Preliminary Findings:
Surface and Groundwater Interaction Along Onion Creek, Hays County, Central Texas

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Abstract

Onion Creek is an important hydrologic link between two major aquifers in Central Texas. Multiple small springs discharging from the Trinity Aquifers sustain base flow in Onion Creek that in turn recharges the Edwards Aquifer, ultimately discharging at Barton and San Marcos Springs. The creek generally contains clear, low nutrient water with high ecological and recreational value. This watershed is rapidly being developed and is experiencing significant population growth and land use changes, thus increasing demand for water supplies and potentially affecting regional hydrology.

Despite the critical importance of Onion Creek to the community, until this study, no comprehensive gain-loss studies have been conducted that characterize the surface and groundwater interactions across the Trinity (Upper Glen Rose) and Edwards Aquifers.

This paper presents the results of a flow study in Onion Creek and its tributaries extending 46 miles from the headwaters in Blanco County to downstream of the Edwards Aquifer recharge zone in Hays County. A total of 69 flow sites were established and 139 quantitative and 57 qualitative flow measurements were made from January through December 2015. The quantitative measurements of streamflow were made using acoustic Doppler velocimeters (ADV).

The focus of the paper is on the results of two synoptic flow-measurement events during low and high flow conditions, July and November 2015, respectively. Detailed geologic, hydrogeologic, and geochemical data were incorporated into the evaluation to understand the hydrogeologic significance of the data.

This study reveals complex surface and groundwater interactions in the Onion Creek watershed. For the first time, flow losses are documented to occur along a creek reach underlain by the Upper Glen Rose that has implications for recharge to the Middle Trinity Aquifer. This reach is highlighted in Figures 2, 3, and 4. These losses combined with other hydrogeologic and geochemical data suggest Onion Creek provides some recharge to the Middle Trinity Aquifer in those reaches. A better understanding of the surface water and groundwater interactions along the creek is important for groundwater and surface-water management in an area undergoing significant population growth.

Results

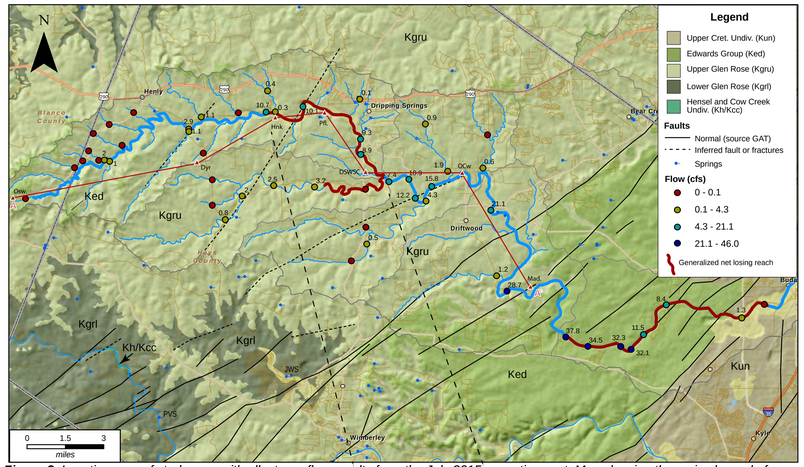

Figure 2. *Location map of study area with all streamflow results from the July 2015 synoptic event. Map showing the main channel of Onion Creek and indicates the losing reaches. Geologic map modified from the GAT.*

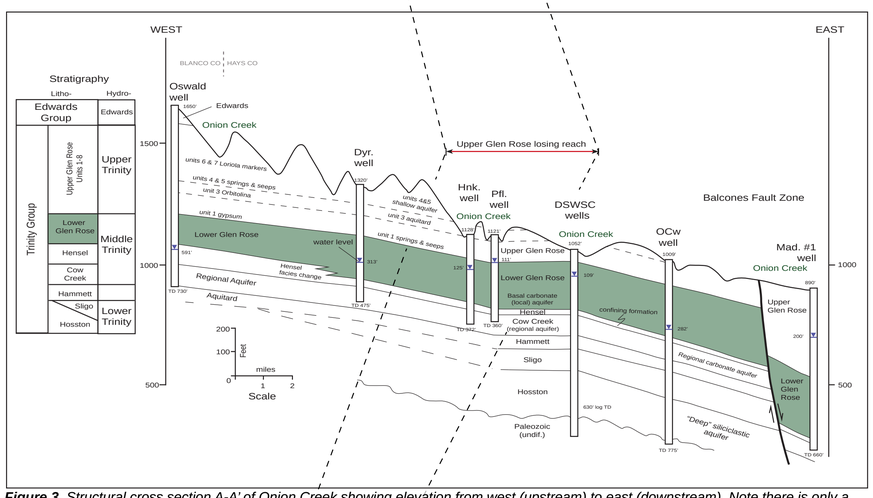

Figure 3. *Structural cross section A-A' of Onion Creek showing elevation from west (upstream) to east (downstream). Note there is only a very thin remnant of the Upper Glen Rose section of about 20 ft in the losing reach. A relatively thinner and fractured Upper Glen Rose may enhance recharge to the Middle Trinity Aquifer in this area.*

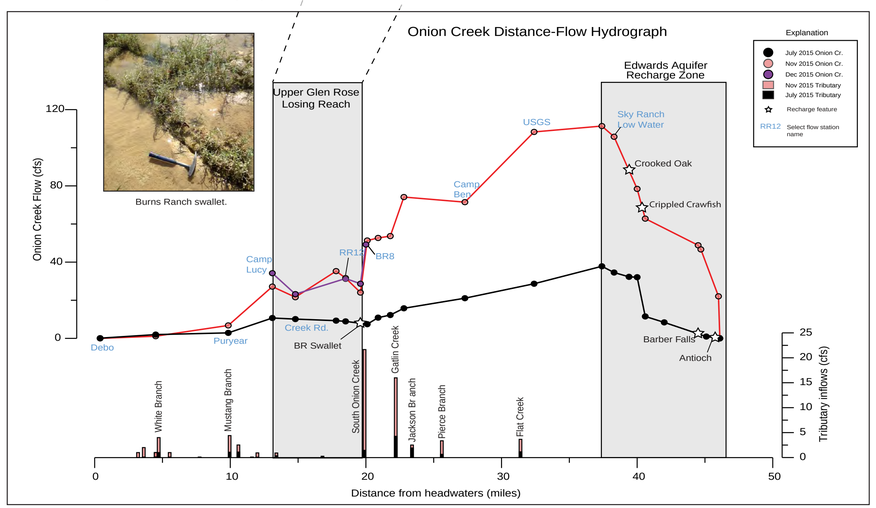

Figure 4. *Flow versus distance in the main channel of Onion Creek. This study has documented consistent loses flow in the area of RR12 and over the Edwards recharge zone. This includes the direct observation of karst features and recharge.*

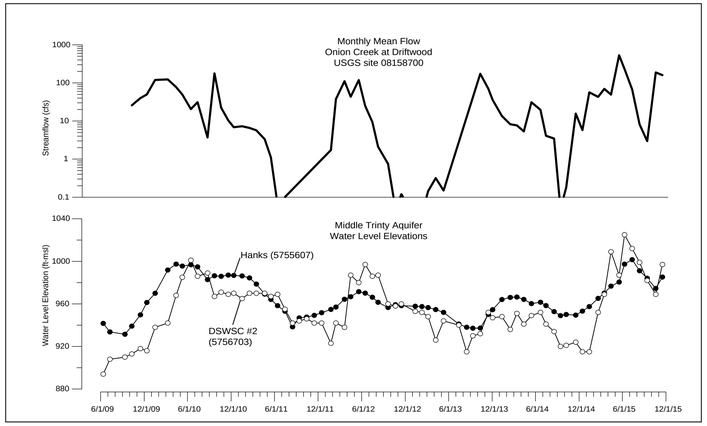

Figure 5. *Hydrograph showing Onion Creek flows versus two Middle Trinity wells adjacent to Onion Creek. Increased recharge in the vicinity of the losing reaches of Onion Creek may cause the higher water levels in DSWSC#2 than in the upgradient Hanks well during periods of high creek flow.*

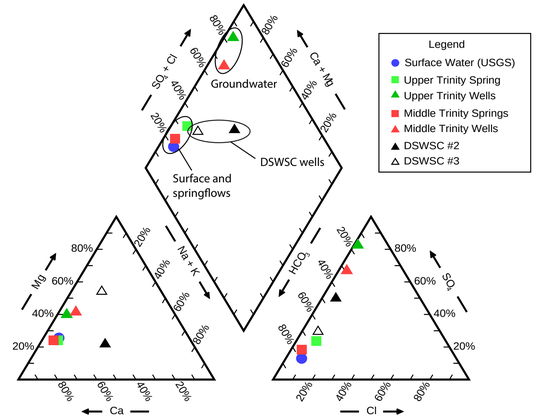

Figure 6. *Piper diagram showing groundwater and surface water geochemistry. DSWSC #3 indicated ion chemistry similar to surface water (#2 perhaps a mixture). Isotopes of modern carbon of 102% and 73%, and relatively high tritium, for the DSWSC wells indicate some portion of modern recharge to the wells.*

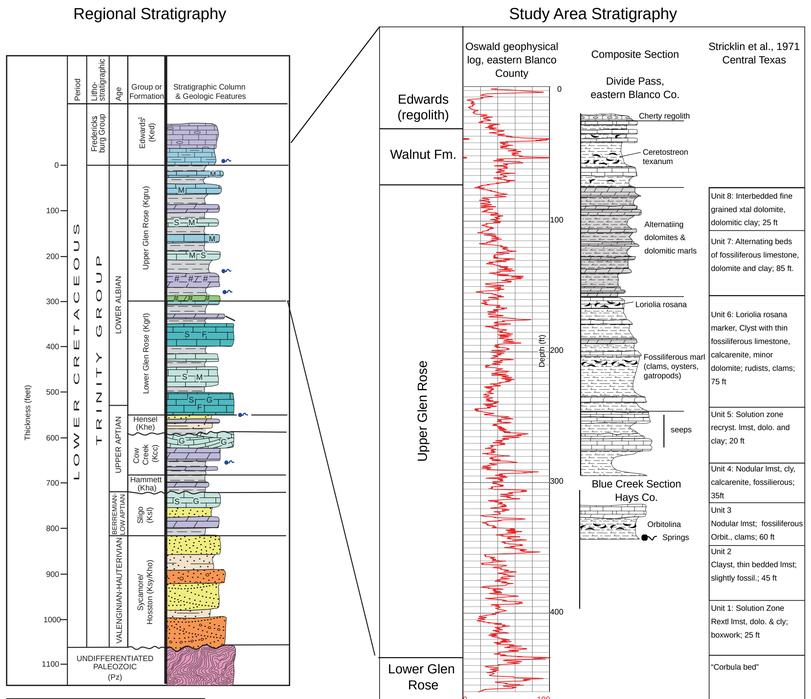

Figure 1. *Regional (from Wierman et al., 2010) and local stratigraphy of the study area. The Oswald well anchors the structural cross section (A-A') in the west, proximal to the headwaters of Onion Creek. The Upper Glen Rose Member is 355 feet thick at Oswald and is subdivided into eight informal lithologic units, which correlate to the classic work of Stricklin et al. (1971).*

Take Aways

1. Results of this study indicate complex surface and groundwater interactions in the Onion Creek Watershed.

2. For the first time, flow losses are documented to occur along a creek reach underlain by the Upper Glen Rose that has implications for recharge to the Middle Trinity Aquifer.

3. These losses combined with other hydrogeologic and geochemical data suggest Onion Creek provides some recharge to the Middle Trinity Aquifer in those reaches.

4. A better understanding of the surface water and groundwater interactions along the creek is important for groundwater and surface water management in an area undergoing significant population growth.

Future Studies

Future studies being planned include dye tracing, establishing stream gages, groundwater head data, and geochemistry among others.

Acknowledgments

The "Onion Creek Project" was initiated in November 2014 with geoscientists from local groundwater districts, the City of Austin, and independent hydrogeological consultants meeting to identify project goals. We extend our thanks to the cooperation and support of landowners and other entities: Dripping Springs Water Supply Corporation, Les White, Browning Ranch, Burns Ranch, Camp Lucy, Lyndon Smith Ranch, US Geological Survey, and the Texas Water Development Board.

Elements of the text and figures in this poster are part of a paper that is "in review" by the Gulf Coast Association of Geological Societies (GCAGS) for publication at their fall 2016 meeting.

Select References

Stricklin, F.L., Jr., C.I. Smith, F.E. Lozo, 1971, Stratigraphy of Lower Cretaceous Trinity deposits of Central Texas: University of Texas at Austin, Bureau of Economic Geology, Report of Investigations no. 71, 63 p.

Wierman, D.A., A. S. Broun, B.B. Hunt, 2010, Hydrogeologic Atlas of the Hill Country Trinity Aquifer, Blanco, Hays, and Travis Counties, Central Texas: Hays-Trinity Groundwater Conservation District, United States. 15 plates.