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Preliminary geologic map of the west half of Owyhee County, Idaho

By

E. B. Ekren, D. H. McIntyre, and E. H. Bennett

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This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

DESCRIPTION OF MAP UNITS

(Phenocryst content is modal volume percentage of the total rock. Phenocryst minerals are listed as percent of total phenocrysts: q, quartz; af, alkali feldspar; pf, plagioclase feldspar; b, biotite; hb, hornblende; cpx, clinopyroxene; opx, orthopyroxene; and o, opaque minerals.)

Qls LANDSLIDE DEPOSITS (QUATERNARY)--Thickness 0-400 m

Qa YOUNGER STREAM ALLUVIUM (QUATERNARY)--Thickness 0-20+ m

Qw WINDBLOWN SAND AND SILT (QUATERNARY)--Thickness 0-50 m

Qtg TERRACE GRAVELS (QUATERNARY)--Thickness 0-10 m

Qp PEDIMENT GRAVELS (QUATERNARY)--Thickness 0-10 m

Qf FAN ALLUVIUM AND FANGLOMERATE (QUATERNARY)--Reddish-brown and buff, poorly sorted silt, arkosic sand, and gravel; locally moderately indurated. Gravel occurs in lenses that thicken and coarsen adjacent to mountain fronts; includes the Quaternary Hart Creek Fanglomerate of Anderson (1965). Thickness 0-150 m

BASALT OF SNAKE RIVER GROUP (HOLOCENE AND PLEISTOCENE) AND BRUNEAU FORMATION (PLEISTOCENE) UNDIFFERENTIATED

Qbc Interbedded basalt, basalt tuff, and colluvium--Thickness 0-50+ m

Qbsr Basaltic lavas--Blue-gray and black olivine basalt, unweathered. Thickness 0-50+ m

BRUNEAU FORMATION (PLEISTOCENE)

Qbu Upper part--Moderately indurated black, gray, and orange basalt tuff and sandstone. Corresponds to the lake beds, above the basalt, in the Pleistocene Montini Formation of Anderson (1965). Thickness 0-60 m

Qbl Lower part--Pink, tan, and white clay, silt, and fine sand. Corresponds to the lower member of the Montini Formation of Anderson (1965). Thickness 0-50+ m

Qbb Undifferentiated basalt of Bruneau age--Blue-black and dark-gray olivine basalt; with local zones of brown alteration. Includes the Pleistocene Montini Formation and the Otter Basalt of Anderson (1965), who reports that the Otter lies on an irregular surface with at least 210 m of topographic relief. Thickness 0-200+ m

Qbj Basalt of Jackass Butte--Unweathered dark-gray to black olivine basalt (Anderson, 1965). Thickness 0-30 m

Qbjs Sediments of Jackass Butte--White buff, gray, pale olive-green, and pale purple clay, silt, and fine to medium sand. Sand occurs only in lenses (Anderson, 1965). Thickness 0-80+ m

Qbg Gravels of Oreana area--Coarse, unconsolidated fan gravel composed of pebbles, cobbles, and boulders of rhyolite and basalt in a tuffaceous sand matrix. Mapped by Anderson (1965) as upper part of Pliocene Oreana Formation. Thickness 0-20+ m

Qbs Sediments of Bruneau Formation undivided--White-weathering lacustrine and fluvial fine silt and clay with minor amounts of sand; in the eastern part mostly iron-stained pebble and cobble gravel with most clasts derived from the tuff of Little Jacks Creek (Tlj). Thickness 0-100+ m

QTg UNDIVIDED GRAVELS (QUATERNARY AND TERTIARY)--Fan and older terrace gravels composed of pebbles, cobbles, and boulders of granite, rhyolite, latite, and basalt in a tuffaceous sand matrix. Locally moderately indurated and distinctly crossbedded; locally contains interbeds of fine sand of possible windblown origin; includes bench and terrace gravels of Bennett and Galbraith (1975) and Asher (1968). Thickness 0-100+ m

QTa OLDER STREAM ALLUVIUM (QUATERNARY AND TERTIARY)--Interbedded sand and gravel with clasts derived from adjacent highlands; mapped only in the vicinity of the Duck Valley Indian Reservation. Thickness 0-100+ m

QTgf GLENNS FERRY FORMATION (PLEISTOCENE? AND PLIOCENE)--Lake and stream deposits characterized by abrupt lateral changes in facies (Malde, Powers, and Marshall, 1963). Mostly thin-bedded ash, tuffaceous sand, silt, and clay; silt commonly micaceous; locally includes pebble gravels containing clasts of rhyolite, basalt, and granite; locally also contains thin beds of vitric ash that have not been extensively reworked. Mapped to include gray and brown thick-bedded fossiliferous oolite at base as much as 30 m thick, or massive unconsolidated brown coarse arkosic sand where oolite is absent; locally the basal part lacks either the oolite or coarse sand and consists of dark-brown pebble conglomerate containing mixed volcanic and granitic clasts and abundant silicified gastropods and pelecypods. Unit includes the Pliocene Oreana Formation of Anderson (1965), exclusive of his upper conglomerate unit. Thickness 0-300+ m

Tch CHALK HILLS FORMATION (PLIOCENE AND MIOCENE)--Lake and stream deposits of buff, white, brown, and gray sand, silt, clay, and diatomite with numerous thin beds of vitric ash and with sparse beds of basaltic tuff; tuffaceous silt and sand zones commonly are much altered to zeolite and montmorillonite; locally, as in the Castle Creek drainage, brown sandstone in the lower 60 m is well indurated and forms steep canyon walls. Unit corresponds to upper part of Pliocene Brown Creek Formation of Anderson (1965). Thickness 0-100+ m

Tpch CHALK HILLS AND POISON CREEK FORMATIONS UNDIVIDED (PLIOCENE AND MIOCENE)--Sediments peripheral to, intruded by, and interbedded with extrusive parts of basalt of Murphy area (Tmb); includes silicic vitric tuff with coarse arkosic sand lenses and fine sandy silt interbedded with variable amounts of basalt clastics; near Rabbit Creek, basalt clastics predominate. South of Sinker Creek, silicic tuff, fine sand, and silt that overlies unit Tmb are correlated with the Chalk Hills Formation (Tch); northwest of lower Reynolds Creek, silicic tuff and interbedded arkosic sandstone are mapped as Poison Creek Formation (Tpc), but age relations with respect to the Chalk Hills Formation are obscure. Exposed thickness 30+ m

Tpcr RHYOLITE VITROPHYRE NORTHWEST OF SINKER CREEK (PLIOCENE)--Small outcrop of strongly flow banded, somewhat lithophysal, rhyolite vitrophyre; rests chiefly on basalt (Tbpc) with intervening oxidized, silicified zone containing silica nodules; toward south and east rests on altered silicic tuff. Phenocrysts 16 percent total rock: q,10; af,59; pf,25; and cpx,6. Reversed magnetic polarity. Thickness 0-5+ m

Tbpc BASALT FLOWS ASSOCIATED WITH CHALK HILLS AND POISON CREEK FORMATIONS UNDIVIDED (MIOCENE)--Olivine basalt; includes subaerial aphyric flows northwest of Sinker Creek, subaerial diktytaxitic flows north of Rabbit Creek near mountain front, subaqueous pillow breccia on mesa northeast of triangulation station 3555, and numerous small basalt occurrences farther northwest

Tbd BASALT DIKE COMPLEX (MIOCENE)--Dikes intruding Chalk Hills and Poison Creek Formations (Tpch) that are apparent source of subaqueous pillow breccia on mesa northeast of triangulation station 3555

Tpc POISON CREEK FORMATION (MIOCENE)--Gray, buff, and white lacustrine and stream silt, sand, and clay; mostly tuffaceous and, in places, much altered to montmorillonite; from Graveyard Point southeastward to Squaw Creek

the basal outcrops are principally arkosic sandstones with interbedded vitric tuffs; the sandstones locally are extremely well cemented and form resistant northeasterly dipping cuestas and tilted buttes. Thickness 0-120+ m

Tmb BASALT OF MURPHY AREA (MIOCENE)--A subaqueous intrusive vent complex consisting of ophitic olivine basalt in tabular dikes, arcuate ring-dikes, and irregular masses more or less surrounded by subaqueous basalt flows and clastic beds; the masses intrude silicic vitric tuff and the younger basalt masses intrude the older. The complex is centered around north-northwesterly aligned oval to subcircular maar- or diatreme-like features filled with altered breccias that commonly contain exotic volcanic clasts, many containing biotite and quartz phenocrysts. The complex chiefly has reverse magnetic polarity, but normal polarity is also present; near Murphy, two peripheral subaqueous flows are separated by a few meters of fine sandy mudstone; lower flow has reversed polarity, the upper flow, normal polarity; basaltic clastics in the peripheral area are massive to crudely bedded, poorly sorted and interfinger with vitric tuffs and sands of unit Tpch

Tb BANBURY BASALT AND UNNAMED INTERBEDDED SEDIMENTS (MIOCENE)--A basalt lava field comprising many thin (generally less than 15 m) flows of vesicular fine-grained, intergranular- to ophitic-textured olivine basalt and minor interbeds of stream and lacustrine deposits. K-Ar dates of Banbury Basalt from nearby exposures to the east and south range from about 8 to 10.5 m.y. (Armstrong, Leeman, and Malde, 1975). All flows measured with the flux-gate magnetometer have normal polarity. Thickness 0-350+ m

Tbu Upper flows--A locally mapped unit consisting of one to as many as three or more thin basalt flows that together form a conspicuous mesa-forming sequence; because of extensive interfingering of lavas from widely separated vents, the rocks included in this map unit may have a wide range in age. Thickness 0-120+ m

Tbs Interbedded sediments--Locally mapped sediments consisting of variegated basalt clastics, brownish tuffaceous sand, pebble gravel, vitric silicic ash, and local lacustrine diatomite; in a few localities includes thin discontinuous basalt lavas. Thickness 0-60+ m

Tlj TUFF OF LITTLE JACKS CREEK (MIOCENE)--Four or five simple cooling units (each 20 m to as much as 100 m thick) of extremely densely welded, flow-layered rhyolite tuff that displays only local evidence of pyroclastic origin; units

commonly have thin basal flow-breccias; the breccias are inferred to indicate that the ash was remobilized to liquid prior to final emplacement and cooling (Ekren, McIntyre, and Bennett, 1978). The various cooling units are bluish gray on fresh fracture but weather reddish gray or brownish gray; vitrophyres are black; because of well-developed flow-layering the units tend to weather to thin flagstones. Phenocryst volumes vary from about 4 percent to 14 percent of the total rock and with a single exception, consist of about 80 percent plagioclase (An 33) and 20 percent clinopyroxene (principally pigeonite). Tuff that mantles a small area near the head of Big Jacks Creek contains a few grains of quartz and alkali feldspar per thin section, and this tuff is inferred to be the youngest rock in the sequence. Sparse magnetic data suggest that the lower two cooling units are normal; the upper two are reversed. The tuff of Little Jacks Creek corresponds to the tuff of Antelope Ridge of Bennett (1976) and the rhyolite of Owyhee Plateau of Neill (1975), who reports K-Ar ages of 9.7±1.5 m.y. and 9.4±2.0 m.y. on plagioclase. Probable source: Owyhee Plateau or Snake River Plain east of map area based on orientation of flow lineations. Thickness 0-350+ m

Tbc TUFF OF BROWNS CREEK (MIOCENE)--Grayish red-purple and grayish-purple densely welded rhyolitic tuff; conspicuously flow layered and locally grandly flow folded; commonly flow brecciated at base. In the Reynolds Creek area only one cooling unit (60+ m thick) is present, which, on the basis of phenocryst mineralogy appears to correlate with the lower of two cooling units in the vicinity of Browns and Hart Creeks; the Reynolds Creek unit fills a paleocanyon cut chiefly in Kg (McIntyre, 1972). Phenocrysts 16: q,29; af,63; pf,7; pyroxene pseudomorphs, 1; and zircon, trace. Upper cooling unit at Browns Creek (60+ m thick) is conspicuously porphyritic and contains alkali feldspar phenocrysts as large as 12 mm. Phenocrysts 25-39: q,39-45; af,39-50; pf,5-16; and altered mafics, trace-7. Neill (1975) reports K-Ar dates of 10.7±0.7 m.y. (sanidine) for the lower cooling unit at Browns Creek and 11.1±0.6 m.y. (sanidine) for the cooling unit at Reynolds Creek. Probable source: Snake River Plain. Thickness 0-100+ m

Twc RHYOLITE OF WILSON CREEK (MIOCENE)--Grayish-purple and red purple blocky to platy, flow-layered rhyolite of uncertain origin; commonly moderately lithophysal. Phenocrysts 4-5: q,32-50; af,50-68; cpx, trace; and zircon, trace. Reversed magnetic polarity. Chiefly confined to SW-NE-trending paleocanyon. Vitrophyre prominent at base of unit at southwesternmost exposures. Near canyon of lower

Hardtrigger Creek flow-layering forms large folds. Along Snake River Plain unit commonly is altered and silicified; favorable host for gem opal deposits. Probable source: Snake River Plain. Thickness 0-150+ m

Tas ARKOSIC SEDIMENTARY ROCKS (MIOCENE)--Principally pale brown coarse-grained arkosic sandstone; locally with bedded tuff and diatomite. The age of this sequence is uncertain; it underlies the tuff of Browns Creek and is, therefore, older than about 11 m.y. It could be as old as the sedimentary basin fill of Reynolds Basin (Trs). Thickness 0-50 m

Tbm RHYOLITE OF BLACK MOUNTAIN (MIOCENE)--Includes several gray and grayish purple hypersthene-bearing rhyolites that are widely separated in space but that appear to be closely contemporaneous: near Black Mountain the rhyolite lies unconformably on an irregular surface developed on rhyolite (Tsc), granitic rocks (Kg), and latite and basalt (Tlb), but elsewhere the rhyolite rests more or less conformably on unit Tsc. Phenocrysts (Black Mountain vicinity) 4-7: q,0-1.5; pf,75-87; opx, 13-24; o,trace; and zircon, trace. Reversed magnetic polarity. Rocks near Pickett and Hart Creek contain 13-14 percent phenocrysts and, in addition to abundant hyperthene, contain as much as 2 percent oxidized biotite; along the Oreana-Spencer Reservoir County road, contains as much as 3.5 percent biotite; the pyroxene is completely altered, and quartz and alkali feldspar phenocrysts are more abundant than plagioclase. All rocks included in this map unit are flow layered; bases commonly are flow brecciated; pumice has not been observed; the rocks could be lavas or remobilized welded tuff. Thickness 0-275 m

Tjc JUMP CREEK RHYOLITE OF KITTLEMAN, 1965 (MIOCENE)--Conspicuously porphyritic rhyolite (Kittleman and others, 1965) with alternating crystal-poor and crystal-rich layers containing plagioclase as large as 15 mm; massive in places with eutaxitic foliation suggestive of welded tuff; flow layered in other places. Thick flow breccias at base in many exposures indicate that the rock is either a lava or a tuff that was remobilized; rock is grayish red, medium gray or brownish gray; weathering dark gray and dark brownish gray; vitrophyres are black. Phenocrysts 15-23: q,0-10; af,0-20; pf(An33), 54-88; cpx, trace-4; opx (hypersthene), 6-13; and o, trace-3. The rhyolite rests on the montmorillonite-rich Sucker Creek Formation (Tsu) and, as a consequence, landslides are common. Reversed magnetism (Neill, 1975) reports a K-Ar age of 10.9±0.2 m.y. on sanidine. Probable source: Snake River Plain. Thickness 0-250 m

Thb HORNBLENDE-BIOTITE RHYOLITE (MIOCENE)--Light gray where devitrified; dark gray and black where glassy. Phenocrysts 30: q,1.3; kf,0; pf,72; b(oxidized), 4; hb,10; cpx,2; opx(hypersthene)7; and o,2.7. Observed only in the vicinity of Graveyard Point. Probable source: Snake River Plain. Thickness 0-30+ m

Tdv TUFF OF DUCK VALLEY (MIOCENE)--Red densely welded rhyolite tuff that is flow layered and contains well-flattened pumice; seen only in Owyhee River Canyon near the pipeline crossing and at Duck Valley. Phenocrysts 14-27: q,8-35; af,36-46; pf,18-38; and altered pyroxene,5-9. Pyroxene remnants indicate both hypersthene and augite; q, af, and pf all are locally as large 6 mm. Exposed thickness 30 m

VOLCANIC ROCKS OF JUNIPER MOUNTAIN VOLCANIC CENTER (MIOCENE)

Tjub Badlands tuff of Juniper Mountain--Simple(?) cooling unit of pink to red, flow-layered, densely welded rhyolite tuff characterized by abundant phenocrysts as large as 1 cm of q and kf; both embayed and resorbed, and kf occasionally rimmed with pf. Phenocrysts 30: q,20; kf,70; pf,10; and cpx (pigeonite),1-2. Thickness 0-50+ m

Tjs Sedimentary rocks--Yellowish-brown, white, gray bedded tuff, tuffaceous sandstone, and silt; locally opalized. Thickness 0-50+ m

Tju Upper flows of Juniper Mountain--Several cooling units of red, densely welded rhyolite tuff that was in part remobilized to form viscous lobate lava flows; pumice is still visible in some layers that are strongly flow layered; tuff exposed in the Beaver Creek drainage on the eastern flank displays well-developed eutaxitic foliation with only minor flowage features. Phenocrysts 14-20: q,12-50; kf,49-60; pf,0-20; and cpx (mostly pigeonite), trace-3. Thickness 0-200+ m

Tjl Lower flows of Juniper Mountain--Compound(?) cooling unit of red densely welded rhyolitic tuff appears to have been largely remobilized to viscous lava; flow layered throughout; many zones display abundant flattened pumice; commonly has flow-brecciated basal vitrophyre. Phenocrysts 17-40: q,10-15; af,40-62; pf,21-40; cpx (pigeonite),2-7; opx (hypersthene),trace-1; and some kf partly mantled by pf. Thickness 0-200+ m

Tsr Tuff of Swisher Ridge (Miocene)--Apparently a compound cooling unit of densely welded rhyolite in most areas but, vitrophyres without subjacent bedded or nonwelded tuff that may mark complete cooling breaks are present at

several intervals. The tuff commonly is flow layered from base to top, and vitrophyres locally are flow brecciated. Pumice or shards are rarely preserved; however, the uppermost ashflows in the vicinity of Hurry Back Creek, a few meters below the base of unit Tjl, contain abundant flattened pumice fragments that are enclosed in shard matrices, and the basal vitrophyre on Swisher Ridge and in Nip and Tuck Creek locally displays the same features. The tuff is medium gray or reddish gray on fresh fracture and weathers reddish brown or red; vitrophyres are flow banded in shades of gray and black. Phenocrysts 18: q,o-trace (topmost only); af,4-20 (lower part) to 25-45 (upper part); pf,60-80 (lower part) to 40-55 (upper part); cpx (pigeonite),8-14; opx (hypersthene),trace-1; o,0-2; and zircon is a conspicuous accessory (as many as 16 grains per thin section). Many pf phenocrysts in lower part have a thin outer shell of kf, near top some kf has a shell of pf. Normal magnetic polarity. The unit is the same as welded tuff no. 1 of Bennett (1976) and the rhyolite of Poison Creek of Neill (1975), who reports K-Ar ages of 11.7±0.2 m.y., 13.1±0.2 m.y., and 13.8±0.4 m.y. on sanidine. Source: Juniper Mountain vicinity. Thickness 0-254+ m

Ts SEDIMENTARY ROCKS BENEATH THE TUFF OF SWISHER RIDGE (MIOCENE)--Principally crystal-poor, yellowish-brown and olive, montmorillonite-rich, thin-bedded tuffaceous sandstone with zones of flaggy, vitric, shard tuff; observed only in the vicinity of Poison Creek in T. 8 S., RS. 1, 2 E. where the rocks overlie the Eocene Challis Volcanics. Thickness 0-60+ m

Tsu SUCKER CREEK FORMATION OF KITTLEMAN, 1965 (MIOCENE)--Altered and vitric nonwelded bedded tuff, volcanic sandstone, arkose, granite-cobble conglomerate, and minor carbonaceous mudstone; intruded locally by small apophyses and thin dikes of basalt that are shown on the map as Banbury Basalt (Tb) although their age is unknown. Most of the beds are yellowish gray or yellowish brown; conspicuous white beds of tuffaceous sandstone and siltstone are found locally, most granitic cobbles in the conglomerate are well rounded and are set in a well-cemented conglomeratic sandstone matrix. A few conglomerate lenses contain abundant cobbles of rhyolite, latite, and basalt as well as granite. According to Kittleman and others (1965), mammalian fossils of the Sucker Creek Formation indicate a Barstovian (late Miocene) age and the flora indicate a Mascall (middle late Miocene) age. Thickness 0-500+ m

Tsc SILVER CITY RHYOLITE OF BENNETT, 1975 (MIOCENE)--Includes several overlapping cooling units of rhyolite that appear to be closely contemporaneous; included are the four cooling units described by Neill (1975), that comprise his rhyolite of Owyhee Ridge; the upper and lower rhyolites of Pansze (1975) and his rhyolite-associated partially welded tuffs, as well as the "quartz latite" of Pansze; corresponds to welded tuff no. 2 of Bennett and Galbraith (1975). Except for the very local lower rhyolite of Pansze (1975), the cooling units probably all are welded tuffs, which were mostly remobilized to liquids prior to final emplacement; they are locally associated with densely welded agglutinates, and we agree with Pansze (1975) that the units were locally derived from various dikes and vents in the Silver City Range, some of which are mapped herein as rhyolite intrusives (Tr). The rocks are phenocryst poor with aphyric zones alternating with zones containing as much as 6 percent phenocrysts. The proportions of phenocrysts vary widely. In the Flint Creek area on the west flank, the Silver City Rhyolite comprises a single cooling unit that contains only 3-4 percent phenocrysts: q,46-57; af,0,pf,38; b (oxidized), trace; and pyroxene pseudomorphs,2-5. The rhyolite at Flint Creek locally displays well-flattened pumice in the basal vitrophyre and in the immediately overlying devitrified rock; the devitrified rock is red in the few localities where it is not altered; where altered, it is gray, white, or purplish gray. In the Silver City Range, two thick cooling units with local zones of partially welded tuff and(or) flow breccia at base contain a trace to as much as 6 percent small phenocrysts of q, pf and kf. In the Reynolds area, near Tiddie Spring and Brunzell Spring, the rock is grayish red to grayish purple; weathers blocky and platy; it is conspicuously lithophysal in upper 30 m and contains 2-6 percent phenocrysts consisting principally of pf, with lesser percentages of q, kf, pyroxene pseudomorphs, and variable minor amounts of biotite and zircon; biotite is more common in upper part. At Little Sugarloaf the rock is grayish purple and contains 2 percent phenocrysts <1 mm q, kf, b and trace of hornblende and allanite; contains sparse fragments of basalt. On the prominent ridge southeast of Little Sugarloaf, a composite mass consists of a lower zone of nearly aphyric gray, flow-laminated, platy-weathering rhyolite with sparse microphenocrysts of plagioclase and pigeonite, overlain by a transitional zone 3 m thick of finely vesicular light grayish-purple rock containing sparse 1 cm basalt fragments and 2 percent of <1 mm phenocrysts, q, kf, pf and biotite; overlain in turn by 10-15 m of coarsely lithophysal rock containing 15-20 percent phenocrysts as large as 2 mm of q, kf, pf, b, and

hb. No unequivocal evidence of welded tuff origin was seen in the rhyolite in the Reynolds area; farther southeast, in the Sinker Creek area, the Silver City Rhyolite locally has a basal vitrophyre typical of welded tuff and, in addition, contains distinct shards seen in glassy laminae in thin section; rock in the Reynolds area is magnetically reversed. In several localities on both the eastern and western flanks of the Silver City Range, landslides are common in the Silver City Rhyolite; in these areas the formation is finely brecciated and commonly silicified; some of the landslides occurred before the deposition of the tuff of Swisher Ridge (Tsr). Probable source for all rocks included in the Silver City Rhyolite is the Silver City Range and adjacent areas. Thickness 0-600+ m

Tql QUARTZ LATITE (MIOCENE)--Lava flows, dark brownish gray and black where fresh; variegated shades of light gray, pink, red, green where hydrothermally altered; aphyric, platy and blocky weathering; mostly lacks conspicuous flow layering or eutaxitic foliation. Unit was mapped only in the Flint Creek area where it corresponds to the quartz latite of Pansze (1975). Thickness 0-100+ m

Tsp PLAGIOCLASE RHYOLITE (MIOCENE)--Three cooling units of brownish-gray densely welded tuff characterized by moderately abundant lenticular laminae (after pumice) that are more or less filled with coarse vapor-phase crystals of kf (as large as 0.5 mm) and tridymite (as large a 0.2 mm); commonly delicately flow laminated. Phenocrysts 1-5: pf <5 mm,90-95; pyroxene pseudomorphs,4-6; and o,trace-4. Much of the plagioclase is incipiently replaced by kf in lower two units and yields low-2V negative interference figures, but the altered feldspar crystals still retain vague albite twinning. Unit corresponds to welded tuff no. 1 of Asher (1968) and is inferred to be closely related in time and source to the Silver City Rhyolite. Thickness 0-100+ m

Tr RHYOLITE DIKES AND PLUGS (MIOCENE)--Principally phenocryst-poor, light-gray rhyolite with a crystal assemblage very similar to the Silver City Rhyolite. Some of the intrusive rhyolite masses probably were feeders for the various cooling units included in the Silver City Rhyolite

Trs SEDIMENTARY BASIN FILL IN REYNOLDS BASIN (MIOCENE)--Altered and unaltered fine vitric tuff, diatomite, pumice breccia, lignite; arkosic silt, sand, and gravel

Trl LATITE FLOWS AND ASSOCIATED TUFF OF REYNOLDS BASIN (MIOCENE)--Flows of nearly aphyric latite or quartz latitic columnar

glass or platy lithoidal rock that may contain crystals of plagioclase, clinopyroxene, orthopyroxene, and olivine, and xenocrysts of quartz. Accompanied by yellow and gray, bedded, clay-altered tuffs containing evidence of former glass shards and pumice, and unaltered black glass fragments; unaltered gray fine vitric tuff locally present

Trb BASALT OF REYNOLDS BASIN (MIOCENE)--Olivine basalt flows and tuffs

Tlb LATITE AND BASALT UNDIVIDED (MIOCENE)--Interbedded thin flows of dark-gray, dark brownish-gray and black latite and basalt; in some exposures, as much as 90 percent of the rock is basalt, in others, most of the rock is latite; both rocks are dense and mostly vesicular; both include porphyritic varieties, some basalts contain plagioclase phenocrysts as large as 3 cm; the basalt flows commonly are holocrystalline or nearly so, displaying intergranular, ophitic, or intersertal textures with olivine and randomly oriented labradorite intergrown with or set in a groundmass of clinopyroxene, magnetite, and minor dusty glass; the latite commonly is aphyric; porphyritic varieties contain small phenocrysts of plagioclase and clinopyroxene set in a weakly devitrified or trachytic-textured groundmass. Both rocks are strongly propylitically altered in many localities. According to Pansze (1975) argillic, silicic, and sericitic altered zones are restricted to thin envelopes (less than 100 cm) adjacent to mineralized veins. Thickness 0-900+ m

Tlbi LATITE AND BASALT INTRUSIVE MASSES UNDIVIDED (MIOCENE)--Basaltic dikes and small apophyses that intrude unit Tlb

Tab ANDESITE AND BASALT OF UPPER SALMON CREEK (MIOCENE?)--Gray and greenish-gray, often platy, aphyric andesite flows and red oxidized breccias interlayered with brown basalt flows that contain olivine phenocrysts. Andesite erupted from center at and north of the headwaters of Salmon Creek. Unit unconformable on irregular surface of granitic rock and was deeply eroded prior to deposition of younger volcanic and sedimentary units. Thickness 0-1,160+ m

Tad ANDESITE DIKES AT HEADWATERS OF SALMON CREEK (MIOCENE?)--Intrudes andesite and basalt (Tab)

Tro OLDER RHYOLITE DIKES (MIOCENE)--Light-gray, yellowish-brown, and yellowish-green rhyolite with mostly obscure flow layering parallel to dike walls. Rock contains larger and more abundant phenocrysts than Tr but commonly is so altered that the crystals are obscure; dikes on War Eagle Mountain contain both biotite and hornblende according to

Pansze (1975) who considered them to be dacite; those that cut the granitic rocks near the head of Birch Creek contain only biotite; 10-15 percent total phenocrysts: principally pf <5 mm; lesser q, kf, and b. Pansze (1975) reports a K-Ar age of 26.6 m.y. on biotite from one of the dikes on War Eagle Mountain

Tqb QUARTZ BIOTITE TUFF (EOCENE?)--Yellowish-gray, white, and buff densely and partially welded tuff with small mostly well flattened pumice; mostly quite altered with sericitized biotite and feldspar; 10-15 percent phenocrysts of quartz <3 mm; pf>kf and abundant flakes of biotite. Thickness 0-50+ m

Tcv CHALLIS VOLCANICS (EOCENE)--Principally a compound cooling unit of medium-brown, light-violet and brownish-gray densely welded rhyodacite tuff; ash flows within the sequence commonly display poorly developed columnar jointing. Phenocrysts vary in size; some flows contain phenocrysts as much as 4-5 mm long; in others, all crystals are less than 3 mm. Phenocrysts 40: q,10-15; af,7-12; pf,45-55; b,10-15; hb,5-10; and o,2-3. Along the northern contact with the granitic rocks south of Birch Creek light-colored flow-layered felsite crops out that is included with the Challis, but it is not clear how much of this rock is extrusive and how much may be part of a dike swarm; this felsite contains 10-15 percent phenocrysts <3 mm of q, pf>kf and abundant flakes and small books of biotite. Neill (1975) reports a K-Ar age of 43.6+0.8 m.y. on biotite from the rhyodacite welded tuff exposed near Poison Creek. Thickness 0-300+ m

TKg GRANITIC ROCKS OF SOUTH MOUNTAIN UNDIVIDED (EOCENE? AND CRETACEOUS)--Gray, structureless and gneissoid, biotite-hornblende quartz diorite and granodiorite. Modes listed by Taubeneck (1971): (quartz diorite) q,18-22; af,2-7; pf, 54-62; b,11-13; hb,5-7; (granodiorite) q,25; af,11-13; pf,50-56; b,7-9; and hb,0.7-2.3. K-Ar dates listed by Armstrong (1975) include 45.2±1.4 m.y. on biotite and 49.7±1.5 m.y. on hornblende (granodiorite sample); and 87±3 m.y. on biotite (quartz diorite sample)

Kg GRANITIC ROCKS UNDIVIDED (CRETACEOUS)--Principally gray to medium-gray, structureless and gneissoid biotite-muscovite granodiorite, but includes large composite masses of medium- to coarse-grained granite and quartz monzonite. In the Birch Creek and Castle Creek drainages includes 1) Porphyritic granodiorite and diorite some of which lacks quartz but most of which contains abundant biotite and hornblende. Groundmasses vary in grain size from dense to medium grained. 2) Quartz-biotite schist and

gneiss in large masses and abundant xenoliths together with small roof pendants of quartzitic micaceous graywacke and quartzite. Aplite and pegmatite dikes locally are abundant

Khg HORNBLENDE GABBRO OF SOUTH MOUNTAIN (CRETACEOUS)--Medium- and coarse-grained black and dark-gray gabbro and coarse-grained hornblendite; locally intruded by quartz diorite. According to Taubeneck (1971), gabbroic complexes such as the South Mountain mass are fairly common satellites of the Idaho batholith

m METAMORPHIC ROCKS UNDIVIDED (PRE-CRETACEOUS)--Interbedded schist, quartzite, and marble. According to Sorenson (1927), the schist is gray, black, yellowish brown, dark green, and includes quartz-biotite varieties, quartz-hornblende, quartz-muscovite, and quartz-graphite varieties; all contain variable amounts of garnet; the quartzite is light gray, weathering yellowish gray, and includes graphitic, calcareous, and micaceous varieties; very locally composed of nearly pure quartz; commonly interlaminated with schist; the marble is the host rock for the South Mountain ore deposits and composes about 1/4 of the metamorphic rock sequence; it is mostly massive, fine grained and, made up of alternating white and bluish bands; bluish color is due to varying amounts of graphite; marble locally is extensively replaced by hedenbergite and ilvaite, diopside, diopside and garnet, and locally by tremolite. Thickness 1,200+ m

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