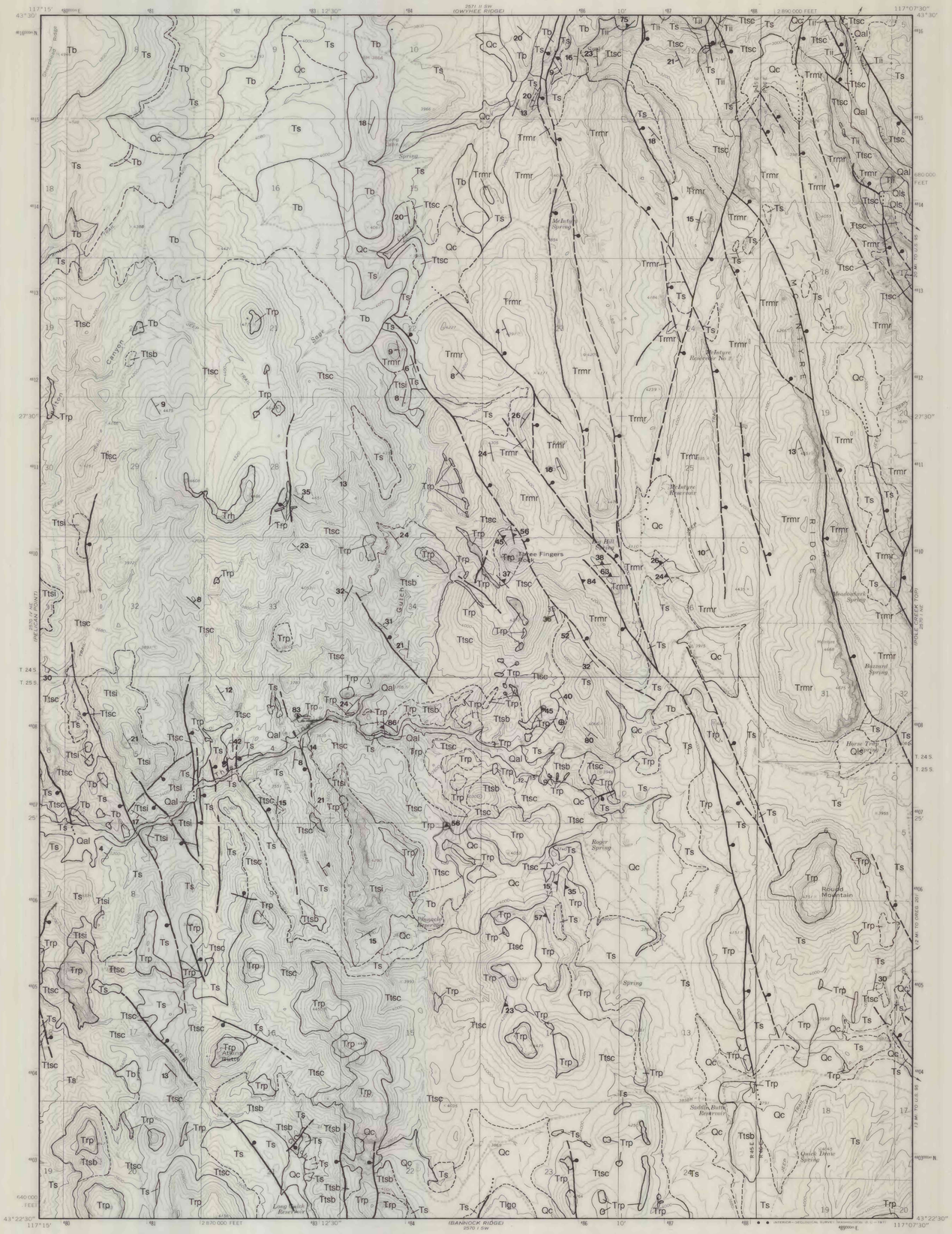
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT
89-344



Base from U.S. Geological Survey, 1967

Geology mapped by D.B. Vander Meulen, 1986 and 1987; T.L. Vercoutere, 1986; and J.J. Rytuba, S.A. Minor, M. Wick, M. Wager, and C.S. Harwood, 1987

APPROXIMATE MEAN DECLINATION, 1987

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

AREA OF MAP

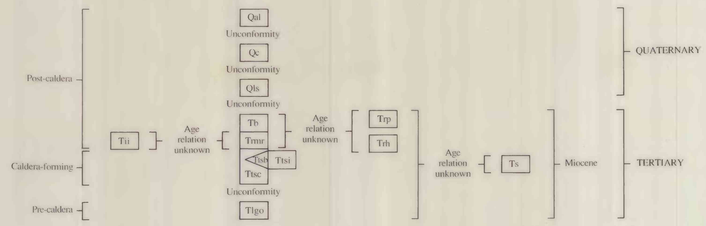
PRELIMINARY GEOLOGIC MAP OF THE THREE FINGERS ROCK QUADRANGLE, MALHEUR COUNTY, OREGON

By

Dean B. Vander Meulen, James J. Rytuba, Scott A. Minor, and Craig S. Harwood

1989

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (QUATERNARY)--Unconsolidated, moderately sorted to poorly sorted, massive to thin-bedded gravel, sand, and silt. Fanglomerate, flood-plain, and stream bed deposits

Qc COLLUVIUM (QUATERNARY)--Unconsolidated, unsorted, indistinctly bedded to massive gravel, sand, and minor silt; locally includes alluvial deposits. Slope-debris, talus, and terrace deposits

Qls LANDSLIDE DEPOSITS (QUATERNARY)

Tii INTERMEDIATE INTRUSION (MIOCENE)--Porphyritic to slightly porphyritic intermediate to silica domes, plugs, and dikes. Unit contains blocky sanidine and quartz phenocrysts less than 4 mm across. Outer devitrified carapace of intrusions are commonly silicified and argillically altered, whereas inner core consists of unaltered vitrophyre. Vitrophyric core and outer concentric layers of domes appear to have grown from inside outward. Endogenous domes were extruded through tuff of Spring Creek and locally show drag folds along their margins. Unit intrudes the northeast margin of Three Fingers caldera

Ts SEDIMENTARY ROCKS, UNDIVIDED (MIOCENE)--Intercalated arkosic sandstone, volcaniclastic siltstone, tuffaceous mudstone, and conglomerate. Tan brown to light gray; locally reddish orange where altered. Internal structure of bedding ranges from high-angle cross-beds to planar beds (2 cm) and laminae (<1 cm). In northern part of quadrangle, unit includes beds of diatomite, bentonite and palagonite clays, and thin basalt flows. Unit fills central part of the Three Fingers caldera, and covers north and east margins of caldera. Locally altered and silicified along east margin of caldera. Correlative with the Succor Creek Formation of Kittleman and others (1965)

Tb BASALT (upper? MIOCENE)--Dense aphyric to porphyritic basalt flows and shallow intrusions. Black to dark gray on fresh surfaces; dark olive green to dark reddish brown on weathered surfaces. Commonly columnar jointed and locally vesicular and scoriaceous; in places characterized by a basal flow breccia. Intrudes and overlies caldera-forming tuffs and is intercalated with caldera-fill sedimentary rocks. Phyric basalt textures range from hyaloophitic to intergranular; contains phenocrysts as large as 6 to 8 mm across of plagioclase (An_{45-65}), clinopyroxene, minor olivine, orthopyroxene, and iron oxides. In northern part of quadrangle, unit is equivalent to (Ttsb and Tbb) of Fern (1988)

Trp RHYOLITE PORPHYRY (MIOCENE)--Domes, plugs, dikes, sills, associated flows, and flow breccias composed of both rhyolite and rhyolite porphyry. Rhyolite is dark grayish red to brownish gray; contains subequal amounts, 2 to 20 modal percent of sanidine and quartz phenocrysts that range from 0.5 to 10 mm across. Rhyolite also contains minor amounts of plagioclase (An_{10}), diopsidic augite, biotite, and iron oxides. Domes and plugs are commonly capped by welded ash and lapilli tuffs. Black porphyritic vitrophyre with well-developed flow foliation is present locally at margins of plugs and domes. Locally, secondary vapor-phase alteration, silicification, and mineralization are common. Potassium-argon age of sanidine separate from rhyolite plug 2 km south of the quadrangle indicates 14.9±0.4 Ma (Vander Meulen and others, 1987b)

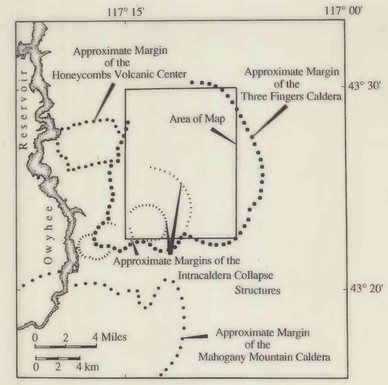
Trh RHYOLITE HORNBLENDE PORPHYRY(MIOCENE)--Dome and plugs of rhyolite porphyry restricted to the north-central part of the quadrangle. Rhyolite is light brown to reddish brown; contains subequal amounts, 8 to 12 modal percent of sanidine and quartz phenocrysts; 2 to 4 mm across. Rhyolite also contains 2 to 3 modal percent hornblende phenocrysts; 2 mm across. Unit intrudes tuff of Spring Creek and forms resistant ridges and spines flanked by talus deposits. Potassium-argon age of sanidine separate from this rhyolite intrusion indicates 15.2±0.5 Ma.

Trmr RHYOLITE OF MCINTYRE RIDGE (MIOCENE)--Rhyolite flows, domes and intrusions composed of reddish brown to purple gray porphyritic rhyolite. Base of flows and margins of domes are composed of black glassy vitrophyre. Phenocrysts consists of up to 20 modal percent quartz and 10 percent glassy sanidine. Unit conformably overlies caldera-forming tuff of Spring Creek (Ttsc) and as an estimated thickness of 220 m. Potassium-argon age of sanidine separate from a rhyolite flow indicates 15.8±0.6 Ma (Ekren and others, 1984)

Ttsc TUFF OF SPRING CREEK (MIOCENE)--Nonwelded to partly welded, pale-greenish-yellow to light-green, metaluminous rhyolite ash-flow tuff. Individual ash flows range from 3 to 20 m in thickness. Unit exceeds 360 m where it fills moat part of the Three Fingers caldera; base of tuff not exposed in quadrangle. Reddish-brown to dark-brown lithic fragments are randomly distributed throughout tuff. Pumice fragments are usually medium green and stand out against lighter green ash matrix. Vitric groundmass is composed of slightly distorted devitrified shards and unflattened to partly flattened pumice fragments. Locally, tuff matrix displays mottled texture of whitish-green fine-grained ash enclosed within coarser ash matrix of contrasting color. Phenocrysts are less than 4 mm long and include 5 percent sanidine, 1 to 5 percent plagioclase (An_{10}), 1 to 2 percent quartz, and less than 1 percent soda pyroxene and opaques. Eruption of the tuff resulted in the formation of Three Fingers caldera (Rytuba and others, 1989). Locally divided into:

Ttsb Basalt bomb member--Upper part of Spring Creek unit contains many ellipsoidal, oblong, and spindle-shaped aphyric to slightly porphyritic basalt bombs. Bombs are randomly clustered in small groups and typically range from 2 to 40 cm in length. Bombs contain xenocrysts of quartz and sanidine that are encapsulated by reaction rims of microcrystalline pyroxene and amphibole. Basalt groundmass consists of microcrystalline plagioclase, olivine, and pyroxene. Tuff is similar to tuff of Spring Creek (Ttsc) in color, degree of welding, and mineralogy. Unit is 50 to 100 m thick; locally separated from lower member by basal vitrophyre that contains 25 to 30 percent blocky sanidine phenocrysts which range from 4 to 8 mm across, and abundant basalt bombs. Bombs are less abundant and smaller upsection. Large blocky sanidine crystals are less abundant upsection and compose about 3 modal percent

Ttsi Intracaldera member--Upper part of Spring Creek unit is partly welded, grayish-yellow, ash-flow and air-fall tuff that contains blocky sanidine phenocrysts from 4 to 8 mm in diameter. Matrix contains 3 modal percent sanidine phenocrysts; phenocrysts are less abundant or absent upsection. Tuff is restricted to Three Fingers caldera and conformably overlies Spring Creek unit (Ttsc). Intracaldera tuff has minimum thickness of 180 m. Basal part of unit locally contains matrix-supported angular blocks up to 18 cm in diameter. Blocks are made up of ash and fine-grained sedimentary rock. Interbedded air-fall tuff units consist of alternating layers of sorted ash and pumice-lapille. Unit forms massive cliffs that exhibit weathered, oval cavities and pockets several meters across.



INDEX MAP OF THE OWYHEE VOLCANIC FIELD

TUFF OF LESLIE GULCH, UNDIVIDED (MIOCENE)--In this area, consists of:

Tlgo Outflow facies--Welded grayish-yellow to greenish-brown, peralkaline, high-silica rhyolite ash-flow tuff. Tuff formed as single cooling unit that has minimum thickness of 85 m. West of the quadrangle, tuff exceeds 350 m where it filled paleo-depocenters. Green to white, fine-grained, silicified air-fall tuff forms basal part of unit. Above air-fall tuff discontinuous black vitrophyre has maximum thickness of 2 m. Vitrophyre grades vertically into lithophysal zone that contains gas cavities several centimeters long. Remainder of tuff has recrystallized granophyric texture. Basal part of ash-flow tuff, above vitrophyre, locally contains abundant subangular blocks, less than 75 cm in length, and lithic fragments of sedimentary origin. Crystal content ranges from 20 percent near base of ash-flow tuff, to less than 5 percent in upper part. Phenocrysts are less than 3 mm across; include 2 to 15 percent sanidine, 2 to 5 percent quartz, and minor albite. Partly welded pumice fragments contain devitrified intergrowths of feldspar and cristobalite. Flattening and distortion of vitric structure is common. Secondary flow foliation is common locally in most densely welded parts of tuff. Air-fall tuffs are locally mapped within upper part of outflow facies unit. Exposures of tuff are restricted to southern part of the quadrangle where they form the south wall of Three Fingers caldera. Eruption of the tuff resulted in formation of the Mahogany Mountain caldera (Rytuba and others, 1985). Potassium-argon age on sanidine from basal vitrophyre indicates 15.5±0.5 Ma (Vander Meulen and others, 1987a)

——— CONTACT--Dashed where approximately located

—·—·— FAULT--Dashed where inferred; dotted where concealed; ball and bar on downthrown side

8 STRIKE AND DIP OF BEDDING

78 STRIKE AND DIP OF FOLIATION

GEOLOGIC SUMMARY

The Three Fingers Rock quadrangle is located in the Owyhee volcanic field of eastern Oregon and occupies the central part of the 16-by 20-km Three Fingers caldera. The quadrangle is underlain by ash-flow and air-fall tuffs, rhyolite flows, interbedded arkosic and tuffaceous sedimentary rocks, basalt flows, and silicic , intermediate, and mafic intrusions. All units in the quadrangle are Miocene or younger in age.

The lowest exposed stratigraphic unit in the quadrangle is the precaldera outflow ash-flow tuff of Leslie Gulch (Tlgo). The Leslie Gulch Tuff erupted from the Mahogany Mountain caldera and forms the south wall of the Three Fingers caldera. The most extensive ash-flow tuff sheet exposed in the quadrangle is the tuff of Spring Creek that fills the western part of Three Fingers caldera. Eruption of the tuff at approximately 15.4 Ma resulted in the formation of the caldera. The tuff of Spring Creek (Ttsc) forms the lowest exposed stratigraphic unit within the caldera. Locally, the tuff includes an overlying basalt bomb member (Ttsb), and an intracaldera member (Ttsi) that is restricted to the caldera moat. In the south-central part of the quadrangle, the intracaldera member contains air-fall tuff deposits that are locally interbedded with moat-fill sedimentary rocks and basalt flows. An extensive rhyolite dome and flow complex (Trmr) exposed in the northeastern part of the quadrangle, stratigraphically overlies the caldera-forming tuff of Spring Creek. These post-caldera rhyolite domes and flows erupted along the caldera ring-fracture and filled the northeastern part of the caldera moat.

In the southwestern part of the Three Fingers caldera, a series of post-caldera rhyolite domes and plugs (Trp) and part of the caldera structural wall define the margins of three intracaldera collapse structures (Index map). A series of arcuate faults that offset the southwestern part of the caldera wall define a fourth collapse structure. An exceptionally steep gravity gradient of 20 milligals occurs over the southwest wall of caldera across the intracaldera collapse structures. The intracaldera collapse structures probably form the area of deepest subsidence within the Three Fingers caldera.

In the east-central part of the quadrangle, a series of rhyolite domes and plugs are coeval with a north-northwest-trending fault zone. Caldera moat-fill sedimentary rocks and caldera-forming tuffs are cut by the N-NW-trending fault zone. Locally, rocks along the fault zone are intensely altered and mineralized. In the northern part of the quadrangle, the margin of the Three Fingers caldera and the northern extent of the N-NW-trending fault zone are buried by interbedded basalt flows (Tb) and sedimentary rocks (Ts).

REFERENCES

Ekren, E.B., McIntyre, D.H., and Bennet, E.H., 1984, High-temperature, large-volume, lavalike ash-flow tuffs without calderas in southwestern Idaho: Geological Survey Professional Paper 1272, 76 p.

Ferns, M.L., 1988, Geology and mineral resources map of the Owyhee Ridge quadrangle, Malheur County, Oregon: Oregon Department of Geology and Mineral Industries, Geological Map Series, GMS-53, scale 1:24,000.

Kittleman, L.R., Green, A.R., Hagood, A.R., Johnson, A.M., McMurray, J.M., Russell, R.G., and Weeden, D.A., 1965, Cenozoic stratigraphy of the Owyhee region, southeastern Oregon: University of Oregon Museum of Natural History Bulletin 1, 45 p.

Rytuba, J.J., Vander Meulen, D.B., Plouff, Donald, and Minor, S.A., 1985, Geology of the Mahogany Mountain caldera, Oregon [abs.]: Geological Society of America Abstracts with Programs, v. 17, no. 4 p. 70.

Rytuba, J.J., Vander Meulen, D.B., Minor, S.A., and McKee, E.H., 1989, Geologic evolution of the Three Fingers caldera, Malheur County, Oregon [abs.]: Geological Society of America Abstracts with Programs, v 21, no 5, p. 138.

Vander Meulen, D.B., Rytuba, J.J., Vercoutere, T.L., and Minor, S.A., 1987, Geologic map of the Rooster Comb quadrangle, Malheur County, Oregon: U.S. Geological Survey Miscellaneous Field Studies Map, MF-1902A, scale 1:24,000.

Vander Meulen, D.B., Rytuba, J.J., Grubensky, M.J., and Goeldner, C.A., 1987, Geologic map of the Bannock Ridge quadrangle, Malheur County, Oregon: U.S. Geological Survey Miscellaneous Field Studies Map, MF-1903B, scale 1:24,000.