

SEMIPRECIOUS GEMSTONES AND ORNAMENTAL STONES FOUND IN UTAH

Adapted by Martha R. Smith





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TO LEND YOU A HELPING HAND...

This description of the semiprecious gemstones found in Utah is based on a chapter on Gem Materials, written by M.D. Dasch and published in Utah Geological and Mineralogical Survey Bulletin 73, *Mineral and Water Resources of Utah*. Bulletin 73, published in 1969, was prepared by the U.S. Geological Survey in cooperation with the UGMS at the request of U.S. Senator Frank E. Moss, member of the Senate Committee on Interior and Insular Affairs. Some additional material has been added, and the reference list has been updated and expanded.

DID YOU KNOW?...

Utah has a wide variety of gem materials from which semiprecious gemstones can be made, or which can be used as ornamental stones. Gemstones are cut or polished stones used as personal ornaments characterized by their beauty, relative rarity, and relative durability. Their value is determined by demand, fashion, and the degree to which polishing and cutting enhances the natural raw stone. Ornamental stones are minerals that are attractively colored and marked and can be used for making vases, statuettes, table tops, fireplaces, and for similar decorative purposes.



COMPARING
TREASURES.

The semiprecious gemstones and ornamental stones found in Utah include: azurite and malachite; beryl (aquamarine and morganite); garnet (pyrope and spessartite); jet; labradorite; obsidian; onyx (chalcedony and marble); opal, quartz (agate, jasper, and chalcedony); rhyolite (“wonderstone”); scheelite; topaz; and variscite.

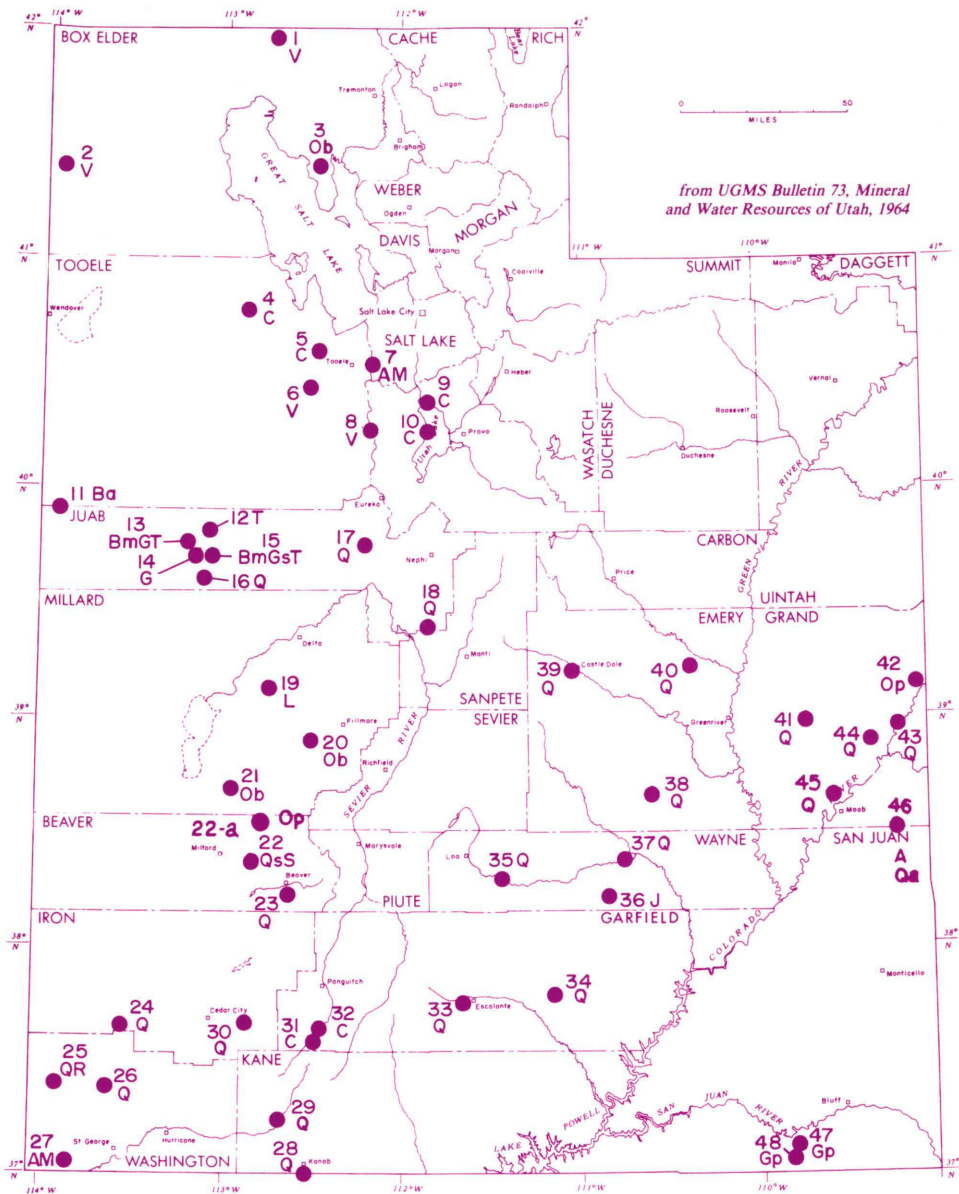
Production of gem materials in Utah depends on known deposits and on current demands. Jet, for example, was mined in significant quantities during the early 1920s when it was fashionable as mourning jewelry; today it is not in vogue and no major market for it exists. Pyrope garnet from the Navajo Indian Reservation, topaz from the Thomas Range, and variscite from several localities in western Utah have been produced sporadically since the turn of the century. Agate, jasper, and petrified wood, much in demand in the mid-1900s, were seldom mentioned earlier in the century. Obsidian, first worked in Utah by the Indians, has been quarried intermittently since the early 1950s.

Petrified wood and dinosaur bone may be collected on federal and state land only after a special permit has been obtained (see section on land ownership).

Gem materials are sought by both amateur and professional collectors. Since the 1960s, “rock hounding” has become a popular hobby and hundreds of visitors come to Utah each year to look for semiprecious gemstones. The gem industry, for the most part, is operated by individuals rather than by large companies. For this reason the locations given for individual deposits are often vague.

The following discussion of Utah gem localities does not pretend to be a complete listing; it is a summary of some of the better known occurrences. The gem materials are described alphabetically, and the approximate locations of significant deposits are shown on figure 1. Table 1 lists the gemstones found at each locality.

Because ownership of the land changes, access roads change, and conditions of the deposits change, we are not providing detailed information to guide gemstone hunters to the deposits described in this publication. References to published articles describing each locality are listed in the back of this publication, and agencies that can provide further information are listed in the section on Information for Gemstone Collectors.



from UGMS Bulletin 73, Mineral and Water Resources of Utah, 1964

- EXPLANATION**
- Deposit of gem material (numbers refer to localities mentioned in text)
 - A-Azurite
 - Ba-Aquamarine
 - Bm-Morganite
 - C-Calcite, referred to as "onyx"
 - G-Garnet, unspecified
 - Gp-Pyrope
 - Gs-Spessartite
 - J-Jet
 - L-Labradorite
 - M-Malachite
 - Ob-Obsidian
 - Op-Opal
 - Q-Cryptocrystalline quartz (one or more varieties: agate, chalcedony, jasper, petrified wood)
 - Qa-Amethyst
 - Qs-Smoky quartz
 - R-Banded rhyolite
 - S-Scheelite
 - T-Topaz
 - V-Variscite

FIGURE 1. Selected semiprecious gem materials in Utah.

TABLE 1. Gemstone localities of Utah described in text. Numbers refer to localities shown on figure 1.

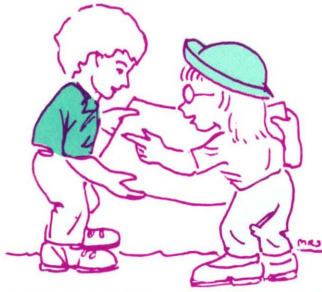
1. Snowville (variscite), Box Elder County
2. Lucin (variscite), Box Elder County
3. Promontory (variscite, obsidian), Box Elder County
4. Cedar Mountains, south of Low (onyx), Tooele County
5. Grantsville (onyx), Tooele County
6. Amatrice mine (variscite), Tooele County
7. Bingham (azurite, malachite), Salt Lake County
8. Utahlite mine (variscite), Utah County
9. Lehi (onyx), Utah County
10. Pelican Point (onyx), Utah County
11. Ibabah Mountain (beryl), Tooele-Juab County.
12. Thomas Range (topaz), Juab County
13. Spor Mountain (beryl, topaz, garnet), Juab County
14. East of Topaz Amphitheater (garnet), Juab County
15. Topaz Mountain (beryl, topaz, garnet), Juab County
16. Drum Mountains (agate, jasper), Juab County
17. Jericho (agate, jasper), Juab County
18. Levan (agate), Juab County
19. Clear Lake railroad siding (labradorite), Millard County
20. White Mountain (obsidian), Millard County
21. Black Rock (obsidian), Millard County
22. Mineral Mountain (smoky quartz, scheelite), Beaver County
- 22a. Milford (opal), Beaver County
23. Blue Valley (black agate), Beaver County
24. Newcastle (chalcedony, geodes), Iron County
25. Beaver Dam Wash (agate, petrified wood*), Washington County
26. Central (grey chalcedony), Washington County
27. Dixie-Apex mine (azurite, malachite), Washington County
28. Kanab (petrified wood), Kane County
29. Orderville (agate, petrified wood*), Kane County
30. Area around Cedar Breaks (agate, petrified wood*), Garfield County
31. Mammoth Creek (onyx), Garfield County
32. Hatch (green onyx), Garfield County
33. Escalante (agate, petrified wood*), Garfield County
34. Circle Cliffs (petrified wood*), Garfield County
35. Torrey (agate, jasper, petrified wood*), Wayne County
36. Coaly Basin (jet), Wayne County
37. Hanksville (agate, petrified wood*), Wayne County
38. San Rafael Swell (agate, petrified wood*), Emery County
39. Castledale (agate), Emery County
40. Woodside (agate, jasper, petrified wood*), Emery County
41. Thompson (jasper, agate), Grand County
42. Colorado River Valley (opal), Grand County
43. Cisco (jasper, petrified wood*, clams), Grand County
44. 7 miles south of Cisco (agate), Grand County
45. Moab (agate, petrified wood*), Grand County
46. LaSal (azurite), Grand County
47. Mule Ear (garnet), San Juan County
48. Moses Rock (garnet), San Juan County

*Petrified wood is subject to some collecting limits (State, Bureau of Land Management regulations).

SEMIPRECIOUS GEMSTONES OF UTAH

AZURITE AND MALACHITE

The azure-blue and bright-green copper carbonate minerals that commonly occur together in the oxidized zone of copper deposits are the alteration products of other copper minerals. Azurite is less common than malachite and occurs as transparent to subtranslucent prismatic crystals and radiating spherical groups. Malachite occurs in translucent to opaque botryoidal and stalactitic masses. Both minerals, although soft, are used extensively for ornamental objects, such as vases and table tops, and occasionally for jewelry. Azurite and malachite occur in the near-surface parts of many copper deposits in Utah; those localities containing gem-grade material, however, are not always specifically identified. Some of the copper ore



IF POSSIBLE, DISCUSS YOUR PLANS WITH SOMEONE WHO HAS BEEN THERE.

BERYL

Two gem varieties of beryl, a hard transparent to translucent beryllium aluminum silicate, are present in small amounts in Utah. Aquamarine occurs as long slender crystals of bluish-green beryl. Blue beryl, including some gem-quality aquamarine, is present in gulch gravels on Ibapah Mountain (No. 11), in Tooele or Juab Counties, western Utah (Sterrett, 1909, p. 811). The beryl-bearing gravels very likely were derived from quartz veins or pegmatites in the Ibapah stock of the Deep Creek Range (Butler and others, 1920, p. 112). One beryl-bearing pegmatite occurs in Fifteenmile Canyon near the southwestern margin of the stock, in Juab County. Morganite occurs as squat, tabular crystals of pale pink to deep rose beryl. On the west side of Spor Mountain (No. 13), western Juab County, morganite is associated with topaz and garnet in Tertiary rhyolite flows (Staatz and Griffiths, 1961, p. 943). In the Topaz Mountain amphitheater (No. 15), a drainage basin at the southeast end of the Thomas Range, rose-red beryl crystals are attached to topaz crystals and to lithophysal cavity walls in Tertiary Topaz Mountain Rhyolite (Palache, 1934, p. 14; Erickson, 1963, p. 32).

GARNET

Garnet includes a group of six minerals with similar physical properties, crystal forms, and a basic chemical formula in which elements replace one another to form a series. Two garnets are produced in Utah, pyrope and spessartite.

Pyrope, a magnesium aluminum silicate and the most common mineral of the garnet group, occurs in mafic igneous rocks, such as peridotite, and serpentine. It is a hard mineral that ranges in color from deep red to nearly black. Pyrope is found in topsoil and gulch gravels on the Navajo Indian Reservation in San Juan County, Utah and northeastern Arizona. The deposits are associated with rocks of funnel-shaped volcanic vents in the vicinity of Comb Ridge. At Moses Rock (No. 48) garnet-bearing material is present in a dike-like body, and garnets which have weathered from the outcrop occur in small patches of alluvium. At the Mule Ear deposit (No. 47) garnets are scattered through alluvium (Gregory, 1917, p. 146-147; Kiersch, 1955, p. 91-94).

Spessartite garnet is a manganese aluminum silicate that occurs in granite, quartzite, and rhyolite. It is a hard garnet that ranges in color from brown to red. Production of rough spessartite from San Juan County was reported during 1907 (Sterrett, 1908, p. 810). Spessartite also is present in the Topaz Mountain amphitheater (No. 15), where it occurs with topaz in lithophysal cavities in the rhyolite of Topaz Mountain (Sterrett, 1909, p. 842). Garnets of an unspecified type and varying quality are present 3 to 4 miles west of the Topaz Mountain

mined from Bingham (figure 1, locality No. 7), Salt Lake County, has been used as gem material (Ball, 1941, p. 1402). Excellent quality azurite and malachite were recovered in the 1940s from the Dixie Apex mine (No. 27) west of St. George, Washington County (Ball, 1945, p. 1561). This mine is now under new management as a gallium-germanium mine. Small specimens of deep-blue azurite sandstone from the La Sal district (No. 46), southeastern Utah, have been suggested for finishing doorways and for ornamental purposes (Sterrett, 1907, p. 1214).



TAKE PHOTOS WHERE COLLECTING IS PROHIBITED.

amphitheater (No. 14). They are as much as 1½ inches in width and are found in rhyolite cavities (Patton, 1908, p. 190). On the west side of Spor Mountain (No. 13), garnets occur with beryl and topaz in Tertiary rhyolite flows (Staatz and Griffiths, 1961, p. 943).

JET

The organic gemstone, jet, is a black variety of lignite or brown coal that is incompletely coalified and retains some woody structure. Jet is soft, light in weight and, because it is homogenous and compact, takes a velvety polish and is tough enough to be worked on a lathe. The most important source of jet in North America is in the Henry Mountains, southern Wayne County. It forms disk-like inclusions in a narrow coal seam found along the precipitous sides of Coaly basin (No. 36) on the northwest flank of Mount Ellen (Sinkankas, 1959, p. 605; Doelling, 1975, p. 159).

LABRADORITE

Labradorite, a calcium-sodium aluminum silicate of the plagioclase feldspar mineral group, occurs in both extrusive and intrusive igneous rocks. It is moderately hard and characteristically exhibits a beautiful play of colors. Fine, straw-yellow labradorite is present northeast of the Clear Lake Railroad Siding (No. 19), east-central Millard County. Small squarish fragments, many of them flawless and more than an inch wide, are abundantly distributed in crumbly andesite (Sinkankas, 1959, p. 149).

OBSIDIAN

Obsidian is a volcanic glass that forms from acid (quartz-rich) magmas or lava which cooled so rapidly that crystallization was not possible. Most of it is black, but it may also be brown, red, or green; it is transparent to translucent and has the same hardness as window glass. Indians used the rock for fashioning arrowheads and for ornamental purposes. Today, transparent and variegated pieces are cut as gem stones. Utah obsidian comes primarily from southern Millard County, where considerable quantities have been mined near Black Rock (No. 21) since the early 1940s. The locality is well known for flowering or snowflake obsidian, a black variety with bluish-gray spots composed of radiating needle-shaped crystals in clusters called spherulites. West of the Black Rock Railroad Station is an abandoned Indian arrowhead-chipping ground littered with numerous fragments of obsidian. At White Mountain (No. 20), near Black Rock, black and red varieties occur both separately and mixed. Obsidian also is present in Box Elder County south of Promontory (No. 3) (Sinkankas, 1959, p. 507).

ONYX

True onyx is a form of chalcedony, a variety of quartz. It is hard and is typified by straight parallel bands of contrasting color. Unfortunately the term onyx is also used in referring to a special kind of limestone, sometimes called onyx marble. Limestone is composed primarily of calcite, or calcium carbonate, which is colorless when pure. In contrast to quartz, calcite is a soft mineral unsuitable for use as a gemstone. Fine-grained masses of calcite deposited from cold-water solutions (travertine) are fairly tough, however, and are suitable for carving table tops and bookends, and for other decorative purposes. In recent years onyx production has been reported from several counties in Utah. None of these deposits appear to be true onyx. For the sake of consistency with popular useage the incorrect term "onyx" will be used in this discussion.

Translucent, green onyx has been quarried at Hatch (No. 32), southwestern Garfield County.



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Large flawless blocks have also been mined on Mammoth Creek (No. 31), 1½ miles south of Hatch (Doelling, 1975, p. 158). Two onyx deposits have been worked in Utah County. Dark and light-amber onyx has been quarried near Pelican Point on Utah Lake (No. 10), and beautiful translucent yellow, orange, buff, and white onyx has been mined near Lehi (No. 9). In Tooele County, white, pink, lavender, and yellow onyx has been produced from veins up to 4500 feet long in the Cedar Mountains (No. 4) south of Low. Onyx has been quarried near Grantsville (No. 5), Tooele County, and used for terrazzo, chicken grit, and stucco, as well as for ornamental purposes (Sinkankas, 1959, p. 556).

OPAL

Opal is an amorphous mineral; that is, it has no definite crystalline structure. It is deposited in cavities and cracks as a gelatinous form of silica (quartz) that loses some of its water content upon hardening. Opal occurs in igneous, metamorphic, and sedimentary rocks, and it is often found associated with volcanic activity. The mineral is moderately hard, transparent to opaque, and is white, or one of a number of colors. Precious opal has an internal play of delicate colors; common opal may be colored but it does not exhibit these internal reflections. Opal is frequently found as a replacement material in fossilized wood. An opalized wood field along the Colorado River Valley extends from western Colorado into eastern Utah (No. 42) (Sinkankas, 1959, p. 116). Another deposit of "bubble opal" is found about 12 miles northeast of Milford in a hot spring deposit (No. 22 -A) (Howell, 1986, p. 3). This is adjacent to Roosevelt geothermal steam-producing wells. Permission to collect at this area is required; contact the Utah State Federation of Gem and Mineralogical Societies (see address on page 16). Opal also has been reported from several metal mines in the state.

QUARTZ

Quartz, an oxide of silicon, is the most common of minerals and occurs in nearly every rock type. It is hard, may be transparent, translucent, or opaque, and commonly is colorless or white, although it may be any color when impure. Quartz can be separated into two categories: phenocrystalline or vitreous (glassy) varieties and cryptocrystalline varieties. Phenocrystalline quartz has a luster similar to broken glass, and individual crystals can be distinguished with the unaided eye; selected material is faceted as gems. Cryptocrystalline quartz is massive and the indistinct crystalline structure can be seen only with a microscope; several varieties are used for ornamental purposes or cut as cabochons.

Two phenocrystalline varieties have been produced in Utah, amethyst and smoky quartz. *Amethyst* crystals are colored violet or purple, probably by the presence of manganese. Small quantities of amethyst have been produced in the Dugway area, in northwestern Utah (Ball,

1948, p. 548); in the La Sal Mountains, in southeastern Utah (No. 46); and in the San Rafael Swell, in Emery County (Ball, 1943, p. 1520). *Smoky quartz* crystals are shades of yellow, brown, or nearly black. Pockets of lustrous dark smoky quartz crystals are present in pegmatites of the Mineral Mountains (No. 22), eastern Beaver County. Gem-grade material from this area has been satisfactorily faceted (Sinkankas, 1959, p. 377).

Cryptocrystalline varieties that have been produced in Utah include several forms of chalcedony, jasper and silicified wood and bone. *Chalcedony* lines or fills rock cavities. It was deposited from aqueous solutions and may contain some opal. Common chalcedony has a waxy luster, is transparent or translucent, is dull gray, blue, brown, or white, and often is botryoidal or mammillary in shape. *Agate*, or variegated chalcedony, is the more colorful and more sought-after variety, due to various colorful inclusions. It is a common constituent of many gravel deposits. The contrasting colors of agate may be banded, irregularly clouded, or distributed throughout the mass. Distinctive agate patterns are referred to by popular names: visible impurities, generally manganese oxide, form the moss-like patterns in moss agate; distinct angular bands are characteristic of fortification agate; and impurities which take on feathery shapes are typical of plume agate. *Jasper*, a variety of impure opaque cryptocrystalline quartz, is red, and less commonly yellow, blue, or green. The coloring material typically is iron. *Petrified wood* is a term loosely applied to fossil wood that has been replaced by mineral matter, commonly some form of silica. Wood that has been mineralized by a variety of quartz, such as agate or jasper, properly should be termed silicified wood. It is generally used for ornamental objects, such as bookends, table tops, and rarely as a unique building stone. Most of it occurs in the Petrified Forest and Shinarump Members of the Triassic Chinle Formation.

Dinosaur bone, likewise, is often replaced by varieties of quartz. Agatized bone has been cut as cabochons and used for ornamental objects. Most dinosaur bone occurs in the Jurassic Brushy Basin Member of the Morrison Formation. Unfortunately, many localities have been picked clean of colorful dinosaur bone. It is illegal to collect any dinosaur bone not on private land without an appropriate state or federal permit.

Different varieties of cryptocrystalline quartz occur together in many places. For this reason, they will be discussed by county and deposit, rather than by variety.

Juab County: Agate and jasper are present on the north slope of the Drum Mountains (No. 16) (Sinkankas, 1959, p. 376); moss agate, plume agate, and jasper are reported from near Jericho (No. 17) (Ball, 1948, p. 547; Sinkankas, 1958, p. 376); fine fortification agate occurs in seams and veins in low hills about 13 miles south of Levan (No. 18) (Sinkankas, 1959, p. 376).

Beaver County: Black agate with blue bands has been found in Blue Valley, south of Beaver



STAY OUT OF MINES UNLESS
YOU HAVE SPECIAL PERMISSION.



STAY AWAY
FROM MINE EQUIPMENT.

(No. 23) (Sinkankas, 1959, p. 376-377). *Iron County*: Excellent red and yellow moss agate is present in the area surrounding Cedar Breaks National Monument (No. 30); chalcedony geodes, up to 2 feet in diameter, occur in the vicinity of Newcastle (No. 24) (Sinkankas, 1959, p. 377). *Washington County*: Agate and petrified wood are present northwest of Castle Cliff Station in the upper reaches of Beaver Dam Wash (No. 25) (Sinkankas, 1959, p. 510); common gray chalcedony occurs as vein fillings and geodes in basaltic rocks near the town of Central (No. 26). Over 500 pounds of material were produced from one basalt cavity (Sinkankas, 1959, p. 377). *Kane County*: Petrified wood has been reported in the vicinity of Kanab (No. 28); agate and petrified wood are present near Orderville (No. 29) (Hartwell and Waters, 1958). *Garfield County*: Agate, agatized wood, and dinosaur bone are reported from the vicinity of Escalante (No. 33) (Thomson and others, 1956); petrified logs, some measuring from 10 to 12 feet in diameter, are abundant in the Circle Cliffs area (No. 34). Reportedly this is one of the finest petrified forests in the country (Sinkankas, 1959, p. 377). *Wayne County*: Agate, jasper, dinosaur bone, and petrified wood are present in the vicinity of Torrey (No. 35) (Thomson and others, 1956); petrified wood and small but fine agate pebbles are scattered over several square miles west of Hanksville (No. 37) (Sinkankas, 1959, p. 376). *Emery County*: Agate has been collected from the Castle Dale area (No. 39) (Hartwell and Waters, 1958); chalcedony, agate, jasper, silicified wood, and dinosaur bone are present in the Jurassic Morrison Formation about 5 miles south of Woodside (No. 40), and in the San Rafael Swell (No. 38) 30 miles southwest of Green River (Sinkankas, 1959, p. 376). *Grand County*: Jasper, agate, and dinosaur bone are reported from the vicinity of Thompson (No. 41) (Hartwell and Blankenbaker, 1958); agate, chalcedony, petrified wood, and silicified dinosaur bone occur 5 miles north of Moab (No. 45) (Sinkankas, 1959, p. 376); jasper, petrified logs up to a foot in diameter, agatized clams almost 5 inches long, and silicified dinosaur bone are present in the hills along the Colorado River near Cisco (No. 43) (Sinkankas, 1959, p. 376); extensive beds of red, pink, and flesh-and-salmon-colored agate are 7 miles south of Cisco (No. 44) (Kunz, 1893, p. 774).



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SUDDEN SUMMER STORMS.

RHYOLITE

Rhyolite is a fine-grained volcanic rock primarily composed of orthoclase feldspar and quartz. When porous, rhyolites absorb water that contains oxides of manganese and iron; recurrent waves of infiltration produce colorful banded patterns in shades of cream, brown, red, and yellow. The bands, which are seen when the rock is broken open, parallel the exterior planes of the rhyolite blocks and are curved toward the interior. The rock is called banded

rhyolite, or more popularly, "wonderstone." It is used for making coarse ornaments, such as bookends, and less commonly for making cabochons. Boulders of good quality "wonderstone" are present in the upper reaches of Beaver Dam Wash (No. 25) near Motoqua, western Washington County (Sinkankas, 1959, p. 509-510). Wonderstone formed in sandstone layers of the Shinarump Conglomerate Member of the Chinle Formation is found near Gunlock in Washington County, and near Kanab in Kane County (Lehi F. Hintze, personal communication).



FILL UP HOLES
BEFORE YOU LEAVE.

SCHEELITE

Scheelite, calcium tungstate, is a valuable ore mineral of tungsten that occurs in pegmatites, contact metamorphic deposits, and in veins. Transparent scheelite can be cut into moderately hard, brilliant gems that resemble diamonds. Deposits of the mineral have been mined in the Mineral Mountains (No. 22), eastern Beaver County. Rich orange-brown scheelite crystals with clear tips are present in the area and Sinkankas (1959, p. 460) reports that he cut an 8-carat stone from gem-quality material.

TOPAZ

Topaz, an aluminum fluosilicate, occurs as crystals that are very hard, transparent, and occur in a wide range of color. Numerous topaz crystals are present at Topaz Mountain amphitheater (No. 15), a favorite collecting locality since 1884. The mineral occurs with quartz, fluorite, garnet, and beryl in lithophysal cavities of Tertiary Topaz Mountain Rhyolite, the uppermost volcanic unit in the Thomas Range (Erickson, 1963, p. 30-32). Well-developed crystals weather out of the rhyolite and are scattered over the ground and concentrated in washes. They are clear and colorless and, in places, sherry-brown before exposure to the sun. Most specimens are a fraction of an inch in length and flawless cut stones seldom weigh more than several carats. In the northeastern part of the Thomas Range (No. 12) topaz is found in a rhyolite similar to that at the Topaz Mountain amphitheater. Gray opaque crystals from this locality measure as much as 2 inches in length and clear specimens measure as much as 1 inch (Sinkankas, 1959, p. 102-103; Patton, 1908, p. 177-192). Topaz, associated with garnet and beryl, also is present in Tertiary rhyolite flows on the west side of Spor Mountain (No. 13) in the Thomas Range (Staatz and Griffiths, 1961, p. 943). Permission to collect at Topaz Mountain must be obtained from the Utah State Federation of Gem and Mineral Societies (see address on page 16).

VARISCITE

Variscite, a hydrated aluminum phosphate, is deposited in breccias or cavities where phosphatic meteoric water reacts with aluminous rocks at or near the surface. It occurs as crusts, rounded nodules, veinlets, and fine-grained masses. Since its discovery in America it has, at one time or another, been called amatrice, utahlite, lucinite, and chlor-utahlite. Variscite is a soft, translucent to opaque, green to colorless mineral that generally occurs with white phosphatic material, chert, and chalcedony in a dark- to light-green matrix stone of intricate and varying patterns. Although variscite resembles turquoise and is used similarly in jewelry, it is softer and does not wear as well. Significant quantities of variscite have been mined in Utah (Sterrett, 1912, p. 1077).

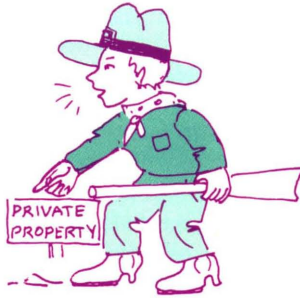
At the Utahlite mine (No. 8) west of Fairfield, Utah County, variscite and associated rare phosphate minerals were discovered in 1894, in nodules and concretions in brecciated zones in a black limestone (Sinkankas, 1959, p. 231-232). At the Amatrice mine (No. 6), eastern Tooele County, fissured and brecciated zones in limestone and quartzite contain variscite (Sinkankas, 1959, p. 233-234; Doelling, 1980a). The Lucin deposit (No. 2) in western Box Elder County was first opened for gold but has produced

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REQUIRED FOR "LARGE" AMOUNTS.*





MAKE SURE THE LAND IS OPEN FOR COLLECTING.



variscite since 1909. Balls, nodules, veins, and seams of variscite and associated phosphates occur in sheared and brecciated zones in a carboniferous quartzite. Small cavities contain perfectly formed crystals of variscite which, although too small to be used as gems, are valued for their uniqueness (Sinkankas, 1959, p. 232-233).

Two other variscite deposits

have been reported in Box Elder County, one near Promontory (No. 3) (Ball, 1971, p. 1401) and the other near Snowville (No. 1) (Foshag and others, 1954, p. 605; Doelling, 1980b).

OTHER GEM MATERIALS

Other gem materials, such as barite nodules, tourmaline, and willemite, have been reported in Utah, but information about specific deposits is incomplete. The possibility still exists that new gem discoveries will be made in unexploited areas of Utah.

INFORMATION FOR GEMSTONE COLLECTORS

FREE-USE COLLECTION

In general, the casual rockhound or gemstone collector may collect small amounts of gemstones, and rocks from unrestricted federal and state lands in Utah without obtaining a special permit if collection is made for personal, non-commercial purposes. (Restricted lands are listed under Land Ownership.)

Collection in large quantities or for commercial purposes requires obtaining a permit, lease, or license from the agencies administering the land on which collection is made. On federal lands, collection in large quantities must be by purchase under acts governing the disposition of materials. Collection in any case "must be accomplished in a manner that avoids unnecessary soil erosion or needless damage to the land or the resources."

Limited quantities of petrified wood may be collected on Bureau of Land Management land without permit if for personal, non-commercial purposes. The Department of Interior has set a daily limit of 25 pounds or one piece, on BLM unrestricted land. The annual limit for recreational collectors is 250 pounds. On state lands, a permit, obtainable from the Utah Division of State History, is required to collect any petrified wood, fossils, or archaeological artifacts.

This free-use collection rule applies primarily to lands administered by the U.S. Bureau of Land Management (comprising almost half of Utah's land area), the U.S. Bureau of Reclamation (except on lands adjoining constructed reservoirs), and the U.S. Forest Service.

LAND OWNERSHIP

It is essential to determine ownership of the land before starting to hunt for gemstones, fossils, or other minerals. The U.S. Bureau of Land Management has maps which show ownership of land in Utah. Information can be obtained from any of the five BLM district offices in Utah: Salt Lake City, State Office, 324 South State Street, Salt Lake City, Utah, 84111-2303, phone 801-524-5348; Vernal, District Office, 170 South 500 East, Vernal, Utah, 84078, phone 801-789-1362; Cedar City, District Office, 176 East DL Sargent Drive, phone 801-586-2401; Richfield, District Office, P.O. Box 768, Richfield, Utah, 84701, phone 801-896-8221; Moab, District Office, P.O. Box 970, Moab, Utah, 84532, phone 801-259-6111.

Over two-thirds of the land of Utah is under the jurisdiction of various agencies of the federal government (Bureau of Land Management, Forest Service, Military and U.S. Bureau of Reclamation); 7½ percent is controlled by the State of Utah and about the same amount is tribal lands, with about 20 percent in private ownership.

State lands are generally sections 2, 16, 32, and 36 in each township, but there are exceptions and collectors should contact a representative of the Division of State Lands and Forestry at 3 Triad Center, Suite 320, 355 West North Temple, Salt Lake City, Utah 84180-1203, phone 801-538-5508 to determine land ownership.

RESTRICTED LANDS

Collecting of any minerals or fossils is prohibited on certain lands including: Indian reservations, military reserves, national parks, national monuments, national recreation areas, state parks, Bureau of Land Management recreation sites, recreation areas developed by local governmental units and organizations where such lands were acquired under the Recreation and Public Purposes Act, and officially designated wilderness areas.

On private land, the collector must always get the permission of the owner before removing gemstones or other material.

No artifacts may be collected on any public land; on private land permission is required.

AVAILABILITY OF MAPS AND GENERAL INFORMATION

FEDERAL AGENCIES

The U.S. Geological Survey (Public Inquiries Office, 125 South State Street, Salt Lake City, Utah 84138, phone 801-524-5652) has topographic maps covering the entire state. These maps show contour lines of equal elevation, and delineate ridges and valleys, roads, and mines on a scale that makes these features easy to find. The USGS also has geologic maps and publications describing many mining districts and other areas of interest to mineral collectors. The U.S. Park Service can provide maps and information about sources and fees in national parks (National Park Service, 125 South State Street, Salt Lake City, Utah 84138, phone 801-524-4165). The U.S. Bureau of Land Management State Office (324 South State Street, Salt Lake City, Utah, 84111-2303, phone 801-524-5348) has maps showing surface and mineral ownership, roads, trails and recreation areas.

For information about roads, facilities and regulations in National Forests, contact the Forest Service, Recreation Information, 125 South State Street, Salt Lake City, Utah 84111, phone 801-942-4059.

STATE AGENCIES

The Utah Geological and Mineral Survey (606 Black Hawk Way, Salt Lake City, Utah 84108, phone 801-581-6831) has geologic maps of many parts of the state and publications on some of the mineralogical areas. The Utah Division of Parks and Recreation (1636 West North Temple, Room 116, Salt Lake City, Utah 841165, phone 801-533-6012) and the Utah Travel Council (Council Hall, Capitol Hill, Salt Lake City, Utah 84114, phone, 801-533-5681) have maps and information about state parks and places of interest in the state.

While no collecting may be done in any of the parks, visiting them is recommended as a way of learning about the geology and for enjoying some of the most exotic natural scenery in the Southwest.



**ASK SOMEONE
WHO HAS BEEN THERE.**



*A PICK CAN BE USED TO
BREAK OUT THE SPECIMENS
YOU WANT—BUT BE CAREFUL!*



*USE A MAGNIFYING GLASS
TO STUDY SMALL SPECIMENS.*



*WEAR PROTECTIVE GOGGLES
WHEN USING A PICK OR HAMMER.*



*A METAL DETECTOR IS SOMETIMES
USED TO FIND BURIED MATERIALS.*

EQUIPMENT FOR COLLECTORS

The proper preparation and equipment can make the difference between a successful, satisfying collecting trip and frustration or disaster.

★ It is important to have the proper clothing for a desert climate, which can mean extremes of temperature, especially in the summer time. Protection may be needed from sudden rains and floods, biting insects, sunburn, and freezing nights.

★ Always carry plenty of extra drinking water, a first aid kit and extra food and bedding in case of an unexpected overnight stay in the desert or mountains.

★ After a rain, ephemeral ponds and lakes may change dry roads into treacherous bogs. Never park or camp in a stream gully, even a dry one. A sudden summer storm upslope may send a flash flood down the gully and carry away your car along with boulders, trees, and bridges.

★ Your car should be equipped with a spare can of gas, a shovel, at least one good spare tire, and the equipment to change it. Many people who travel off the paved roads also carry a comealong or handyman jack to get a car out of bad spots. If going into areas with poorly maintained roads, it is not a bad idea to have a CB radio to call for help in case of a breakdown or accident and to leave word with a friend or relative about your itinerary.

If possible, discuss the collecting area with someone who has already been there (check with the local filling station or nearest rockhound club, see page 16). Club members can warn you about potential problems as well as advise you about the best spot for collecting, and they can tell you where to get the necessary permission to do the collecting. Obtain and study available maps before you start; plan your route, and let someone else know your route and schedule so that help can be sent if you are lost, hurt, or your car becomes disabled. Never go alone!

For the actual collecting of gemstones and other minerals, wear protective equipment to avoid injury: safety glasses, safety shoes or boots, hard-hats, and gloves. A tempered steel hammer or a cold chisel are needed to break the rocks and free the specimens. A small sledge hammer is useful for breaking larger rocks. Never use a tempered hammer with a cold chisel or other hardened steel tool. A hand lens or magnifying glass is useful for examining small crystals.

There are many books available at bookstores and libraries which describe the equipment needed for collecting minerals, where to get it, how to care for it, and recommended collecting techniques.

Local rock and lapidary supply shops listed in the local telephone directory may also sell publications which describe local collecting areas in the state. Some of these contain a wealth of valuable information.

There are also books to help identify the minerals; those with colored pictures are most helpful although few specimens found in the field are as large or attractive as those shown in the pictures. The Utah Museum of Natural History at the University of Utah in Salt Lake City has a very fine mineral collection useful for learning to identify the gemstones and other minerals. The other colleges and universities in the state also have collections that are very informative and well worth studying.

CAUTIONS: DON'T BECOME A STATISTIC

When breaking rocks or climbing steep slopes, watch out for other people, particularly small children and inexperienced adults. Never work directly above or below anyone on a steep slope, or near vertical walls where there is danger of falling rocks.

Do not enter abandoned mines and buildings or climb on heavy equipment; most are unsafe. David A. Zegeer, Assistant Secretary for Mine Safety and Health, (MSHA) emphasized that families, amateur prospectors, hikers and others should become familiar with the potential dangers associated with these types of properties:

- ★ Abandoned properties may be especially dangerous during the spring when thawing from winter storms occurs and there is a danger of falling rock and loose dirt associated with pits and quarries.
- ★ Additionally, idle or intermittently operated underground mines may have oxygen-deficient air, an explosive atmosphere, or poor roof conditions. Everyone must stay away from these life-threatening properties.

MSHA accident reports indicate the ages of the victims at abandoned mining properties have ranged from 5 to 66 years old (Deseret News, 5/30/86).

Do not work near deep water in a pond, quarry or mine shaft. A slip or fall could result in injury or even death by drowning.

Be careful and have a great trip!



BEWARE OF FALLING ROCKS.



KEEP AN EYE ON YOUR CHILDREN.

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**Out of print. Available in some libraries.*



WATCH FOR FLASHFLOODS IN NARROW CANYONS.

GROUP 'OUTINGS'
CAN BE LOTS OF FUN!



ROCKHOUND, GEM AND MINERAL CLUBS IN UTAH, 1987

Beehive Rock and Gem Club, P.O. Box 1011, Ogden, Utah 84402. Meets last Thursday of each month, Weber County Library, 2464 Jefferson Avenue, Ogden, Utah.

Francis Peak Gem and Mineral Society, c/o Marvin Sandmire, 120 East 1000 North, Centerville, Utah 84014. Meets first Tuesday, 7:30 p.m. at Layton VFW Lodge, 1389 N. Main, Layton, Utah.

**Golden Spike Gem & Mineral Society*, c/o Dale A. Leatham, President, 2687 North 200 East, North Ogden, Utah 84404. Meets 3rd Wednesday of each month, 7:30 pm, except August and December, Golden Hours Center, 650 25th Street, Ogden, Utah.

**Mineral Collectors of Utah*, c/o Phil Richardson, President, 1415 East Murphy Lane, Salt Lake City, Utah 84106. Publishes bi-monthly newsletter, Crystalith.

**Mineralogical Society of Utah P.O.*, c/o Marvin Bate, President, 3700 West 4195 South, West Valley City, Utah 84120. Meets 2nd Friday, 7:30 pm, Room 102 Business Lecture Bldg., University of Utah. Publishes monthly newsletter, Mineralscoop. Visitors welcome.

Moab Points & Pebbles Rock Club, 486 Locust Lane, Moab, Utah 84532. Meets 2nd Thursday 7:30 pm, 35 W. Center St., Moab, Utah.

**Timpanogos Gem & Mineral Society*, P.O. Box 65, Provo, Utah 84601. Meets 7:30 pm, last Thursday, Orem City Center, Orem, Utah.

Tooele Gem & Mineral Society, P.O. Box 348, Tooele, Utah 84074. Organized in 1964. Meets 2nd Tuesday, 7:30 pm, Credit Union, Tooele Army Depot.

Utah State Federation of Gem and Mineralogical Societies, c/o Jim Bean, President, 213 East Leslie Ave., Salt Lake City, Utah 84115. This organization handles all of the leases of special collecting areas owned by the various clubs. Permission must be obtained from the Federation before collecting on these areas: Bubble Opal (Beaver County), Topaz Amphitheater (Juab County).

**Wasatch Gem Society*, c/o Dell E. Beckstead, President, 1887 West 11800 South, Riverton, Utah 84065. Meets 2nd Monday, 7:30 pm, Senior Citizens Recreation Center 237 S. 1000 East, Salt Lake City, Utah.

**Note: The members of some rockhound clubs have offered to answer questions about access to collecting areas in their vicinity, road conditions, and the best places to go.*

ROCKHOUND CODE OF ETHICS

In an effort to keep land open for rockhounding, the American Federation of Mineralogical Societies has adopted a code of ethics. While specifically for rockhounds, portions of the code apply equally well to everybody else, too. We invite you to examine the rockhound's code and join us in trying to preserve access to nature's wonders.

I will respect both private and public property and will do no collecting on privately owned land without the owner's permission.

I will keep informed of all laws, regulations, or rules governing collecting on public lands and will observe them. I am aware that it is illegal to excavate, collect, injure or destroy any historic or prehistoric ruins, monuments, or objects made by prehistoric peoples in Utah.

I will, to the best of my ability, ascertain the boundary lines of property on which I plan to collect. I will use no firearms or blasting material in collecting areas.

I will cause no willful damage to property of any kind —fences, signs, buildings, etc.

I will leave all gates as found.

I will build fires in designated or safe places only, and will be certain they are completely extinguished before leaving the area.

I will discard no burning material—matches, cigarettes, etc.

I will not contaminate wells, creeks or other water supplies.

I will cause no willful damage to collecting areas and will take home only what I can reasonably use.

I will support the rockhound project H.E.L.P. (Help Eliminate Litter, Please) and will leave all collecting areas devoid of litter, regardless of how found. (Several areas have been closed to rockhounds because a few people left their garbage behind.)

I will cooperate with field trip leaders and those designated in authority in all collecting areas.

I will report to my club or federation officers, Bureau of Land Management, or other proper authorities, any deposit of petrified wood or other material on public lands which should be protected for the enjoyment of future generations.

I will appreciate and protect our heritage of natural resources.

I will observe the "Golden Rule," will use "Good Outdoor Manners," and will at all times conduct myself in a manner which will add to the stature and public image of rockhounds everywhere.



UTAH DEPARTMENT OF NATURAL RESOURCES

Utah Geological and Mineral Survey

606 Black Hawk Way

Salt Lake City, UT 84108-1280

*SEMIPRECIOUS
GEMSTONES AND
ORNAMENTAL STONES
IN UTAH*

