DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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PLATE 1 OF 13

Base from U.S. Geological Survey
1955 (Revised 1970)

A RECONNAISSANCE GEOLOGIC MAP OF THE ADEL 1° X 2° QUADRANGLE, SOUTHEASTERN OREGON

by

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DESCRIPTION OF MAP UNITS

Qp **Playa deposits (Quaternary)**--Clay, silt, sand, and some evaporites

Qal **Alluvium (Quaternary)**--Unconsolidated fluviatile gravel, sand, and silt. In places, includes talus, slope wash, fanglomerate, and in some areas lake bed deposits and windblown sand

Qlb **Late basalt flows (Quaternary)**--Thin flows of olivine-bearing, diktytaxitic basalt. Commonly highly foldspathic. Upper flow surfaces show little evidence of erosion; pressure ridges, tumuli, and elongated depressions, representing collapsed lava tubes, common

QTls **Landslide debris (Quaternary and Tertiary)**--Mostly unstratified mixtures of basaltic and tuffaceous sedimentary bedrock. In some places includes disordered fault blocks, basalt rubble, and talus

QTba **Basalt and andesite (Quaternary and Tertiary)**--Flows mostly of basalt and minor basaltic andesite commonly vesicular or scoriaceous but locally dense or platy. Minor interbeds of tuffaceous sedimentary rocks

QTs **Sedimentary deposits (Quaternary and Tertiary)**--Lacustrine, fluviatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. Locally divided into:

QTg Pediment or fluvioglacial gravels that lie about playal lake levels

QTd **Dikes, sills, and necks (Quaternary and Tertiary)**--Mostly basalt intrusions or gabbro but includes some andesite intrusions

QTp **Pyroclastic rocks of basaltic cinder cones (Quaternary and Tertiary)**--Mostly unconsolidated reddish, fine to coarse scoriaceous basaltic ejecta

Rocks of stratovolcanoes and domes (Quaternary and Tertiary)--Locally divided into:

QTv Agglomerate, breccia, scoria, cinder, ash, flows, and intrusive masses forming constructional volcanic features

QTvf Mostly large silicreous complex exogeneous domes and related flows and flow breccias

QTvm Volcanic complexes ranging from mafic to silicic in composition

Tuffaceous sedimentary rocks, tuffs, and interbedded basaltic and andesitic flows (Miocene)--Locally divided into:

Tsb Tuffaceous siltstone, sandstone, conglomerate, tuff, and interbedded basalt or andesite flows, flat to gently dipping

Tst Semiconsolidated lacustrine tuffaceous sandstone and siltstone, ash and ashy diatomite, conglomerate and minor fanglomerate, virtic-crystal and virtic-lithic tuff, pumice lapilli tuff, and tuff breccia. Includes Devine Canyon ash-flow tuff and Rattlesnake ash-flow tuff (Walker, 1979)

Tob Mostly thin, vesicular basalt flows

Volcanic and sedimentary rocks (Tertiary)--Locally divided into:

Tva Flows of platy andesite basaltic andesite and glassy black or gray dacite or rhyodacite

Tvb Thin, discontinuous basalt flows

Tvp Tuffaceous sedimentary rocks and tuffs

Tb **Basalt (Tertiary)**--Basalt flows, generally dipping 5 to 10 degrees. Some major topographic rims capped by these flows. Basalt is commonly highly feldspathic, contains small to moderate amount of olivine

Tuffaceous sedimentary rocks tuffs, and silicic flows (Tertiary)--Locally divided into:

Ttf Tuff of rhyolitic and dacitic composition, tuffaceous sedimentary rocks, and areally restricted rhyodacitic flows. Some tuffs partly to densely welded. Laps on unit Tfb with slight angular discordance

Tts Mostly fine-grained tuffaceous sedimentary rocks and tuffs representing flood plain or shallow lake deposits. In southeastern part of quadrangle contains more abundant lake beds, including interlayers of ashy diatomite locally with fish and plant remains. In western part of quadrangle grades up into pumice lapilli tuffs

Trd **Rhyolite and dacite domes and flows associated with main outer caldera ring fractures (Miocene)**--Composed of high-silica rhyolite to dacite plugs, endogenous domes, flows, flow breccia, and intrusive breccia. Typically dark color, weakly porphyritic with glassy groundmass, flow foliation is common. Flow breccia is monolithologic and contains clasts as much as several meters in diameter. K-Ar data on sanidine from ring dome of the Whitehorse caldera is 13.8±1 Ma (Rytuba and others, 1981)

Trf **Rhyolite flows and flow breccia (Miocene)**--Texture generally shows well-developed flow banding with trachytic flow texture. Unit commonly associated with caldera ring domes

Ttw **Tuff of Whitehorse Creek (Miocene)**--Unwelded to densely welded perralkaline ash-flow tuff composed of several separate ash flows as well as interstratified air-fall tuffs. Basal ash-flow tuff is light-gray to white aphyric and unwelded; contains abundant white to gray pumice in a light-gray ash matrix. Lithic fragments are locally abundant. Beds of air-fall tuff, composed of interstratified pumice-rich and ash-rich layers overlies the basal ash-flow tuff. Above air-fall tuff is an ash-flow tuff which is unwelded near base and densely welded at top; locally it is columnar jointed. It is light gray, aphyric, and pumice rich at base and grades upward into a dark-gray to black unwelded tuff containing abundant lithic fragments. Upper welded zone is tan to brown and contains as much as 1 percent phenocrysts of sanidine. Lithophysal zones are common near base of welded zone. K-Ar date on sanidine of 15.0±0.3 m.y. (Rytuba and others, 1981). Eruption of the tuff of Whitehorse Creek resulted in the formation of the Whitehorse caldera located in the southeast part of the quadrangle (Rytuba and McKee, 1984)

Ttl **Tuff of Long Ridge (Miocene)**--Unwelded to densely welded, vapor-phase recrystallized tuff. Basal part consists of brick-red unwelded to partly welded tuff with black obsidian and lithic fragments. Phenocrysts total less than 5 percent and include sanidine as much as 3 mm long, plagioclase, quartz, augite, and hypersthene. Augite occurs as inclusions in both ilmenite and hypersthene. Magnetite occurs as inclusions in hypersthene. Above unwelded zone is a black, nearly aphyric basal vitrophyric 0.5 to 2 m thick. Phenocrysts total less than 1.5 percent and consist of ilmenite, magnetite, fayalite, alkali feldspar, aenigmatite, and ferrohedenbergite with inclusions of apatite. Above basal vitrophyric tuff is green to gray-green densely welded aphyric comendite. Original eutaxitic texture has been destroyed by vapor-phase recrystallization. Above aphyric comendite, unit consists of interstratified green aphyric to weakly porphyritic welded tuff and brown porphyritic densely welded tuff. Brown porphyritic tuff is a soda trachytic rhyolite containing 7.5 percent potassium-feldspar phenocrysts, 0.3 percent clinopyroxene, 1.5 percent fayalite, and 0.3 percent opaques in a recrystallized groundmass of quartz and potassium feldspar. Secondary flow folds and lineation are common. K-Ar date on sanidine of 15.8±0.6 m.y. (Rytuba and others, 1981). Eruption of the tuff of Long Ridge resulted in the formation of the 33-km-diameter Long Ridge caldera. The northern arcuate margin of the caldera is located in the southeast corner of the quadrangle

Ttt **Tuff of Trout Creek Mountains (Miocene)**--Unwelded to densely welded vapor-phase recrystallized comendilic ash-flow tuff and, at base of unit, included 1 to 4 m of unwelded tan to yellow-brown air-fall and pumice lapilli tuff. The ash-flow tuff is a simple cooling unit. Basal part consists of unwelded to partly welded porphyritic gray tuff containing 26 percent anorthoclase phenocrysts, 1 percent ferrohedenbergite, 1 to 5 percent aenigmatite, 1 percent fayalite, and 1 percent quartz. Ilmenite occurs as inclusions in clinopyroxene and all phases contain apatite inclusions. Sparse phenocrysts of augite and hypersthene also are present. Tuff grades upward into black vitrophyric 1/2 to 1 m thick. Above the vitrophyric tuff is densely welded green, blue-green, to green-gray porphyritic tuff containing vapor-phase cavities developed within partly flattened tan to white pumice fragments up to 5 cm long. Lithic fragments of andesite and basalt up to 4 cm in length are locally abundant. Phenocrysts of anorthoclase vary from about 5 to 25 percent and up to 3 percent smoky quartz phenocrysts are present locally. In places tuff is columnar jointed. K-Ar date on sanidine of 15.9±0.3 m.y. (Greene, 1976). Eruption of the tuff of Trout Creek Mountains resulted in the collapse of the Pueblo calders. The caldera margin is located along the east scarp of the Pueblo Mountains in the southern part of the quadrangle (Rytuba and McKee, 1984)

Tto **Tuff of Oregon Canyon (Miocene)**--Unwelded to densely welded, light-bluish-green to white, comendilic tuff; upper part is reddish brown. Thickness is approximately 40 to 65 m in the easternmost part of the quadrangle (Rytuba and Curtis, 1983) where it conformably overlies basaltic flows. This gray to tan air-fall tuffs in basal part of unit are overlain by gray vitrophyric 1 to 2 m thick. Above vitrophyric is light-bluish-green to white, vapor-phase-recrystallized tuff; this lithology makes up most of unit and forms prominent cliffs that display well-developed columnar jointing. Phenocrysts, 3 to 6 mm across, of sanidine (about 6 percent), quartz (about 4 percent), and arfvedsonite (1 percent) are present in a finely crystalline groundmass of quartz, potassium feldspar, and arfvedsonite, which indicates tuff is peralkaline. Flattened pumice fragments as long as 1 cm are replaced by these minerals. Lithic fragments of porphyritic andesite are locally abundant. Upper 10 to 40 m of unit consist of reddish-brown, unwelded to partly welded tuff. Dark-gray to brown partly flattened pumice fragments, as long as 10 cm, are present in a reddish-brown ash matrix. Lithic fragments as large as a few centimeters in diameter are abundant in this upper part of unit. Phenocrysts in upper part of unit of sanidine (about 4 percent), quartz (1.5 percent), and clinopyroxene (0.2 percent) are about 1 to 4 mm long. Transitional lithology between lower and upper parts of unit is gradational over approximately 2 m and typically consists of reddish-brown pumice in a green matrix. Potassium-argon age on sanidine extracted from rock is 16.1±2 Ma (Rytuba and McKee, 1984). Eruption of the tuff of Oregon Canyon resulted in the collapse of the Washburn caldera which is located east of the quadrangle (Rytuba and McKee, 1984)

Taf **Andesite flows (Miocene)**--Mostly platy andesite flows but contains some flows of porphyritic olivine basalt and andesite breccia. Some thin beds of interstratified tuffaceous sedimentary rock and air-fall tuff

Tbf **Steens basalt (Miocene)**--Basalt flows with an average thickness of 6 m. Flows commonly form resistant, laterally continuous ledges; less resistant flow tops and bottoms are commonly vesicular and locally auto-brecciated. Conspicuous zoned plagioclase phenocrysts (An_{65} to An_{80}), as long as 4 cm, comprise as much as 50 percent of the flows

Tb **Steens Mountain Volcanics (Miocene)**--Basalt and andesite flows and flow breccias are variable in texture and mineral composition. Tuff, scoria, and pyroclastic intermediate rocks near top of the unit. Shows unconformable relations with underlying Pike Creek Formation

Tpc **Pike Creek Formation (Tertiary)**--Mostly well lithified and altered silicic tuffaceous sedimentary rocks, but includes some rhyolitic and dacitic flows, ash-flow tuffs, and intrusive masses

Tac **Alvord Creek Formation (Miocene and (or) Oligocene)**--Multi-colored, interstratified tuff, volcaniclastic sandstone and siltstone, and minor conglomerate and tuff breccia. Unit usually finely bedded and friable, with rare well-indurated layers that locally form prominent ledges. Tuff, which is commonly white, beige, or light gray, fine grained, and well sorted, is composed of pumice lapilli, ash, and crystal fragments; compositions range from silicic to intermediate. Locally includes thick (at least 50 m) sequences of purple, green, and gray, bedded, poorly-sorted, non- to partly-welded tuff containing feldspar and biotite fragments. Volcaniclastic sandstone and siltstone are buff, olive-green to brown, or gray, finely bedded and typically well sorted. Sedimentary rocks locally contain plant fossils. Tuffs and tuffaceous rocks are commonly silicified and show argillic alteration; they locally are opaline, appear cherty, and are turquoise, purple, or beige. Unit age is based on stratigraphic relations with the overlying Pike Creek Formation

Kgd **Granodiorite and quartz albitite, partly gneissic (Cretaceous?)**--Leucocratic, foliated, equigranular, fine-grained biotite granodiorite. In places cut by pegmatite stringer. Also includes some "intrusive" masses of quartz albitite

Metamorphic complex of Pueblo Mountains (Jurassic)

Jpi **Intrusives**--Quartz porphyry, felsic dikes, quartz diorite, and quartz monzonite (Roback and others, 1987)

Jps **Metamorphosed sedimentary and volcanic rocks**--Intermediate to felsic volcanic flows, moderately to strongly foliated schist and mylonitic schist (Roback and others, 1987)

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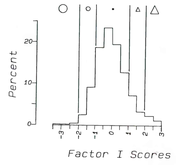
Scale 1:250,000
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

LOCATION DIAGRAM

B MAP SHOWING WILDERNESS STUDY AREAS IN THE ADEL QUADRANGLE, OREGON

EXPLANATION



Scale 1:250,000
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

LOCATION DIAGRAM

C MAP SHOWING FACTOR I SCORES (Fe, Sc, V, Ni, Mg, Co, Cr, Ti, Cu, Ca) IN SOILS, ADEL QUADRANGLE, OREGON

ASSESSMENT OF THE MINERAL RESOURCES FOR THE ADEL 1° X 2° QUADRANGLE, OREGON

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These maps are preliminary and have not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.