Upper SanPedro Partnership

Going With the Flow

Where our water comes from

In the dry Arizona environment, we are dependent on pumping water from the ground to supply our needs. This **groundwater** is contained in an **aquifer**, underground rock and soil deposits that yield water. Much of the water in the aquifier is believed to have filled during the last glacial wet period 10,000 to 20,000 years ago. Groundwater currently supplies water to nearly 70,000 people in homes, businesses, farms, and industries in the Sierra Vista sub-watershed and provides the critical **base flow** for the San Pedro River. **Base flow** refers to the water in the river during dry periods when no rainfall, runoff or floods contribute water to the river. We currently take more water from the underground aquifer in the Sierra Vista sub-watershed each year than nature can recharge or replenish with rainwater and snow melt, resulting in a water deficit or overdraft.

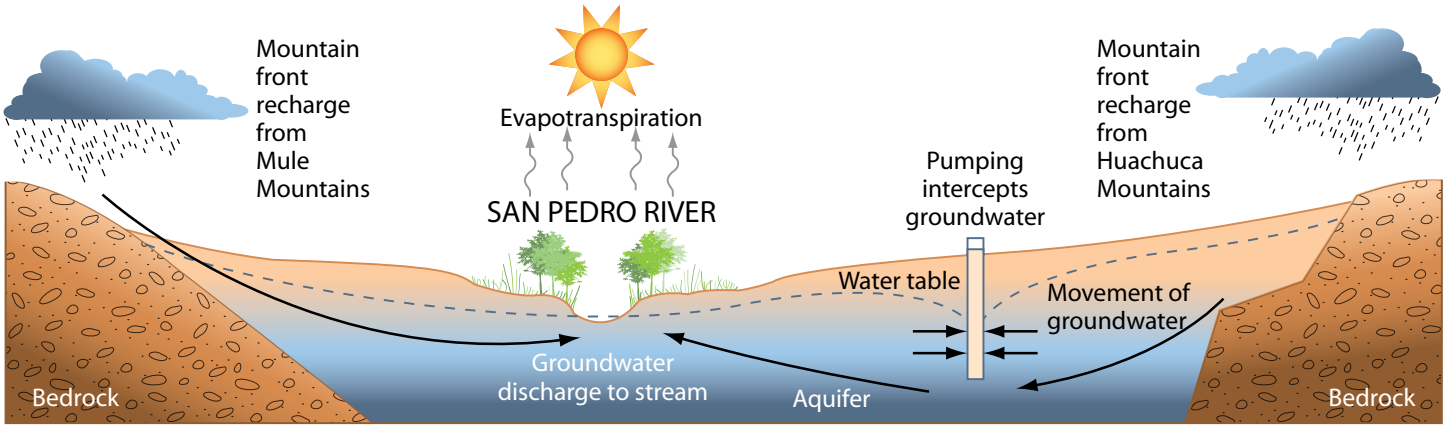
Because of the unpredictability of the summer and winter storms, the San Pedro, like many other desert rivers, experiences a wide range of flows

The continuous process that moves water from the clouds to the earth and back again is called the **water or hydrologic cycle**. Locally, precipitation over the mountains is an important part of this water cycle. Water from rain and snow flows down the mountain into sediments at the base of the mountain and sinks into the valley aquifer (**mountain front recharge**). The groundwater then moves slowly toward the river, eventually discharging directly into the San Pedro River. Depending on the route the water takes, this journey to the river may take days, weeks, or thousands of years.

Our current water situation

When groundwater is pumped out without equal amounts of recharged water being put back into the systems, the water deficit grows, and the water table drops over time, making water harder to reach and more expensive to obtain. Without a reliable long-term water supply, neither the people of the area nor the river will continue to thrive. Around wells, this pumping also creates **cones of depression** in the water table, which capture some of the groundwater that would otherwise travel to the river.

The Partnership is committed to ensuring that water is managed in a way that can support the people in the region and the federally protected **riparian area** on a **sustainable** basis. Sustainable water use means the water use can be maintained for an indefinite period of time, without causing unacceptable environmental, economic, or social consequences. Recent legislation adopted by the U.S. Congress



(www.lastgreatplaces.org/sanpedro/geography/hydrology.html) USGS OFR

SAHRA www.sahra.arizona.edu

This fact sheet was produced in collaboration with SAHRA, the NSF Center for Sustainability of semi-Arid Region Hydrology and Riparian Areas, at the University of Arizona (www.sahra.arizona.edu). It is part of a series connecting science findings with decision-making in the Upper San Pedro Basin.

requires that water use management and conservation measures must be taken to restore and maintain sustainable yield by 2011 in the Upper San Pedro Basin.

Keeping track of the aquifer: What's going on down there?

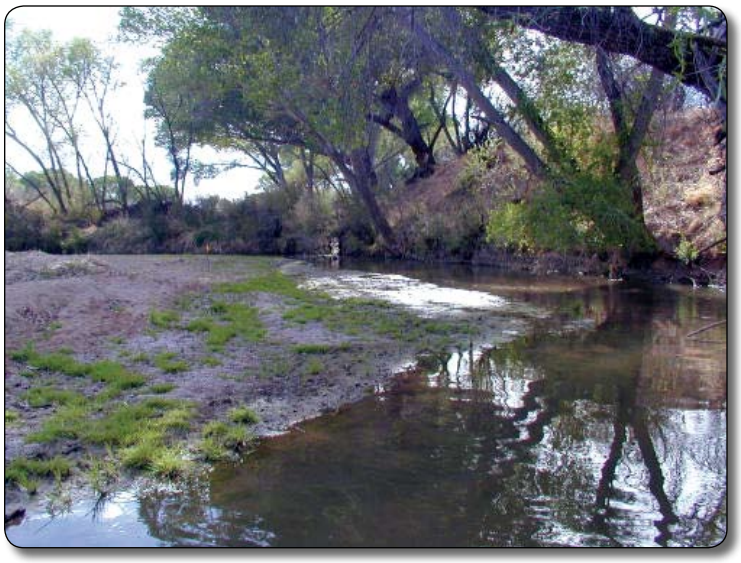
We know we have a water overdraft because of the science of **hydrology**. The U.S. Geological Survey (USGS) has monitored over 200 locations throughout the sub-watershed to better inform us how the aquifier works and how it is changing. By monitoring groundwater levels and other hydrologic factors, we can better predict which water management measures will be most effective in reducing aquifer overdraft. The Arizona Department of Water Resources recently estimated that in 2002 there were 9,900 more acre-feet of water taken out of the aquifer than were naturally recharged. An **acre-foot** of groundwater equals 325,851 gallons, about enough for two families for a year. Even factoring in efforts by Partnership members to help conserve and recharge water back into the aquifer, the overdraft in 2002 was still 3,500 acre-feet. The effects of the overdraft are cumulative and continue to add up over time.

Watching for changes

Hydrologic monitoring looks at changes in water stored in the regional aquifer and helps us better understand the connections between climate, precipitation, tributary stream flow, recharge, groundwater flow, and the volume of water that flows ("discharges") out of the Sierra Vista sub-watershed via the San Pedro River. Ongoing research in the Sierra Vista sub-watershed will provide the high quality scientific information that can be the basis for effective water management strategies. Recent monitoring projects have evaluated inflows, outflows, and changes in groundwater storage:

Inflows

- **Natural recharge** — An assessment of variations in natural recharge using streamflow data from gauging stations at the mountain front and in intermittent stream channels.
- **Enhanced recharge of stormwater due to urbanization** — Monitoring of key intermittent stream locations to improve estimates of recharge, which is predicted to increase as urbanization concentrates more stormwater runoff.



Flooding creates new sandbars where cottonwood seeds can germinate.

Outflows

- **Stream base flow and springs** — Measurement of groundwater outflow to the San Pedro River at USGS streamflow-gauging stations. Groundwater discharge will also be measured at selected springs.
- **Riparian evapotranspiration within the SPRNCA** — Continuation of existing monitoring efforts to improve estimates of total groundwater outflow through direct evaporation and plant transpiration.
- **Groundwater pumping** — Annual tabulation and estimation of groundwater pumping by industrial users, municipal providers, private water companies, households with private wells, and agricultural users.

Change in Storage

- **Changes in regional groundwater levels and storage** — Monitoring of water-level changes in selected Sierra Vista wells. Measurement of changes in aquifer storage using microgravity measurement techniques.
- **Changes in hydraulic gradients between the regional aquifer and the river** — Monitoring of the slope of the water table that moves water from the regional aquifer to the river.

FIND OUT MORE...

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