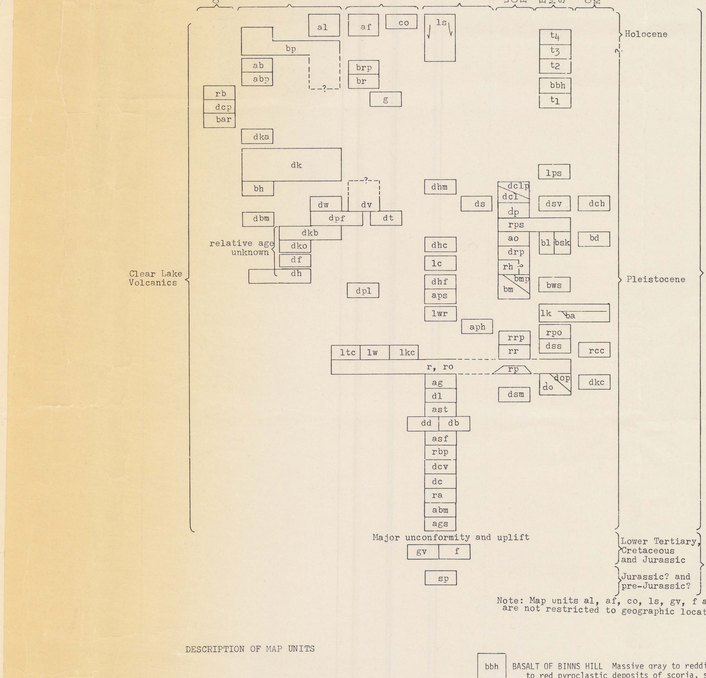
CORRELATION OF MAP UNITS



Note: Map units al, af, co, ls, gv, f and sp are not restricted to geographic locations in brackets

DESCRIPTION OF MAP UNITS

al ALLUVIUM Flood-plain, channel and lake deposits of conglomerate, sand, silt and clay which fill present valleys and closed topographic depressions; composed of detritus of local derivation; maximum thickness probably about 15 meters.

co COLLUVIUM Slope deposits of coarse detritus which has moved mainly by gravity from nearby upslope sources and is subject to continued movement; mapped only where extensive or where covering critical contacts of bedrock units; maximum thickness about 10 meters.

af ALLUVIAL FAN DEPOSITS Coarse material from nearby unslope sources which has been deposited in bottoms and outlets of small valleys during periods of rapid erosion; maximum thickness about 10 meters.

ls LANDSLIDE DEPOSITS Unsorted blocks and soil which have moved downslope as a unit or as a mass of debris; generally not subject to continued movement; characterized by hummocky topography, and in larger landslides, by closed topographic depressions; deposit of largest areal extent is on the west side of Mt. Konocti where the maximum thickness is inferred to be at least 250 meters; typical thickness of other landslides ranges from a few meters to a few tens of meters.

t_4 TERRACE GRAVELS OF COLE CREEK VALLEY Coarse, sub-angular to well-rounded pebble, cobble and boulder gravels composed of a mixture of volcanic rocks (obsidian, rhyolite and basalt) up to boulder size from nearby bedrock sources, and resistant components of gravel recycled from lake deposits of Kelseyville (dominantly chert, with some dacite and andesite) of pebble to cobble size; minor amounts of interbedded sand, present at four levels within the lower parts of Cole Creek and McIntire Creek drainages; overlies rhyolite of Thurston Creek, basalt of McIntire Creek, and lake deposits of Kelseyville; highest terrace gravel (t_4) overlain by basalt of Binns Hill, and may correlate with gravel deposits at about 1600 feet elevation in Big Valley; maximum thickness about 5 meters.

t_3

t_2

t_1

bp YOUNG PYROCLASTIC DEPOSITS Well-bedded deposits of tuff, lapilli tuff and minor tuff breccia which mantle much of the lower north, east and south slopes of Mt. Konocti and the ridge northeast of Ely Flat, and constitute much of Buckingham Peninsula; have come to dark orange soil and erode to intricately gullied pattern; dominantly airfall deposits, rarely reworked by water or by mudflow; typically show rhythmic, alternating coarse and fine-grained layers 1-15 cm thick which have graded beddin, or rarely, reverse-graded bedding; dominant fragments are white, yellow, and brown altered pumice, along with gray to black rock fragments, mainly of andesitic to basaltic composition; pumice is 0.5-15 cm size in coarse beds, and 1 mm or less in fine-grained beds; most exposures contain 1-20 percent of variously altered crystals and lithic fragments, of dacite of several varieties, olivine andesite, highly porphyritic andesites, olivine basalt, and rare rhyolite of the Franciscan assemblage and Great Valley sequence, such as chert and serpentine up to 1 meter size, greenstone, graywacke and shale; many of these deposits are known to have been erupted from underwater or phreatic eruptions, as shown by mud-armored lapilli, accretionary lapilli, deformed layering beneath blocks, and locally, truncation of layering by overlying deposits; sources are circular depression of Little Borax Lake, and the inferred circular vents suggested by arcuate seaments of the present lake shore, by lake-bottom topography, and by presence of bedded pyroclastic deposits along the lake shore; trajectories of blocks and bombs from bedding sags suggest sources in Clear Lake and at Little Borax Lake; overlie dacites of Mt. Konocti, Buckingham Point, Horsehead Bay, Wheeler Point, Plum Flat, Konocti Bay, and Bell Mine, older hornblende dacite of Mt. Konocti, and rhyolite of Thurston Creek; parts of the pyroclastic deposits correlate with ash beds in sediments beneath Clear Lake; the youngest ash bed in a core taken midway between Fraser Point and Pirates Cove is about 11,000 years old (Sone 7, Sims and Rymer, 1975); maximum exposed thickness about 60 meters, maximum thickness unknown.

ab OLIVINE ANDESITE OF RUCKINNHAM PEAK Massive flow 10 meters thick of gray olivine andesite and cinder cone (abp) of anglutinate, bombs up to 1.5 meters size, and scoria of gray andesite and olivine andesite; contains 5 percent of 0.5-1 mm olivine, rare 1-2 mm quartz and feldspar, in aphanitic groundmass; source at Buckinnham Peak; part of flow and cone have been covered by landslide and explosive eruptions which produced the Little Borax Lake maar; olivine andesite fragments are a common inclusion in young pyroclastic deposits northwest, north and east of Buckinnham Peak; overlies dacite of Mt. Konocti; K/Ar age 0.03 ± 0.03 m.y., magnetic polarity normal; maximum thickness 100 meters.

abp

br OLIVINE BASALT OF ROUNDTOP MOUNTAIN Flow composed of gray, massive to platy basalt; contains 5 percent of 0.5 mm olivine, rare 0.5 mm plagioclase and 1-5 mm inclusions? of quartz in aphanitic groundmass; western part of flow surmounted by a 200-meter tall cinder cone (brn) composed of poorly bedded red to orange vesicular cinders, blocks and anglutinate with mineralogy similar to that of the flow; flow erupted from probable fissures indicated by east-west vertically-sheeted ribs connecting the cinder cone and a small area of scoria on the east end of flow; overlies volcaniclastic deposits of Wildcat Canyon and dacites of Thurston Lake and Pinkeye Lake; magnetic polarity normal; maximum thickness of flow 20 meters.

brp

rb RHYOLITE OF BORAX LAKE Flow and associated pumice breccia of white, pink, gray and black, massive to highly vesicular, inhomogeneous, sparsely porphyritic to non-porphyritic obsidian and perlite; contains about 1 percent of 0.1 mm and smaller plagioclase laths, 0.5 percent total of 0.2 mm and smaller clots and crystals of olivine?, orthopyroxene and clinopyroxene, and sparse lithic inclusions; source within present outcrop area; overlies olivine dacite of Clearlake Park and olivine basalt of Arrowhead Road; overlain by lake sediments and alluvium in Borax Lake valley; K/Ar age 0.088 ± 0.013 m.y., magnetic polarity normal; exposed thickness about 20 meters, maximum thickness unknown.

dco OLIVINE DACITE OF CLEARLAKE FARK Flow of blocky, vesicular, black to reddish, glassy to aphanitic dacite; contains about 0.5 percent of 0.5-2 mm olivine, 0.25 percent of 0.5-2 mm plagioclase, and rare 1-2 mm quartz inclusions in a groundmass of olivine, pyroxene, plagioclase, opaques and pale brown glass; contains inclusions of baked sandstone; source west of present outcrop area or close to area of olivine basalt of Arrowhead Road in SW 1/4 sec. 16, T. 13 N., R. 7 W; probably overlies olivine basalt of Arrowhead Road, and probably overlies lake sediments; overlain by rhyolite of Borax Lake; thickness about 10-15 meters.

bar OLIVINE BASALT OF ARROWHEAD ROAD Subdued cinder cone and small satellitic areas of scoria; partly bedded, red to gray blocks and bombs up to 1.5 meter size, cinders and anglutinate of vesicular olivine basalt; contains 0.5 percent or less of 0.5-1.5 mm olivine, rare 0.5-2 mm plagioclase, and rare 1-2 mm quartz inclusions in a groundmass of olivine, pyroxene, plagioclase and opaques and brown glass; source within or close to present outcrop areas of scoria in SW 1/4 sec. 16 and center of south line of sec. 17. T. 13 N., R. 7 W; overlain by rhyolite of Borax Lake; flank of cinder cone apparently overlain by lake sediments in SE 1/4 sec. 16; probably overlain by olivine dacite of Clearlake Park; exposed thickness of scoria about 10 meters, maximum thickness of at least 70 meters suggested by well data.

bbh BASALT OF BINNS HILL Massive gray to reddish flow and coarse brown to red pyroclastic deposits of scoria, scoriaceous blocks and bombs, and rare black glassy fragments, of fine-grained basalt; contains less than 0.5 percent of 0.5-1 mm olivine, about 0.5 percent of 1-3 mm lath-shaped to equant plagioclase, and rare 1-3 mm quartz, in gray aphanitic or black glassy groundmass; source vents along crest of Binns Hill; overlies rhyolite of Thurston Creek, basalt of McIntire Creek, lake deposits of Kelseyville, and overlies highest, obsidian-rich terrace gravels of Cole Creek valley (t_4); maximum exposed thickness 30 meters.

dhm MEDIUM-GRAINED DACITE OF MT. HANNAH Vesicular and massive to platy flows, near-surface irregular intrusives, and local coarse pyroclastic deposits, of gray to pink, medium-grained, moderately porphyritic dacite; contains 5-10 percent of 0.5-3 mm feldspar, 1 percent of 1-3 mm quartz, 1 percent of 1-2 mm green pyroxene in mottled gray or gray and pink groundmass; contains sparse small diabasic-textured lithic inclusions; source vents at summit of Mt. Hannah; in part intrusive northwest of summit; another possible source vent north of Boggs Lake in NE 1/4 sec. 18, T. 12 N., R. 8 W; youngest dacite on Mt. Hannah; overlies coarse-grained dacite of Mt. Hannah, dacites of Harrington Flat Road and Loch Lomond, andesites of Split Top Ridge and Glenview, and pyroxene dacite of Boggs Lake; maximum thickness about 50 meters.

q GRAVEL DEPOSIT EAST OF PINKEYE LAKE Stream gravel of pebbles and small cobbles in a sandy matrix admixed with organic soil; consists chiefly of obsidian of Thurston Creek, dacite, and Franciscan chert; derived from Manning Flat area and deposited in a now-abandoned eastward drainage through Pinkeye Lake; overlies dacite of Pinkeye Lake and volcaniclastic deposits of Wildcat Canyon; maximum thickness 2-3 metres.

dka BIOTITE DACITE OF KAMDOT (ANDERSON ISLAND) Massive flow or dome of gray to buff, porphyritic, perlitic biotite dacite; contains 10 percent total of 2-15 mm plagioclase and sanidine, 5 percent of 1-5 mm quartz, about 1 percent of 1-3 mm biotite, in perlitic glass; contains common 2-20 mm diabasic-textured lithic inclusions; source unknown; overlain by young pyroclastic deposits; K/Ar age 0.18 ± .02 m.y. exposed thickness 25 meters, maximum thickness unknown.

dk DACITES OF MT. KONOCTI Combined map unit of large volume of dacites which make up most of Mt. Konocti; further mapping may enable separation of various dacites within this unit. Mostly vitrophyric and vesicular flows, domes and coarse pyroclastic deposits of gray and pink, commonly flow-banded dacite; characterized by obvious presence of mafic minerals, especially biotite. Lithic varieties are coarsely and highly porphyritic in hand specimen and quartz- typical varieties contain 10-20 percent of 1-10 mm plagioclase and sanidine, about 5-10 percent of 1-5 mm quartz, 5 percent of 0.5-2 mm biotite, 0.5-2 percent of 0.5-2 mm pyroxene, in glassy to aphanitic groundmass; dacite in vicinity of Clear Lake State Park contains up to 20 percent of 1-5 mm quartz; dacite east of Bell Mine contains abundant 1 mm and smaller needles of hornblende; sources within Mt. Konocti, near Wright, Howard and South Peaks and on northeast slopes of Mt. Konocti; overlies olivine basalt of Horseshoe Bend, older hornblende dacite of Mt. Konocti, biotite-hornblende dacite of Shaul Valley, dacite of Bell Mine, a biotite rhyolite pyroclastic deposit west of Sugarloaf, biotite rhyolite of Cole Creek, olivine basalts of Lower Lake Road and south flank of Mt. Konocti; overlies dacite of Fraser Point; overlain by young pyroclastic deposits, olivine andesite of Buckinnham Peak, pyroclastic and lake deposits of Shaul Valley; K/Ar age 0.27 ± 0.04 m.y. ; magnetic polarities normal; exposed thickness about 900 meters, total thickness unknown.

lps PYROCLASTIC AND LAKE DEPOSITS OF SHAUL VALLEY AREA Poorly exposed, white, yellow and brown siltstone and diatomaceous siltstone, locally opalized, locally contains plant imprints; lapilli tuff and tuff breccia, of lightgray to light yellow andesitic to dacitic pumice, up to 2 cm size in Shaul Valley, up to 10 cm size to east; contains 1-2 percent total of 0.5-1 mm pyroxene and olivine?, 1-2 percent of 0.5-2 mm quartz and feldspar; contains local concentrations of blocks up to 1.2 meter size of biotite-hornblende dacite resembling dacite of Mt. Olive, sparsely porphyritic biotite-hornblende dacite, hornblende dacite, and dacite lacking biotite or hornblende; source or source vent of dumice unknown; deposited by airfall, possibly in part water-worked ; apparently postdates dacite of Mt. Olive and biotite rhyolites of Cole Creek and northeast of Mt. Olive; stratigraphic occurrences overlain by dacite of Mt. Konocti; maximum exposed thickness about 10 meters, maximum thickness unknown.

bh OLIVINE BASALT OF HORSESHE BEND. Blocky flow, bombs and scoria of red oxidized and black glassy, sparsely porphyritic olivine basalt; contains 2 percent of 1-2 mm olivine, 5 percent of 1-3 mm plagioclase, 1 percent of 0.5-1 mm pyroxene, and rare 1-2 mm quartz, in aphanitic to glassy groundmass; deposits of a now-destroyed cinder cone source which was subsequently destroyed by explosive eruption which shaped Horseshoe Bay; overlies dacite of Horseshoe Bay, overlain by dacite of Mt. Konocti; north of Buckinnham Peak; maximum thickness of flow 5 meters, maximum exposed total thickness about 80 meters, original thickness unknown.

dbm DACITE OF BELL MINE Flow of rubbly, massive and sheeted, black glassy, and pink and gray devitrified, sparsely porphyritic dacite; contains 5-10 percent of 2-6 mm feldspar, 1-2 percent of 1-2 mm pyroxene, in glassy to aphanitic groundmass; lack of biotite or hornblende distinguishes this flow from all other known dacite flows on Mt. Konocti; source vent at about 3300 feet elevation southeast of South Peak, now mostly buried by dacite of Mt. Konocti; also overlain by young pyroclastic deposits; maximum thickness unknown.

dw DACITE OF WHEELER POINT Massive, rubbly and vesicular domes and flows of poorly flow-banded, gray and pink, locally black glassy, moderately porphyritic quartz-rich dacite; shows steep flow-fronts along shore of Clear Lake; contains 5-8 percent of 1-10 mm plagioclase, 3-5 percent of 1-5 mm quartz (commonly rimmed by pyroxene), about 3 percent of elongate pyroxene up to 1 mm size, and rare needles of hornblende up to 1 mm size, in gray or pink aphanitic to black glassy groundmass; source vents near Konocti Bay are in NE 1/4 SE 1/4 sec. 22, and SW 1/4 SW 1/4 sec. 23, T. 13 N., R. 8 W; flows north of Thurston Lake probably fed by vents or fissures aligned west-northwest in present outcrop area; overlies dacites of Plum Flat and Thurston Lake; probably overlies dacite of Konocti Bay; overlain by young pyroclastic deposits; maximum exposed thickness 200 meters, maximum thickness unknown.

dv DACITE OF VULTURE ROCK Flows and domes of dark gray or bluish-gray, massive to finely sheeted porphyritic dacite. black glassy dacite at base; contains 5-10 percent total of 1-3 mm feldspar and quartz, 2 percent of 1 mm hypersthene, and rare tiny black clinopyroxene, in glassy to aphanitic groundmass; source vent at Vulture Rock; overlies basin deposits of lower Thurston Creek, rhyolite of Thurston Creek, dacites of Thurston Lake and Plum Flat; maximum thickness about 150 meters.

ds HORNBLENDE-BIOTITE DACITE OF SEIGLER MOUNTAIN Domes and flows of rubbly to massive, poorly flow-banded light gray, gray and pink, porphyritic dacite; contains 10 percent of 1-10 mm feldspar, 5 percent of 1-5 mm quartz, 3 percent of 1-3 mm black hornblende, and 1-2 percent of 1 mm biotite, and sparse 1-3 mm pyroxene, in gray or gray and pink aphanitic groundmass; size and abundance of hornblende distinguishes this unit from all other known volcanic rocks in Clear Lake field; source or sources within Seigler Mountain; overlies rhyolitic tuff of Bonanza Springs, andesites of Split Top Ridge and Salmina Flat, and probably flowed against, and overlies, dacite of Loch Lomond; magnetic polarity normal; maximum thickness about 350 meters.

dpf HORNBLENDE-BIOTITE DACITE OF PLUM FLAT Massive to rubbly flows and domes of gray to pink, highly porphyritic hornblende-biotite dacite; contains 15-20 percent of 2-10 mm feldspar, 2-3 percent of 1-5 mm quartz, 2-5 percent of 1-2 mm biotite, 1-2 percent of 1-4 mm dark brown orthopyroxene, 1 percent of 1-2 mm green clinopyroxene, and about 2 percent of 0.25-1 mm dark to reddish hornblende in aphanitic groundmass; possible source vents in SE 1/4 sec. 21 and NW 1/4 sec. 27, NW 1/4 NW 1/4 and NE 1/4 NE 1/4 sec. 35, T. 13 N., R. 8 W; overlies rhyolite of Thurston Creek, basin deposits of lower Thurston Creek and dacite of Konocti Bay; overlain by dacites of Wheeler Point and Vulture Rock, and by young pyroclastic deposits; maximum exposed thickness 130 meters, maximum thickness unknown.

dt DACITE OF THURSTON LAKE Two or possibly three coalesced flows, domes, and minor pyroclastic deposits; gray and pink platy to massive porphyritic dacite; contains 10 percent or more of 5 mm quartz and plagioclase, 3 percent of 1 mm clinopyroxene and hypersthene, and rare tiny reddish needles of oxyhornblende in a pink-streaked gray glassy to aphanitic groundmass; most specimens contain one or more 1 cm or larger phenocrysts of feldspar and diabasic-textured lithic inclusions; probable vents are south of Thurston Lake, and domes on and southeast of Luebow Point; probably overlies rhyolite of Thurston Creek; overlain by dacites of Wheeler Point and Vulture Rock and olivine basalt of Roundtop Mountain; exposed thickness about 250 meters, maximum thickness unknown.

dkb DACITE OF KONOCTI BAY Flows and domes of gray to black, moderately porphyritic dacite; contains 10 percent of 1-5 mm feldspar, 5 percent of 1-5 mm quartz, 3 percent of 1-3 mm pyroxene, and rare 1-2 mm biotite, in glassy to aphanitic groundmass; contains fewer and smaller phenocrysts than dacites of Plum Flat and Mt. Konocti; inferred to overlie rhyolite of Thurston Creek; overlain by dacites of Plum Flat and Wheeler Point and by young pyroclastic deposits; magnetic polarity normal; exposed thickness about 200 meters, maximum thickness unknown.

dko OLDER HORNBLENDE DACITE OF MT. KONOCTI Massive to rubbly flows of pink and gray flow-banded, sparsely porphyritic hornblende dacite; contains 5 percent of 1-10 mm feldspar, 2 percent of 1-10 mm quartz, 1 percent of 0.5-2 mm pyroxene, and 1-2 percent of abundant 0.25-1 mm needles of hornblende in aphanitic groundmass; overlain by dacite of Mt. Konocti and by young pyroclastic deposits; source concealed beneath Mt. Konocti; exposed thickness about 300 meters, maximum thickness unknown.

df DACITE OF FRASER POINT Massive to rubbly flows of gray or gray and pink flow-banded, sparsely porphyritic dacite, locally shows fused breccia texture; contains sparse 1-5 mm quartz and feldspar, 10 percent total of 0.5-1 mm pyroxene, and 1-2 percent of 0.5-2 mm pyroxene, and rare hornblende in aphanitic groundmass; source probably concealed beneath Mt. Konocti; overlain by young pyroclastic deposits and probably by dacite of Mt. Konocti, downslope from Wright Peak and Buckingham Peak; exposed thickness 200-300 meters, maximum thickness unknown.

dh BIOTITE DACITE OF HORSESHOE BAY Massive flow of gray and pink-streaked, rubbly-weathering, coarsely porphyritic dacite; contains 10-15 percent total of 3-10 mm plagioclase and sanidine, 3-5 percent of 1-5 mm quartz, 1-2 percent each of 0.5-2 mm biotite and pyroxene, in aphanitic groundmass; contains abundant diabasic textured inclusions; source probably beneath Mt. Konocti; overlain by olivine basaltof Horseshoe Bend; K/Ar age 0.34 ± .01 m.y., magnetic polarity normal; exposed thickness 230 meters, maximum thickness unknown.

dhc COARSE-GRAINED DACITE OF MT. HANNAH Vesicular, massive and rubbly flows and domes of gray to pink, coarsely porphyritic dacite; contains 5-10 percent of 1-10 mm feldspar , 3-5 percent of 1-3 mm quartz, 5 percent of 1-2 mm sparse 0.5-1 mm biotite in aphanitic to gray to pink mottled aphanitic, or rarely glassy, groundmass; contains up to 10 percent of diabasic-textured lithic inclusions up to 15 cm size; source within Mt. Hannah; overlies andesites of Split Top Ridge, Salmina Flat, and Glenview, dacites of Harrington Flat Road and Loch Lomond; overlain by and intruded by medium-grained dacite of Mt. Hannah; maximum thickness unknown, possibly as much as 450 meters.

lc BASIN DEPOSITS SOUTHEAST OF CAMELBACK RIDGE Poorly exposed; local lake sediments, alluvium and pyroclastic deposits; light brown silty claystone, white diatomaceous siltstone; lapilli tuff of white to tan rhyolitic pumice, which contains 1 percent of 0.5-1 mm fragments of equant to shard-like shape, sub-angular fragments of pink and gray dacite, abundant 1-3 mm quartz grains and sparse 1 mm biotite flakes, sparse 1-3 cm pebbles of rhyolite, overlain by andesites of Split Top Ridge, Salmina Flat, and Glenview, dacites of Harrington Flat Road and Loch Lomond; overlain by and intruded by medium-grained dacite of Mt. Hannah; maximum thickness unknown, possibly as much as 450 meters.

dsv BIOTITE-HORNBLENDE DACITE OF SHAUL VALLEY Dome of flows and coarse rubble of dominantly gray, partly pink and red, massive to vesicular, poorly flow-banded, moderately porphyritic dacite; contains 5 percent total of 1-5 mm feldspar and glassy quartz, less than 0.5 percent of 0.5-1 mm biotite, 1 percent of 0.5-1 mm hornblende needles, 1 percent 0.5-2 mm pyroxene, about 2 percent of 3-15 mm lithic inclusions, in aphanitic groundmass; source within present outcrop area; overlies rhyolite of Thurston Creek and south flank of Mt. Konocti; overlain by dacite of Mt. Konocti; maximum thickness at least 130 meters.

dcl DACITE OF CLEFT HILL Small flows (dcl) and pyroclastic deposits (dclp) of agglomerate and tuff breccia of tan, pink, light gray, vesicular to massive, in part flow-banded, moderately crystal-rich, glassy perlitic to aphanitic biotite dacite; contains 5 percent of 2-8 mm quartz, 5-10 percent total of 2-15 mm plagioclase and sanidine?, 1 percent of 0.5-1 mm biotite, rare 1-2 mm pyroxene, and lithic inclusions, in perlitic glassy or aphanitic groundmass; flows restricted to top of Cleft Hill and north side of McIntire Creek at Route 175; pyroclastic deposits contain vesicular blocks of biotite dacite up to 1.5 meters size close to Cleft Hill, also contain sparse obsidian fragments; main source vent at top of Cleft Hill; another source possibly close to McIntire Creek at Route 175; deposited by airfall, block avalanche and possible mudflows; youngest unit in complex sequence east of Mt. Olive; overlies biotite rhyolite pyroclastic deposits west of Sugarloaf and rhyolite of Thurston Creek; maximum thickness about 25-40 meters.

dclp

dp DACITIC PYROCLASTIC DEPOSIT NORTH OF MCINTIRE CREEK Light tan unbedded? dacitic tuff breccia; contains blocks of biotite dacite and biotite-hornblende dacite up to 60 cm size, sparsely porphyritic obsidian fragments up to 5 cm size, and rare small fragments of Franciscan chert; lacks blocks of biotite rhyolite and lacks abundant fragments of Franciscan or Great Valley sequence rocks; source probably near the present outcrop area; overlies rhyolite of Thurston Creek and mixed pyroclastic deposits north of McIntire Creek, apparently overlies biotite rhyolite pyroclastics west of Sugarloaf; maximum thickness about 20 meters.

rps BIOTITE RHYOLITE PYROCLASTIC DEPOSITS WEST OF SUGARLOAF Tan, white light yellow, weathered orange-red, agglomerate, tuff breccia, lapilli tuff and tuff, mostly unbedded to poorly bedded, locally well bedded; pumice, pumice blocks and lithic blocks up to 1 meter size, of crystal-rich biotite rhyolite make up 90-95 percent of deposit; contains 10-15 percent of 1-5 mm glassy rounded quartz, 10-15 percent total of 2-8 mm glassy plagioclase and sanidine?, 2-3 percent of 0.5-1.5 mm biotite, 1 percent or less lithic inclusions, in gray to white, perlitic glassy or aphanitic groundmass; well-bedded airfall pumice is locally abundant, up to 12 cm size in layers 1-15 cm thick, which also contain fragments of chert and graywacke of average size 6 mm; deposit is rich in 1-3 mm quartz grains, and is locally rich in fragments of Franciscan and Great Valley Sequence chert and graywacke; contains common fragments and blocks up to 70 cm size of biotite-hornblende dacite resembling dacite of Shaul Spring, rare blocks and fragments of black glassy pyroxene dacite of Diener Drive up to 15 cm size, basalt, diabasic-textured lithic inclusions up to 40 cm size; generally lacks obsidian fragments; deposited mainly by airfall, in part by mudflow, locally reworked by water; source within present outcrop area; overlies rhyolite of Thurston Creek, olivine andesite west of Sulphur Mound Mine, mixed pyroclastic deposits north of McIntire Creek, basalt of Lower Lake Road, and biotite-hornblende dacite of Shaul Spring; overlain by biotite dacite of Cleft Hill and dacite of Mt. Konocti; maximum exposed thickness 40 meters.

ao OLIVINE ANDESITE WEST OF SULPHUR MOUND MINE Mainly red to orange-red scoriaceous bombs and blocks up to 3 meters size and tuff breccia, of porphyritic plagioclase-olivine andesite; small area of red oxidized andesite and gray, massive fresh andesite in SW 1/4 SE 1/4 sec. 32, T. 13 N., R. 8 W. may be a small flow and vent plug; contains 10 percent of 0.5-2 mm plagioclase, 5 percent of 1 mm olivine, rare 0.5 mm clinopyroxene in gray to red micro-crystalline groundmass of plagioclase, clinopyroxene and opaques; contains partially fused inclusions of biotite dacite up to 30 cm size; overlies mixed pyroclastics west of Sulphur Mound Mine, apparently overlies rhyolite of Thurston Creek and dacite of Sulphur Mound Mine; overlain by biotite rhyolite pyroclastic deposits west of Sugarloaf and dacitic pyroclastics north of McIntire Creek; maximum thickness about 10 meters.

drp MIXED PYROCLASTIC DEPOSIT WEST OF SULPHUR MOUND MINE Poorly bedded, light tan, light yellow, and rusty agglomerate, tuff breccia and lapilli tuff, of mixed rhyolitic, dacitic, and pre-Tertiary rock types in variable proportions in a clayey matrix; deposited mainly by air-fall, and in part possibly by mudflow, after explosive rhyolitic? eruption; contains beds rich in biotite-free, sparsely porphyritic rhyolitic pumice(average size 10 mm) and pumice blocks which are of largest size, up to about 1 meter, in western part of unit; contains blocks of biotite-hornblende dacite and biotite dacite up to 25 cm, sparsely porphyritic obsidian fragments up to 5 cm size, rare black glassy pyroxene dacite, and abundant light gray altered fragments of pyroxene dacite?, abundant 1-3 mm quartz grains, abundant angular 2-10 mm fragments of shale, siltstone, sandstone, red, green and white chert; source probably near west part of present outcrop area; overlies rhyolite of Thurston Creek; overlain by olivine andesite west of Sulphur Mound Mine, biotite rhyolite pyroclastic deposits west of Sugarloaf, and dacitic pyroclastics north of McIntire Creek; maximum thickness about 65 meters.

rh RHYOLITE OF HILDEBRAND SPRINGS White, orange and tan pumice, pumice blocks, fused pumice breccia and black obsidian; contains 1 percent of 1-2 mm plagioclase, 1 percent of 1 mm orthopyroxene, sparse opaques in glass; closely resembles rhyolitic obsidian of Thurston Creek; outcrop inferred to be vent area of small eruption of pyroclastic material; cuts basalt of McIntire Creek; vent filling could extend to several hundred meters depth.

bmp

bm BASALT OF MCINTIRE CREEK Massive, scoriaceous and sheeted flows, of irregularly flow-banded, red, brown and gray, in part mottled or streaked, sparsely porphyritic basalt; subdued, eroded cinder cone (bmp) of red, orange, brown, rarely black glassy, scoriaceous blocks, bombs and tuff breccia; flows contain less than 0.5 percent of 1-2 mm lath-shaped plagioclase, rare 0.5-1 mm olivine and 1-3 mm clear quartz, in aphanitic groundmass which contains tiny needles of plagioclase; most samples lack conspicuous pyroxene or olivine phenocrysts; basalt in cinder cone is slightly more olivine rich, contains about 1 percent of 0.25 mm olivine; sources within present outcrop area; cinder cone overlies flows and is one probable source area; overlies rhyolite of Thurston Creek and biotite rhyolite of Red Hill Road; cut by rhyolite of Hildebrand Springs; overlain by basalt of Binns Hill, dacite of Cleft Hill, and by lake deposits of Kelseyville; K/Ar age 0.40 ± 0.18 m.y., magnetic polarity of flow normal; maximum thickness about 80 meters in eastern part, thickness about 10 meters in western part.

bl OLIVINE BASALT OF LOWER LAKE ROAD Massive, scoriaceous and sheeted flows and associated coarse red pyroclastic deposits of vesicular to irregularly flow-banded reddish, brown and gray, in part mottled or streaked, sparsely porphyritic olivine basalt; contains 1-2 percent of 0.5-1 mm olivine, rare 1 mm clinopyroxene,rare inclusions of 1-2 mm quartz in aphanitic groundmass; contains inclusions of biotite rhyolite, and of biotite-hornblende dacite of Shaul Spring; probable sources in NW 1/4 NW 1/4 sec. 32, T. 13 N., R. 8 W., and in partially buried cinder cone of red scoria in NW 1/4 SW 1/4 sec. 29, T. 13 N., R. 8 W; overlies and contains inclusions of biotite-hornblende dacite of Shaul Spring, biotite rhyolite pyroclastic deposits northeast of Mt. Olive; overlies rhyolite of Thurston Creek; overlain by biotite rhyolite pyroclastic deposits west of Sugarloaf, and by dacite of Mt. Konocti; magnetic polarity normal; maximum exposed thickness 50 metres.

bsk OLIVINE BASALT OF SOUTH FLANK MT. KONOCTI Massive to vesicular flows and coarse pyroclastic deposits of blocks and bombs of gray, brown and red basalt and rare black glassy fragments; contains 3-5 percent of 1 mm olivine, about 1 percent of 1-2 mm green clinopyroxene, and about 1 percent of 1-2 mm quartz, in aphanitic groundmass; source near present outcrop area but probably concealed beneath biotite dacite of Mt. Konocti near SW corner of sec. 20, T. 13 N., R. 8 W; contains vesicular, partially melted blocks of crystal-rich dacite which lacks visible biotite or hornblende; overlain by dacite of Mt. Konocti and by biotite-hornblende dacite of Shaul Valley; possibly contemporaneous with olivine basalt of Lower Lake Road which contains less olivine and pyroxene; total thickness unknown, exposed thickness about 50 meters.

bd DIATREME BRECCIA White to light brown coarse breccia, in part poorly bedded, in part hydrothermally altered, which contains gray basaltic or dacitic? pumice, blocks up to 30 cm size of black glassy basalt or pyroxene dacite, crystal-rich perlitic biotite rhyolite and serpentinized ultramafic rock; blocks, up to several meters in size, of conglomerate of Franciscan rock types; a block of schistose amphibole-plagioclase-chlorite granulite; rounded chert pebbles, obsidian fragments, and fragments from adjacent lake deposits of Kelseyville and their gravels; source in present outcrop areas east and southwest of Camel's Hump; cuts rhyolite of Thurston Creek and lake sediments of Kelseyville; cut by biotite-hornblende dacite of Camel's Hump; maximum thickness unknown.

bws BASALT WEST OF SHAUL VALLEY Dikes, adjacent coarse pyroclastic deposits of flows and bombs, and rooted one flow?, of vesicular, scoriaceous to massive flow-banded red to gray basalt; contains 0.5-1 percent of 0.5-1 mm olivine and sparse tiny laths of plagioclase in an aphanitic groundmass; vented from dikes, cuts biotite rhyolite of Cole Creek and biotite-hornblende dacite of Mt. Olive; maximum thickness of pyroclastic deposits and small flow? about 5 meters.

lk LAKE DEPOSITS OF KELSEYVILLE Well-bedded, light brown, rusty, yellow and white lake and fluviatile deposits of pebble-cobble conglomeratic sand, sand, silt, diataceous siltstone, claystone, pumiceous sandstone and lapilli tuff; basal 1-4 meters near Bottle Rock Road is rich in fragments of rhyolitic obsidian and pumice; gravels in conglomeratic sands are 95 percent pre-Tertiary rock types (chert, greenstone, graywacke and serpentinized ultramafic rocks) and 5-20 percent volcanic rock types, mainly from the Clear Lake volcanic field (gray sparsely porphyritic dacite, biotite rhyolite of Alder Creek, andesite of Boggs Mountain, and sparsely porphyritic obsidian); conglomeratic sands are derived from terrain to the south or southwest; lake sediments were deposited in an ancestral Clear Lake basin and are probably co-extensive with similar deposits exposed at the surface and concealed at depth in Big Valley; contains aquifer ash, which is intermittently exposed west of Mt. Olive, between Benson Ridge and Kelsey Creek, and in part of Big Valley; overlies rhyolite of Thurston Creek, basalt of McIntire Creek, biotite-hornblende dacite of Mt. Olive, biotite rhyolite of Cole Creek; overlain by basalt of Binns Hill, by terrace gravels of Cole Creek area and probably over much basin deposits southeast of Camelback Ridge; cut by diatreme breccia and by biotite-hornblende dacite of Camel's Hump; maximum thickness in map area probably greater than 160 meters.

ba AQUIFER ASH Thin interval of poorly bedded, unsorted, gray to light tan, crystal-poor pumiceous basaltic or andesitic lapilli tuff and tuff interbedded with lake deposits of Kelseyville; typically 95 percent pumice, 5 percent lithic fragments of dacite and Franciscan greenstone, chert or graywacke, and rare diabase-textured inclusions; average size of pumice 0.5 cm, maximum size 6 cm; pumice contains about 2 percent of 1-2 mm plagioclase, 2 percent of 1-2 mm olivine (commonly pseudomorphed or etched away), less than 1 percent of 1-2 mm pyroxene and 1mm and green clinopyroxene, and about 1 percent small inclusions mainly of Franciscan rocks; locally shows features of contemporaneous slump and soft-sediment deformation; thickest and coarsest beneath bed typically contains several gray to rusty beds, in part graded finer upward, 2 to 15 cm thick, of 1-3 mm pumice fragments; deposited sub-aqueously from air-fall into lake basin; source within the Clear Lake volcanic field; occurs as deep as 70 meters beneath much of Big Valley and is major aquifer (Lake County Flood Control and Water Conservation District, 1967), probably is present at greater depth beneath northern Big Valley; thickness 40 to 140 cm in outcrop.

rpo BIOTITE RHYOLITE PYROCLASTIC DEPOSITS NORTHEAST OF MT. OLIVE Tan, white, light yellow agglomerate, tuff breccia, lapilli tuff and tuff, poorly exposed, mostly unbedded; dominant rock type is crystal-rich biotite rhyolite pumice, blocks of crystal-poor biotite dacite up to 50 cm size, and fragments of Franciscan chert up to 2 cm size; lacks obsidian fragments; biotite rhyolite contains 10-15 percent of 1-5 mm glassy quartz, 10-15 percent of 2-8 mm glassy feldspar, 2-3 percent of 0.5-1 mm biotite, and sparse lithic inclusions in perlitic glassy or aphanitic groundmass; closely resembles rhyolite of Thurston Creek, but contains 1 percent of 0.5-1 mm hornblende needles, 1 percent 0.5-2 mm pyroxene, about 2 percent of 3-15 mm lithic inclusions, in aphanitic groundmass; source probably within present outcrop area; overlies rhyolite of Thurston Creek, dacites of Mt. Olive and Shaul Spring, occurs as inclusions in, and is overlain by, olivine basalt of Lower Lake Road; maximum exposed thickness 25 meters, maximum thickness at least 130 meters.

dss BIOTITE-HORNBLENDE DACITE OF SHAUL SPRING Flows, domes and associated pyroclastic deposits of tuff breccia and lapilli tuff, of gray to reddish, vesicular, massive, rarely flow-banded porphyritic dacite; contains 5-10 percent of 2-7 mm feldspar, 5 percent of 2-10 mm quartz, 1 percent of 0.5-1 mm biotite, abundant 0.25-1 mm needles of hornblende, and 2-5 percent of lithic inclusions 10 mm or larger, in aphanitic groundmass; pyroclastic deposits contain domin