OPEN-FILE REPORT O-93-11

PRELIMINARY GEOLOGIC MAP OF THE SOURDOUGH SPRINGS QUADRANGLE MALHEUR COUNTY OREGON

1993

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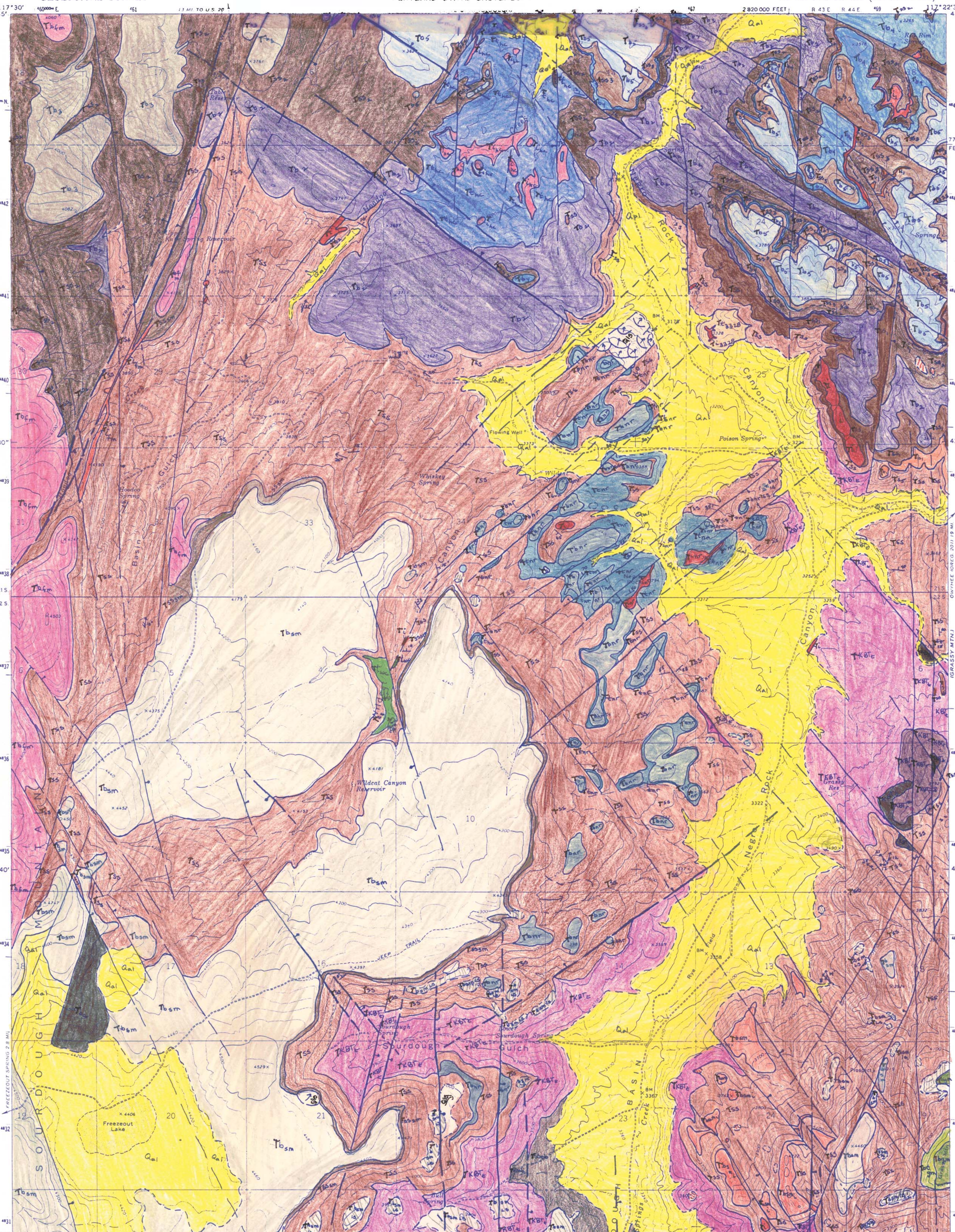
PORTLAND STATE UNIVERSITY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SOURDOUGH SPRING QUADRANGLE
OREGON—MALHEUR CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1966. Field checked 1967

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, shown in blue

Fine red dashed lines indicate selected fence lines

UTM GRID AND 1967 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Field work conducted in 1989

Funded jointly by the Oregon Department of Geology and Mineral Industries, the Oregon State Lottery, and the U.S. Geological Survey COGEOMAP Program

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Unimproved dirt

Geology by M.L Cummings

Field work - Summer, 1990

SOURDOUGH SPRING, OREG.
N4337.5—W11722.5/7.5

1967

AMS 2571 III NW—SERIES V892

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By Michael L. Cummings
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This unpublished Open-File Report has not been reviewed and may not meet all Oregon Department of Geology and Mineral Industries' standards

Field work conducted in 1990
Map Scale: 1:24,000

Prepared for the Oregon Department of Geology and Mineral Industries and released as supplementary map to the Vale 1:100,000. Map shows detailed stratigraphic relationships west of Grassy Mountain.

Funding Statement: Funded jointly by the Oregon Department of Geology and Mineral Industries, the Oregon State Lottery, and the U. S. Geological Survey COGEOMAP Program as part of a cooperative effort to map the west half of the 1° X 2° Boise sheet, eastern Oregon.

Qal (Quaternary) Alluvium, unconsolidated silt to sand size sediment. Locally may contain coarser cobbles derived from conglomerate in the bed rock.

Qls (Quaternary) Symbol used on the map as a suffix to the primary lithology designation too indicate that an area is a landslide block composed of a particular parent lithology.

------------------- unconformity -------------------

((Late Miocene) Basalt cinder deposit and thin flow of limited extent. Cinders are red and form low outcrops north of Freezeout Lake.

------------------- Unconformity -------------------

Tbsm1
Tbsm
TbsmLS

(Late Miocene) Basalt at Sourdough Mountain: Basalt to basaltic andesite forming the cap on Sourdough Mountain. Single flow covering a minimum of 45 km^2 and extends into the Twin Springs and Hurley Flat quadrangles. Up to 35 m thick. Source area is believed to be dikes, sills, and cindery deposits associated with characterized by shear planes along which vesicles have accumulated.

Tsssm (Late Miocene) Poorly exposed, basalt tephra dominated unit with variable amounts of interbedded siltstone and volcanic sandstone which immediately underlie the basalt cap (Tbsm) on Sourdough Mountain. Up to 20 m thick. The base of the unit is commonly at a narrow topographic bench that marks the unconformity at the top of the Grassy Mountain Formation and the top of the basalt at Freezeout Mountain.

------------------- Unconformity -------------------

Tbfm (Late Miocene) Basalt at Freezeout Mountain occurs as massive basalt flows within thin scoriaceous flow-top breccia zones. Characterized by abundant (30 to 40%) platy shaped plagioclase microphenocrysts. Texturally similar to basalt which caps Freezeout Mountain in the Hurley Flat quadrangle.

Tifm (Late Miocene) Basalt dikes that may be feeders for the basalt at Freezeout Mountain. Intruded along northeast-striking fault

---- angular unconformity -----

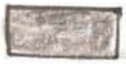
Tb_5 (Late Miocene) Basalt flow up to 8 m thick and forming the uppermost cap on hills in the northeastern part of the quadrangle. Dark gray to black, weakly vesiculated, weakly phyric with plagioclase and olivine phenocrysts. A widespread, intensely red baked zone up to 2 m thick occurs at the base of this flow.

Tss_3 (Late Miocene) Volcaniclastic sediment including sandstone and siltstone deposited in lacustrine and fluvial environments. Channel sandstones contain granule size lithic clasts. A vertebrated fossil locality has been located in a strongly silicified channel sandstone. Indistinguishable from Tss_5 in the area west of Hoodoo Creek.

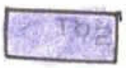
Tb_4 (Late Miocene) Basalt flow up to 5 m thick. Discontinuous and pinches out against paleotopography. Dark gray to black, weakly vesiculated, weakly phyric with plagioclase and olivine microphenocrysts. Poorly exposed where slopes are steep.

Ti_1 (Late Miocene) Gabbroic intrusion located immediately below flow Tb_4 in the northeastern part of the quadrangle. Ranges from 2 to 5 m thick and may occur as a single sill or split into two sills. Commonly immediately at the base of the flow, but may be separated from the flow by a thin screen of sediment.

Tb_8 (Late Miocene) Basalt flow of uncertain thickness. Occurs in the northwest part of the quadrangle and is invasive into sediment that is similar to Tss_3. Intensely altered and irregular in morphology and thickness. Secondary minerals are developed along low-angle fracture surfaces and around vesicles. Primary mineralogy includes plagioclase microlites that are partially altered to clay.



(Late Miocene) Volcaniclastic sediment interbedded with basalt tephra deposits. Volcaniclastic sediment includes lacustrine and fluvial facies. A light pink massive to laminated, tuffaceous siltstone is the most distinctive widespread lithology and is up to 25 m thick. Sedimentary structures are consistent with a lacustrine depositional evironment. Commonly the siltstone is overlain by basalt tephra. The tephra deposit is up to 12 to 15 m thick and includes a lower sequence of interbedded lacustrine siltstone and cindery basalt tephra. The middle sequence is characterized by planar bedded tephra and cross-bedded cindery tephra deposited as surge deposits. The upper sequence is chaotic, massive, unsorted material including rounded cobbles derived from the underlying Grassy Mountain Formation. The upper sequence is interpreted as a debris flow deposit. Approximately 10 to 20 m of lacustrine and fluvial sediment overlies the mudflow deposits.



(Late Miocene) Basalt flow occurring immediately above the unconformity with the underlying Grassy Mountain Formation in the northwestern part of the quadrangle, but occurring above volcaniclastic sedimentary deposits (Tss_1) in the northeast. Thickness is variable due to paleotopography and ranges from 5 to 30 m. Dark gray to black and contain crude columns where interior zone is poorly exposed producing an outcrop pattern that suggests two separate flows.

(Late Miocene) Interbedded basalt tephra, rhyolite ash and pumice deposits, and fluvial and lacustrine volcaniclastic sediment. Rhyolitic ash and pumice deposits, and fluvial and lacustrine volcaniclastic sediment. Rhyolitic ash and pumice deposits were partially eroded before the eruption of flow Tb_2. Locally this unit lies unconformably over the Grassy Mountain Formation.

(Late Miocene) Basalt flow occurring immediately above the unconformity with the underlying Grassy Mountain Formation along the northeastern edge of the quadrangle. Locally, underlain by silicified rhyolitic tephra which occurs between the base of the flow and the unconformity.

---------------------- unconformity ---------------------

Tbgm

(Late Miocene) Grassy Mountain Basalt forming a cap that extends east and northeast into the Grassy Mountain quadrangle (Ferns and Ramp, 1989). Whether the Grassy Mountain Basalt is the upper unit of the Grassy Mountain Formation is questionable on the basis of mapping in the summer of 1990. The Grassy Mountain Basalt is potentially the same age as the basalts interbedded with volcaniclastic sediment and tephra in the northern part of the quadrangle and that overlie the unconformity at the top of the Grassy Mountain Formation. Unit Tbtgm that immediately underlies the basalt is not typical deposits of the Grassy Mountain Formation, but is much more similar to deposits in the northern part of the quadrangle. If this is so, the Grassy Mountain Formation was probably deposited between 13.8 m.y. (date of KBT from personal communication, second hand from Mark Ferns, DOGAMI) and probably 12 m.y. A potentially prolonged period of erosion and weathering followed and developed the unconformity and paleosol at the top of the Grassy Mountain Formation. The volcanic and volcaniclastic sequence of which the Grassy Mountain Basalt is a part is probably 10 to 11 m.m. and is consistent with the 10.4 m.y. date of Hart (1981) for the Grassy Mountain Basalt.

Tbtgm

(Late Miocene) Tephra deposits and interbedded volcaniclastic sediment are potentially 25 m thick and immediately underlie the Grassy Mountain Basalt. Upper part is moderately baked by the Grassy Mountain Basalt and is composed of basalt cindery lapilli which becomes less prominent downward. Poorly exposed and lithology was determined by trenching. Root seats suggest paleosols occur in siltstone layers and that the unit is more lacustrine and fluvial downward. Mica does not appear to be present as a detrital mineral.

------------------------ unconformity ------------------

Grassy Mountain Formation

Tss

(Middle-Late Miocene) Sedimentary deposits that are interlayered with tephra deposits and flows from locally basalt centers. Sedimentary deposits include the following facies: channel facies, flood plain facies, and volcaniclastic facies. Channel facies is characterized by coarse-grained sand to coarse conglomerate. Conglomerate clasts are well rounded and up to 12 cm in diameter. Clasts include amphibole-biotite gneiss, granite, granite pegmatite, feldspar porphyry, flow-banded rhyolite, obsidian, glassy rhyolite dome rocks, and silica sinter. The obsidian, glassy rhyolite dome rocks, and some of the flow banded rhyolite are present west of the eruptive center for the Kern Basin Tuff. Con Conglomerate clasts are orange-brown where they occur at the unconformity that forms the top of the Grassy Mountain Formation. Channel facies also include cross-bedded, medium to coarse-grained sandstone interbedded with or without conglomerate lenses. Detrital muscovite and biotite are characteristic minerals. Flood plain facies include siltstone, fine-grained sandstone, organic-rich layers up to 30 cm thick, fossiliferous siltstone, and claystone. Thin ash deposits up to 2 cm thick are present in this facies. Well-rooted paleosols are common. Volcaniclastic facies varies in character and degree of development. Best exposures are near the western edge of the quadrangle along Hoodoo Creek and in Hoodoo Creek Canyon. Dominated by volcanic detritus and generally lacking in rounded quartz, feldspar, biotite and muscovite grains. Fine-grained pumice is locally present.

Ttwc

(Middle-Late Miocene) Wildcat Creek tephra deposit and eruptive center is located along Wildcat Creek and produced tephra that is interbedded with the flood-plain and channel facies of unit Tss. Massive to well-bedded tephra deposits with surge-style cross bedding. Cinder content is relatively high.

Tthc

(Middle-Late Miocene) Hoodoo Creek tephra deposit and eruptive center is located along Hoodoo Creek near the northern edge of the quadrangle. Apparently formed a topographic high that strongly controlled the distribution of facies in the Tss unit. Directly overlain by light colored siltstone of unit Tss_2. Palagonite and cindery plagionite range from well bedded to massive. Accidental inclusions of basalt up to 12 cm in diameter are common. Stratigraphically higher deposits are more cindery than palagonitic.

Tihc (Middle-Late Miocene) Intrusions into the Hoodoo Creek eruptive center located along Hoodoo Creek. Intrusions are dense, black, columnar jointed basalt. Creek bed of Hoodoo Creek is locally controlled by the distribution of intrusions.

Ttnr (Middle-Late Miocene) Negro Rock tephra and eruptive center is located at Negro Rock. Massive to massively bedded palagonite with accidental inclusions of basalt to crudely bedded palagonite with scoriaceous basalt clasts within the proximal to the source crater. Upward and at intermediate and distal settings, the tephra becomes planar-bedded cinder deposits.

Tbnr (Middle-Late Miocene) Basalt of Negro Rock is a flow unit up to 5 m thick that overlies the tephra deposits in distal and intermediate settings. Distribution indicates Negro Rock is the source, but the vent for the eruption is not known. In sec. 26, T. 21 S., R. 43 E. the basalt flow overlies pepperite deposits that lie between the base of the basalt flow and the top of well-bedded cindery tephra of Ttnr. The pepperite includes clasts of well-rounded stream cobbles and sand similar to deposits of the channel facies of unit Tss. Interpreted to be a stream channel that became established after eruption of the tephra and was subsequently destroyed by the eruption of the basalt. Indicates a time gap between tephra eruption (Ttnr) and basalt (Tbnr) eruption.

Tinr (Middle-Late Miocene) Basalt intrusions and breccias of the Negro rock center. The tall spires and columns that form Negro Rock include massive, crudely columnar jointed basalt and massive and complex basalt cinder and cinder blocks.

Tt3328 (Middle-Late Miocene) Palagonite deposits associated with eruptive center at hill marked by elevation 3328. Palagonite deposits are proximal deposits characterized by massive to massively bedded palagonite with accidental inclusions of basalt and basalt scoria. Directly overlain by fine- to medium-grained sandstone of the channel and flood-plain facies of unit Tss.

i3328 (Middle-Late Miocene) Basalt intrusions into plagionite deposits at hill noted by elevation 3328. Dikes are columnar jointed and irregular in shape and orientation.

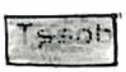
(Middle-Late Miocene) Dacite tuff of Kern Basin or the Kern Basin Tuff. Hornblende, biotite, plagioclase, and quartz phenocrysts are characteristic of pumice from this center. At least four different tuffs are included in the unite. Large blocks of 1 m in diameter of flow-banded rhyolite, and hornblende-biotite gray glassy dacite occur locally and are interpreted as proximal to vent. Surge bedding is presenting deposits exposed in Sourdough Canyon. Distribution of lithic clast sizes and pumice indicates vents are near the eastern edge of the quadrangle and that the source may be a series of vents elongate along a north-trending structure. Strongly altered Kern Basin Tuff occurs along the eastern edge of the quadrangle in sec. 6, T. 22 S., R. 44 E.

(Middle-Late Miocene) Vent breccia for the vent complex of the Kern Basin Tuff located in sec. 7, T. 22 S., R. 43 E. Forms a ring pattern on the southwest flank of rhyolite flows and domes that may be older than the vent. The vent is intruded by a dacite dome. Silicified by opaline silica.

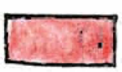
(Middle-Late Miocene) Flow-banded rhyolite flows and domes located in sec. 7, T. 22 S., R. 43 E. Believed to be one of the source areas for the Kern Basin Tuff. Aphyric to horn blende-biotite porphyry. Strongly to weakly flow banded.

---------------------- (angular?) unconformity ---------

Deer Butte Formation



(Middle Miocene) Siltstone and claystone of the sequence of Oxbow Basin of the Deer Butte Formation. Poorly exposed along the course of Twin Springs Creek.



(Middle Miocene) Basalt intrusions of uncertain age. Probably most were emplaced during or after the deposition of the basalts and interbedded volcanic and volcaniclastic deposits labeled Tb_{1-5}, Tss_{1-3}, Tbgm and Tbtgm.

REFERENCES

Ferns, M. L., and Ramp, L., 1989, Geology and Mineral Resources map of the Grassy Mountain Quadrangle, Malheur County, Oregon: Oregon Department of Geology and Mineral Industries GMS-57, 1:24,000.

Hart, W. K., 1981, Chemical, geochronologic and isotopic significances of low-K, high-alumina olivine tholeiite magmatism in the northwestern Great Basin: Ph.D. dissertation, Cleveland, Ohio, Case Western Reserve University, 410 p.

MAP SYMBOLS

Contact -- approximately located

Fault contact -- dashed where approximately located, dotted where concealed. Ball and bar on down throw side

Strike and dip of beds