LIST OF MAP UNITS

[Note that **not all map units are labeled on the map**. To identify units that are not labeled, because they are too small for color identification and (or) labeling will obscure data, see database (accompanying CD-ROM). See **table 3** for an alphabetical listing of map unit labels, as well as unit name, page number of unit description in pamphlet, radiometric age, location by heading in Correlation of Map Units, and quadrangle location in database. See **Methodology** section for detailed information on methods used to describe and name map units. **Unit labels** are abbreviations for age (all units without capital are Quaternary), rock type, and unit name: unit bb10 represents Quaternary basalts and basaltic andesites of Bogard Buttes, unit 10. **Rock type abbreviations (volcanic units)**: b, basalt (<53% SiO_2); m, basaltic andesite (53%–57% SiO_2); a, andesite (57–63% SiO_2); d, dacite (63–68% SiO_2); r, rhyodacite (68–72% SiO_2) and rhyolite (>72% SiO_2); p, pyroclastic flow and fall deposits. **Rock type abbreviations (glacial and sedimentary units)**: c, colluvium, including talus; d, diatomite; f, fluvial deposits, including all alluvium; h, hydrothermally altered rocks and travertine deposits; o, glacial outwash deposits; s, landslide and avalanche deposits; t, till; w, mudflow and other debris-flow deposits. **Common mineral abbreviations**: pl, plagioclase; ol, olivine; aug, augite; hyp, hypersthene; pyr, pyroxene; hbl, hornblende; bt, biotite; and qtz, quartz. **Abbreviations in brackets** at end of unit description represent 1:24,000-scale quadrangle(s) where unit is mapped (see fig. 3)]

GLACIAL, SEDIMENTARY, AND HYDROTHERMAL DEPOSITS

NONVOLCANIC SEDIMENTARY DEPOSITS

Alluvium and Colluvium

- Qf — **Alluvium (Holocene and Pleistocene)**—[BB, CH, CM, GP, LP, MH, MN, MZ, OS, PL, PP, RC, RP, ST, SW, TH, VI, WP]
- Qc — **Colluvium and talus (Holocene and Pleistocene)**—[BB, CH, LP, LY, MH, MN, MZ, OS, PL, PP, RC, RP, ST, SW, WP]
- Qcl — **Talus on Lassen Peak (late Pleistocene)**—[LP, MZ, RP]

Mass-Wasting Deposits

- Qsh — **Landslide deposits in hydrothermally altered core of Brokeoff Volcano (Holocene)**—[LP, RP]
- Qsj — **Avalanche deposits of Chaos Jumbles (Holocene)**—[MZ]
- Qwh — **Debris-flow deposits from the northeast side of Lassen Peak (Holocene)**—[LP, MZ, RP, WP]
- Qsl — **Avalanche debris from Lassen Peak spread across glacial ice (late Pleistocene)**—[WP]
- Qs82 — **Avalanche deposit from dacite of hill 8283 (middle Pleistocene)**—[MZ, VI]
- Qwb — **Debris-flow deposit from Brokeoff Volcano (middle Pleistocene)**—[GP]

Hydrothermal Deposits

- h — **Hydrothermally altered rocks in active thermal areas (Holocene)**—[LP, RP]
- ht — **Travertine (Holocene)**—[LP]

Glacial Deposits

Till

- Qth — **Till or protalus-rampart debris (Holocene)**—[RP]
- Qty — **Till, younger glaciations (late Pleistocene)**—[BB, CH, CM, LP, MH, MZ, PP, RC, RP, ST, TH, VI, WP]
- Qtal — **Late till of Anklin Meadows (Holocene to late Pleistocene)**—[LP, MZ, RP, WP]
- Qta — **Till of Anklin Meadows (late Pleistocene)**—[GP, LP, MZ, RP, WP]
- Qtrl — **Post-maximum till of Raker Peak consisting of Lassen Peak avalanche debris (late Pleistocene)**—[WP]
- Qtr — **Till of Raker Peak (late Pleistocene)**—[GP, MZ, WP]
- Qto — **Till, older glaciations (late Pleistocene)**—[BB, CH, CM, GP, LP, LY, MH, MN, MZ, PP, RC, RP, ST, VI]
- Qtb — **Till of Badger Mountain (late Pleistocene)**—[MZ, WP]

Outwash

- Qoy — **Outwash gravel, younger glaciations (late Pleistocene)**—[BB, CH, CM, LP, MH, MN, MZ, OS, PP, RC, RP, ST, TH, VI, WP]
- Qou — **Outwash gravel, undivided (late Pleistocene)**—[GP, LY, MN, PP, SW, VI]
- Qoa — **Outwash gravel of Anklin Meadows (late Pleistocene)**—[MZ, OS, WP]
- Qor — **Outwash gravel of Raker Peak (late Pleistocene)**—[MZ, OS, WP]
- Qoo — **Outwash gravel, older glaciations (late Pleistocene)**—[CM, MN]

Sedimentary Deposits

- Qd — **Diatomite (Holocene)**—[PP]

VOLCANIC CENTERS OF SOUTHERNMOST CASCADES

LASSEN VOLCANIC CENTER

Lassen domefield

Twin Lakes sequence, younger

Deposits of 1914–1917 eruption of Lassen Peak (Holocene)—[LP, MZ, OS, RP, WP]

1917 C.E.

- p17 — **Phreatic deposit, May–June**—[LP]

1915 C.E.

- w2 — **Viscous debris-flow deposits, May 22**—[LP, MZ, RP, WP]
- p2 — **Pumice-fall deposit, May 22**—[LP, RP, WP]
- pw2 — **Pyroclastic-flow and associated fluid debris-flow deposits, May 22**—[LP, MZ, OS, RP, WP]
- d9 — **Dacite flow, May 19–20**—[LP]
- f9 — **Flood deposits, May 19–20**—[WP]
- sw9 — **Avalanche and debris-flow deposits, May 19–20**—[WP]
- p9 — **Pyroclastic deposit, May 19**—[LP]
- d4 — **Dacite dome, May 14–19**—[LP]

Basaltic andesites of Cinder Cone (Holocene)—[PP]

Fantastic Lava Beds

- mf2 — **Flow 2**—[PP]
- mf1 — **Flow 1**—[PP]

Painted Dunes

- mp2 — **Flow 2**—[PP]
- mp1 — **Flow 1**—[PP]
- mo — **Old Bench flow**—[PP]
- a74 — **Andesite of hill 7416 (late Pleistocene)**—[OS, PP, SW]
- ah — **Andesite of Hat Mountain (late Pleistocene)**—[MH, PP, RP, WP]
- ae — **Andesite of Eagle Peak (late Pleistocene)**—[LP]
- mfp — **Basaltic andesite of Fairfield Peak (late Pleistocene)**—[PP]
- ac — **Andesite of Crater Butte (late Pleistocene)**—[MH, PP]

Twin Lakes sequence, older

- acl — **Andesite and basaltic andesite of Cluster Lakes (middle Pleistocene)**—[PP, WP]
- arp — **Andesite of Raker Peak (middle Pleistocene)**—[MZ, WP]
- av — **Andesite of Viola (middle Pleistocene)**—[LP, MZ, VI]

Eagle Peak sequence

Rhyodacite of Chaos Crags (Holocene)—[MZ, OS, VI, WP]

- cc — **Talus, emplaced hot from domes B–F**—[MZ]
- rcf — **Dome F**—[MZ]
- pce — **Lithic pyroclastic-flow deposit from partial collapse of dome E**—[MZ, WP]
- rce — **Dome E**—[MZ]
- pcd — **Lithic pyroclastic-flow deposit from partial collapse of dome D**—[MZ]
- rcd — **Dome D**—[MZ]
- rcc — **Dome C**—[MZ]
- rcb — **Dome B**—[MZ]
- pc — **Pumiceous pyroclastic-flow and fall deposits**—[MZ, OS, VI, WP]
- rca — **Dome A**—[MZ]

Dacite of Lassen Peak (late Pleistocene)—[LP, MZ, RP, WP]

- pfl — **Lithic pyroclastic-flow deposit from partial collapse of dome**—[WP]
- dl — **Dome**—[LP, MZ, RP]

Rhyodacite of Kings Creek (late Pleistocene)—[LP, RP, WP]

- rk — **Flows**—[LP, RP]
- pk — **Pumiceous pyroclastic-flow deposits**—[LP, RP, WP]

Rhyodacite of Sunflower Flat (late Pleistocene)—[MZ, WP]

- rsf — **Domes**—[MZ, WP]
- psf — **Pumiceous pyroclastic-flow deposits**—[MZ]
- rkr — **Rhyodacite of Krummholz (late Pleistocene)**—[MZ, WP]
- r27 — **Rhyodacite of section 27 (late Pleistocene)**—[MZ, WP]

Rhyodacite of Eagle Peak (late Pleistocene)—[GP, LP, MZ]

- re — **Dome and flow**—[LP]
- pe — **Pumiceous pyroclastic-flow deposits**—[GP, LP, MZ]

Bumpass sequence

- rd — **Rhyodacite of Dersch Meadows (middle Pleistocene)**—[RP, WP]
- dr — **Dacite of Reading Peak (middle Pleistocene)**—[RP]
- db — **Dacite of Bumpass Mountain (middle Pleistocene)**—[LP, RP]
- dc — **Dacite of Crescent Crater (middle Pleistocene)**—[MZ, WP]
- ds — **Dacite of Ski Heil Peak (middle Pleistocene)**—[LP]
- dh — **Dacite of Mount Helen (middle Pleistocene)**—[LP, RP]
- duh — **Dacite under Mount Helen (middle Pleistocene)**—[RP]
- dsc — **Dacite of Summit Creek (middle Pleistocene)**—[RP]
- dpl — **Dacite of Lassen Peak parking lot (middle Pleistocene)**—[LP]
- dv — **Dacite of Vulcans Castle (middle Pleistocene)**—[LP]
- d82 — **Dacite of hill 8283 (middle Pleistocene)**—[MZ, WP]
- dmz — **Dacite of upper Manzanita Creek (middle Pleistocene)**—[MZ]
- rmz — **Rhyodacite of Manzanita Chute (middle Pleistocene)**—[LP, MZ]
- rmc — **Rhyodacite of Mount Conard (middle Pleistocene)**—[LP, RP]
- rlm — **Rhyodacite of Loomis Peak (middle Pleistocene)**—[LP, MZ]

Brokeoff Volcano

Diller sequence

- amd — **Andesite of Mount Diller (middle Pleistocene)**—[LP, RP]
- ad — **Andesites of Diller sequence, undivided (middle Pleistocene)**—[GP, MZ, VI, WP]
- adc — **Andesite of Digger Creek (middle Pleistocene)**—[GP, LP, MZ, VI]
- amz — **Andesite of Manzanita Creek (middle Pleistocene)**—[MZ, VI]
- ag — **Andesite of Glassburner Meadows (middle Pleistocene)**—[LP]
- abf — **Andesite of Bluff Falls quarry (middle Pleistocene)**—[LP]
- ar — **Andesite of Rice Creek (middle Pleistocene)**—[CM, LP, RP]

Mill Canyon sequence

- dt — **Dacite of Twin Meadows (middle Pleistocene)**—[LP, RP]
- amc — **Andesites of Mill Canyon (middle Pleistocene)**—[LP, RP, WP]

Rockland caldera complex

- pr — **Rockland tephra (middle Pleistocene)**—[GP, LY, VI]
- rr — **Rhyolite of Raker Peak (middle Pleistocene)**—[WP]
- drr — **Dacite of Red Rock Mountain (middle Pleistocene)**—[GP, LP]
- dbl — **Dacite of Bench Lake (middle Pleistocene)**—[RP]
- dbc — **Dacite of Bailey Creek (middle Pleistocene)**—[LP]
- drp — **Dacite of Rocky Peak (early Pleistocene)**—[GP, LP]
- dfr — **Dacite of Flatiron Ridge (early Pleistocene)**—[MH, RP]
- dp — **Dacite of Panther Creek (early Pleistocene)**—[RP]
- dpg — **Dacite of Plantation Gulch (early Pleistocene)**—[LP, MN]
- dch — **Dacite of Christie Hill (early Pleistocene)**—[LP, MN]
- dmm — **Dacite of Morgan Mountain (early Pleistocene)**—[LP, MN]
- dcy — **Dacite of Canyon Creek (early Pleistocene)**—[LP, RP]

MAIDU VOLCANIC CENTER

Stage 3

- rb — **Rhyolite of Blue Ridge (early Pleistocene)**—[GP, LY]
- rmp — **Rhyolite of Mill Creek Plateau (early Pleistocene)**—[CM, LP, MN]
- rlp — **Rhyolite of Lost Creek Plateau (early Pleistocene)**—[CM]
- rsm — **Rhyolite of North Stover Mountain (early Pleistocene)**—[CM, ST]
- rg — **Rhyodacite of Gurnsey Creek (early Pleistocene)**—[CM, LP]

Stage 2

- Tah — **Andesites of Hampton Butte (late Pliocene)**—[GP, LY]
- Tdm — **Dacites of Maidu Volcanic Center, Stage 2, undivided (late Pliocene)**—[GP, LY, MN]

Stage 1

- Tam — **Andesites of Maidu Volcanic Center, Stage 1, undivided (late Pliocene)**— [LP, LY, MN]
- Tab — **Andesite of South Fork Battle Creek (late Pliocene)**—[GP, LY]
- Tml — **Basaltic andesite of Lassen Lodge (late Pliocene)**—[LY]

DITTMAR VOLCANIC CENTER

Stage 3

- rd3 — **Rhyolites of Dittmar Volcanic Center, Stage 3 (early Pleistocene)**—[MH, RP]

Stage 2

- ad2 — **Andesites of Dittmar Volcanic Center, Stage 2, undivided (early Pleistocene)**—[MH, PP, RP, ST]
- adm — **Andesite of Doe Mountain (early Pleistocene)**—[CM, MH]
- ads — **Andesite of Domingo Spring (early Pleistocene)**—[MH, ST]
- adb — **Andesites of Benner Creek (early Pleistocene)**—[CH, ST]

Stage 1

- Tad — **Andesites of Dittmar Volcanic Center, Stage 1, undivided (late Pliocene to early Pleistocene)**—[MH, PP, RP, ST]
- Taw — **Andesites of Wild Cattle Mountain (late Pliocene)**—[CM, LP, MN, RP]

LATOUR VOLCANIC CENTER

- Tlv — **Rocks of Latour Volcanic Center (late Pliocene)**—[VI]

TUSCAN FORMATION

- Tt — **Tuscan Formation (late Pliocene)**—[LY]

REGIONAL VOLCANIC ROCKS

NORTH AND WEST OF LASSEN VOLCANIC CENTER

Late Pleistocene volcanic rocks

- bhc — **Hat Creek Basalt (late Pleistocene)**—[OS]

Tholeiitic basalts of Big Lake (late Pleistocene)—[MZ, TH, VI]

- bk2 — **Unit 2**—[MZ, TH, VI]
- bk1 — **Unit 1**—[MZ, VI]
- meh — **Basaltic andesite of Eskimo Hill (late Pleistocene)**—[MZ]
- mrd — **Basaltic andesite and andesite of Red Lake Mountain (late Pleistocene)**—[MZ, VI]
- mrm — **Basaltic andesite of Red Mountain (late Pleistocene)**—[MZ]

Tumble Buttes chain

- atd — **Andesite of Devils Rock Garden (late Pleistocene)**—[TH]
- atb — **Andesite of Bear Wallow Butte (late Pleistocene)**—[MZ, OS, TH, WP]
- mt67 — **Basaltic andesite of hill 6770 (late Pleistocene)**—[TH]
- mtu — **Basaltic andesite of Tumble Buttes (late Pleistocene)**—[TH]
- mt54 — **Basaltic andesite of hill 5410 (late Pleistocene)**—[TH]
- mtb — **Basaltic andesite of Bear Wallow Butte (late Pleistocene)**—[TH]
- mt61 — **Basaltic andesite of hill 6138 (late Pleistocene)**—[TH]
- mt5 — **Basaltic andesite of section 5 (late Pleistocene)**—[TH]
- att — **Andesite of Tumble Buttes (late Pleistocene)**—[MZ, OS, TH, WP]
- mtm — **Basaltic andesite of Mud Lake (late Pleistocene)**—[TH]

Sugarloaf chain

- ass — **Andesite of Sugarloaf Peak (late Pleistocene)**—[OS]
- msl — **Basaltic andesite of Little Potato Butte (late Pleistocene)**—[OS]
- asp — **Andesite of Potato Butte (late Pleistocene)**—[OS]
- ms47 — **Basaltic andesite of hill 4709 (late Pleistocene)**—[OS]
- aso — **Andesites of Old Station (late Pleistocene)**—[OS]

Middle Pleistocene and older volcanic rocks

- mbg — **Basaltic andesite of Little Bunchgrass Meadow (middle Pleistocene)**—[WP]
- mbx — **Basaltic andesite of Box Canyon (middle Pleistocene)**—[WP]
- b44 — **Tholeiitic basalt of Calif. Hwy 44 (middle Pleistocene)**—[OS, PP, SW]
- b18 — **Tholeiitic basalt of hill 1879 (middle Pleistocene)**—[BB, PL, PP, SW]
- bec — **Tholeiitic basalt of Eagle Canyon (middle Pleistocene)**—[GP, MZ, VI]
- mm — **Basaltic andesites of Magee Volcano (middle Pleistocene)**—[TH]
- bn — **Tholeiitic basalt of Nobles Trail (middle Pleistocene)**—[WP]
- ap — **Andesite and basaltic andesite of Prospect Peak (middle Pleistocene)**—[PP, SW, WP]
- pdh — **Lithic tephra from Deep Hole (middle Pleistocene)**—[MZ]
- bct — **Basalt of Cherry Thicket (middle Pleistocene)**—[VI]
- bo — **Basalt of Onion Springs (middle Pleistocene)**—[LP, MZ]
- awp — **Andesites of West Prospect Peak (middle Pleistocene)**—[OS, PP, SW, WP]
- bbf — **Basalt of Badger Flat (middle Pleistocene)**—[OS, WP]
- mhr — **Basaltic andesite of Hootman Ranch (middle Pleistocene)**—[GP, VI]
- aw — **Andesite of Wilcox Peak (middle Pleistocene)**—[OS]
- alg — **Andesite of Logan Mountain (middle Pleistocene)**—[TH]
- agr — **Andesite of Grayback Ridge (middle Pleistocene)**—[MZ]
- acs — **Andesite of Cabin Spring (middle Pleistocene)**—[GP]
- mr — **Basaltic andesite of Rock Spring (middle Pleistocene)**—[GP]
- ao — **Andesite of Onion Creek (middle Pleistocene)**—[GP]
- at — **Andesite of Table Mountain (middle Pleistocene)**—[MZ]
- abm — **Andesites of Badger Mountain (middle Pleistocene)**—[OS, WP]
- btb — **Tholeiitic basalt of Twin Bridges (middle Pleistocene)**—[OS, WP]
- aa — **Andesite of Ashpan Butte (early Pleistocene)**—[MZ]
- msg — **Basaltic andesite of Signal Butte (early Pleistocene)**—[OS, SW]
- ahc — **Andesites, basaltic andesites, and basalts of Hat Creek Rim (early Pleistocene)**—[OS, PP, SW]
- abl — **Andesite of Butte Lake (early Pleistocene)**—[PP]
- a22 — **Andesite of section 22 (early Pleistocene)**—[PP]
- dhm — **Dacite of Huckleberry Mountain (early Pleistocene)**—[TH, VI]
- am — **Older regional andesites and basaltic andesites, undivided (early Pleistocene)**—[GP, MZ, OS, TH, VI]
- mcf — **Basaltic andesites of Camp Forward (early Pleistocene)**—[GP]

SOUTH AND EAST OF LASSEN VOLCANIC CENTER

- bbz — **Tholeiitic basalts of Buzzard Springs (late Pleistocene)**—[CM, RP, ST]
- bic — **Tholeiitic basalt of Ice Cave Mountain (late Pleistocene)**—[CM]
- bcc — **Basalts of Cold Creek Butte (late Pleistocene)**—[LY, MN]
- bmc — **Tholeiitic basalts of Mill Creek Plateau (middle to late Pleistocene)**—[CM, MN]
- bsm — **Basalts and basaltic andesites of Sifford Mountain (middle Pleistocene)**—[CM, MH, RP, ST]
- msm — **Basaltic andesite of Small Butte (middle Pleistocene)**—[CM, RP]
- amh — **Andesite and basalt of Mount Harkness (middle Pleistocene)**—[MH]
- mhl — **Basaltic andesite of Huckleberry Lake (middle Pleistocene)**—[LP, MN]
- bwv — **Tholeiitic basalt of Warner Valley (middle Pleistocene)**—[CH, MH, ST]
- mgp — **Basaltic andesite of Grays Peak (early Pleistocene)**—[GP, LY]
- bpa — **Basalt of Panther Creek (early Pleistocene)**—[LY]
- amr — **Andesite of Martin Creek (early Pleistocene)**—[LP, MN]
- acc — **Andesites of Cowslip Campground (early Pleistocene)**—[GP, LP, LY, MN]
- mbc — **Basaltic andesites of South Fork Battle Creek (early Pleistocene)**—[LY]

REGIONAL VOLCANIC ROCKS OF THE CARIBOU AREA

Caribou Volcanic Field

Tuya chains

- mtt — **Basaltic andesite of Turnaround Lake (late Pleistocene)**—[BB, RC]
- mte — **Basaltic andesites of Evelyn Lake (late Pleistocene)**—[RC]

Red Cinder chain

- mrc — **Basaltic andesite of Red Cinder Cone (late Pleistocene)**—[MH, PP]
- brc — **Basalt of Red Cinder Cone (late Pleistocene)**—[MH, PP]
- mrr — **Basaltic andesite of Red Cinder (late Pleistocene)**—[BB, MH, PP, RC]
- br80 — **Basalt of hill 8030 (late Pleistocene)**—[MH, RC]
- brm — **Basalt of Cameron Meadow (late Pleistocene)**—[MH]
- bra — **Basalt of Ash Butte (late Pleistocene)**—[PP]
- br22 — **Basalt of hill 2283 (late Pleistocene)**—[BB, PP]
- br25 — **Basalt of section 25 (late Pleistocene)**—[PP]
- arr — **Andesite of Red Cinder (late Pleistocene)**—[BB, MH, PP, RC]
- bre — **Basalt east of Ash Butte (late Pleistocene)**—[PP]
- brw — **Basalt of Widow Lake (late Pleistocene)**—[BB, PP]

Basaltic andesites of Long Lake (late Pleistocene)—[MH, RC]

- mrg3 — **Unit 3**—[MH, RC]
- mrg2 — **Unit 2**—[MH, RC]
- mrg1 — **Unit 1**—[RC]
- mrb — **Basaltic andesite of Caribou Wilderness (late Pleistocene)**—[BB]

Basalts of Triangle Lake (late Pleistocene)—[BB]

- brt2 — **Unit 2**—[BB]
- brt1 — **Unit 1**—[BB]

Bidwell Spring chain

- adb — **Andesite of Bidwell Spring (late Pleistocene)**—[PP, SW]
- mdp — **Basaltic andesite of Pole Spring Road (late Pleistocene)**—[PP]
- md36 — **Basaltic andesite of section 36 (late Pleistocene)**—[BB, PP]
- bdt — **Basalt of Twin Buttes (late Pleistocene)**—[BB, PL, PP]

Basaltic andesites of Black Butte (late Pleistocene)—[BB, PP]

- mdb2 — **Unit 2**—[BB]
- mdb1 — **Unit 1**—[BB, PP]

Poison Lake chain

Basalts of Cone Lake Road (late Pleistocene)—[BB]

- bc2 — **Unit 2**—[BB]
- bc1 — **Unit 1**—[BB]

Basalts of old railroad grade (late Pleistocene)—[BB, PL, SW]

- bg4 — **Unit 4**—[PL]
- bg3 — **Unit 3**—[PL, SW]
- bg2 — **Unit 2**—[PL]
- bg1 — **Unit 1**—[BB, PL]

Basalts of Poison Butte (late Pleistocene)—[PL]

- bp6 — **Unit 6**—[PL]
- bp5 — **Unit 5**—[PL]
- bp4 — **Unit 4**—[PL]
- bp3 — **Unit 3**—[PL]
- bp2 — **Unit 2**—[PL]
- bp1 — **Unit 1**—[PL]

Basalts and basaltic andesites of Bogard Buttes (late Pleistocene)—[BB, PL]

- bb12 — **Unit 12**—[BB]
- bb11 — **Unit 11**—[BB]
- bb10 — **Unit 10**—[BB]
- bb9 — **Unit 9**—[BB]
- bb8 — **Unit 8**—[BB]
- bb6 — **Unit 6**—[BB]
- bb5 — **Unit 5**—[BB, PL]
- bb4 — **Unit 4**—[BB]
- bb3 — **Unit 3**—[BB]
- bb2 — **Unit 2**—[BB]
- bb1 — **Unit 1**—[BB]

Basalts of Pine Creek (late Pleistocene)—[BB]

- bpc3 — **Unit 3**—[BB]
- bpc2 — **Unit 2**—[BB]
- bpc1 — **Unit 1**—[BB]

Basalts of Pittville Road (late Pleistocene)—[BB, PL]

- bt4 — **Unit 4**—[BB, PL]
- bt3 — **Unit 3**—[BB]
- bt2 — **Unit 2**—[BB, PL]
- bt1 — **Unit 1**—[PL]
- m20 — **Basaltic andesite west of hill 2078 (late Pleistocene)**—[BB]

Basalts of Stephens Campground (late Pleistocene)—[BB, PL]

- bs5 — **Unit 5**—[BB, PL]
- bs4 — **Unit 4**—[BB]
- bs3 — **Unit 3**—[BB]
- bs2 — **Unit 2**—[BB]
- bs1 — **Unit 1**—[BB]

Basalts of Robbers Spring (middle Pleistocene)—[BB, PL]

- br2 — **Unit 2**—[BB]
- br1 — **Unit 1**—[BB]

Cone Lake chain

- bl35 — **Basalt of section 35 (middle Pleistocene)**—[BB]
- bl2 — **Basalt of section 2 (middle Pleistocene)**—[BB]
- bl20 — **Basalt of hill 2088 (middle Pleistocene)**—[BB]
- bl30 — **Basalt of section 30 (middle Pleistocene)**—[BB]
- bl22 — **Basalt of hill 2232 (middle Pleistocene)**—[BB]
- bl21 — **Basalt of hill 2109 (middle Pleistocene)**—[BB, PP]
- mlc — **Basaltic andesites of Cone Lake (middle Pleistocene)**—[BB]
- ml18 — **Basaltic andesite of hill 1868 (middle Pleistocene)**—[BB, PL]

Caribou chain

Triangle Lake sequence

- mtr — **Basaltic andesite of Triangle Lake (middle Pleistocene)**—[BB]
- mt20 — **Basaltic andesites of section 20 (middle Pleistocene)**—[BB]

Echo Lake sequence

Basalts of Bond Valley (middle Pleistocene)—[RC]

- beb3 — **Unit 3**—[RC]
- beb2 — **Unit 2**—[RC]
- beb1 — **Unit 1**—[RC]

Basaltic andesites of Echo Lake (middle Pleistocene)—[RC]

- mee2 — **Unit 2**—[RC]
- mee1 — **Unit 1**—[RC]
- mes — **Basaltic andesite of Star Butte (middle Pleistocene)**—[RC]

Caribou sequence

- mce — **Basaltic andesite of Eleanor Lake (middle Pleistocene)**—[BB]
- mcj — **Basaltic andesite of Jewel Lake (middle Pleistocene)**—[BB, RC]
- mcr — **Basaltic andesite of Rim Lake (middle Pleistocene)**—[RC]

Basaltic andesites of North Caribou (middle Pleistocene)—[RC]

- mcn8 — **Unit 8**—[RC]
- mcn7 — **Unit 7**—[RC]
- mcn6 — **Unit 6**—[RC]
- mcn5 — **Unit 5**—[RC]
- mcn4 — **Unit 4**—[RC]
- mcn3 — **Unit 3**—[RC]
- mcn2 — **Unit 2**—[RC]
- mcn1 — **Unit 1**—[RC]
- bcs — **Basalt of South Caribou (middle Pleistocene)**—[RC]
- mcm — **Basaltic andesites of Middle Caribou (middle Pleistocene)**—[RC]
- mch — **Basaltic andesite of Hay Meadow (middle Pleistocene)**—[RC]
- mc71 — **Basaltic andesite of hill 7114 (middle Pleistocene)**—[RC]
- bci — **Basalt of Indian Meadow (middle Pleistocene)**—[RC]

Basaltic andesites of Silver Lake (middle Pleistocene)—[BB, RC]

- mc11 — **Unit 11**—[RC]
- mc10 — **Unit 10**—[RC]
- mc9 — **Unit 9**—[BB, RC]
- mc8 — **Unit 8**—[BB, RC]
- mc7 — **Unit 7**—[RC]
- mc6 — **Unit 6**—[RC]
- mc5 — **Unit 5**—[RC]
- mc4 — **Unit 4**—[BB]
- mc3 — **Unit 3**—[RC]
- mc2 — **Unit 2**—[RC]
- mc1 — **Unit 1**—[RC]
- bcw — **Basalt of Caribou Wilderness (middle Pleistocene)**—[BB]
- bcp — **Basalt of Caribou Peak (middle Pleistocene)**—[BB]
- bcb — **Basalt of Cowboy Lake (middle Pleistocene)**—[BB, RC]

Sunrise Peak sequence

- bsl — **Basalt of Lost Spring (middle Pleistocene)**—[PP]
- bsd — **Basalt of Duck Lake (middle Pleistocene)**—[PP]
- bs72 — **Basalt of hill 7243 (middle Pleistocene)**—[PP]

Basalts of Sunrise Peak (middle Pleistocene)—[PP]

- bss2 — **Unit 2**—[PP]
- bss1 — **Unit 1**—[PP]
- bsb — **Basalt of Bathtub Lake (middle Pleistocene)**—[PP]

Island Lake sequence

- bii — **Basalt of Island Lake (middle Pleistocene)**—[MH]
- bie — **Basalt of East Lake (middle Pleistocene)**—[MH, RC]

Beauty Lake sequence

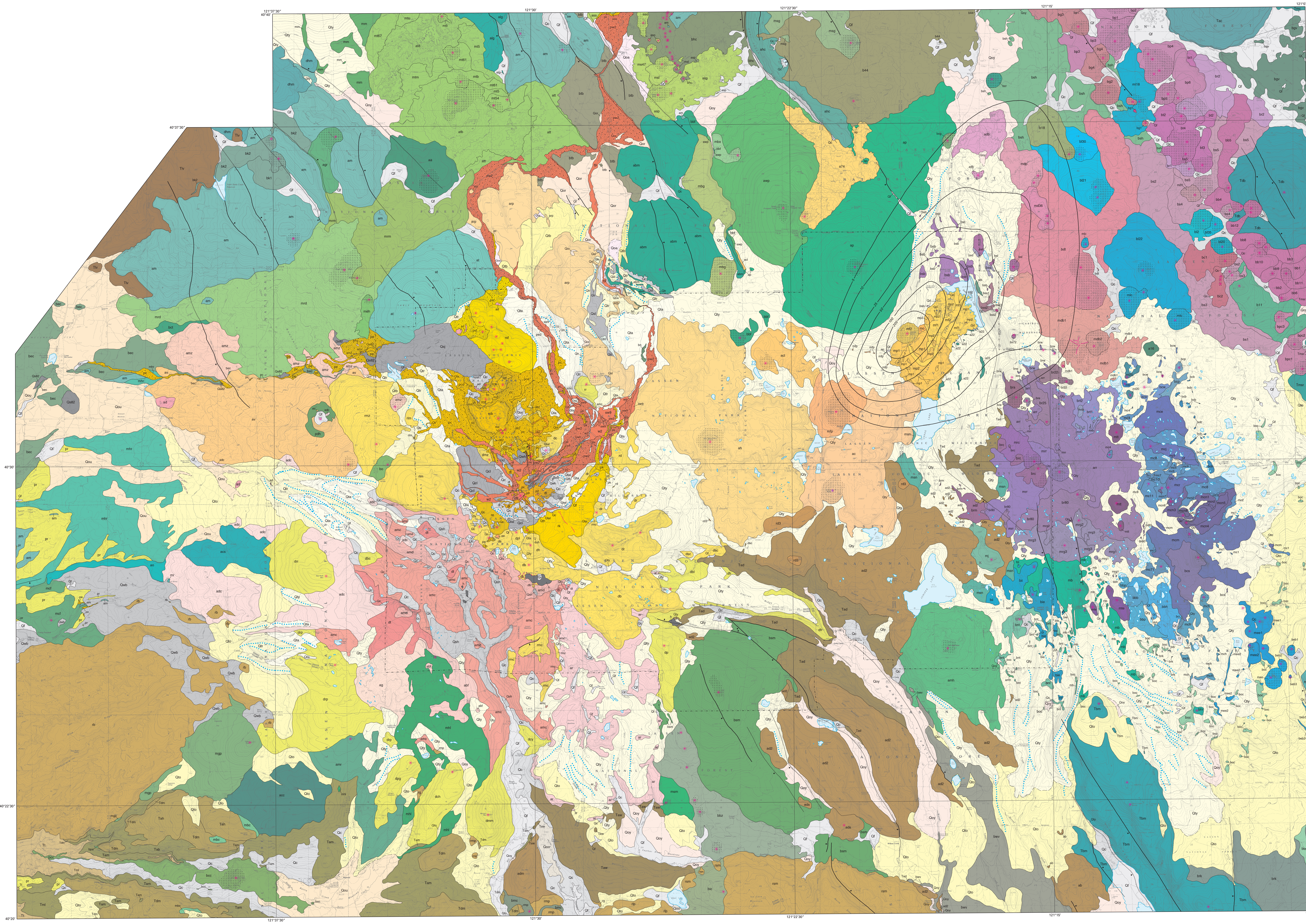
- bbb — **Basalt of Beauty Lake (middle Pleistocene)**—[RC]
- bbp — **Basalt of Posey Lake (middle Pleistocene)**—[RC]
- bbh — **Basalt of Hidden Lakes (middle Pleistocene)**—[RC]

Older volcanic rocks

- bgv — **Tholeiitic basalt of Grays Valley (middle Pleistocene)**—[BB, PL]
- bsh — **Basalts and basaltic andesites of Swains Hole (middle Pleistocene)**—[BB, PL, PP, SW]
- boc — **Older basalts and basaltic andesites south of Caribou Volcanic Field (middle Pleistocene)**—[BB, CH, MH, RC]
- bhr — **Basaltic plug near Heckle Ranch (middle Pleistocene)**—[RC]
- mj — **Basaltic andesite of Jakey Lake (middle Pleistocene)**—[MH]
- bcg — **Basalt of Butte Creek Campground (middle Pleistocene)**—[PP]
- mb — **Basaltic andesite of Black Cinder Rock (middle Pleistocene)**—[MH, RC]
- msn — **Basaltic andesites and basalt of Snag Lake (middle Pleistocene)**—[MH, PP]
- bnt — **Basalt of Bonte Peak (middle Pleistocene)**—[MH, RC]
- bcr — **Basalt of Butte Creek Ranch (early Pleistocene)**—[SW]
- a16 — **Andesite of section 16 (early Pleistocene)**—[BB]
- brk — **Tholeiitic basalt of Rock Creek (early Pleistocene)**—[CH, RC]
- msw — **Basaltic andesites of Swain Mountain (early Pleistocene)**—[RC]
- b11 — **Basalt of section 11 (early Pleistocene)**—[BB]
- Tbm — **Basalts and basaltic andesites of Mud Creek Rim (late Pliocene)**—[CH, RC]
- Tdb — **Dacite of Bogard Buttes (late Pliocene)**—[BB]
- Tac — **Andesite of Cal Mountain (late Pliocene)**—[PL]
- Tmc — **Basaltic andesite of Cone Mountain (late Pliocene)**—[PL]
- Tmsr — **Basaltic andesites of Susan River (late Pliocene)**—[BB]

EXPLANATION OF MAP SYMBOLS

- **Contact**—Dashed where approximately located, dotted where concealed
- **Normal fault**—Dotted where concealed. Ball and bar on downthrown block
- **Volcanic vent**—Known and inferred
- **Cinder and agglutinate cones**
- 25 **Ash from Cinder Cone**—Isopach contours show thicknesses of 5, 10, 25, 50, 100, and 200 cm
- **Phreatic eruption deposit**—Dacite of Bumpass Mountain
- **Fissure**
- **Crest line of moraine**
- **Lassen Volcanic National Park boundary**



Base from U.S. Geological Survey, 1:24,000, Lambert Conformal Conic projection: Chester, 1979; Childs Meadows, 1985; Grays Peak, 1985; Lassen Peak, 1985; Lyonsville, 1985; Manzanita Lake, 1985; Mineral, 1986; Mount Harkness, 1985; Old Station, 1985; Prospect Peak, 1985; Reading Peak, 1985; Red Cinder, 1979; Stover Mountain, 1985; Swains Hole, 1985; Thousand Lakes Valley, 1985; Viola, 1986; West Prospect Peak, 1985.

Base from U.S. Geological Survey, 1:24,000, Universal Transverse Mercator projection: Bogard Buttes, 1983; Poison Lake, 1983;

TRUE NORTH — MAGNETIC NORTH — 14½°
APPROXIMATE MEAN DECLINATION, 2008

SCALE 1:50 000

1 — 1/2 — 0 — 1 — 2 — 3 — 4 MILES
3000 — 0 — 3000 — 6000 — 9000 — 12000 — 15000 — 18000 — 21000 FEET
1 — .5 — 0 — 1 — 2 — 3 — 4 — 5 KILOMETERS

CONTOUR INTERVALS 5, 10, 20, AND 40 FEET
SUPPLEMENTARY CONTOUR INTERVALS 5, 10, AND 20 FEET

MAP LOCATION

Geology mapped by M.A. Clynne (1979-1992) and L.J.P. Muffler (1980, 1987-1992), assisted by Deborah Trimble (1980-1985), Marianne Guffanti (1980), Lars Borg (1986), Miranda Fram (1987), Gordon Keating (1988), and Charles Melancon (1989)
Digital database by L.J.P. Muffler, J.E. Robinson, T.J Felger, D. Dutton, and M.A. Clynne, (with contributions from D. Ramsey and E. Lougee)
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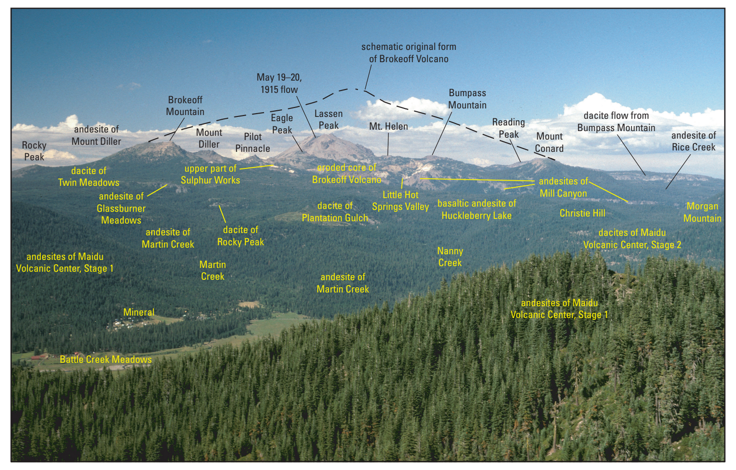
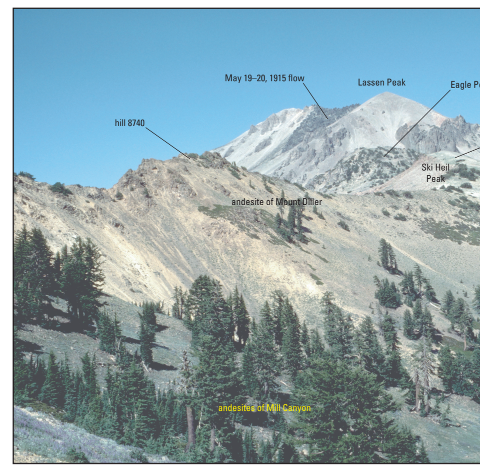


Lassen and Maidu Volcanic Centers
View looking north from Turner Mountain (Mineral quadrangle) towards Lassen Volcanic Center. Battle Creek Meadows, now filled with glacial outwash (unit Qou) marks the approximate core of the Maidu Volcanic Center. The forested hill in the right foreground consists of andesites of the Maidu Volcanic Center, Stage 1, undivided (unit ~2,150–2,375 ka), overlain to the east by dacites of the Maidu Volcanic Center, Stage 2, undivided (unit Tdm, 2,120±46 ka). The hills just beyond the town of Mineral are also andesites of the Maidu Volcanic Center, Stage 1, undivided, overlain by the andesite of Martin Creek (unit amr, ~1,100–1,300 ka), a regional calc-alkaline unit. The dacite domes of Plantation Gulch (unit dpg), Christie Hill (unit dch) and Morgan Mountain (unit dmm) are ~800–830 ka and are part of the Rockland caldera complex of the Lassen Volcanic Center. The dacite of Rocky Peak (unit drp, 803±27 ka, also part of the Rockland caldera complex) makes up Rocky Peak and a prominent outcrop in the left center of the photo. The skyline comprises Brokeoff Volcano and the Lassen Domefield. The eroded core of Brokeoff Volcano is composed of the andesites of Mill Canyon (unit amc, 590–470 ka). Mount Conard (also unit amc) marks the east rim of the erosional amphitheater in Brokeoff Volcano. The southwest rim is marked by Brokeoff Mountain, composed primarily of the dacite of Twin Meadows (unit dt, 470±10 ka, the uppermost unit of the Mill Canyon sequence) but capped on the west by the andesite of Mount Diller (unit amd, 387±10 ka, part of the Diller sequence). The northwest rim is marked by Mount Diller and Pilot Pinnacle, both composed of andesite of Mount Diller. More distal units of the Diller sequence include the andesite of Glassburner Meadows (unit ag, ~450 ka) at the left center and the andesite of Rice Creek (unit ar, 480±5 ka) at the far right. The basaltic andesite of Huckleberry Lake (unit mhl, ~300 ka) is a regional calc-alkaline unit that is younger than the Brokeoff Volcano. Mt. Helen (unit dh, 249±12 ka), Reading Peak (unit dr, 212±5 ka) and Bumpass Mountain (unit db, 232±8 ka) are domes of the Bumpass sequence of the Lassen domefield. Eagle Peak (unit re, 66±4 ka) and Lassen Peak (unit dl, 27±1 ka) are domes of the Eagle Peak sequence of the Lassen domefield. The dark, triangular mass on the west side of Lassen Peak is the west lobe of the dacite flow of May 19–20, 1915.
Photograph by Michael A. Clynne.



1915 flow on Lassen Peak
Telephoto view northeast from summit of Brokeoff Mountain (Lassen Peak quadrangle). The west lobe of the dacite flow of May 19–20, 1915 (unit d9) is on the west side of Lassen Peak (unit dl, 27±1 ka). Eagle Peak (unit re, 66±4 ka) is part of the Eagle Peak sequence. Ski Heil Peak (unit ds, 244±10 ka, part of the Bumpass sequence) is mantled by tephra (unit pe) erupted from Eagle Peak. Ridge below and to the left of Ski Heil Peak is composed of the hydrothermally altered andesite of Mount Diller (unit amd, 387±10 ka). Gray slopes in the foreground are the andesites of Mill Canyon (unit amc, 590–470 ka).
Photograph by Patrick Muffler.

Geologic Map of Lassen Volcanic National Park and Vicinity, California

By

Michael A. Clynne and L.J. Patrick Muffler

2010

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