

## BRINE CONTAMINATION TO PRAIRIE POTHOLES FROM ENERGY DEVELOPMENT IN THE WILLISTON BASIN: A DEVELOPING INTEGRATED SCIENCE PROJECT

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The Williston Basin is an intracratonic basin with significant petroleum reserves which occupies 143,000 square miles of Montana, North Dakota, South Dakota, and Saskatchewan. Superimposed over this landscape is the Prairie Pothole Region (PPR), which includes critical wetland and grassland habitats of importance to breeding, nesting, and migrating waterfowl. A potential impact of energy resource development on these important habitats is contamination from co-produced waters that leach from oil well reserve pits, and injection wells, or that leak from infrastructure such as pipe lines and storage tanks. Co-produced waters from the basin typically exhibit total dissolved solid concentrations >200,000 mg/L (dominated by ions of sodium and chloride). Previous studies have identified contamination of wetlands and groundwater resources on private, state, federal and tribal lands. The U.S. Geological Survey (USGS) focuses on providing comprehensive assessments of the Nation's energy and mineral resources and the environmental effects of their production and use. Currently, the extent of contamination within the United States from co-produced waters across the Williston Basin, is unknown. Consequently, there is a need for scientific-based information to assess possible impacts on ecosystems and groundwater resources.

The USGS has initiated work (<http://steppe.cr.usgs.gov/>) to: 1) use Geographic Information System (GIS) analyses to evaluate the spatial extent and potential risk to natural resources of past and ongoing energy development, 2) characterize brine contamination composition (including isotopic analysis), distribution, and impact at selected sites, 3) conduct a user needs analysis and design a prototype decision support system for resource management, and 4) establish an Interagency Energy Contamination Science Team. The USGS lead team is working with county, state, and federal agencies to identify agency needs related to specific research objectives. Currently, the team is studying sites in eastern Montana (Medicine Lake Refuge) and western North Dakota (Beaver Lake), in addition to compiling basin-wide information pertinent to contamination from current and future energy production in the basin.