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Lake stage fluctuations correspond well with observed carbonate water level variations and probably are a major contributing factor in the variability of the springs and the decline in water levels and spring discharges since 2000. Water withdrawals from the carbonate aquifer system are also a contributing factor and probably account for about 0.6 ft of the observed decline in nearby monitoring wells.

These findings suggest that the Muddy Spring area is not the terminus of the White River flow system; rather a significant quantity of groundwater flows under the spring area and discharges into Lake Mead, probably in the area along the original Muddy River, Virgin River, and Colorado River bottoms. The change in head that resulted from lake filling, and the corresponding decrease in groundwater discharge along the river bottoms caused an allometric response over a large area of the system. This response was manifested in rises in both water levels in the carbonate aquifer and in spring discharge rates in the Muddy Springs area. As the lake began to decline in 2000, the response reversed and water levels and spring discharge rates began to decline. Analyses are continuing to determine the response of spring discharge to each of the independent variables that form the system to better quantify the impacts of groundwater withdrawals on this complex hydrogeologic regime. However, final confirmation may not be possible until the current drought conditions are relieved and the stage of Lake Mead rises to its 1998 to 1999 levels.

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