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Evaluating the hydrologic connection of the Blanco River and Barton Springs using discharge and geochemical data

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Delineating flowpaths in karst aquifers is important for understanding contaminant transport and water availability. This is especially important for groundwater availability in highly populated, drought-prone regions such as the Edwards Aquifer, in central Texas. South of Austin, the Edwards Aquifer is typically considered hydrologically separated into two segments, the more northern Barton Springs segment and the more southern San Antonio segment. One unknown is the extent to which there is cross-boundary flow between the two segments. We mined historical discharge and geochemical data, and examined conclusions from dye-tracing studies to determine the hydrologic connection between the Blanco River and Barton Springs, which allows us to investigate cross-boundary flow between the two segments.

Dye-tracing studies indicate that during extremely dry hydrologic conditions there is flow from the Blanco River to Barton Springs. To further investigate cross-boundary flow we isolated extremely dry hydrologic conditions when there was no recharge occurring in the Barton Springs segment and recharge was occurring from the Blanco River, located in the San Antonio segment. During extremely dry hydrologic conditions we found 16 instances of increased recharge from the Blanco River with associated, time lagged increased discharge at Barton Springs.

Geochemical data were analyzed to determine their usefulness as tracers of recharge arising from the Blanco River and contributing to discharge at Barton Springs. The results of the geochemical analyses are inconclusive due to (1) variations in the specific conductance of discharge at Barton Springs being within instrumental error; and (2) a lack of temporal matching between major ion data and the time periods of interest.

There appears to be a hydrologic response via increased discharge at Barton Springs, which is correlated with increased recharge from the Blanco River. This is supportive of a hydrologic connection of the two segments of the Edwards Aquifer during extremely dry hydrologic conditions. Our conclusions agree with dye-tracing studies, although there are differences between the proposed lag times and the travel times of dye-tracing studies.

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