

Tourmaline-bearing Granite Boulders of the Reno, Nevada Area

by

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Distinctive granite boulders containing black tourmaline (schorlite) have been noted in the Reno area for more than a century. John A. Reid, a professor in the Mackay School of Mines from 1903 to 1905, first described the boulders, and reported that a type of granite from Verdi is found at present only in boulders lying on the surface of a dark-gray granite that is found in place as outcrops. He also noted that at least some of the tourmaline-bearing material should be considered pegmatite, and he remarked on the large size of the boulders. The color was reported to be light red with irregularly dispersed black tourmaline crystals. These bunches of tourmaline were described as being from one-quarter inch to more than a foot in diameter. It is not clear if the rock was in use at that time as a building stone, but Reid remarked that the stone would take a high polish, and should meet with some favor for ornamental and building stone.



Large tourmaline-granite boulder at intersection of Eric Court and Third Street in Verdi, Nevada. This boulder must have been transported from the Truckee Canyon area by a large-volume flood (see LaPointe et al., 2006).

Today, we see these boulders, or building stone split from them, as ornamental rocks that have been placed at many sites around Reno. The rock is pinkish-gray to very light-gray or very pale-orange granite. Many boulders are 2 to 3 feet in diameter, and sprays or clots of black tourmaline can be seen in many of them. At the University of Nevada, Reno campus one boulder is used as a decorative stone just outside the south door of the Mines Wing of the Scroggins Engineering Mines Building—the door most people enter to visit the offices of the Nevada Bureau of Mines and Geology. Others are found as some of the boulders used to control erosion around Manzanita Lake on campus, and rough-worked stones apparently cut from such boulders were used as one rock type in the rock wall south of the College of Agriculture, just west of the Evans Street entrance to the campus. Also, similar tourmaline-granite cut stones can be seen as foundation stones in older homes in the downtown Reno area.

There is a story behind these boulders, and where they came from. We see many large granite boulders in the Reno area; only a small percentage of them are the tourmaline-bearing variety. Because granite makes up much of the Sierra Nevada to the west, we might suspect that large boulders we see today came from there, but only for some distinctive types, like the tourmaline-bearing ones, do we have a chance to figure out in detail where they came from and how they were transported. Granitic bedrock is exposed in several areas along the route of the Truckee River upstream from Reno: at Mogul, near Fleish and the Nevada-California State Line; further up the canyon, there are exposures at Farad, between Floriston and Farad, and at Floriston. Granite boulders could have come from any of these areas or from glacial deposits still farther up the canyon. However, the small area of some of these exposures argues that a source for most may be between Donner Lake and Donner Pass (see below).

Many large boulders have been removed from gravel pits in the Reno area during the mining of gravel. Although they were often considered a hindrance to the gravel operations, many eventually were used as decorative stones at office buildings, industrial sites, and individual homes in the Reno-Sparks area.

More than 45 years ago, Peter Birkeland observed these boulders in glacial outwash deposits along the Truckee River, during research for his Ph.D. (see several Birkeland references). According to Dennis Bryan, a local Reno geologist, they were very common in a 20-foot thick zone in the upper wall of an old gravel pit near the site of the Grand Sierra Resort Hotel (now partly filled in for the U.S. Highway 395 freeway, but preserved as a pond at the Grand Sierra). According to Bryan (and described as well by Bingler, 1975), they are also found in gravels about 20 feet below downtown Reno buildings. Granitic boulders up to 20 ft in diameter were removed during excavation for Interstate 80 just south of the University of Nevada campus (Bingler, 1975, p. 4).

Birkeland (1968) reported that Tahoe-age floods (approximately 50,000 to 140,000 years ago) carried granitic boulders, many of them 5–10 feet in diameter, from the upper Truckee Canyon in California to Verdi. Boulders up to 4 feet across were transported through the Truckee Meadows to Mustang east of Reno. Today, some of these tourmaline-bearing granite boulders can be seen

along a road south of Interstate 80 about 0.3 mi east of the Mustang exit. They have apparently been excavated from Donner Lake age glacial outwash deposits (about 200,000 to 700,000 years old) found there (Birkeland, 1965, 1968; Bell and Bonham, 1987). The catastrophic floods that transported these large boulders are believed to have resulted from the collapse of unstable dams of glacier ice which had blocked the flow of the Truckee River above its intersection with Squaw Creek (about 5 miles below the present outlet from Lake Tahoe). Such glacial ice dams are believed to have raised the level of Lake Tahoe at that time about 80 feet above the present level. Even older glacial ice dams are believed to have existed during Donner Lake age glacial activity (about 200,000 to 700,000 years ago); these dams are thought to have raised Lake Tahoe's level over 600 feet above today's level. Even older gravels in the Reno area contain tourmaline-bearing granite boulders (Queen, 2008), providing some evidence for catastrophic floods one to two million years ago.



Left: Historic hitching post made from tourmaline-bearing granite in the front yard of the Sigma Alpha Epsilon Fraternity just south of the University of Nevada, Reno campus. *Right:* Pinkish granite boulder with groups of radiating black tourmaline crystals, south of Interstate 80 near Mustang, Nevada (see Birkeland, 1965 and Bell and Bonham, 1987).

Catastrophic floods from ice-dammed lakes are known from several areas of the world today. In Iceland, where geothermal heat can melt glaciers, they are called jökulhlaups. Some glacier-dammed lakes dump a flood of water with considerable regularity. As the lake level behind the ice dam rises, it floats the glacier after the water rises to about 90% of the total glacier height

(because ice has a density 90% that of water). Once the glacier becomes buoyant, the flood of water will undercut it and may destroy the ice dam entirely through mechanical and thermal erosion. A well known example is the multiple catastrophic outburst floods of glacial Lake Missoula that formed the famous scablands of eastern Washington about 12,000–15,000 years ago (Alt, 2001).

Birkeland (1968) estimated that the Tahoe-age floods were probably between 40 and 80 ft deep at Verdi (about 27 mi downstream from the ice dam at Squaw Creek) and somewhat less than 40 feet deep at Mustang (45 mi from the ice dam) in the lower Truckee River Canyon. To move the large boulders the flood water must have been flowing at many, many times the volume and rate of today's stream flows. Because water from such floods would pond in the Truckee Meadows and then slow down the movement of large boulders, the boulders seen today at Mustang must have been moved during the peak discharge of these catastrophic floods, before ponding in the low areas of the Truckee Meadows.

From the information above, we can see that for the typical granitic rocks found in the Sierra Nevada west of Reno, it would be difficult to identify a specific rock exposure that a particular granite boulder came from. But, tourmaline-bearing granite and granite pegmatite are not common granitic rock types. The only areas where such rocks are exposed along the course of the Truckee River are at Floriston (about 1/4 square mile), half way between Floriston and Farad (about 1/8 square mile).and Mystic (Peter Vikre, oral commun., 2004). Tourmaline-bearing pegmatite dikes are also reported from the area between Donner Lake and Donner Pass (Hudson, 1960); boulders from there could have been moved to the Truckee Canyon below Donner Lake by Pleistocene glaciers. Because the areas of exposure are small along the Truckee below Donner Lake, and because these exposures may not have been excavated by the Truckee River until fairly recently, the Donner Lake–Donner Pass area is probably the most likely source for the boulders. Thus, it seems likely that boulders from near Donner Lake, were moved a minimum of 27 miles to Verdi and over 45 miles to Mustang by one or more massive, catastrophic floods 100,000 to one or possibly two million years ago.

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