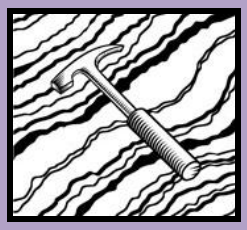
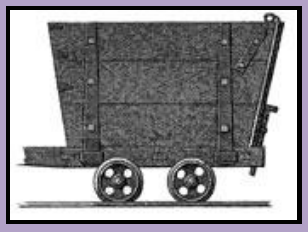
Gem Hunter – The Prospector's Newsletter

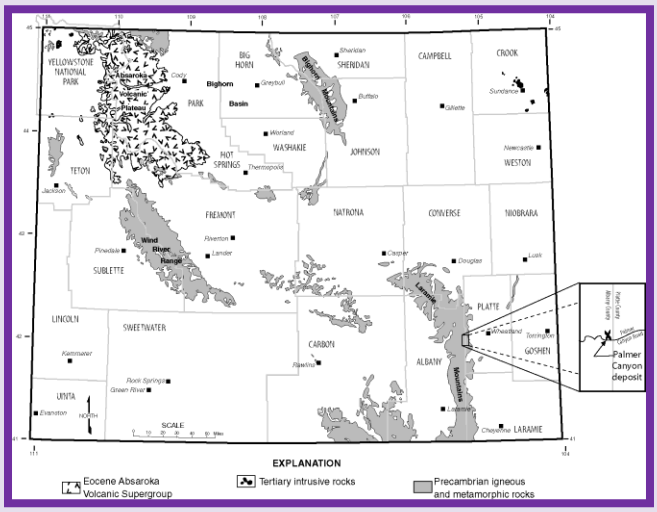




Vol 2, No 4, April, 2010 *Newsletter from the GemHunter*

DISCOVERY OF GIANT GEMSTONE DEPOSITS

After discovering iolite, ruby, sapphire and kyanite at Palmer Canyon in 1996, I began searching for other places with similar geology. I was looking large blocks of mica schist and/or vermiculite where kyanite, andalusite, sillimanite and/or cordierite had been reported. The areas I immediately highlighted were Grizzly Creek, Owen Creek and West Cooney Hills in the Laramie Mountains and Copper Mountain in the Owl Creek Mountains. Then there was the Laramie Anorthosite-Syenite Complex – a highly aluminous igneous batholith covering more than 350 mi^2. These were not the only targets, just the more obvious ones. I particularly wanted to get to Grizzly Creek because some ruby had apparently been found, but I didn't have easy access. *Anyone interested in following up on these deposits – please note that I do not keep information on claims or ownership – so you will have to get this information. The BLM provides a website with mining claim information at http://www.geocommunicator.gov/blmMap/Map.jsp.*



Another interesting area was the Laramie anorthosite-syenite complex further south near Laramie that was described to have considerable cordierite and had been investigated by many researchers from several universities – although no one ever mentioned gem iolite. But the same could be said of the peridot (http://gemhunter.webs.com/peridotolivine.htm) I had discovered in 1997 the Leucite Hills (http://leucitehills.blogspot.com), which also had been investigated by several universities with no mention of gem material. The anorthosite complex had already produced some excellent gem-quality labradorite with great 'fire', but like all gemstones found in Wyoming, even the labradorite remained unevaluated and overlooked. In fact, two rockhounds from Torrington had collected several excellent gem quality labradorite specimens from the road bed material in Albany County 11 and 12 running from Sybille Canyon.

The GemHunter Newsletter
W. Dan Hausel (DiamondProspector@live.com)
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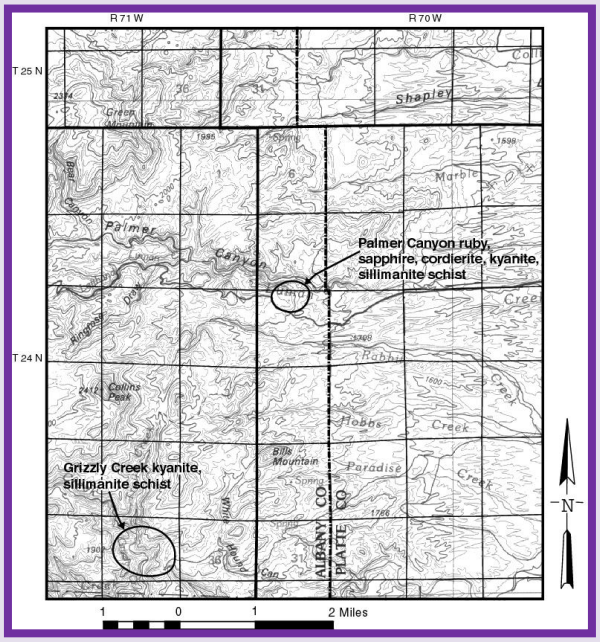
In a book on gemstones (Hausel and Sutherland, 2000) Wayne and I mentioned these deposits, but we had not yet conducted any field investigations. It became more and more apparent with each discovery (http://geologicalconsultant.webs.com/discoveries.htm) that essentially all researchers had been walking around with blinders in the field.

Mineralogy

I was looking for gem-quality iolite, as well as corundum (ruby and sapphire) and kyanite. I was hopeful other gems might be found such as almandine, andalusite, chiastolite, cat's eye sillimanite and sillimanite and anyone searching these areas should study the raw forms of all of these gems, as they are likely to be found. Iolite is the gem-variety of cordierite and also referred to as *dichroite* and *water sapphire.* Some people have compared it to tanzanite due to its spectacular blue to violet color.

Cordierite {$(Mg,Fe)_2Al_4Si_5O_{18}$} occurs in a couple of different crystal habits (forms) such as short orthorhombic (pseudohexagonal) prismatic crystals with rectangular cross-sections. Another common habit is elliptical to rounded porphyroblasts (large crystals) or nodules. The mineral is brittle with conchoidal fracture and may have poor cleavage parallel to the b-axis b{010} and parting parallel to c-axis c{001}. If you are unfamiliar with crystal habits, cleavage and axes, don't worry, it takes time to get familiar with these. Visit the Mindat website as they have great 3-D graphics of crystal forms (http://www.mindat.org/min-1128.html). When looking for iolite – look for clear, glassy rounded material in mica schists and gneisses that may look like massive amethyst, tanzanite, or blue sapphire. Nearly all iolite I found also had a very thin coating (reaction rim) of greenish mica.

Cordierite (iolite) has a hardness of 7 to 7.5 and is transparent to translucent with vitreous luster (Hurlbut and Switzer, 1979). The hardness and luster are perfect for high-quality and lasting gemstones. According to Sinkankas (1964), the gem variety of cordierite is *iolite*. The word *iolite* is derived from the Greek word *ion*, meaning *violet*, the common color of gem-quality cordierite. The color of cordierite may vary from yellow to green to blue to violet, but transparent blue and violet-blue grains are sought for gems. No matter what the color of the stone, as long as it is attractive, it can be marketed as proven by the recent popularity of former industrial diamonds that include canary, cognac, champagne, black and chocolate. When it comes to gemstones, much of the value is due to marketing.

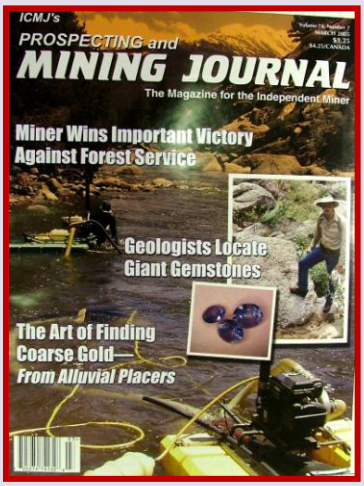


Cordierite is also referred to as *dichorite* due to strong pronounced pleochroism resulting in gems that change shades of color depending on the angle viewed and intensity and typle of light source. In one direction, iolite will appear sapphire-blue; when rotated, it may be grayish-blue to gray. Wyoming iolite includes transparent violet-blue nodules, resorbed crystals, rounded black, translucent to opaque grains, and brownish rounded resorbed grains that are replaced by mica and quartz. These latter grains have been referred to as *'peanuts'* or '*almonds'* due to distinct, rounded,

morphology that makes them look like peanuts weathering out of metagreywacke at South Pass.

GRIZZLY CREEK

Because of geology, Grizzly Creek became my next iolite target. Deep down inside, I felt this was going to produce some gems, but when I finally was able to get access through a private ranch in 2004, I was amazed that this deposit had been missed. I discovered very large masses of gem-quality iolite scattered around on the ground, as well as enormous quantities of gem-grade kyanite. So great was this discovery that a photo taken of me by my field assistant ended up on the cover of the *ICMJ's Prospecting and Mining Journal*. Although my investigation was only preliminary, it was apparent this was a world-class colored gemstone deposit that needed detailed mapping and sampling to properly appraise as there were likely other gemstones including some of the largest ever found! The cordierite was surrounded by billions of carats of sky-blue kyanite with some sillimanite schist that have trace corundum (ruby). The deposit lies in a 300 by 5000 foot belt of metapelite (mica schist) that is only partially explored at the surface. A collector's quarry reportedly yielded a couple of specimens of ruby (George Snyder, personal communication). But very little corundum was found.



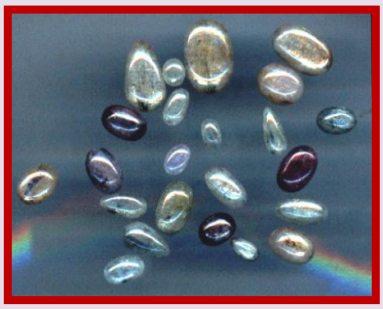
Cover of ICMJ's Prospecting and Mining Journal, March 2005 showing the first faceted iolites from Wyoming with me standing adjacent to boulder filled with several thousand carats of gem kyanite and some ruby.

Grizzly Creek is accessed from Palmer Canyon road 4 miles east of the Palmer Canyon deposit at the base of the Laramie Range. Following discovery of the Palmer Canyon iolite (Hausel, 1998b), it became clear that similar deposits were likely to be found elsewhere. The thermal metamorphic event that produced the masses of iolite at Palmer Canyon was relatively widespread in the Laramie Range in southeastern Wyoming. An earlier metamorphic event produced large crystals of kyanite in the aluminum-rich rocks. The presence of kyanite could possibly represent an indicator mineral of sorts in a search for alumino-silicate (andalusite, iolite, kyanite, sillimanite) and alumina (ruby, sapphire) gemstones in this region.

Kyanite (from Grizzly Creek) has distinct rectangular shaped sky-blue prisms. Notable is its hardness. With a pocketknife it can be scratched parallel to the c-axis (long direction) but cannot be scratched parallel to the perpendicular b-axis.

Kyanite at Grizzly Creek is high quality and there are billions of carats of this material. It is cabochon grade and much has very pleasing, sky-blue color with some pink and golden specimens. But the iolite I found nearby was incredible. It occurred as large and giant replacement masses of the schist. This deposit is one of the largest iolite deposits in the world (if not the largest) and if ever explored, developed and marketed, it would likely yield several $billion in gemstones.

The first kyanite gemstones from Wyoming. These were discovered by the author at Palmer Canyon, Grizzly Creek, and the West Cooney Hills.

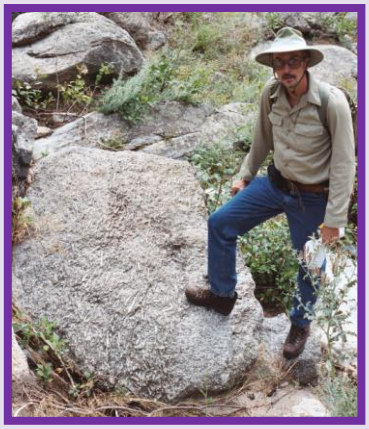


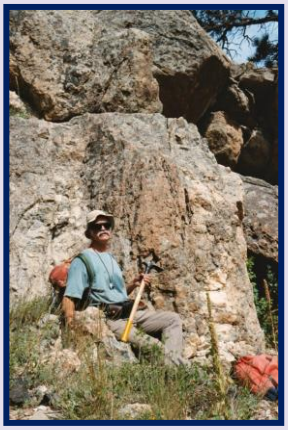
Variety of kyanite cabochons from Grizzly Creek (photo courtesy of Vic Norris).

During reconnaissance, I recovered the largest piece of gem-quality iolite in the world lying on the ground that I named the *Grizzly Creek Blue Giant* - a football-size transparent gemstone of 24,150 carats. The gem was placed on exhibit on first floor of the Wyoming Geological Survey building, but such a rare specimen should be in a more secure location. I have little doubt that if I would have been able to continue my research, I would have recovered stones weighing several hundred thousand carats, and likely a few weighing more than a million carats. One such gemstone was too large to recover, was about the size of a Volkswagen, and sits in the outcrop!

The *Blue Giant* was dwarfed by masses of iolite in outcrop that will require quarrying operations to recover. Some are likely worth $1 to $tens of millions! In outcrop, the iolite is weakly iron-stained with excellent blue color and transparency on fresh surfaces. It is not known how much if any of this material has been destroyed by mylonitization (granulation). For example, some specimens collected at Palmer Canyon showed distinct mylonitic to ultramylonitic texture in thin section that resulted in a cloudy, light-blue and glassy material of poor quality due to granulation over the past 2 billion years.

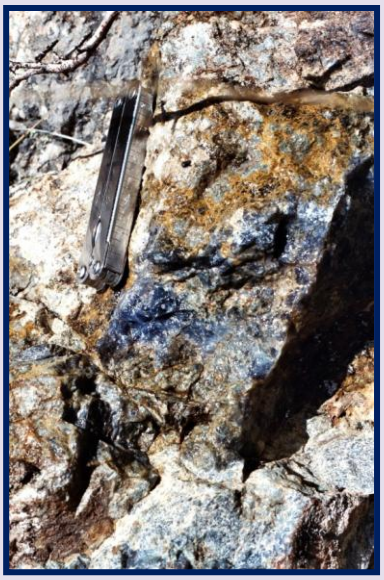
The largest iolite gem in the world – the 'Grizzly Creek Blue Giant'. This 24,150 carat stone, although highly fractured, the gem material is high quality and could produce thousands of carats of gemstones. This stone, however, is dwarfed by specimens in outcrop at Grizzly Creek.





<u>Left</u>. The author with foot on boulder containing hundreds of pencil-shaped (prisms) gem-quality kyanite crystals at Grizzly Creek.

<u>Right</u>, Wayne Sutherland sits in front of an outcrop of massive iolite that likely would yield a massive gemstone of several hundred thousand to a few million carats. Nearly the entire outcrop in this photo is one massive piece of iolite.



***Far left** - Blue color of iolite in weathered outcrop behind rock hammer. **Left** - Fresh broken surface exposing the high-quality gemstone.*

Below – some Wyoming iolites with ruby.

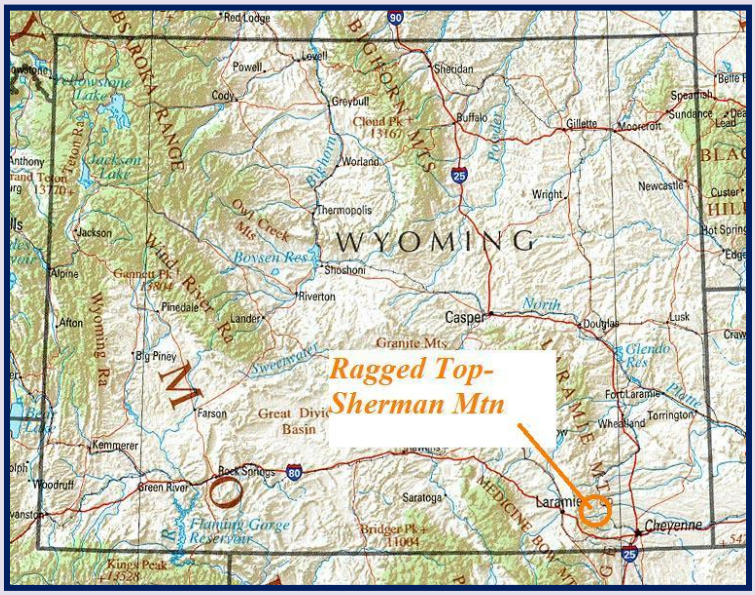
LARMIE ANORTHOSITE– THE LARGEST COLORED GEMSTONE DEPOSIT ON EARTH?

After the discovery of the Palmer Canyon and Grizzly Creek iolite deposits, I came across a very interesting reference while doing research for another gemstone book (Hausel, W.D., and Sutherland, W.M., 2006, ***World Gemstones: Geology, Mineralogy, Gemology & Exploration***: WSGS Mineral Report MR06-1, 363 p). Up to this point, I thought I had found the first gem iolite in Wyoming, but apparently some had already found.

In his book on *Gemstones in the US*, John Sinkankas (1959, p. 475) wrote: *"iolite is a widespread constituent of schistose and gneissic rocks in the Laramie Range of Albany County. One estimate has placed the quantity available at thousands of tons. Specimens from this locality examined by the author are glassy broken fragments of rather light blue color, verging towards grayish; small sections are clear and suitable for faceted gems. It is entirely possible that important amounts of gem quality material will be produced from this area in the future"*. I called Sinkankas and asked him for his field notes, location or any other information. He told me he had no recollection of this occurrence and no information on its location. So, to this day, I do not know if this was in reference to Grizzly Creek, or in reference to another deposit that remained undiscovered. At the time of publication (1959), only one cordierite deposit had been described in the literature in Wyoming. The deposit, known as the Sherman Mountains deposit, lies along the north fork of Horse Creek near Ragged Top Mountain northeast of Laramie and 15 miles south of Palmer Canyon and is accessed from the 9th street road from Laramie, but is almost entirely on private land. In this region, 1.5 billion year old aluminum-rich igneous rocks and some metasedimentary rocks known as metanorite, syenite syenite-diorite gneiss and anorthosite are found. Newhouse and Hagner (1949) and Osterwald and others (1966) reported widespread lenticular to tabular layers of cordierite in metanorite (hypersthene gneiss), gneiss and syenite along the southern margin of the anorthosite complex in sections 13, 14 and 24, T 17N, R 72W and sections 17, 18, 19 and 20, T17N, R71W.

The host rock is described to have as 50-80% cordierite and was never investigated for gemstones, although it is likely this is the deposit referred to by Sinkankas (1959) due to tonnage (*"…thousands of tons…"*) and lies 0.5-mile west of Ragged Top Mountain in a belt 0.3 to 1.2 miles wide and 6 miles long. The host gneiss is highly foliated, intensely folded and contorted.

Howard (1952) described weathered cordierite with dark-brown surfaces that yielded blue or bluish gray massive material on fresh surfaces. The cordierite was described to be colorless in thin section (a thin-section is a piece of rock cut and polished to 0.03 millimeters in thickness so that light can be projected through minerals examined with a petrographic microscope) and from a fraction of a millimeter to 1 mm across. I just had to get out to see this deposit, but was able to obtain only small samples of disseminated cordierite along the margin along the county road. Very little of the deposit was investigated as it was nearly all on private land.



Location map of the Laramie anorthosite-syenite cordierite deposit, Wyoming.

The material I collected was small and granular, but all was very high quality gem material in grains <5 carats in weight. Thus, another major (potentially world-class) gemstone deposit apparently had been overlooked by all previous researchers. The massive portions of this deposit described by Newhouse and Hagner (1949) remain unevaluated for gems and may represent one of the largest, if not the largest, colored gem deposit in the world.

The Sherman-Raggedtop Mountain deposit is apparently scattered over a large area in lenticular to tabular masses in low ridges. It was estimated that the combined deposits have strike lengths of 100 feet or more with a resource of >453,600 tonnes (500,000 tons) of cordierite (Newhouse and Hagner, 1949). In other words, **a potential resource of >2 trillion carats!** How could such deposits continue to be overlooked by researchers and geologists? This one deposit could pay for the outrageous costs for a few months of Obamacare! Think of it in this way. It costs only about $0.5 to $1 to have an iolite gemstone faceted in Sri Lanka. This faceted stone, when placed in jewelry, can sell for $15 to $150/carat. Large iolite gemstones above 10 carats are almost unheard of and will sell for more per carat. And because iolite is so rare, there have been virtually no emphasis on marketing. Yet this stone is sometimes mistaken for tanzanite. When tanzanite was first sold in the US, it brought an average price of only $20/carat. But due to marketing, by 1978, this gem was selling for $1,000/carat!

Sinkankas (1959) indicated that much of the material was gem-quality (if this was the deposit mentioned in his book). This (along with Grizzly Creek) could be one of the greatest discoveries of colored gemstones in the last several decades. For those of you who are geologists, the cordierite in the Complex is interpreted to have formed by replacement of metanorite during emplacement of diorite gneiss (Newhouse and Hagner, 1949). Subbarayuda (1975) described the cordierite in the cordierite-

hypersthene gneiss as contact metamorphosed sedimentary rocks along the edge of the anorthosite batholith. The formation temperature was estimated at 1000°C (Miyashiro, 1957).

Newhouse and Hagner (1949) had initially investigated the deposit for iron and magnesium and did not explore for gemstones. Even though parts of the cordierite and anorthosite was described and investigated in research projects at different universities including the University of Wyoming, no one ever looked at the gem potential.

OTHER DEPOSITS

Cordierite is described in the South Pass greenstone belt in the Wind River Mountains of western Wyoming (Hausel 1991) and in the Copper Mountain supracrustal belt of the Owl Creek Mountains in northwestern Wyoming (Hausel and others, 1985). Cordierite in these two metamorphic belts forms opaque, black to brown, rounded porphyroblasts typically less than 0.5 inch (1.3 cm) across, but much of the cordierite is unexplored.

Abundant placer industrial corundum with some "dark, rich red" rubies (including star rubies) are found in the Big Sandy opening in the southern Wind River Mountains, western Wyoming (Spendlove, 1989). The source of this corundum has not been identified. Detrital corundum is dredged by hobbyists along Grass Creek (a tributary of the Big Sandy) (Joe Sims, personal communication, 2003) and specimens up to 80 carats have been recovered. These show rounding of the crystal edges, which may be due to stream abrasion. Much of the corundum is reddish to reddish-brown, opaque to translucent. Gem material was lacking. But the corundum suggests that there is undiscovered aluminum-rich mica schist and or vermiculite upstream – whether or not these deposits contain gem ruby or iolite, is unknown.

Owen Creek

Another cordierite (iolite) deposit in the northern Laramie Mountains is referred to as Owen Creek (Hausel, 2009). Snyder and others (1989) report kyanite, sillimanite, cordierite and relict staurolite in pelitic schist in this region. This deposit remains unexplored but potentially is another gem iolite occurrence north of Palmer Canyon. Cordierite is also reported at South Pass (Hausel, 1991), Copper Mountain (Hausel and others, 1985), in the Sierra Madre, and in the Powder River Basin (Osterwald and others, 1966). The cordierite occurrences at South Pass were investigated during field mapping of the greenstone belt. I did not observe any gem-quality material in that area. However, I recommend investigations of cordierite at Copper Mountain as this supracrustal belt contains abundant metapelite (alumina-rich rock) that was subjected to similar metamorphic conditions as the Elmer's Rock greenstone belt. The mention of staurolite at Owen Creek could lead to another gem. Staurolite is almost always opaque to translucent, but forms fascinating cruciform crystals that have been made into unique lapidary stones.

EXPLORATION MODEL

Exploration for iolite should focus on regional metamorphic terrains with significant metapelite successions. Such successions were subjected to amphibolite- to granulite-grade metamorphism. The

presence of nearby kyanite, sillimanite, andalusite, chrysoberyl, staurolite and/or almandine garnet signal distinctly aluminous rocks that have been subjected to pressures and temperatures favorable for cordierite, ruby and sapphire. Field examination of mica schists with these alumino-silicates may lead to previously unrecognized gem discoveries. Anorthosite-norite-syenite complexes also are potential targets for magmatic iolite. I was looking forward to conducting detailed investigations on this deposit, Grizzly Creek and the Cedar Rim opals, but my field vehicle was confiscated, so I decided to move on since I no longer had the ability to continue research. Below are just a few photos of some of the iolites (and rubies) faceted from these deposits.

SOME REFERENCES

Dana, E.S., and Ford, W.E., 1949, A textbook of mineralogy, 4th edition, John Wiley and Sons, New York, 851.

Deer, W.A., Howie, R.A., and Zussman, J., 1972, *Rock-Forming Minerals – vol. 1 Ortho-and Ring Silicates*. William Clowes & Sons, Ltd. New York, NY. 333.

Graff, P.J., Sears, J.W., Holden, G.S., and Hausel, W.D., 1982, *Geology of Elmers Rock greenstone belt, Laramie Range, Wyoming*. Geological Survey of Wyoming report of investigations 14.

Hagner, A. F. 1944. *Wyoming vermiculite deposits.* Wyoming State Geological Survey bulletin 34.

Hausel, W.D., 1991. *Economic geology of the South Pass granite-greenstone belt, Wind River Mountains, western Wyoming.* Geological Survey of Wyoming Report of Investigations 44. 129.

Hausel, W.D., 1998b, Field Reconnaissance of the Palmer Canyon corundum-kyanite-cordierite deposit, Laramie Mountains Wyoming: WSGS Mineral Report MR98-1, 7.

Hausel, W.D., 2002, A new source of gem-quality cordierite and corundum in the Laramie Range of Southeastern Wyoming: Rocks & Minerals 76:5, 334-339.

Hausel, W.D., 2004, Geological Reconnaissance of the Grizzly Creek Gemstone Deposit, Laramie Mountains, Wyoming – A Potential Source for Iolite, Sapphire, Ruby & Kyanite: WSGS Open File Report 04-14, 8.

Hausel, W.D., 2005a, Minerals and Rocks of Wyoming – A Guide for Collectors, Prospectors and Rock Hounds: Wyoming Geological Survey Bulletin 72, 159 p.

Hausel, W.D., 2005b, Geologists Locate Giant Gemstones: Prospecting and Mining Journal 74:7, 7-9.

Hausel, W.D., 2006a, Gemstone discoveries in Wyoming: RMAG Outcrop 55:3.

Hausel, W.D., 2009, ***Gems, Minerals and Rocks of Wyoming. A Guide for Rock Hounds, Prospectors & Collectors.*** *Booksurge,* 175 p.

Hausel, W.D., in preparation, Gemstones of the World: Geology, Mineralogy, Gemology & Exploration.

Hausel, W.D., Graff, P.J., and Albert, K.G., 1985, ***Economic Geology of the Copper Mountain Supracrustal Belt, Owl Creek Mountains, Fremont County, Wyoming***: Geological Survey of Wyoming Report of Investigations 28, 33 p., 3 plates (scale 1:24,000).

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Hausel, W. D., and Sutherland, W.M., 2000, *Gemstones and other unique minerals and rocks of Wyoming - a field guide for collectors.* Wyoming State Geological Survey bulletin 71.
Hausel, W.D., Graff, P.J. and Albert, K.G., 1985. *Economic geology of the Copper Mountain supracrustal belt, Owl Creek Mountains, Fremont County, Wyoming.* Geological Survey of Wyoming report of investigations 28.
Howard, R.H., 1952, Variations in cordierite composition, Laramie Range, Albany County, Wyoming: Colgate University thesis, 22p.
Hurlbut, C.S., Jr., and Switzer, G.S., 1979. *Gemology*. New York: John Wiley & Sons, 243 p.
Kievlenko, E.Y. 2003. Geology of Gems. Ocean Publications Ltd., Littleton, CO. 432.
Miyashiro, A., 1957, Cordierite-indialite relation: American Journal of Science, v. 255, p. 43-62.
Newhouse, W.H. and Hagner, A.F., 1949. Cordierite deposits of the Laramie Range, Albany County, Wyoming. Wyoming Geological Survey. Bulletin 41. 18p.
Osterwald, F.W., Osterwald, D.B., Long, Jr., J.S., and Wilson, W.H., 1966. *Mineral resources of Wyoming*. Wyoming State Geological Survey bulletin 50.
Sinkankas, J. 1959, Gemstones of North America: New York: Van Nostrand Reinhold Company. 675 p.
Sinkankas, J. 1964. *Mineralogy*. New York: Van Nostrand Reinhold Company.
Snyder, G.L., Hausel, W.D., Klein, T.L., Houston, R.S., and Graff, P.J., 1989, Precambrian rocks and mineralization, Wyoming Province, guide to field trip T-332: 28th International Geological Congress, Washington D.C., 48 p.
Spry, A. 1969. Metamorphic textures. Pergamon Press. Oxford, England. 350.
Subbarayudu, G.V., 1975, The rubidium-strontium isotopic composition and the origin of the Laramie anorthosite-mangerite complex: PhD dissertation, State University of New York at Buffalo, 109.

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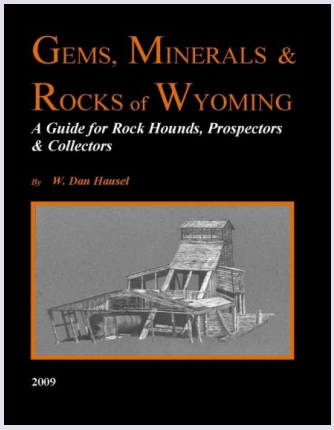
Gold III (3/2007)	http://www.rmag.org/rmag_uploads/outcrops/330.pdf
South Pass Guide	http://www.wsgs.uwyo.edu/Publications/OnlinePubs/docs/pic-29.pdf



BOOKS

Published in 2009. A book about how to recognize and identify rocks, minerals and raw gemstones in Wyoming. Based on 30 years experience as a geologist in Wyoming and consulting geologist for several national and international mining and exploration companies.

Gems, Minerals and Rocks of Wyoming – A Guide for Rock Hounds, Prospectors and Collectors, by W. Dan Hausel is available from Amazon. Either type in a search for *Dan Hausel*, at Amazon, or copy the following address and place it in your browser:

http://www.amazon.com/Gems-Minerals-Rocks-Wyoming-Prospectors/dp/1439218560/ref=sr_1_1?ie=UTF8&s=books&qid=1257276514&sr=1-1.

FIELD TRIPS

http://www.coloradostatedirectory.com/templates/1.cfm?ClientNumber=356&Table=ClientDetails_ad
http://www.learngoldprospecting.com/index.cfm?var_file=fieldtrips/fieldtrips.cfm