

THE GEOLOGICAL SURVEY OF WYOMING

Gary B. Glass, State Geologist

OPEN FILE REPORT 87-2

EPSOMITE (MAGNESIUM SULFATE) IN WYOMING

by

Ray E. Harris

Laramie, Wyoming

1987

This report has not been reviewed for conformity with the editorial standards of the Geological Survey of Wyoming.

Table of contents

	Page
Introduction	1
Reported occurrences	2
References	7

Illustration

Figure	Page
1. Index map showing reported occurrences of epsomite in Wyoming	2

Introduction

Epsomite is a mineral with the chemical formula $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (hydrous magnesium sulfate). It is also known as epsom salt. Epsomite has been used in relatively small quantities for the production of industrial chemicals and medical products.

Magnesium compounds including epsom salts are currently produced from seawater, well brines in Michigan and from Great Salt Lake brines in Utah. Some of these domestically-produced compounds are also derived from magnesite (MgCO_3) mined in Nevada and from olivine (Magnesium-iron silicate) mined in North Carolina and Washington. In recent years (1980-present) imports of magnesium compounds by the United States have increased. During this period, the production of domestic magnesium and magnesium compounds fell to 70 percent of capacity (Kramer, 1986).

Epsomite is found in Wyoming in evaporite deposits in playa lakes which are subject to seasonal flooding and drying (see Index Map page 2). Large quantities of epsomite are present in several lakes, and excellent crystals have been found. Two Wyoming deposits (Rock Creek Lakes and Poison Lake) produced small amounts of epsomite in the early 1900s. Development of Wyoming epsomite deposits is not likely to occur unless the demand for magnesium sulfate increases.

Reported Occurrences

Albany County

Downey Lakes

sec. 15 and 22, T.13N., R.75W.

Three lakes occupy a wind-excavated closed depression. The bedrock exposed around the lake is the Triassic Chugwater Formation. Approximately 100 acres

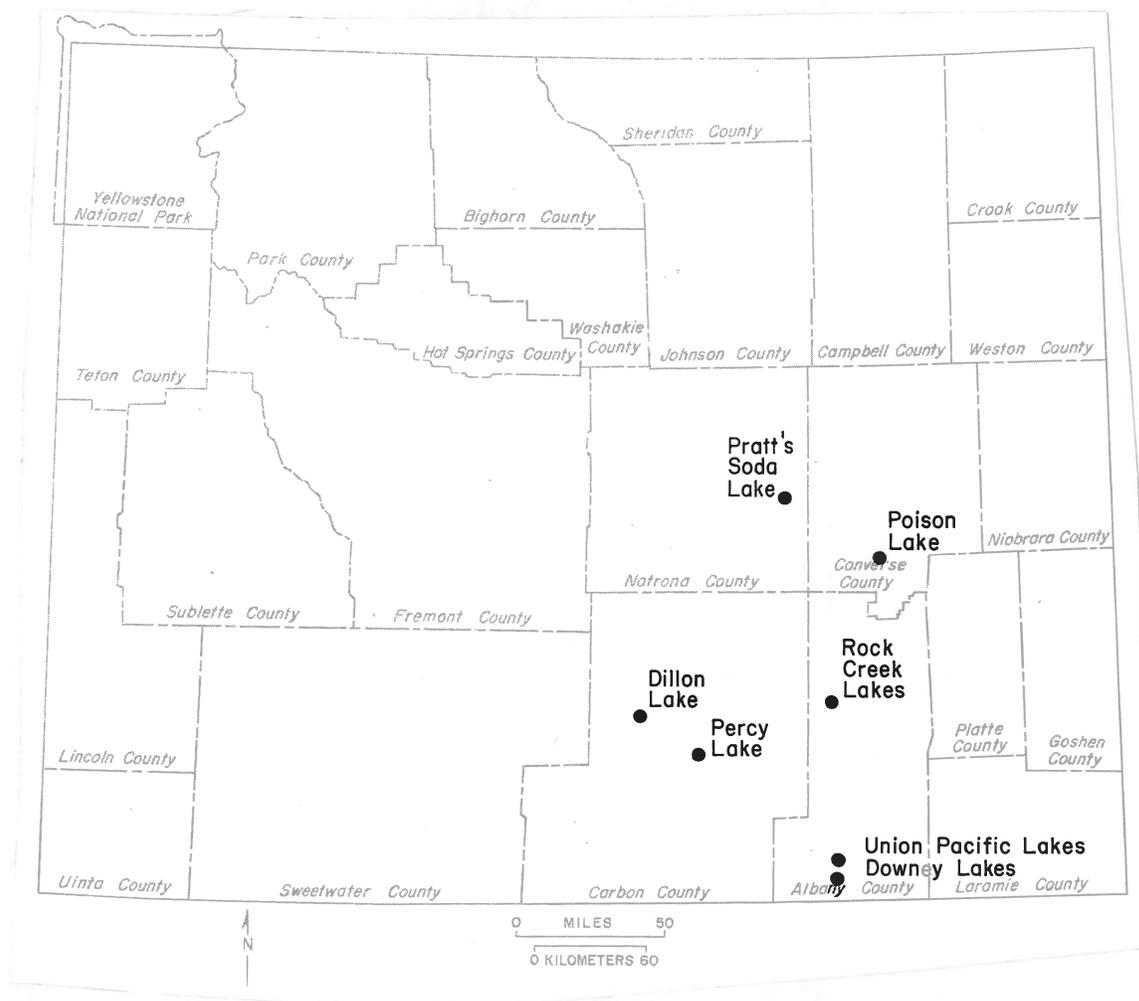


Figure 1. Index map showing reported occurrences of epsomite in Wyoming.

Magnesium sulfate analyses of evaporite deposits from Brooklyn Lake are reported by Knight (1939b):

Sample number	1	2	3	4	5
MgSO ₄ (chemical)	83.6	88.4		77.18	70.11
MgSO ₄ ·7H ₂ O (Epsomite mineral)			96.8		

- (1) Sample at surface of Brooklyn Lake.
- (2) Same.
- (3) Sample of pure salt collected by Ricketts in December 1887.
- (4) Sampled February 1898 by W.C. Knight.
- (5) Sample collected in 1903 by W.C. Knight.

S.H. Knight (1939b) also estimated that Brooklyn Lake contained 1,500 tons of mirabilite (Na₂SO₄·10H₂O) on the surface; another 100,000 tons of mirabilite in black mud; 25,000 tons of epsomite on the surface; and 150,000 tons of epsomite in black muds.

In Philadelphia Lake, SW¹/₄ sec. 21 and SE¹/₄ sec. 20, T.23N., R.76W., soft black mud covered the lake in 1935. Sodium salt crystals (NaCl, Na₂SO₄ etc.) were scattered over the surface of the mud, and analyses of material from this lake showed considerable epsomite (Knight, 1939b):

	Surface Mud	Black Mud
percent epsomite (mineral)	75.00	17.00

Other lakes in the Rock Creek group contain large amounts of epsomite. The following analyses are from Knight (1939b).

	Lake No. 1	Lake No. 2	Lake No. 3	Lake No. 4
percent epsomite (mineral)	79.5	65.00	89.00	87.00

An earlier analysis of material from this area was reported by Hoag (1929), as follows:

"Near Medicine Bow, Wyoming (sections 20 and 28, T.23N., R.76W.) is located a playa lake deposit of $MgSO_4$ upon which our consulting chemist has returned an analysis: $MgSO_4$ = 53.89 percent, $MgCl_2$ = 0.38 percent, H_2O = 45.67 percent, insoluble = 0.60 percent. An analysis in U.S. Geological Survey Bulletin 364 [Darton and Siebenthal, 1909] gives $MgSO_4$ = 51.22 percent, water = 47.83 percent, $NaCl$, $CaCl$, and $MgCl_2$ = 0.42 percent, Fe = trace, insoluble = 0.08 percent, loss = 0.45 percent."

Union Pacific Lakes
(Big Lake, Track Lake and Red Lake) secs. 2, 3, 4, and 5, T.14N., R.75W.

These three lakes are located 13 miles southwest of Laramie adjacent to Wyoming Highway 230. In 1885 the Union Pacific Railroad built a spur to the lakes and salt cake, soda ash and caustic soda were produced at Laramie for several years. From two to three percent $MgSO_4$ was present in the evaporites at this locality (Osterwald and others, 1966).

Carbon County

Dillon Lake sec. 21, T.22N., R.86W.

Saline deposits in this lake reportedly contained 8.73 percent epsomite. The saline deposits were worked in the late 1800s for salt ($NaCl$) (Schultz, 1910).

Percy Lake

sec. 23, T.21N., R.81W.

Black mud in a playa lake at this locality reportedly contained 48.28 percent $MgSO_4$ (Wells, 1923).

Converse County

Poison Lake

S1/2 sec. 4, T.30N., R.72W.

An analysis of evaporite minerals from this lake indicated 53 percent $MgSO_4$. A reduction plant was built at this site, and some production was reported (prior to 1966) (Anonymous, undated). Poison Lake occupies about 100 acres in a closed depression floored by red shales and silts of the Triassic Chugwater Formation. The drainage basin is also underlain by Permo-Pennsylvanian, Permian and Jurassic Formations. Weathered building foundations were present near the northeast corner of the lake in 1985, and these structures may be the remains of the reduction plant noted above.

Natrona County

Pratt's Soda Lakes (Gill Lakes)

sec. 26, T.35N., R.78W.

Saline deposits in this lake extended to a depth of more than twelve feet in 1890. These deposits covered about 90 acres. An analysis of the saline material follows:

Na ₂ SO ₄	94.50 percent
MgSO ₄	2.52
NaCl	0.54
Water	1.61
Undetermined and loss	0.83
	100.00

Some of the saline deposit had been removed prior to 1890 (Ricketts, 1890).

References

- Anonymous, undated, Saline deposits in Wyoming, Geological Survey of Wyoming files, 6 p.
- Darton, N.H., and Siebenthal, C.E., 1909, Geology and mineral resources of the Laramie Basin, Wyoming, a preliminary report: U.S. Geological Survey Bulletin 364, 81 p.
- Hoag, E.C., 1929, Letter to Wyoming State Geologist: Geological Survey of Wyoming files, 2 p.
- Knight, S.H., 1939a, The saline deposits of Wyoming, part I, the Downey Lakes, Albany County, Wyoming: Geological Survey of Wyoming Report of Investigations 1, 8 p.
- Knight, S.H., 1939b, The saline deposits of Wyoming, part II, the Rock Creek Lakes, Albany County, Wyoming: Geological Survey of Wyoming Report of investigations 2, 8 p.
- Kramer, D., 1986, Magnesium metal: U.S. Bureau of Mines Mineral Commodity Summaries 1986, p. 94-95.
- Osterwald, F.W., Osterwald, D.B., Long, J.S., Jr., and Wilson, W.H., 1966, Mineral resources of Wyoming: Geological Survey of Wyoming Bulletin 50, 287 p.
- Ricketts, L.D., 1890, Annual report of the Territorial Geologist to the Governor of Wyoming: The Cheyenne Daily Leader Steam Book Print, Cheyenne, Wyoming, p. 70.
- Schultz, A.R., 1910, Deposits of sodium salts in Wyoming: U.S. Geological Survey Bulletin 430-I, p. 570-589.
- Wells, R.C., 1923, Sodium sulfate: its sources and use: U.S. Geological Survey Bulletin 717, 43 p.