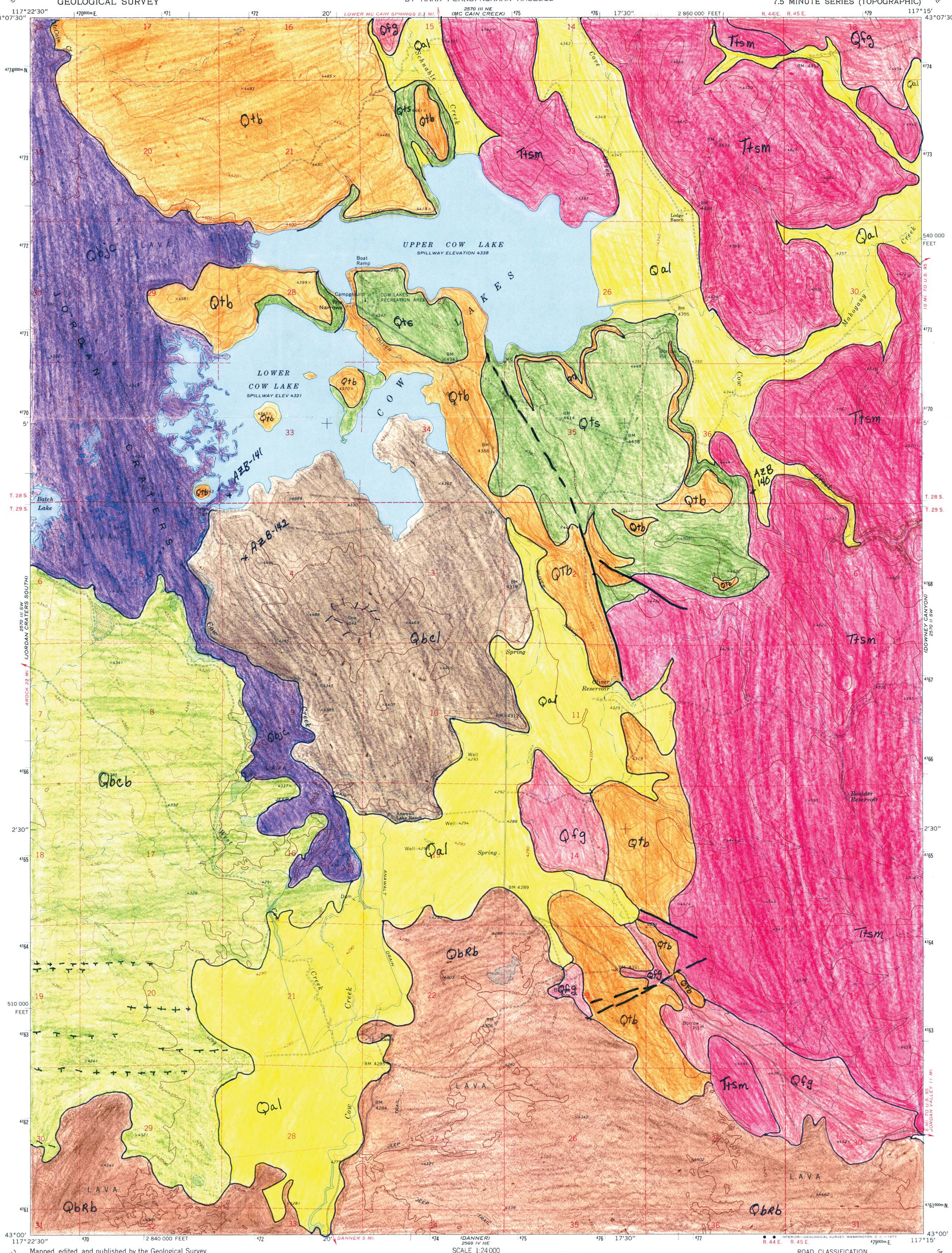
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OPEN-FILE REPORT 0-92-06
PRELIMINARY GEOLOGIC MAP OF THE COW LAKES QUADRANGLE
MALHEUR COUNTY, OREGON
1992
BY MARK FERNS/NORMAN MACLEOD

COW LAKES 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 1968. Field checked 1969

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 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
OREGON DEPARTMENT OF GEOLOGY
AND MINERAL INDUSTRIES

Field work conducted 1990/1991

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

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

COW LAKES, OREG.
N4300—W11715/7.5
1969
AMS 2570 III SE—SERIES V892

OPEN-FILE REPORT O-92-06
PRELIMINARY GEOLOGIC MAP OF THE COW LAKES QUADRANGLE MALHEUR COUNTY, OREGON

By M. L. Ferns, and N. S. MacLeod
Oregon Department of Geology and Mineral Industries

1992

This unpublished Open-File Report has not been reviewed and may not meet all Oregon Department of Geology and Mineral Industries' standards.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 1990/1991
Map Scale: 1:24,000

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° by 2° Boise sheet, eastern Oregon.

Cow Lakes

A large portion of the eastern half of the Cow Lakes quadrangle is covered by a densely welded, dark-purple weathering, crystal-lithic ashflow tuff (Ttsm). The ashflow surface is commonly comprised of a pumiceous carapace breccia made up of blocks of black and red-banded vitrophyre blocks. The ashflow, which thickens southward from the south edge of the Diamond Butte quadrangle, is made up of nearly 20 percent plagioclase phenocrysts that are broken and deformed. The ashflow is a low-silica, meta-aluminous rhyolite and is considered, on the basis of petrographic and chemical similarities, to be part of the tuff of Swisher Mountain of Ekren and others (1982). It is identical in appearance to the tuff of Swisher Mountain in the upper Owyhee Canyon where, according to Evans (1990) the section thickens to over 300 meters.

The western part of the Cow Lakes quadrangle is overlain by interbedded fluviatile gravels (QTs), basalt flows (QTb, Qbcl, Qbcb, Qbrb, and Qbjc) and alluvial fan deposits (Qfg). The youngest flows include both high-alumina (Qbcl) and alkalic (Qbcb, Qbrb, Qbjc) olivine basalts. The youngest flow (Qbjc) blocked the Cow Creek drainage, forming the Cow Lakes about 3,000 years ago.

Qfg Alluvial fan and pediment gravel deposits (Holocene and Pleistocene) Accumulation of poorly sorted and unconsolidated gravels, sands, and silts exposed on benches and ridges above the modern course of Cow Creek. Clasts are well rounded and consist mainly of rhyolite and rhyolite vitrophyre derived from the flanks of Mahogany Mountain to the north.

QTb Olivine basalt (Pleistocene? and Pliocene) Bluish-gray to black, diktytaxitic olivine basalt flows exposed adjacent to Upper Cow Lake. Locally heavily mantled by gravels of Qfg. Holocrystalline and equigranular with subophitic clinopyroxene, plagioclase, and intergranular olivine. According to Hart (1982) a transitional basalt dated at 3.84 Ma.

QTs Fluviatile gravels (Pleistocene? or Pliocene) Mainly poorly consolidated, cross-bedded pebble conglomerates with interbedded coarse- to fine-grained epiclastic sandstones. Includes minor interbedded tuffaceous siltstones. Contains transported vertebrate fossils at F in Lower Cow Lake.

Ttsm Tuff of Swisher Mountain (Middle Miocene) Densely welded, dark purple to reddish-purple, crystal-lithic ashflow tuff. Interior of ashflow is devitrified. Flow top is locally marked by pumiceous carapace breccias containing blocks of black and banded red and black vitrophyre and reddish, vesicular, devitrified tuff. Contains about 15 - 20 percent broken plagioclase crystals as much as 1 cm in length, light green pigeonite crystals, and as much as 5 % lithic fragments. Sanidine and orthopyroxene occur as accessory minerals in some thin sections. Chemically, a low-silica meta-aluminous rhyolite (Analyses , Table 1). Ashflow extends across the quadrangle northwestward through the McCain Creek into the Jordan Craters North and Diamond Butte quadrangles, where it forms the south wall of the Owyhee River Canyon. Unit thickens southeastward into the Downey Canyon quadrangle. Petrographically and chemically similar to the tuff of Swisher Mountain as described by Ekren and others (1982) and herein considered to be a northern extension of the Swisher Mountain from the upper Owyhee Canyon where mapped and described by Evans (1990). The tuff of Swisher Mountain is considered to be about 13.9 Ma in age (Ekren, 1982).

COW LAKES QUADRANGLE

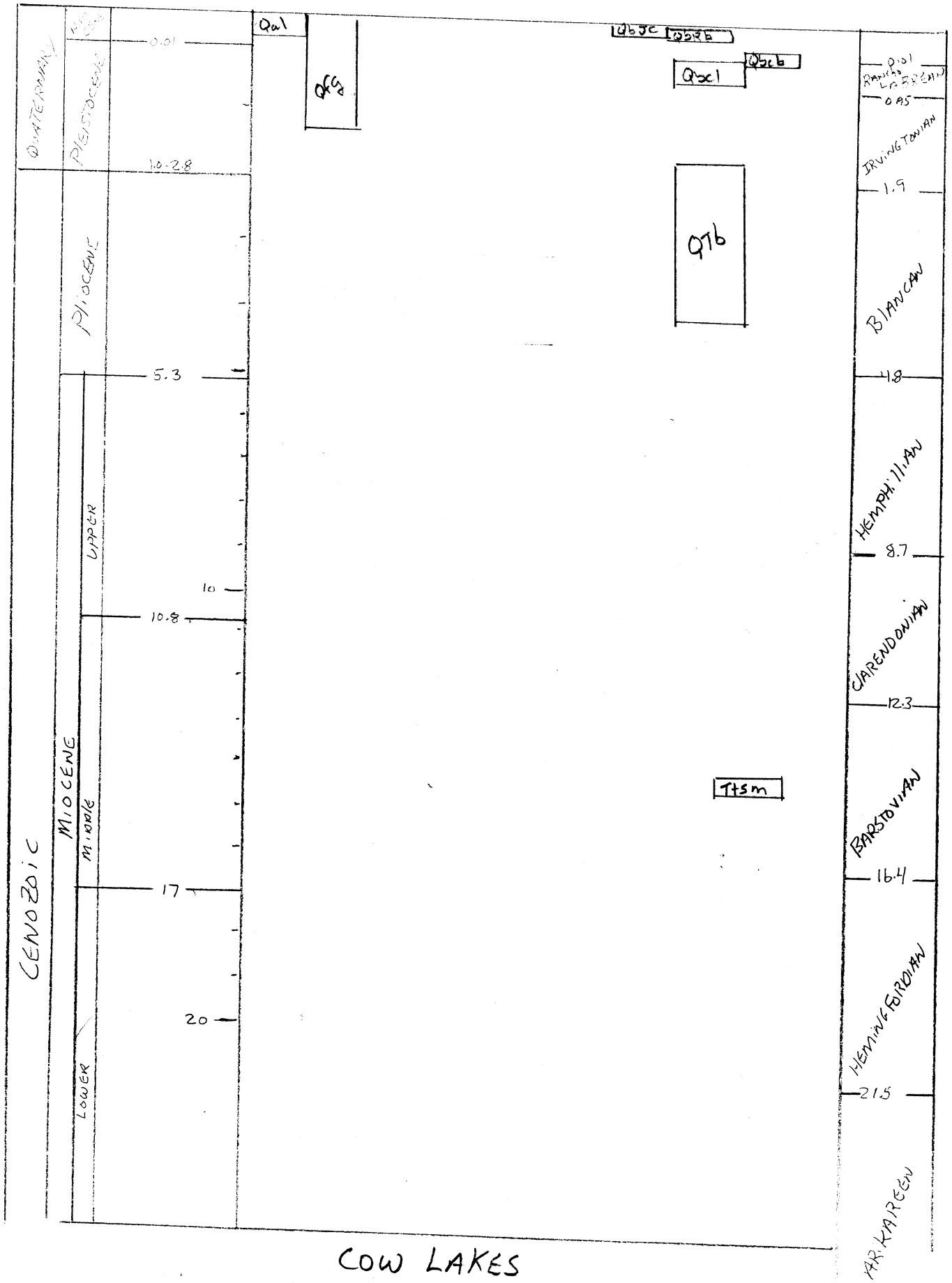
Qal Fluviatile and lacustrine deposits (Holocene and Pleistocene). Mainly unconsolidated deposits of stream gravels and silts deposited along the modern channel of Cow Creek. Includes fine-grained lacustrine silts deposited in Cow Lakes formed by the damming of drainages by basalt flows of unit Qbjc.

Qbjc Basalt of Jordan Craters (Holocene) Black iridescent vesicular olivine basalt flow with exceptionally well preserved tumuli, pahoehoe surfaces, and collapse structures. Fresh flow surfaces are exposed with no soil cover. In thin section, consists of 2-3mm olivine phenocrysts in a subophitic groundmass of plagioclase, clinopyroxene, and opaques. Chemically an alkali olivine basalt with a maximum age of 0.15 Ma, according to Hart (1982). Minimum age of 2800 years indicated by radiocarbon date from organic debris in upper Cow Lake (Mehringer, 1987).

Qbrb Basalt of Rocky Butte (Quaternary) Dark gray diktytaxitic olivine basalt flows, with well preserved primary volcanic structures such as tumuli, pahoehoe surfaces, and collapse structures. In thin section, consists of olivine phenocrysts 3 mm in diameter and elongate plagioclase phenocrysts set in a subophitic groundmass of clinopyroxene, opaques, and glass. According to Hart (1982) the unit consists of alkali olivine basalt flows with a maximum age of 0.03 - 0.09 Ma.

Qbcb Basalt of Clarks Butte (Pleistocene) Grayish-black olivine basal flows forming lava field about Clarks Butte. Well preserved tumuli, pahoehoe surfaces, and collapse structures are mantled by eolian and lacustrine silts. In thin section, consists of phenocrysts of olivine and plagioclase with glomerocrysts of plagioclase and olivine set in an intergranular groundmass of plagioclase, opaques, and clinopyroxene. Chemically an alkali olivine basalt radiometrically dated at 0.25 Ma (Hart, 1982).

Qbcl Basalt at Cow Lakes (Pleistocene) Vesicular grayish-black diktytaxitic olivine basalt flows, mantled by soil and alluvial deposits. Includes holocrystalline, diktytaxitic flows with plagioclase, clinopyroxene, and intergranular olivine. Includes high alumina olivine tholeiites (Analyses, Table 1) dated at 0.44 Ma by Hart (1982).



QUATERNARY
PLEISTOCENE
PLIOCENE
MIOCENE
UPPER
MIDDLE
LOWER
CENOZOIC
0.01
1.0-2.8
5.3
10
10.8
17
20
Qal
Qfg
QbJc
QbRb
Qbcl
Qbcb
QTb
Ttsm
0.01
RANCHO LABREAN
0.85
IRVINGTONIAN
1.9
BLANCAN
4.8
HEMPHILLIAN
8.7
CLARENDONIAN
12.3
BARSTOVIAN
16.4
HEMINGFORDIAN
21.5
ARIKAREEN

COW LAKES

LAB #	1/4	1/4	Sec.	T.(S.)	R.(E.)	Lithology	Unit	SiO2	Al2O3	TiO2	Fe2O3	MnO	CaO	MgO	K2O	NA2O	P2O5	Cr	Co	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	Li
									%	%	%	%	%	%	%	%		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
AZB-140	SE	SE	36	28	44	Rhyolite tuff	Ttsm	68.5	13.3	0.48	3.40	0.0	1.3	0.39	5.33	3.30	0.10	<10	7	8	6.9	65.	173	104	51	583	52	1940	17.0
AZB-141	SW	SW	33	28	44	Olivine basalt	Qbjc	47.3	15.7	2.14	11.6	0.1	9.2	8.49	0.83	3.10	0.41	163	49	162	59.0	90.	33	585	19	146	26	307	7.4
AZB-142	SW	NW	4	29	44	Olivine basalt	Qbcl	47.6	16.4	1.30	11.2	0.1	11.7	8.37	0.26	2.45	0.17	224	50	130	73.3	83.	<10	242	11	99	20	337	7.1

Evans, J.G., 1987, Geologic map of the Owyhee Canyon Wilderness Studay Area, Malheur County, Oregon: U.S. Geological Survey Miscellaenous Field Studies Map MF-1926, Scale 1:62,500

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Evans, J.G., 1991, Geologic Map of the Lower Owyhee Canyon Wilderness Study Area, Malheur County, Oregon: U.S. Geological Survey Miscellaneous Field Studies Map MF-2167, scale 1:50,000

Hart, W.K. and Merzman, S.A., 1983, Late Cenozoic volcanic stratigraphy of the Jordan Valley area, southeastern Oregon: Oregon Department of Geology and Mineral Industries, Oregon Geology, Vol. 45, no. 2, p. 15-19.

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

Location of whole rock sample analyzed in Table 1