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Colorado vermiculite deposits:

Mines, Prospects, and Occurrences

by

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Summary

This report lists and locates 26 vermiculite deposits in Colorado, including 16 historic mines, 6 prospects, and 4 additional known occurrences. Table 1 lists the 26 deposits and provides details regarding their locations, as well as references specific to each vermiculite locality. The same information shown in table 1 is also provided in the accompanying digital file **COverm.xls**, which is a spreadsheet in Excel format (Microsoft Excel version 5.0/95 workbook) that can be imported into a variety of digital database programs and used to plot site locations with Geographic Information Systems (GIS) software. The vermiculite deposits were located on 7.5-minute USGS (U.S. Geological Survey) topographic maps based on available literature and on field notes made by Alfred Bush. The latitude and longitude values listed in table 1 and data file **COverm.xls** were calculated from hand-plotted points on the topographic maps. Data file **Refs.xls** (also in Excel format) provides full reference information for the references cited in table 1 and **COverm.xls**. Figure 1 is an index map showing the distribution of the known vermiculite deposits in Colorado.

Vermiculite is a group of platy, mica-like, hydrated silicate minerals with the general formula: $(Mg,Fe,Al)_3(Al, Si)_4O_{10}(OH)_2 \bullet 4H_2O$. Vermiculite group minerals are typically the products of aqueous alteration of micas, primarily biotite and phlogopite, and they pseudomorph the platy morphology of the replaced mica. The vermiculites display a wide range of chemical compositions and vary in color from light yellow to brown to black, generally with a bronze hue. As described by Bates and Jackson (1987): "They are characterized by marked exfoliation when heated at 800° to 1100°C; granules expand 6 to 20 times at right angles to the cleavage [accordion like] as the contained water is converted into steam. The result is elongated wormlike particles that entrap air and produce a lightweight material that is used as an insulator and as an aggregate in concrete and plaster." Other common applications of vermiculite are in horticulture, as an additive to mulch, potting soils, and growing mixes, and as a carrier and extender for fertilizers, pesticides, and herbicides (Potter, 2001).

The first reported discovery of a vermiculite deposit of commercial size in the United States was in 1913 in the Turret mining district of Chaffee County, Colorado (Henahen, 1914; Gwinn, 1944). Another deposit in the Turret district, which was also discovered in 1913 and called the "Tung Ash" deposit (table 1), was the first vermiculite deposit mined and marketed in the U.S. (Gwinn, 1944). The bulk of Colorado vermiculite production occurred during 1933 to 1950, mainly from the mines in Fremont, Custer, and Gunnison Counties (U.S. Bureau of Mines,

1935-1940, 1944-1950; data for 1942-1944 are provided in Vanderwilt, 1947, p. 251). The U.S. Bureau of Mines reports that minor vermiculite production also occurred in Colorado during 1962 and 1963 (U.S. Bureau of Mines, 1963, 1964). Although little production data is published for the Colorado vermiculite mines, their output was evidently modest. For example, Vanderwilt (1947, p. 251) reported that for 1942, 1943, and 1944, annual total vermiculite production from Colorado mines was 2,574 short tons, 356 short tons, and 1,189 short tons, respectively. As done with most vermiculite raw ores, the Colorado vermiculite was heat processed to expand (exfoliate) the mineral before their use in industrial applications. Their main applications were as loose-fill insulation, as filler in lightweight plaster, and as lightweight concrete aggregate. The qualities and uses of Colorado vermiculite are described in Goldstein (1946) and Bush (1951).

Bush's assertion (1951) that vermiculite was part of the hydrothermal suite was based on the literature available in 1947 and a brief 1947 field reconnaissance. Subsequent research and field examinations in 1965 (continuing through 1975) resulted in the now virtually universally accepted conclusion that vermiculite development resulted from the supergene alteration of micaceous minerals in the zone of groundwater (meteoric water) circulation (Bush and Sweeney, 1968, p. 222; Bush, 1972, p. 350; 1976, p. 151).

Data Files Comprising this Report

Three data files comprise this report:

Readme.pdf	A copy of this text in Portable Document Format.
COverm.xls	A spreadsheet in Excel format (Microsoft Excel version 5.0/95 workbook)
Refs.xls	A spreadsheet in Excel format (Microsoft Excel version 5.0/95 workbook)

Site name	**San Isabel deposit**	**Unnamed deposit**	**Shorty Robison-Marjorie Lode and Young deposits**
Extent of development	Surface/underground mines	Surface occurrence	Surface/underground mines
County	Pueblo	Custer	Custer
7.5-minute topographic map	San Isabel	Mount Tyndall	Mount Tyndall
Township	24 S	22 S	22 S
Range	68 W	71 W	71 W
Section	8	8	5
Sub-section	SE¼ SE¼	SE¼ SE¼	Center of SW¼
Latitude	37.971	38.1141	38.1595
Longitude	-105.015	-105.3386	-105.3520
References	Bush (1951, p. 344)	Alfred Bush, field notes, July 2001	Bush (1951, p. 333-335)

Site name	**Sparling Ranch deposit**	**Unknown**	**Unknown**
Extent of development	Surface/underground mines	Surface mine	Surface raw prospect
County	Custer	Custer	Fremont
7.5-minute topographic map	Mount Tyndall	Mount Tyndall	Curley Peak
Township	21 S	21 S	20 S
Range	71 W	71 W	71 W
Section	27	6	32
Sub-section	NE¼ NW¼	SW¼ SE¼	SE¼ SE¼
Latitude	38.1986	38.2461	38.2623
Longitude	-105.3124	-105.3627	-105.3386
References	Bush (1951, p. 335-336)	Christman and others (1959, p. 527-528)	Christman and others (1959, p. 527-528)

Table 1. Known vermiculite deposits in Colorado and corresponding references.

Site name	**Unknown**	**Phares and Allen deposit**	**Voss Land deposit**
Extent of development	Surface raw prospect	Surface/underground mines	Surface/underground mines
County	Fremont	Custer	Custer
7.5-minute topographic map	Curley Peak	Beckwith Mountain	Westcliffe
Township	20 S	21 S	21 S
Range	71 W	73 W	72 W
Section	33	26	16
Sub-section	SW¼ NE¼	NW¼ NW¼	SW¼ SW¼ SW¼
Latitude	38.2684	38.2032	38.2193
Longitude	-105.3240	-105.5185	-105.4453
References	Christman and others (1959, p. 527-528)	Bush (1951, p. 337-338)	Alderson (1925); Waldschmidt (1924); Bush (1951, p. 336-337)

Site name	**Quist claim**	**Powderhorn No. 1 deposit**	**Powderhorn No. 2 deposit**
Extent of development	Surface/underground mines	Surface mines	Surface mines
County	Custer	Gunnison	Gunnison
7.5-minute topographic map	Westcliffe	Rudolph Hill	Powderhorn
Township	21 S	46 N	46 N
Range	72 W	02 W	02 W
Section	17	14	12
Sub-section	SW¼ NE¼	NE¼ SE¼	NE¼ NW¼ NE¼
Latitude	38.2260	38.2396	38.2623
Longitude	-105.4517	-107.0566	-107.0417
References	Alderson (1925); Waldschmidt (1924); Bush (1951, p. 336)	Bush (1951, p. 339)	Bush (1951, p. 339-340)

Table 1. Continued.

Site name	**Niles mine**	**Vermiculite mine**	**Letha Lee prospect**
Extent of development	Underground mine	Surface mine	Surface raw prospect
County	Custer	Fremont	Fremont
7.5-minute topographic map	Hillside	Hillside	Hillside
Township	21 S	20 S	20 S
Range	73 W	73 W	73 W
Section	4	33	33
Sub-section	NW¼ SW¼ NW¼	SW¼ SE¼	SW¼
Latitude	38.2599	38.2669	38.2684
Longitude	-105.5531	-105.5449	-105.5500
References	Parker and Sharp (1970)	Parker and Sharp (1970)	Parker and Sharp (1970)

Site name	**Unnamed deposit**	**Abe Lincoln Number 2 deposit**	**Spinney Mountain deposit**
Extent of development	Surface occurrence	Surface occurrence	Surface occurrence
County	Chaffee	Chaffee	Park
7.5-minute topographic map	Nathrop	Buena Vista East	Spinney Mountain
Township	15 S	14 S	12 S
Range	77 W	77 W	74 W
Section	29	17	24
Sub-section	SW¼ SW¼	SW¼ NE¼	SE¼ NW¼
Latitude	38.7093	38.8329	38.994
Longitude	-106.0320	-106.0242	-105.618
References	Bush (1951, p. 333)	Bush (1951, p. 333)	Bush (1951, p. 342-343)

Table 1. Continued.

Site name	**Hayman deposit**	**Quaintance mine**	**Riggs mine**
Extent of development	Surface mine	Surface/underground mines	Surface/underground mines
County	Park	Jackson	Jackson
7.5-minute topographic map	Tarryall	Northgate	Northgate
Township	12 S	12 N	12 N
Range	72 W	80 W	80 W
Section	2	34	34
Sub-section	SE¼	Center of SW¼ SE¼	NE¼ NE¼ NE¼
Latitude	38.0395	40.9664	40.9782
Longitude	-105.4103	-106.3589	-106.3531
References	Bush (1951, p. 343-344)	Goldstein (1946); Argall (1949, p. 474); Bush (1951, p. 340-341)	Goldstein (1946); Argall (1949, p. 474)

Site name	**Fourney mine**	**Resort claim**	**Unknown**
Extent of development	Surface/underground mines	Surface raw prospect	Surface raw prospect
County	Jackson	Jackson	Jackson
7.5-minute topographic map	Northgate	Northgate	Northgate
Township	12 N	12 N	12 N
Range	80 W	80 W	80 W
Section	26	26	26
Sub-section	SW¼ SW¼	South half of south half	NE¼ SE¼ SE¼
Latitude	40.9789	40.9794	40.9817
Longitude	-106.3491	-106.3422	-106.3341
References	Goldstein (1946); Argall (1949, p. 474); Bush (1951, p. 341-342)	Bush (1951, p. 342); Neubert and Dersch (1994, p. A-11, fig. 41, sample #287)	Neubert and Dersch (1994, p. A-11, fig. 41, sample #285)

Table 1. Continued.

Site name	**Unknown**	**Turret (Tung Ash) deposit**
Extent of development	Surface raw prospect	Underground mine
County	Jackson	Chaffee
7.5-minute topographic map	Northgate	Cameron Mountain
Township	12 N	51 N
Range	80 W	09 E
Section	25	33?
Sub-section	NW¼ SW¼	NW¼ SW¼?
Latitude	40.9836	38.629
Longitude	-106.3320	-105.984
References	Neubert and Dersch (1994, p. A-11, fig. 41, sample #284)	Henahen (1914, p. 135-139); Bush (1951, p. 332-333)

Table 1. Continued.

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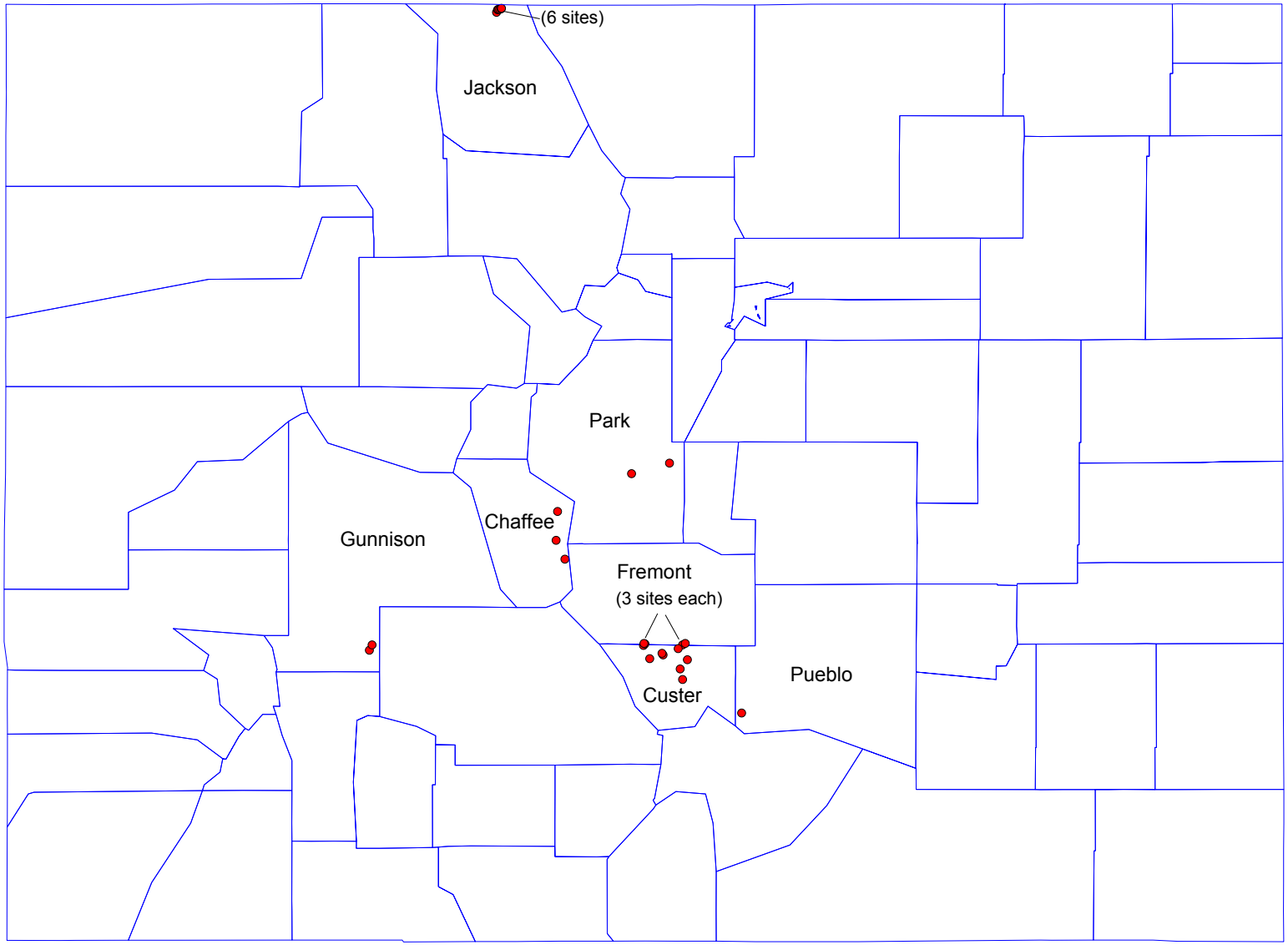

Figure 1. Index map showing the distribution of the 26 known vermiculite deposits in Colorado.