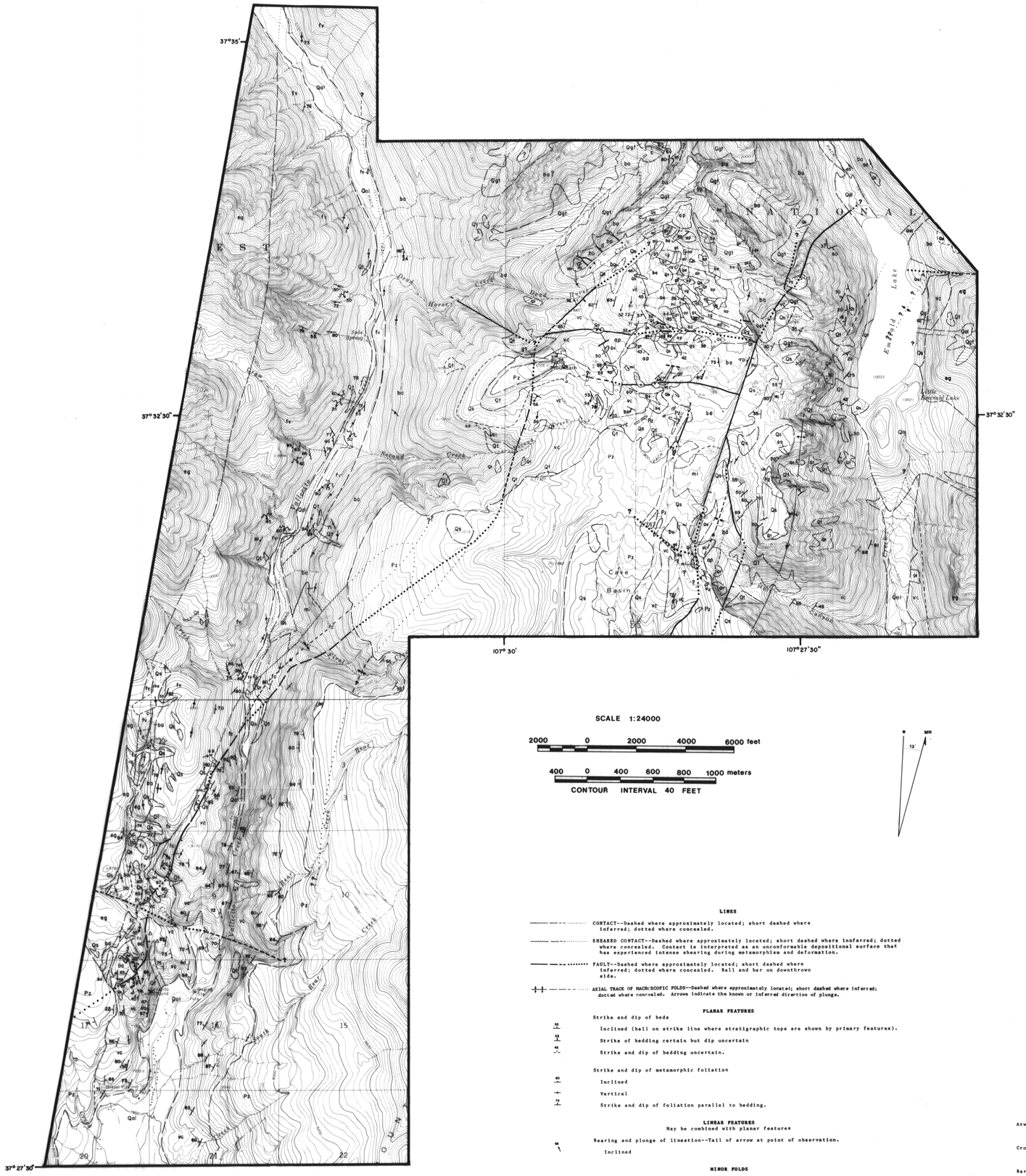
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 94-437
PLATE 2 OF 2



SCALE 1:24000

2000 0 2000 4000 6000 feet

400 0 400 600 800 1000 meters

CONTOUR INTERVAL 40 FEET

MN 13°

Base from U.S. Geological Survey topo series 1:24,000
Columbine Pass, Emerald Lake, Granite Peak, Vallecito
Reservoir, Colorado.

DESCRIPTION OF MAP UNITS

QUATERNARY DEPOSITS

Qal ALLUVIAL AND DEBRIS FLOW DEPOSITS (HOLOCENE)--Unconsolidated deposits of sand and gravel confined to major drainage basins and their tributaries.

Qt TALUS (HOLOCENE)--Composite cones and aprons of angular, pebble to boulder sized blocks, deposited at the base of cliffs and on the flanks of steep ridges.

Qs SOIL AND BOG/POND DEPOSITS (HOLOCENE)--Soil, bogs, and ponds through which little or no bedrock is exposed; commonly covered with a thick blanket of vegetation.

Qls LANDSLIDE DEPOSITS (HOLOCENE)--Jumbled rock debris located south and east of Emerald Lake. This deposit is composed of angular blocks of Eolus Granite often exceeding 1 m in maximum dimension that were derived from the steep granite walls along the eastern side of Lake Creek. It forms a natural levee that blocks Lake Creek and is responsible for the development of Emerald Lake. Atwood and Mather (1932, page 159) attribute its formation to oversteepening of the canyon walls due to glaciation.

Qg GLACIAL DEBRIS (PLEISTOCENE AND HOLOCENE)--Poorly sorted ice (inactive) glacier deposits which commonly form arcuate, toe-shaped ridges characterized by hummocky and furrowed surfaces along steep valley walls and cirques; active rock glaciers; and sheets to small lobes confined to gentle slopes that formed as the result of glacier processes and/or frost action (i.e. permafrost).

Qgt UNDIFFERENTIATED GLACIAL AND TALUS DEPOSITS (PLEISTOCENE AND HOLOCENE).

PALEOZOIC ROCKS

Pz UNDIFFERENTIATED SEDIMENTARY ROCKS (UPPER CAMBRIAN-LOWER PERMIAN)--Includes the Upper Cambrian Ignacio Quartzite, Devonian Elbert Formation and Ouray Limestone, Mississipian Leadville Limestone, Pennsylvanian Molas and Hermosa Formations, and Lower Permian Rico Formation (Steven and others, 1974).

d UNMETAMORPHOSED DIABASE (?)--Phaneritic, fine-grained diabase dike exposed on the sharp ridge separating the north and south branches of Dead Horse Creek. This dike is composed largely of unaltered pyroxene and plagioclase (subophitic) and appears to have been intruded subsequent to regional metamorphism of the Irving Formation. Its absolute age, however, is unknown. It could correlate with diabase dikes observed in the Irving Formation in the Animas River-Deep Creek area (Cross and others, 1905) which Barker (1969c, page A29) suggests might be Cambrian in age.

PROTEROZOIC METAMORPHIC AND PLUTONIC ROCKS

eg EOLUS GRANITE (MIDDLE PROTEROZOIC)--Brick-red to reddish-orange or gray, medium- to coarse-grained biotite-hornblende quartz monzonite, biotite quartz monzonite, granite, and granodiorite. Mappable dikes of granite, pegmatite, aplite, and quartz porphyry interpreted as offshoots from main bodies of Eolus Granite are included.

vc VALLECITO CONGLOMERATE (EARLY PROTEROZOIC)--Interstatified clast to matrix supported pebble to boulder conglomerate, sandstone, and minor siltstone. Clast types in conglomeratic beds include chert, epidote-rich quartzite, jasper, hemitite-banded jasper, milky and white quartz, banded iron formation, grayish-white to gray quartzite, and argillite or meta-argillite. Clasts of "amphibolite, greenstone, epidote-quartz gneiss, biotite-quartz-plagioclase schist, chlorite schist, and phyllite" have also been reported (Burns and others, 1980). Bedding and well-preserved primary sedimentary structures are displayed in most exposures.

fc CONGLOMERATE OF FALL CREEK (EARLY PROTEROZOIC)--Matrix to clast supported, polymictic conglomerate and subordinate lenses of cross-stratified sandstone. Conglomerate contains abundant pebble- to cobble-sized clasts of mafic to intermediate igneous rocks, bluish-gray to grayish-white quartzite, and vein quartz. Fragments of felsic to mafic schist and gneiss were observed locally. Clasts are set in a very fine- to fine-grained greenish-black matrix composed principally of quartz, lithic fragments, opaque oxides, biotite, and actinolitic hornblende. A strong pebble/mineral lineation and foliation are displayed in most outcrops. This unit is interpreted as debris flow deposits and minor channel sands that were deposited at or near the base of the Vallecito Conglomerate.

IRVING FORMATION (EARLY PROTEROZOIC)

mi MAFIC INTRUSIVE ROCKS--Greenish-black to grayish-black porphyry (amphibole pseudomorphs of primary pyroxene phenocrysts and chlorite-sericite-magnetite (?) pseudomorphs of primary amphibole phenocrysts) and fine- to medium-grained gabbro/diabase. These rocks are typically massive and unfoliated and most are composed chiefly of varying proportions of hornblende, plagioclase, and epidote.

fv FELSIC VOLCANICLASTICS--Fine-grained, grayish-white to brownish-gray, rhyolitic schist and gneiss composed principally of quartz, plagioclase, muscovite, biotite, and microcline. Outcrops generally display a prominent foliation and mineral lineation. No relict textures and structures were observed. Field and chemical criteria suggest that these rocks originated as tuffs and/or reworked tuffs. A U-Pb zircon age of 1828 ± 31 Ma was obtained for felsic schist of this unit, however, the relative stratigraphic position of these rocks in the Irving is uncertain. Discontinuous exposures of amphibolite occur locally in this felsic sequence. The origin of amphibolite in this unit is uncertain, but it may represent metamorphosed mafic dikes and/or volcanics.

c CHERT--Beds of massive, bluish-gray to grayish-white, fine-grained chert. Locally, beds are up to 30 m thick.

cg CONGLOMERATE--Massive, clast-supported, polymictic conglomerate containing subrounded to subangular, pebble to boulder sized clasts of aphyric to porphyritic mafic volcanic rock. Internal stratification and primary sedimentary structures were not observed in these deposits. Locally, this conglomerate is interbedded with discontinuous lenses of massive to cross-laminated graywacke and siltstone up to 1-8 m thick.

gs GRAYWACKE AND SILTSTONE--Interstratified successions of grayish-black to gray, thinly laminated to thickly bedded, siltstone and fine- to coarse-grained graywacke. Relict phenocrysts of plagioclase and lithic fragments are abundant in coarser beds. Laminae and beds are generally ungraded and massive, but in some outcrops well-preserved grading and cross-lamination are exhibited.

t LAPILLI TUFF--Unstratified tuff composed of angular to rounded lapilli sized fragments. Clasts consists chiefly of aphyric to porphyritic mafic volcanic debris. Clasts are generally dispersed in a very-fine grained, grayish-black matrix, but locally these deposits are clast-supported.

ap ANDESITIC TO BASALTIC FLOWS--Intermediate to mafic flow rocks composed chiefly of varying proportions of biotite, epidote, hornblende, and plagioclase. Two principal varieties were mapped.

Dark-gray to grayish black porphyry, predominantly andesitic in composition, which contains abundant .5-8 mm relict phenocrysts of plagioclase that locally define a blastotrachytic texture. Foliation is absent or only poorly developed in most outcrops.

ba Black to greenish-black aphyric to porphyritic flow rocks that are largely basaltic in composition. Fine- to medium-grained varieties containing sparse to abundant, <1-2 mm, laths of relict plagioclase and/or crystals of hornblende (in some exposures are 5 mm to 2 cm long and locally occurs as pseudomorphs of primary pyroxene phenocrysts) are commom. Rocks that comprise this map unit are generally massive, but locally exhibit a weak to strong foliation.

LINES

CONTACT--Dashed where approximately located; short dashed where inferred; dotted where concealed.

SHEARED CONTACT--Dashed where approximately located; short dashed where innferred; dotted where concealed. Contact is interpreted as an unconforamble depositional surface that has experienced intense shearing during metamorphism and deformation.

FAULT--Dashed where approximately located; short dashed where inferred; dotted where concealed. Ball and bar on downthrown side.

AXIAL TRACE OF MACROSCOPIC FOLDS--Dashed where approximately located; short dashed where inferred; dotted where concealed. Arrows indicate the known or inferred direction of plunge.

PLANAR FEATURES

Strike and dip of beds

Inclined (ball on strike line where stratigraphic tops are shown by primary features).

Strike of bedding certain but dip uncertain

Strike and dip of bedding uncertain.

Strike and dip of metamorphic foliation

Inclined

Vertical

Strike and dip of foliation parallel to bedding.

LINEAR FEATURES
May be combined with planar features

Bearing and plunge of lineation--Tail of arrow at point of observation.

Inclined

MINOR FOLDS

Bearing and plunge of fold axis.

Multiple (general shapes of folds in profile not indicated).

Small-scale folds with known map sense.

OTHER SYMBOLS

Locations of breccia zones.

References Cited

Atwood, W.W., and Mather, W.R., 1932, Physiography and Quaternary geology of the San Juan Mountains, Colorado: U.S. Geological Survey Professional Paper 166, 176 p.

Cross, W., Howe, E., Irving, J.D., and Emmons, W.H., 1905, Description of the Needle Mountains quadrangle: U.S. Geological Survey, Geological Atlas of the United States, Folio 131, 14 p.

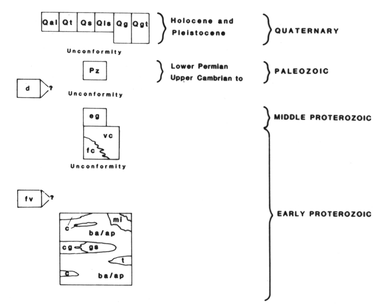
Barker, F., 1969c, Precambrian geology of the Needle Mountain, southwestern Colorado: U.S. Geological Survey Professional Paper 644-A, 35 p.

Burns, L.K., Ethridge, F.G., Tyler, N., Gross, A.S., and Campo, A.M., 1980, Geology and uranium evaluation of the Precambrian quartz-pebble conglomerates of the Needle Mountains, southwest Colorado: National Uranium Resource Evaluation, U.S. Department of Energy, Report GJBX-118(80), 161 p.

Steven, T.A., Lipman, P.W., Hail, W.J., Jr., Barker, F., and Luedke, R.G., 1974, Geologic map of the Durango quadrangle, southwestern Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-764, scale 1:250,000.

Note: Strikes and dips of bedding in the Vallecito Conglomerate (except Table Mountain-Dead Horse Creek area) on Plate 1 of Burns and others (1980) are included.

CORRELATION OF MAP UNITS



GEOLOGIC MAP OF THE VALLECITO CREEK-LAKE CREEK AREA, LAPLATA AND HINSDALE COUNTIES, COLORADO

By

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1994

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