

2012 Summary of Age-Dating Groundwater in and near the Balcones Canyonlands Sam Hamilton and Bull Creek Preserves

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A conceptual groundwater model was proposed for the Jollyville Plateau area comprised of (1) a shallow system tens of feet thick feeding springs and creeks documented by groundwater tracing and (2) a deeper system greater than 100 ft below the surface poorly connected to the shallow system. Water samples were collected to determine geochemical characteristics and the relative age of water in each system testing the hypothesis that the shallow system would have younger and less chemically evolved water than the deep system. Water samples were collected from four surface water sites, 11 different springs and 17 wells ranging from >30 ft to >200 ft deep. Springs included those discharging from the Edwards, Walnut, Glen Rose formations as well as terrace deposits adjacent to the channels. Wells were screened in all three formations also. Sample collection began in April 2012 and was largely completed by August.

Geochemical signatures of surface and shallow groundwater are CaHCO₃ evolving to greater enrichment in Mg and SO₄ in deeper groundwater (Figure 1). Ion chemistry of the springs, creeks and shallow wells are largely identical with the exception of the Colorado River having significantly higher ion concentrations. In addition, Tanglewood and Spider Springs also have elevated ion concentrations due to impacts from urbanization. Chemistry in deeper wells (Glen Rose) is characterized by higher ion concentrations, particularly strontium, fluoride, sulfate, and potassium and lower Ca/Mg ratios (i.e. shallow water has more calcium and deeper water has more magnesium).

Interpretation of the tritium results is in progress and the following discussion is preliminary and subject to change (Table 1). Tritium results (Figure 2) indicate that the springs and creeks contain modern water (from precipitation since 1950) averaging 2.3 and 2.5 Tritium Units (TU) respectively. The deeper system (all Glen Rose wells) contains mostly pre-modern water (recharged before 1950) averaging 0.19 TU. A couple of Glen Rose wells have values in the range of 0.3 and 0.5 TUs which suggests there is mixing of pre-modern and modern water. The shallow groundwater system (Edwards and Walnut wells), contains locations with a mix of modern and pre-modern water or surprisingly only pre-modern water. For example, Edwards wells JT124, JT114, and JT101A are all characterized by pre-modern water with values between -0.4 and 0.4 TUs. Six Edwards and Walnut wells, JT104, JT109, JT112, JT113, JT115, JT127 and JT128 appear to contain a mix of pre-modern and modern water, ranging from 0.13 to 1.57 TUs. Results in JT112 and JT128 are likely due to introduction of surface water used in tracer injections. JT113 and JT115 may also be influenced by tracing water since tracers were detected in those wells. However, natural mixing of older and younger water may also be

occurring. JT104 and JT109 may have natural mixing within the Walnut. JT127 is adjacent to the Jollyville shaft and had a large drop in the local water table prior to sampling which may have influenced the tritium results.

Results indicate that in the Jollyville Plateau, there is a shallow groundwater system feeding the springs and creeks that is characterized by recently recharge water (modern water). Most groundwater in wells is either a mix of modern and pre-modern water or only pre-modern. Additional data analysis is on-going.