



ARIZONA WATER RESOURCE

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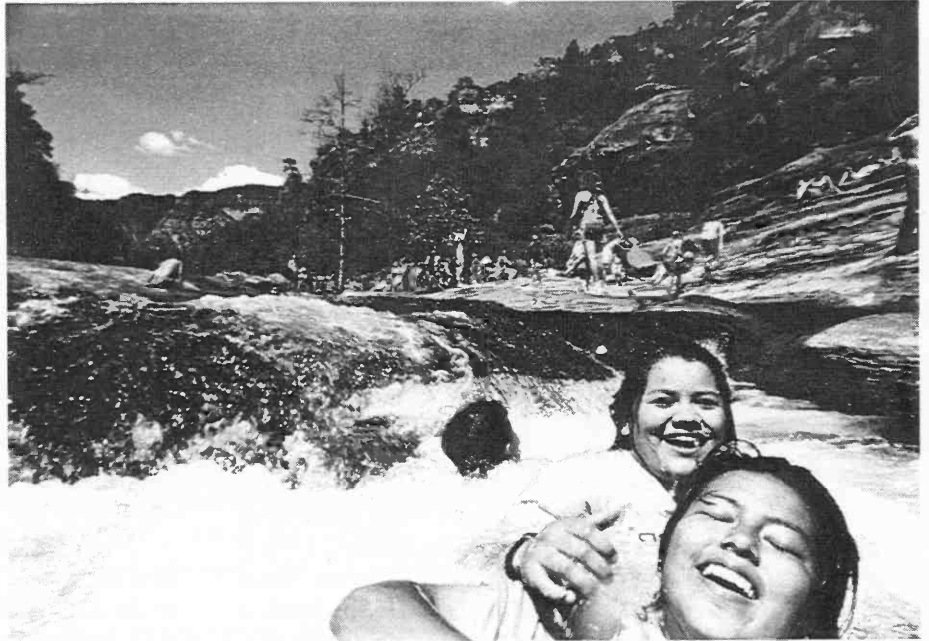
Flow of San Pedro Threatened

A classic controversy is being played out in the Sierra Vista area as officials grapple with a trio of issues — growth, water and the preservation of the San Pedro River.

Of the 60,000 people living in the upper San Pedro basin, 50,000 reside in Sierra Vista, with the rest located in various rural communities. The city's annual growth rate since 1990 has averaged 3.9 percent. Expansion of the Fort Huachuca Army Base sparks much of Sierra Vista's growth. In a recent strategy, city and base officials are pushing for the transfer of the Defense Language Institute from Monterey, California to Fort Huachuca.

The troubling specter of water scarcity complicates matters however. Sierra Vista's growth has depended upon pumping groundwater. These reserves are being depleted by about 11,000 acre-feet per year and, in the process, the flow of the San Pedro River is threatened.

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When it comes to summertime water play, the owners of Arizona's 150,000 boats and 190,000 backyard pools have nothing on these children shooting the rapids at Slide Rock, Sedona. (Photo: Peter Essick; Water Facts: Arizona Water map)

Arizona Water Bank Idea Draws Interest

Western states do not appear willing to "go with the flow" and let the federal government control leasing of Colorado River water. Instead, the lower basin states of Arizona, California and Nevada are busy devising their own strategies to use unused portions of Colorado River allotments.

Present arrangements allocate 2.8 million acre-feet of Colorado River water to Arizona, 4.4 million acre-feet to California, and 300,000 acre-feet to Nevada. Arizona is using at most 1.6 million acre-feet of its annual allocation, while California uses its full share plus Arizona's unused portion. Rapidly growing Nevada expects to tap its full allocation within a decade.

California wants to continue tapping Arizona's allocation, and Nevada seeks to augment its share of the Colorado River, probably at Arizona's expense. Arizona seeks to control its allocation to ensure its full future use when needed. Despite the divergent goals, the states prefer to resolve the situation among themselves rather than accept a plan proposed by the Bureau of Reclamation.

The federal plan calls for interstate leasing of unused water allotments to be authorized by the secretary of interior. The Bureau has circulated a draft of its plan to the Colorado River Compact states for comment. Reaction to the plan has been less than favorable, mainly because the federal government would gain control of how states manage and eventually sell their allotments of Colorado River water.

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Water Bank, continued from page 1

Arizona Governor Fife Symington deemed the federal plan sufficiently onerous to threaten to sue over the proposed new regulations. The governor claims the proposed regulations conflict with the 1922 Colorado River Compact and threaten Arizona's allocation.

In response to the Bureau of Reclamation proposal, Nevada and Arizona each have devised their own plans for managing Colorado River allotments. Nevada has proposed establishing a three-state commission of the lower-basin states. According to the plan Nevada, Arizona and California would have equal voice in determining strategies for gaining additional water to support economic development.

Arizona is critical of Nevada's plan. Equal voice among three states means Arizona would lose individual control over the management and sale of its unused Colorado River water. Arizona countered by devising its own plan to safeguard its water rights even while selling unused portions — a "water bank" proposal to advance its interests; i.e., assure future control of its Colorado River allotment while allowing current sales of unused portions to other states.

The proposal would establish a water bank controlled by the state. The bank would acquire unused water allocations for sale to other states or for recharge. The Arizona Department of Water Resources (ADWR) would operate the water bank, with legislative action needed to authorize the bank to acquire water from those with rights to it. Unused water allotments that the bank acquires would be put into a special water category that statute allows to be marketed. Money to acquire the water could come from a legislative appropriation and be repaid by the water bank or from revenue bonds with water contracts for security.

The plan would require legislation for the state to decline to use its entire water allotment. Also legislation would be needed to create a new category of water to be available to the bank and to grant ADWR's director authority to deal directly with the secretary of the interior on river matters and Arizona's contract.

Arizona's plan was presented to all seven members of the Colorado River Compact in July. A technical subcommittee was appointed to review the water bank concept and to report its results at a meeting in Phoenix October 11.

California and Nevada's initial responses to the Arizona proposal were cautious. Arizona's ability to sell unused portions of its allocation does not appeal to California since it has had free use of Arizona's unused water. The water banking plan might provide Nevada the opportunity to acquire additional water resources, but without the control it would have under its proposed tri-state commission plan.

Meanwhile, since the states appear to be digging in to fashion their own options, the Interior Department is holding off advancing its proposed water marketing regulations.

Ten tribes with Colorado River water rights also are meeting to develop a position on water banking. The tribes are expected to review a water banking proposal that recognizes the tribes as equal and separate entities from the states.

San Pedro, continued from page 1

A 1990 report by University of Arizona hydrologists predicted that even without further growth, if present groundwater pumping rates continue, the aquifer would be sufficiently depleted within two decades to end surface flow on the San Pedro River and destroy its riparian zone. The report has been a thorn in the side of those pushing for further growth.

Officials are seeking additional water resources. One proposed remedy is to extend the Central Arizona Project canal from Tucson to Sierra Vista. A U.S. Bureau of Reclamation report suggests three possible routes, with cost estimates varying from \$71.4 million to \$95 million and annual pumping costs from \$883,000 to \$971,000 per year depending upon selected route.

Sierra Vista's plan is to recharge the aquifer with 20,000 acre-feet of CAP water, thus reducing the cone of depression beneath the city and Army post.

The city's less extravagant water resource options include developing effective water conservation policies and improving wastewater treatment. Also suggested is the practice of watershed management to retain natural runoff and enhance recharge of the aquifer.

Some critics suggest the problem is not so much getting new water as controlling growth. The situation comes down to deciding whether the San Pedro River is more important than unrestricted growth. They point out that the flow of the San Pedro River is protected by law.

This view motivated the Southwest Center for Biological Diversity to file suit in U.S. District Court claiming the Army is expanding its Fort Huachuca facilities without considering possible damage to the San Pedro River. The suit alleges the Army is violating the National Environmental Protection Act by failing to complete an environmental impact statement.

Secretary of Interior Bruce Babbitt added poignancy to the situation with a not-so-veiled threat that Fort Huachuca could be closed down if longstanding groundwater disputes are not resolved. Babbitt offered the services of a federal mediator. To the regret of some residents he side-stepped the CAP request.



"The well was dry beside the door,
And so we went with pail and can
Across the fields behind the house
To seek the brook if still it ran;"

from Going for Water by Robert Frost

New England farmers long have understood the connection between groundwater and surface water. Arizona continues to struggle with this hydrologic concept. See "Goodfarb defines subflow," page 6.



Water Vapors

Our summer issue is tardy, but once again, we have a scapegoat — a computer virus (a Taiwanese mutant of a Bulgarian strain) evaded our software defenses, mangled files and rendered six computers temporarily unusable.

Mister Media Mania

Another distraction was the overwhelming media response to last issue's piece on the water use and cooling efficiency of one low-pressure outdoor misting system. To date, the story has been covered by three of Arizona's four largest papers, picked up by AP's wire service, featured on five TV stations, and carried on several radio stations. But remember, you read it here first.

More importantly, it appears that the Water Center may in fact receive funding to systematically test misting systems. We hope to be able to look at water use and cooling efficiency of both low-pressure residential and high-pressure commercial systems as a function of temperature, humidity and wind velocity.

We Got Letters!

Thomas Sands of SRP's Operational Support Division writes requesting clarification of a statement in an article in our April issue entitled "CAP NO Fishing Policy Catches Flack." Mr. Sands notes that "the article implies fishing is permitted in the SRP canals. It should be noted that since fishing is regulated by the Arizona Game and Fish Department, SRP is not authorized to prohibit fishing in its canals. SRP, however, strongly discourages it." So noted.

David Hancocks, executive director of the Arizona-Sonora Desert Museum writes in response to a request in the last installment of *Vapors*:

"In the latest issue of your excellent magazine you ask for information about personal experiences with water

conserving features. I lived in Australia about five years ago and was impressed by a law that all new toilets have to be dual-flush: one button delivers a partial flush, the other is for full flush. I don't know if the new limited flush toilets used here make that system redundant, but it seems to me that an option to use a lesser flush has advantages. It puzzles me that dual flush toilets are not (to my knowledge) available here. Do you have any information on this?"

Well, Dave, some of us old-timers remember when dual-flush toilets were sold in Arizona. Rather than dual buttons, they operated by pressing the lever up to deliver a low-volume flush or pressing it down for a standard flush. This particular model was sold in Arizona a few years ago. It appears to have disappeared, partly due to the need to re-train people in how to use them and partly due to the growing acceptance of ultra-low flow 1.6 gallon toilets.

One of us who serves on a citizens' group that recommends water rates recently received a letter from someone who apparently failed to grasp the elegant simplicity and manifest fairness of Tucson Water's new rate structure. While most of the hand-written diatribe was indecipherable, certain legible phrases stood out:

To the Members of the Citizen's Water Committee,

Thank you so much for raising my water rates... no longer pay my water

bills... become a fire danger... I attempted to strangle my cat... urinated all over... adding the last bit of stress... punishing us and rewarding those who waste... now the reverse will happen... contrary to all natural laws... injuring my physical health... you don't understand... taxation without representation.

Sincerely,

Mr. Smith (actual name)

The immediate reaction was, "Gee, I wonder if there's a death threat buried in here somewhere?" Upon calmer reflection, we concluded it was time for a review of recent trends and changes in municipal water pricing, which is found on page 5.

Wrong Number — Try the Net

Until recently, one could phone the Water Center using either our published 792-9591 number or our old University of Arizona number (621-7607). Due to changes in phone rates, we recently dropped the 621- lines and added capacity to the 792-9591 lines. Our fax line (792-8518) is unchanged. Please make a note of this.

AWR readers, being on the cutting edge of societal change, will be pleased to know they now can communicate with us via the Internet. Send us your thoughts using our Email address, wrrc@ccit.arizona.edu. (All Water Center addresses and phone numbers are contained in the credits box at the bottom of this page.)



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News Briefs

Central Arizona ID Goes Bankrupt

The Central Arizona Irrigation and Drainage District has sought Chapter 9 bankruptcy protection from \$91 million in Central Arizona Project-related debts. Some \$25 million of the debts is owed to private bondholders with the balance owed to the U.S. Bureau of Reclamation. The private bonds currently are not in default. The debt was incurred to finance construction of distribution canals to bring CAP water to the district's 87,000 acres located on 200 farms in Pima County near Eloy.

The filing comes just seven months after New Magma Irrigation and Drainage District filed for bankruptcy (see April *AWR*, p. 1). Neither action was unexpected and apparently will have no immediate impact on finances of the Central Arizona Water Conservation District (CAWCD). Impacts are being felt, however, by local governments in Pinal County, and especially school districts. The property tax base has shrunk, and bond ratings have deteriorated. It is not clear whether the bond ratings of other local governments in central Arizona will be affected.

Equally unclear are the long-term impacts these bankruptcies will have on the irrigation districts' capability to stay in business and buy CAP water. Should the districts cease operations, the CAP repayment burden will fall more heavily on municipal and remaining agricultural users.

Distrust Hinders Search for CAP Solutions

A consultant team seeking ways to rebuild public confidence in Tucson Water and forge a community consensus on how Tucson's CAP allocation should be put to use reported unprece-

dent levels of distrust of local government. Martha Bean of Triangle Associates told the Citizens' CAP Oversight Committee that the lack of public confidence in local government and the highly technical issues involved will even preclude some consensus-building techniques commonly used to resolve public disputes.

The results of a public attitudes survey based on in-depth interviews with 60 key opinion leaders throughout the community revealed a general belief that Tucson should hang onto its CAP water and put it to use in some fashion. There was wide disagreement on what those uses should be, however. The consultants suggested that Tucson's Mayor and Council reaffirm their commitment to having all CAP options put "on the table" for consideration, noting that there was a widespread sense that viable alternatives to direct treatment and delivery of CAP water had been arbitrarily rejected in the past.

The consulting team, headed by Martha Rozelle of Dames and Moore, reported that the level of distrust and technical complexity of the issues would preclude it from completing the scope of work within the original timeline or \$609,000 budget. The Oversight Committee directed the consultants to bring back two options, one indicating what could be accomplished within the original budget, and another option including substantially more public input and a higher budget.

AZ's Largest Recharge Project Dedicated

The Salt River Project (SRP), the Salt River Pima-Maricopa Indian Community (SRP-MIC) and the Cities of Chandler, Mesa, Gilbert, Phoenix, Tempe and Scottsdale have completed a major in-stream recharge project in the Salt River. Known as the Granite Reef Underground Storage Project or GRUSP, the \$2.1 million project is capable of storing up to 200,000 acre-feet of unused CAP water per year at the GRUSP site.

Located on 350 acres of land leased

from the SRP-M Indian Community, the project is to be operated by SRP. Annual operating costs of \$420,000 and project storage capacity are divided among the seven participants with SRP owning 34 percent, Phoenix 27 percent, Mesa 25 percent, Chandler 7 percent, Gilbert 3 percent and Tempe and Scottsdale 2 percent each.

Four shallow spreading basins totalling 174 acres in area lying in the Salt River receive water via a 1.7 mile delivery channel from a headworks in SRP's South Canal. The project, which was constructed by SRP-MIC's Salt River Sand and Rock enterprise, will operate with two basins wetted at any given time while the other two are dried and cleaned. The basins will be inundated by Salt River flows in excess of 10,000 cubic feet per second; reconstruction of the basins is estimated to cost \$35,000.

GRUSP is the first significant groundwater recharge project in the Phoenix area and the largest in Arizona. The project is capable of recharging CAP water for only a few dollars per acre-foot during wet years and storing it to be pumped out as groundwater during years when surface water supplies are insufficient.

Students Win Water Poster Award

State finalists in the Water Education Poster Contest were announced. Lorraine Wright, third grade, Santa Clara School, Tucson, and Danny Handke, fifth grade, Cochise School, Scottsdale, will have their water posters featured in a 1994-95 calendar.

The annual contest is sponsored by the International Office of Water Education, Logan, Utah and is open to all K-6 students in Arizona, California (Los Angeles), Colorado, Nevada, New Mexico, Utah and Wyoming. This year's poster theme was "Groundwater — A Natural Wonder."

Project Water Education for Teachers (WET) of the Water Resources Research Center at the University of Arizona is the state sponsor of the event.

Municipal Rate Hikes Meeting Resistance

A number of Arizona municipalities have hiked water rates in the last several months, in many cases due to increased costs of buying and treating CAP water. Others are financing repairs and expansions to distribution systems. In several cities, water department recommendations for sizable increases are meeting with resistance from city councils trying to avoid customer rate shock.

Phoenix Water raised its rates effective in June, with the typical customer seeing a 7.3 percent increase. The hike was less than half the 15 percent recommended by a citizens' advisory committee; the deferred increase, earmarked for water treatment facilities to meet federal water quality mandates, will be considered in December. Phoenix last raised rates in December 1992.

Elsewhere in Maricopa County, Chandler raised rates 4 percent in February, with another increase contemplated in October. Glendale's rates were raised 7.2 percent last November, with another increase planned for this November. Mesa hasn't raised rates since a 5 percent increase in July 1993, but an increase is possible this summer.

Scottsdale imposed a hefty 15 percent rate increase on its water customers in July 1993, and also is contemplating another increase in the near future. Tempe water bills went up an average of 5 percent after a rate increase last January. Rates will be considered again in November.

In Pima County, Metropolitan Domestic Water Improvement District and affiliated Oro Valley Water Improvement District #1 raised rates by 12.5 percent effective August 1 for their 14,000 customers. MDWID, which was formed from the private Metropolitan Water company in 1992, previously raised rates January 1993. The additional revenue generated will be used to replace undersized and deteriorating mains, increase storage capacity and install more fire hydrants.

After 17 years of annual rate in-

creases, Tucson Water's rates have not been raised since May of 1992; nevertheless, Tucson's Mayor and Council have been attacked by irate customers who believe rates have been hiked, and that the utility has begun charging more for water in the summer than in the winter.

The confusion stems from changes Tucson Water made to its rate structure in December 1993. The number of customer classes was reduced from seven to four and residential customers were changed from an increasing block rate structure with higher summer steps to a summer surcharge structure. Overall, the rate changes are revenue-neutral for the utility, but some customers, particularly those with above-average summer-to-winter water use peaks, saw significant bill increases. Equally significant, water bills now highlight the increased cost of summertime water use; previous bills gave no indication that water cost more in the summer.

Tucson's Mayor and Council have voted to reconsider the rate changes in early 1995. Circumstances may not give them much flexibility in providing customer relief, however. Deferred rate increases since 1992, the sale of bonds to rebuild much of the aging water distribution system, higher costs for CAP water and major increases in water quality testing all have caused Tucson Water's rate consultant to propose annual rate increases of 8.2 percent for each of the next five years.

Cholera Fears Fade Along Mexico Border

Weekly testing of sewage and water samples in Nogales, Arizona has failed to uncover any further signs of cholera after the potentially deadly bacteria were detected two months ago. Cholera, which has killed over 6,000 people in Mexico since 1991, was found in early June in sewage samples from the Nogales International Wastewater Treatment Plant just north of Nogales. The plant treats sewage from both sides of the border.

Santa Cruz County Health Depart-

ment had been conducting monthly tests for cholera since the disease invaded Mexico from Peru three years ago. More frequent testing, chlorination of wastewater and stepped-up inspections of restaurants and food markets are expected to prevent the disease from gaining a foothold in Arizona.

Visitor Center Costs to Rival Dam, Bridge

The Bureau of Reclamation's new visitor center at Hoover Dam reportedly will cost \$119 million, nearly four times its original estimated cost of \$32 million. The 44,000 square foot center is nestled into the side of a cliff and includes a five-level parking structure. Cost overruns attributed to bad management are blamed for pushing the price of the center, scheduled for completion in 1995, nearly as high as the cost of building Hoover Dam itself. (Authorized in 1928 and built between 1933 and 1936, the total project cost \$385 million, with the dam costing \$175 million. However, Hoover Dam would cost nearly \$2 billion in 1994 dollars.)

The \$119 million price tag also comes close to the estimated \$150 million cost of a planned bridge which will span the Colorado River near Hoover Dam. Ultimately, the visitor center costs will be borne by utilities and co-ops who purchase Hoover Dam power, several of which are located in Arizona.

Miscellany

The City of Tucson reversed an earlier decision and on July 5 applied for an additional allocation of CAP water of 36,116 acre-feet. Tucson currently has the CAP's largest M&I sub-contract. (see May *AWR*, p. 6).

Dr. Nathan Buras of the University of Arizona's Department of Hydrology and Water Resources received the Education and Public Service award from the University Council on Water Resources at its annual meeting in Big Sky, Montana.



Legislation & Law

Goodfarb Defines Subflow

Progress was made in the ongoing quest to define subflow in Arizona when Judge Stanley Goodfarb decided on criteria for determining what groundwater is subject to adjudication (see April *AWR*, p. 7).

Goodfarb defined subflow in his June 30 opinion as the saturated floodplain alluvium. He stated that wells that pump subflow or whose cones of depression reach the subflow zone and affect the stream are to be included in the Gila River Adjudication.

Judge Goodfarb's subflow definition includes the following:

- Subflow is adjacent to a perennial or intermittent stream and hydrologically connected with the stream;
- The subflow zone is limited to that portion of the floodplain alluvium where flow direction, water level, gradient and chemical composition are substantially the same as the surface stream;
- The outside boundary of the subflow zone will be adjusted to eliminate the effects of adjacent tributary or basin fill aquifers (i.e., a 100- to 200-foot setback); and
- Well owners within the subflow zone will have an opportunity to prove that their wells take water from below the zone.

Goodfarb's 66-page ruling (along with 26 appendices) was issued after the judge conducted a series of hearings and a field trip to the San Pedro River. His highly technical ruling includes testimony of experts and consideration of diverse positions of groundwater users and surface water proponents. The ruling, which gives a rather expansive definition of subflow, is expected to be reviewed by the Arizona Supreme Court.

Border Sewage Plant Study Funded

A House-Senate conference committee has approved a bill containing \$13 million to study options for expanding sewage treatment capacity on the U.S.-Mexico border at Nogales. The existing plant, jointly owned and operated by the International Border Water Commission and Nogales, Arizona, serves both Nogales, Arizona and Nogales, Sonora. A recent \$11 million expansion substantially boosted treatment capacity, but rapid growth in Nogales, Sonora has caused sewage inflows to outpace capacity.

The study will consider expanding the current plant, building a new plant, and other options. Arizona's congressional delegation had sought funding for the study since the crisis became apparent in 1992, but the measure was defeated until now by opponents of the North American Free Trade Act.

Appeals Court Upholds ADWR's SMP

The Arizona Court of Appeals reversed a Superior Court ruling and upheld the Arizona Department of Water Resources' authority to regulate the use of groundwater pumped as recovered effluent. Arizona Municipal Water Users Association (AMWUA) had challenged ADWR's authority to limit the use of groundwater pumped as recovered effluent, arguing that since ADWR could not regulate the direct use of effluent, it could not regulate its indirect use.

The ruling upholds ADWR's Second Management Plan (SMP) that states recovered effluent shall be counted in determining whether a municipal water provider's per capita water consumption (GPCD) exceeds allowed levels. AMWUA had argued successfully before the lower court that the Arizona Supreme Court's decision in *Arizona Public Service Co. v. Long*, which held that effluent was not regulated under the groundwater code,

precluded ADWR from counting the use of recovered effluent in GPCD calculations. The Appeals Court rejected this argument, stating that "counting recovered effluent is not the same as regulation of effluent." AMWUA has appealed the decision to the Arizona Supreme Court.

Tucson Settles ADEQ Lawsuit

The City of Tucson and the Arizona Department of Environmental Quality agreed to an out-of-court settlement of a dispute over testing of drinking water wells. ADEQ had cited Tucson in November 1993 for not testing water at each of the City's 173 active wells. ADEQ also had alleged that Tucson failed to report three instances of water quality violations and had not received final state approval for its CAP water treatment plant. Tucson has maintained that it has to test water at only 16 locations within its potable water system, and that it never delivered substandard water to customers.

Terms of the settlement call for Tucson to:

- pay ADEQ a \$50,000 fine to be used to help small rural water systems;
- spend \$300,000 to \$400,000 to create an artificial wetlands to recharge groundwater with treated effluent; and
- begin testing water at 126 locations in the potable system.

The settlement's biggest expense is the cost of increasing water testing from 16 to 126 sites, projected to raise testing costs from a current level of \$1.2 million to \$2.3 million per year.

Apache Junction Forms Water District

The City of Apache Junction has formed Arizona's first water community facilities district to enable it to acquire Consolidated Water's Apache Junction System. Consolidated, which filed for bankruptcy in June 1993, serves 4,000 of Apache Junction's 18,000 residents and some 3,800 persons in its Parker Strip System.



Special Projects

The Arizona Department of Water Resources, Phoenix Active Management Area (AMA), has awarded \$520,000 in grants for 17 conservation assistance projects. (An additional \$1.1 million has been awarded for 11 augmentation grants, which will be reviewed next month.) Grants are awarded annually following a review process by the Phoenix AMA Groundwater Users Advisory Council.

The number and size of grants funded in 1994 were substantially increased by the transfer of money originally set aside to fund the start-up of the authorized but never formed Phoenix AMA Groundwater Replenishment District. The grants, which loosely fall into four categories, are summarized below:

Training

Arizona Municipal Water Users Association (AMWUA) received \$6,200 to hold a one-day technical training workshop for water auditors. The eight-hour workshop, conducted by Pequod Associates of California, will be open to up to 25 conservation program managers from municipal water departments and private water companies in the Phoenix AMA.

Scholarships totalling \$3,975 were funded to provide Phoenix AMA high school students with scholarships to attend the Natural Resource Conservation Workshop for Arizona Youth.

Phoenix Revitalization Corporation is receiving \$45,000 to train residents of low-income neighborhoods to do plumbing retrofits. The program will train "at risk" youths in an area marked by high water use and high crime, to perform indoor plumbing retrofits.

Communications

KAET-TV will receive \$11,000 to produce spring and fall versions of low water use landscaping videos. Kid's View Communications was awarded \$30,000 to extend their *Bear Essential News* for children from Pima and Santa Cruz Counties into elementary schools in Maricopa County. The newspaper will include information on water conservation and living in the desert.

Demonstration Projects

The City of Tempe will use its \$20,000 grant to construct a xeriscape demonstration garden in Papago Park along the north bank of the Salt River. Mesa will spend \$15,000 to rehabilitate a demonstration xeriscape garden located at Superstition Springs Center shopping mall. Improvements will include signage. Boyce-Thompson Arboretum is receiving \$20,000 for interpretive signage for its demonstration garden, also. And Arizona Master Gardeners will

spend its \$4,500 grant to create interpretive signage and publish "Trail Guide" pamphlets for its demonstration garden.

The City of Peoria will use \$4,000 to retrofit plumbing fixtures in its public housing units.

Desert Botanical Gardens received the second largest grant awarded, \$59,025, to be used at the Desert House for plant irrigation with greywater. Cloud Ranches was awarded \$30,000 to demonstrate the use of sub-surface drip irrigation on 61 acres of nursery and fruit trees and vegetables.

Research and Analysis

The University of Arizona's Arizona Meteorological (AZMET) program was awarded \$10,400 to upgrade the evapotranspiration (ET) data derived from its weather station and to continue making the information available by phone for landscape irrigators in the Phoenix AMA. AZMET has been funded by AMWUA, but its support ends September 1994.

USDA-ARS received \$45,000 to develop agricultural water budget software to design more efficient sloping field irrigation systems. The software will be distributed free of charge through ADWR and other agencies.

Boyce-Thompson Arboretum received a second grant for \$11,558 to measure the consumptive water use of various groundcovers and identify low water-use species.

The largest grant, for \$110,000, will be shared by Arizona State's Morrison Institute and the University of Arizona's Water Resources Research Center. Each submitted proposals to evaluate the effectiveness of conservation measures, using different approaches. ADWR currently is negotiating with both groups to produce a scope of work tailored to meet the Phoenix AMA's needs.

Finally, \$16,000 was awarded to MegEcon Consulting. Sharon Megdal, a former Arizona Corporation Commissioner, will attempt to resolve differences and draft an intergovernmental agreement between ADWR and the ACC that lessens constraints on private water companies adopting conservation-oriented rate structures and passing through costs for conservation programs to customers.

For more information on these grants, call Marjie Risk or Jim Holway at ADWR, Phoenix AMA, 602-542-1512.

1995 Program Applications Solicited

ADWR's Phoenix AMA currently is soliciting augmentation and conservation assistance grant proposals for its 1995 grant cycle. Approximately \$2 million is available for awards. The purpose of the Augmentation Program is to supplement the water supply of the Phoenix AMA, including surface water storage, artificial groundwater recharge, and effluent reuse. The objective of the Conservation Assistance Program is to assist water users within the AMA to reduce water consumption, both indoors and outdoors.

For more information or to receive an application packet, contact Alan Fehrman, Augmentation and Conservation Assistance Grant Coordinator, at ADWR, Phoenix AMA, 602-542-1512.



Publications

My Well v. Your Surface Water Rights: How Western States Manage Interconnected Groundwater and Surface Water

Barbara Tellman. This study reviews options for coordinated management of groundwater and surface water. Management plans now in place in various western states are described, without evaluating their effectiveness. State instream flow programs also are described. Based on historical background, Tellman presents a theory as to why conjunctive management has been adopted in most states.

Single copies are available free from the Water Resources Research Center, University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721; Phone: 602-792-9591; Fax 792-8518.

Arizona Stream Adjudication Bulletin

The Office of the Special Master publishes the "Arizona Stream Adjudication Bulletin" to report adjudication progress. Published 10 times per year, the bulletin can be purchased for \$12 from the Office of the Special Master, Arizona General Stream Adjudication, Arizona State Courts Building, 1501 W. Washington, Suite 228, Phoenix, AZ 85007. For more information, contact the Office of the Special Master at 602-542-9600 or the Adjudications Division of the Arizona Department of Water Resources at 602-542-1520 or 1-800-352-8488.

Fish May Be Cash Crop for Arizona Farmers — Harvesting the Desert Waters

Joe Gelt. Volume 7, Number 4 of *Arroyo*, a quarterly publication of the Water Resources Research Center. This edition discusses the growth of aquaculture and its expansion into the arid Southwest. It describes how aquaculture and agriculture are complementary activities in Arizona. Opportunities and constraints to Arizona aquaculture are identified.

Individual copies — also subscriptions of *Arroyo* — are available without charge from the Water Resources Research Center, University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721; Phone: 602-792-9591; Fax: 602-792-8518.

Flash Flood: A Warning to Beware

This 30-minute video depicts the threat that flash floods pose to unsuspecting motorists in Arizona. One half of all flood deaths are vehicle related, and driving quickly through a flash flood intensifies the danger. Footage includes several scenes of motorists stranded in the middle of rushing waters while rescuers attempt to reach them.

Available from the Public Information Coordinator, Flood Control District of Maricopa County, 2801 West Durango St., Phoenix, AZ 85009; Phone: 602-506-1501; \$5.

Where to Get Free (or Almost Free) Information About Water in Arizona

Barbara Tellman. This updated version of a 1991 publication serves as a convenient guide to sources of information about various aspects of water in Arizona.

The first two copies of the directory are free. Request prices for larger quantities. Water Resources Research Center, University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721; Phone: 602-792-9591; FAX: 602-792-8518.

Water: The Resource That Gets Used and Used and Used For Everything

This free poster, available in both English and Spanish, illustrates the diverse uses of water and how water is recycled throughout time. Water terms, a game and water consumption and usage charts are included on the back side of the poster.

Three additional posters depicting groundwater, wastewater treatment and wetlands also are available. All four of the posters are available at two educational levels: kindergarten through grade five; and grades six through eight.

Up to 50 copies of each of the four posters are available free from the United States Geological Survey, Map Distribution, Box 25286, Denver Federal Center, Denver, CO 80225-0425. Posters for classroom use should be requested on official school letterhead and indicate the grade level of the students.

Method to identify wells that yield water that will be replaced by Colorado River water in Arizona, California, Nevada, and Utah

Richard P. Wilson and Sandra J. Owen-Joyce. This report presents a method of identifying wells outside the flood plain of the lower Colorado River that yield water that will be replaced by Colorado River water.

The report is published as U.S. Geological Survey Water-Resources Investigations Report 94-4005. Copies are available for inspection at U.S. Geological Survey offices in Tucson, Tempe, Yuma and Flagstaff and may be purchased from USGS, Earth Science Information Center, Open-File Reports Section, Box 25286, MS517 Denver Federal Center, CO 80225. Microfiche \$18.25; paper copy \$86.25.

Water Resources Data for Arizona, Water Year 1993

C.F. Smith, P.D. Rigas, L.K. Ham, N.R. Duet, and D.W. Anning. This report compiles surface water, chemical quality and groundwater data. It includes discharge records, annual peaks, lake and reservoir records, evaporation of lakes and reservoirs, diversions, return flows and water quality records for both surface water stations and wells.

Published as U.S. Geological Survey Water-Data Report AZ-93-1, the report can be purchased from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. Copies are available for inspection at the U.S.G.S offices in Tucson, Tempe, Yuma and Flagstaff.



Transitions

Central Arizona Water Conservation District General Manager **Tom Clark** announced he will retire December 30. Clark, who started in 1981, has been CAWCD's only general manager. During his tenure, CAWCD's staff grew, along with the Central Arizona Project, from three employees in 1981 to over 400 employees today.

Prior to going to CAWCD, Clark worked with the U.S. Bureau of Reclamation and the Arizona Interstate Stream Commission. His responsibilities at the CAWCD included developing repayment analyses used to fashion CAP repayment and contracting structures. Clark leaves the CAWCD at a time when it is struggling to deal with lagging demand for CAP water, a problem exacerbated by the recent bankruptcy of two major irrigation district contractors (see story, p. 4).

President Clinton named Tucsonan **John Bernal** as Commissioner of the International Boundary and Water Commission. Bernal replaced **Narendra Gunaji**, who retired in May (see *AWR*, May 1994, p. 9). Bernal left a position as director of Pima County's Department of Transportation and Flood Control to become the first Arizonan to head the IBWC.

Kent McClain has been named the new director of Tucson Water effective August 15. The appointment by Tucson City Manager **Mike Brown** ends an 11-month search for a replacement for **Mike Tubbs**, which saw several finalists withdraw or turn down the opportunity to run the beleaguered utility.

McClain's previous experience includes stints as city manager of Flagstaff, Santa Monica and Fremont, California. Most recently, McClain was general manager of Las Virgenes Municipal Water District in Calabasas, California. **John Jones**, who served as acting director in the interim, is assisting in the transition before returning to administrative duties in City Hall.

Bob Brice has left Tucson Water where he served as Assistant Director of Operations to become the director of water and wastewater for Cobb County, Georgia. The utility, located outside of Atlanta, serves a population of 400,000. Brice had been with Tucson Water 20 years, the last 10 as assistant director. The position of assistant director of operations is being eliminated through reorganization.

The new head of the U.S.G.S. is **Gordon P. Eaton**, who was nominated last spring and recently confirmed by Congress. Eaton, who replaces **Dallas Peck**, previously was Director of the Lamont-Doherty Earth Observatory at Columbia University.

There has been substantial turnover in recent months at the U.S.G.S., due mainly to several hundred employees

taking advantage of an early retirement incentive offered last spring. New appointments include **Robert M. Hirsch**, the Survey's new chief hydrologist in Reston. Hirsch, who replaced the retiring **Phil Cohen**, previously held the position of Assistant Chief Hydrologist for Research and External Coordination.

The U.S.G.S. has named **Nick B. Melcher** as its new Arizona District Chief. Melcher, who came to Tucson in July from the District Chief position in Iowa, replaces **Bob Mac Nish**, now at the University of Arizona (see *AWR*, April 1994, p. 7).

Arizona Department of Water Resources Chief Legal Council **T.C. Richmond** currently is on a three-month leave following the birth of her daughter June 9. **Pat Schiffer** is Acting Council in the interim.

Arizona Department of Water Resources, Tucson AMA, has two new members on its Groundwater Users Advisory Council. **John Jones**, who has been acting director of Tucson Water, replaces **Bill Ely**, who served since 1982. **Alan Lurie**, a retired 4-star general and executive vice president of SAWARA, replaces water attorney **Hugh Holub**, who has been on the GUAC since 1988.

Dale Pontius has returned to Tucson after two years in Washington, D.C. serving as Vice President of Conservation Programs for American Rivers. Pontius has been named director of American Rivers' Southwest Regional Office, with offices in Phoenix and Tucson. He will be housed in the Udall Center at the University of Arizona through the end of the year. Prior to working for American Rivers, Pontius worked as a natural resources consultant and water lawyer.

Arizona Water Resource is financed in part by sponsoring agencies, including:

Arizona Department of Environmental Quality

Arizona Department of Water Resources

Arizona Municipal Water Users Association

Central Arizona Water Conservation District

Salt River Project

Tucson Water

USGS Water Resources Division

Water Utilities Association of Arizona

Their contributions help make continued publication of this newsletter possible.



Announcements

Conjunctive Management Conference Scheduled

This conference is to provide an opportunity for decision-makers, agency staff and university faculty to discuss legislative options for managing groundwater and surface water. The goal is not to reach agreement but to explore various options and ideas. The conference is to be held October 6 in Casa Grande at the Holiday Inn, 777 N. Pinal Ave. For additional information contact Barbara Tellman, Water Resources Research Center, University of Arizona, 350 N. Campbell Ave, Tucson, AZ 85721; Phone: 602-792-9591; Fax: 602-792-8518.

ADWR Prepares for Final Round of Public Comment on Proposed Rules

The Arizona Department of Water Resources' Proposed Assured and Adequate Water Supply Rules have been approved by the Governor's Regulatory Review Council. ADWR now is preparing for a final round of public comments to be presented in writing or at public meetings. Submit written comments by 5:00 p.m., September 7, to Rose Mae Nokes, Docket Supervisor, Arizona Department of Water Resources, 15 South 15th Ave., Phoenix, AZ 85007; Phone: 602-542-1540; Fax: 602-542-3383.

A Tucson public hearing is scheduled 10:00 a.m., September 6, at the Arizona Corporation Commission Hearing Room, Room 222, State Office Building, 400 W. Congress. A Phoenix public hearing is scheduled 2:00 p.m., Sept. 7 at the Maricopa County Board of Supervisors Auditorium, 205 W. Jefferson.

Arizona Hydrological Society Hosts Annual Symposium

The Arizona Hydrological Society announces its Seventh Annual Symposium, "Approaching the Millennium: Evolving Perspectives in Water Resources" to be held September 22-23 in Scottsdale at the Wyndham Paradise Valley Resort.

The program includes over 60 speakers who will present papers in 15 technical sessions on legal, technical and institutional aspects of surface water and groundwater management. In addition, contractors, service companies and suppliers will showcase product and service capabilities in water and environmental applications. Registration fees range from \$140 to \$190. For registration information and a program brochure, contact Delores Geiser at 602-236-2308.

Xeriscape Conference Upcoming

Xeriscape: Making it Work for You" is the title of a September 8 conference to be held at the Phoenix Civic Plaza. Conference sessions will illustrate Xeriscape principles and will provide participants with practical information on landscape design, plant selection, irrigation system design, plant maintenance and efficient irrigation systems. For additional information contact the Arizona Municipal Water Users Association, 602-248-8482.

RFP-Nonpoint Source Demonstration Projects

The Arizona Department of Environmental Quality, Nonpoint Source Unit request proposals for 319(h) Nonpoint Source Demonstration Projects by October 15. For information regarding projects questionnaire, targeting criteria, and the USEPA 319(h) Demonstration Project Guidance for Federal FY-95, contact Larry Stephenson, Nonpoint Source Unit, Arizona Department of Environmental Quality, 3033 N. Central Ave., 5th flr., Phoenix, AZ 85012; 602-207-4508.

CAWCD Seeks General Manager


The Central Arizona Water Conservation District is seeking a new general manager to replace Thomas C. Clark who is retiring December 30. Interested candidates should contact by September 30 Mr. Bruce Lawson, Ernst and Young, 2 Renaissance Square, 40 N. Central Avenue, Suite 900, Phoenix, AZ 85004; Phone: 602-528-5167.

Arizona Water Resources Association Symposium to Meet


The 15th annual Arizona Water Resources Association Symposium will be held on October 28th in Tucson. This year's conference theme is "The Future of Water Quality in Arizona: Federal, State and Local Issues." For additional information, contact Virginia Welford, Arizona Department of Water Resources, 400 W. Congress, Suite 518, Tucson, AZ 85701; 602-628-6758.

Corp of Engineers Has Volunteer Hotline

The U.S. Army Corps of Engineers has established a Volunteer Hotline (1-800-VOL-TEER or 1-800-865-8337) to provide information about volunteer opportunities with the Corps nationwide. This Clearinghouse helps determine where volunteers' skills can be most used within the 200 Corps projects across the country. Callers should be ready to provide information about their interests, talents, and preferred service locations.



Calendar of Events



RECURRING



Arizona Hydrological Society. 2nd Tuesday of the month. Meetings held at WRRC, 350 N. Campbell Ave., Tucson. Contact: Laurie Wirt 602-670-6231.

Arizona Water Resources Advisory Board. Sept. 22, 10:00 a.m., ADWR, 15 South 15th Ave., Phoenix. Contact: Beverly Beddow 602-542-1553.

Casa Del Agua. Hourly tours, Sundays noon to 4:00 p.m., 4366 North Stanley, Tucson. Contact: 602-791-4331.

Central Arizona Water Conservation District. 1st Thursday of the month, 12:30 p.m. CAP Board Room, 23636 N. 7th St., Phoenix. Contact: 602-870-2333.

City of Tucson Citizens Water Advisory Committee. 1st Tuesday of the month, 7:00 a.m. 310 W. Alameda, Tucson. Contact: Karen Alff 602-791-2666.

Phoenix AMA, GUAC. Sept. 7, 9:30 a.m. ADWR, Phoenix AMA Conference Room, 15 S. 15th Ave., Phoenix. Contact: Mark Frank 602-542-1512.

Pima Association of Governments / Water Quality Subcommittee. Sept. 16, 9:30 a.m. meeting scheduled. Contact: Gail Kushner 602-792-1093.

Pima County Flood Control District. Sept. 21, 7:30-9:30 a.m. meeting. Contact: Carla Danforth 602-740-6350.

Pinal AMA, GUAC. 3rd Wednesday of the month, 5:30 p.m. Pinal AMA Office, 1000 E. Racine, Conference Room, Casa Grande. Contact: Dennis Kimberlin 602-836-4857.

Prescott AMA, GUAC. Sept. 26, 10:00 a.m. Prescott City Council Chambers, 2200 Hillside, Suite A, Prescott. Contact: Phil Foster 602-778-7202.

Tucson AMA, GUAC. Tentatively set for Sept. 16, 9:00 a.m. Tucson AMA offices, 400 West Congress, Suite 518, Tucson. Contact: Linda Stitzer 602-628-6758.

Verde Watershed Association. Sept. 6, 9:00 p.m. in Sedona. For more information contact Tom Bonomo, VWA Newsletter Editor, c/o Verde R.D., P.O. Box 670, Camp Verde. 602-567-4121.

Yavapai County Flood Control District. 1st Monday of the month in Prescott; 4th Monday of the month in Camp Verde. Contact: YCFCD, 255 East Gurley, Prescott, 86301.

UPCOMING



Sept. 6 (Tue) **Public Hearing, Arizona Department of Water Resources' Proposed Assured and Adequate Water Supply Rules.** 10:00 a.m., Arizona Corporation Commission Hearing Room, Room 222, State Office Building, 400 W. Congress. Contact: Rose Mae Nokes, Docket Supervisor, Arizona Department of Water Resources, 602-542-1540.

Sept. 7 (Wed) **Public Hearing, Arizona Department of Water Resources' Proposed Assured and Adequate Water Supply Rules.** 2:00 p.m., Maricopa County Board of Supervisors Auditorium, 205 W. Jefferson. Contact Rose Mae Nokes, Docket Supervisor, Arizona Department of Water Resources, 602-542-1540.

Sept. 8 (Thu) **"Xeriscape: Making it Work for You."** Phoenix Civic Plaza. Contact Arizona Municipal Water Users Association, 602-248-8482.

Sept. 22-23 (Thu-Fri) **Arizona Hydrological Society's Seventh Annual Symposium, "Approaching the Millennium: Evolving Perspectives in Water Resources."** Wyndham Paradise Valley Resort, Scottsdale. Registration fees range from \$140 to \$190. Contact: Delores Geiser, 602-236-2308.

Sept. 22-23 (Thu-Fri) **Water Quality in the Sustainable West.** Utah National Park Service Water Quality Task Force. Contact Jack Wilbur, 801-538-7098.

Sept. 26-28 (Mon-Wed) **7th Annual Rocky Mountain Groundwater Conference.** Contact Dr. Paul Seaber, Desert Research Institute, P.O. Box 19040, Las Vegas, NV 89132-0040; 702-895-0487.

Oct. 6 (Thu) **Managing Arizona's Groundwater and Surface Water: Problems, Choices and Opportunities.** Holiday Inn, 777 N. Pinal Ave., Casa Grande. Contact Barbara Tellman, Water Resources Research Center, University of Arizona, 350 N. Campbell Ave, Tucson, AZ 85721; Phone: 602-792-9591; Fax: 602-792-8518.

Oct. 28 (Fri) **15th annual Arizona Water Resources Association Symposium, "The Future of Water Quality in Arizona: Federal, State and Local Issues."** Contact Virginia Welford, Arizona Department of Water Resources, 400 W. Congress, Suite 518, Tucson, AZ 85701; 602-628-6758.

Nov. 6-10 (Thu-Mon) **American Water Resources Association Conference.** Chicago, Illinois. Featuring a National Symposium on Water Quality. Contact AWRA, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192; 301-493-8600.

Announcements, continued from page 10

Rocky Mountain Groundwater Conference Scheduled

The 7th Annual Rocky Mountain Groundwater Conference is scheduled for September 26-28 in Las Vegas, Nevada. Topics include groundwater resource management, aquifer and wellhead protection, vadose zone flow and transport, groundwater quality and contamination, legal and policy aspects and interstate and international issues. The conference also will include a field trip to the Nevada Test Site and Yucca Mountain. Conference fee is \$125 and includes the field trip. For more information contact the Conference Host and Chairman: Dr. Paul Seaber, Desert Research Institute, P.O. Box 19040, Las Vegas, NV 89132-0040; Telephone: 702-895-0487; Fax: 702-895-0427.

Water Use Clearinghouse Established

The American Water Works Association (AWWA) has established a National Water Use Clearinghouse with funding from the Environmental Protection Agency. The clearinghouse collects and distributes both technical information and general consumer information about water use efficiency and conservation. Topics include resource management issues, utility conservation measures, wastewater reuse and more. For additional information contact: Rick Harmon; 303-347-6195.

Student Papers Invited for Competition

The Hydrolab Corporation, the American Water Resources Association and the Universities Council on Water Resources are sponsoring a student paper competition. An award will be given for best student paper presented at the Annual American Water Resources Association (AWRA) meeting November 6-10, in Chicago. Other awards will be presented for the best undergraduate technical paper and the best graduate technical paper.

Two copies of the paper must be submitted by September 16, 1994. For additional information contact: Dr. N. Earl Spangenberg, AWRA Student Paper Competition, College of Natural Resources, University of Wisconsin-Stevens Point, WI 54481; 715-346-2372.

IWRA Seeks New Executive Director

The International Water Resources Association (IWRA) seeks an executive director to run the day-to-day operations and direct the organization's world-wide growth. This half-to full-time position is an opportunity for a professional and an affiliated institution to operate at an international level.

Inquiries about the position and the application procedure should be addressed to: Dr. Glenn E. Stout, Executive Director, University of Illinois, 1101 West Peabody Drive, Urbana, IL 61801. Suggested submission date is October 15, 1994.

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