Chapter 17

Quartzite Gravel of Northwest Wyoming

The quartzites of southwest Montana and adjacent Idaho extend eastward into Wyoming[1] in a semi-continuous belt, as shown on Figure 16.1 of the previous chapter. This chapter will describe those deposits.

Quartzite Gravel Lag

John Hergenrather and I have found scattered surficial quartzites from near Interstate 15 in northeastern Idaho, just south of Lima, Montana, eastward to the northern Teton Mountains and over a four-wheel drive pass between Yellowstone and Grand Teton National Parks. These quartzites seem to have mostly formed a thin layer or lag deposit on the surface or were reworked by local mountain glaciation. This lag represents the red hashed area in Figure 16.1.

Figure 17.1. Slightly dipping limestone at the top of Red Mountain.

Quartzites on Top of the Northern Teton Mountains

Probably the most fascinating quartzite location is on *top* of the northern Teton Mountains! Brent Carter and I took a three day round trip hike to the top of Red Mountain in the northern Teton Mountains, 10,177 feet (3,102 m) msl![2,3] Red Mountain and Mount Moran (12,605 feet, 3,842 m msl) represent remnants of a flat-topped planation surface.[2] Red Mountain is composed of slightly tilted limestones (Figure 17.1), while Mount Moran is composed of granite or gneiss with a 50-foot (15 m) thick cap of Flathead Sandstone on top (see Figure 33.7).

The quartzites on top of Red Mountain are mainly a thin lag mixed with angular limestone cobbles and boulders (Figure 17.2). Some of the quartzites boulders were fractured perpendicular to the long axis, presumably due to freeze thaw weathering of pre-existing fractures. The largest quartzite was about 20 inches (50 cm) long (Figure 17.3). Some had percussion marks (Figure 17.4) and pressure solution marks with an iron patina, a coating on the outside of the rock (Figure 17.5). The pressure solution marks and fractures show that the quartzite was re-eroded after being deeply buried. The iron staining happened

---

1 Oard, M.J., J. Hergenrather, and P. Klevberg, 2005. Flood transported quartzites—east of the Rocky Mountains. *Journal of Creation* 19(3):76–90.

2 Blackwelder, E., 1915. Post-Cretaceous history of the mountains of central western Wyoming, *Journal of Geology* 23:193–217.

3 Love, J.D., 1973. Harebell Formation (Upper Cretaceous) and Pinyon Conglomerate (Uppermost Cretaceous and Paleocene), Northwestern Wyoming, *U.S. Geological Survey Professional Paper* 734-A, U.S. Government Printing Office, Washington, D.C.

Figure 17.2. Quartzite cobbles and boulders from the top of the generally flat-topped Red Mountain, over 10,000 feet (3,000 m) high in the northern Teton Mountains of northwest Wyoming. Split quartzites here are probably due to freeze-thaw weathering action along pre-existing fractures. The quartz-ites were among angular rocks from the local limestone. Brent Carter, creation geologist from Boise, Idaho, provides the scale.

Figure 17.3. The largest quartzite boulder, about 20 inches (50 cm) long, from on top of Red Mountain, northern Teton Mountains.

before the pressure solution marks were formed, which means that the thick accumulations of quartzites were deposited in an iron-rich, watery environment.

Another interesting location for quartzite gravel is a valley 2 miles (3km) west of Survey Peak, which is filled with 2,080 feet (635 km) of cobbles and boulders. The largest quartzite boulder found by uniformitarian geologists in the valley is 54 x 48 x 30 inches (138 x 122 x 75 cm).

Quartzites Piled 11,000 Feet Thick Northeast of Jackson

Another unusual quartzite gravel deposit lies east and northeast of Jackson, Wyoming, as shown on Figure 17.6. The thick deposits of quartzites make up 90% of the Harebell and Pinyon conglomerates.[3,4] This area, once a deep basin, is filled with 11,000 feet (3,350 m) of quartzite gravel. Some of the mountains of gravel are appropriately named, such as Gravel Mountain. A cliff about 1,000 feet (300 m) high of quartzite conglomerate can be seen on this mountain after a relatively short hike. The present-day estimated volume of the Harebell and Pinyon conglomerates is 75 mi^3 (300 km^3). Gold is sometimes found in the finer-grained material, indicating catastrophic transport.

One can view the in-place quartzites in a road cut about 11 to 14 miles (17 to 23 km) east of Moran Junction on highway 26 toward Togwotee Pass (Figure 17.7). The quartzites in these road cuts display percussion marks, as usual, but also are loaded with pressure solution marks, fractures, and are polished. The polish is probably from being transported within a fine-grained sediment. Normally a quartzite cobble is difficult to crack with a rock hammer but, these fractured quartzites are so brittle that they

---

[4] Lindsey, D.A., 1972. Sedimentary petrology and paleocurrents of the Harebell Formation, Pinyon Conglomerate, and Associated Coarse Clastic Deposits, Northwestern Wyoming, *U.S. Geological Survey Professional Paper* 734-B, U.S. Government Printing Office, Washington, D.C.

Figure 17.4. Percussion marks on a quartzite from on top of Red Mountain.

Figure 17.5. Pressure solution marks on a quartzite from the top of Red Mountain.

shatter with a gentle tap of a rock hammer. Since fractured quartzites with pressure solution marks are found on top of the thick accumulation of quartzite, these features indicate thousands of feet of quartzite once covered the area causing the pressure solution marks and fractures. This lends credence to Dr. David Love's estimate that the quartzite boulders represent erosional remnants of a volume that was once about 560 mi^3 (2,300 km^3).[3] This means that over 85% of the original volume has been eroded and probably accounts for the quartzites we find farther to the east.

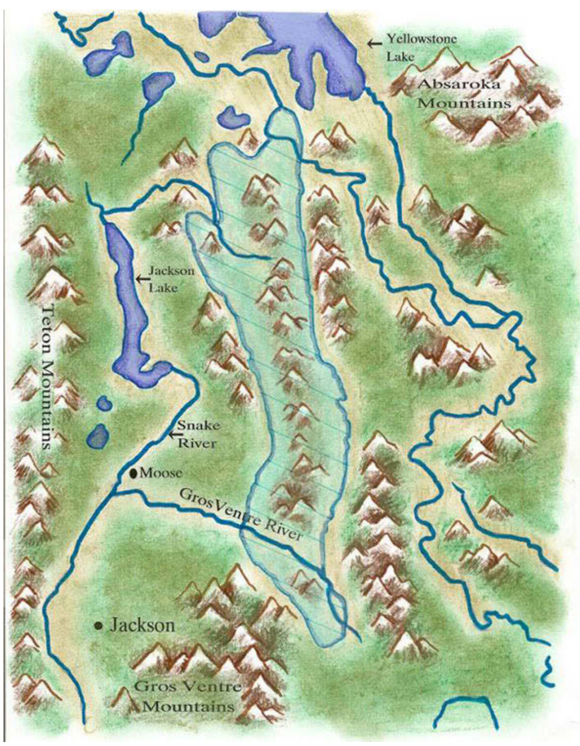

Figure 17.6. Map of the northwest Wyoming showing the location of the quartzites east and northeast of Jackson (drawn by Mrs. Melanie Richard).

One can view transported quartzite cobbles and boulders throughout Jackson Hole, the valley that includes the city of Jackson. The post-Flood ice sheet over Yellowstone Park extended south to around Jackson. As the ice sheet advanced, receded, and eventually melted, it extensively eroded the quartzite rocks along the edge of the valley and spread the gravel over the Jackson Hole Valley.[4] There are so many quartzites in the area that a boulder fence, filled with percussion marks, was built at Jenny Lake in Grand Teton National Park (Figure 17.8).

Quartzites Elsewhere

Other outcrops of quartzite are found in northwestern Wyoming. The Pass Peak Conglomerate in the Hoback Basin about 19 miles (30 km) southeast of Jackson, Wyoming, is up to 3,480 feet (1,060 m) thick.[5,6] This conglomerate is very similar to the Harebell and Pinyon Conglomerates in that the rocks are 90 to 100%

[5] Steidtmann, J.R., 1971. Origin of the Pass Peak Formation and equivalent Early Eocene strata, Central Western Wyoming, *GSA Bulletin* 82:156–176.

[6] Schmitt, J.G. and J.R. Steidtmann, 1990. Interior ramp-supported uplifts: implications for sediment provenance in foreland basins, *GSA Bulletin* 102:494–501.

Figure 17.7. Outcrop of quartzite gravel about 12 miles (20 km) east of Moran Junction on highway 26, east of Teton National Park. Notice the pressure solution marks and the polished rocks with a few fractures.

Figure 17.8. Quartzite boulder fence at Jenny Lake, Grand Teton National Park, Wyoming.

Figure 17.9. Pass Peak conglomerate 19 miles (30 km) southeast of Jackson, Wyoming. Notice the pressure solution marks on the well-rounded quartzites.

Figure 17.10. Quarztite on top of the Green River Formation at Fontenelle Reservoir, northern Green River Basin, Wyoming.

quartzite, well-rounded, polished, fractured, and contain gold in the matrix. They are also marked with percussion and pressure solution marks (Figure 17.9). The conglomerate is cross-bedded in places,[5] just like the quartzite gravel in the western Bighorn Basin (see below). The Pass Peak quartzite conglomerate is probably an erosional remnant from a much larger accumulation of quartzite. In fact, Dorr and colleagues claim that the conglomerate was reworked from the Pinyon conglomerate to the north,[7] but David Love disagrees because the rocks are too large (up to 16 inches (40 cm) long) and are unbroken contrary to what is expected since the Harebell and Pinyon quartzites are already fractured.

[7] Dorr, Jr, J.A., D.R. Spearing, and J.R. Steidtmann, 1977. Deformation and Deposition between a Foreland Uplift and an Impinging Thrust Belt: Hoback Basin, Wyoming, *Geological Society of American Special Paper* 177, Boulder, CO.

Figure 17.11. Yu Bench, a gravel-capped planation surface west-central Bighorn Basin about 20 miles (32 km) southeast of Cody, Wyoming (view north with McCullough Peaks in the background). A small percentage of the rounded rocks were quartzite; most were volcanic from the Absaroka Mountains to the west.

Another interesting location for quartzite gravel is in the northern Green River Basin, south of the Pass Peak conglomerate, on top of the soft Green River Formation that outcrops at the top of this basin (Figure 17.10). These quartzites likely came from central Idaho like the rest of the quartzites in northwest Wyoming. There are other quartzite gravels on top of the Green River Formation farther south, but these likely were transported from the mountains of southeast Idaho, southwest Wyoming, and northern Utah (Uinta Mountains) that all contain layers of quartzite.

Rounded quartzite gravel outcrops extensively in the southern Bighorn Basin and only sporadically in the northern part of the basin (Figures 17.11 and 17.12). They also were carried by water to the northwest portion of the Wind River Basin.[3,4] There the quartzite boulders are up to 16 inches (40 cm) long and a small amount of gold occurs in the fine matrix. There is a minor dispute on the source of these quartzites. Lindsey claims that these quartzites are different from the Harebell and Pinyon quartzites because there are other types of rocks mixed with the quartzites. David Love believes these quartzites are "partial-lateral equivalents."[8]

Figure 17.12. Quartzite cobble with numerous percussion marks found on Yu Bench.

[8] Love, Ref. 3, p. A28.

However, Kraus states that the quartzite gravels are similar to the quartzite conglomerates in northwest Wyoming, southwest Montana, and adjacent Idaho.[9]

In the southwestern Bighorn Basin, the quartzites are layered with fascinating cobble and boulder cross-beds over 16 feet (5 m) high. Kraus is surprised at the thickness and lateral extent of these cross-bedded gravels:

> Planar cross-sets are remarkably extensive in directions both perpendicular and parallel to paleoflow. A single set … can be traced approximately 450 m [1,475 feet] in a direction perpendicular to the general paleoflow for the exposure … . The abundance and magnitude of planar cross-sets in the *Gp* facies assemblage [stratified gravel] is unusual, especially in comparison with deposits described from modern gravel streams.[10]

Quartzite boulders are found among andesite conglomerate on top of Tatman Mountain, about 2,000 feet (610 m) above the valley to the northeast in the central Bighorn Basin.[11] Kraus states there are no quartzites in the eastern Bighorn Basin.[12] She probably means there are no bedded quartzites, since I have found quartzites at many locations: on pediments, terraces, and bluffs in the eastern Bighorn Basin (see Figure 66.1). It is likely that some of this gravel, especially those on river terraces, has been reworked by the river. The locations in the northeastern Bighorn Basin represent a further transport of about 30 miles (50 km) across the Bighorn Basin. The total distance of travel from the nearest outcrop of thick quartzite rocks in central Idaho to the eastern Bighorn Basin is 220 to 375 miles (350 to 600 km)!

But that is not all. There is a report of a quartzite gravel deposit farther to the east, in the southwest Powder River Basins across the Bighorn Mountains.[13] This is about 75 miles (120 km) farther east.

In conclusion, quartzites managed to move up to 400 miles (640 km) from their known source in central Idaho. It becomes glaringly obvious that present processes could not have accomplished this massive transport.

---

9 Kraus, M.J., 1984. Sedimentology and tectonic setting of early Tertiary quartzite conglomerates, northwest Wyoming; in, Koster, E.H. and R.J. Steel, (editors), Sedimentology of Gravels and Conglomerates, *Canadian Society of Petroleum Geologists Memoir* 10, Calgary, Alberta, pp. 203–216.

10 Kraus, Ref. 9, pp. 209, 212.

11 Rohrer, W.L. and E.B. Leopold, 1963. Fenton Pass Formation (Pleistocene?), Bighorn Basin, Wyoming, *U.S. Geological Survey Professional Paper* 475-C:C45–C48.

12 Kraus, Ref. 9, pp. 204–205.

13 Love, J.D., 1960. Cenozoic sedimentation and crustal movement in Wyoming. *American Journal of Science* 258-A:204–215.