THE GEOLOGICAL SURVEY OF WYOMING
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SINTER (INCLUDING TRAVERTINE) RESOURCES OF WYOMING

by

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Illustration

INTRODUCTION

Sinter is a chemical sedimentary rock deposited by precipitation from mineralized waters. Sinter outcrops can be massive to cavernous. In hand-sized samples, sinter is commonly banded, and varies from cellular and porous to compact and impermeable. Calcareous sinter is composed of calcium carbonate ($CaCO_3$) and is commonly known as travertine (the term used in this report), or tufa. Geologists restrict the term travertine to banded, compact rocks made up of calcium carbonate. Siliceous sinter is composed of silica [silicon dioxide (SiO_2)].

Wyoming contains abundant calcareous and siliceous sinter. Most of these deposits are located in the northwestern part of the State (Figure 1). The sinter in Yellowstone National Park is primarily siliceous; sinter outside of Yellowstone is usually calcareous. All of the calcareous and siliceous sinter deposits in Wyoming are probably Quaternary in age. These deposits are usually vuggy and contain abundant foreign material, such as decomposed and decomposing vegetation, alluvial and colluvial material and altered bed rock. Because of these impurities, most of Wyoming's sinter and travertine deposits are not economically valuable.

Massive sinter is used primarily for ornamental stone. It is cut and polished for building interiors and facades, monument stone, table tops, wash basins and other decorative products. To be economically valuable for these uses, a deposit must be hard, compact, free from flaws and impurities and of a relatively large size. The aesthetic qualities of color and pattern are most important in determining marketability. Sinter may also be crushed, sized,

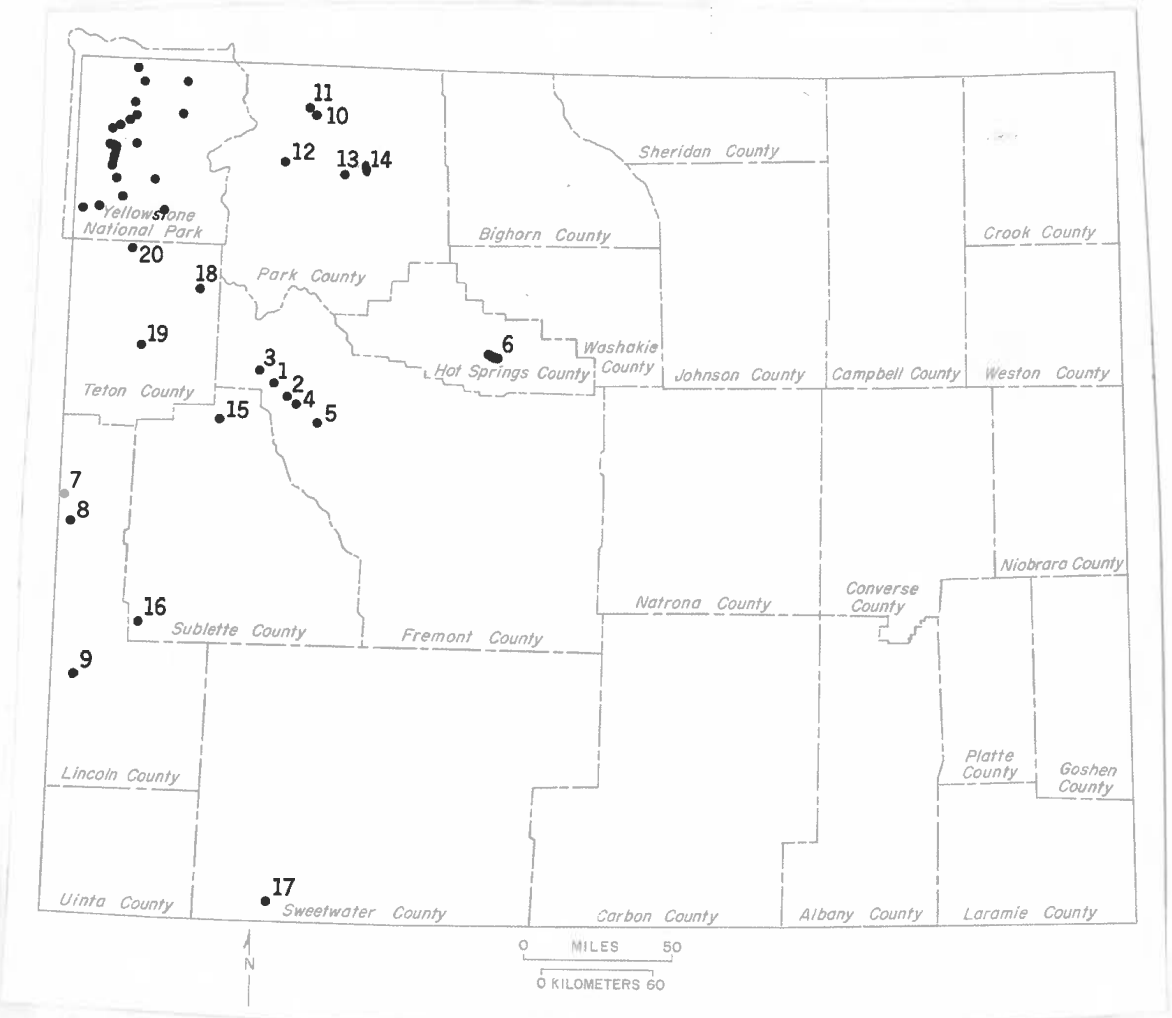
incorporated into a binder such as portland cement, cut and polished to produce terrazzo, which is used as ornamental and decorative stone. Siliceous sinter might be used as a source of silica. Calcareous sinter has been used as a substitute for high-calcium limestone.

Because plastic can be colored and prepared to look like travertine and other ornamental stone, the demand for travertine has been dropping. Plastic has replaced its use in wash basins, table tops and similar products.

Sinter deposits, due to their generally small size, are normally best suited for small operations. Working one or a few deposits, an individual with the proper equipment may be able to satisfy local and regional demand for ornamental stone products.

In 1985, about 104,000 short tons of miscellaneous ornamental and dimension stone including sinter was produced in the United States. This figure does not include granite, limestone, sandstone, slate and marble (Taylor, 1986). Transportation costs preclude the large scale development of deposits that are isolated from the major commercial centers where they are used.

No sinter is currently mined in Wyoming, although a small amount of sinter was recently removed from the Warm Spring Creek locality (Index map, page 3 and description, page 4). From 1950 through 1953, the Red Lane Calcareous Sinter Company produced almost 1,000 tons of calcareous sinter for use as agricultural lime (Wyoming Department of Revenue). Red Lane is just north of Thermopolis on U.S. Highway 20 (Index map, page 3 and description, page 4). Sinter has also been mined at Cody and Thermopolis in order in extract the associated sulfur and to produce a soil conditioner containing both sulfur and gypsum (Harris and King, 1986).



Sinter occurrences in Wyoming

1. Dubois area
2. Blue Holes area
3. Warm Spring Creek area
4. Red Creek area
5. Meadow Creek area
6. Thermopolis area
7. Thayne area
8. Auburn area and Johnson Springs
9. Cokeville area
10. Dead Indian Creek
11. Lower Sunlight Basin
12. Sweetwater Mineral Springs
13. Shoshone Canyon
14. Cody area
15. Kendall Warm Springs
16. Big Fall Creek
17. Little Mountain area
18. Soda Creek
19. Kelly area
20. Flagg Ranch area

OCCURRENCES

Fremont County

Dubois area

Gilliland (1959) maps five Quaternary travertine deposits southeast, south and southwest of Dubois. As mapped, they vary in size from 330 feet across to 2,600 by 4,250 feet.

Jakeys Fork Springs	Center N1/2 sec. 29, T.41N., R.106W.
Little Warm Springs Creek	S1/2 sec. 11, SW1/4 sec. 12, N1/2 sec. 14, T.41N., R.107W.
near Little Warm Springs Creek	S1/2SW1/4 sec. 3, T.41N., R.107W.
near Torrey Creek	Center sec. 28-33 line, T.41N., R.106W.
unnamed	SW1/4SE1/4SW1/4 sec. 25, T.41N., R.106W.

Blue Holes area

E1/2 sec. 7 and 8, W1/2 sec. 9, NE1/4 sec. 18 and secs. 17 and 20, T.40N., R.105W.

Gilliland (1959) depicts five Quaternary travertine deposits in this area; some extend beyond his map but are mapped by Keefer (1970). They vary in size from 1,000 feet across to 6,560 by 3,280 feet. The deposits are up to 80 feet thick but are very impure (Gilliland, 1959).

Warm Spring Creek area

SE1/4NW1/4 sec. 23, T.42N., R.108W.
Sec. 31, center N1/2 sec. 32, T.42N., R.107W.

Keefer (1957) maps three exposures of Quaternary travertine deposits near the Wind River west of Dubois. He also mentions, but does not map, another deposit on the south edge of a terrace along the south side of the Wind River, east of Warm Spring Creek (possibly section 32 and/or 33, T.41N., R.107W.). As

depicted, the travertine exposures are from 650 feet across to at least 1,300 by 4,000 feet. The largest exposure may not be completely mapped because Keefer (1957) does not map south of Warm Spring Creek. These mapped deposits are described as very porous, and containing silty material and boulders up to three feet in diameter.

Red Creek area	Secs. 22, 24, 25, 26 and 35, T.5N., R.6W.

Keefer (1970) maps, but does not describe, three exposures of Quaternary travertine deposits on the north flank of the Wind River Mountains on the Wind River Indian Reservation. The exposures range in size from 1,600 feet across to 0.9 by 0.6 miles to 0.3 by 2.2 miles.

Meadow Creek area	Secs. 31, 32, 33, 34 and 35, T.4N., R.4W.; Secs. 4, 5, 6 and 8, T.3N., R.4W; sec. 1, T.3N., R.5W.

Keefer (1970) maps three large Quaternary travertine deposits southeast of Red Creek. The exposures are from 0.3 by 0.9 miles to 4.7 by about 1.2 miles.

Hot Springs County

Thermopolis area

Numerous deposits of travertine are present in the Thermopolis area from Hot Springs State Park west to Rose Dome. The travertine is usually vuggy and cavernous, and often contains gypsum and sulfur. Exposures vary in size from about 200 feet across to 5,000 x 2,000 feet, with a 3,500 x 400 feet extension, and are from ten to 120 feet thick (after King, 1980). A quarry is located outside the Park between the Bighorn River and U.S. Highway 20, just west of the river, on the Thermopolis 7½-minute Topographic Quadrangle Map. This was pro-

bably the site of the Red Lane Calcareous Sinter Company's operations (center N1/2 SE1/4 sec. 25, T.43N., R.94W.). Localities listed below are from King (1980) unless otherwise noted.

Monument Hill (in Park)	NW1/4NW1/4 sec. 30, T.43N., R.94W.
Big Spring area (mostly in Park)	NW1/4 sec. 36, E1/2 sec. 35, T.43N., R.95W.; SW1/4 sec. 30, W1/2NW1/4 sec. 31, T.43N., R.94W.
T-Hill (mostly in Park)	Center sec. 25-36, line, T.43N., R.95W.
Airport area (two exposures)	Center N1/2NW1/4 sec. 36, T.43N., R.95W.
Round Top	Center SE1/4 sec. 26, T.43N., R.95W.
Cedar Ridge	N1/2NE1/4 sec. 28, T.43N., R.95W.
north of Cedar Ridge (sulfur prospects)	Approximately center sec. 21, T.43N., R.95W. (Woodruff, 1909)
south of Cedar Ridge (sulfur prospects)	W1/2SW1/4 sec. 21, N1/2 sec. 28, T.43N., R.95W. (Majors, 1946; Wideman, 1957)
Rose Dome (three unverified prospects)	W1/2 sec. 18, T.43N., R.95W.

Lincoln County

Thayne area	Center E1/2SE1/4 sec. 9, W1/2 sec. 15, center sec. 22, T.34N., R.119W.

Mansfield (1927) maps four travertine deposits west of Thayne, the smallest is separated from the largest exposure by a drainage course. They range in size from 200 by 350 yards to 600 x 1,300 yards. Mansfield (1927) describes the character of travertine deposits in the area (Idaho and Wyoming) as dense and banded to cellular with white to ferruginous coloration.

Auburn area	Sec. 25, NW1/4 sec. 24, sec. 23 and along the south edge of secs. 13 and 14, T.33N., R.119W.

Combining Mansfield's (1927) and Rubey's (1958) mapping, there are three travertine exposures north of Auburn. They vary in size from 350 yards across (sec. 24) to about 3/4 to one mile long and an average width of 400 yards.

Johnson Springs — SE1/4NE1/4 sec. 26, T.33N., R.119W.

Breckenridge and Hinckley (1978) note five travertine cones up to eight feet high at these springs.

Cokeville area — approximately N1/2SW1/4 sec. 25, SW1/4 sec. 25 and NW1/4 sec. 36, T.25N., R.119W. unsurveyed

Rubey and others (1980) map two exposures of travertine (calcareous tufa) north of Cokeville near Quealy Reservoir. They are about 450 by 550 yards and 170 by 400 yards in size.

Park County

Dead Indian Creek — NW1/4SW1/4 sec. 17, T.55N., R.104W.

Pierce and Nelson (1968) map a 200 x 100 yard travertine exposure on the Gros Ventre Formation, along and parallel to Dead Indian Creek.

Lower Sunlight Basin area — Center section 5 and 6 line, center W1/4 sec. 7, T.55N., R.104W.
SE1/4 sec. 12 and NW1/4 sec. 13, T.55N., R.10W.

Pierce (1965) maps two travertine exposures in this area. The largest one straddles Elk Creek (secs. 12 and 13). The other is mapped near Sunlight Creek (secs. 5 and 6). Henry P. Heasler (personal communication, 1986) has noted one between Elk and Sunlight Creeks (sec. 7). The exposures range in size from 60 yards across (both near Sunlight Creek) to 275 x 550 yards (on Elk Creek).

Sweetwater Mineral Springs — Unsurveyed, estimated location T.52N., R.106W.

This locality is about 3.5 miles upstream from the North Fork of the Shoshone River on Sweetwater Creek. Siliceous sinter and travertine containing

oil, asphaltum, native sulfur, iron oxides and pyrite(?) are present on both sides of the creek. The spring deposits are in bleached and decomposed colluvium, volcanic conglomerate and agglomerate (Eocene Wapiti Formation of Nelson, and others, 1980) and in a 20-feet-square block of Paleozoic carbonates. Spring deposits are present for about 1,400 feet along the stream. At the springs, the deposit extends about 400 feet above the creek on the east side of the drainage course (after Hewitt, 1914; Love and Good, 1970).

Shoshone Canyon	Center sec. 12, NE1/4NE1/4 sec. 11, T.52N., R.103W.

Pierce (1970) maps travertine on both sides of the Buffalo Bill Reservoir at the upper end of Shoshone Canyon. The exposures are 200 by 500 yards and 200 by 300 yards in size. Henry P. Heasler (personal communication, 1986) says they are about 200 feet thick. Love and Good (1970) report these deposits are sulfur-bearing.

Cody area	SW1/4 sec. 35, SE1/4SE1/4 sec. 34, T.53N., R.102W. N2/3W1/2 sec. 3, N2/3E1/2 sec. 4, center W1/2 sec. 4, lot 65, NE corner lot 63, NW1/4NW1/4 sec. 14, T.52N., R.102W.

The locations are surface exposures as depicted by Pierce (1966, 1970) and Heasler (1980). There are two main areas, one near DeMaris Hot Spring (about 0.6 x 1.2 miles in area) and another near the site of the old sulfur refinery on South Fork Road (two areas about 1/3 mile across and 1/3 x 1/2 mile across). The travertine, which contains native sulfur and gypsum, is at least 60 feet thick and is probably more extensive in the subsurface (after Bullock and Wilson, 1969; Wideman, 1957).

Sublette County

Kendall Warm Springs NE1/4SE1/4SW1/4 sec. 2, T.38N., R.110W.

Breckenridge and Hinckley (1978) note travertine at these warm springs on both sides of the stream. The springs are protected for an endangered species of fish. The travertine is 15 feet thick and 150 feet wide on one side of the stream; the length of the travertine and the size of the exposure on the other side of the stream are not stated.

Big Fall Creek Secs. 20, 29, 30, 31, T.28N., R.115W.

Travertine is present along the creek from 1/4 to 2 1/2 miles downstream from Big Fall Creek Springs. The travertine generally becomes thinner and narrower downstream, starting out about 15 feet thick and 350 feet wide, and becoming just an encrustation on rocks in section 31 (Rubey and others, 1980; Hauf, 1963).

Sweetwater County

Little Mountain area Secs. 31, 32 and 33, T.13N., R.107W.

This locality encompasses five, flat to cone-shaped mounds of dolomite(?) and calcite resting unconformably on the Green River Formation. These deposits contain quartz crusts and veins, and have brecciated margins. These characteristics imply deposition from springs. The mounds are from less than 100 feet across to 150 x 500 yards in size. The mounds form a linear array on mesas and in valleys that trends N25°E (Weigman, 1964, 1965).

Teton County

Soda Creek — Approximately sec. 33, T.46N., R.111W., unsurveyed

Love (1956) maps a small travertine deposit (200 x 400 yards) on Soda Creek one mile upstream from the junction of the North Buffalo Fork of the Snake River. The junction is the site of the North Buffalo Fork Springs.

Kelly area — SW1/4 sec. 35, T.43N., R.115W.

Love (1956) maps another small travertine deposit (200 x 400 yards) just north of the Kelly Warm Spring.

Flagg Ranch area — Approximately SW1/4 T.48N., R.115W, unsurveyed.

Love (1956) maps two exposures of travertine near Polecat Creek. The exposures are about 400 x 800 yards and 1/2 by 1 3/4 miles. The exposures are mostly siliceous sinter with some travertine (Love and others, 1975).

Yellowstone National Park

The Park contains many deposits of travertine and siliceous sinter. Only the largest exposures as shown on the geologic map of Yellowstone National Park (U.S. Geological Survey, 1972) are listed below. For more detail the reader should see Allen and Day (1935), and the series of surficial geologic maps published by the U.S. Geological Survey (Pierce, 1973a, 1973b, 1974a, 1974b; Richmond, 1973a, 1973b, 1973c, 1973d, 1974, 1977; Richmond and Pierce 1971a, 1971b, 1972; Richmond and Waldrop, 1972, 1975; Waldrop, 1975a, 1975b; Waldrop and Richmond, 1975).

Areas of travertine deposition include Mammoth Hot Springs, Terrace Mountain, Terrace Spring, along the Sheepeater Cliffs, one drainage east of the Sheepeater Cliffs, near Rustic Falls and near Tower Junction.

The more extensive siliceous sinter deposits are in the Norris, Gibbon, Lower, Midway, Upper, West Thumb, Shoshone and Heart Lake Geyser Basins, at Amphitheater Springs, Potts Hot Spring Basin and Lone Star Geyser, near Boundary Creek, Seven Mile Hole, Lone Star Geyser and Secret Valley Creek, and South of Nez Pierce Creek.

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