

EVALUATION OF GROUNDWATER CHEMISTRY IN THE SHEYENNE DELTA,
GALESBURG, ELK VALLEY, AND OAKES AQUIFERS

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ABSTRACT

Aldassugurov, Nurlan, M.S., Program of Natural Resources Management, College of Graduate and Interdisciplinary Studies, North Dakota State University, May 2007. Evaluation of Groundwater Chemistry in the Sheyenne Delta, Galesburg, Elk Valley, and Oakes Aquifers. Major Professor: Dr. Larry Cihacek.

The Soil and Water Environmental Laboratory at North Dakota State University has performed thousands of chemical analyses of groundwater from all over the state. These data have never been evaluated. The objective of this study was to summarize and evaluate groundwater chemistry data with a focus on four aquifers: the Sheyenne Delta, Galesburg, Elk Valley, and Oakes Aquifers. The tested hypothesis of this research was that the groundwater chemical compositions in these four aquifers were not significantly different at the 0.05 probability level. In order to evaluate groundwater chemistry, the following statistical techniques were performed: simple descriptive statistics, multiple comparison tests, and principal component analysis. The other method of data analysis was a graphical analysis based on the Durov diagram. According to the Durov diagrams, most of the groundwater samples from these four eastern North Dakota glacial aquifers can be classified as a calcium carbonate type. The majority of groundwater samples examined in this study showed high salinity levels. Groundwater from the Oakes Aquifer exhibited a high sodium hazard level. Half of the variability in the original data set was explained by the first principal component, which was highly influenced by variation in TDS, SO_4^{2-} , HCO_3^{2-} , and K^+ content in the groundwater samples. Sodium and chloride concentrations had the highest variability and positively contributed to the first two principal components. Multiple comparison tests results suggested that the overall groundwater chemistry of the Elk Valley Aquifer was significantly different from the geochemistry of the Sheyenne and Oakes Aquifers.