 MINERAL REPORT
MR87-2

SWEETWATER ROCKS WILDERNESS STUDY AREA

by
W. Dan Hausel

The Sweetwater Rocks wilderness study area (WSA) lies along the southeastern margin of the South Pass granite-greenstone belt and includes a portion of the Lewiston gold mining district. The South Pass greenstone belt located at the southern tip of the Wind River Mountains is an Archean age volcano-sedimentary belt intruded along its exposed flanks by Late Archean granite and granodiorite (Bayley and others, 1973). Vast regions of the South Pass granite-greenstone terrain are covered by Tertiary sediments originally defined as the South Pass Formation but more recently described as Upper Miocene Rocks Undivided by Love and Christiansen (1985).

Greenstone Belt Rocks

Along the western margin of the WSA are layered metamorphic rocks of the South Pass greenstone belt. The lowermost rocks include a less than 1,000 feet thick sequence of serpentinite, talc-actinolite schist, and amphibolite of ultramafic to mafic affinity.

The MgO content of the ultramafics (serpentinites and talc-actinolite schists) range from 18.5% to 37.6% and the alkali (Na_2O=0.03% to 0.23%; K_2O=0.04% to 0.10%) and TiO_2 contents (0.10 to 0.33%) are very low. CaO/Al_2O_3 ratios for the talc-actinolite schists are relatively high and range from 0.6 to 2.8. Typically, these ultramafics have high Cr and Ni concentrations (Ni=160 ppm to 1,690 ppm; Cr=595 ppm to 8,655 ppm) that increase with increasing MgO content (Hausel, 1987).

Amphibolites in this lower unit have MgO values that range from 9.16% to 11.5%, Cr from 97 ppm to 1,139 ppm, and Ni from 30 ppm to 245 ppm. These rocks also exhibit low TiO_2 (0.43% to 1.33%) and low alkali (Na_2O=0.92% to 2.95%; K_2O= 0.15% to 1.54%) contents (Hausel, 1987). Ti/V ratios for the amphibolites average about 24 which is characteristic of modern mid-oceanic-ridge basalts (Shervais, 1982).

Chemically, these rocks have komatiite and tholeiite affinities (Hausel, 1987). Unfortunately, primary textures have all been destroyed except for occasional cumulate textures in some serpentinites.

Lying on top of the lower metaigneous unit is a sequence of metasediments similar to the Goldman Meadows Formation metasediments described by Bayley and others (1973) along the northern edge of the greenstone belt. This sequence attains a thickness of nearly 1,000 feet along Strawberry Creek in the WSA. The unit contains quartzite, fuchsitic quartzite, metapelite, and amphibolite. The metapelites are porphyroblastic muscovite schists with porphyroblasts of andalusite, and quartz-sericite replacements. Although banded iron formation does not crop out in the WSA, hematite-quartz and magnetite-metachert iron formation is exposed a short distance north (Hausel, 1987).

Lying on top of the metasediments are amphibolites and metabasalts with minor augen gneiss and grunerite schist. In places, the metabasalts exhibit vesicular texture and contain

large white inclusions(?) of clinozoisite. The amphibolites and metabasalts are similar to metatholeiites mapped by Bayley (1965) as Roundtop Mountain Greenstones along the northern flank of the greenstone belt. These rocks in the WSA may be as much as 2,000 feet thick. Chemically, they range in composition from high-magnesian tholeiite to tholeiitic andesite with rare amphibolite of basaltic komatiite composition (Hausel, 1987). Although no definite spinifex textured rocks were identified in the WSA, Harper (in press) recognized possible spinifex-textured rock along the northern margin of the greenstone belt.

The youngest Archean supracrustal unit exposed in the WSA as well as in the greenstone belt, is the Miners Delight Formation. Rocks of the Miners Delight Formation have yielded a Rb-Sr whole rock isochron of 2.8 Ga (Z.E. Peterman, pers. comm. to Stuckless and others, 1985). Rocks of the Miners Delight Formation are the principal host of gold mineralization in the South Pass-Atlantic City district (Bayley and others, 1973) and in the Lewiston district (Hausel, 1986a,b).

Within the WSA, only Miners Delight Formation metagreywackes crop out. The metagreywackes are primarily quartz, plagioclase, biotite greywackes with lesser quartz, plagioclase, chlorite greywackes. Chemically , these rocks have quartz diorite to granodiorite affinity (Condie, 1967, 1981; Hausel, 1987).

Intrusive Rocks

The supracrustals of the greenstone belt have been intruded by several metagabbro (orthoamphibolite) sills and dikes with variable degrees of foliation. These are plagioclase-amphibole amphibolites.

At the extreme western edge of the WSA, a medium-to-coarse-grained dike with diorite to quartz diorite composition intrudes Miners Delight metasediments. The dike contains blocks and nodules of plutonic rock of similar composition and grain size to the host dike rock.

Much of the WSA is underlain by Late Archean granite. The granite is massive to weakly foliated, light-gray, biotite granite that is locally stained red. Schlieren, pods and lenses of biotite gneiss, aplite, muscovite-biotite granite, and amphibolite are common, but pegmatite is rare. The granite is cut by numerous northeasterly trending mafic dikes that often lie in contact with porphyritic granite.

The last recorded igneous event in this region was the intrusion of the predominately northeasterly-trending mafic dikes of tholeiite composition. These are fine-grained to diabasic mafic dikes that have produced whole-rock ages of 1,270 Ma to 2,010 Ma elsewhere in the Wind River Mountains (Condie and others, 1969). K-Ar ages of pyroxenes from these dikes are restricted to 1,600 to 1,880 Ma (Spall, 1971). The dikes range from several feet to several tens of feet wide and are composed of relatively fresh pyroxene and labradorite feldspar.

Phanerozoic Sediments

The extreme northeastern edge of the WSA is underlain by Flathead Formation quartzites of Cambrian Age. The quartzite dips gradually to the northeast and lies unconformably on Precambrian granite.

Large portions of the South Pass granite-greenstone belt are covered with a thin veneer of Tertiary sediment originally defined as the South Pass Formation. This is a siliceous, arkosic sandstone, claystone, siltstone and conglomerate of Pliocene, Miocene, and possibly Eocene age (Love and Christiansen, 1985). The conglomerate contains pebbles, boulders, and cobbles of metamorphic and granitic rock derived from the South Pass granite-greenstone belt.

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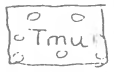
W. Dan Hausel

EXPLANATION

CENOZOIC — QUATERNARY

Alluvium

CENOZOIC — TERTIARY



Upper Miocene Rocks

White River Formation

PALEOZOIC — PENNSYLVANIAN

Tensleep Formation

Amsden Formation

MISSISSIPPIAN

Madison Limestone

ORDOVICIAN

Bighorn Dolomite

CAMBRIAN

Gallatin Formation

Gros Ventre Formation

Flathead Sandstone

INTRUSIVE IGNEOUS AND METAIGNEOUS ROCKS

Proterozoic mafic dikes

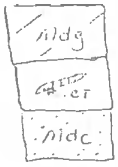
Late Archean granite

Late Archean granite with amphibolite pods and schlieren

Quartz diorite to diorite dike

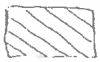
Metagabbro (orthoamphibolite) dikes and sills

METASEDIMENTARY AND METAIGNEOUS SUPRACRUSTAL ROCKS



Miners Delight Formation

Mdg, biotite, quartz, feldspar metagreywacke; GF, banded metacherts and mdc, chlorite, quartz, feldspar metagreywacke



Amphibolite and Metabasalt

Quartzite and Metapelite

Lower Amphibolite, Serpentinite, and Talc-actinolite Schist

Early Supracrustals
(Quartzite, metapelite, and amphibolite interleaved with granite)

68 Strike and dip of foliation.

43 Strike and dip of joint.

20 Strike and dip of beds

? Graded beds? Direction of top of beds?

U D Fault or shear zone

70 Shear zone showing dip.

Quartz vein with boudins.

Mine shaft

Inclined shaft

Mine adit (accessible in 1984).

Caved adit

Open pit or prospect

X Cu Prospect (Cu = copper stains)

Wilderness Study boundary

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GEOLOGICAL SURVEY OF WYOMING
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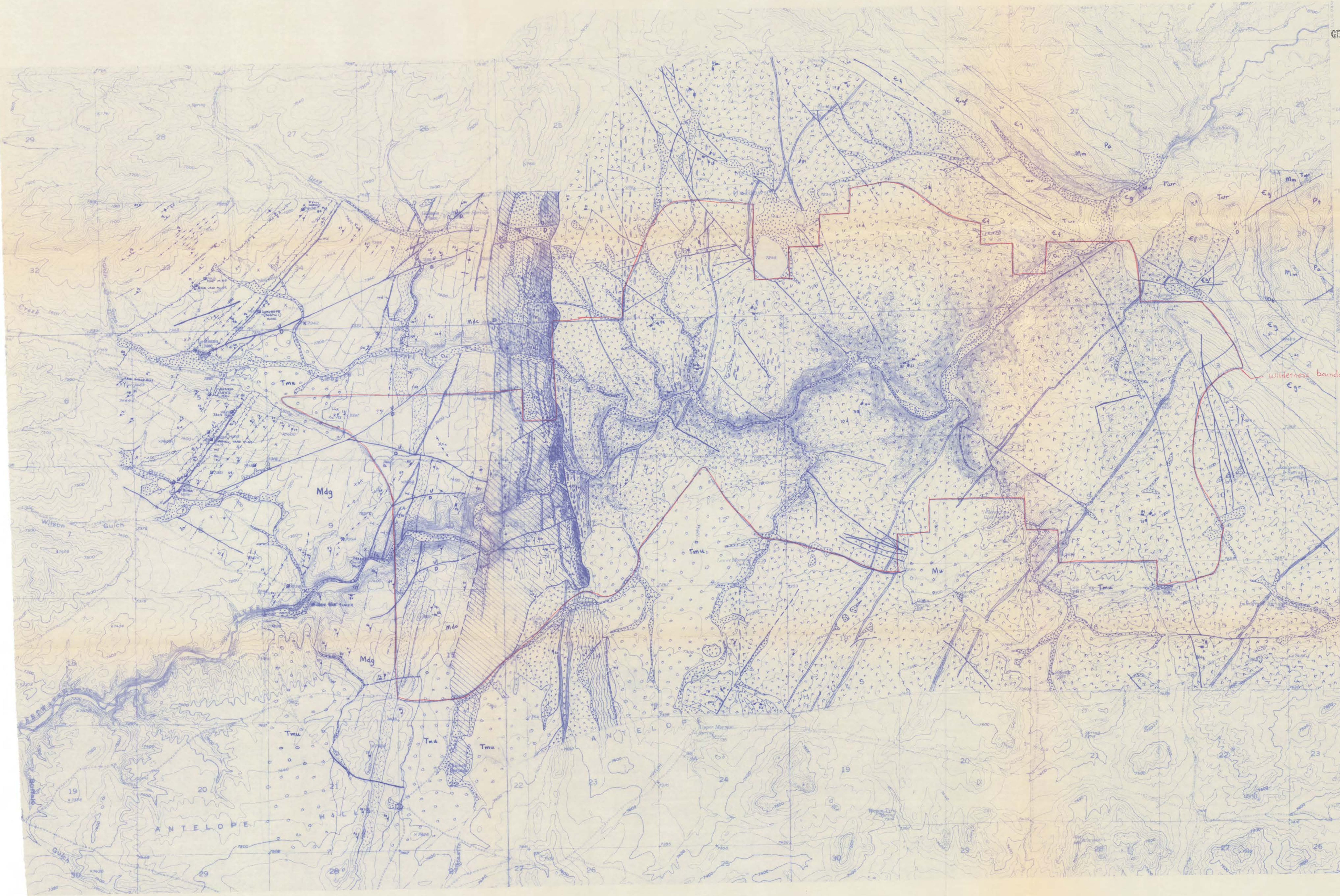

GEOLOGIC MAP OF THE SWEETWATER ROCKS WILDERNESS STUDY AREA

compiled by

W. Dan Hausel

1986

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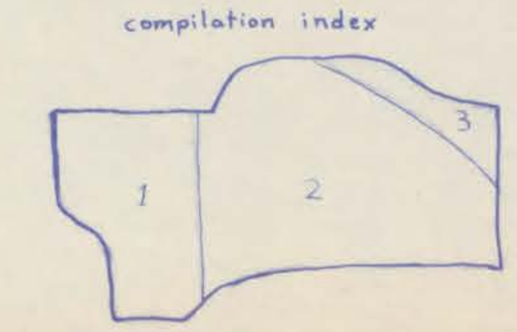

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0 ½ 1 mile

TN MN 15°