DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN FILE REPORT 89-282
SHEET 1 OF 2

Base from U.S. Geological Survey, 1981

SCALE 1:100 000
1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND
CONTOUR INTERVAL 50 METERS

Photogeology and field checks by G.R. Scott, 1980-82; geology by C.L. Pillmore, 1982-87 (compiled on a PG-2 photogrammetric plotter); geology of Cass Grande 15' quadrangle from C.L. Pillmore (1969); geology of Brilliant 15' quadrangle partly from W.T. Lee (1922); geology of Cimarron 15' quadrangle partly from A.A. Wanek (1963); geology of Pine Buttes quadrangle largely from M.H. Staatz (1968)

Geologic map

CORRELATION OF MAP UNITS

DESCRIPTION OF MAP UNITS

(In order to describe all rocks of the Union all complex together, descriptions of some units are given in the order of emplacement. The correct age sequence of rocks of the complex is shown above)

af **Artificial fill (Historic)**—Chiefly spoil at coal mines at Hagerite, Koehler, and Gardner and varyingmaterial fill at construction sites near Raton. The artificial fill of highway and railroad embankments is not shown separately on the geologic map.

Qal **Alluvium (upper Holocene)**—Yellowish-gray, silty to gravelly, stratified, stream deposits in lowest parts of valleys. Locally, includes a thin veneer of eolian sand and silt. Generally, upper part, only a few feet thick, is soil. Locally, includes a thin deposit of alluvium that lacks a soil. It was deposited between about 1,500 yr ago and the beginning of the last ice age (about 1000 A.D.); the lower part, about 13 ft (4 m) thick, is more firmly consolidated and was deposited during the last ice age. Generally, a sandy silicious-containing sparse pebbles. Generally, about 50 ft (14 m) of gravel composed chiefly of pebbles, cobbles, and boulders of sandstone, igneous, and metamorphic rocks. Grades upward into finer grained, a sandy gravel and a sandy loam. Thickness of the alluvium is as much as 30 ft (9.1 m) or locally more. Thickness of the alluvium is as much as 30 ft (9 m).

Qfa **Alluvium (Holocene and upper Pleistocene)**—Yellowish-gray, clayey, sandy, stratified silt and clay deposited on the floors of alluvial valleys in small depressions, mostly in the east-central part of the quadrangle. Thickness is as much as 10 ft (3 m).

Qfo **Alluvium (Holocene and upper Pleistocene)**—Fan-like accumulations of poorly sorted, crudely to well-stratified, cross-stratified, sandy, pebbly, cobbly, and bouldery alluvium. Generally, yellowish-brown where deposited on sandstone and yellowish-gray where deposited on slopes steeper than those covered by sheetwash alluvium (Qsw). Chiefly, derived from the erosion of the sandstone and shale. Generally about 10 ft (3 m) thick.

Qfm **Sheetwash alluvium (Holocene and upper Pleistocene)**—Yellowish-gray, clayey, sandy, stratified silt and clay deposited on gentle slopes and generally thinner deposits on steeper slopes. Grades downward to Qfo. Chiefly, derived from the erosion of the sandstone and shale. Thickness of alluvium is well stratified and has a 2-5% (2-4 my) thick soil in the upper part. The younger part of this unit is equivalent to the Capulin Basalt of Collins (1949) and Dalton (1925).

Qc **Colluvium (Holocene and upper Pleistocene)**—Yellowish-gray to grayish-brown, fine- to coarse-grained, unconsolidated, generally poorly stratified, locally well-stratified, slope deposits. Derived from landslide deposits by having pebbly, cobbly, and bouldery; contains large blocks of the basalt, basanite, and phonolite that cap the mesas. Generally, about 10 ft (3 m) thick.

Qls **Landslide deposit (Holocene and upper Pleistocene)**—Dark-gray and yellowish-gray deposits consisting of large blocks or a jumble of angular blocks of gravel, boulders, and cobbles of the basalt that caps the mesas. Unit formed on steep unstable slopes of mesas. Generally, about 50 ft (15 m) thick. Some of the landslide deposits could occur where the toe of a slide is indistinct or the head is eroded, especially where deposits are saturated.

Qtg **Talus and glacial deposits (Holocene)**—Deposits of angular blocks of gravel, boulders, cobbles, and sand of basaltic rock of the basalt that caps the mesas. Unit formed on steep unstable slopes of mesas. Generally, about 50 ft (15 m) thick.

Qrg **Rock glacier (Holocene and upper Pleistocene)**—Lobate deposits consisting of angular fragments of hornblende rhyodacite in steep valleys near the top of Rail Road Mountain, in the southeastern corner of the map

Classification of Volcanic and Subvolcanic Rocks

The names of the volcanic and subvolcanic rocks in this quadrangle are those used by Scott and others (in press) and Staatz (1972) to describe the igneous rocks of the Raton quadrangle. This classification system (fig. 1), which is based on the chemical analyses of rocks in the Raton quadrangle and in all well suited for the igneous rock suite of the Raton area.

Qb **Capulin basalt (Holocene)**—Dark-gray to black, vesicular, porphyritic flows and, less commonly, dikes that range in composition from andesitebasalt to latitebasalt but are mostly olivine basalt. Generally, contains sparse phenocrysts of olivine, pyroxene (a ferromagnesian mineral), finely crystalline, or aphanitic, and composed of lathe of plagioclase, clinopyroxene, magnetite, and olivine, augite, sugarcite, and accessory apatite. Texture is intergranular. Unit forms volcanic cones and flows in young valleys. The flows, which are as much as 100 ft (30 m) thick, are commonly observed to have rough clinkery and spinose surfaces, and commonly have tumuli on their surfaces. The cones are steep and range in height from about 100 ft (30 m) to 1,000 ft (300 m). They are composed of ash, scoria, bombs, and blocks in various states of induration. Unit is equivalent to the Capulin Basalt of Collins (1949) and Dalton (1925). Unit is of Pleistocene and Holocene age and is probable source to those, the flows are designated older or younger and the different flow sheets are mapped separately.

Tbp **Basalt and basanite plugs (Miocene)**—Dark-gray to black, porphyritic basalt and basanite. Basalt contains olivine phenocrysts; basanite contains olivine and nepheline phenocrysts. Samples only were studied from three exposures of Dalton Formation.

Tbc **Basalt cinder cone (Miocene)**—Basaltic ash and cone lapilli and bombs. Forms a small cinder cone in the NE¼ sec. 29, T. 31 N., R. 24 E., on the central crests of Los Pinos; cone rises locally from near the base of the cones.

Tbl **Basalt of Los Pinos, Miocene and upper Pliocene(?)**—Dark-gray to brownish-gray, stratified grades composed mostly of nepheline, olivine, and some boulders of sedimentary, igneous, and metamorphic rocks. Crops in abrupt and well-stratified and interlayered with lenses of sand. Uppermost part of olivine basalt flow in the NE¼ sec. 29, T. 31 N., R. 24 E., on the Los Pinos. Thickness of this unit is as much as 30 ft (9 m).

Tp **High-level gravel (Miocene?)**—Largely composed of Precambrian quartzite and metamorphic rocks as large as 2 ft (0.6 m) in diameter and locally contains bodies of basalt; rounded pebbles of the basalt that caps the mesas. Crops out on the tops of mesas and below early basalt flows and is probably of Miocene and older age. Thickness of the alluvium as much as 30 ft (9 m).

Qtal **Alluvium and terrace deposits (Holocene and Pleistocene)**—Alluvium and terrace deposits of Dry Cimarron River and Cimarron River.

Qtch **Higher (older) terrace level** about 60 ft (18 m) above stream.

Qtcm **Dalton sand and silt (Holocene and upper Pleistocene)**—Yellowish-gray, yellowish-brown, brown, or light-brown, well-consolidated, stratified sand and silt. Crops out in the valley of Dry Cimarron River. Unit is fairly well-developed soil in the upper part that has moderate-brown B horizon 24 in. (61 cm) thick and Cca horizon 12 in. (30 cm) thick. Thickness of the unit is 10 ft (3 m).

Qfa **Dalton Alluvium (Holocene and upper Pleistocene)**—Yellowish-gray, stratified gravel composed chiefly of flat basalt and sandstone pebbles. Crops out in the valley of Dry Cimarron River and locally the lowest part of the unit is clayey, sandy material by calcium carbonate. The upper part of the alluvium is less consolidated than the lower part and is a sandy loam. Unit has a well in thick soil and contains a thick Bca horizon. Thickness of clay B horizon with strong prismatic structure underlain by a B horizon that has strong platy structure and is underlain by a Cca horizon that has a strong concentration of calcium carbonate that forms 1/4-in. (6-mm) to 1-in. (25-mm) thick plates. Thickness of the Dalton Alluvium locally forms three terraces near its source in the high mesas; down valley these terraces merge into a single terrace.

Qc **Colluvium (Holocene and upper Pleistocene)**—Yellowish-gray to grayish-brown, fine- to coarse-grained, unconsolidated, generally poorly stratified, locally well-stratified, slope deposits. Derived from landslide deposits by having pebbly, cobbly, and bouldery; contains large blocks of the basalt, basanite, and phonolite that cap the mesas. Generally, about 10 ft (3 m) thick.

Qls **Landslide deposit (Holocene and upper Pleistocene)**—Dark-gray and yellowish-gray deposits consisting of large blocks or a jumble of angular blocks of gravel, boulders, cobbles of the basalt that caps the mesas. Unit formed on steep unstable slopes of mesas. Generally, about 50 ft (15 m) thick. Some of the landslide deposits could occur where the toe of a slide is indistinct or the head is eroded, especially where deposits are saturated.

Tbg **Talus and glacial deposits (Holocene)**—Deposits of angular blocks of gravel hornblende rhyodacite in the steep southeastern flank of Laughlin Peak and deposits of blocks of the basalt that caps the mesas. Unit formed on steep unstable slopes of mesas.

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Qbam **Basalt and basanite of Mesa Alta (Holocene)**—Dark-gray to black, porphyritic basalt and basanite. Basalt contains olivine phenocrysts; basanite contains olivine and nepheline phenocrysts. Samples only were studied from three exposures of Dalton Formation.

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Tfa **Alluvium (Holocene and upper Pleistocene)**—Fan-like accumulations of poorly sorted, crudely to well-stratified, cross-stratified, sandy, pebbly, cobbly, and bouldery alluvium. Generally, yellowish-brown where deposited on sandstone and yellowish-gray where deposited on slopes steeper than those covered by sheetwash alluvium (Qsw). Chiefly, derived from the erosion of the sandstone and shale. Generally about 10 ft (3 m) thick.

Tsd **Sheetwash alluvium (Holocene and upper Pleistocene)**—Yellowish-gray, clayey, sandy, stratified silt and clay deposited on gentle slopes and generally thinner deposits on steeper slopes. Grades downward to Qfo. Chiefly, derived from the erosion of the sandstone and shale. Thickness of alluvium is well stratified and has a 2-5% (2-4 my) thick soil in the upper part. The younger part of this unit is equivalent to the Capulin Basalt of Collins (1949) and Dalton (1925).

Tc **Colluvium (Holocene and upper Pleistocene)**—Yellowish-gray to grayish-brown, fine- to coarse-grained, unconsolidated, generally poorly stratified, locally well-stratified, slope deposits. Derived from landslide deposits by having pebbly, cobbly, and bouldery; contains large blocks of the basalt, basanite, and phonolite that cap the mesas. Generally, about 10 ft (3 m) thick.

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