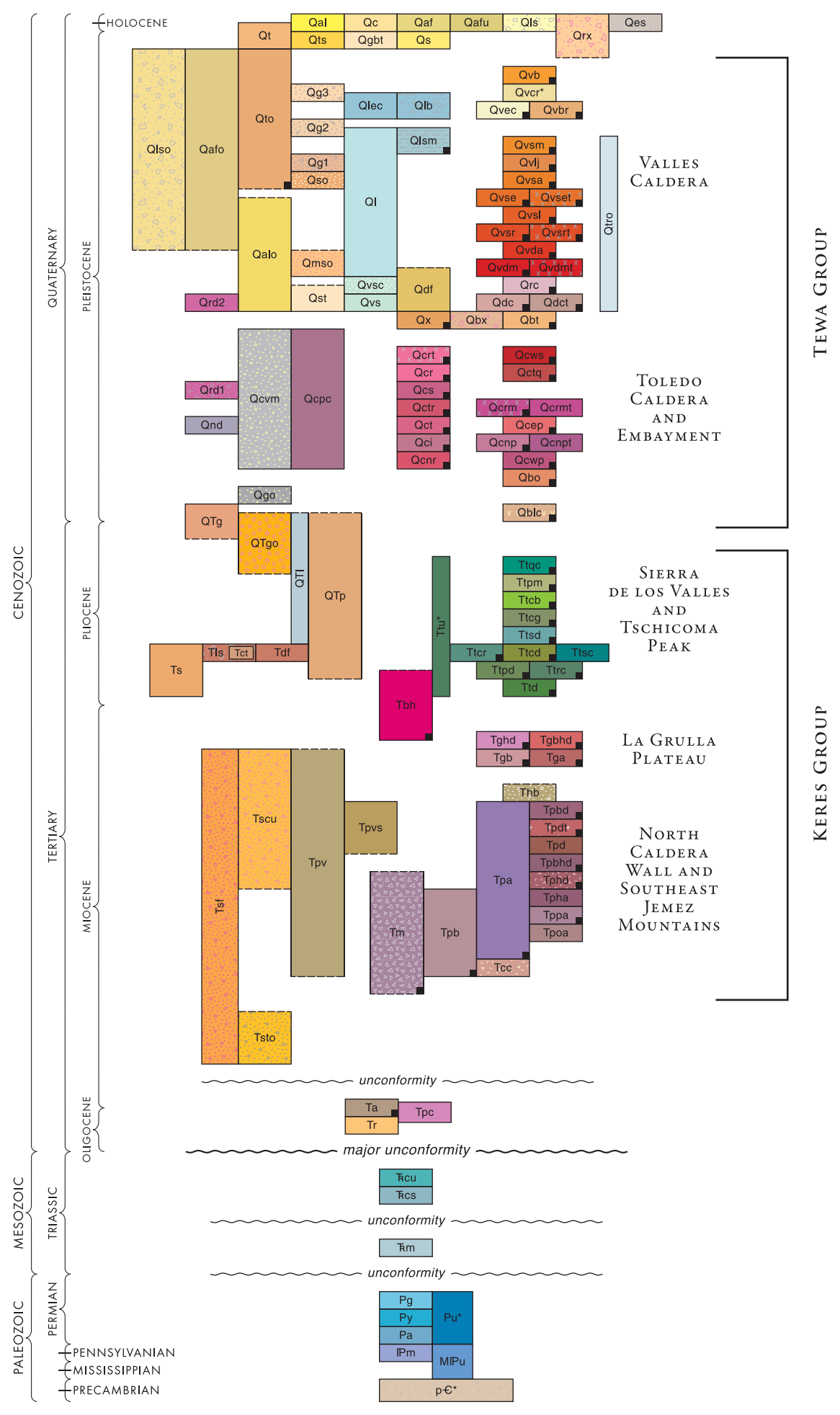
(1 inch equals approximately .8 miles or 1.3 kilometers)


Santa Fe
Albuquerque

INDEX MAP OF NEW MEXICO

Correlation of Geologic Map and Cross Section Units

Asterisk (*) denotes units shown on cross sections only
Black square denotes dated unit


CENOZOIC
QUATERNARY
HOLOCENE
PLEISTOCENE
TERTIARY
PLIOCENE
MIOCENE
OLIGOCENE
MESOZOIC
TRIASSIC
PALEOZOIC
PERMIAN
PENNSYLVANIAN
MISSISSIPPIAN
PRECAMBRIAN
Valles Caldera
Toledo Caldera and Embayment
Sierra de los Valles and Tschicoma Peak
La Grulla Plateau
North Caldera Wall and Southeast Jemez Mountains
Tewa Group
Keres Group
unconformity
major unconformity
unconformity
unconformity

Map Symbols

- **Contact**–Dashed where approximately located
- **Normal fault**–Showing dip; bar and ball on downthrown side; dashed where approximately located; dotted where concealed; queried where inferred
- **Reactivated fault**–Faults that have changed direction of motion or that have moved at different times during rifting, collapse and resurgence. *(Cross sections only)*
- **Paleo beach ridge**
- **Landslide direction**
- **Isotherm** *(Cross sections only)*
- **Horizontal bedding**
- **Strike and dip of inclined bedding**
- **Strike and dip of inclined foliation**
- **Strike and dip of vertical foliation**
- **Strike and dip of inclined joint**
- **Vent**–From either surface evidence or inferred from topography
- **Spring**
- **Fumarole**
- **Bog**
- **Well**
- **Location and age of fresh sample**
- **Location and age of altered sample**
- **Mine**
- **Geologic cross section**
- **Major drainage**
- **Valles Caldera National Preserve boundary**
- **Bandelier National Monument boundary**
- **Santa Clara Pueblo boundary**
- **State highway**
- **Valles Caldera National Preserve road** (unpaved)
- **National Forest Service road** (unpaved)
- **Bureau of Indian Affairs road** (unpaved)
- **County road** (unpaved)

Map Units

Partial description of units; complete descriptions can be found in the Map Booklet.

CENOZOIC

Holocene to Pleistocene fluvial, mass wasting, eolian, and spring deposits

Qdi	**Disturbed areas**
Qal	**Alluvium** (mostly Holocene)
Qc	**Colluvium** (mostly Holocene)
Qaf Qafu	**Alluvial fans** (late Holocene to late Pleistocene)
Qes	**Wind-blown deposits** (Holocene)
Qls	**Landslides** (late Holocene to late Pleistocene)
Qrx	**Boulder fields** (Holocene to Pleistocene)
Qt	**Younger stream terraces** (inferred Holocene or late Pleistocene)
Qts	**Sulphur Creek terraces** (Holocene to late Pleistocene)
Qs	**Terrace sandstone** (Pleistocene)
Qto	**Older stream terraces** (late Pleistocene)
Qlso	**Older landslides** (late Pleistocene)
Qtro	**Old travertine deposits** (Pleistocene)
Qgbt	**Gravel deposit** (Pleistocene)

Pleistocene intracaldera sedimentary and hydrothermal deposits

Qafo	**Older alluvial fans** (mainly Pleistocene)
Qg3 Qg2 Qg1	**Sedimentary deposits of southern caldera** (Pleistocene)
Qlec Qlb	**El Cajete lake deposits** (Pleistocene)
Qlsm	**South Mountain lake deposits** (Pleistocene)
Ql	**Lacustrine deposits in northern caldera** (Pleistocene)
Qso	**Older intracaldera sandstone** (Pleistocene)
Qmso	**Older sedimentary deposits of northern caldera** (Pleistocene)
Qvsc Qvs	**Early caldera-fill lacustrine and fluvial deposits** (Pleistocene)
Qdf	**Early caldera-fill debris-flow, landslide, alluvium, and colluvium deposits** (Pleistocene)
Qst	**Sinter deposits** (Pleistocene)

TEWA GROUP (Pleistocene)

Valles Rhyolite

East Fork Member

Qvb	**Banco Bonito Flow**
Qvcr	**VC-1 rhyolite**–(*Shown in cross section B–B′ only*)
Qvbr	**Battleship Rock Ignimbrite**
Qvec	**El Cajete Pyroclastic Beds**
Qvsm: Qvsm4 Qvsm3 Qvsm2 Qvsm1 Qvlj	**South Mountain Member**
Qvsa: Qvsa3 Qvsa2 Qvsa1	**San Antonio Mountain Member**
Qvse: Qvse2 Qvse1 Qvset	**Cerro Seco Member**
Qvsl: Qvsl2 Qvsl1	**Cerro San Luis Member**
Qvsr: Qvsr2 Qvsr1 Qvsrt	**Cerro Santa Rosa Member**
Qvda: Qvda4 Qvda3 Qvda2 Qvda1	**Cerros del Abrigo Member**
Qvdm: Qvdmt Qvdm6 Qvdm5 Qvdm4 Qvdmn Qvdmw Qvdms	**Cerro del Medio Member**
Qrc	**Redondo Creek Member**
Qdc Qdct	**Deer Canyon Member**

Pleistocene sedimentary rocks on the Tshirege Member, Bandelier Tuff

Qalo	**Older alluvium** (Pleistocene)
Qrd2	**Young Rabbit Mountain debris-flow deposits** (Pleistocene)

Bandelier Tuff (Upper)

Qbx	**Vent and/or hydrothermal breccia**
Qbt	**Bandelier Tuff, Tshirege Member**
Qx: Qxg Qxbo Qxt Qxpt Qxp Qxsf Qxab Qxr Qxa Qxm Qxp-€	**Caldera-collapse breccia**

Cerro Toledo Formation

Qcpc	**Pueblo Canyon Member** (Pleistocene)
Qcvm	**Virgin Mesa Member** (Pleistocene)

Valle Toledo Member

Toledo embayment domes

Qcrt	**Rhyolite tuff**
Qcr	**Aphyric rhyolite**
Qcs	**Sierra de Toledo rhyolite**
Qctr	**Turkey Ridge rhyolite**
Qct	**Cerro Toledo rhyolite**
Qci	**Indian Point rhyolite**
Qcnr	**North caldera rim intrusion**

Toledo caldera ring-fracture domes

Qcws	**Warm Springs rhyolite**
Qctq	**Cerro Trasquilar rhyolite**
Qrd1	**Old Rabbit Mountain debris-flow deposits**
Qcrm Qcrmt	**Rabbit Mountain rhyolite**
Qcep	**East Los Posos rhyolite**
Qnd	**Paso del Norte debris avalanche deposit**
Qcnp Qcnpt	**Paso del Norte rhyolite**
Qcwp	**West Los Posos rhyolite**

Bandelier Tuff (Lower)

Qbo	**Bandelier Tuff, Otowi Member**
Qgo	**Older gravels** (Pleistocene)
Qblc	**Bandelier Tuff, La Cueva Member**

QUATERNARY–TERTIARY

QTg	**Old fluvial gravel** (early Quaternary to late Pliocene?)
QTgo	**Older fluvial gravels**
QTp	**Puye Formation**
QTl	**Lake deposits**

TERTIARY (Pliocene–Oligocene)

Tls Tdf	**Debris avalanche and debris-flow deposits**
Tct	**Block of tuff**
Ts	**Tertiary sediments, undivided** (Pliocene to Miocene?)

KERES GROUP (Pliocene–Miocene)

Tschicoma Formation (Pliocene)

Ttqc	**Upper Quemazon Canyon dacite**
Ttpm	**Pajarito Mountain dacite**
Ttcb	**Caballo Mountain dacite**
Ttcg	**Cerro Grande dacite**
Ttsd	**Sawyer Dome dacite**
Ttcr	**Cerro Rubio dacite**
Ttcd	**Dacite intrusion north of Cerro Rubio**
Ttsc	**Santa Clara Canyon dacite**
Ttpd	**Tschicoma Peak area dacite and rhyodacite, undivided**
Ttrc	**Rendija Canyon rhyodacite**
Ttd	**Porphyritic dacite, undivided**
Ttu	**Dacite and andesite, undivided**–(*Shown in cross section A–A′ only*)

Bearhead Rhyolite (Pliocene–Miocene)

Tbh	**Bearhead Rhyolite**

La Grulla Formation (Miocene)

Tgbhd	**Porphyritic biotite, hornblende rhyodacite**
Tghd	**Hornblende dacite and rhyodacite**
Tga	**Porphyritic andesite and dacite, undivided**
Tgb	**Olivine basalt**

Paliza Canyon Formation (Miocene)

Tpv Tpvs	**Volcaniclastic member** (Pliocene? to Miocene)
Thb	**Hydrothermal breccia**
Tpd	**Aphyric dacite**
Tpbd	**Porphyritic biotite dacite**
Tpdt	**Porphyritic dacite tuff**
Tphd	**Porphyritic hornblende dacite**
Tpbhd	**Porphyritic biotite, hornblende dacite**
Tpha	**Hornblende andesite**
Tppa	**Porphyritic andesite**
Tpoa	**Olivine andesite**
Tpa	**Two-pyroxene andesite, undivided**
Tpb	**Olivine basalt and basaltic andesite, undivided**

Bland intrusive rocks

Tm	**Bland monzonite** (Miocene)

Canovas Canyon Rhyolite

Tcc	**Canovas Canyon Rhyolite** (Miocene)

Santa Fe Group

Tsf	**Santa Fe Group, undivided** (Miocene)

Chamita Formation of the Santa Fe Group

Tscu	**Hernandez Member (?)**–(Miocene)

Tesuque Formation of the Santa Fe Group

Tsto	**Ojo Caliente Sandstone Member** (Miocene)

Early Rio Grande rift sedimentary deposits

Tpc	**Pedernal chert** (Miocene to Oligocene)
Ta	**Abiquiu Formation** (Miocene to Oligocene)
Tr	**Ritito Conglomerate** (Miocene to Oligocene)

MESOZOIC

TRIASSIC

Ŧcu	**Upper Chinle Group, undivided**
Ŧcs	**Shinarump Formation, Chinle Group**
Ŧm	**Moenkopi Formation**

PALEOZOIC

PERMIAN

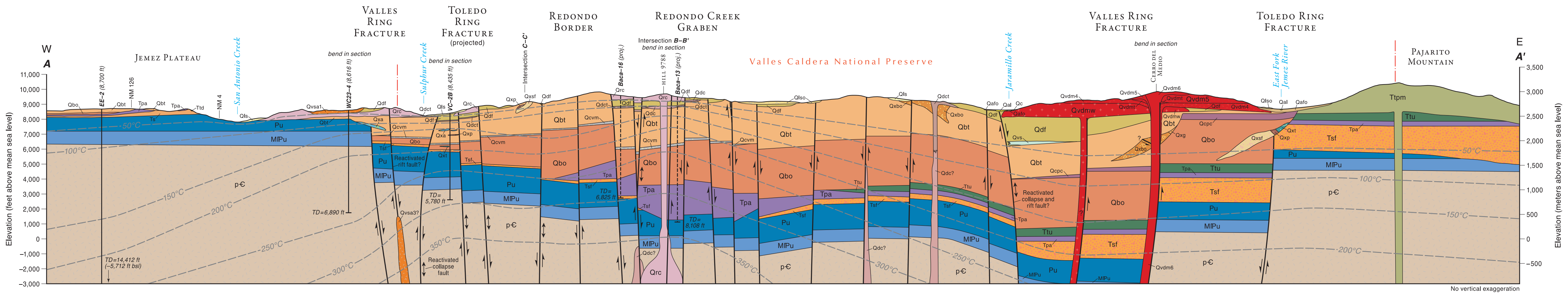
Pg	**Glorieta Sandstone**
Py	**Yeso Group**
Pa	**Abo Formation**
Pu	**Permian rocks, undivided**–(*Shown in cross sections only*)

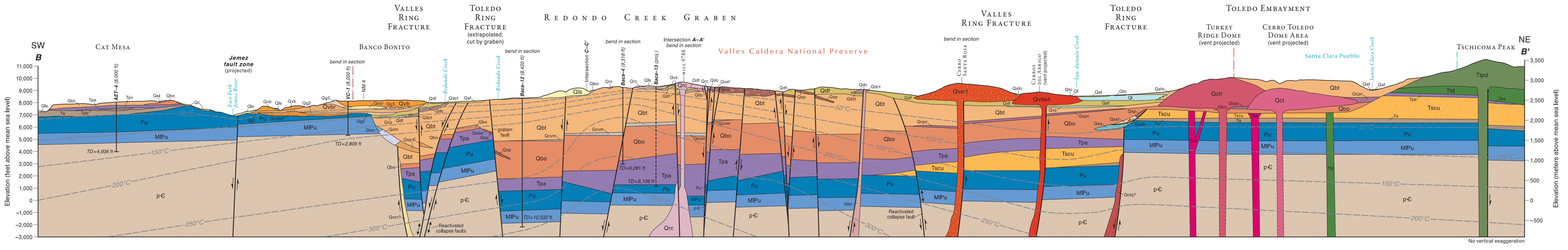
PENNSYLVANIAN–MISSISSIPPIAN

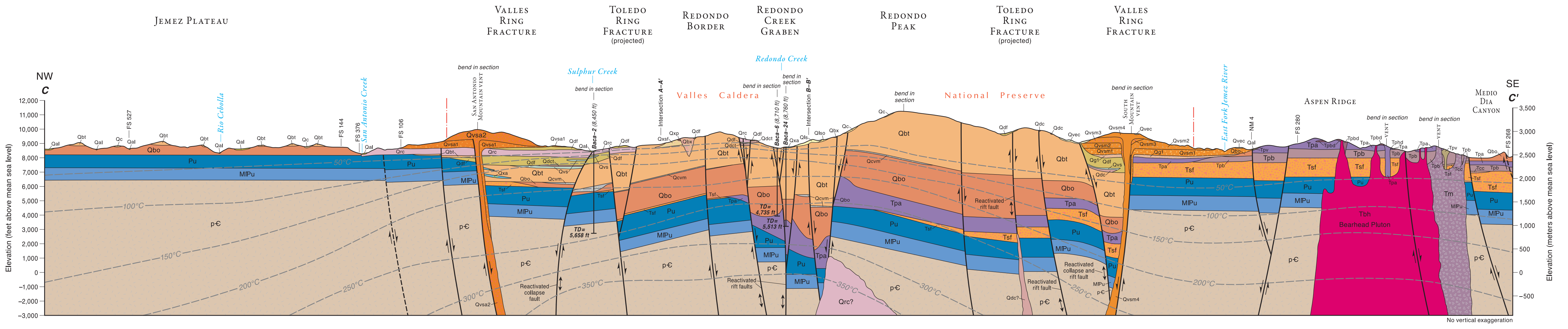
IPm	**Madera Group** (Pennsylvanian)
MIPu	**Pennsylvanian–Mississippian rocks, undivided**–(*Shown in cross sections only*)

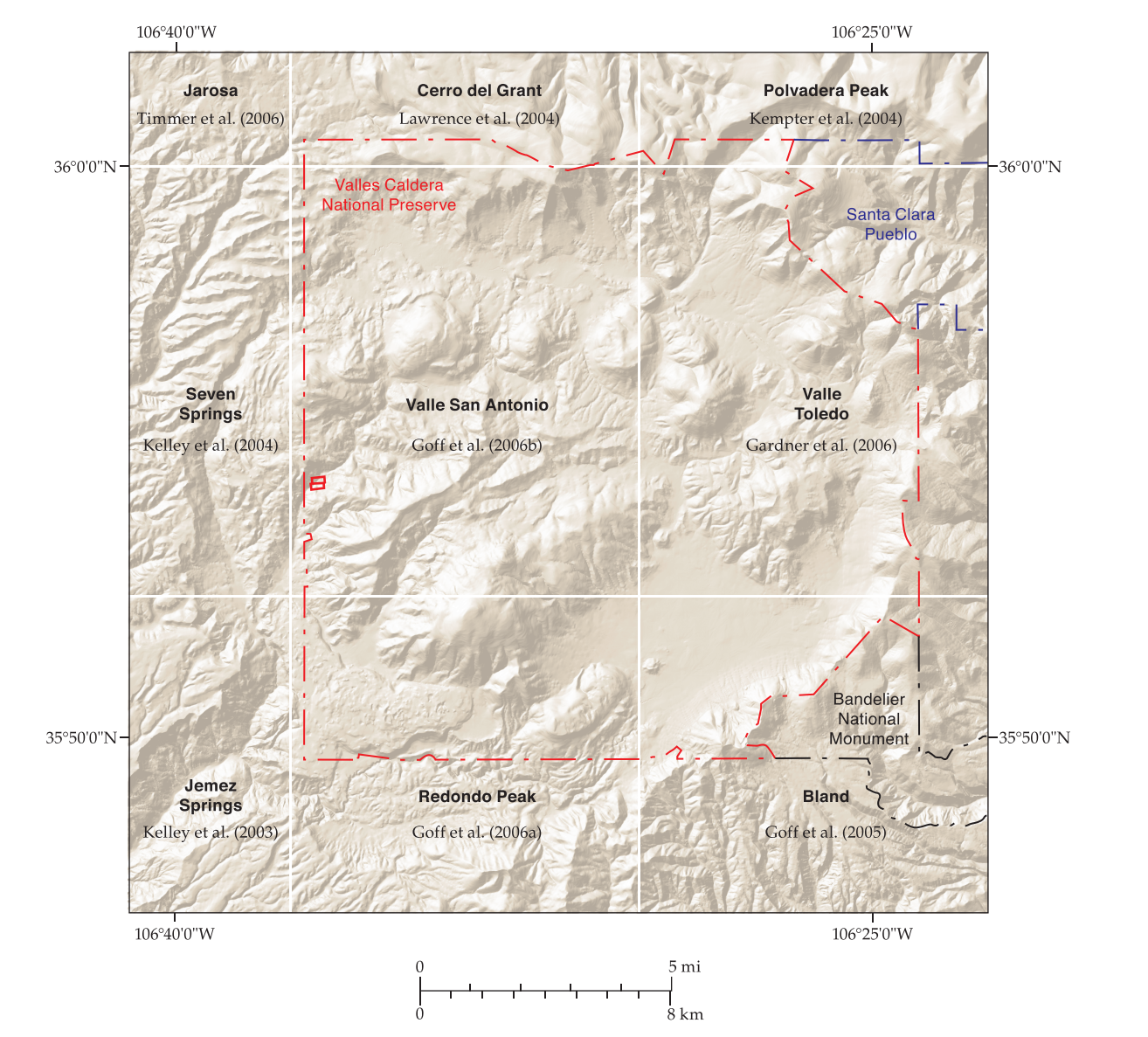
PROTEROZOIC

p€	**Proterozoic rocks, undivided**–(*Shown in cross sections only*)


W
A
Jemez Plateau
San Antonio Creek
Valles Ring Fracture
Sulphur Creek
Toledo Ring Fracture (projected)
Intersection C–C′
Redondo Border
Redondo Creek Graben
Intersection B–B′
Valles Caldera National Preserve
Jaramillo Creek
Valles Ring Fracture
Cerro del Medio
Toledo Ring Fracture
East Fork Jemez River
Pajarito Mountain
E
A′
Elevation (feet above mean sea level)
Elevation (meters above mean sea level)
TD=14,412 ft (–5,712 ft bsl)
TD=6,890 ft
Reactivated rift fault?
Reactivated collapse fault
Reactivated collapse and rift fault?
No vertical exaggeration


SW
B
Cat Mesa
Jemez fault zone (projected)
Banco Bonito
Valles Ring Fracture
Toledo Ring Fracture (extrapolated; cut by graben)
Redondo Creek Graben
Valles Caldera National Preserve
Intersection C–C′
Intersection A–A′
Valles Ring Fracture
Cerro Santa Rosa
Cerros del Abrigo (vent projected)
Toledo Ring Fracture
Toledo Embayment
Turkey Ridge Dome (vent projected)
Cerro Toledo Dome Area (vent projected)
Santa Clara Pueblo
Santa Clara Creek
Tschicoma Peak
NE
B′
Elevation (feet above mean sea level)
Elevation (meters above mean sea level)
TD=4,006 ft
TD=2,809 ft
TD=10,532 ft
Reactivated collapse faults
Reactivated collapse fault
No vertical exaggeration


NW
C
Jemez Plateau
Rio Cebolla
San Antonio Creek
Valles Ring Fracture
San Antonio Mountain vent
Sulphur Creek
Toledo Ring Fracture (projected)
Intersection A–A′
Redondo Border
Redondo Creek Graben
Redondo Creek
Intersection B–B′
Valles Caldera National Preserve
Redondo Peak
Toledo Ring Fracture (projected)
Valles Ring Fracture
South Mountain vent
East Fork Jemez River
Aspen Ridge
Bearhead Pluton
Medio Dia Canyon
SE
C′
Elevation (feet above mean sea level)
Elevation (meters above mean sea level)
TD=5,658 ft
TD=4,735 ft
TD=5,513 ft
Reactivated collapse fault
Reactivated rift faults
Reactivated rift fault
Reactivated collapse and rift fault
No vertical exaggeration


106°40′0″W
106°25′0″W
36°0′0″N
35°50′0″N
Jarosa
Timmer et al. (2006)
Cerro del Grant
Lawrence et al. (2004)
Polvadera Peak
Kempter et al. (2004)
Valles Caldera National Preserve
Santa Clara Pueblo
Seven Springs
Kelley et al. (2004)
Valle San Antonio
Goff et al. (2006b)
Valle Toledo
Gardner et al. (2006)
Bandelier National Monument
Jemez Springs
Kelley et al. (2003)
Redondo Peak
Goff et al. (2006a)
Bland
Goff et al. (2005)
0
5 mi
0
8 km

Key to the new geologic quadrangles used to construct this map.