

ISSN 0270-952X **GMS-57** Geology and Mineral Resources Map of the Grassy Mountain Quadrangle, Malheur County, Oregon By M.L. Ferns and L. Ramp Funded in part by the U.S. Geological Survey (COGEOMAP)

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Tdt	Lithic tuff breccia (upper Miocene) — Mafic clast lithic tuff, airfall tuffs, and overlying reworked tuffaceous silt and sandstones. Breccia clasts include yellow inflated pumice and basaltic scoria.	Tas	Arkosic and Mainly white t
	Distinguished from unit Tkt by absence of banded rhyolite clasts and biotite and hornblende phenocrysts that are present in unit Tkt . Age based on Hemphillian mammalian fossils found near Poison Springs in the Sourdough Spring quadrangle to the west (Kittleman and others, 1965) and		20-ft-thick ma base of the uni becomes finer
	camel bones from fossil locality F1 (SW¼ sec. 29, T. 21 S., R. 44 E.) along the west boundary of the quadrangle, west of Lowe Reservoir, that were identified by D.E. Savage (written communication,		Locally includ
	1988). Unit Trt is about 80 ft thick where exposed in the western part of the quadrangle. It		Basin and Hay that have beer
	unconformably overlies unit Tis and is conformably overlain by unit Trsb. Correlative with the		of the Owyhee
	pyroclastic interbed of the Grassy Mountain Formation as mapped by Storm (1975)		Butte Formati
	Chert-pebble conglomerate and interbedded diatomaceous siltstone (upper Miocene) —		in the underlyi
Tis	Mainly tuffaceous and arkosic sandstone and siltstone with interbedded conglomerate. Unit Tis		Miocene age is rocks to the eas
	locally becomes finer grained upward into pale, white and yellow claystones and interbedded		1989b)
	diatomaceous siltstones. Presumed base of unit Tis near Grassy Mountain Reservoir contains black		
	chert-pebble and granite-clast conglomerate. Erosional contact with underlying unit Tgs marked by rounded boulders of olivine basalt unit (unit Tgb). Uppermost exposures on Sagebrush Gulch	Тьр	Basalt and b holocrystalline
	are altered yellowish-orange arkosic sandstones containing abundant gastropods. Late Miocene age	100	underlying ba
	based on Clarendonian mammalian fossils at Poison Springs (Kittleman and others, 1965) and		groundmass fo
	Hemphillian fossils from Sagebrush Gulch in the Double Mountain quadrangle to the north (D.E.		phenocrysts le
	Savage, written communication, 1988). Unit is about 400 ft thick in the quadrangle		iddingsitized o quadrangle(Fo
	Basalt and basaltic-andesite flows (upper Miocene) — Black olivine basalt flows underlying		(Hart, 1981) a
Tdmv	the chert-pebble conglomerates south of fossil locality F1. May be part of the mafic volcanic sequence		flows analyzed
	predating the rhyolite dome complexes in the Double Mountain quadrangle to the north (Ramp and		Geldsetzer (19
	Ferns, 1989) that includes Snake River-type olivine tholeiites similar in chemistry to flows of overlying unit Trsb		Corcoran and o and Growney
	overlying unit 1130		quadrangle is
	Silicic volcanic and volcaniclastic rocks (upper Miocene) — Mainly glassy, aphyric platy		equivalent flor
Tdsv	andesite and dacite flows ranging from dark gray to shades of pink or red in color. Includes		m.y. Hart and
	interbedded accumulations of lithic tuffs and monolithologic breccias composed of aphyric glassy dacite clasts in a green tuffaceous matrix. Flows are hyalopilitic and contain phenocrysts of		R. 44 E., in C
	plagioclase, hypersthene, and clinopyroxene. Unit is about 300 ft thick on Sagebrush Gulch, where		intracanyon fl by generally fr
	two thick platy vitric flows are separated by a 100-ft-thick section of tuff breccias. Uppermost flow		that are more
	exposed on Sagebrush Gulch is chemically a dacite (Ramp and Ferns, 1989), with an ${ m SiO}_2$ content		as phenocryst
	of 67 percent		conglomerates
	Olivine basalt flows (upper Miocene) — Flow-on-flow sequence of olivine basalts capping the		Owyhee Basa
⊤gb	summit of Grassy Mountain; includes somewhat younger intracanyon flows forming benches on the	Tbo	flows and inte
	south side of Grassy Mountain. Locally includes overlying stream gravels containing chert pebbles		characteristica
	and large rounded basalt clasts. Flow east of Schweitzer Reservoir contains mafic xenoliths up to 3 in. in length. Cummings (personal communication, 1989) reports felsic xenoliths in the irregularly		that contains l Basalt, but inc
	shaped flow exposed on the far west end of Grassy Mountain. Flows are gray and holocrystalline		flows (Brown a
	and are characterized by large olivine phenocrysts with ophitic clinopyroxene in a diktytaxitic		rare clinopyro
	groundmass in which voids are filled by calcite. Major-element geochemistry indicates these are high-alumina or transitional basalts according to the terminology of Hart (1981), with relatively		part, on radio
	high Al ₂ O ₃ (>15 percent) and low TiO ₂ (<1.5 percent) and K ₂ O (<0.5 percent) contents as compared		25-m.y. K-Ar a by Hart (writt
	to unit Trsb flows. Unit Tgb is presumably equivalent to the high-alumina basalt, which has an		more appropri
	age of 10.4 m.y. (Hart, 1981). Maximum thickness is about 200 ft, with individual flows reaching		
	up to 40 ft in thickness. Part of the Grassy Mountain Basalt of Bryan (1929)	Tdr	Plagioclase n rhyolite best ex
	Arkose sandstones and channel-fill granite-clast conglomerates (middle and upper?		Rare phenocry
⊤gs	Miocene) — Mainly white to tan arkose sandstones. Includes channel-fill conglomerates, with		calc-alkaline r
	abundant granite and rhyolite clasts in the upper part of the unit. Uppermost conglomerates locally		According to (
	contain rounded obsidian clasts and rare black chert clasts. Unit Tgs generally becomes finer grained upward and includes white bentonitic clays near the top of the section which, where overlain		rhyolite overli Formation
	by unit Tgb , often generate large landslide masses. Hot-spring activity contemporaneous with		roimation
	deposition of the arkoses is indicated by float boulders of sinter containing silicified reeds near the		Mafic tuffs a
	Grassy Mountain gold prospect. Previously mapped as the upper part of the Kern Basin Formation	Tos	to light orang
	of Corcoran and others (1962) and the lower part of the Grassy Mountain Formation of Kittleman and others (1965, 1967). Unit Tgs is about 300 ft thick		phyric and aph in part, unit T
	and others (1909, 1907). Onit 1gs is about 500 it thick		Tdr . Contacts
	Tuff at Kern Basin (middle Miocene) — Mainly nonwelded, fine-grained, white to pale-yellow		age based on
Tkt	lithic tuff containing basalt, banded rhyolite, and white pumice clasts and biotite, hornblende,		25.3±1.8 m.y.
	quartz, and plagioclase crystals. Includes thinly bedded airfall tuffs at the base of the unit and		unit Tbo

	20-ft-thick massive beds of coarse, matrix-supported, granite-clast conglomerate is base of the unit along the Owyhee River in the Owyhee Dam quadrangle (Ferns, 1 becomes finer grained upward into medium- to coarse-grained biotite-bearing ar Locally includes thin tuffaceous siltstone and bentonitic clay interbeds. Low but Basin and Haystack Rock areas that generally weather to shades of red are made that have been silicified by introduction of hydrothermal fluids. Unit Tas exposed of the Owyhee River was originally named the Pinnacle Point Beds by Baldwin (19 Butte Formation by Corcoran and others (1962) and Kittleman (1962). The unit f in the underlying Owyhee Basalt (unit Tbo) and is locally interbedded with flows of Miocene age is based on mammalian fossils of Barstovian age recovered from presur rocks to the east at Tunnel Point (Corcoran and others, 1962) in the Owyhee Dam qu 1989b)
Tbb	Basalt and basaltic andesite? flows (middle? Miocene) — Mainly gray to holocrystalline, aphyric and plagioclase-phyric basalt flows that fill paleocanyons underlying basalt of unit Tbo . Commonly gray in color on fresh surfaces d groundmass feldspars. Textures range from pilotaxitic to ophitic. Characterize phenocrysts less than 3 mm in length and microphenocrysts of clinopyroxene, ort iddingsitized olivine. Samples from presumably correlative capping flows in th quadrangle (Ferns, 1988), Owyhee Dam quadrangle (Ferns, 1989b), and near Dry C (Hart, 1981) are calc-alkaline basalts similar in composition to basal Owyhee B flows analyzed by Brown and Petros (1985). Equivalent to the Blackjack Basalt of H Geldsetzer (1966), the Deer Butte basalts and uppermost flows of the Owyhee Bas. Corcoran and others (1962) and Kittleman and others (1965), and the 12-flow sequen and Growney (1988). Locally contains basal arkosic channel-fill conglomerate. The quadrangle is about 200 ft. Radiometric K-Ar ages summarized by Fiebelkorn and equivalent flows in the Owyhee Dam quadrangle (Ferns, 1989b) range from 13.8 m.y. Hart and Carlson (1983) report an 8.67±0.42 m.y. age from a flow in the SE ¹ /4 R. 44 E., in Oxbow Basin. This may be either an alteration age or a sample intracanyon flow related to unit Trsb . Unit Tbb is distinguished from underlying f by generally fresher appearances on weathered surfaces; thinner weathering rind that are more commonly holocrystalline; abundance of olivine (up to 5 percent) an as phenocryst phases; and the presence of narrow, discontinuous lenses of inte conglomerates
Tbo	Owyhee Basalt (lower to middle Miocene) — Includes basalt, basaltic andes flows and interbedded deposits of agglutinate and nonwelded and welded scori characteristically stained red. Near the top of the section includes a 100-ft-thick and that contains blocks of scoriaceous andesite in a white tuff matrix. Previously ma Basalt, but includes many andesitic flows (sample E, Table 1, Plate 2) as well as cal flows (Brown and Petros, 1985). Andesites are hyalopilitic in texture and contain rare clinopyroxene phenocrysts. Previously considered as middle to late Miocene part, on radiometric dates from overlying unit Tbb . Age is presumably early Mio 25-m.y. K-Ar age from the base of the unit (Fiebelkorn and others, 1982). A younger by Hart (written communication, 1989), who suggests that a maximum age of 16 more appropriate. Total thickness is about 1,000 ft
Tdr	Plagioclase rhyolite (lower Miocene) — Flow-foliated, red, glassy, and ger rhyolite best exposed along the abutments of the Owyhee Dam. Includes capping vitt Rare phenocrysts include embayed plagioclase crystals from 0.25 to 4 mm in leng calc-alkaline rhyolite. Brown and Petros (1985) report a 22.8±2.6-m.y. K-Ar a According to Corcoran and others (1962) and Kittleman and others (1967), the orhyolite overlies sedimentary rocks to the west and south that correlate with the Formation
Tos	Mafic tuffs and tuff breccias (hydrovolcanic deposits?) (lower? Miocene) to light orange-brown, coarse- to medium-grained palagonitic breccias that comphyric and aphanitic mafic volcanic clasts up to 0.6 m in diameter. Underlies unit T in part, unit Tdr. Uppermost beds include a 3-ft-thick white rhyolitic lithic tuff t Tdr. Contacts between the underlying mafic tuffs and tuff breccias are not expose age based on a 22.8±2.6-m.y. K-Ar age for overlying unit Tdr (Brown and Petr 25.3±1.8 m.y. K-Ar age (Fiebelkorn and others, 1982) for a basalt flow near the b

gon Cooperative Book Store, magnetostratigraphy of a : Oregon Geology, v. 47, no. Owyhee Irrigation Project, N.C., 1962, Geology of the ogy and Mineral Industries s in the Dry Creek arm area relations: Oregon Geology, v. ozoic stratigraphy of western 1., eds., Cenozoic geology of Ridge quadrangle, Malheur tries Geological Map Series nt of Geology and Mineral

1989b). Generally arkosic sandstone. ittes in the Oxbow e up of sandstones d on the west side (1959) and the Deer t fills a depression funit **Tbb**. Middle umably equivalent uadrangle(Ferns,

ns eroded onto the due to abundant zed by plagioclase rthopyroxene, and he Owyhee Ridge Creek to the south Basalt (unit **Tbo**) f Bryan (1929) and isalt as mapped by ence of Cummings Total thickness in d others (1982) for 3.8±0.3 to 16.1±0.9 1/4 sec. 23, T. 22 S., e from a younger g flows of unit Tbo ids; groundmasses nd orthopyroxene tervening arkosic

esite, and andesite ria and lithic tuff andesitic lithic tuff happed as Owyhee alc-alkaline basalt in plagioclase and ne in age based, in liocene based on a er age is suggested 16-17 m.y. may be

generally aphyric trophyre breccias. igth. Chemically a age for this unit. e distal end of the the Sucker Creek

) — Mainly brown ntain plagioclase-Tbo and overlies, that overlies unit sed. Early Miocene etros, 1985) and a base of overlying