SYMPOSIUM ABSTRACTS

HYDROGEOLOGY OF ARMSTRONG AND NELSON SPRING CREEKS, PARK COUNTY, MONTANA

by
Chet Clarke
Texas Water Commission
Austin, Texas 78759

Armstrong and Nelson springs, nationally famous for their trout habitat, spawning areas, and fishing, represent an important water source of previously unknown origin. The springs issue alongside the Yellowstone River in a trend which parallels the central axis of the Paradise Valley. The springs issue from the Quaternary Yellowstone River alluvium aquifer which probably is interstratified with the Quaternary alluvial fan aquifer to the east. Both Quaternary aquifers are underlain with the Mississippian Madison Group aquifer. Major Laramide faults, perpendicular to the trend of the valley, cut the Madison Group aquifer. Each of the three aquifers yields water for local domestic purposes.

Based upon measurement of static water levels in domestic water wells and review of well reports for those wells, the local groundwater system is interpreted to be unconfined. The groundwater system receives recharge in the mountain ranges which border the valley. Groundwater migrates from the recharge areas toward the central axis of the valley.

The discharges and temperatures of individual springs in the Armstrong and Nelson springs systems were intermittently measured from March, 1987 through February, 1988. The size and number of springs in each system were also observed during this period. These measurements and observations indicate the discharge, temperature, size, and number of individual springs increase through spring and summer and decrease through fall and winter. Water samples collected from the spring systems and three aquifers indicate each yields water of calcium-bicarbonate type. Comparison of the water samples and historical Yellowstone River water quality data on a Piper plot suggests Armstrong Spring, Nelson springs, and the Yellowstone River alluvial aquifer yield water of the same quality. Also, the Piper plot comparison suggests the springs and the Yellowstone River alluvial aquifer receive recharge from both the Yellowstone River and the alluvial fan aquifer. The water quality of the Madison Group aquifer is dissimilar to the quality of the springs.

The springs are interpreted to represent depression springs which serve as a discharge area for the unconfined groundwater system. The springs vary in discharge, temperature, size, and number in response to seasonal fluctuations in recharge. The springs are not interpreted to be structurally controlled due to a contrast in trends of the springs and the Laramide faults. The springs issure from the Yellowstone River alluvial aquifer which is recharged by both the Yellowstone River and the alluvial fan aquifer. The Madison Group aquifer is not interpreted to contribute significant recharge to the springs, if any at all.