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## **Geologic Characterization of the Birds Nest Aquifer in the Uinta Basin, Utah: Assessing the Aquifer's Potential as a Significant Saline Water Disposal Zone**

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As Uinta Basin petroleum production increases – natural gas production increased 250% in the past 10 years, while oil production increased 130% – so has saline water production, increasing the need for economic and environmentally responsible disposal plans. Current water disposal wells are near capacity and permitting for new wells is delayed because of insufficient technical data regarding potential disposal aquifers and questions concerning contamination of fresh water sources. Many Uinta Basin operators claim that petroleum production cannot reach its full potential until a suitable, long-term water disposal solution is determined. The presented research evaluates the potential of the Birds Nest aquifer, formed from the dissolution of saline minerals in the Eocene upper Green River Formation, as a potential large-scale saline water disposal zone.

Evaluation of geophysical logs from over 300 wells, together with 21 core descriptions, 5 measured sections, and creation of 5 regional stratigraphic cross sections were used to map the spatial and vertical extent of the upper and lower Birds Nest aquifer zones that demonstrate potential for large-scale saline water disposal. As ancient Lake Uinta began to recede, its waters became hypersaline, depositing large saline nodules and thin saline mineral beds within a 40 to 120 foot thick interval of dolomitic mudstone, forming the more extensive, ~670 square mile, lower Birds Nest zone. An influx of fresh water, represented by volcanoclastic debris flows recorded in rocks on the east side of the basin (Horsebench Sandstone), decreased the lake's salinity for a period of time, greatly reducing saline mineral deposition. However, as the lake continued to shrink, it once again returned to its hypersaline state, depositing large saline nodules in a less extensive, ~460 square mile and 30-140 foot thick, upper Birds Nest zone, centered farther to the west than the lower zone.

Several other limiting factors will play a role in determining potentially safe saline water disposal volumes into the Birds Nest aquifer, including: 1) chemistry of water currently in the Birds nest zone – saline water disposal can only occur in an aquifer with water greater than 10,000 ppm TDS, 2) saline mineral dissolution – only areas with significant saline mineral dissolution can transmit and store saline water, 3) transmission of water via fractures or gilsonite veins, and 4) proximity to potentially developable oil shale resources.