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HYDROLOGIC ATLAS OF THE BLACK HILLS, PENNINGTON
COUNTY, SOUTH DAKOTA
BLACKHAWK QUADRANGLE
Aquifer Vulnerability Maps

Aquifer Vulnerability:

Basically, vulnerability "...is the tendency or likelihood that pollutants may reach the water supply" (Hargrave, 2005) and includes human influences in the introduction of pollutants into aquifers. See the lower left corner of the aquifer vulnerability maps for information regarding the rating system used here.

Madison Aquifer (Pahasapa Limestone): (see map)

The recharge area for the Madison aquifer underlies about one square mile in the hilly southwestern part of the quadrangle. This area contains less than 10 on-site waste water treatment facilities, limited roads, and little to no agricultural activity. Therefore, it is assigned a **low** vulnerability rating.

Minnelusa Formation (see map)

The approximately eight square mile recharge area for the Minnelusa aquifer extends along the central western and southwestern part of the map area with a maximum width of three miles along the south margin of the map area. Both privately owned and U.S. Forest Service administered land lies in this area.

Concentrations of home sites (and the associated on-site waste water disposal units) and roads vary across the recharge area. Approximately three and one-half square miles have no development, and are assigned a rating of **low** vulnerability in this study. In the three areas of greater development approximately one and one-half square miles are assigned **high to very high** rating and a separate development area a rating of **medium to high**.

In the extreme southwestern corner of the map area a 100-meter buffer along Nemo Road is assigned a **high** value due to the travel of cars and trucks on this main transportation artery.

Inyan Kara Group:

The recharge area for the Inyan Kara aquifer extends from the northwest to the southeast corners across the quadrangle with a width varying from one to three miles. The total recharge area is approximately 13 square miles. All of this land is privately owned. Two geologic formations, the Fall River Formation and the underlying Lakota Formation comprise the Inyan Kara Group.

Septic Systems:

The Black Hawk Quadrangle area has undergone rapid urbanization and growth in numbers of home sites and, therefore, on-site waste water treatment facilities during the past 45 years. The U.S. Geological Survey topographic map published in 1953 shows 12 home sites on the Inyan Kara Group, an average of less than one per square mile. In 1971 there were 14 home

sites (Figure 1). In 1998, based upon areal photographic analysis, this number had increased to 193 and by 2004 to 310.

As shown on the vulnerability map, portions of the recharge area (approximately four square miles) are as yet undeveloped, and are assigned a rating of **low** vulnerability in this study as a result of the lack of road and on-site waste water treatment facilities there. The areas of highest vulnerability are four developments where home-site concentrations are shown as greater than 40 sites per square mile (see map): lots within these areas are generally of one acre size or less. These areas (a total of approximately one square mile) are assigned a **high to very high** vulnerability rating. The remainder of the recharge area, averaging 10-40 on-site waste water treatment facilities per square mile, is assigned a **medium** vulnerability rating.

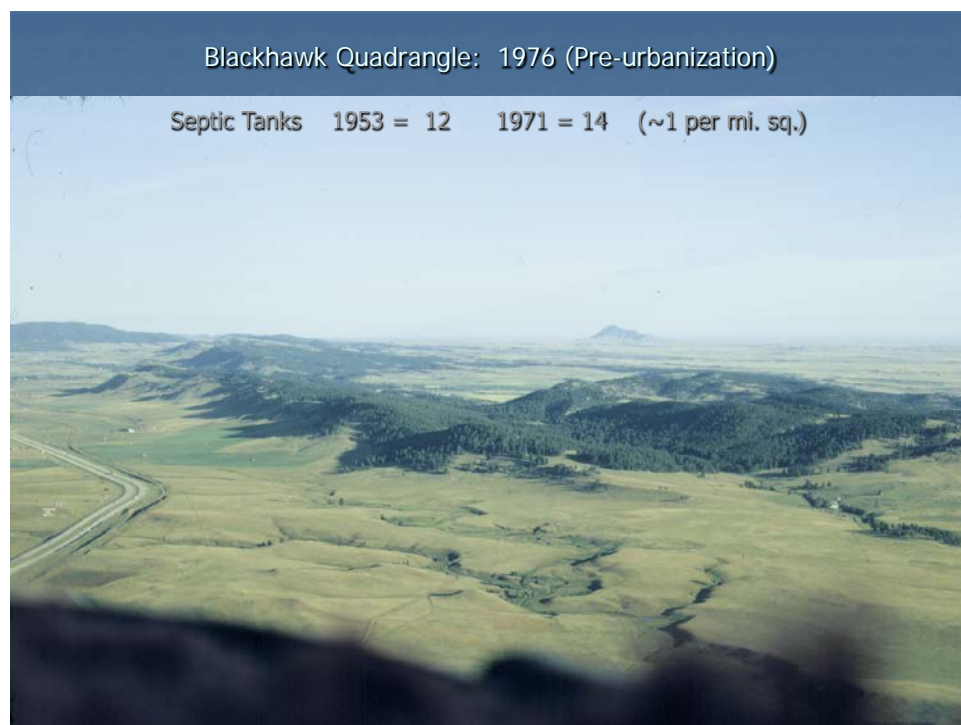


Figure 1. Aerial photographic view of the “Red Valley” and adjacent, pine-tree covered hills underlain by the Inyan Kara aquifer. Photo taken in 1974 prior to major urbanization.

Roads

One hundred meter (330 feet)-wide buffer zones along roads assigned values ranging from **low**, on dirt roads with lesser traffic, to **high** along paved road on the flood plain deposits of Little Elk Creek and along the Erickson Ranch Road which crosses the eastern portion of the recharge area. Vehicles, e.g., gasoline tankers and propane trucks, as well as others carrying chemicals, travel these roads, both along the recharge area of the Inyan Kara aquifer and upstream of it. Any substances released from such tanks, or from the vehicles themselves, have the potential to contaminate ground water in the underlying aquifer.

Agricultural uses

Limited cattle grazing occurs on some portions of the recharge area, but major feed lots, etc., are lacking. Farms, which might apply chemicals, are not currently active within the recharge area.

References

Francisco, E. M, 2008, Susceptibility and Vulnerability of the Inyan Kara Aquifer in the Blackhawk Quadrangle: unpub. M. S. thesis, South Dakota School of Mines and Technology, 81 p.

Hargrave, R. G, 2005, Vulnerability of the Minnelusa Aquifer to Contamination in the Rapid City West Quadrangle, Pennington County, South Dakota: M. S. thesis, South Dakota School of Mines and Technology, 80 p.