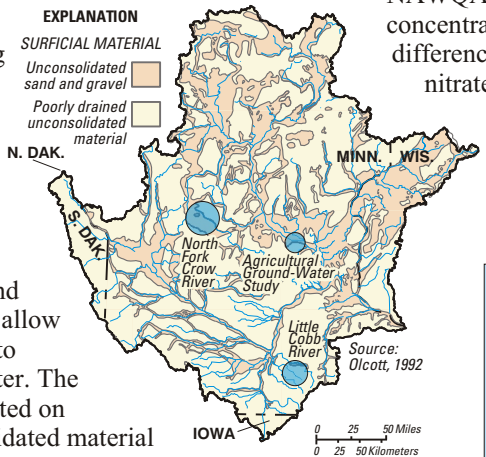
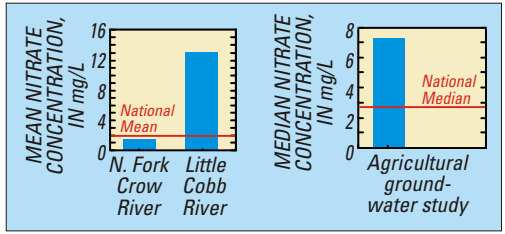
NITRATE IN A NATIONAL CONTEXT--CONCENTRATIONS RELATE TO HYDROGEOLOGY AND AGRICULTURAL DRAINAGE IN THE STUDY UNIT

Nitrate concentrations in the Study Unit are related to hydrogeologic setting and agricultural drainage. The application of commercial fertilizers and manure are sources of nitrate in streams and ground water. In general, nitrate concentrations in water are greatest in agricultural areas throughout the Nation (U.S. Geological Survey, 1999) including the Upper Mississippi River Basin. Yet, within agricultural areas within the Study Unit, nitrate concentrations vary due to the hydrogeologic setting.

Two rivers draining agricultural land in the Study Unit were frequently sampled for nitrate (1996-98). The North Fork Crow River is located in an area underlain by unconsolidated, coarse-grained sand and gravel deposits, that allow water and contaminants to infiltrate into ground water. The Little Cobb River is located on poorly drained unconsolidated material that limits the ability of water and contaminants to infiltrate into ground water. Artificial drainage systems (ditches and tiles) have been installed throughout these poorly drained soils to improve agricultural production. These systems also result in more direct transport of contaminants to nearby streams.



Although nitrate application rates from fertilizer and manure were similar in both river basins, nitrate concentrations in the streams were different. The nitrate concentration in the naturally well-drained North Fork Crow River was less than the national average for agricultural streams. In contrast, artificial drainage in the Little Cobb River Basin has contributed to nitrate concentrations in the stream, which rank among the top 2 percent of all streams sampled in the NAWQA Program. Differences between the nitrate concentrations in these two streams (see graph) reflect differences in their hydrogeologic settings. Although nitrate concentrations were low in streams draining surficial sand and gravel deposits, concentrations were greater in ground water--much greater than the national median. (see graph.)



To maintain good water quality in streams and ground water, best management practices could include consideration of the hydrogeologic setting of the area of interest.

This figure taken from: **Stark, J.R., Hanson, P. E., Goldstein, R.M., Fallon, J.D., Fong, A.L., Lee, K.E., Kroening, S.E., and Andrews, W.J.,** 2001, Water quality in the Upper Mississippi River Basin, Minnesota and Wisconsin, South Dakota, Iowa, and North Dakota, 1995-98: U.S. Geological Survey Summary Circular 1211, 35 p.