Nevada Bureau of Mines and Geology

USGS Prepared in cooperation with the US Geological Survey

MAP 138 GEOLOGIC MAP OF THE BOBS FLAT QUADRANGLE, EUREKA COUNTY, NEVADA

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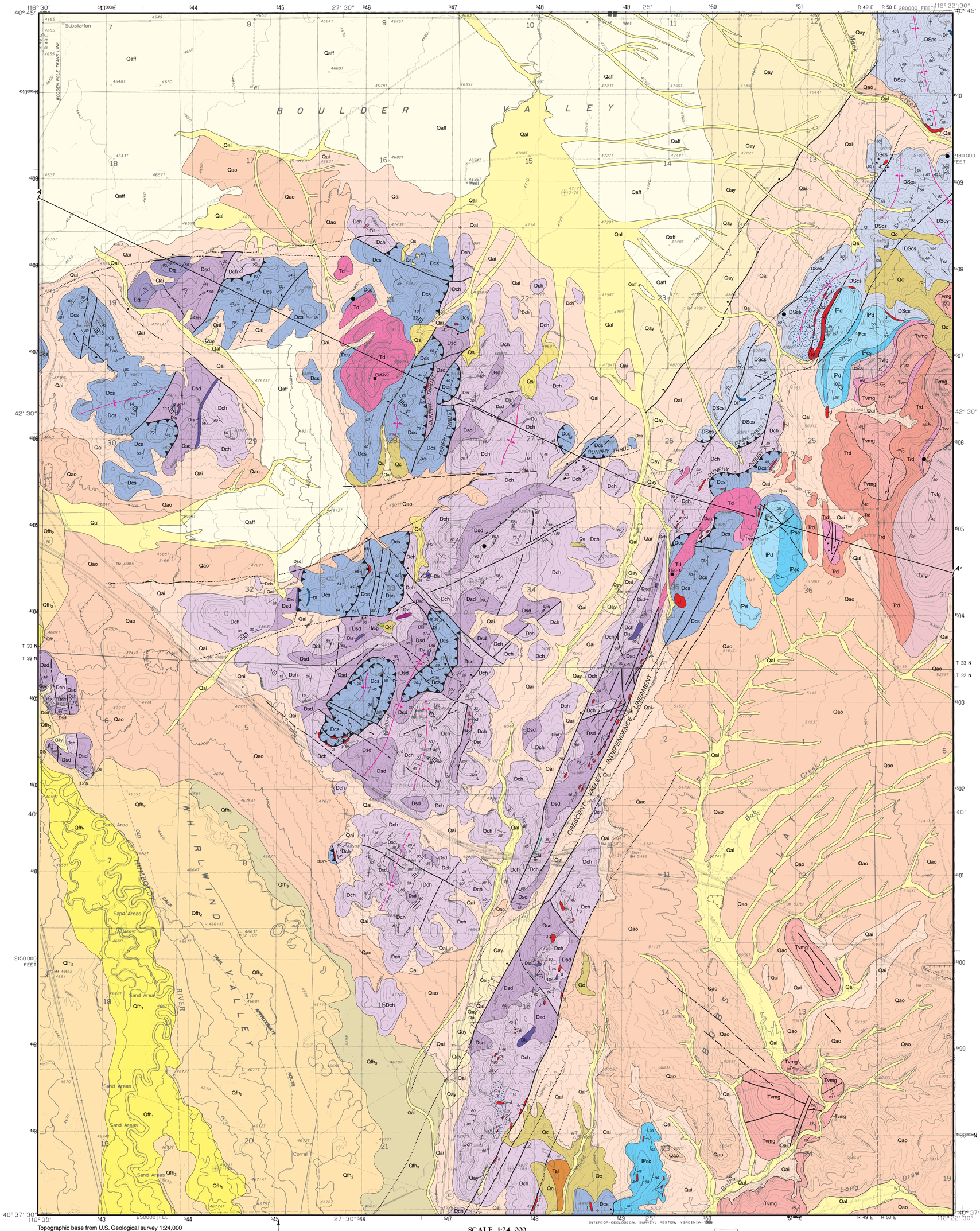
Stephen G. Peters
2003



Topographic base from U.S. Geological survey 1:24,000
Bobs Flat Quadrangle (1986). Transverse Mercator, 1927 North Amercian Datum.

Field work 1998–1999.

Geologic mapping was supported by the U.S. Geological Survey

Office Reviewers: Chris Henry (NBMG), Ted Theodore (USGS, Menlo Park), Alan Wallace (USGS, Reno)

Field Reviewers: Steve Garwin (Newmont), Chris Henry (NBMG), Debra McFarlane (BLM, Winnemucca), Steve Moore (Newmont), and Ted Theodore (USGS, Menlo Park)

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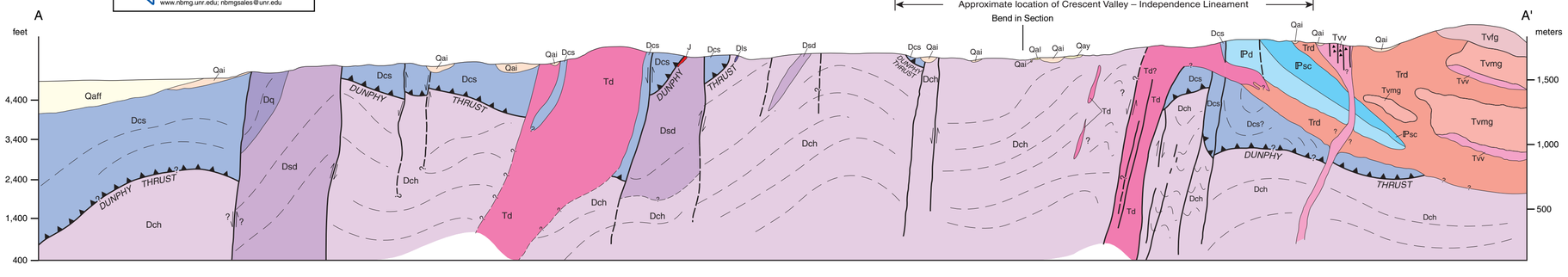
Nevada Bureau of Mines and Geology
University of Nevada, Mail Stop 178
Reno, Nevada 89557-0088
(775) 784-6691, ext. 2;
www.nbmg.unr.edu; nbmgsales@unr.edu

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
SUPPLEMENTARY CONTOUR INTERVAL 10 FEET
CONTROL ELEVATIONS SHOWN TO THE NEAREST 0.1 FOOT
OTHER ELEVATIONS SHOWN TO THE NEAREST FOOT
To convert feet to meters multiply by .3048
To convert meters to feet multiply by 3.2808

QUADRANGLE LOCATION

ADJOINING 7.5' QUADRANGLE NAMES



Surficial Deposits

Qs **Eolian deposits (Holocene)** White to tan, unconsolidated fine-grained sand and silt deposits. May be partially derived from weathered crystalline Miocene ash deposits (Tal). Commonly contained in valleys and hillsides. Maximum thickness is 5 to 10 m.

Qal **Alluvium (Holocene)** Possibly includes some Pleistocene deposits. Poorly sorted, unconsolidated silty sand and subrounded pebbles and cobbles. Young stream deposits and sheet-flood deposits. Maximum thickness is a few meters.

Qc **Colluvium (Holocene and Pleistocene)** Very heterogeneous mixtures of cobble to pebble-size angular to subrounded rock fragments, sand, and soil, usually on hillsides or locally in valleys. Includes some talus deposits near outcrops of volcanic rocks.

Fluvial Deposits of the Humboldt River

Qfh_1 **Young Humboldt River fluvial deposits (Holocene)** Deposits in active stream channels and oxbow channels. Poorly sorted, unconsolidated, silt, sand, and subrounded pebbles and cobbles.

Qfh_2 **Intermediate-age Humboldt River fluvial deposits (Holocene)** Poorly sorted, unconsolidated silt, sand, and subrounded pebbles and cobbles. Deposits flank younger deposits **(Qfh_1)** or are present as remnant islands. Deposits in oxbows and channels are truncated by active channels.

Qfh_3 **Old Humboldt River fluvial deposits (Holocene and Pleistocene)** Partially consolidated deposits of silt, sand, and subrounded pebbles and cobbles. In places includes some consolidated pebble conglomerate and calcrete. Flank intermediate-age deposits **(Qfh_2)** on northeast parts. Covered by older alluvial fan deposits **(Qao)** on northern parts. Contains remnant channel and oxbow channel deposits.

Alluvial Fan Deposits

Qaff **Fan fringe deposits (Quaternary)** Alluvium and mixed colluvium down slope from alluvial fan deposits (units Qay, Qai, Qao). Includes valley fill, stream, and flood-plain deposits. Unconsolidated silt, sand, pebbles, and cobbles.

Qay **Young alluvial fan deposits (Holocene)** Discrete 100- to 200-m-wide fans in center of quadrangle. Derived from drainages along uplifted range fronts. Includes large composite fan deposits derived from Mack and Welches Creek north of quadrangle. Thicknesses of small fan deposits is 10 to 30 m. Thickness of larger fan deposits may exceed 100 m. Unconsolidated silt, sand, pebbles, and cobbles.

Qai **Intermediate-age alluvial fan deposits (Holocene)** Possibly includes some Pleistocene deposits. Soil-covered, unsorted, unconsolidated silt, sand, and subrounded to angular cobbles mixed with local colluvial deposits in flatter areas. Widespread occurrences fill smaller valleys adjacent to ridges and side drainages in hills. Chert clasts most common in western areas of quadrangle and in Boulder Valley. Volcanic rock clasts more common in Bobs Flat area. Also present in interior parts of older alluvial fans (unit Qao) that have been eroded and reworked. Thicknesses of deposits is usually less than 20 m, but may locally exceed 50 m.

Qao **Old alluvial fan deposits (Holocene and Pleistocene)** Silt, sand, and rounded cobbles. Soil covered and locally lithified at base with caliche, calcrete, and silica. Composite fans and sheets. Indurated and eroded, locally filled with deposits of Qai. Deposits in Bobs Flat contain clasts of volcanic rocks. Other deposits in Humboldt River Valley and in Boulder Valley contain chert and some volcanic rock clasts. May include units Qfh_1 and Qai in E½ sec. 6, T32N, R49E and sec. 31, T33N, R49E. Thicknesses of deposits may exceed 100 m in Bobs Flat area.

Other surficial deposits

Tal **Miocene ash and lacustrine deposits (Miocene)** Ash and lacustrine deposits are present as local white, crystalline, detrital, porous, bedded sand and silt deposits below old alluvial fans (Qao) in sec. 22, T32N, R49E. The unit may be part of lacustrine deposits exposed to the south of the quadrangle and may correlate with deposits in the Emigrant Pass Quadrangle (see Henry and Faulds, 1999) to the northeast. White crystal sand component is reworked and deposited in younger eolian deposits (Qs) and in soils on alluvial deposits (Qai, Qaff) and some fluvial deposits (Qfh_{1-2}).

Volcanic Rocks (Eocene)

Tvv **Vitrophyre and vitrophyre-bearing breccia units (Eocene)** Black, concoidally fractured. Massive, 5- to 30-m-thick layered bodies among volcanic flow units (NW¼ sec. 30, T33N, R50E). Also included in this unit, but of probable intrusive origin at margins of units Td and Trd, forms chilled margins, auto intrusive (carapace?) breccia bodies, and clasts in igneous intrusion breccia (NE¼ sec. 36, T33N, R49E).

Tvfg **Fine-grained andesite volcanic flows (Eocene)** Black to locally light red, hard, aphanitic, rarely hornblende-bearing andesite with local layering. Thickness may exceed 200 m. Western extension of Bob Creek lava dome of Henry and Faulds (1999) in the Emigrant Pass Quadrangle [36.82±0.4 Ma (sanidine) and 37.19±0.10 Ma (hornblende)].

Tvmg **Medium- to fine-grained dacite volcanic flows (Eocene)** Buff, pink to brown, layered, flow-foliated volcanic flows with vitrophyric or brecciated bases. Thickness may exceed 200 m. Two main occurrences are interlayered with hypabyssal intrusive rhyodacite in sec. 30, T33N, R50E. Rocks in northeast part of quadrangle are part of the Mack Creek lava sequence, and rocks south of Interstate 80 may be part of Primeaux lava sequence, both of the Emigrant Pass volcanic field in the Emigrant Pass Quadrangle to the east (Henry and Faulds, 1999).

Intrusive rocks

Trd **Rhyodacite (Eocene)** Gray, equigranular, medium-grained to hypabyssal, locally foliated porphyritic intrusive rhyodacite. May be texturally and mineralogically transitional to volcanic Tvmg bodies to the east and intrusive Td body to the west. Biotite, plagioclase, sanidine, quartz, and hornblende. Contains vitrophyre-bearing (Tvv) breccia bodies on southern margin.

Td **Dacite (Eocene)** Gray, porphyritic hornblende-biotite intrusive rock. Forms two main bodies: (1) a small plug northwest part of the map (Boulder Valley Pluton 37.87±0. Ma hornblende); and (2) a 100-m-thick dike in the east-central part of the map [37.40±0.17 Ma (hornblende) Henry and Faulds, 1999)], which strikes northeast into an irregular-shaped plug and is transitional to unit Trd to the east. Several 0.5- to 1-m-thick dikes (not all mapped) also are present along the northeast-trending ridge between Beowawe Turnoff and sec. 26, T33N, R49E.

Mzg **Granodiorite (Mesozoic?)** Medium-grained, equigranular, quartz, plagioclase, K-feldspar, biotite granodiorite in weathered outcrops in valley in sec. 33, T33N, R49E. Contains centimeter- to decimeter-scale orbicular nodules of siliceous white aplite.

Jd **Lamprophyre dikes (Jurassic?)** Fine- to medium-grained, porphyritic, highly weathered, gray to greenish gray, <1-m-thick steeply dipping dikes striking northeast along ridge from upper road cut in sec. 10, T32N, R49E. Also may fill northeast trending faults along ridge line in northeast-central part of quadrangle.

Sedimentary Rocks of the Overlap Assemblage

IPd **Dolomite, chert, dolomitic shale, and sandstone (Pennsylvanian)** Tan to creamy white, hard, poorly bedded, locally silicified, detrital-rich dolomite and limestone and shaly limestone with low knobby outcrops in northeast part of quadrangle. Contains 1- to 4-m-thick layers of sandstone and conglomerate (mapped as unit IPsc). May correlate with the Pennsylvanian Tomera Formation of Dott (1955) on the basis of fossil fragments of the conodont juvenile *idiognathoides spp.*, (Early Pennsylvanian Morrowan or Atokan, M Kurka, written commun., 1998). Exposed thickness may exceed 200 m.

IPsc **Sandstone, conglomerate and shale (Pennsylvanian)** Tan to light-gray outcrops where unsilicified. Usually silicified, dark-brown, bold, hard, resistant outcrops of rounded quartzite pebble conglomerate as channels in mudstone, shale, and fine- to medium-grained quartzite. High bold outcrops where silicified. Beds of conglomerate are 0.25- to 5-m-thick, locally channeled into basal sandstone layers. Interlayered with dolomite and dolomitic shale (unit IPd) in northeaster part of quadrangle. May correlate with Pennsylvanian Moleen Formation of Dott (1955) on the basis of lithology and spatial association with unit IPd.

Paleozoic Sedimentary Rocks of the Roberts Mountains Allochthon

Rocks below Dunphy thrust (Silurian or younger)

The rocks below the Dunphy thrust are assigned an age of Silurian(?) to Devonian or younger on the basis of poorly preserved radiolarian and conodont fossils. The unit has some similarities to the upper parts of the Silurian Elder Sandstone and also the Devonian Slaven Chert of Gilluly and Gates (1965) in the Battle Mountain area. Major unit Dsd generally lies above major unit Dch, although horizons typical of each unit are interbedded locally. Local horizons of quartzite (Dq), limestone (Dls) and volcanic rock (Dv) are locally interbedded mainly in unit Dsd. Total thickness of Dch and Dsd may exceed 1,525 m.

Dsd **Sandy dolomite, shale, chert, limestone, and quartzite (Late Silurian? to Devonian)** Tan to orange, homogenous dolomite, dolomitic and limey sandstone, and sandy dolomitic shale. Sandstone is fine-grained to locally medium-grained with rounded quartz grains. Sandy dolomite and limestone grade into tan to green-gray dolomitic shale, sandstone. Limestone (Dls) is gray weathering, massive to layered or fine bedded, black, locally micritic, and interbedded with 5- to 20-cm-thick black to dark-gray chert beds, and thicker horizons of dolomite, black cherty shale, and mudstone. Quartzite is massive and dark-gray to light maroon. Intact sections of Dsd may be over 1,000 m thick.

Dch **Chert and undifferentiated rocks (Late Silurian? to Devonian)** Poorly-bedded, brecia-textured, commonly tightly and broadly folded, brecciated and tectonized chert. Chert forms abundant subrounded to elongated interbedded blebs and orbicules and flattened, or flame-like, amorphous light-gray, light creamy green to black nodules. Unit also contains locally bedded and radiolarian-bearing, massive, black, gray, and tan cherts, tan to orange sandy dolomite, sandstone, green gray phyllite, limestone, and shale. A Devonian or younger age is inferred from poorly preserved radiolarians assigned to the Entactinid superzone of Noble and Aitchison (2000). This fauna includes *Trilonche* and *Ceratoikiscum*. In addition, samples containing fragments of *Holoeikiscus* are assigned a Famennian age. Unit horizons generally are not as fissile as units in Dcs. Massive chert units are as much as 150 m thick. Contains local 1- to 10-m-thick chert horizons. Total thickness of Dch may be 150 m.

Dq **Quartzite (Late Silurian? to Devonian)** Dark gray to light maroon, massive, hard quartzite, consisting of well-sorted, subrounded to rounded, medium- to fine-grained quartz grains in a silicified matrix. Commonly is present as isolated 5-m-thick interbeds in unit Dsd. May be basal part of unit Dsd where thickness of a massive quartzite in sec. 19, T33N, R49E is 300 m.

Dls **Limestone (Late Silurian? to Devonian)** Gray to black layered to massive limestone, interbedded with black chert and sandy dolomite (Dsd). Many occurrences not mapped. Contains elements of the conodonts *Polygnathus sp.* and *P. linguiformis* that give a middle Devonian, Emsian through Givetian age (M. Kurka, written commun., 1998).

Dv **Volcanic rocks (Late Silurian? to Devonian)** Creamy tan to black with quartz and feldspar phenocrysts. Locally layered, tectonized, mottled, and brecciated with black, 0.5- to 1-cm-thick flat, stringy, aphanitic textured clasts. Interlayered with chert (unit Dch) in isolated outcrops, particularly near SE¼ sec. 31, T33N, R49E. Thickness is between 2 and 100 m.

Paleozoic Rocks above the Dunphy thrust (Silurian and Devonian or younger)

Rocks above the Dunphy thrust are assigned to the Roberts Mountain allochthon on the basis of regional geologic setting and their similarity to lithologic units described by Merriam and Anderson (1942) and by Madrid (1987) and Madrid and others (1992). Rocks above the Dunphy thrust are divided into two units, Dcs in the west and DScs in the northeast parts of the Bobs Flat Quadrangle on the basis of lithology and structural style. These two units are less deformed than rocks below the Dunphy thrust. Both units may be correlative to parts of the Devonian Slaven Chert and Silurian Elder Sandstone of Gilluly and Gates (1965). This tentative correlation is made on the basis of locally abundant fine-grained calcareous sandstone lithologies and radiolarians from four localities in chert in unit Dcs that suggest a Devonian or younger age (P. Noble, written commun., 1998). Radiolarians include entactinids (species and genus undetermined) and *Trilonche* of the Entactinid superzone of Noble and Aitchison (2000). Limestone (Dl) in these rocks also may correlate with Late Devonian limestone mapped in the Welches Canyon Quadrangle, 10 km to the northeast, by Evans (1980) and in the Emigrant Pass Quadrangle by Henry and Faulds (1999). The rocks are well-bedded and fissile compared to rocks below the Dunphy thrust.

DScs **Sandstone, chert, limestone, and shale (Silurian and Devonian or younger)** Lies in the northeast part of the quadrangle and is contiguous with Paleozoic units to the east in the Emigrant Pass Quadrangle (Henry and Faulds, 1999) and Silurian and Devonian units in the Welches Canyon Quadrangle to the northeast (Evans, 1980). The unit is steeply dipping and isoclinally folded and contains abundant buff, tan, and gray, calcareous, fine-grained sandstone units and 1- to 5-m-thick gray to tan chert horizons interbedded with gray and green shale and fine-grained limestone (Dl). A diagnostic horizon is black, knobby, 1- to 2-m-thick limestone commonly in contact with bedded, gray limestone and dolomite, in hills north and south of Mack Creek. Approximate thickness is >670 m.

Dcs **Chert, shale, limestone, and chert pebble conglomerate (Devonian or younger)** Lies in the western part of the quadrangle. Chert is well bedded and tan, light gray, maroon, and light green with common mammary surfaces. Shale is maroon to black to light-gray and locally siliceous. Chert pebble conglomerate layers are rare but diagnostic of the unit. Exposed thickness of Dcs may exceed 800 m.

Dl **Undifferentiated limestone** units above the Dunphy thrust interbedded with horizons in DScs and Dcs. Many occurrences not mapped. Commonly, 2-m-thick, gray to black, layered to massive limestone, particularly in Dcs. Within DScs unit gray limestone interbedded with chert and black, and knobby, 1- to 2-m-thick limestone commonly in contact with bedded, gray limestone and dolomite in hills north and south of Mack Creek.

See accompanying text for references and a discussion of the geology of the Bobs Flat Quadrangle.

Contact

Fault Showing dip where known. Dashed where approximately located or inferred; dotted where concealed; queried where uncertain. Arrows indicate sense of displacement.

Normal fault Bar and ball on downdropped block. Dashed where approximately located or inferred; dotted where concealed; queried where uncertain.

Thrust fault Sawteeth on upper plate. Dashed where approximately located or inferred; dotted where concealed; queried where uncertain.

Lineament Determined from aerial photography.

Shear zone **Dike** **Breccia**

Alteration Projection to the surface of approximate outer limit of hydrothermal alteration.

Sand and gravel pit

Jasperoid

Strike and dip of bedding

Inclined Vertical

Strike and dip of foliation

Inclined compaction foliation in volcanic rocks

Vertical compaction foliation in volcanic rocks

Inclined tectonic foliation and jointing in Paleozoic rocks
Vertical tectonic foliation and jointing in Paleozoic rocks

Joint

Folds

Anticline, showing direction of plunge, dashed where approximately located or inferred

Syncline, dashed where approximately located or inferred

Fold axis with plunge (measured)

Fold lineation

Fold axis with plunge (by stereographic net)

Sample locations

Paleontological sample

Radiometric age sample

Anthropologic artifact site