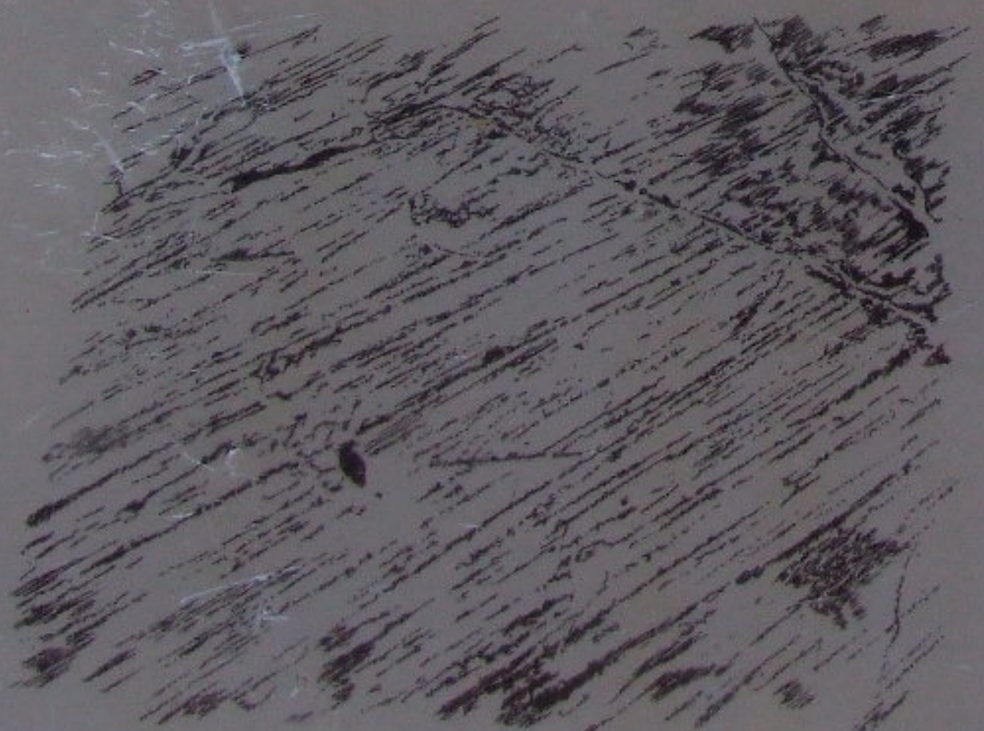
THE SIOUX RIDGE

DISTRIBUTION OF SIOUX QUARTZITE

Palisades is a small scenic part of a large area of Sioux quartzite known as the Sioux Ridge. The Sioux Ridge was once exposed over a wide area that stretched from west of the Missouri River to the Minnesota River. During the passage of millions of years, later inland seas deposited chalk, limestone and sandstone over large sections of the Sioux Ridge quartzite formation.

Following the advance and recession of ice sheets, the Sioux Ridge was further buried by large amounts of glacial drift. Weathering and down cutting by streams like Split Rock Creek and the Big Sioux River have washed away the drift and exposed parts of this ancient pre-cambrian formation in many areas.

GEOLOGICAL FEATURES



GLACIAL STRIATIONS are long, deep scratches that appear on smooth, exposed outcrops of Sioux quartzite. They were made by rocks and boulders embedded in the bottom of an ice sheet that slowly scraped over the quartzite. Glacial striations indicate the direction of glacial movements that took place thousands of years ago.

SIOUX QUARTZITE

The pink rock before you that forms the cliffs of Split Rock Creek is known as Sioux quartzite. It is an extremely old metamorphosed sedimentary rock that was laid down in this area about 1.8 billion years ago when water first covered the earth. The rock began as sand grains that water carefully worked and sifted for a long time before depositing on the shore of an ancient shallow sea. Over millions of years the layers of quartz grains grew and compressed into the hard quartzite form we see it in today.

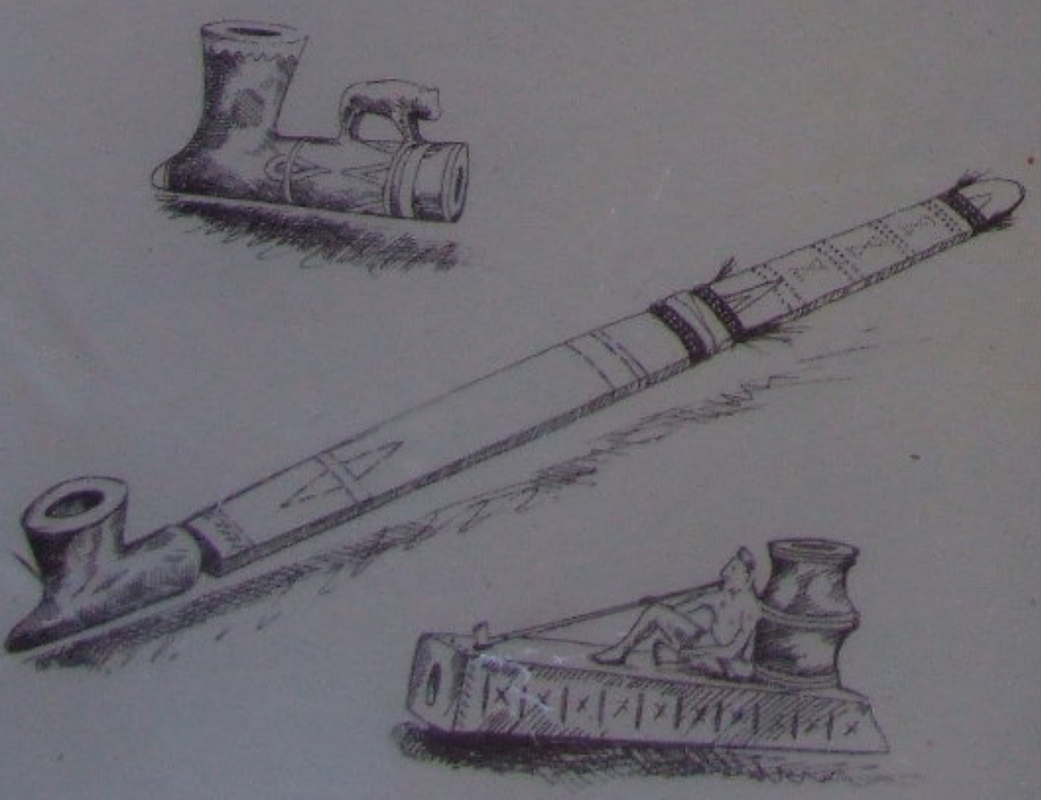
Sioux quartzite commonly occurs at Palisades in shades of pink or red. Outcrops, however, can vary from nearly gray or white, with a faint pinkish color, to dark purple. The many hues of the quartzite is due to thin films of hemitite, or iron oxide, that coat the grains of quartz. Slight variations in the amount and nature of the iron oxide coating result in noticeable variations in rock color.

SHALE AND PIPESTONE

On several occasions during the long ages of sand deposition, water washed silty clay down from nearby highlands and deposited it over small areas of the quartzite beds. These fine-grained layers of clay eventually dried and hardened under pressure to form shale, or mudstone, and in a few cases pipestone. The shale and pipestone deposits, interspersed between the quartzite beds, vary in thickness from less than one inch to about 30 feet. Most of the shale deposits are thinly layered and soft. Shale beds that became pipestone were the result of a chemical alteration in an unusual sediment containing a relatively large amount of alumina. This unique sediment that would become pipestone dried and weathered in the elements for a long time before it was buried again by water and sand.

The color of shale and pipestone beds ranges from red to purple and is due to the amount of finely disseminated hemitite particles present. One bed outcrops in the park on the south bank of the creek. The shale here is pipestone quality, deep red in color, and lies under 94 feet of quartzite.

A SACRED STONE



Pipestone has been accorded sacred qualities for centuries by plains Indian people. One legend states that the Great Spirit took a piece of the red stone and formed it into a large pipe. He then smoked the pipe and told his children to value the red stone of Mother Earth as their own flesh and blood and use it to make pipes of peace.

This fine textured red stone continues to be regarded by the plains people as a sacred gift from the Earth and is still used in pipe form as a vehicle for sending prayers to the Creator Spirit of all life.

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RIPPLE MARKS are plentiful in shale and Sioux quartzite formations. They indicate that currents along the bottom of the lake or stream bed were strong enough to periodically pile up undulating ridges of sand grains.

MUD CRACKS are typical on shallow water lake shores or streams and result from the drying out and shrinking of clay. The cracks are preserved by being filled with a coarser or finer sediment after they have thoroughly hardened and dried.

CROSS BEDDING is also common. It indicates that currents were periodically strong enough to transport a large amount of sand for a short distance before losing its force and piling it up on 20/30 degree slopes.

JOINTING refers to the well-developed cracks in the exposed rocks. Most of the joints are vertical and are probably the result of regional stresses and shifting of the earth's crust.