

Gem Mining District and the Wet Mountains Alkalic Province, Custer and Fremont Counties

(Gem, Hardscrabble, Rosita Hills, Querida, and Silver Cliff Districts)

The Gem District is a small area that lies within the extensive Wet Mountain Alkalic Province in southern Fremont and adjacent Custer Counties. For that reason, it will be included in a discussion of that larger area. As a mining district, the Gem District has never been successful. The Wet Mountain Alkalic Province, however, has attracted considerable interest in recent years, however, because of its unusual geologic characteristics and its mining potential. The rare rock types intruded in the area contain anomalously high concentrations of critical and strategic commodities including thorium, niobium and the rare earth elements (Lanthanide elements.)

The Wet Mountain Alkalic Province is composed of three spatially separated, slightly different, igneous complexes containing an abundance of alkalic igneous rocks. The McClure Mountain Complex consists of mafic and ultramafic (pyroxenite and gabbro) and syenitic intrusions in turn intruded by carbonatite, lamprophyre and syenite dikes and thorium-bearing veins. The Gem Park Complex contains similar mafic and ultramafic cumulates intruded by carbonatite, lamprophyre and nepheline-syenite pegmatites. The third - the Democrat Creek Complex - contains subordinate mafic and ultramafic rocks and quartz syenite bordered by significant breccia zones likewise intruded by syenite dikes and quartz-barite-thorite veins (Armbrustmacher, 1984). All these Cambrian-age intrusions are contained within rocks of the Precambrian Idaho Springs Formation. (Armbrustmacher, 1979, 1984). Throughout the terrain around the three main complexes are dikes of varying composition, including carbonatites.

The rare earth element resource (REE) in the Wet Mountains Province has caught the attention of geologists. The minerals baestnesite, synchisite, ancylite, monazite and thorite have been identified within the carbonatites and contain the REE (Armbrustmacher, 1979). The minerals are known to occur over a large area - a 10 x 25-mile province containing at least 37 documented claims or prospects. Haynes (1961) stated that more than 300 prospects were known in 1958 for thorium, and it is likely that REE occur in most of those.

Several investigators noted an enrichment of the heavy rare earths (HREE) within the province. Armbrustmacher (1988) pointed out that thorite veins on the Lepley Ranch specifically are HREE-enriched. Haynes (1961) commented that the deposits across the entire province are HREE-enriched. That is important because the heavy rare earths (including dysprosium, terbium and ytterbium) are much less abundant than the LREE and command a premium in the market. Enrichment of HREE came make a marginal deposit economic.

Niobium (also known as columbium) is another critical metal for which the US is 100% dependent on imports. The metal is used as an alloying agent in specialty steels, especially for the defense and aerospace industries and such specialized applications as superconducting magnets. Niobium is distributed with the REE in the Wet Mountains area, occurring in the minerals pyrochlore, leuschite, fersmite and natroncolite (Parker and Sharp, 1970).

Armbrustmacher (1988) made some resource estimates for the REE, niobium and thorium in the Wet Mountains Complex. He estimated 161,000 short tons of ThO₂; 136,000 short tons of REE (including 48,850 tons of the heavy rare earths); and over 4000 short tons of Nb₂O₅. These estimates are based on the known thorite veins and carbonatite dikes. Parker and Sharp (1970), in one of the earliest detailed studies of the unique deposits, postulated the presence of a large buried carbonatite body in the area that served as a source of the carbonatite dikes. (This is a typical occurrence.) Their guess was that the most

likely location of this buried body is beneath the area of the large Vermiculite Mine in the area of sections 33 and 34, T20S, R72W (in the Gem District), on the Fremont-Custer County line. The CGS knows of no detailed exploration for ore bodies that do not occur on the surface.

In summary, the Wet Mountains Alkalic Province is known to contain highly desired minerals. Exploration has been only cursory and it remains a promising target for the future.

Minerals occurring in the district (Mindat.org).

Mineral list contains entries from the region specified including sub-localities

Actinolite	Celestine	Magnesioriebeckite	Ralstonite
Aegirine	Chalcocite	Magnesioriebeckite-Riebeckite	Richterite
Aegirine-augite	Chalcopyrite	Series	Riebeckite
Albite	'Chlorite Group'	var: Crocidolite'	Rutile
Analcime	'Clinopyroxene Subgroup'	Magnetite	'Serpentine Group'
Anatase	Columbite	Marcasite	Siderite
'Ancylite'	Cryolite	Maucherite	Sodalite
Ancylite-(Ce)	Dolomite	Microcline	Sphalerite
Ankerite	Edenite	'Monazite'	Strontianite
Annabergite	Elpasolite	Monazite-(Ce)	Thorianite
Anorthite	Fersmite	Muscovite	Thorite
var: Labradorite	Fluorapatite	var: Sericite	Titanite
'Apatite'	Fluorite	Natrolite	Tremolite
Augite	Galena	Natroniobite	Vermiculite
Baryte	Goethite	Nepheline	'Wad'
'Bastnäsité'	Hematite	Nickeline	Weberite
Biotite	Ilmenite	'Olivine'	Winchite
Bornite	Kaersutite ?	Pachnolite	'Xenotime'
Brockite	'K Feldspar'	Perovskite	Zircon
Brookite	Lamprophyllite	Phlogopite	
Calcite	Lepidocrocite	Prosopite	
	Lueshite	Pyrite	
		Pyrochlore Group	
		Pyrrhotite	
		Quartz	

A large number of references exist for the area. Many of them are included in this list, although not necessarily referenced in the text.

References:

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