UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

# Geologic Map of the Pinto Spring and Part of the Atchison Creek Quadrangles, Beaver and Iron Counties, Utah

By

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

DESCRIPTION OF MAP UNITS

Qac — ALLUVIUM AND COLLUVIUM (QUATERNARY)--Unconsolidated, poorly sorted stream, fan, and slope-wash deposits of gravel, sand, and silt; includes moderately resistant older gravels, some of which are composed of boulders 10 m in diameter along Cottonwood Creek; also includes hummocky patches of rhyolite debris of possible mass-wastage origin on the flanks of hills capped by rhyolite; presumably less than 100 m thick on the flanks of the Indian Peak range, thickening toward the valleys on either side

RHYOLITE OF COTTONWOOD CREEK (MIOCENE)

Trc — Thick flow-folded lava flow--Consists of gray, strongly porphyritic rock whose phenocrysts include large sanidine (10 mm) and quartz with less abundant smaller hornblende and plagioclase. Dark vitrophyre and lithophysal rock with fewer phenocrysts occurs along the faulted southern margin

Trcd — Feeder dike

Trp — RHYOLITE OF PINTO CREEK (MIOCENE)--Resistant lava flows and dikes. Flows are pink with phenocrysts of smokey quartz, sanidine, plagioclase, and minor biotite, constituting 15-25 percent of the rock. Groundmass is commonly blotchy due to late-stage differential crystallization. Secondary fluorite locally present. Vitrophyre and flow-breccia as much as 50 m thick form the base of the flows. A lithic-rich, orange-pink ash-flow tuff, as thick as 100 m, underlies the lava flows in the southern and western parts of the quadrangle; this tuff contains 20 percent crystals of quartz, sanidine, plagioclase, and biotite. Thickness of flows is several hundred meters. Dikes are white, pale gray, tan and pink, flow foliated, aphanitic to coarsely porphyritic with 25 percent phenocrysts as large as 10 mm of quartz, sanidine, and plagioclase, and smaller altered mica and ubiquitous limonite pseudomorphs after pyrite. Gray to greenish-gray quartz latite, containing quartz and feldspar xenocrysts, occurs locally along dike margins. Dikes are commonly 5-10 m thick

Tpc — PLUG COMPLEX (MIOCENE OR OLIGOCENE?)--Resistant intrusions of black to greenish-gray quartz latite with steep flow-foliation and subhorizontal columnar jointing. Most of the rock has 10-15 percent phenocrysts of plagioclase, biotite, hornblende, and pyroxene. The margins of the eastern plug are brecciated and filled with light-greenish-gray quartz latite having larger and more abundant hornblende. The latite of the western plug contains fragments of quartz, feldspar, granite, and banded aplite as large as 2 m across concentrated along its margin. Also present in the western complex is a holocrystalline, nearly aphanitic rhyodacite containing xenocrysts of quartz and feldspar

Tvc — VOLCANIC ROCKS OF COMMISSARY CREEK (MIOCENE)--A sequence of ash-flow tuffs, lava flows, and volcaniclastic sediments. The tuffs occur throughout the sequence and are generally pale pink and lithic bearing, with as much as 20 percent phenocrysts of quartz, sanidine, and biotite; one of the tuffs contains garnet. Most of the tuffs are loosely consolidated, but one near the middle of the sequence is firmly welded and grades from pale purple-brown tuff in the upper part downward through orange brown to dark olive gray in the basal vitrophyre. Phenocrysts comprise 10 percent of this welded tuff with sanidine most abundant in the upper part, and plagioclase most abundant in the lower part. Biotite is a minor constituent throughout. This welded tuff probably correlates with the tuff of Leigh Well in the Lund Quadrangle in the west. Lava flows near the top of the sequence consist of a widespread red-brown rhyodacite containing phenocrysts of plagioclase and pyroxene and xenocrysts of quartz and hornblende, underlain by dark-brown-red foliated flow with 10-15 percent phenocrysts of plagioclase, biotite, and hornblende; pods and stringers of secondary chalcedony follow the flow foliation. Volcaniclastic beds of chalky volcanic sandstone, locally containing alunite south of the Cougar Spar mine, lie at the top of the unit, and rust-colored breccia lies at the base. The basal breccia has clasts, as much as 20 cm in diameter, of the flows in the unit Tva. The entire unit is several hundred meters thick

Tva — VOLCANIC ROCKS OF ATCHISON CREEK (OLIGOCENE)--Light- to medium-gray, strongly foliated flows or flow domes of quartz latite containing 5-15 percent phenocrysts of plagioclase, biotite, and conspicuous hornblende. Locally present are zones of autobreccia, black vitrophyre and, near the top of the unit, purple-red to brown ash-flow tuff which resembles tuffs in the Isom Formation. A dark purple-red to brown, finer-grained flow with strong foliation parting and sparse quartz xenocrysts occurs in the northwest corner of sec. 17, R.18 W., T. 30 S., and a light-colored ash-flow tuff containing 5-10 percent quartz, sanidine, and biotite lies about 3 km farther northwest. Thickness of the entire unit is at least 500 m

Ti — ISOM FORMATION (OLIGOCENE)--Densely welded, massive to strongly foliated vitric tuffs in a variety of colors, including red, purple, orange, and gray. Phenocrysts of plagioclase and minor altered pyroxene comprise 5-12 percent of the rock. Compressed pumice lapilli are locally filled with vapor-phase minerals. Unit includes a lava flow containing larger and more abundant phenocrysts of plagioclase and pyroxene. Both tuffs and flow have tubular alined vesicles and both weather to plates or grus. As thick as 300 m. Age, 25 m.y. (Fleck and others, 1975)

NEEDLES RANGE FORMATION (OLIGOCENE)--Sheets of densely to moderately welded crystal-rich ash-flow tuff. The Needles Range can be divided into mappable parts over much of its extent, and should be assigned to higher stratigraphic rank. Age, 29 m.y. (Fleck and others, 1975)

Tl — Lund Tuff Member--Ranges from a pink-gray slightly welded top, through a light-red, moderately welded central part, to a dark purple-brown near the densely welded base of thick sections. Phenocrysts comprise 35-45 percent of the tuff and include mainly plagioclase, with prominent quartz, biotite, hornblende (conspicuous only near the base of thick sections) and traces of sphene and sanidine. Thick sections have brown volcanic fragments as much as 10 cm in diameter near the top. About 500 m thick in the southeast part of the map, but 100-200 m in the northwest

Tr — TUFF OF RYAN SPRING (OLIGOCENE)--A sequence of crystal-poor, lithic-rich ash-flow tuffs with minor volcanic sandstone described by Rauch (1975). Tuffs are pale brown to pink gray, moderately welded, with about 10 percent phenocrysts of mainly plagioclase with lesser biotite and traces of quartz and hornblende. Lithic fragments range from cobble size in the north to less than a centimeter elsewhere and consist of dark volcanic flow-rock of intermediate composition. East of the New Arrowhead mine, tuffs are possibly as much as 500 m thick and are overlain by a thin volcanic sandstone bed composed of 0.2 mm grains of quartz, plagioclase, and glassy rock fragments. Local traces of the unit occur at the contact of the Lund and Wah Wah Springs Tuff Members where none is shown on the map

WAH WAH SPRINGS TUFF MEMBER OF NEEDLES RANGE FORMATION (OLIGOCENE)--Crystal-rich ash-flow tuffs and a related plutonic porphyry containing 25-40 percent phenocrysts of mainly plagioclase with lesser hornblende, biotite, quartz, and a trace of pyroxene

Twn — Nonlithic intracauldron unit--Light-gray to moderately welded tuff similar to that found between the inner and outer ring faults of the Indian Peak cauldron in the Miners Cabin Wash and Buckhorn Spring Quadrangles (Best and others, 1979). Lithic fragments are scarce but are more vividly colored than in the lithic intracauldron unit; over 100 m thick

Twl

Lithic intracauldron unit--Olive to brown-gray, densely welded ash-flow tuffs filling the Indian Peak cauldron. Lithic fragments of dark volcanic rocks, quartzite, and lesser argillite constitute as much as 15 percent of some intervals; lithic fragments increase in abundance toward the intercalated landslide breccias (Tbv) but some parts of the unit are nearly lithic free. Most lithics are 1-2 cm in diameter, but some exceed 2 m near the breccias. Pumice lapilli contain larger but fewer crystals and tend to blend into the surrounding matrix where welding is extreme. The upper part of the unit is purple and tends to fracture along the foliation in contrast to the lower portion which more commonly breaks across the compaction foliation. Hornblende in the upper part of the unit is commonly altered to an opaque oxide on the rim and a pale carbonate in the core. Some of the tuff near the lenses of breccia may have abnormally abundant quartz. High in the section near the breccias in the north part of Atchison Creek Quadrangle the tuff is orange with black vitrophyre. This member may be as much as 2 km thick

Twi

Intrusive porphyry unit--Olive-gray quartz monzonite porphyry intrusive into the base of the lithic intracauldron unit. Phenocrysts are somewhat less abundant, show better crystal outlines, and are larger (to 8 mm) in the porphyry than in the tuff host rock. The large central intrusive body has relatively more crystals than the peripheral bodies which have more nearly euhedral phenocrysts. Xenoliths of fine-grained granodiorite and of much larger, but less abundant, quartzite are distributed throughout the porphyry. The intrusions are weakly resistant to erosion because widespread propylitic alteration destroyed most of the hornblende in the central body

Tbv

INTRACAULDRON BRECCIA OF VOLCANIC ROCKS, UNDIVIDED (OLIGOCENE)--Breccia derived by caving of unstable cauldron walls. Clast components change from north to south in an irregular fashion. In the north, clasts of Cottonwood Wash Tuff Member of Needles Range Formation (Best and others, 1973) are dominant. In the central area, lava flows or megabreccia blocks (Lipman, 1976) include gray to pink flow-foliated rhyolite with 5-10 percent phenocrysts of plagioclase, biotite, and hornblende, a slate-gray to dark-brown andesite, and dark-gray porphyry with 30-40 percent phenocrysts of plagioclase and pyroxene. In the south a light-gray quartz-rich ash-flow tuff comprises all clasts in one part of a breccia body and another part consists entirely of clasts of a darker-toned tuff with less quartz; the quartz-rich tuff may be of the Sawtooth Peak Formation (Conrad, 1969) and the darker tuff may correlate with a tuff underlying the Escalante Desert Formation in the Lund Quadrangle (Grant and Best, 1979). North and east of the New Arrowhead Mine, breccia clasts are exclusively of quartzite in one body and a megabreccia block of bleached carbonate occurs in another. Breccia bodies are as much as 100 m thick

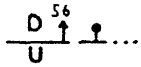
P

PALEOZOIC ROCKS, UNDIVIDED--Silicified and bleached carbonate rocks, quartzite, and minor shale

## EXPLANATION OF SYMBOLS

CONTACT--Dashed where inferred or approximately located

CONTACT OF LANDSLIDE MASS WITHIN INDIAN PEAK CAULDRON--Tick marks on sole of body; dashed where approximately or schematically located




FAULT--Dashed where inferred or schematically located; dotted where concealed. Ball and bar, or D, on downthrown side; barb shows dip

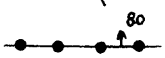

STRIKE AND DIP OF BEDDING


STRIKE AND DIP OF COMPACTION FOLIATION IN ASH-FLOW TUFFS

STRIKE AND DIP OF FLOW LAYERING IN LAVAS, FLOW-DOMES, AND REMOBILIZED TUFFS


Inclined

Vertical




RHYOLITE DIKE--Barb shows dip

QUARTZ VEIN--Multiple large veins shown by one representative; areas of many small veins indicated by stippling. Veins range from a few millimeters to 5 m in width and locally coalesce to form wide zones. Comprised of prismatic and massive quartz, white crystalline and brown massive calcite, and shattered fluorite in lenses oblique to the vein. Veins cut or follow rhyolite dikes with which they are associated. Sparse pyrite occurs in a few veins

QUARTZ VEIN ALONG FAULT--Ball and bar on downthrown side

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## INDIAN PEAK CAULDRON

Most of the Atchison Creek and Pinto Springs Ouadrangles lie within the Indian Peak cauldron which formed as thousands of cubic kilometers of Wah Wah Springs Tuff Member was erupted and spread over southwestern Utah and southeastern Nevada (Best and others, 1979). The eastern segment of the ring fault controlling its subsidence is now buried beneath younger deposits but may not be far from the eastern limit of outcrop of the lithic intracauldron unit of the Wah Wah Springs (Twl). Subsequent resurgence of the floor of the cauldron, possibly during emplacement of an intrusive porphyry (Twi) whose composition is the same as the Wah Wah Springs tuffs, tilted the tuffs and landslide breccias filling the cauldron. Some of this resurgent uplift may have occurred along the existing ring fault (see east end of cross section A-A') before deposition of the tuff of Ryan Springs which is about a kilometer thick north of the map, pinches out in the north part of the Pinto Spring Quadrangle and then reappears and thickens to the southeast in the southeast corner of the map. The tuff of Ryan Spring and overlying Lund Tuff Member filled the depression surrounding the area of resurgence.