Rivers, continued from page 23
beginning, utilizing collaborative processes and applied interdisciplinary science.

Most rivers in the Southwest are groundwater-dependent, flowing primarily in a baseflow regime supported by discharge from the connected aquifer. In an undeveloped aquifer, the rate of recharge to the aquifer is balanced by the rate of discharge from it. Aquifers naturally discharge through two principal pathways: 1) to the land surface via rivers, springs, and wetlands; and 2) through vegetation via transpiration. Pumping through wells is the one artificial pathway of aquifer discharge.

In aquifers that still support surface-water discharge, consumptive groundwater use (by pumping) captures water that would otherwise discharge to the stream or spring system (Filippone and Leake, 2005; Anning and Konieczki, 2005). Thus, every drop of water consumptively used by humans is a drop lost to the riverine ecosystem. To the public, groundwater is out of sight, out of mind, and impacts to streams from groundwater use are often spatially and temporally distant from the place of pumping, and thus are easy to ignore or discount. Understanding the spatial connections of the natural and human-built environments is critical to managing water efficiently to meet both human and ecosystem water needs. In the Upper San Pedro Basin in southeast Arizona, for example, Cochise County utilized results from regional groundwater modeling to define a corridor adjacent to the river where future pumping and increases in development density would have the most immediate and direct impacts on riparian health and sustainability. The county subsequently established an overlay district that, among other things, sets up a process for the transfer of development rights from this sensitive corridor into other areas of the watershed where pumping will not as directly impact the river (Cochise County, 2006).

Reality Meets Theory

Protecting our remaining rivers and wetlands is a considerable challenge, given the limited water availability; the time and space separation between groundwater pumping and streamflow depletion; the largely unmanaged growth