

THE GEOLOGICAL SURVEY OF WYOMING  
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FIELD GUIDE TO SOME COMMON ROCKS AND  
MINERALS OF WYOMING

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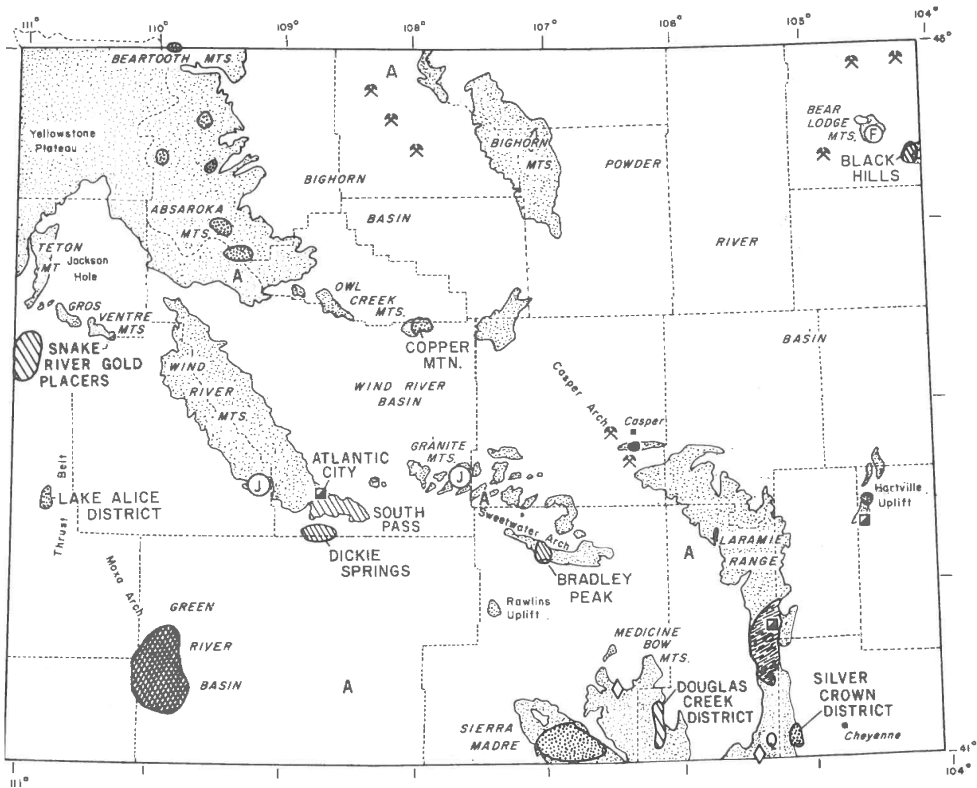
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Wyoming.

Wyoming is known for its abundance of energy and mineral resources. In addition to vast oil, natural gas, and coal resources there are many other rocks and minerals occurring in the state. A few of these are briefly examined in this article. Additional information on the rocks and minerals of Wyoming are contained in publications by Root (1977) and Hausel and others (1979a)

## ANORTHOSITE

Anorthosite is a gray, coarsely-crystalline, intrusive igneous rock consisting almost entirely of plagioclase feldspar. The plagioclase is so aluminum-rich that during the Second World War the anorthosite was seriously considered as a possible alumina source in the event our imported resources had been cut off by enemy activity. Presently, there is some interest in using anorthosite as a source of sodium flux used in the manufacture of glass.

Nearly all of the known anorthosite in the state occurs within a large 350-square-mile batholith exposed in the central Laramie Range northeast of Laramie (Figure 1). Accessible collecting localities lie along State Highway 34 through Sybille Canyon. While driving through the canyon, the light gray anorthosite, and the associated dark gray to black syenite rocks are easily recognizable in road cuts because the rocks sparkle as sunlight is reflected off of the plagioclase crystal faces.



**EXPLANATION**

- |     |                              |      |                             |
|-----|------------------------------|------|-----------------------------|
| Ⓝ Ⓣ | Jade and Fluorite Localities | ◇    | Diamond Deposits            |
| ▨   | Anorthosite                  | Ⓠ, ⓐ | Quartz and Agate Localities |
| ▩   | Gold                         | ▨    | Copper Deposits             |
| ⚒   | Bentonite Mining Areas       | ●    | Asbestos                    |
| ▣   | Iron Deposits                | ▩    | Trona                       |



Figure 1. General localities of some common rocks and minerals.

## ASBESTOS

In 1891, asbestos deposits on Casper Mountain (Figure 1) were proclaimed to rival the best asbestos deposits on the North American continent. Although this status was short-lived, excellent specimens of cross-fiber asbestos can still be collected from the historic quarries.

The Casper Mountain asbestos deposits occur as 1/8- to 1/4-inch-wide cross-fiber chrysotile veinlets, separated by massive serpentine (Hausel and Glass, 1980).

## BENTONITE

Bentonite is a commercial term used for clays that consist of 75 percent or more montmorillonite. Most bentonites in the "Cowboy State" are termed "Wyoming" or "western" bentonites and are different from those bentonites located in the southern United States. The Wyoming bentonites uniquely expand up to 15 times their dry volume upon wetting. This characteristic is useful in drilling muds used by the petroleum industry, for pelletizing taconite in the iron ore industry, and for binding foundry sands.

Much of the bentonite in the state is interbedded within Cretaceous shales (Hausel and others, 1979). Two important mining regions are the Black Hills and eastern Bighorn Basin (Figure 1).

## COPPER

During the early 1900's, Wyoming's copper industry ranked as one of the more important in the United States. Presently, Wyoming has numerous but scattered resources, and copper is presently considered unimportant except where it may be associated with valuable gold and silver resources.

Although copper is found in nearly every mountain range in the state, six regions stand out (Figure 1). These are the Sierra Madre (Grand Encampment District), the Absaroka Plateau, the Silver Crown District, the Hartville Uplift, the Copper Mountain region, and the Lake Alice District (Hausel, 1982a).

The Sierra Madre contains hundreds of scattered copper prospects and mines including the historic Ferris Haggerty Mine. Historical records show that the Ferris Haggerty Mine operated a 16-mile-long aerial tramway in the early 1900's which carried copper ore from the mine site, up over the continental divide at more than 10,000 feet, and downslope to a copper smelter located at Encampment (Wyoming Recreation Commission, 1976).

The copper deposits found in the Absaroka Plateau are similar to the gigantic porphyry copper deposits mined in the southwestern United States (Hausel, 1982b). The largest open pit mine in the world, the Bingham Mine outside Salt Lake City, Utah, is developed on a similar copper deposit.

Copper in the Silver Crown and Copper Mountain

Districts occurs in quartz veins and mineralized fissures. At Hartville, the deposits are associated with limestone and hematite schist. In the Lake Alice District, copper with some silver and zinc are found in red-bed sandstones of the Nugget and Twin Creek Formations (Triassic-Jurassic).

Some excellent copper specimens are found in southeastern Wyoming (Hausel and Jones, 1984). The common copper minerals found in the state include malachite, azurite, and chalcopyrite, with lesser amounts of tenorite and cuprite. Simple tests have been devised to recognize these minerals in the field. Malachite and azurite are green and blue copper carbonates that effervesce (give off  $\text{CO}_2$  bubbles) when a few drops of dilute hydrochloric acid (10 percent) are dropped on them. Vinegar will produce a similar effect although the reaction is not quite as strong.

Chalcopyrite, a copper-iron sulfide, generally occurs in bright, massive, metallic, bronze-colored specimens that produce a black to dull greenish-black powder when scratched with a pocket knife. Two other copper minerals that commonly are associated with malachite and azurite are tenorite and cuprite (both are copper oxides). While tenorite usually occurs as a glossy black stain, cuprite appears as an earth-red stain. These minerals are identified by placing a few drops of 10 percent hydrochloric acid on a suspected sample, and then rubbing a well-used rock pick or pocket knife into the acid-covered specimen. If the sample is a copper oxide, a coat of bright metallic copper will remain on the pick after the acid and residue are wiped off.

## DIAMOND

Because diamond is the only naturally occurring mineral harder than corundum, a good test for diamond is to scratch corundum. Diamond has a hardness of 10 and corundum 9.

Beware of the old adage that only diamond will scratch glass. Plate glass has an average hardness of only about  $5\frac{1}{2}$ , and is softer than hundreds of minerals (including quartz) that will scratch the plate glass. Another falsehood is that diamond is nearly indestructible. A very light blow with a hammer will shatter diamond into a thousand pieces!

Chromian diopside and pyrope garnet, which are sometimes considered as semi-precious gemstones, are commonly associated with diamond in Wyoming. Chromian diopside is emerald green and forms rectangular crystals with flat surfaces. Pyrope garnets are almost always rounded, and may have a distinctive purple-red coloration. These minerals occur in association with kimberlite diatremes located in the southeastern corner of the state (Hausel and others 1979b).

## FLUORITE (fluorspar)

A number of fluorspar collecting localities are located in the Bear Lodge Mountains north of Sundance (Figure 1). The mineral occurs in marbleized limestone as a dark purple mass. The fluorspar will generally fluoresce weakly under long wavelength black light.



## GOLD

Gold is found at a number of localities in Wyoming (Osterwald and others, 1966; Hausel, 1980). For the weekend prospector, the better places to search for gold are the historic placer (stream transported) deposits, but be careful that you do not trespass on someone else's mining claim or on private property!

If you have a metal detector, it might be worthwhile to prospect the extensive gravel piles along Rock Creek in the South Pass District (Figure 1). These gravel piles are the rejected rock from a gold dredging operation conducted in the late 1930's (Hausel, 1984). Although there is little likelihood of finding large coarse nuggets, gold dredges are designed to reject coarse gravel, as well as any large coarse nuggets.

Two other historic gold placers are located along the Snake River between Jackson and Alpine, and along Douglas Creek in the Keystone area west of Laramie. The Dickie Springs area, located to the south of South Pass, is a dry placer (Figure 1).

Gold is a soft (hardness  $2\frac{1}{2}$  to 3), malleable, yellow submetallic to metallic metal. Minerals often mistaken for gold include mica, pyrite (fool's gold), and chalcopyrite. Pyrite and chalcopyrite are hard and brittle and will produce a black streak if scratched with a knife.

Mica, which often forms small bronze-colored flakes with flat surfaces, is more often mistaken for gold than is fool's gold. The mica is brittle

and will break into pieces under the pressure of a pin point.

## IRON

Three types of iron ore deposits have been exploited in Wyoming. Taconite, a black, highly magnetic, banded magnetite and silica rock, is found at Copper Mountain and South Pass (Figure 1). Hematite, which occurs as powdery to massive red iron oxide or as a steel-gray nonmagnetic metallic substance, was mined for nearly 100 years in the Hartville Uplift (Figure 1). Titaniferous magnetite is found in scattered pods in the Laramie Range anorthosite complex and was mined during the late 1950's and early 1960's. This material is steel-gray, metallic, and weakly to strongly magnetic.

## JADE

A highly prized mineral found in the state is Wyoming jade. Samples have been collected as far east as Lewis Flats to the north of Wheatland in Platte County and as far west as the Prospect Hills area to the southeast of Big Sandy (Hausel and others, 1979a). The Granite Mountains, which lie between these two localities, have been a favorite jade collecting locality for many years (Figure 1). Some large jade boulders have been discovered in the Granite Mountains, although the largest reported boulder was discovered in 1977 in the Prospect Hills area. This boulder was reported to be about the size of a pickup truck and to weigh nearly seven tons.

The Wyoming jade is a different variety from the jade which is imported from southeast Asia. The jade found in Wyoming is nephrite, an amphibole of the tremolite-actinolite series (a calcium-magnesium silicate). The Asian variety is jadeite, a pyroxene (aluminum-sodium silicate). The two varieties are similar in appearance and essentially indistinguishable without x-ray diffraction and other physical-chemical tests. Wyoming jade varies in color from apple green to black and has a hardness of  $5\frac{1}{2}$  to  $6\frac{1}{2}$ .

### QUARTZ (agate)

Quartz crystallizes in the hexagonal system and often forms beautiful, clear crystals. Cryptocrystalline varieties of quartz, known as chalcedony (commonly called agate), are found as replacements or as cavity fillings.

Good hexagonal specimens of quartz have been collected from vugs formed within pegmatites in the Laramie Range east and southeast of Laramie. Many of these pegmatites were mined in the 1940's for feldspar, and mining exposed several quartz-bearing vugs.

Specimens of faintly colored amethyst have been collected from small cavities formed in volcanic rock in the Absaroka Plateau to the east of Yellowstone National Park. Agate-filled casts of tree trunks and branches also are found in the Absaroka Plateau (Root, 1977).

Several varieties of banded and moss agate occur in Wyoming. One popular agate indigenous to Wyoming is the Sweetwater moss agate, a gray-blue agate with black dendrites. Collecting areas

for the Sweetwater moss agate are located along Sage Hen Creek in the Granite Mountains to the north of Jeffrey City and Split Rock. In the same general area, moss agate pebbles also occur along the banks of the Sweetwater River (Root, 1977; Hausel and Glass, 1980).

Dry head agate, a red and white banded agate, is found along the Bighorn River northeast of Lovell. This area is an extension of the famous Dryhead agate grounds of Montana.

### TRONA

Trona is a hydrated sodium carbonate and sodium bicarbonate used to produce industrial soda ash. Soda ash is vitally important in the glass, paper, soap, petroleum refining, and textile industries. Baking soda is also a product of soda ash.

The largest known trona resource in the world is buried within 45-million-year-old lake sediments in the Green River Basin west of Rock Springs. Five companies presently mine trona from shafts that extend as deep as 1,700 feet below the surface. The trona industry is vitally important to the economies of Rock Springs and Green River.

### URANIUM

The major uranium districts are located on Figure 2. The uranium minerals found at the surface are oxidized and form brightly colored

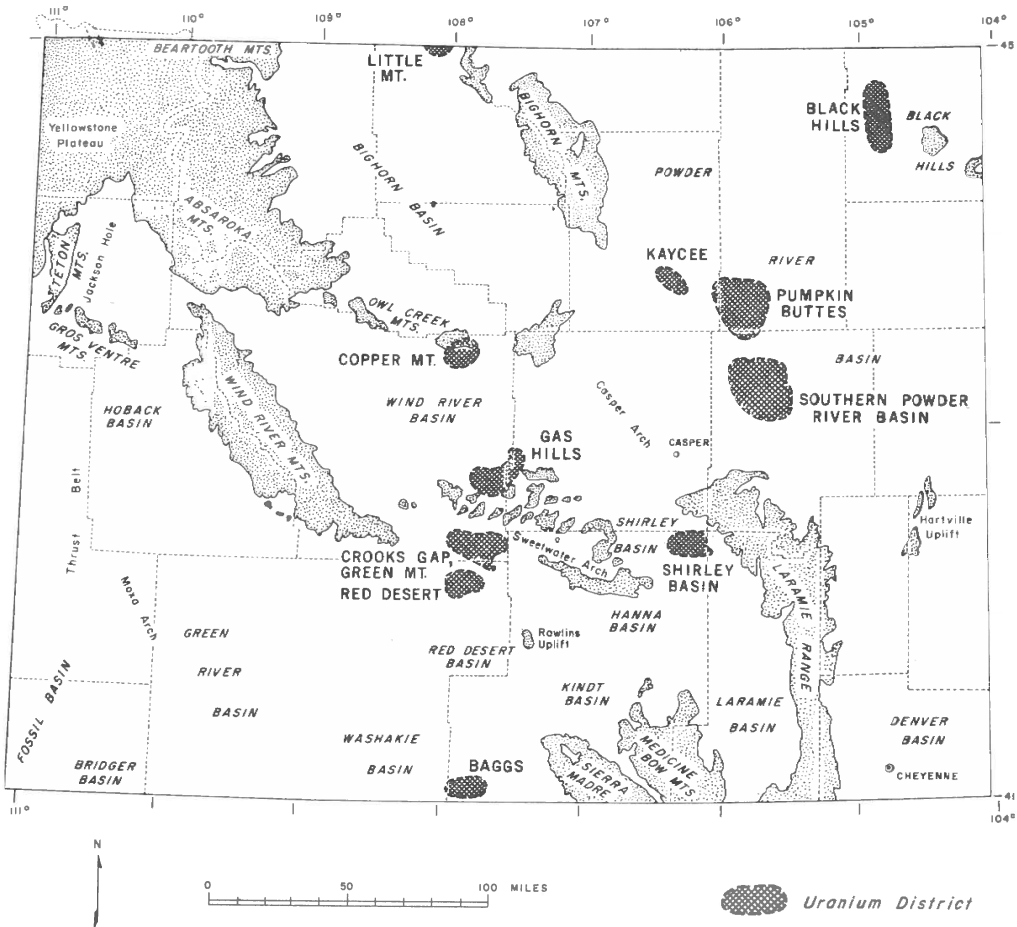


Figure 2. Uranium mining districts in Wyoming. For many years, Wyoming has been the nation's second leading uranium producer, after New Mexico.

radioactive yellowish coatings on rocks and occur as a cementing agent in sandstones.

## SUMMARY

Only a few of Wyoming's minerals and rocks have been described. For more information, we recommend that you obtain copies of the publications listed in REFERENCES CITED. These publications are available from the Geological Survey of Wyoming in Laramie at a minimal cost. Write to the Geological Survey of Wyoming, P.O. Box 3008, University Station, Laramie, Wyoming 82071 for a free publications list. Additional information on some of these minerals can also be obtained from other free information circulars published by the State Survey.

Because many of the minerals found in the state are difficult to identify, we recommend that a person interested in identifying mineral and rock specimens obtain a good descriptive mineralogy book. If you cannot identify a rock or mineral specimen that you have found in Wyoming, the Geological Survey of Wyoming, on the University of Wyoming campus in Laramie, offers a rock and mineral identification service free of charge to the public. Please feel free to stop in.

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#### FOR PUBLICATIONS OF INTEREST

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