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Understanding the Aquifers in the Uinta Basin, Utah: A Key to Solving the Basin's Saline Water Disposal Problem

Michael D. Vanden Berg[1], Paul B. Anderson[2], Craig D. Morgan[1], and Stephanie Carney[1]

[1]Utah Geological Survey, Salt Lake City, UT
[2]Consulting Geologist, Salt Lake City, UT

Our project aims to solve the major problem of saline water disposal faced by oil and gas operators in the Uinta Basin of Utah. As petroleum production increases - natural gas alone increased 60% in the last 10 years - so does saline water production, creating an increased need for economic and environmentally responsible disposal plans. Current water disposal wells are near capacity and permitting for new wells is being delayed because of a lack of technical data regarding potential disposal aquifers and questions concerning contamination of fresh water sources. Many Uinta Basin operators claim that crude oil and natural gas production cannot reach its full potential until a suitable, long-term saline water disposal solution is determined.

Part one of our effort involves re-mapping the base of the moderately saline aquifer within the Uinta Basin using more robust data and more sophisticated GIS techniques than previous work. Below this horizon, regulators agree that saline water can be injected without damage to the overlying fresh water aquifers. Thus far, we have compiled down-hole water chemistry data from about 1200 wells, mainly clustered around large oil and gas fields. For areas where water quality information is not available, we have developed refined techniques for determining the base of the moderately saline aquifer using geophysical logs.

Part two of our project includes a detailed study of the Birds Nest aquifer, which is recognized as a possible large-volume saline water disposal zone. This aquifer, ranging in thickness from 100 to 300 feet, formed from the dissolution of saline minerals near the top of the Green River Formation and is mostly restricted to Uintah County. We have begun mapping this aquifer in the subsurface via core and geophysical logs and have examined this interval on outcrop. Preliminary research shows that northwest-trending gilsonite veins may influence groundwater flow patterns in the Birds Nest aquifer by creating "channels" of dissolution and impermeable barriers to flow. In addition, the Birds Nest aquifer is within the R-8 oil shale zone, creating concerns over how saline water disposal could affect future oil shale development.