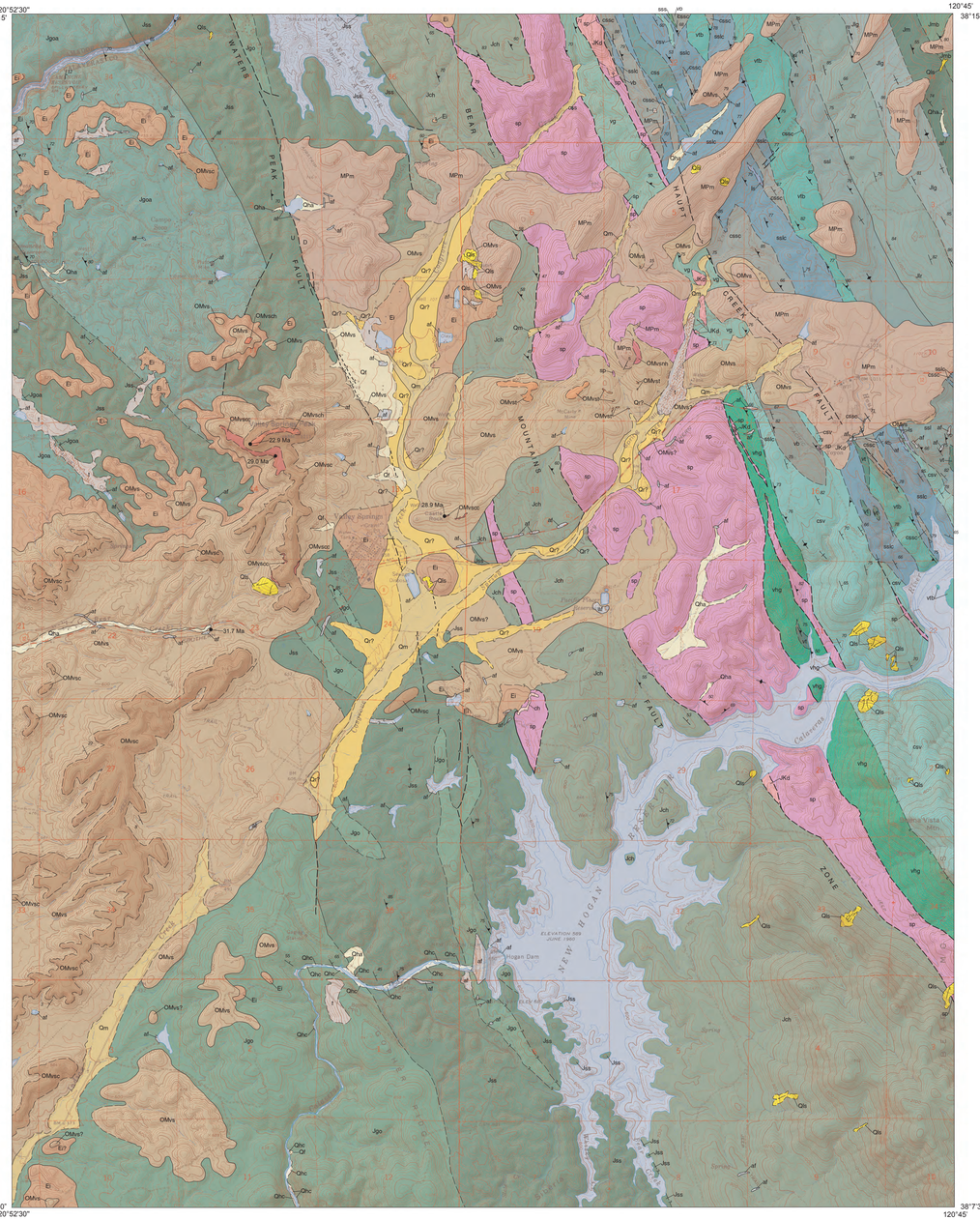
Preliminary Geologic Map available from:
http://www.conservation.ca.gov/cgs/rghm/rgm/preliminary_geologic_maps.htm



Projection: Universal Transverse Mercator, Zone 10N, North American Datum 1927.

Topographic base from U.S. Geological Survey Valley Springs 7.5-minute Quadrangle, 1962. Shaded relief image derived from USGS 1/3 arc-second National Elevation Dataset (NED).

Scale 1:24,000

Miles

Kilometers

Thousand Feet

Contour Interval 40 feet
National Geodetic Vertical Datum of 1929

13.58°
TRUE NORTH
MAGNETIC NORTH
Approximate Mean Declination, 2015

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PRELIMINARY GEOLOGIC MAP OF THE VALLEY SPRINGS 7.5' QUADRANGLE, AMADOR AND CALAVERAS COUNTIES, CALIFORNIA

VERSION 1.0

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2015

DESCRIPTION OF MAP UNITS

SURFICIAL UNITS

af — **Artificial fill (historic)**—Consists of man-made deposits of earth materials that may be engineered or non-engineered.

t — **Tailings (historic)**—Consists of man-made deposits of earth materials that are the by-product of mining processes.

Qhc — **Stream channel deposits (modern to latest Holocene)**—Unconsolidated deposits of sand, gravel, and cobbles along the Calaveras River.

Qha — **Alluvium (Holocene)**—Alluvium deposited in fan, terrace, or basin environments. Typically consists of poorly to moderately sorted sand, silt, and gravel that form geomorphic surfaces with slight to moderate dissection.

Qf — **Alluvial fan deposits (Holocene to late Pleistocene)**—Unconsolidated deosits of sand, gravel, and cobbles derived mostly from the Valley Springs Formation.

Qls — **Landslide deposits (Holocene to Late Pleistocene)**—Arrows indicate direction of movement; queried where landslide existence is questionable.

Qm — **Modesto Formation, undivided (late Pleistocene)**—Alluvial deposits of arkosic gravel, sand, and silt. Deposited as a series of coalescing alluvial fans extending continuously from the Kern River drainage in the south, to the Sacramento River tributaries in the north. Compositionally, deposits of the Modesto Formation are often indistinguishable from those of the Riverbank, Turlock Lake and Laguna Formations. However, these units are temporally distinct and separated by unconformities. Identity is usually determined by topographic position, geomorphic expression, or (most commonly) by soil development. (Marchand and Allwardt, 1981)

Qr — **Riverbank Formation, undivided (Pleistocene)**—Consists primarily of arkosic sediment derived mainly from the interior of the Sierra Nevada but also includes locally derived sediment from small drainage basins along the foothills (Marchand and Allwardt, 1981).

TERTIARY SEDIMENTARY AND VOLCANIC UNITS

MPm — **Mehrten Formation (early Pliocene to Miocene)—**Volcanic mudflow deposits interbedded with sandstone and conglomerate. Compositionally distinct – dominated by andesite clasts. Lahar beds laden with andesite cobbles are particularly resistant, and often form a cap and corresponding cliff faces.

OMvs — **Valley Springs Formation (Miocene to middle Oligocene)—**Tuffaceous sandstone, siltstone, and conglomerate interbedded with tuff and minor clay. Deposits are moderately mature compositionally which reflects the peritropical environment at the time of deposition. The formation may be distinguishable by rhyolitic ash component. Conglomerates are compositionally heterogeneous and feature significant proportions of Jurassic metamorphic rocks, quartzite, and chert cobbles. Tuff beds are often present as resistant, cliff-forming outcrops. Map pattern partially expresses path of paleochannels, and the unit is commonly present in inverted topography. Green clay rock, which consists of silica-cemented pebbles of expansive smectitic clay, is present near the base of unit and poses significant geologic hazards related to ground swelling and slope stability (California Geological Survey, 2009; Wood and Glasmann, 2013; Wood, 2015).

OMvsc — **Conglomerate**—Particularly resistant conglomeratic beds, often capping ridges.

OMvst — **Tuff, undifferentiated**

OMvsch — **Central Hilill member**—Poorly welded, crystal, vitric tuff-breccia. Locally brecciated zones. Characterized by an abundance of biotite phenocrysts and white pumice fragments (Woloszyn, 1975). Approximately 22.9 MA (Henry, 2014).

OMvsnh — **Nine Hill member**—Densely welded, devitrified ash flow tuff. Predominantly massive and indurated with local well-defined jointing patterns. Less welded towards basal section. This unit was called Chili Gulch by Woloszyn (1979), but is correlated to the 25.3 MA Nine Hill Tuff per Chris Henry (2014).

OMvscc — **Campbell Creek member**—Moderately welded, vitric ash flow tuff. Equivalent to Castle Rock tuff of Woloszyn (1979). Approximately 28.9 MA (Henry, 2014).

Ei — **Ione Formation (middle Eocene)—**Clay, sandstone, and siltstone. Distinctly light in color, dominated by white and light pastel shades of buff, rust and lavender on the weathered surface. Compositionally, this unit is very mature and is distinctly dominated by various forms of quartz, especially vein quartz. Clays are predominantly kaolinitic and are interpreted as having formed in a tropical climate (Wood, 1995). Sandstones are often silica-cemented. Conglomerates typically feature abundant white vein quartz and quartzite cobbles in a matrix of reddish oxidized silt and sand. Finer beds typically feature striking sedimentary structures such as cross-bedding and convolute laminae crossed by more recent subparallel and subvertical joints typically filled with iron or silica cement. Clays of the Ione Fm. are commercially valuable, and have been actively mined for many decades. Early prospectors also suspected the Ione conglomerates of being gold-bearing, and where exposed, they are often disturbed by historic exploratory strip mining.

MESOZOIC UNITS

JKd — **Diorite (Late Jurassic to Early Cretaceous)—**Green, microcrystalline groundmass with sparse hornblende. Generally restricted to the western margin of the melange belt and preferentially intrudes obvious zones of weakness (Parkison, 1976). Does not possess the regional cleavage characteristic of the rocks it intrudes.

Jch — **Copper Hill Volcanics (Late Jurassic)—**Dark to medium green meta-andesite and meta-basalt. Strongly sheared near the Calaveras River. Minor porphyritic rhyolite or dacite with quartz phenocrysts. Named by Clark (1964) with the type section on the Cosumnes River in Amador and El Dorado Counties north of the quadrangle. Interfingers with and overlies the Salt Springs Slate and is likely of Kimmeridgian age (Clark, 1964).

Jss — **Salt Springs Slate (Late Jurassic)—**Black sericite slate is the dominant lithology of the formation, but greywacke and tuff are widespread, and thin conglomerate layers occur locally (Clark, 1964). Prior to Clark (1964) naming the formation, these rocks were mapped as Mariposa Formation in the western part of the quadrangle. Late Oxfordian to early Kimmeridgian in age based on invertebrate fossils collected along the Cosumnes River. Plesiosaur fossil reported from Salt Springs Slate at Lake McClure south of the Quadrangle (Clark, 1964).

Jgo — **Gopher Ridge Volcanics (Late Jurassic)—**Named by Clark (1964) for exposures along the Calaveras River within the Valley Springs quadrangle. Detailed mapping of the Penn Mine by Paterson (1985) which was too detailed to show on this map indicates lithologies consisting of felsic quartz porphyry, siliceous tuff, basalt, mafic to intermediate tuff, greywacke and agglomerate. Likely Oxfordian in age (Clark, 1964). Areas where amphibolite predominates (Jgoa).

Jgoa — **Amphibolite facies**

Logtown Ridge Formation (Middle to Late Jurassic)—Metamorphosed pyroclastic deposits, basaltic to andesitic lava, and associated breccia. Named by Duffield and Sharp (1975) who designated the type section for exposures on the north bank of the Mokelumne River in the Jackson 7.5' quadrangle, which is adjacent to the north.

Jlr — **Rabbit Flat member (Late Jurassic)**—Coarsely porphyritic augite andesite-basalt breccia and massive flows or sills, as well as minor bedded pyroclastic rocks. Breccia is typically medium bluish-green in outcrop and contains abundant dark, euhedral augite phenocrysts between 2 and 5 mm. The base is in fault contact with melange to the west. Clasts typically between 2 and 5 cm and are often ellipsoidal or disc shaped. Named by Duffield and Sharp (1975).

Jlg — **Goat Hill member (Middle to Late Jurassic)**—Thinly- to thickly-bedded very fine to medium grained tuff, coarse pumice lapilli tuff in graded beds and thickly-bedded fine to coarse volcanic breccia that grades upward into medium-fine grained tuff. Conformably overlies the Rabbit Flat member. The age of the Goat Hill Member is well established as Callovian to late Jurassic by the occurrence of the ammonite *Pseudocadoceras* (Duffield and Sharp, 1975).

Jm — **Mariposa Formation (Late Jurassic)**—Slate, tuff, and greywacke; petromict conglomerate abundant west and south of Deer Peak; metachert and quartzose slate abundant southwest of Hogback Mountain. (Clark, 1964)

Jmb — **Bower Creek member**—Very coarse, heterogeneous volcanic breccia in vicinity of Fowler Lookout; elsewhere ranges from very fine tuff to coarse breccia; contains pillow lava near Bear Creek. (Clark, 1964)

MELANGE BELT - MESOZOIC TO PALEOZOIC

First recognized by Duffield and Sharp (1975) as a mélange of rocks that had previously been mapped by Turner (1894) as Calaveras Formation in the Valley Springs quadrangle. Later mapped as Cosumnes Formation of the Amador Group by Taliaferro (1943). Blocks in mélange include rocks of Paleozoic age. Saleeby (1982) reports a Pb/U date of 304±3 Ma for metaplagiogranite block in this unit in the Fiddletown 7.5' quadrangle north of the study area, and the blocks of limestone contain Permian fusilinids (Douglass, 1967). Subdivided by Parkison into the following units:

sp — **Serpentinite (Early Jurassic)**—Black to bluish gray, sheared to blocky, often with well developed slaty cleavage. Occasionally contains unserpentinized ultramafic rocks. Locally includes chert (ch) - microcrystalline quartz with abundant quartz veins, pale yellow to brown, very hard; may be product of hydrothermal alteration of serpentinite.

ch

Pyroclastic Assemblage

vtb — **vtb**—Predominantly interbedded volcanic breccia and tuff with some shale and greywacke.

vb — **vb**—Predominantly massive augite porphyry volcanic breccia with some tuff, shale and greywacke.

vt — **vt**—Predominantly massive fine to lapilli tuff with interbedded shale and greywacke.

Siliceous Assemblage—Siliceous slate with chert to buff siliceous slate with intercalated gray chert. Often has a phyllitic sheen on cleaved surfaces, is very brittle and fractures into thin plates when broken. Chert sometimes occurs as massive blocks up to 7 m long. Well-developed, pervasive slaty cleavage is apparent at nearly every outcrop giving a sharp and jagged appearance.

sss — **sss**—Siliceous clastic rocks, mostly fine grained quartzite and chert pebble conglomerate.

ssl — **ssl**—Siliceous slate and shale, light in color, without chert.

sslc — **sslc**—Siliceous slate, light in color, with thinly interbedded to massive chert.

Epiclastic Assemblage

csv — **csv**—Predominantly clay shale with some interbedded greywacke, fine tuff, volcanic breccia and massive flow rocks.

css — **css**—Predominantly clay shale with some interbedded greywacke, no conglomerate.

cssc — **cssc**—Interbedded clay shale and greywacke with some conglomerate.

Ophiolitic Assemblage

vhg — **vhg**—Massive, dark colored hypabyssal gabbroic intrusive rocks and basaltic (?) extrusive rocks.

vg — **vg**—Massive greenstone with minor interbedded chert.

ls — **Limestone**—Gray, fine- to coarse-grained and massive. Douglass (1967) identified Permian fossils in a similar unit north of the quadrangle.

MAP SYMBOLS

Contact between map units - Solid where accurately located; short dash where inferred; long dash where approximately located; dotted where concealed; queried where identity or existence is uncertain

Fault - Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain. U = upthrown block; D = downthrown block

Thrust Fault - Barbs on upper plate; solid where accurately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain.

Strike and dip of sedimentary beds. Number indicates dip angle in degrees:

Inclined bedding

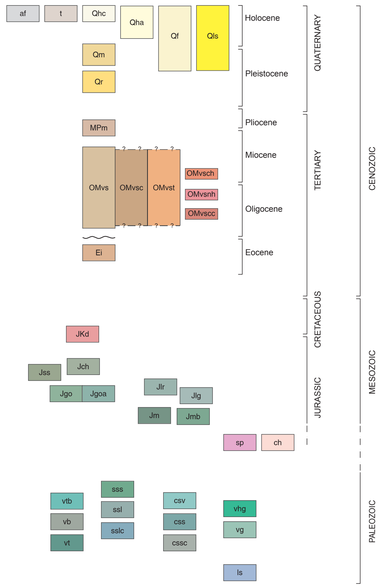
Vertical bedding

Strike and dip of inclined metamorphic foliation. Number indicates dip angle in degrees

Strike and dip of inclined joints. Number indicates dip angle in degrees.

22.9 Ma — Sample locality showing radiometric age date; may be shown with leader line

CORRELATION OF MAP UNITS



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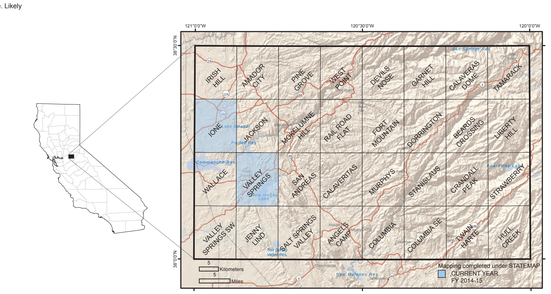

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