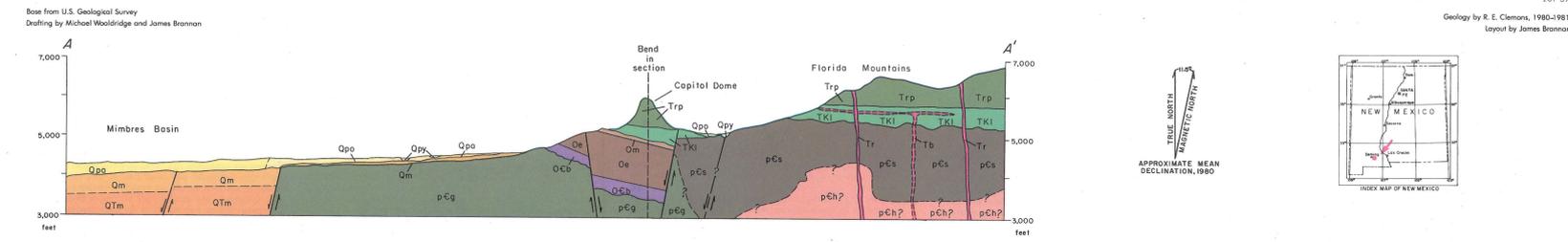


- DESCRIPTION OF UNITS**
- Qa** Windblown sand—Unconsolidated, dunes up to 10 ft (3 m) high, mostly underlain by caliche horizon, forms cover over rock and shown by symbol under the line, for example, Qa Qpo.
  - Qpy** Younger piedmont-slope alluvium—Fills (silt) to gravelly, of shallow drainageways cut below older fan and erosion surfaces graded to closed basins.
  - Qpo** Older piedmont-slope alluvium—Unconsolidated fan deposits, piedmont-valley fills, and erosion-surface veneers, associated with surfaces graded to closed basins, uppermost beds often composed of caliche (caliche) to several feet thick, exposed only in crevices and on a few bare slopes.
  - Qpa** Undifferentiated piedmont-slope alluvium—Complexly interbedded, older piedmont-slope alluvium and younger piedmont-slope alluvium (Qpo and Qpy).
  - Qca** Undifferentiated alluvium—Thin talus-slope veneers and colluvial and alluvial fills on eroded-slope side slopes, four or more feet thick on a few bare slopes.
  - Qbfy** Younger basin-floor sediments—Similar to Qbf except nonindurated, contain very fine pedogenic carbonate.
  - Qbfo** Older basin-floor sediments—Predominantly nonargillaceous to slightly argillaceous alluvium in the Mimbras Basin unaffected by argillaceous incision, moderately to well-indurated by pedogenic carbonate.
  - Qm** Mimbras formation—Fan gravel and interbedded sandy lenses representing piedmont-slope facies; includes thin erosion-surface veneers near mountain fronts, upper layers contain carbonate concretions (caliche) to several feet thick; thickness is 100 ft (30 m).
  - Qtm** Mimbras formation—Similar to Qm but found on higher terrace remnants, igneous rock clasts are much more intensely weathered; thickness is 200 ft (60 m).
  - Tr** Rhyolite of Little Florida Mountains—Irregular, domal to dike-like intrusions and small flows of pale-red to dark-gray-green, fine-bedded to blocky, phenocrysts are very coarse, includes two small outcrops along eastern margin of quadrangle, but much more extensive in Florida Geo quadrangle to east.
  - Ta** Hornblende-andesite dikes—Intensely altered and deeply weathered dikes ranging from 1 to 6 ft (0.3-1.8 m) thick, exposed only in crevices and on a few bare slopes.
  - Tb** Basalt or basaltic-andesite dikes and sills—Dark-gray to black, dense, aphanitic rock, a few dikes are diabasic, some of the rocks are slightly vesicular with carbonate and chlorite fillings.
  - Tr** Rhyolite dikes—Very light gray dikes ranging from 6 to 18 ft (1.8-5.5 m) thick, generally nonargillaceous, rhyolite fractures commonly stained with manganese oxides.
  - Trp** Rubia Peak Formation—Grayish-purple and reddish breccia of polyphitic volcanic clasts grading upward into greenish-gray breccia and conglomeratic sandstones, basal beds contain abundant granitic phenocrysts, upper beds are volcanic breccias with abundant argillaceous concretions, entire section is strongly pyroclastic, thickness is 1,600 ft (490 m).
  - TKI** Lobo Formation—Interbedded reddish shale and nodular shaly limestone, gray siltstone, sandstone, and pebbly-to-bouldery conglomerate, this unit is Danton's (1916) Lobo Formation, thickness is 500 ft (150 m).
  - Om** Montoya Formation—Basal, coarse sandy dolomite (Cable Canyon) overlain by dark-brown, coarse-crystalline dolomite (Upham); upper part of section consists of thin-bedded, medium-gray limestone and cherty limestone (Alman), thickness is 140 ft (42 m).
  - Oe** El Paso Formation—Basal unit of dark-gray, medium-crystalline dolomite overlain by thin- to medium-bedded, light- to medium-gray limestone and cherty limestone, few siltstone lenses, thickness approximately 1,000 ft (311 m).
  - Ocb** Bliss Sandstone—Basal, brown argillaceous and coarse sandstone overlain by white, medium- to coarse-grained sandstone and a few fine-crystalline limestone beds; thickness from 30 to 185 ft (15-56 m).
  - pCg** Conglomerate—Cobble-to-boulder conglomerate with dark-red and green shale matrix, described as diamicton by Corbit and Woodward (1973a), only exposure is 0.5 mi (0.8 km) north of Capitol Dome, thickness to approximately 40 ft (12 m).
  - pCs** Granite—Coarse-crystalline, red granite, contains approximately 60% perthite and microcline, 24% quartz, 5% chlorite (altered biotite), and 2% magnetite, zircon, sphene, and apatite, cut by few felsic and basaltic dikes, underlies Bliss Sandstone west of Capitol Dome.
  - pCs** Syenite and quartz syenite—Predominantly coarse crystalline with many apatite inclusions, fresh, unaltered rock is bluish gray, but prevailing outcrops are a yellowish brown, composition ranges from syenite with only a trace of quartz through quartz syenite to granite with 20% quartz.
  - pCh** Hornfels—Dark-gray, fine- to medium-crystalline rock intruded by quartz syenite, composed of 32% calcic orthopyroxene, 22% cordierite, 19% augite, 2% biotite, and 4% magnetite, all minerals altered to some extent.
  - pCm** Metamorphic sequence—Biotite schist, biotite-hornblende gneiss, and quartz-feldspar gneiss.



# Geology of Capitol Dome quadrangle, Luna County, New Mexico

by Russell E. Clemons, 1984

scale 1:24,000

**INTRODUCTION**

Capitol Dome quadrangle is in east-central Luna County, immediately southeast of Deming (fig. 1), NM-11 from Deming to Columbus parallels the edge of the quadrangle 0.1 mi (0.15 km) west of the quadrangle boundary. Paved roads to Rock House State Park cross the northern parts of the quadrangle, and several dirt roads to cattle tanks and windmills provide access to the southern parts.

The northwest end of the Florida Mountains occupies the extreme southeast corner of the Capitol Dome quadrangle and accounts for the highest elevation (7,100 ft, 2,164 m) in the quadrangle (fig. 2). Piedmont and alluvial fans extend northwest into the Mimbras Basin. The northwest half of the quadrangle with elevations between 4,220 and 4,320 ft (1,286-1,317 m) is in the western Mimbras Basin.

The Capitol Dome quadrangle was included in Danton's (1916) geologic map of Luna County and in the Deming Folio (Darton, 1917b). Lochman-Balk (1958, 1974) provided a detailed description of the Paleozoic section exposed west of Capitol Dome, and Griswold (1961) included generalized descriptions of the geology and mines in his report on the mineral deposits of Luna County. Corbit (1971, 1974) mapped the southeast corner of the quadrangle in his reports of the Florida Mountains. Discussions on the relationships of rocks exposed in the Florida Mountains to surrounding areas are included in Bogart (1953), Brooks (1974a, 1974b, 1980), Brooks and Corbit (1974), Brooks and others (1978), Corbit and Woodward (1973a), Danton (1917a, 1928), Greenwood and others (1970), Hawley (1981), Hayes (1975), Hoffer, R. L., and Hoffer, J. M. (1981), Hoffer, J. M., and Hoffer, R. L. (1981), Howe (1959), Jicha (1954), Kelley and Bogart (1952), Kottowski (1957, 1958, 1960, 1962, 1963, 1965, 1971, 1973), Kottowski and Foster (1962), Kottowski, Foster, and Wenger (1969), Kottowski, LeMone, and Foster (1969), Kottowski and Pray (1967), LeMone (1974), Lochman-Balk (1958, 1974), Loring and Armstrong (1980), Loring and Loring (1980), Lynn (1975), Thompson (1982), Wilson and others (1969), and Woodward (1970, 1973b). Structural features in the Florida Mountains and regional tectonics affecting the Florida Mountains have been discussed by Brown (1982), Brown and Clemons (1983), Corbit and Woodward (1970, 1973b), Elston (1958), Turner (1962), Woodward (1980), and Woodward and DuChene (1981).

This report is the result of detailed geologic study conducted during 1980 and 1981 and is the second phase of a comprehensive geologic and mineral-resource investigation of the Florida Mountains. The first phase, a geologic map of the Capitol Dome quadrangle (phase 1) was completed in 1981-82 (Clemons and Brown, 1983), followed by a geologic study of the South Peak quadrangle (phase 2) completed in 1982 and submitted for publication in 1983. Two master's theses involving studies of the Lobo Formation by Irene S. Lemley (1982) and Mahoney mining district by Glen A. Brown (1982) were conducted as parts of phase 2.

Danton's (1916) map of the Capitol Dome quadrangle is the classification of Streckeisen (1976, 1978).

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**STRATIGRAPHY**

**Precambrian rocks**

Precambrian rocks crop out along the western foot of the Florida Mountains and include five map units: 1) high-grade metamorphic sequence containing schists and gneisses, 2) hornfelses, 3) quartz syenite, 4) granite, and 5) diamicton.

**Metamorphic sequence (pCm)**—Two low hills on the southwest side of the mouth of Mexican Canyon are underlain by granite gneiss interlayered with biotite schist, biotite and hornblende gneisses, and amphibolite belonging to unit 1. The granite gneiss is fine to medium crystalline, strongly foliated, and contains approximately 58% potassium feldspar, 33% quartz, 7% biotite, 2% plagioclase, magnetite, and apatite. The potassium feldspar is chiefly orthoclase with kaolinite and sericitic alteration. One modal analysis of a fine-crystalline, dark-gray gneiss with faint foliation gave a composition of approximately 36% hornblende, 33% orthoclase, 16% quartz, 11% biotite, and 4% accessories including magnetite and apatite. The oldest rocks are probably the metamorphic rocks although their relation to the other candidate (hornfelses) is unknown, and their outcrops are separated by approximately 1 mi (1.6 km).

**Hornfelses (pCh)**—Unit 2 contains dark-gray, fine- to medium-crystalline hornfelses that crop out around the Stenson and Copper Queen mines, in the central part of sec. 14, T. 25 S., R. 8 W., Lindgren and others (1910) described this rock as an andesite; Griswold (1961) referred to it as sheets and masses of chlorite and gabbro intruded by pink and gray granite. Corbit (1971) described the same rock as a northwest-dipping sill of diabase and gabbroic rock intrusive into syenite. Extinction angles on plagioclase, using the Michel-Levy method, indicate it has an An<sub>50</sub> content, thus placing the rock in the diorites. The average of three modal analyses of medium-crystalline samples with optically texture is 52% calcic andesine, 23% urtite, 19% augite, 2% biotite, 4% magnetite, and a trace of apatite. The plagioclase has been intensely altered, chiefly to saussurite and some sericite. All of the small pyroxenes have been converted to urtite; some large pyroxene crystals are partially unaltered. The biotite is closely associated with magnetite and probably a result of deuteric alteration of the pyroxenes. The finely crystalline hornfels contains little or no pyroxene unaltered to urtite and even more intense sericitization and saussurization of the plagioclase than the more coarsely crystalline rocks.

Xenoliths of the hornfelses are abundant in the quartz syenite from Tubb Spring southeastward to beyond the southern edge of the Capitol Dome quadrangle. In some parts of the northwest-trending ridges between Tubb Spring and Stenson mine, outcrops are close to 50% of each rock type. Quartz syenite veins and dikes cutting the hornfelses are seen in many exposures in the arroyos. Apatite phases of quartz syenite are present along some of the intrusive contacts.

Brooks (1974b, 1980) reported K-Ar ages for hornblende in the (gabbro) hornfelses ranging from 530 to 555 m.y., and K-Ar ages for hornblende in the quartz syenite of 418 and 419 m.y. He also reported Rb-Sr ages on feldspars from the quartz syenite ranging from 456 to 515 m.y. Although I believe that all these

ages are too young due to intense late Tertiary (?) alteration of these rocks, the chronology of the hornfelses being older than the quartz syenite agrees with field observations (Clemons, 1982c).

**QUARTZ SYENITE (pCs)**—Plutonic rock, ranging in composition from granite to quartz syenite and syenite, crops out from Tubb Spring to beyond the southern edge of the Capitol Dome quadrangle. This plutonic rock is the predominant rock type in much of the Gym Peak and South Peak quadrangles to the southeast and south, respectively. The unaltered, fresh rock is medium light gray (N6) to medium bluish gray (5B5.1), but in fresh exposures at Capitol Dome the rock varies from pink to red brown and yellowish brown as a result of hydrothermal alteration and deep chemical weathering. The texture is predominantly coarse to very coarse, with some fine- and medium-textured rocks. Locally the rock tends toward porphyritic with perthite crystals up to 2 cm long. Six modal analyses on two altered rock samples 0.5 mi (0.8 km) southeast of Tubb Spring, two fresh samples from core FM4 (Brooks and others, 1978) 3.5 mi (5.6 km) south-southeast of Tubb Spring (in South Peak quadrangle), and two fresh samples from core FMS (Brooks and others, 1978) 3.9 mi (6.2 km) southeast of Tubb Spring (in Gym Peak quadrangle) provide the following ranges in mineral content: microcline and perthite, 58.2-93.0%; quartz, 0.2-18.2%; hastingsite, 0.8-12.2%; biotite, trace-2.8%. One sample contains 14% augite, but not more than a trace is identified in the other samples. Accessory minerals include magnetite, apatite, zircon, and sphene.

**GRANITE (pCa)**—Precambrian granite underlies the Bliss Sandstone west and northwest of Capitol Dome in the E1/2 sec. 10, T. 25 S., R. 8 W. This granite intrudes the high-grade metamorphic sequence in the extreme northeast corner of sec. 10. The granite is coarse-crystalline, reddish rock that is deeply weathered and altered. The mean of 12 thin sections from core FM5 (Brooks and others, 1978) through depths of 3 and 30 ft (1 and 9 m) have the following mineral content: 69% perthite, microcline, and minor plagioclase; 24.4% quartz; 4.3% chlorite (altered biotite); 2.1% magnetite (chiefly from altered biotite); and trace amounts of zircon, sphene, and apatite. The feldspars are intensely kaolinized, but string and patch perthite with sodic plagioclase rims can be distinguished in most samples. The quartz is typically dusted with dark inclusions and possesses slight undulatory extinction and faint rhombic cleavage. Some quartz is in graphic intergrowth with microcline. The granite is cut by numerous apite and mafic dikes of probable Precambrian age.

**DIAMICTITE (pCg)**—A small exposure of diamicton, located along the north end of the line between secs. 10 and 11, T. 25 S., R. 8 W., rests unconformably on the mafic gneisses and is overlain unconformably by Bliss Sandstone. The diamicton is 40 ft (12 m) thick and consists of small pebbles to large boulder clasts in a red and greenish fissile shale matrix (Corbit, 1971; Corbit and Woodward, 1973a). The clasts include 45% lithic sandstone, 17% siltstone, 17% siliceous ironstone, 1.2% diabase, and 10% granite. Corbit (1971) suggested a mudflow origin, and Corbit and Woodward (1973a) supported a glacial origin for these beds. Evidence cited in support of a glacial origin include: 1) sedimentary structures caused by ice-raftered boulders, 2) exotic clasts, and 3) resemblance to Precambrian diamictons from Alaska to California. No conclusive evidence was found during this study.

**Paleozoic rocks**

**BLISS SANDSTONE (Ocb)**—The Bliss Sandstone crops out intermittently for approximately 1 mi (1.6 km) along the lower slopes

west and northwest of Capitol Dome. It varies in thickness from 50 to 200 ft (15-60 m) occurring as channel-fill deposits or filling depressions cut in the Precambrian granite. The Bliss Sandstone is conformably overlain by the El Paso Formation. Basal Bliss beds in the Capitol Dome area are typically arkosic, ranging from Tubb Spring to beyond the southern edge of the Capitol Dome. The arkosic sandstone above the basal units is greenish due to chlorite and mafic rock-fragment content. A red cemented sandstone 0.5 mi (0.8 km) west of Capitol Dome is interbedded with hematite. Interbedded sandy limestone, dense gray limestone, and thin black shale and an upper white quartzite unit complete the section.

These rocks were mapped as Bliss by Danton (1916, 1917b) and Corbit (1971). Two stratigraphic sections west of Capitol Dome were measured and described by Lochman-Balk (1958, 1974). The regional aspects of the Bliss Sandstone, including its occurrence in the Florida Mountains, were described by Flower (1953a, 1953b, 1965), Hayes (1975), Kottowski (1963), and Thompson and Potter (1981).

**EL PASO FORMATION (Oe)**—The El Paso Formation forms an arcuate outcrop around the western slopes of Capitol Dome. It generally dips easterly, but attitudes vary locally reflecting structural deformations. Lochman-Balk (1958, 1974) described three lithic units in the El Paso Group at Capitol Dome but did not assign any formation names. The basal unit consists of 155-200 ft (47-60 m) of thin-bedded, dark-gray, medium-crystalline dolomite. The medial unit is 750 ft (229 m) of thin- to thick-bedded, light-gray to blue-gray limestone. These beds contain numerous stromatolite and sponge reefs and fossiliferous, oolitic, pellicular, and algal beds. The upper unit contains 115 ft (35 m) of medium to the medial unit. Abundant chert lenses and elongate nodules make up as much as 25% of some of the upper-unit beds. The chert and reddish-brown weathering aspect of these strata aid in identifying the upper unit. The upper unit is in fault contact with the middle lithic unit at Capitol Dome. Compared to complete sections of El Paso near Gym Peak, approximately 5 mi (8 km) to the southeast, the top 150 ft (45 m) of the middle unit and lower 70 ft (21 m) of the upper unit are probably not exposed at Capitol Dome due to faulting.

Danton (1916, 1917b) referred to these rocks as El Paso limestone, which had been named in the Franklin Mountains by Richardson (1904, 1909). Kelley and Silver (1952) raised the El Paso to group status, but various formations that have been named in the El Paso are not mappable at 1:24,000 scale; therefore, El Paso Formation is used in this report. The Capitol Dome section was measured and described by Lochman-Balk (1958, 1974) and remapped by Corbit (1971). Discussions of regional correlations and depositional environments are included in Flower (1953b, 1965), Hayes (1975), Kottowski (1963), Kottowski, LeMone, and Foster (1969), LeMone (1969), Lucas (1969), and Lynn (1975).

**MONTAYA FORMATION (Om)**—The Montoya does not qualify as a group in southwest and south-central New Mexico, nor can it accurately be called the Montoya Dolomite, because the unit consists of alternating limestone, chert, and sandstone. In this map area I am changing its status to formation. The four members that compose the Montoya Formation (basal Cable Canyon Sandstone, Upham Dolomite, Alman Dolomite, and Catter Dolomite) at their type localities in the Caballo Mountains (Kelley and Silver, 1952) are easily recognized in the southern Florida Mountains. The Cable Canyon Sandstone, however, is only represented by basal sandy beds of the Upham Dolomite. None are thick enough to be shown at the scale of this map.

**Mesozoic (?)—Cenozoic rocks**

**LOBO FORMATION (TKI)**—The Lobo Formation forms a continuous outcrop band from Mexican Canyon to the southeast corner of the quadrangle. It rests nonconformably on Precambrian gneisses

at its northern end, to the south the Lobo Formation rests with angular unconformity on El Paso and Montoya strata in a faulted fault block at Capitol Dome. The Lobo rests nonconformably on Precambrian quartz syenite from Tubb Spring to the southeast corner of the quadrangle and across the Florida Mountains to its type locality in Lobo Draw on the east side. The thickness of the Lobo Formation ranges from less than 100 ft (30 m) to more than 500 ft (150 m) in this area, primarily due to the irregular topography upon which it was deposited. Its top is an erosional discontinuity beneath the Rubia Peak Formation, but the surface does not appear to have been deeply channelled.

The basal part of the Lobo Formation reflects the underlying rocks. Where it rests on the Precambrian, the Lobo is a cobble-to-boulder conglomerate with abundant clasts of granite, syenite, gneiss, Bliss Sandstone, and Paleozoic limestone, dolomite, and chert. Upon the El Paso and Montoya rocks west and south of Capitol Dome, the Lobo Formation is a limestone-chert-dolomite cobble conglomerate with red mudstone matrix. This conglomerate may be a karst-filling deposit.

The typical Lobo in the Capitol Dome quadrangle above these basal units is thin- to medium-bedded, light-gray, calcareous silt-

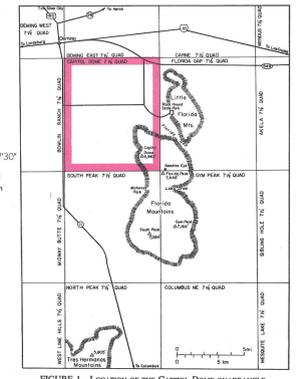


FIGURE 1—LOCATION OF THE CAPITOL DOME QUADRANGLE.

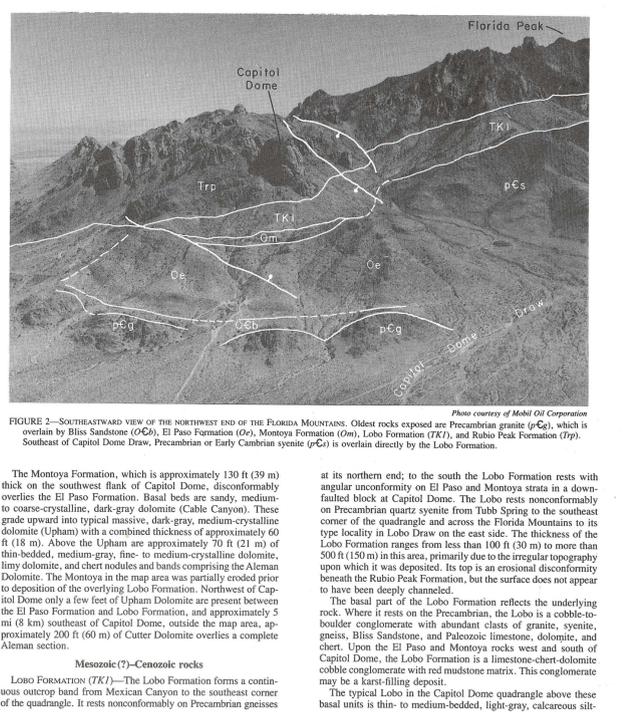


FIGURE 2—SOUTHWESTWARD VIEW OF THE NORTHWEST END OF THE FLORIDA MOUNTAINS. Oldest rocks exposed are Precambrian granite (pCa), which is overlain by Bliss Sandstone (Ocb), El Paso Formation (Oe), Montoya Formation (Om), Lobo Formation (TKI), and Rubia Peak Formation (Trp). Southeast of Capitol Dome Draw, Precambrian or Early Cambrian syenite (pCs) is overlain directly by the Lobo Formation.