UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Preliminary Geologic Map of the Las Vegas $1^{o}x2^{o}$ quadrangle, Nevada, Arizona and California

Compiled by

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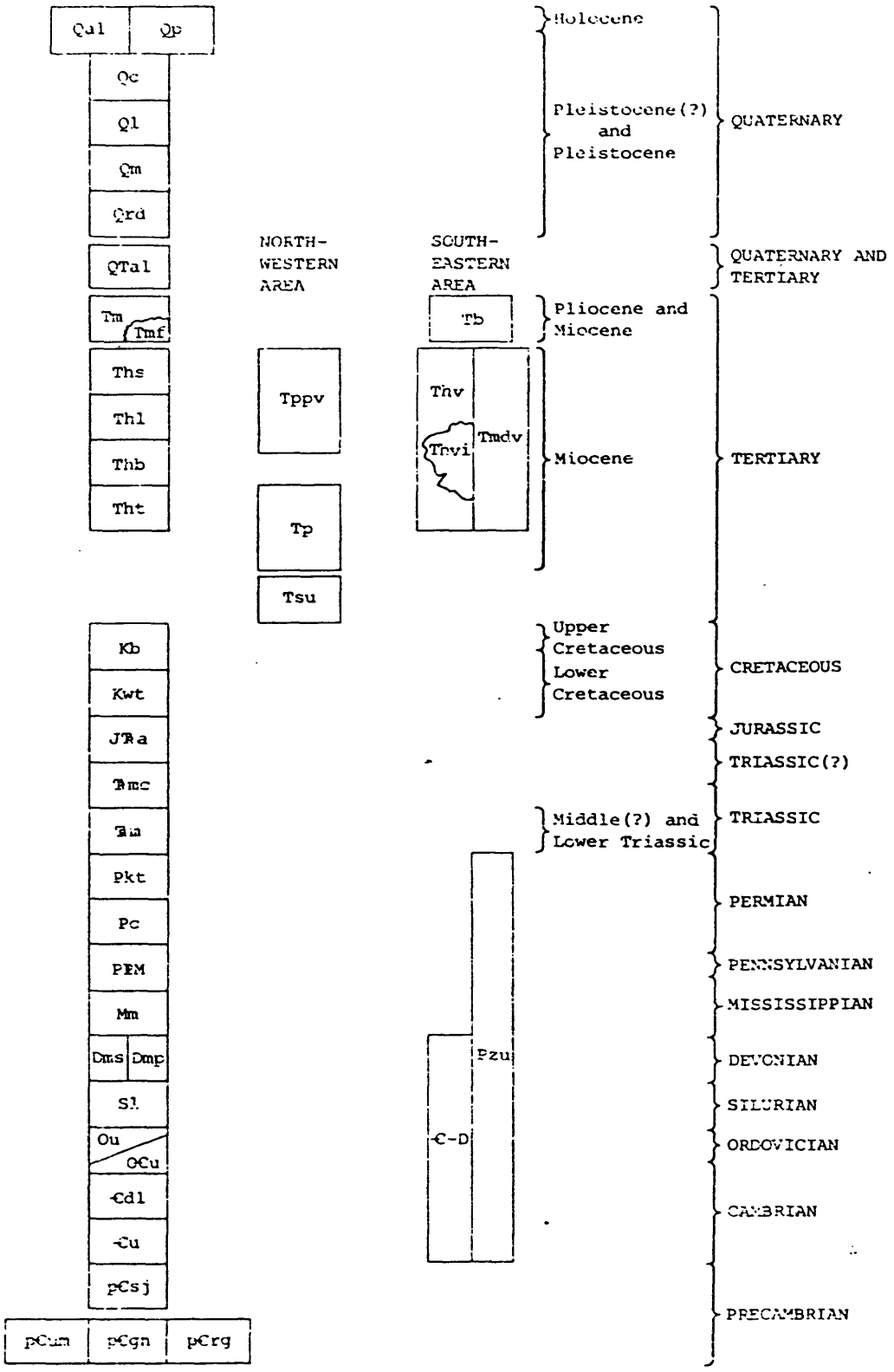
This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qal — ALLUVIAL DEPOSITS (HOLOCENE AND PLEISTOCENE?)--Various types of young alluvial deposits; mostly dissected alluvial cover, terrace deposits, and channel fill; also includes sand dunes, talus, gypsiferous terrace deposits, and tufa. Predominately unconsolidated, caliche horizons common

Qp — PLAYA DEPOSITS (HOLOCENE AND PLEISTOCENE?)--Fine-grained, unconsolidated to poorly consolidated sand, silt, and clay; locally interfinger with alluvial deposits

Qc — CHEMEHUEVI FORMATION (PLEISTOCENE)--Light-colored poorly consolidated sand, silt, and clay. Probably deposited in large lake that once covered area of Lake Mead and Colorado River

Ql — LAS VEGAS FORMATION (PLEISTOCENE)--Light-colored, poorly consolidated clay and silt; abundant mollusk fragments and some vertebrate remains occur. Probably deposited in similar lake to Chemehuevi Formation, but restricted to Las Vegas Valley

Qm — CALICHE OF MORMON MESA (PLEISTOCENE?)--Caliche and limestone in a thin, but widespread deposit; overlies Muddy Creek Formation and gravels of the Colorado and Virgin Rivers

Qrd — GRAVEL OF THE COLORADO AND VIRGIN RIVERS (LOWER PLEISTOCENE)--Predominately conglomerate; well-rounded, well-sorted pebbles and cobbles of a variety of igneous, sedimentary, and metamorphic types. Probably derived from the Colorado Plateau; records early history of the Colorado and Virgin Rivers

QTal — ALLUVIAL FAN DEPOSITS (QUATERNARY AND TERTIARY)--Poorly consolidated to highly indurated conglomerate; mostly local derivation; occurs locally in thick undeformed alluvial fan deposits

Tb — BASALT (PLIOCENE AND MIOCENE)--Dark-colored flow(s) of basalt exposed in the Grand Wash area, eastern map boundary; dated at 3.8 ± 0.11 m.y. by Damon and others (1978)

MUDDY CREEK FORMATION (PLIOCENE? AND MIOCENE)

Tm — Claystone unit--Pink to brown, calcareous to gypsiferous claystone, siltstone and sandstone; mostly undeformed or slightly deformed. Occurs as a widespread deposit in the Virgin River, Moapa, Dry Lake, and Las Vegas Valleys as well as in isolated exposures within mountain ranges

Tmf — Fortification Basalt Member--Dark olivine basalt with vesicular or amygdaloidal texture; olivine altered to iddingsite or serpentine; possibly as many as thirty flows on Fortification Hill. Anderson and others (1972) report an age of 11.3 ± 0.3 m.y., but Damon and others (1978) reevaluated dates assigned at type section as 5.88 ± 0.18 m.y

Tppv ASH-FLOW TUFF (MIOCENE)--Densely welded to nonwelded ash-flow tuff and bedded tuff; zeolitic in places; occurs in northwestern corner of map area. Includes Paintbrush Tuff, Timber Mountain Tuff, and other informally named ash-flow units, formerly assigned to the Piapi Canyon Formation; ranges in age from about 15 to 12 m.y. before present

Tp ROCKS OF PAVITS SPRINGS (MIOCENE)--Sedimentary rocks, bedded tuffs, and some unwelded ash flows; fossiliferous in places

Thv ROCKS OF THE HAMBLIN-CLEOPATRA VOLCANO (MIOCENE)--Dark-colored augite andesite lava and breccia; intruded by a radial dike swarm; probably represents a single stratovolcano or composite cone. Anderson and others (1972) report an age of 12.7 $\pm$ 0.8 m.y. before present

Thvi INTRUSIVE ROCKS (MIOCENE)--Intrusive andesite associated with the Hamblin-Cleopatra Volcano

Tmdv MOUNT DAVIS VOLCANICS (MIOCENE)--Undifferentiated intrusive and extrusive basaltic and andesitic rocks; part of a widespread field in the River and Black Mountains. In Black Mountains rocks of this age and type are not differentiated from Precambrian gneiss. Anderson and others report an age range of 14.6 to 11.8 m.y. before present

HORSE SPRING FORMATION (MIOCENE)

Ths Sandstone and silver tuff--Red calcareous sandstone, siltstone, and claystone interbedded with unaltered to slightly altered, silver, bedded air-fall and sedimentary tuff; locally gypsiferous; conglomeratic near some faults

Thl Rocks of Lovell Wash--White and gray algal limestone, tuffaceous sedimentary rocks, and bedded tuff; locally clay-rich; contains borate mineralization and is locally enriched in lithium; locally conglomeratic

Thb Limestone of Bitter Ridge--Yellow and buff algal limestone; regular wavy bedding

Tht Lower member--Brown and red sandstone, siltstone, conglomerate, breccia, gypsum, limestone, magnesite, and dolomite; green, altered tuffaceous sedimentary rocks interbedded; locally contains interstratified volcanics. Corresponds to Thumb Formation

Tsu UNDIFFERENTIATED SEDIMENTARY ROCKS (TERTIARY)

Kb BASELINE SANDSTONE (UPPER AND LOWER CRETACEOUS)--Light-colored nonresistant quartz arenite and conglomerate; sandstone derived from Aztec Sandstone, conglomerate derived from Paleozoic rocks; largely fluviatile

Kwt WILLOW TANK FORMATION (LOWER CRETACEOUS)--Light-colored tuff, claystone, and conglomerate. Includes fossil plant "Temskya" which suggests deposition in a quiet lagoon

JTr a AZTEC SANDSTONE (JURASSIC AND TRIASSIC?)--Brick-red and buff, moderately indurated, well-sorted quartz arenite; distinctive large-scale cross stratification; probably windblown

Tr mc MOENAVE (UPPER TRIASSIC?) AND CHINLE (UPPER TRIASSIC) FORMATIONS--Moenave Formation is red gypsiferous sandstone and siltstone. Chinle Formation includes Petrified Forest Member of buff, purple, and dark-brown fluviatile sandstone and Shinarump Member of sandstone and discontinuous, lenticular conglomerate

Tr m MOENKOPI FORMATION (MIDDLE? AND LOWER TRIASSIC)--Includes four members; marine, gray limestone, and brown sandstone; gray and yellow marine limestone; nonmarine? to nearshore white gypsum and limestone; and nonmarine brown siltstone

Pkt KAIBAB LIMESTONE AND TOROWEAP FORMATION (LOWER PERMIAN) --Resistant gray marine limestone; chert bands common

Pc CLASTIC ROCKS (LOWER PERMIAN)--Includes Coconino Sandstone in the Virgin Mountains and at Frenchman Mountain; Hermit Shale, and Queantoweap Sandstone of McNair (1951) in the Virgin Mountains and Muddy Mountains; and Permian red beds at other localities. Mostly yellow and red gypsiferous sandstone and shale

PPM CALLVILLE LIMESTONE AND BIRD SPRING FORMATION (LOWER PERMIAN, PENNSYLVANIAN AND UPPER MISSISSIPPIAN)--Mostly gray well-bedded marine limestone; called Callville in the Muddy and Virgin Mountains and at Frenchman Mountain; Permian part called Pakoon Limestone by McNair (1951) in the Virgin Mountains; referred to as Bird Spring elsewhere on map; contains Late Mississippian through Early Permian fossils

Mm MISSISSIPPIAN ROCKS--Mostly gray thick-bedded marine limestone. Rogers Spring and Bluepoint Limestones in the Muddy Mountains; Redwall Limestone in the Virgin Mountains and at Frenchman Mountain; Monte Cristo Limestone in the Spring Mountains and throughout the central portion of the map; Chainman Shale, the limestone in Timpi Canyon, Mercury Limestone, and Narrow Canyon Limestone at the Nevada Test Site

DEVONIAN ROCKS--Mostly poorly bedded gray marine limestone

Dmp Muddy Peak Limestone in the Virgin and Muddy Mountains and at Frenchman Mountain

Dms Sultan Limestone in the Spring Mountains and over most of the north-central part of the map; includes Devils Gate Limestone as well as unnamed limestone at the Nevada Test Site

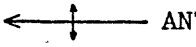
Sl	SILURIAN ROCKS--Mostly gray marine dolomite; present only in the western and north-central part of the map; includes Lone Mountain Dolomite and Laketown Dolomite
Ou	ORDOVICIAN ROCKS--Mostly gray marine dolomite and limestone present in the higher level thrust sheets in the western and central parts of the map. Includes Ely Springs Dolomite, Eureka Quartzite, and Pogonip Group
O€u	UNDIFFERENTIATED ORDOVICIAN AND CAMBRIAN ROCKS--Mostly gray marine dolomite and limestone; occurs occurs in lowest thrust plates and autochthon; mostly unnamed, includes rocks above the Nopah Formation and Dunderberg Shale
€dl	CARBONATE ROCKS (UPPER AND MIDDLE CAMBRIAN)--Mostly gray, marine dolomite and limestone. Bonanza King Dolomite over much of map area; Nopah Formation in the west and north-central parts; Peasley Limestone in the Virgin Mountains; Dunderberg Shale occurs at top of unit in southeast part of the map
€u	UNDIFFERENTIATED CLASTIC ROCKS (MIDDLE AND LOWER CAMBRIAN)--Quartzite, shale, sandstone, and limestone. Tapeats Sandstone in eastern part of the map; Prospect Mountain Quartzite, Wood Canyon Formation, Pioche Shale, Lyndon Limestone, Chisholm Shale, and Carrara Formation over most of the map; thickens to northwest
€-Du	UNDIFFERENTIATED DEVONIAN THROUGH CAMBRIAN ROCKS
Pzu	UNDIFFERENTIATED PALEOZOIC ROCKS
p€sj	STIRLING QUARTZITE AND JOHNNIE FORMATION (PRECAMBRIAN)--Mostly quartzite of Stirling Quartzite and of Johnnie Formation; exposed in western part of the map
p€um	ULTRAMAFIC ROCKS (PRECAMBRIAN)--Amphibolite, metadiabase, and hornblende-vermiculite-biotite rocks; derived from pyroxenite, hornblendite, mafic norite, lamprophyre, or diabase
p€gn	GNEISS AND SCHIST (PRECAMBRIAN)--Garnet-cordierite-sillimanite gneiss and schist, amphibolite, mica schist, and migmatite
p€rg	RAPAKIVI GRANITE (PRECAMBRIAN)--Coarse-grained, porphyritic perthite-quartz-biotite granite and biotite rapakivi granite; intruded into gneiss and schist

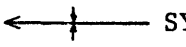
———— CONTACT--Dashed where approximately located

———— FAULT--Dashed where approximately located; dotted where concealed

▲▲▲▲▲ THRUST FAULT--Dashed where approximately located; dotted where concealed; sawteeth on upper plate. Presumed pre-Tertiary age

▲▲▲▲▲▲ LOW-ANGLE FAULT--Sawteeth on upper plate. Presumed Tertiary age

 ANTICLINE--Showing direction of plunge

 SYNCLINE--Showing direction of plunge

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