Recharge basins and headworks of the Vidler Recharge Facility. Photo is oriented to the northwest; intersection of I-10 and the CAP delivery canal can be seen.

Recharge

The Vidler Recharge Facility: Development of a Large Scale Groundwater Storage Facility in Western Arizona

Part 1 of 3: The Pilot Recharge Facility

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Vidler Water Company (VWC), a privately held corporation from Carson City, NV, has developed the Vidler Recharge Facility (VRF) in the Harquahala Valley, approximately 90 miles west of the Phoenix metropolitan area. The facility will be used to store excess Central Arizona Project (CAP) water; it has been designed and permitted to store 100,000 acre-feet of water annually for 20 years. The VRF uses a combination of methods to store the CAP water, including basins and vadose zone recharge wells.

In 1998, VWC initiated the design and construction of a pilot recharge facility at the MBT Ranch properties in La Paz County, Arizona. This activity was performed under a "constructed" underground storage facility permit issued by the Arizona Department of Water Resources (ADWR). The pilot recharge facility was used to evaluate recharge methods of coupling shallow basins with vadose zone recharge wells. The photograph above shows the three identical four-acre basins and headworks that were constructed as part of the facility. CAP source water was pumped from the canal and piped to a distribution box located at the top of the "T" between the three recharge basins.

Water was pumped at a rate between 3,000 and 3,500 gallons per minute from the CAP aqueduct to the pilot recharge site through a 15-inch PVC pipeline approximately 6,000 feet in length. Hourly performance data, including water level and flow rate for each basin, were collected by a programmable controller and transmitted via satellite back to the office of HydroSystems, Inc., for analysis. Soil resistivity and neutron logging data, as well as groundwater level and water quality data, were used to evaluate the efficiency of the water migrating to the aquifer.

Initial pilot studies were performed on the basins during a 90-day test period. Two of the three basins had no form of infiltration-rate enhancement and yielded an infiltration rate of 0.8 to 0.9 feet per day. The third basin incorporated two vadose-zone recharge wells within the basin and achieved a recharge rate of 1.05 feet per day. Utilizing the vadose zone wells allowed the source water to bypass upper fine-grained soils and access coarser-grained sediments approximately 80 feet below the basin.

Part 2 of this series will focus on the design and construction of the full-scale recharge facility.

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Water Storage Facility Planned for Phoenix's West Valley

The Salt River Project (SRP), the largest provider of water and power to the greater Phoenix metropolitan area, along with Phoenix-area municipalities are developing a new water banking facility for Phoenix's West Valley. The New River-Agua Fria River Underground Storage Project (NAUSP) is sited in the river bottom near the confluence of the two rivers, several miles downstream of CAP's Agua Fria River Recharge Project (see next article). SRP will operate the facility, which will recharge and store up to 100,000 acre-feet of water per year from the Colorado, Verde, and Salt Rivers, through existing allocations to West Valley communities and SRP. Additional, still-undetermined sources will also be recharged. Permit applications for the facility are currently being processed by the Arizona Department of Water Resources; construction is planned to begin in the second half of 2002. The first recharge of water is expected in late 2002 or early 2003.

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Two More Recharge Facilities to Store Colorado River Water for the Central Arizona Project

The Central Arizona Project (CAP), the organization that manages the distribution of Colorado River water in Arizona, has begun to recharge Colorado River water in the newly-completed Aqua Fria River Recharge Project (AFRRP) in the Salt River Valley near Phoenix, and is set to begin construction on another recharge project near Phoenix this spring.

The AFRRP is unique in Arizona because recharge occurs both in the natural stream channel and in constructed spreading basins. CAP water is released into the dry Aqua Fria channel to recharge naturally, and any water still flowing five miles downstream from the release point is diverted into 120 acres of spreading basins. The facility has a storage capacity of 100,000 acre-feet per year, due in part to its location in an area that has been over-pumped for many years, resulting in a large cone of depression with a water table decline of nearly 400 feet.

The AFRRP is the fourth full-scale recharge project constructed by the CAP; three others are located in Pima County in southern Arizona, including the Lower Santa Cruz, Avra Valley, and the Pima Mine Road Recharge Projects, which cumulatively have a storage capacity of more than 70,000 acre-feet of CAP water per year. A fifth recharge project, the second in the Phoenix area, will bring Arizona's CAP storage capacity to more than 200,000 acre-feet per year. Ultimately, CAP hopes to have enough facilities to store 400,000 acre-feet per year.

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Groundwater Modeling and Biodiversity Conservation on the Lower San Pedro River

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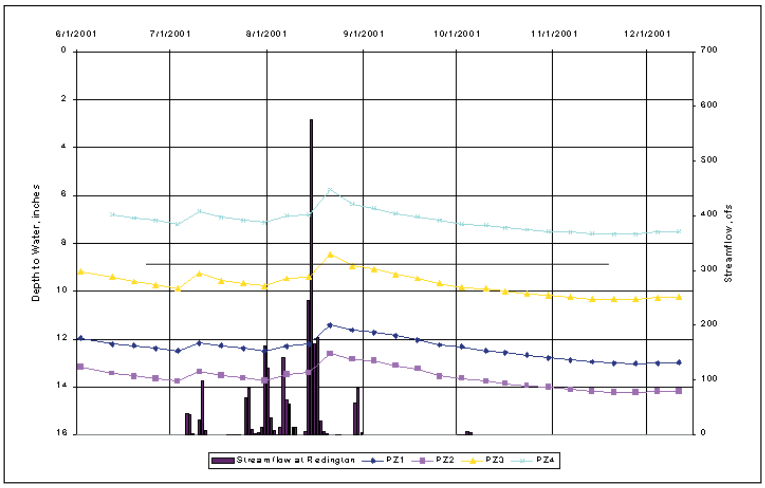
The binational San Pedro River supports one of the best remaining occurrences of cottonwood-willow riparian forest in Arizona, which in turn supports an exceptional diversity of terrestrial and aquatic species. The Nature Conservancy (TNC) is involved in conservation of this unique habitat on a basin-wide scale.

The lower San Pedro, from The Narrows south of Interstate-10 in southeastern Arizona to its confluence with the Gila River near Winkleman, Arizona is characterized by reaches of perennial flow with quality riparian habitat separated by reaches of intermittent or ephemeral flow with degraded or no riparian habitat. TNC staff estimate that about 16 miles of the total 84 miles, mostly perennial in the past, remain perennial. Loss of flow and riparian habitat is chiefly the result of groundwater pumping, clearing, grazing, and ATV use. Through use of a flow management approach, TNC believes there is abundant opportunity for increased surface water flow and associated riparian forest recovery.



Depth of groundwater at SWREF and flow recorded at USGS gages

TNC's approach to flow management is guided and informed by groundwater modeling. An existing MODFLOW model for the reach from Fairbanks to Redington was updated and used to predict effects on river flow based on alternative agricultural pumping scenarios. Results are being used to guide protection and restoration strategy in this area.

Downstream from Mammoth, where an appropriate-scale model does not yet exist, groundwater pumping and depth to water information obtained from the Arizona Department of Water Resources was used to guide acquisition of a 528-acre farm. This farm accounted for about 40% of total groundwater pumping between Mammoth and Winkleman. TNC, in association with Southwest Wildlife Rehabilitation and Educational Foundation (SWREF), and with funding from the Arizona Department of Environmental Quality, has initiated restoration of native grasses in the abandoned agricultural fields. In addition, TNC is monitoring groundwater levels following cessation of agricultural pumping. A riparian monitoring program will be initiated spring 2002 to track changes in riparian vegetation associated with changes in groundwater level and river flows.

Groundwater levels at the SWREF site rose about nine feet following cessation of agricultural pumping. A comparison of water levels in shallow piezometers and flow recorded at the USGS gage at Redington (see graph) indicates that water level rose in response to surface flow, with a slow decay of water levels following cessation of surface flow. Water level is now approximately 7 feet below the bottom of the active channel. TNC believes that with cessation of pumping and fencing of the floodplain to eliminate cattle grazing and ATVs, groundwater level in the alluvial aquifer will recover sufficiently to support surface flow much of the year, providing the shallow water source needed for recruitment of cottonwood and willow.

Lack of a groundwater model for the lower San Pedro below Redington hampers prediction of future groundwater and streamflow conditions based on various flow management scenarios. TNC's Freshwater Initiative and the University of Arizona's SAHRA Center are providing funding for development of a MODFLOW model. In addition, TNC is seeking funding to conduct a detailed investigation of hydrogeologic conditions in the vicinity of the SWREF property. Results from these efforts will inform TNC's future conservation activities in the lower San Pedro basin.

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