

## **Hydrologic Requirements of and Evapotranspiration by Riparian Vegetation along the San Pedro River, Arizona**

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In response to a need to better understand how ground-water and streamflow conditions are related to riparian vegetation condition and water use, a study was completed by the U.S. Geological Survey, Arizona State University, and the Department of Agriculture-ARS. Hydrologic (ground-water and streamflow variables), riparian, and evapotranspiration (ET) data were collected from 2000 to 2003 at a series of sites spanning the conditions present within the San Pedro Riparian National Conservation Area (SPRNCA), Upper San Pedro Basin, Arizona. The SPRNCA extends about 60 km north from the U.S. boundary with Mexico and the drainage area above the downstream SPRNCA boundary is about 4,800 km<sup>2</sup>.

The study identified relations between hydrologic and riparian variables through the development of three riparian condition classes: wet, intermediate, and dry. First, reaches along the river were defined using geomorphic measures. Then each reach was assigned to a condition class on the basis of vegetation structure and ecosystem functioning capacity data collected at each study site. Finally, ground-water depth and variability, and annual permanence of streamflow within each reach were related to the riparian condition class. Overall, 39 percent of the riparian corridor fell within the wet class, 55 percent in the intermediate class, and 6 percent in the dry class.

On an area-normalized basis, riparian ET from cottonwood trees in a wet reach was more than twice the value for an intermediate reach. With respect to the overall ET flux from the SPRNCA's riparian system, mesquite trees were the dominant component at about 4,700 acre-feet/year while cottonwood trees consumed about 2,300 acre-feet/year. Total ET from the riparian system within the SPRNCA was estimated as being in the range of 7,350 to 9,010 acre feet/year.