DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

BULLETIN 1739-A
PLATE 1

MINERAL RESOURCE POTENTIAL MAP OF THE SHEEPSHEAD MOUNTAINS, WILDCAT CANYON, AND TABLE MOUNTAIN WILDERNESS STUDY AREAS, MALHEUR AND HARNEY COUNTIES, OREGON

DEFINITION OF LEVELS OF MINERAL RESOURCE POTENTIAL AND CERTAINTY OF ASSESSMENT

LEVELS OF RESOURCE POTENTIAL

- H **HIGH** mineral resource potential is assigned to areas where geologic, geochemical, and geophysical char-acteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data support mineral-deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.
- M **MODERATE** mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate reasonable likelihood for resource accumulation, and (or) where an application of mineral-deposit models indicates favorable ground for the specified type(s) of deposits.
- L **LOW** mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is permissive. This broad category embraces areas with dispersed but insignificantly mineralized rock, as well as areas with little or no indication of having been mineralized.
- N **NO** mineral resource potential is a category reserved for a specific type of resource in a well-defined area.
- U **UNKNOWN** mineral resource potential is assigned to areas where information is inadequate to assign a low, moderate, or high level of resource potential.

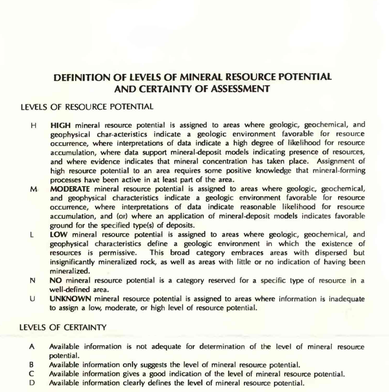
LEVELS OF CERTAINTY

- A Available information is not adequate for determination of the level of mineral resource potential.
- B Available information only suggests the level of mineral resource potential.
- C Available information gives a good indication of the level of mineral resource potential.
- D Available information clearly defines the level of mineral resource potential.

LEVEL OF RESOURCE POTENTIAL ↑ / LEVEL OF CERTAINTY →	A	B	C	D
UNKNOWN POTENTIAL	U/A	H/B HIGH POTENTIAL	H/C HIGH POTENTIAL	H/D HIGH POTENTIAL
		M/B MODERATE POTENTIAL	M/C MODERATE POTENTIAL	M/D MODERATE POTENTIAL
		L/B LOW POTENTIAL	L/C LOW POTENTIAL	L/D LOW POTENTIAL
				N/D NO POTENTIAL

Abstracted with minor modifications from:

Taylor, R.B., and Steven, T.A., 1983, Definition of mineral resource potential: Economic Geology, v. 78, no. 6, p. 1268-1270.
Taylor, R.B., Stoneman, R.J., and Marsh, S.P., 1984, An assessment of the mineral resource potential of the San Isabel National Forest, south-central Colorado: U.S. Geological Survey Bulletin 1638, p. 40-42.
Coudarz, G.H., compiler, 1984, Guide to preparation of mineral survey reports on public lands: U.S. Geological Survey Open-File Report 84-0787, p. 7, 8.



INDEX MAP

LIMIT OF GEOLOGIC MAPPING

CORRELATION OF MAP UNITS

EXPLANATION

- Area with high mineral resource potential (H)
- Area with moderate mineral resource potential (M)
- Area with low mineral resource potential (L)

Commodities

Au	Gold
Ag	Silver
Diat	Diatomite
Geo	Geothermal
O, G	Oil, Gas

DESCRIPTION OF MAP UNITS

Qp **Playa deposits (Holocene)**--Sand, silt, clay, and evaporitic deposits in the closed depressions of Heath, South, and Ten Cent Lakes, Folly Farm Flat, and other small areas

Qc **Colluvium (Holocene and Pleistocene)**--Slope-wash and talus deposits comprising locally derived, unconsolidated, generally unsorted soil material, sand, and gravel. Locally includes alluvium. In many areas includes a blanket of pale-brownish-gray loam that is probably a stabilized Pleistocene loess

Ql **Lacustrine deposits (Holocene? and Pleistocene)**--Gravel, sand, silt, and clay on the floors of large, closed depressions. Unit deposited primarily or entirely during Pleistocene pluvial periods. Includes coarse blocks of basalt where talus sheets have been reworked into shoreline deposits near escarpments. Shoreline deposits form a succession of terraces in stair-step arrangement

Qls **Landslide deposits (Holocene or Pleistocene)**--Unsorted rock debris that may include large (greater than 10 m) slide blocks. Unit forms hummocky topography

Qb **Younger basalt (Pleistocene)**--Lava flows of Saddle Butte Lava Field. Many primary flow features are preserved, such as ropy pahoehoe texture, tumuli, and pressure ridges. Circular hachured line marks rim of closed depression on small hill that probably is a lava cone (vent area). K-Ar whole-rock age of 0.43±0.09 Ma (Hart and Mertzman, 1982)

QTb **Older basalt (Pleistocene or Pliocene)**--Lava flows similar to unit Qb. Older than unit Qb, based on amount of soil cover, which buries or subdues most primary flow features. Circular hachured line marks rim of low conical hill that is probably the vent for unit

QTg **Gravel (Pleistocene and (or) Pliocene)**--Unconsolidated basaltic pebble and cobble deposit that concordantly veneers unit Tts southeast of Heath Lake; also forms alluvial fan east of Ryegrass Creek

Tts **Tuff, sandstone, and diatomite (Pliocene and Miocene)**--Tuff, fluvial(?) sandstone, and minor lacustrine deposits. Tuff is mostly pale brown, massive, and very thick bedded. Sandstone is locally crossbedded, ranges from coarse to very fine grained and thin to thick bedded, and lacks silt and clay laminae. Includes impure diatomite locally exposed in southeastern part of map area

Td **Devine Canyon Ash-flow Tuff (Miocene)**--Crystal-rich, pumice-poor welded ash-flow tuff exposed chiefly near Folly Farm Flat at north end of map area. Unit is flat lying or only slightly tilted (2-3° west), on basis of orientation of primary layering (welding features) and cuesta dip slopes. K-Ar ages range from 10.0 to 8.5 Ma, but most are about 9.2-9.3 Ma (Walker, 1979)

Ttp **Tuff of Pouge Hole Spring (Miocene)**--Pale-gray, nonpumiceous, very slightly porphyritic unwelded tuff. Crops out near Pouge Hole Spring and forms small fields of monolithologic float at other locales. Overlies unit Ta

Tbt **Basalt, basaltic andesite, and tuff (Miocene)**--Chiefly mafic lava flows with minor interbedded silicic tuff and tuffaceous sandstone. Some lava altered to palagonite, suggesting that it was chilled quickly during eruption onto wet ground or into standing water. Massive lava flows form ledges, whereas intervening slopes are generally mantled with slope wash and talus from flows. A few man-made exposures and monolithologic float from animal burrows are only evidence for lithology of interbedded tuffaceous and palagonitic rocks. Proportion of tuff, sandstone, and palagonitic basalt increases from south to north as inferred from the decreasing proportion of ledge-forming lava flows relative to colluvium-mantled slopes. Whole-rock K-Ar ages of 11.7±0.65 Ma and 11.7±0.65 Ma from samples collected at north end of Sheepshead Mountains (Hart and Mertzman, 1982)

Tap **Andesite of Palomino Creek (Miocene)**--Flow-banded andesite and dacite exposed in Palomino Creek. Includes small dome of vitrophyric dacite and orange-red ash-flow tuff near Red Line Reservoir. Unit interfingers with lava flows of unit Tbt and Ta

Ta **Andesite (Miocene)**--Chiefly platy, aphyric gray lava flows that weather to shades of brown. Locally flow folded. Includes fewer basalt and minor dacite lava flows. Locally contains thin (less than 5 m) layers of light-gray to reddish tuff. Intertongues with unit Tbt but is distinguished from it by near absence of basalt, which predominates in unit Tbt

Tto **Tuff of Oregon Canyon (Miocene)**--Medium-gray, unwelded to partly welded rhyolitic ash-flow tuff. Contains pumice lapilli and approximately 5 percent crystal fragments of embayed quartz, blocky sanidine, and minor aegirine-augite in a matrix of slightly devitrified ash. Where partly welded, collapsed pumice lapilli form dark-gray fiamme that define eutaxitic texture. Welded part weathers orange brown and locally forms a ledge. Top of unit is locally punky and reddish brown and contains dark-red oxidized scoriaceous lapilli. Basal nonwelded fine-grained bedded tuff locally present. Ash-flow tuff has a maximum thickness of about 7 m and is exposed intermittently only in southern part of map area, where it is interstratified with Steens Basalt (unit Ts). Unit correlated with tuff of Oregon Canyon of Rytuba and McKee (1984), who obtained a K-Ar sanidine age of 16.1±0.2 Ma from the unit. Unit also equivalent to Mickey ignimbrite of Hook (1981)

Ts **Steens Basalt (Miocene)**--Light- to dark-gray porphyritic to aphyric lava flows and breccia of olivine basalt and basaltic andesite. Flows average about 6 m thick and form resistant continuous ledges; less resistant flow tops and bottoms are commonly vesicular and locally autobrecciated. Composed of 40-70 percent plagioclase; 20-30 percent clinopyroxene, 7-10 percent olivine, 3-15 percent Fe-Ti oxide, and as much as 15 percent glass. Conspicuous, zoned plagioclase phenocrysts (An60-70) as long as 4 cm form as much as 50 percent of some flows; less abundant olivine phenocrysts are generally associated with plagioclase as glomerocrysts. Distribution of plagioclase phenocrysts ranges widely on all scales: within individual flows, between adjacent flows, and (or) between groups of flows. Sequences of aphyric, platy to blocky, commonly coarse-grained flows are present throughout unit. Other textures include diktytaxitic, ophitic, subophitic, intergranular, and intersertal. Vesicles are locally filled with calcite, zeolites, and (or) clays. Unit includes a few thin (less than 3 m) interbeds of tuff and tuffaceous sedimentary rocks, including tuff of Oregon Canyon (unit Tto) where too thin to map. Samples collected by Hart and Carlson (1985) at base and near top of escarpment in northern Sheepshead Mountains yielded K-Ar whole rock ages of 17.0±1.1 Ma and 14.8±0.8 Ma, respectively. Age of type section (Steens Mountain range-front escarpment, 50 km southwest) is 15.5±0.3 Ma (Baksi and others, 1967)

- Contact--Approximately located
- Gradational contact--Separates chiefly basalt (unit Tbt) in northern part of range from andesite (unit Ta) in south, across a poorly understood zone of interfingering lava flows
- Fault--Dotted where buried. Ball and bar on downthrown side
- Strike and dip of layering in lava flows
- Trace of tuff of Oregon Canyon--Shown only where too thin to map separately
- Rim of volcanoes--For lava flows in units Qb and QTb

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Baksi, A.K., York, D., and Watkins, N.D., 1967, Age of the Steens Mountain geomagnetic polarity transitions: Journal of Geophysical Research, v. 72, no. 24, 6299-6308.
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Hart, W.K., and Mertzman, S.A., 1982, K-Ar ages of basalt from south-central and southeastern Oregon: Isochron/West, no. 33, p. 23-26.
Hook, Richard, 1981, The volcanic stratigraphy of the Mickey Hot Springs area, Harney County, Oregon: Corvallis, Oregon State University, M.S. thesis, 66 p.
Rytuba, J.J., and McKee, E.H., 1984, Peralkaline ash-flow tuffs and calderas of the McDermitt volcanic field, southeast Oregon and northcentral Nevada: Journal of Geophysical Research, v. 89, n. B-10, p. 8616-8628.
Walker, G.W., 1979, Revisions to the Cenozoic stratigraphy of Harney Basin, southeastern Oregon: U.S. Geological Survey Bulletin 1475, 35 p.

NOTE: GEOLOGIC CROSS SECTIONS A-A' AND B-B' DO NOT APPEAR IN THIS PUBLICATION

Base from U.S. Geological Survey, 1:100,000: Malheur Lake and Steens Mountain, 1982

SCALE 1:50 000

1 1/2 0 1 2 3 4 5 MILES

1 .5 0 1 2 3 4 5 6 7 KILOMETRES

CONTOUR INTERVAL 50 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1988

Geology mapped by D.R. Sherrod, S.A. Minor, and T.L. Vercoutere, assisted by D.B. Vander Meulen, C.S. Harwood, J.L. Muntean, and J.A. Johnson, May-June, 1986