

A GIS based vulnerability assessment of contamination to aquatic resources from oil and gas development in eastern Sheridan County, MT

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There is growing public concern over the environmental risks associated with saline water that is co-produced with oil during development and production in the Williston Basin in the Northern Great Plains. Superimposed over this landscape is the Prairie Pothole Region (PPR), a region comprised of glacial sediments and characterized by numerous wetlands and grasslands that are the major waterfowl production areas of North America. Previous studies have identified saline contamination from oil development and production in wetlands and groundwater resources in the Williston Basin and PPR. The Montana Bureau of Mines and Geology and the U.S. Fish and Wildlife Service developed a contamination index (CI), defined as the ratio of the chloride concentration to specific conductance in a water sample, to delineate the magnitude of saline contamination in eastern Sheridan County, Montana. Although the PPR is known to have aquatic resources with high salinity and total dissolved solid concentrations, these values are primarily driven by sulfate, not chloride, salts. Aquatic resources with a CI greater than 0.035 are considered to be contaminated by co-produced water in eastern Sheridan County, which lies within the PPR.

During a study evaluating saline contamination in the Williston Basin and PPR, U.S. Geological Survey researchers conducted a GIS based county level vulnerability assessment of aquatic resources to saline contamination from oil development and production in the Williston Basin. The vulnerability assessment was based on the age and density of oil wells, proximity of oil wells to wetlands and streams, and type of glacial deposits. A GIS based analysis using a similar protocol, but at the section level, was conducted to validate the vulnerability assessment in eastern Sheridan County, Montana. The vulnerability assessment assigned a value to each of the 810 sections in the study area from a possible low of 0 to a high of 100. Ten sections were then selected across the range of values, with two wetland and two groundwater samples collected from each section in mid-September 2011 to determine the magnitude of saline contamination based on the CI value. Water chemistry results will be available by the time of the conference.