YOGO SAPPHIRE

The first sapphires found in the United States were discovered on May 5, 1865 along the Missouri River about 14 miles (23 km) east of Helena, Montana in Lewis and Clark County, Montana by Ed "Sapphire" Collins. Collins sent the sapphires to Tiffany's in New York City, and to Amsterdam for evaluation; however, the sapphires he sent were of poor coloring and low overall quality, garnering little notice and giving Montana sapphires a poor reputation. Corundum was also found at Dry Cottonwood Creek near Butte in 1889, Rock Creek near Philipsburg in 1892, and Quartz Gulch near Bozeman in 1894. By 1890, the English-owned Sapphire and Ruby Mining Company had bought several thousand acres of land where Montana sapphires were found, but the venture failed after a few years because of fraudulent practices by the owners.

In 1879 a rumor spread telling of the discovery of gold in Yogo Creek, hundreds of men flocked. Peak population was reported at 1,200 and 1,500, between Yogo City and Hoover City (only a few hundred yards apart). Little gold was turned up so the men left. By 1883 almost everyone was gone, 10 years later only a dozen men remained.

In 1894 Jake Hoover and Frank Hobson again thought they had turned up gold, and began their digging once again. This time they started noticing small blue pebbles, but threw them out with the waste. A friend, who was a teacher, asked if she could take some gold to school to show her class. When she returned she thanked the men for the sapphires.

Sapphire mining began in 1895 after a local rancher named Jake Hoover sent a cigar box of gems he had collected to an assay office, which in turn sent them to Tiffany's in New York, where an appraiser pronounced them "the finest precious gemstones ever found in the United States". Tiffany's sent Hoover a check for $3,750, along with a letter that described the blue pebbles as "sapphires of unusual quality.

Hoover purchased the original mother lode from a sheepherder and in turn sold it to other investors. It became highly profitable English Mine, which flourished from 1899 until the late 1920s and, under a series of changing owners, periodically operated into the early 21st century. A second operation, the "American Mine," was owned by a series of investors in the western section of the Yogo dike, but was less profitable and ultimately bought out by the syndicate, which owned the English Mine. In 1984, a third set of claims, known as the Vortex mine, opened.

Sapphires are a form of corundum, a crystalline form of aluminum oxide (Al_2O_3). Corundum is one of the hardest minerals, rating 9 on the Mohs scale. Corundum gems of most colors are called sapphires, except for red, which are called rubies. The term "Yogo sapphire" refers only to sapphires from the Yogo Gulch. The cornflower blue color of the Yogo results from trace amounts of iron and titanium.

Yogo sapphires are unique in that they lack color zoning, are free of cavities and inclusions, have high uniform clarity, and do not need heat-treating because their cornflower blue coloring is uniform and deep. Unlike Asian sapphires, they maintain their brilliance in artificial light. Yogos present an advantage to gem cutters: since they are found as primary constituent minerals within an igneous bedrock rather than in sedimentary alluvial deposits where most other sapphires are located, they retain a perfect or near perfect crystalline shape, making cutting much easier, as does their lack of inclusions,

Except for the Yogo Gulch deposit and one small site in Kashmir, most other corundum is alluvial, mined from the sand and gravel created by the weathering of metamorphic rock. Alluvial sapphires are found in the Orient, Australia, and in three other Montana locations—the Missouri River, Rock Creek, and Dry Cottonwood Creek. The location of most Yogo sapphires within hard igneous rock rather than from alluvial placer deposits, coupled with American labor costs, makes their extraction fairly expensive.

The host rock for the sapphires, the Yogo dike, is a dark gray to green lamprophyre consisting of clinopyroxene and phlogopite phenocrysts set in a matrix of clinopyroxene, titanian magnetite, apatite, chlorite, serpentine and calcite. The phlogopite composition suggests a 900 °C (1,650 °F) crystallization temperature. Xenoliths of limestone, clastic sedimentary rocks, and gneiss are present. In some locations, due to the abundance of xenoliths, the dike has the appearance of a limestone breccia in an igneous matrix. One gneiss fragment found as a xenolith contains corundum. The Yogo sapphires themselves are rimmed with a reaction layer of spinel and are etched, indicating that the sapphires were not in chemical equilibrium with their host, the lamprophyre magma. This suggests the sapphire crystals may have originated in an earlier rock, such as a corundum-bearing gneiss, later assimilated by the lamprophyre magma at depth. Earlier investigators had assumed that the sapphire had crystallized from the magma with the necessary high aluminum content provided by assimilation of clay rich shales of the Proterozoic Belt Supergroup sediments, which are known to be present at depth in the region.

The Yogo dike is a narrow, near vertical sheet-like igneous intrusion. It varies from 2 to 26 feet (0.61 to 7.9 m) thick and extends for 5 miles (8.0 km) forming a linear feature across the landscape with a compass direction or strike of 75° east of north. This linear body is broken into three offset en echelon segments. It has been dated at 48.6 mya using Ar dating on phlogopite. The dike intrudes Mississippian age (360 to 325 Mya) limestone and other sedimentary rocks of the Madison and Big Snowy Groups.

There was considerable debate over the years as to the depth of the Yogo dike and how many ounces of rough sapphires per ton it contained. In the late 1970s and early 1980s, Delmer L. Brown, a geological engineer and gemologist, conducted the most thorough scientific exploration to date, concluding that the dike was at least 7,000 feet (2,100 m) deep and that the concentration of rough sapphires was not

constant throughout the deposit. Brown found that the dike had intruded into a pre-existing fault that had been a conduit for groundwater circulation. The overlying shale, the Kibbey Formation, was deposited on an unconformity, an ancient Mississippian age karst erosion surface, and was not intruded by the dike. This groundwater action had produced collapsed zones, which were intruded by the dike to form breccia zones. Recent erosion in the area removed the overlying shales and again exposed the limestone to groundwater action, which again produced collapse breccias, which include fragments of the dike rock.

Most sapphires are formed under low pressure and temperature over geologically short periods of time, and this is why most non-Yogo sapphires have imperfections and inconsistent coloring. Yogos show crystalline formation under very high temperatures and pressures over geologically long periods of time, conditions only possible at great depths: Yogos were formed at depths of thousands of feet, perhaps miles deep, and then carried upwards by slowly thickening magma. As sapphires are heavier than magma, the smaller roughs rose closer to the surface, which was later confirmed by subsequent mining at the English Mine.
Montana sapphires in general come in a variety of colors, but Yogos are almost always blue, possibly because their host rock had a longer cooling time, allowing a more even distribution of titanium and iron throughout the stone's crystals. About two percent of Yogos are purple, rather than blue.

Montana sapphires were heavily mined during World War II for industrial abrasive and cutting purposes. However, because the Yogo mines were still owned by the English, the United States government could not control the mines, so the mines were little affected by the war, even though industrial sapphires were critical to the war effort.
American companies negotiated for purchase of the mines in 1946 but the purchase was not completed until 1956 because of assorted legal issues.
Production was poor and mining ceased in September 1959. From 1959 to 1963 the mine itself was left unattended and unsecured, resulting in hobbyists, picnickers, and rockhounds from all over the US and Canada coming to gather loose rough sapphires. The American Syndicate took action to stop this in 1963, with fences and threats of prosecution.

The mine was eventually sold in August 1968 to Herman Yaras of Oxnard, California for $585,000, and named it Sapphire Village. Doing no significant mining or marketing, Sapphire Village, Inc. was sold in 1973 to one of its investors, Chikara Kunisaki, a celery farmer from Oxnard, California. Kunisaki renamed the business Sapphire International Corporation and actually attempted mining. He built a modern 3,000-foot tunnel at the site of the old American Mine, named the "Kunisaki Tunnel". But operation costs were so high that Sapphire International Corporation shut down in late 1976. This was the last attempt to mine the American Mine section of the Yogo dike, and today, only the locked portal to the tunnel still exists.

In January 1977, Victor di Suvero and his firm Sapphire-Yogo Mines became next to tackle the mine. Di Suvero's expertise was in marketing: he formed a company called Sapphire Trading to cut and market the Yogos. He had novel marketing ideas but was not as knowledgeable about the mining side of the business. Unable to make payments, his venture folded in late 1979.

Kunisaki put his mine up for sale, asking $6 million in total to recoup his expenses. Even though mine profits had been poor over the decades, prices of precious gems were very high at the time due to the worldwide oil crises of the 1970s and early 1980s. Four individuals or groups seriously considered Kunisaki's offer. Relying heavily upon Delmer Brown's expertise, Harry C. Bullock and J. R. Edington formed the limited partnership American Yogo Sapphire Limited, becoming the 14th American company to work the Yogo dike. Bullock and Brown had Yogo mine experience, as they had worked with di Suvero. Bullock's plan included mining, cutting, making jewelry, and marketing—the whole spectrum of the business. They paid the $6 million asked by Kunisaki and then raised another $7.2 million in funding by October 1981. Brown located quality gem cutters in Thailand who were willing to further improve their skills, and set up the American Yogo Sapphire Company there. Brown also set up a thorough, computerized security system that tracked gems from the mine to the Thai gem cutters. Bigger roughs were sent to American cutters, specialty cuts were done in Germany, a few cuts were done in Hong Kong, and the vast majority was done in Thailand. American Yogo Sapphire Limited secured a $5-million line of credit with Citibank. Desiring a more modern name, American Yogo Sapphire Limited changed its name to Intergem Limited in early 1982. Intergem marketed the Yogo as the "Royal American Sapphire." Their first line of jewelry appeared in mid-1982, first marketed regionally in the American west and later at the national level. Intergem also developed a system of authorized dealers. Intergem found success in its first four years, with sales over $3 million in 1984 alone.

Intergem rocked the gem trade by marketing the Yogo as the world's only guaranteed untreated sapphire. By 1982, the practice of routinely heat-treating gems had become a major issue in the industry. At the time, 95 percent of all the world's sapphires were being heated to enhance their natural color.. A problem with the practice was that heated gems often fade over time, though trained gemologists can detect a heated gem with 95 percent accuracy. Intergem's marketing of guaranteed untreated Yogos set them against many in the gem industry. Intergem began planning to dig even deeper into the Yogo dike, which held more known reserves than all the world's other known sapphire deposits combined, albeit deep underground rather than near the surface in the manner of the other known deposits. They also set up a washing plant and maintenance sheds at the site of the former American mine. However, finances were a problem. Intergem had made a $1.5 million down payment and agreed to make semi-annual payments to Kunisaki's Sapphire International Corporation, which had been renamed to Roncor. Intergem also had loan and interest payments on the $7.2 million loan to make to Citibank.

While the company's sales were steadily increasing, their profits were still too low and in May 1985 they missed a $250,000 payment to Roncor. Simultaneously, their collateral with Citibank, which was their gem inventory, had declined because the value of gems was declining; as a result, Citibank called in its loan. Intergem had over $1 million in sales lined up for the 1985 Christmas season but could only fill a tiny portion because they did not have enough operating capital to manufacture the Yogo jewelry. In mid-1986 Roncor regained full ownership even though Intergem had sold loose gems and jewelry worth millions of dollars.

In 1992, Roncor found an 11-carat (2.2 g) rough. AMAX Exploration, operating as the Yogo Sapphire Project, signed a 22-month lease with Roncor in March 1993 and had some success in the middle and eastern portions of the dike; it decided not to continue after the end of its lease due to the cost of underground mining, depletion of easily accessible Yogos, and the relatively small size of Yogos then easily accessible. During this time additional dikes were found in the area. Low-grade sapphire rough was found in the Eastern Flats Dike, a parallel dike some 500 feet northeast of the main dike. A Canadian company called Pacific Cascade Sapphires had a mining lease with Roncor in 2000 and 2001 but ran out of funds before becoming successful and their option expired. By this time most of the easily accessible Yogos had been mined and miners had to dig deeper, further increasing costs.

Various companies attempted leasing the mine from Roncor, but in the meantime, two local couples, Lanny and Joy Perry and Chuck and Marie Ridgeway, discovered a new site at Yogo Gulch in January 1984 by following a trail to an unused section of the dike that had previously been deemed unsuitable. They began mining the site and named it the "Vortex Mine", forming a company named Vortex Mining. The mineshaft went 280 feet (85 m) down and contained two Yogo ore-bearing veins. The portion of the dike they had mined was an extension of the main dike. The Vortex mine, renamed Yogo Creek Mining, was successful for years but eventually declined and closed in 2004.

A new owner, Michael Duane Roberts, bought the Vortex mine in 2008. Its operations were designed to be environmentally friendly, using methods such as recycling all water and not using other chemicals. Roberts died in a mining accident March 19, 2012.

At least 28,000,000 carats (5,600 kg) are estimated to still be in the ground.

More gem-quality sapphires are produced in Montana than anywhere else in North America. Today, the term "Montana sapphire" generally refers to gems found in Montana locations other than Yogo Gulch, where "Yogo sapphire" is the preferred term for the gems found there.

Yogos tend to be beautiful, small, and very expensive. The United States Geological Survey and many gem experts have stated that Yogos are "among the world's finest

sapphires. The roughs tend to be small and flat, so cut Yogo gems heavier than 2 carats (0.40 g) are rare. Only about 10 percent of cut pieces are over 1 carat (0.20 g). The largest recorded Yogo rough, found in 1910, weighed 19 carats (3.8 g) and was cut into an 8-carat (1.6 g) gem. The largest cut Yogo is 10.2-carat (2.0 g).Because of the rarity of large rough Yogo sapphires, gem prices begin rising sharply when they are over 0.5 carats (0.10 g), and skyrocket when they are over 1 carat (0.20 g).

In 1969, the sapphire was co-designated along with the agate as Montana's state gemstone.

Compiled by Harry A. Wagoner