STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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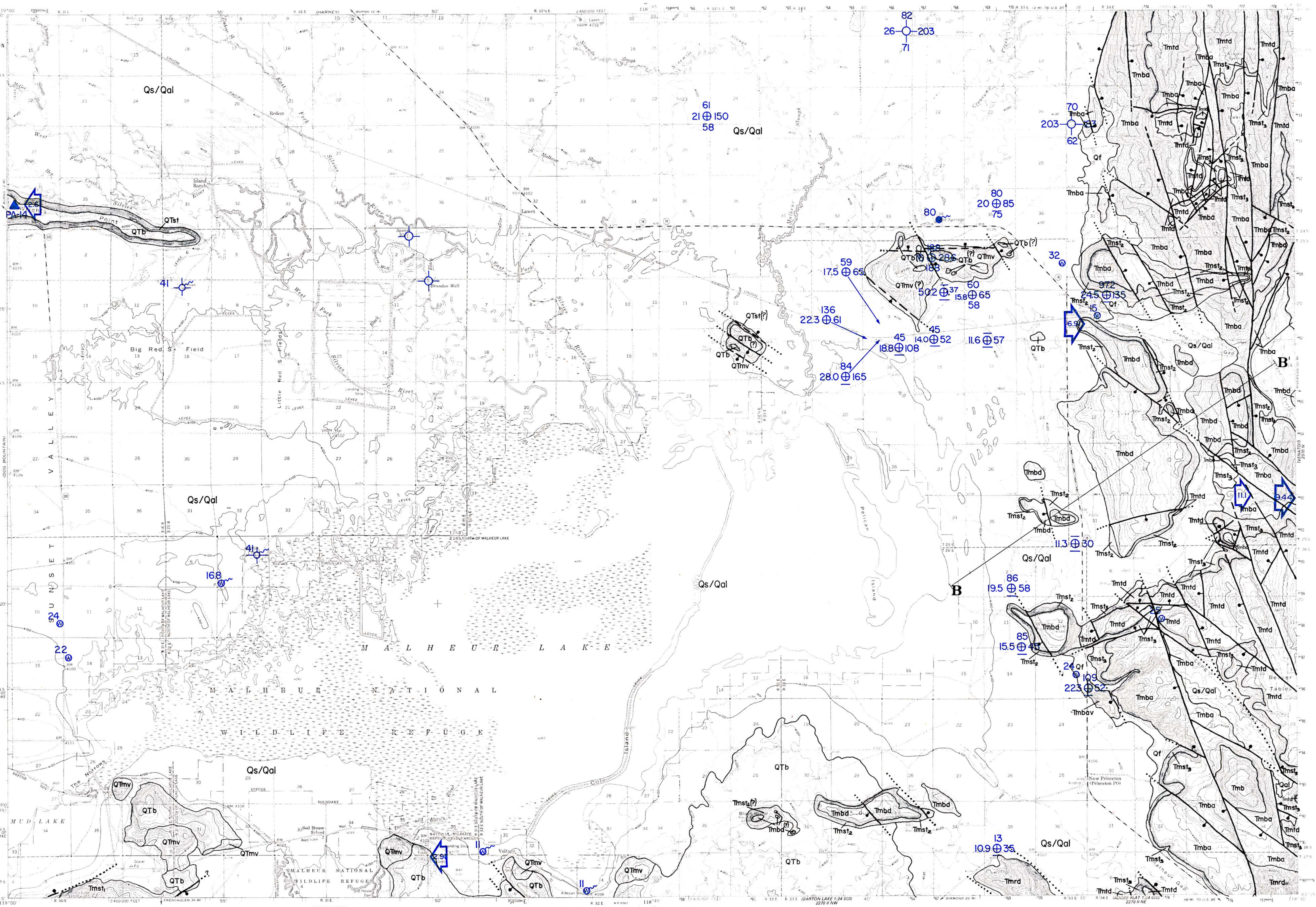
OPEN FILE REPORT #O-80-7

GEOLOGIC MAP OF THE SOUTHERN HARNEY BASIN, OREGON

PLATE II



SCALE 1:62500

1 ½ 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 INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

Control by USGS, USC&GS, and State of Oregon

Topography from aerial photographs by photogrammetric methods and by planetable surveys 1959. Aerial photographs taken 1957

Polyconic projection. 1927 North American datum
10,000-foot grid based on Oregon coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 11

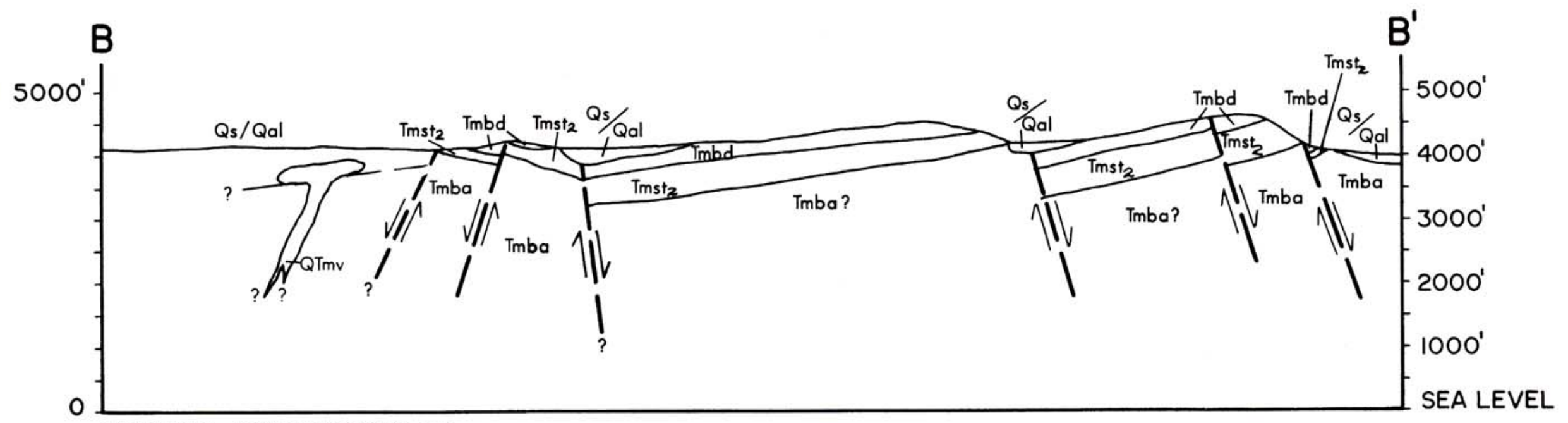
Dashed land lines indicate approximate locations

TRUE NORTH
MAGNETIC NORTH
20°
APPROXIMATE MEAN DECLINATION, 1959

OREGON
QUADRANGLE LOCATION

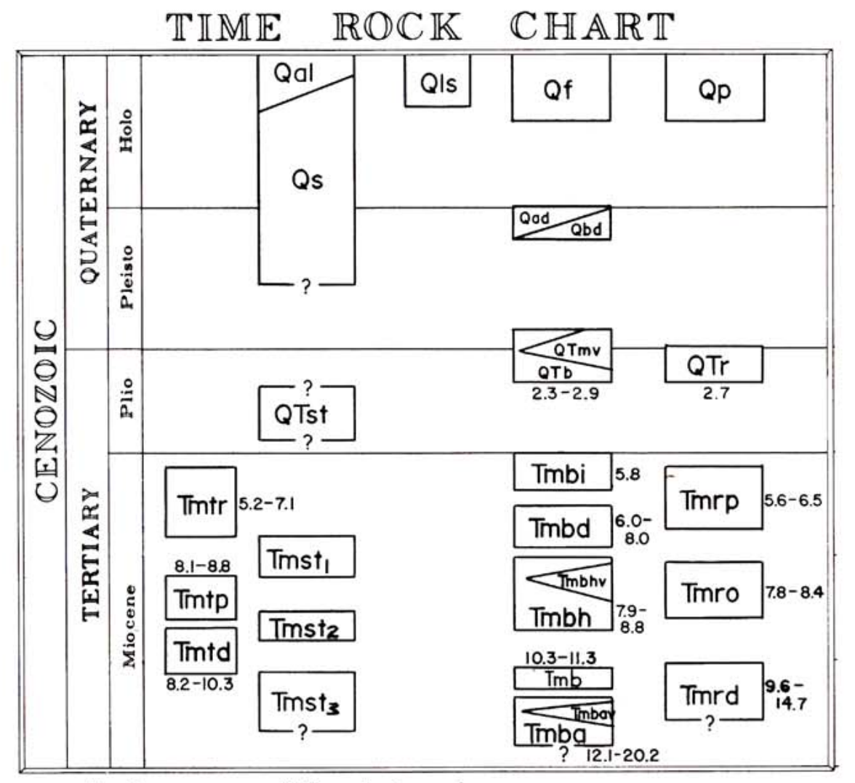
Map prepared by
STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Geologic Cross Section



VERTICAL EXAGGERATION 2:1

TIME ROCK CHART



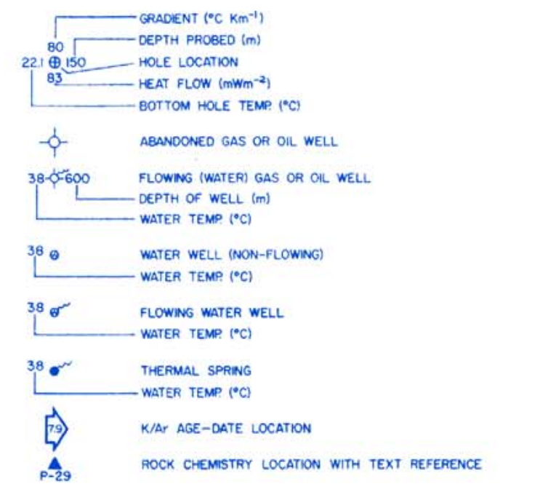
Numbers are K/Ar dates in m.y.

EXPLANATION

(Boundaries are approximate; statements are general; descriptions are based on hand-specimen identification)

Qal/Qs	Alluvium and Holocene sedimentary deposits, undifferentiated: Unconsolidated, locally stratified, white to buff silt, sand, and gravel; found in recent stream channels and throughout Harney Basin floor. Gravel composed of bedrock fragments predominates in existing stream channels and in preexisting stream channels buried under recent lake and fluviatile deposits. Approximately equivalent to Qal (alluvium) and Qs (sedimentary deposits) of Greene, Walker, and Corcoran (1972); Parker (1974); and Walker (1977)
Qf	Alluvial fan deposits: Unconsolidated to partially cemented, stratified, poorly sorted mixtures of silt, sand and gravel; found at mouths of elevated canyons and drainageways. Partial cementing by caliche common. Approximately equivalent to Qf (alluvial fan deposits) of Greene, Walker, and Corcoran (1972)
Qls	Landslide deposits: Unconsolidated blocks of bedrock and debris moved downslope via debris flow and slumping from undercutting by stream action. Sliding is most common in unconsolidated sediments directly overlain by more resistant welded ash-flow tuffs and lava flows. Approximately equivalent to Qls (landslide deposits) of Greene, Walker, and Corcoran (1972)
Qp	Playa deposits: Unconsolidated to cemented clay, silt, and sand, with some evaporite deposits; found in closed, undrained basins in bedrock and Holocene sediments *
Qbd	Basalt of Diamond Craters: Holocene, medium- to dark-gray, fine-grained vesicular basalt found at Diamond Craters in the southeast corner of the study area. Also includes limited amounts of ash, agglomerate, and cinders. Approximately equivalent to Qbd (late basalt near Diamond) of Piper, Robinson, and Park (1939); Qlb (late basalt) of Greene, Walker, and Corcoran (1972); and Qlb (late basalt) of Walker (1977)
Qad	Ash of Diamond Craters: Holocene, red to dark-gray ash, cinders, and agglomerate found mantling unit *Qbd* at Diamond Craters. Mapped where unit conceals basalt flows. Approximately equivalent to Qa (ash) of Greene, Walker, and Corcoran (1972)
QTb	Upper Pliocene basalt: Upper Pliocene, medium-gray, diktytaxitic, olivine-bearing vesicular basaltic flows; occurs as series of thin flows generally overlying unit *QTst* in northwestern corner of study area, north and west of Dog Mountain, and as extensive flows and low shield volcanoes south and east of Malheur Lake. Partially equivalent to Th (Harney Formation) of Piper, Robinson, and Park (1939); QTb (basalt) of Greene, Walker, and Corcoran (1972); TQb (Tertiary and Quaternary basalt) of Parker (1974), and QTb (basalt) of Walker (1977)
QTmv	Upper Pliocene mafic vent complexes: Upper Pliocene basaltic and andesitic scoria, cinders, agglomerate ash, and limited flows; occurs as cones, low mounds, and tuff rings northwest of Harney Lake and east and south of Malheur Lake. Thought to be source for flows of unit *QTb*. Partially equivalent to Qbh (late basalt) of Piper, Robinson, and Park (1939); QTmv (mafic vent complexes) and QTs (pyroclastic rocks of cinder cones) of Greene, Walker, and Corcoran (1972); QTps (subaqueous pyroclastic deposits and associated cinder cones) of Parker (1974); and Tvm (mafic vent complexes) and Tpb (pyroclastic rocks of basaltic cinder cones) of Walker (1977)
QTst	Tuffaceous sedimentary rocks: Pliocene, white to buff, semiconsolidated, stratified, pumiceous sandstone, siltstone, and conglomerate; underlies unit *QTb* in northwest corner of study area. Partially equivalent to Th (Harney Formation) of Piper, Robinson, and Park (1939); QTtg (terrace gravels) and QTs (sedimentary rocks) of Greene, Walker, and Corcoran (1972); TQs (Tertiary and Quaternary sedimentary rocks) of Parker (1974); and QTs (sedimentary rocks) of Walker (1977)
QTr	Rhyolite of Iron Mountain: Upper Pliocene, multicolored, flow-banded, vitrophyric, rhyolitic rocks; occurs as exogenous domes and flows forming Iron Mountain in the westernmost portion of the study area. Mapped separately from units *Tmro*, *Tmrp*, and *Tmrd* on basis of stratigraphic position and K/Ar age dates. Partially equivalent to Trr (rhyolite and rhyodacite) of Greene, Walker, and Corcoran (1972) and Tus (silicic vent rocks) of Walker (1977). Approximately equivalent to Trim (rhyolite of Iron Mountain) of Parker (1974)
Tmbi	Basalt of Iron Mountain: Upper Miocene, black, fine-grained, olivine-bearing basaltic rocks; occurs as flows found immediately west of Iron Mountain overlying unit *Tmtr*. Mapped separately from unit *Tmbh* on basis of stratigraphic position and K/Ar age dates. Partially equivalent to Tob (basalt) of Greene, Walker, and Corcoran (1972); Tba (Tertiary basaltic rocks) of Parker (1974); and Tob (olivine basalt) of Walker (1977)
Tmrp	Rhyolite of Palomino Butte: Upper Miocene, multicolored, flow-banded, pumiceous, rhyolitic rocks; occurs as exogenous domes and flows forming Palomino Butte in the northwestern corner of the study area. Mapped separately from unit *Tmro*, *QTr*, and *Tmrd* on basis of stratigraphic position and K/Ar age dates. Partially equivalent to Tv (older siliceous extrusives) of Piper, Robinson, and Park (1939); Trr (rhyolite and rhyodacite) of Greene, Walker, and Corcoran (1972); and Tus (silicic vent rocks) of Walker (1977). Approximately equivalent to Trpb (rhyolite of Palomino Butte) of Parker (1974)
Tmtr	Rattlesnake ash-flow tuff: Upper Miocene, light-brown to red-brown to gray, pumice-rich, rhyolitic, welded ash-flow tuff. Commonly zoned into recognizable basal vitric, spherulitic, lithophysal, and upper devitrified zones. Visible phenocrysts consist of sanidine, plagioclase feldspar, quartz, and pyroxene. Pumice is eutaxitic and generally light brown in color, and fragments range from 2 to 20 cm in longest dimension. Partially equivalent to Td (Danforth Formation) of Piper, Robinson, and Park (1939) and Tat (silicic ash-flow tuff) of Walker (1977). Approximately equivalent to Tdo (welded tuff of Double O Ranch) of Greene, Walker, and Corcoran (1972) and Trs (Rattlesnake ignimbrite tongue) of Parker (1974)
Tmst₁	Tuffaceous sedimentary rocks: Upper Miocene, white to buff, semi- to well-consolidated, stratified, poorly sorted, tuffaceous, pumiceous siltstones, sandstones, and conglomerates. Generally lacustrine, with some fluviatile and air-fall deposits. Includes all sedimentary rocks occurring between unit *Tmtr* and unit *Tmtp*. Partially equivalent to Td (Danforth Formation) of Piper, Robinson, and Park (1939). Approximately equivalent to Tst (tuffaceous sedimentary rocks) of Greene, Walker, and Corcoran (1972); Tst (Tertiary sedimentary rocks) of Parker (1974) and Ts (tuffaceous sedimentary rocks and tuff) of Walker (1977)
Tmbd	Drinkwater basalt: Upper Miocene, dark-gray, diktytaxitic, slightly porphyritic, basaltic rocks with phenocrysts and glomerocrysts of plagioclase and olivine; forms ridge-capping flows in the eastern portion of the study area near Crane and south of Diamond Craters. Found to overlie limited outcrops of unit *Tmtp* east of Crane, with upper stratigraphic limits unclear. Mapped separately from other basalt units on basis of lithology, stratigraphic position, and K/Ar age dates. Partially equivalent to Th (Harney Formation) of Piper, Robinson, and Park (1939) and Tob (olivine basalt) of Walker (1977). Approximately equivalent to Tdw Drinkwater basalt) of Greene, Walker, and Corcoran (1972)
Tmbh	Basalt of Harney Lake: Upper Miocene, black to dark-gray, olivine-bearing basaltic rocks, with common yellowish devitrified glass and pillow structures; occurs as thin flows immediately underlying unit *Tmtr* south and west of Harney Lake. Mapped separately from unit *Tmbi* on basis of stratigraphic position and K/Ar age dates. Partially equivalent to Tbb (basaltic breccia member of the Danforth Formation) of Piper, Robinson, and Park (1939); Tob (basalt) of Greene, Walker, and Corcoran (1972); Tba (Tertiary basaltic rocks) of Parker (1974); and Tob (olivine basalt) of Walker (1977)
Tmbhv	Mafic vent complexes: Upper Miocene basaltic scoria, cinders, agglomerate, and palagonitic tuff; occurs as incised cones and tuff rings at the head of an unnamed draw immediately west of Saddle Butte and near the Donner und Blitzen River, both in the central portion of the study area. Thought to be the source for some flows of unit *Tmbh*
Tmro	Rhyolite of Double O Ranch: Upper Miocene, multicolored, flow-banded, vitrophyric rhyolitic rocks; occurs as flows and cumulo-domes immediately south and west of Harney Lake. Mapped separately from units *QTr*, *Tmrp*, and *Tmri* on the basis of stratigraphic position and K/Ar age dates. Partially equivalent to Th (Harney Formation) of Piper, Robinson, and Park (1939); Trr (rhyolite and rhyodacite) of Greene, Walker, and Corcoran (1972); and Tvs (silicic vent rocks) of Walker (1977). Approximately equivalent to Trdo (rhyolite of Double O Ranch) of Parker (1974)
Tmtp	Prater Creek ash-flow tuff: Miocene, light-reddish-brown to light-gray, pumice-poor, rhyolitic, welded ash-flow tuff. Generally devitrified and crystal-poor with rare eutaxitic, light-brown pumice fragments that are 1 to 3 cm in longest dimension. Forms thin flows in limited outcrops near Harney Lake and immediately northeast of Crane. Partially equivalent to Td (Danforth Formation) of Piper, Robinson, and Park (1939) and Tat (silicic ash-flow tuff) of Walker (1977). Approximately equivalent to Tatp (ash-flow tuff of Prater Creek) of Parker (1974) and Twtp (welded tuff of Prater Creek) of Greene, Walker, and Corcoran (1972)
Tmst₂	Tuffaceous sedimentary rocks: Miocene, white to buff, semi- to well-consolidated, poorly stratified, poorly sorted, tuffaceous siltstones and sandstones with some air-fall pumice deposits. Includes all sedimentary rocks occurring between unit *Tmtp* and unit *Tmtd*. Partially equivalent to Td (Danforth Formation) of Piper, Robinson, and Park (1939); overlying sedimentary rocks of Tdv (welded tuff of Devine Canyon) of Greene, Walker, and Corcoran (1972); Tst (Tertiary sedimentary rocks) of Parker (1974); and Tat (silicic ash-flow tuff) of Walker (1977)
Tmtd	Devine Canyon ash-flow tuff: Middle Miocene, light-gray to greenish-gray, crystal-rich, pumiceous, rhyolitic, welded ash-flow tuff. Found as either devitrified or vitric units, with no lithophysal or spherulitic zones recognized. Pumice fragments are generally eutaxitic, light brown in color, and 1 to 5 cm in longest dimension. Appears to represent multiple-flow, simple cooling unit. Partially equivalent to Td (Danforth Formation) of Piper, Robinson, and Park (1939); Tdv (welded tuff of Devine Canyon) of Greene, Walker, and Corcoran (1972); and Tat (silicic ash-flow tuff) of Walker (1977). Approximately equivalent to Tdv (ash-flow tuff of Devine Canyon) of Parker (1974)
Tmst₃	Tuffaceous sedimentary rocks: Middle Miocene, white to yellow, semi- to well-consolidated, poorly sorted, poorly stratified, tuffaceous siltstones and sandstones with some air-fall pumice deposits. Includes all sedimentary rocks found beneath unit *Tmtd*, including those that interfinger with units *Tmba* and *Tmb*, and may represent several discrete sedimentary events. Partially equivalent to Td (Danforth Formation) of Piper, Robinson, and Park (1939); Tts (tuffaceous sedimentary rocks) of Greene, Walker, and Corcoran (1972); Tst (Tertiary sedimentary rocks) of Parker (1974); and Tts (tuffaceous sedimentary rocks, pumicites, and silicic flows) of Walker (1977)
Tmrd	Rhyodacite: Middle Miocene, light-gray to brownish-red, flow-banded, locally vesicular, aphanitic, rhyodacitic rocks with associated vitrophyres and obsidian. Occurs as exogenous domes and flows forming low, rounded hills near Malheur Gap, in the southeastern portion of the study area. Approximately equivalent to Tv (older siliceous extrusives) of Piper, Robinson, and Park (1939); Trd (rhyodacite) of Greene, Walker, and Corcoran (1972); and Tvs (silicic vent rocks) of Walker (1977)
Tmb	Miocene basalt: Middle Miocene, fine-grained, subophitic and diktytaxitic, olivine-bearing basaltic rocks; occurs as flows overlying unit *Tmba* near Malheur Gap in the southeastern portion of the study area. Partially equivalent to Th (Harney Formation) of Piper, Robinson, and Park (1939). Approximately equivalent to Tb (basalt) of Greene, Walker, and Corcoran (1972) and Tb (basalt) of Walker (1977)
Tmba	Basalt and andesite: Lower to middle Miocene, medium- to dark-gray to brick-red, dense, aphyric to vitrophyric, thin, basaltic and andesitic rocks; occurs as multiple thin flows along the eastern portion of the project area and at Jackass Butte in the south-central portion. Approximately equivalent to Ts (Steens basalt) of Piper, Robinson, and Park (1939); Tba (basalt and andesite) of Greene, Walker, and Corcoran (1972); and Tf (basalt and andesite flows and breccia) of Walker (1977)
Tmbav	Mafic vent complex: Lower to middle Miocene basaltic scoria, cinders, agglomerate, and palagonite tuff; occurs as incised cones and low mounds south of Crane, near Diamond, and near Anderson Valley in the eastern portion of the study area. Thought to be the source for some flows of unit *Tmba*

* Qp generally combined with Qal in most areas



GEOLOGIC SYMBOLS

- Contacts - Dashed where estimated, dotted where concealed
- Normal faults - Solid where exposed, dashed where inferred, dotted where concealed; ball and bar on downdropped side
- Anticline - Dashed where inferred or generalized; arrow indicates plunge
- Syncline - Dashed where inferred or generalized; arrow indicates plunge
- Structural basin - Doubly plunging syncline
- Structural dome - Doubly plunging anticline
- Volcanic center - Small shield volcanoes

Geology by David E. Brown and Gary D. McLean. Adapted from Piper, Robinson, and Park, 1939; Greene, Walker, and Corcoran, 1972; Parker, 1974; and Walker, 1977