

LIST OF MAP UNITS

The complete description of map units and references are in the accompanying Author's Notes.

SURFICIAL DEPOSITS

ALLUVIAL DEPOSITS

- Qa1 Alluvial unit one (Holocene)
- Qa2 Alluvial unit two (upper Pleistocene)
- Qa Alluvial units one and two, undivided (Holocene and upper Pleistocene)
- Qao Older alluvium, undivided (middle or lower? Pleistocene)

MASS-WASTING DEPOSITS

- Qlsy Younger landslide deposits (Holocene)
- Qptr Protalus-rampart deposits (Holocene)
- Qc Colluvium (Holocene and upper Pleistocene)
- Qta Talus (Holocene and upper Pleistocene)
- Qls Landslide deposits (Holocene and upper Pleistocene)
- Qlso Older landslide deposits (Pleistocene)

ALLUVIAL AND MASS-WASTING DEPOSITS

- Qly Younger fan deposits (Holocene and upper Pleistocene)
- Qac Alluvium and colluvium, undivided (Holocene and upper Pleistocene)
- Qfo Older fan deposits (Pleistocene)
- Qaco Older alluvium and colluvium, undivided (Pleistocene)

GLACIAL DEPOSITS

- Qmy Morainal deposit one (upper Pleistocene); locally subdivided into younger (Qm.y) and older (Qm.o) units
- Qmt Morainal deposit two (upper middle Pleistocene)

PERIGLACIAL DEPOSITS

- Qs Solifluction deposits (Holocene and upper Pleistocene)

DIAMICTON

- Qdi Diamicton (upper Pleistocene)
- Qdio Older diamicton (upper middle Pleistocene)

BEDROCK

TERTIARY SEDIMENTARY AND IGNEOUS ROCKS

- Santa Fe Group (upper Oligocene? and Miocene)
- Informal sedimentary member of the Santa Fe Group
- Lower Santa Fe Group sedimentary rocks (upper Oligocene? and Miocene)
- Informal volcanic members of the Santa Fe Group
- Tdb Dacitic breccia (Miocene)
- Td Dacite (Miocene)
- Tbtc Basaltic to trachybasaltic andesite cinder deposits (Miocene)
- Tbt Basaltic to trachyandesitic rocks (Miocene)
- Tim Mafic dike (Miocene or Oligocene)
- Tvc Volcaniclastic deposits (Oligocene)
- Tgd Granodiorite (Miocene)

MESOZOIC AND PALEOZOIC SEDIMENTARY ROCKS

- Ku Upper Cretaceous rocks, undivided; includes Pierre Shale, Niobrara Formation, Carlile Shale, Greenhorn Limestone, and Graneros Shale
- Kdp Dakota Sandstone and Purgatoire Formation, undivided (Lower Cretaceous)
- Jm Morrison Formation (Upper Jurassic) and Entrada Sandstone, undivided (Middle Jurassic)
- Tj Johnson Gap Formation and Trujillo Formation, undivided (Triassic)
- PPsc Sangre de Cristo Formation (Lower Permian and Upper Pennsylvanian)
- IPm Madera(?) Formation (Middle Pennsylvanian)

LOWER PALEOZOIC OR NEOPROTEROZOIC INTRUSIVE ROCKS

- Zsg Gabbro

PALEOPROTEROZOIC INTRUSIVE ROCKS

- Xp Pegmatite
- Xap Aplitite
- Xg Gneissic granite
- Xag Granitic augen gneiss

LAYERED PALEOPROTEROZOIC ROCKS

- Xhb Hornblende-biotite gneiss and amphibolite
- Xa Amphibolite
- Xf Felsic gneiss

MAP SYMBOLS

- Contact—Approximately located
- Fault—Dashed where approximately located; dotted where concealed; queried where uncertain; ball and bar on downthrown side; tick mark shows dip of fault plane; arrow shows trend and plunge of fault striae lineation (slickenlines); on cross section direction of strike-slip motion indicated by T (towards) and A (away)
- Thrust fault—Dashed where approximately located; dotted where concealed; barbed teeth are on overthrust block side of fault
- Moraine crest
- Qdi / Tvc Multiple unit symbol—Indicates a thin veneer of one deposit (upper unit) overlies another deposit (lower unit)
- Large block of relatively intact rock within and part of a landslide complex (includes toreva blocks)
- Zone of strong brittle deformation—Highly fractured and locally brecciated area along the El Fraguoso fault near its intersection with the Ricardo Creek thrust fault; numerous minor faults within this zone are not shown individually
- Shear zone or wide fault zone
- Strike and dip of sedimentary beds or volcanic flow layering—Angle of dip shown in degrees
- Strike and dip of overturned sedimentary beds—Angle of dip shown in degrees
- Approximate strike and dip of sedimentary beds—Estimated from aerial photography; two tick marks indicate dip is between 30 degrees and 60 degrees
- Strike and dip of flow foliation in volcanic rocks—Angle of dip shown in degrees
- Strike and dip of S1 foliation in metamorphic rocks—Angle of dip shown in degrees
- Strike and dip of S2 foliation in metamorphic rocks—Angle of dip shown in degrees
- Strike and dip of fractures and joints—Angle of dip shown in degrees; arrow shows trend and plunge of striae (slickenlines); angle of plunge shown in degrees
- Inclined
- Vertical
- Trend and plunge of small fold axis—Angle shown in degrees
- Paleocurrent direction—Direction estimated from the orientation of imbricated gravel clasts
- Trend and plunge of mineral lineations in metamorphic rocks—Angle of dip shown in degrees
- CP1 Location and identification number of rock sample with major-element geochemical analyses (see appendix 1 in booklet for analysis)
- JK034 Location and identification number of rock sample with trace-element geochemical analyses (see appendix 2 in booklet for analysis)
- CP46 Location and identification number of rock sample with major-element geochemical analysis and "Ar"/Ar age date (see Appendix 1 in booklet for analysis and Table 1 for age date)
- A—A' Alignment of cross section

GEOLOGIC MAP OF THE SOUTHERN HALF OF THE CULEBRA PEAK QUADRANGLE,  
COSTILLA AND LAS ANIMAS COUNTIES, COLORADO

By Robert M. Kirkham, John W. Keller, Jason B. Price, and Neil R. Lindsay  
2005



Bill Owens, Governor,  
State of Colorado  
Russell George, Executive Director,  
Department of Natural Resources  
Vincent Matthews,  
State Geologist and Division Director,  
Colorado Geological Survey