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HYDROLOGIC ATLAS OF THE BLACK HILLS, PENNINGTON
COUNTY, SOUTH DAKOTA
PIEDMONT QUADRANGLE
Aquifer Susceptibility Map

Aquifer Susceptibility:

In general, the varying capabilities of rocks to absorb water are referred to as *aquifer susceptibility*. The susceptibility rating assigned to the various aquifers is based upon the intrinsic characteristics of the rock, without regard to human influences. See chart at lower left of maps for factors utilized in determining susceptibility rating

Deadwood Formation: (see map)

As shown on the accompanying map, the recharge area of the Deadwood Formation comprises about six square miles in this quadrangle in the area of covered slopes along the valleys walls of Box Elder Creek and Little Elk Creek.

The Deadwood Formation is composed of interbedded layers of sandstone, mudstone and minor edgewise pebble conglomerate. Although the sandstone represents a suitable aquifer, the enclosing mudstone does not. Therefore, the average rating assigned for the combined rock types (based upon a non-quantitative model) is **low susceptibility** (shown in yellow).

Along drainages, e.g., Elk Creek and Boxelder Creek, a rating of **moderate susceptibility** (shown in green) is assigned to those areas of the Inyan Kara aquifer overlain by alluvial deposits. The increased rating results from the likelihood of a longer period of contact of the aquifer with water contained in the alluvial material (these material comprise an aquifer themselves).

Madison Aquifer (Pahasapa Limestone): (see map)

The recharge area of the Madison aquifer in the Blackhawk Quadrangle comprises approximately 25 square miles of the central portion of the quadrangle. The formation consists of layers of karstic limestone and dolomite (Miller, 2005).

Because the Madison is strongly affected by fractures and karst (caves, breccia pipes, etc.) it is assigned an overall rating of **high susceptibility**. Where alluvial deposits overlie the Madison along streams, e.g., Boxelder Creek or Little Elk Creek near the southern margin and northern margins of the quadrangle, respectively, the susceptibility is even greater as a result of the longer period in which water contained in the gravel (these gravels comprise an aquifer themselves) could be in contact with the underlying layers. In both canyons, stream flow is reduced, or completely adsorbed, by passage into sink holes and caves in this formation.



Massive layers of karstic Pahasapa Limestone (Madison aquifer) exposed along Box Elder Creek (Photo by S. Miller).

Minnelusa Formation (see map)

The recharge area of the Minnelusa aquifer in the Piedmont Quadrangle comprises about nine square miles along the eastern margin of the quadrangle. The formation consists of layers of limestone, dolomite, sandstone and shale in the lower part and dominantly sandstone and mudstone in the upper part.

As shown on the Aquifer Susceptibility Map, these rock layers are assigned a rating of **medium susceptibility** (shown in a golden color). The *sandstone unit in the upper part* of the formation is quite permeable and, if mapped separately, would be assigned a rating of **high susceptibility**. *Along drainages*, e.g., Little Elk Creek near the northern margin of the quadrangle, a rating of **moderate to high susceptibility** is assigned to those areas of the Minnelusa aquifer overlain by alluvial deposits. The increased rating results from the likelihood of a longer period of contact of water contained in the gravel (these gravels comprise an aquifer themselves) with the underlying layers.

BIBLIOGRAPHY

Redden, J. A., 2009, Geologic Map of the Piedmont Quadrangle, South Dakota Geological Survey, 7.5 Minute Series Geologic Quadrangle Map 10, 1:24,000 scale.