



Water Protection Fund Commission Formed

The Arizona legislature has created a Water Protection Fund administered by a 15-member Commission. Appointments to the Commission are made by the Governor, the president of the Senate and the speaker of the House, with certain numbers allocated for various categories (see table, p. 2). Ex-officio, non-voting members are Rita Pearson, ADWR, Jean Hassell, State Land Commission, and the chairs of House and Senate natural resource committees.

The Fund, which is administered by the director of DWR and the State Land Commissioner, is earmarked for supporting projects that will enhance riparian areas. The authorizing legislation calls for "a coordinated effort for the restoration and conservation of the water resources of this state. This policy is designed to allow the people of this state to prosper while protecting and

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Land and water fit together zipper-like to maximize lakefront and fairway lots at Arrowhead Ranch. (Photo: Peter Essick: Arizona Water Map)

Officials Still Seek Source of Havasu Bacteria

High levels of fecal coliform bacteria that forced summer closure of several Lake Havasu beaches began declining in September. Investigators seeking the cause of the elevated coliform levels are uncertain why they now are declining.

Officials were alerted to a problem in late May when sampling at Lake Havasu beaches showed high levels of fecal coliform. Under state water quality standards, the monthly average fecal coliform counts for water used for swimming is supposed to be less than 200 colony forming units (cfu) per 100 milliliters (ml) — or about one-half cup — of sampled water. Readings as high as 98,000 cfu/100 ml were recorded at Lake Havasu's East State Beach.

The situation prompted officials to take action. Seven swimming areas were closed, and on July 26 Governor Fife Symington declared a State of Emergency at Lake Havasu, releasing up to \$100,000 to find the cause of the problem. The Arizona Department of Environmental Quality spearheaded an effort to identify the source of the bacteria.

One aspect of the situation that has puzzled investigators is the lack of correlation between the high bacteria count and population pressures. Usually a pattern exists, with increased numbers of people using the lake during holidays causing bacteria counts to rise and then drop off later in the week. Bacteria counts in Lake Havasu fluctuated erratically, even when population pressure was removed.

During the intensive investigation period there were no spills nor excessive urban runoff in the area to account for the high bacteria count. Also puzzling

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restoring this state's rivers and streams and associated riparian habitats, including fish and wildlife resources that are dependent on these important habitats."

Grants may be made to both public and private bodies, including natural resource conservation districts for various projects. They may include restoration or protection of rivers, promotion of water conservation activities outside AMAs, and research and public awareness programs for water and riparian protection and enhancement.

Statutory limitations on how the funds can be spent include: no purchases of land can be made at the Heritage Fund; no more than \$100,000 per year can be spent on research; and no more than \$100,000 per year can be spent on water conservation projects, which must be located outside the state's five Active Management Areas.

The Commission will administer a grants program of \$4 million this year, \$6 million next year, and \$5 million in subsequent years. Initially, all revenues will come from Arizona's general fund. Over time, general fund revenues may be wholly or partially replaced by proceeds from fees on the sale or lease of CAP water by entities not paying CAP ad valorem taxes.

COMMISSION APPOINTMENTS TO THE ARIZONA WATER PROTECTION FUND

Category	Commissioner	Affiliation	Appointer
Public with relevant work experience	Julie Stromberg	Environ Studies, ASU	Governor
	Dennis Parker	Patagonia	Speaker
	Michael Block	Metro Water District	President
	Gwendolyn Waring	Forestry School, NAU	President
Municipal CAP contractors	Roger Manning	AMWUA	Governor
	Doug Koppinger	Tucson	President
	Kay Otte	Mayor, Florence	Speaker
Environmental organizations	Andy Laurenzi	Nature Conservancy	Governor
	Frank Brandt	N AZ Audobon Soc	Governor
CAWCD	Virginia Korte	CAWCD Board	CAWCD
Salt River Project	John Keane	Salt River Project	Governor
Industrial user	Jim Hartdegan	Cyprus Mines	Governor
Agricultural user	Paul Orme	Mayer, AZ	Speaker
Natural resource dist	Paul Brick	AZ Assoc of Cons Dist	Governor
Inter-tribal council	Martin Antone, Sr.	Chair, Ak-Chin Comm	Inter-tribal

Havasu Bacteria, cont. from page 1

to researchers is that the high bacteria counts at Lake Havasu were not accompanied by high nutrient values. Nutrient values in near-shore waters were low. Work continues to locate the source or sources of the problem.

Researchers examined the theory that the high bacteria count might be the result of a natural process. Sampling therefore was done at other areas of Lake Havasu with conditions similar to the affected areas, but without the population pressure. High bacteria counts were not recorded. This led investigators to believe that there probably is a near-shore source of the problem.

Continuing research will include a study of groundwater transport on an island near the affected beach areas, including transport from a wastewater treatment plant with a recharge pond. Researchers also are examining what happens to the groundwater flow and bacteria levels when the lake level fluctuates.

Analysis and identification of fecal coliform bacteria species also are being done. Different species are associated with different sources, for example, human or animal. Preliminary work has identified bacteria normally associated with waste from pulp, paper and sugar cane operations. No such operations are located in the area. Other variables being examined include channel flow, temperatures and wind direction.

"We have not found a single smoking gun, but have identified various situations that may contribute to the larger problem," explained Bill Wiley of the ADEQ.

ADEQ plans to issue a report by the end of October, with a public meeting to follow.

Quote of the Millennia

*One cannot step twice
into the same river
for other waters are
forever flowing on to you.*

Heroclitus, circa 500 B.C.



Water Vapors

We often implore our readers to correspond with us, to little avail. This month, we are reminded that nothing generates interest like a little errata.

San Pedro Story Disputed

Our first Email communication gently took us to task:

"I just got hold of *AWR* 3:3. Now you can be criticized electronically! No, really, I enjoy your publications and appreciate the information.

Re 'Flow of San Pedro Threatened,' it's the National Environmental *Policy* Act (not *Protection*). I suppose I'm well down the list of folks who pointed this out, but just in case..."
Matt Chew, Streams & Wetlands Coordinator, Arizona State Parks

Actually, Matt was the first and only person to bring this error to our attention. Our cover story on the San Pedro brought a lengthier and more severe rebuke from another reader:

"Your article titled 'Flow of San Pedro Threatened' is grossly inaccurate. I don't know the source of your information, but, in the future, I'd encourage you to check your facts or your publication may end up with the same credibility problems as your misguided informant.

Of the 50,000 people living in the Sierra Vista sub-basin of the Upper San Pedro Basin, about 36,000 actually live in Sierra Vista which includes Fort Huachuca. Although Fort Huachuca has received some new missions in recent years, the down-sizing of our military has resulted in a very minor change in the number of employees. We are a growing community, but paled by comparison (sic) to other major cities in Arizona. Fort Huachuca is a major factor in the stability of our economy but not the driving force sparking our growth. In fact, the SPRNCA (San Pedro Riparian National Conservation Area) may be sparking more growth than Fort Huachuca.

Sierra Vista, like almost every other city in the West, depends on groundwater. The 11,000 acre-feet (AF) of depleted groundwater you reference is actually a number from a much-debated water budget published in the Hydrologic Survey Report of the San Pedro Watershed in 1991. The budget includes all surface water and groundwater sources and all natural and cultural uses within the basin. That same budget shows net municipal use to be only 6,730 AF, other cultural uses bring the total to 13,450 AF, while natural uses account for 15,400 AF. Listed under "surplus" is 39,200 AF of surface water outflow from the sub-basin and a change in storage of -11,230 AF. Implying that Sierra Vista's growth is responsible for 11,000 AF of depleted reserves is a gross exaggeration of our situation.

The 1990 University of Arizona's hydrologist report you reference is actually dated November 1991, with a supplemental report on a hydrology model published in 1992. The first report did make some 20 year projections, the second one did not. There is no statement in either report to indicate any of the population growth scenarios would predict any significant effect on the river within the period studied. One scenario assumed the historical 2% (population growth) rate and the other assumed a 'high' 3.5% rate. The report did suggest drought and/or significant growth in agricultural uses could effect (sic) river flows. To use your words, the misstatement

of the U of A report's conclusions has definitely been a 'thorn in the side' of this community, not the report itself.
George P. Michael, Jr., P.E., Director Public Works, City of Sierra Vista

Our article states "50,000 reside in Sierra Vista," which is an accepted figure for metropolitan Sierra Vista. Also, we noted that annual growth in the 1990s has averaged 3.9 percent, double the historical 2 percent rate and higher than even the "high" 3.5 percent scenario used in the referenced reports. Economic activity associated with Fort Huachuca, including military retirees, accounts for significant growth. There certainly are other factors, including the SPRNCA.

The article does not state, nor did we mean to imply, that Sierra Vista's growth is responsible for all 11,000 AF of depleted reserves. Growth certainly does portend increased groundwater pumping, absent intensified conservation and watershed management.

The article does contain one significant misstatement — "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 correct statement is "If present groundwater pumping rates continue, the aquifer would be sufficiently depleted **after** two decades to **begin to affect** surface flow on the San Pedro." We regret the error.



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News Briefs

U.S. Seeks Mexican O.K. for Flood Devices

In what has been an ongoing effort U.S. officials attempted recently to obtain permission from Mexico to install water measuring systems within the country to help warn of floods approaching Nogales. The area currently has no flood warning system.

Efforts to set up such a system began in 1991 when the U.S. Army Corps of Engineers approached Mexican officials for permission to install measuring instruments in Nogales, Sonora. Meetings continued over the next three years without the United States gaining the necessary approval.

The U.S. plan involves installing five rain and stream gauges in Nogales, Sonora, to measure rainfall and water pressure. On the U.S. side of the border, eight gauges would be located in Nogales, Arizona and also a base station and microwave repeater to record and send data.

U.S. officials say the system would provide early warning of approaching floods, and thus reduce life and property loss. Lack of flood warnings likely contributed recently to the deaths of a Nogales, Sonoran mother and her two children. A flood swept their pickup truck into a wash on August 21. Nogales, Arizona will receive up to \$100,000 in state aid for property damage caused by the same storm.

Mexican officials have claimed the United States benefits more than Mexico from the proposed warning system. Since water flows north across the border into the United States, Mexico would be hit first by severe flooding and receive less warning than the United States further north.

U.S. officials concede the warning system would allow the United States slightly more time to prepare for an approaching flood. If Nogales, Arizona receives an hour notice of an ap-

proaching flood, Nogales, Sonora would be notified about 50 minutes before the onslaught of a flood.

The program is priced at \$80,000, with the Army Corps of Engineers to pay about 75 percent of the cost and the Santa Cruz Flood Control District to come up with rest.

Phoenix to Test Bulrush for Cleaning Wastewater

Phoenix officials plan to grow bulrush, a wetland plant of the cattail family, to treat wastewater. Officials hope the strategy will help the city meet stricter federal standards that may exist in 1997 when Phoenix is to renew its waste-water discharge permit.

The strategy is to build two 3- to 4-acre ponds or "minifarms" near the wastewater treatment plant along the Salt River. The ponds are to be filled with effluent from the plant. Engineers would monitor the water flowing through the ponds to determine the effectiveness of the bulrushes to treat wastewater. They especially will be evaluating the plants' ability to absorb such contaminants as trace metals and organics which are expected to be the focus of new federal regulations.

Because of their growth patterns bulrushes are considered better adapted to absorb contaminants found in effluent than are other forms of vegetation. Bulrushes grow as single sprouts several inches apart for each other. Water therefore is able to flow more readily through bulrushes than through vegetation growing in clumps. Wildlife also is better able to use wetlands vegetated with bulrush.

Bulrushes are to be obtained from Kingman which currently uses the plant for wastewater treatment. The effectiveness of bulrushes to treat wastewater in the hotter, drier Phoenix climate will be evaluated.

Costing about \$3 million, Phoenix's wetlands project might last four years, with the U.S. Bureau of Reclamation paying half the cost and Phoenix, Glendale, Mesa, Scottsdale, Tempe and Youngtown sharing the balance.

Magma Copper to Pay for Spill

Magma Copper Co. is to pay \$625,000 for spilling toxic mine tailings into Pinto Creek near Globe. The money will be divided between the Environmental Protection Agency, which will receive \$385,000, and the Arizona Department of Environmental Quality, which is to get \$240,000. The state money will go into the Arizona Superfund account.

The incident occurred as the result of heavy rains in January 1993 filling a tailings impoundment. The flow breached a dam causing a massive discharge of tailings into Pinto Creek, according to the EPA. The federal agency considers waste from these mine tailings to be extremely toxic to aquatic life.

Pinto Creek flows into the Salt River just above Roosevelt Lake, which supplies drinking water to the Phoenix area.

Magma's Miami-based Pinto Valley Division was the source of the Pinto Creek spill. Other Magma locations that EPA cited for "overflows and leaks" from tailing ponds include its Superior Division, in Superior, and its Miami-based Copper Cities Unit.

Magma officials say that after the 1993 mishap the company has worked on all its tailings ponds. Dam and catchment facilities were improved and upgraded. Further, emergency power sources were developed for pumps in the ponds. Also, Magma has set a fall construction date to begin work on a \$5-million dam to contain possible spills from its sulfuric-acid leaching operation. Spilled tailings were removed from Pinto Creek in the summer of 1993.

As part of the settlement Magma also agreed to fund an Arizona Game and Fish study of endangered native fish species in the Pinto Valley area.

The company claims the tailings were not as toxic as reported by environmental agencies. It says the tailings mainly were sand waste and affected primarily the longfin dace and a desert sucker.

CAP Siphon Repairs Underway

Repair of six huge siphons which carry Central Arizona Project water under river beds was scheduled to begin the first of October. During the repairs, the CAP will not deliver Colorado River water to its customers. The Bureau of Reclamation is scheduled to complete repairs and begin delivering water by December 15, with a 15-day contingency period.

Shutdown of the system was necessitated by the progressive deterioration of the huge, U-shaped pre-stressed wire-wrapped pipes. Built in the late 1970s, the siphons were discovered to be suffering from corrosion in 1990. Whether the problems resulted from design or construction errors and who will ultimately pay for repairs still is unclear. (See related story, p. 6.)

The Bureau of Reclamation reports that there has been widespread failure of pipes of similar construction around the world. When they fail, it often is sudden and explosive. Therefore, the Bureau is replacing the siphons with pipes of a different and more expensive design. The original siphons cost about \$30 million, while their replacements will cost up to five times as much.

Repairs are being made in the autumn when agricultural water demand is minimal and municipal demand is lower. Municipal providers are coping with the temporary shut-off by switching to groundwater wells and other surface water sources.

In Tucson, the switch back to groundwater comes at a time when the future use of the area's CAP allocation is being debated. Tucson Water experienced problems when it first delivered CAP water, and subsequently returned most customers to groundwater pending an examination of treatment and delivery options. Some customers now being temporarily switched back to groundwater are demanding that they be kept on groundwater until the City decides on a long-term CAP usage strategy for the entire service area.

Tucson Water Delivers TCE-Stripped Water

The lengthy process of cleaning up a large plume of TCE-tainted groundwater underlying south-central Tucson reached another milepost with water cleaned of the solvent being delivered to Tucson Water customers. The plume was caused by decades of dumping of TCE (trichloroethylene) into wells at the Hughes Missile plant located on land owned by the Air Force near Tucson International Airport. Detection of the cancer-causing solvent in Tucson Water wells in 1981 forced the City to shut down a south-side well field and triggered the ongoing cleanup efforts.

The plume of contaminated groundwater is intercepted by a line of nine wells and pumped at the rate of eight million gallons per day to air stripping towers. Inside the towers, water trickling down mixes with air flowing upward. TCE evaporates out of the water into the air, which then is blown through activated carbon filters to absorb the solvent.

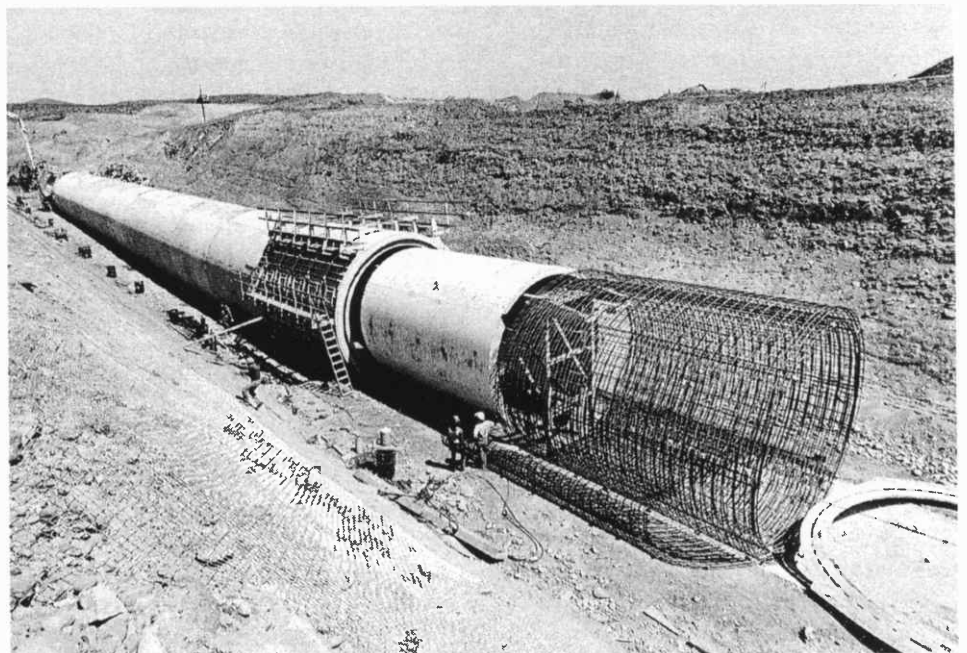
The treated water is disinfected with chlorine, treated with acid to adjust alkalinity, and then pumped into Tucson Water's distribution system and delivered to 25,000 customers on

the westside, downtown and near northside areas of Tucson.

Contaminated water entering the treatment plant contains up to 5 parts per billion (ppb) TCE. The plant, whose construction and operation is being monitored by the Environmental Protection Agency, is designed to remove 99 percent of the TCE. Whether it is lowering it to 0.05 ppb is unknown, since testing equipment cannot detect TCE at concentrations below 0.3 ppb. The current drinking water standard is 1.5 ppb.

Delivery of the treated water to households was opposed by Pima County supervisors and others, who recommended instead that the water be pumped into the normally dry Santa Cruz River bed. Because the treated water meets all federal and state water quality standards, such a move would have had regulatory consequences, including increasing Tucson Water's per capita daily consumption rate by some 15 gallons.

To date, complaints have been few. Those receiving the water have the consolation of knowing that the water quality is being closely monitored. In addition, they will not receive more saline Central Arizona Project water until the entire plume of contaminated groundwater is pumped and treated, a process expected to take 20 to 30 years.



Large-diameter CAP pipelines under construction. (Photo: Arizona Daily Star)



Legislation & Law

Siphon Suit Sunk

A Federal judge has ruled that the Central Arizona Water Conservation District has no standing to sue Kiewit Sons' over the failure of six 24-foot-diameter concrete pipes that carry Central Arizona Project water under riverbeds. (See related story, p. 5.) The Court ruled that the lawsuit was barred because CAWCD was not a party to the construction contract between Kiewit and the Bureau of Reclamation. CAWCD based its claim on its being a third-party beneficiary to the contract. An appeal is possible.

Judge Goodfarb Resigns

The Gila River adjudication faces another hurdle with the resignation of Judge Stanley Goodfarb from the Maricopa County Superior Court bench on August 31, 1994. A day earlier, the Arizona Supreme Court ordered Goodfarb to be suspended without pay for the rest of his current term, which was set to expire on December 31, 1994. Goodfarb had earlier announced he would not seek another term after the Commission on Judicial Conduct recommended his suspension without pay for the remainder of his term.

In upholding the Commission recommendation, the Supreme Court ruled the judiciary had been harmed by Goodfarb's conduct in a 1989 trial in which he used a racial slur and in other proceedings when he used profane language. Goodfarb has steadfastly maintained he is not a racist and that his decisions have been unbiased.

Goodfarb has handled the complex Gila River adjudication since its consolidation in Maricopa County Superior Court. Recently, he issued an opinion in which he defined subflow and determined what groundwater is subject to

the adjudication. This ruling is now before the Supreme Court for review.

The Supreme Court is expected to act promptly to replace Goodfarb as the presiding judge in the Gila River adjudication. The complexity of the proceeding, however, may prompt the court to appoint Goodfarb as a pro tem judge. He then could continue presiding over the adjudication.

Goodfarb's resignation is not expected to cause any delays in the short-term because a number of important jurisdictional issues including the groundwater ruling are now before the Supreme Court for review. Some of the parties in the adjudication have raised questions about whether the disciplinary action may have affected the groundwater ruling and have asked the Supreme Court to investigate.

Strategy Approved to Expedite Adjudication

Legislative efforts are underway to expedite the adjudication process — now going on for 15 years — by settling matters that otherwise would occupy the special water master and the court. In a move in this direction, the Joint Select Committee on Arizona General Stream Adjudications approved, in concept, statutory changes hastening settlement of water rights for the majority of claimants.

Proposed changes mainly affect small or "de minimis" water users, a classification that includes 47,000 claimants or about 60 percent of the total.

Legislation is called for that would:

- define as de minimis users domestic or other users of three acre-feet of water or less per year, and stockponds with a capacity of 15 acre-feet or less;
- ask the court to summarily adjudicate de minimis claimants without requiring them to take further action;
- require challengers to de minimis claims to bear the burden of proof by clear and convincing evidence;
- deem that de minimis claims are an adjudicated right, a valid beneficial use and a vested property right;
- allow claimants to be represented by persons other than attorneys;

- presume valid any pre-1919 water rights claim, unless it can be proven otherwise by clear and convincing evidence; and

- give the Legislature the exclusive authority to determine what public trust values, if any, are associated with water rights.

Also, the committee heard from organizations suggesting other changes to the adjudication process. The Arizona Department of Water Resources recommended including a settlement judge who could negotiate settlements. Such a judge would provide flexibility and quicken adjudication settlements. In contrast to a settlement judge, the special water master is concerned with deciding contested points of law.

The City of Phoenix proposed that a priority of cases be set, with tribal water claims settled first, then federal and state claims. Claims from other users then would be addressed. Settling the larger claims first might then make the smaller claims more readily determined. The committee took no action on the recommendations.

Congress Trims Water Institutes Program

Congress cut fiscal year 1995 appropriations for U.S. Geological Survey Water Resources Research Institutes by 21 percent from FY94 levels. The funds, which support 104(b) grants administered by water institutes located in each state, will be cut from approximately \$101,000 per institute to \$80,000. The Senate's version of the Interior appropriations bill had maintained funding at FY94 levels. The House version included deeper cuts and would have replaced the state 104(b) grant programs with a regional 104(g) program. The conference committee essentially split the difference and kept the monies in the current 104(b) program. Language in the conference calls on the U.S.G.S. to "examine ways to introduce competition into the distribution of Federal funds among Institutes beginning in FY96." (See p. 10 for details on applying for 104(b) funds.)



Special Projects

Augmentation Grants Awarded

The Arizona Department of Water Resources, Phoenix Active Management Area (AMA) has awarded \$1.1 million for 11 augmentation grants. (For descriptions of 17 conservation assistance grants awarded, see June/July 1994 *AWR*, p. 7.) Grants are awarded annually following a review process by the Phoenix AMA Groundwater Users Advisory Council.

Cities to Recharge Water

The City of Mesa received \$21,000 towards a feasibility study of recharging storm water, SRP water, CAP water and effluent in Queen Creek Wash. Monitoring wells will be developed as part of hydrologic studies to evaluate impacts of an underground storage project.

The City of Surprise received \$200,000 to develop and construct a project to recharge CAP water and effluent near Granite Reef Dam.

The Town of Gilbert received \$76,000 for drywell recharge of treated wastewater at an existing facility. If successful, recharge initially would be about 800 AF per year, but could grow over time to as much as 10,000 AF per year.

The City of Chandler received \$50,000 to augment construction and operation of a recharge facility that will inject up to 3,100 AF per year of treated effluent associated with a new Intel plant.

Arizona State to Develop Recharge Techniques

Arizona State University's Department of Civil Engineering received two grants. \$57,659 was awarded to develop an optimum recharge methodology for soil aquifer treatment (SAT). Another \$56,797 will be used study water quality transformations from recharge of high-quality treated effluent and CAP water at the Scottsdale Water Campus. The goal is to better understand the need to blend or treat source waters for recharge.

Arizona State University's Center for Environmental Studies received \$30,910 for a feasibility study to help develop criteria for releasing Lake Pleasant water from behind New Waddell Dam. Arizona Department of Water Resources also may provide hydrologic services to assist in the effort. The project proposes to test the feasibility of using the Agua Fria riverbed to recharge groundwater while enhancing riparian wildlife habitat.

A fourth grant of \$88,364 awarded to Arizona State University will help fund a novel recharge project — a potable aquatic plant filtration system mounted on a flatbed truck. Water will be pumped from SRP canals through the system and then recharged into SRP wells.

Wetlands to be Used for Recharge

Three grants totalling half the total funds awarded are to investigate methods of using wetlands to recharge water. The City of Phoenix received \$150,000 towards testing the capability of constructed wetlands to treat effluent from the 91st Avenue wastewater plant to meet National Pollutant Discharge Elimination System (NPDES) permit requirements. A successful test would be followed by development of design and operating criteria for a full-scale wetland. Phoenix believes that a \$50 million constructed wetlands project might eliminate the need for \$368 million in upgrades to the facility. (See related story, p. 4.)

At a more modest level, the City of Avondale received \$10,000 towards purchase of wetland plant material for a project that will recharge up to 10,000 AF over the next two years.

The largest single grant was awarded to University of Arizona researchers who will receive \$392,180 to construct a wetland system to treat dairy wastewater. The treated effluent then will be recharged or used by the facility.

The planned wetland basically is to be a polishing facility, to further treat water already processed by the dairy's present water treatment procedure. The water quality will be monitored to determine improvement and the potential of the water to be recharged or re-used by the dairy facility. The quality of the water and the dairy's water uses and needs will determine the eventual use of the treated water.

The wetland will contain several herbaceous plant species in parallel systems. This will be a working wetland, not designed specifically for recreational uses, although it is expected to provide habitat for animals.

This project is important to the dairy industry and the people of Arizona because of increasingly strict environmental regulations; water conservation requirements that are due to take effect in the year 2000; the lack of cost-effective treatment alternatives; and the size and importance of the growing dairy industry in Arizona.

The wetland facility is intended as a demonstration project to acquaint the dairy industry with options for increasing water use efficiency. As a result, education and outreach are included as major project activities. The two-year project will be built by the end of the year at a dairy with approximately 1,000 milk cows, to be selected in Maricopa County.

Details on 1994, 1995 Phoenix AMA Augmentation Programs

For more information on these grants, call Marjie Risk or Jim Holway at ADWR, Phoenix AMA, 602-417-2465. (For information on how to apply for an augmentation grant in the upcoming funding cycle, see Announcements, p. 10.)





Publications

The following four U.S. Geological Survey (USGS) publications are available for inspection at USGS offices in Flagstaff, Tempe, Tucson and Yuma, and may be purchased from USGS, Earth Sciences and Information Center, Open-File Reports Section, P.O. Box 25286, MS 517, Federal Center, Denver, CO 80225.

Simulation of Ground-Water Flow and Potential Land Subsidence, Upper Santa Cruz Basin, Arizona

R.T. Hanson and J.F. Benedict. This report suggests that without artificial recharge, Central Arizona Project water use, and reduced pumping rates, the land surface in the upper Santa Cruz basin will continue to subside as long as ground-water withdrawals continue at 1986 pumping levels. The report describes the simulation of ground-water flow from pre-development, 1940 conditions through 1986, and into the future for projected land subsidence to 2025. Investigations Report No. 93-4196; Open-File Report No. 93-174; microfiche \$4; paper copy \$8.

Isotopic Compositions and Sources of Nitrate in Ground Water from Western Salt River Valley, Arizona

D.J. Gellenbeck. In this report, sources of high nitrate concentrations in ground water in western Salt River Valley near Phoenix are identified using isotopic and chemical techniques. The report identifies four possible sources of nitrate: dairies and feedlots, sewage treatment plants, natural sources, and agricultural activities. Some standard scientific approaches and new isotopic applications were successful identifiers of some man-made nitrate sources. Report No. 94-4063. microfiche \$4; paper copy \$9.

Hydrogeology and Hydrologic System of Pinal Creek Basin, Gila County, Arizona

Chris C. Neaville and James G. Brown. This study reports that acidic water in a mining district near Globe, AZ has contaminated a stream and alluvial aquifer with metals. The report describes hydrogeologic setting of the contaminated areas and describes the stream and aquifer system through which the contaminants have been moving. Report No. 93-4212; microfiche \$4; paper copy \$11.

Potential Flood Hazards and Hydraulic Characteristics of Distributary-Flow Areas in Maricopa County, Arizona

H.W. Hjalmarson. This study finds that the current method being used to define flood hazards in distributary flow areas is inappropriate. The study offers alternative methods to define relative flood hazards in distributary flow regions using morphologic features such as the presence of developed soils and the absence of saguaro cactus in the potential flood area. Report No. 93-4169; microfiche \$4; paper copy \$9.25.

Analysis of Central Arizona Angler Opportunity and Benefits Gained By Installing Artificial Habitat in Saguaro Lake, Based on Adaptation of the Comprehensive Management Planning Model, RIOFISH

Richard Cole et al. New Mexico State University researchers modified and applied RIOFISH, the New Mexico fishery planning model, to Saguaro Lake near Phoenix, where artificial cover for sport fish was introduced into the littoral waters of the lake. Their results call RIOFISH model benefit/costs into question.

Free copies are available from the Water Resources Research Institute, Box 30001/Dept. 3167, Las Cruces, NM 88003; 505-646-1813.

Water Banking in the West

Larry MacDonnell, Charles Howe, Kathleen Miller, Teresa Rice, Sarah Bates. This report provides a detailed evaluation of water banking experiences in Idaho, California and Texas and of the recharging of aquifers as a means of banking water. It includes a recommended framework for such banks. Copies are available from the Natural Resource Law Center, University of Colorado School of Law, Campus Box 401, Boulder, CO 80309-0410.

Bridging Borders: A Cross-Border Exchange

Video and audio tapes from the "Bridging Borders" conference held in Puerto Peñasco in January are available. The conference marked the establishment of the International Sonoran Desert Alliance, an organization of area residents dedicated to protect and promote the border region. Participants of the conference devised a plan of action for the alliance.

For a list of available video and audio tapes contact the International Sonoran Desert Alliance, c/o Sonoran Institute, 6842 E. Tanque Verde Rd., Suite D, Tucson, AZ 85715; Phone: 602-290-0828; FAX: 602-290-0969.

National Water Summary 1990-91 — Hydrologic Events and Stream Water Quality

This document is the seventh in a series of reports describing conditions, trends, availability, quality, and use of U.S. water resources. It discusses surface water resources by assembling information on water quality conditions and determining water-quality trends during the past decade. The present volume is particularly timely because Congress is considering reauthorization of the Clean Water Act. The document is for sale by the U.S. Printing Office, Superintendent of Documents, M.S. SSOP, Washington, D.C. 20402-9328.

Geographic Information Systems and Water Resources

John M. Harlin and Kenneth J. Lanfear, Editors. These proceedings describe for managers, educators, and scientists the most recent applications of Geographic Information Systems technology to the field of water resources. Order from American Water Resources Association, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192; 301-493-8600; \$76 for AWRA members, \$95 for non-members.



Transitions

Tom McLean has left Tucson Water where he served as Assistant Director for Planning & Technical Services and the Engineering Divisions to accept a senior position with CH2M-Hill's **Phoenix office**. McLean joined Tucson Water in November 1974. He was promoted from administrator for Planning and Technical Services Division to assistant director in September 1991.

McLean's departure continues a near-total turnover of top administrative positions at Tucson Water that began a year ago with the announced retirement of then-director Mike Tubbs. Turmoil resulting from as-yet unsuccessful efforts to fully integrate treated CAP water into the potable system and a reorganization suggested by a management study have resulted in six top managerial positions currently being vacant.

In addition, the loss of five persons in the **water quality lab** has forced Tucson to bring in the consulting firm of **Montgomery-Watson** to manage the lab and supply supplemental technical people until permanent replacements are recruited.

A total of **55 vacancies** exist at the utility. The recruiting process is well under way for the majority of the key positions, most of which are slated to be filled by the end of the year.

Larry MacDonnell, founding director of the **Natural Resources Law Center** at the University of Colorado, has left to form his own firm. The Center is known for its active program in natural resources issues and in particular for its highly popular water conferences held each June in Boulder. A nation-wide search is underway for a successor.

The Phoenix Active Management Area's Groundwater Users Advisory Committee has a new member. **John Williams, Jr.**, Vice President of the Salt River Project, replaces **John Lassen**, who recently retired as SRP president.

Pacido dos Santos was selected from 17 applicants to head DWR's new **Santa Cruz Active Management Area (AMA)**. Dos Santos has served with the Tucson AMA for eight years, including considerable work in the southern part of the Tucson AMA that now comprises the Santa Cruz AMA. The new AMA office has a staff of two, including **Lisa Jackson**, also currently at the Tucson AMA, and a clerical position to be filled. The new Santa Cruz AMA currently is being run out of the Tucson AMA office while an office is established in Nogales.



Gray Wilson of the University of Arizona's Department of Hydrology and Water Resources retired in July. Gray received his Ph.D. from the University of California at Davis in 1962. Sol Resnick, director of the UA Institute for Water Utilization, hired Gray to begin work in July 1962. The institute later evolved into the Water Resources Research Center. In 1988, Gray transferred to the UA Department of Hydrology and Water Resources.

Gray's research specialties include artificial groundwater recharge and vadose zone monitoring. He currently is completing work as a senior editor on a book on vadose zone characteristics and monitoring and also will be assisting the hydrology department with a thesis workshop studying the Cienega Creek watershed.

W. Don Maughan, former Arizona Assistant State Water Engineer and Chief Deputy Director of the Arizona Department of Water Resources, passed away in September. He was 72. His career spanned half a century, from aviation engineering during World War II to stints with the Utah State Water and Power Board and Bureau of Reclamation in the late 40s and 50s, to several positions in California, including chairman of the State Water Resources Control Board under four governors.

Maughan's affiliations have included membership with the Western States Water Council, the Colorado River Basin Salinity Control Forum, Committee of 14 with the International Boundary and Water Commission, the National Governors Association Subcommittee on Federal Water Policy, and several EPA task forces.

Maughan came to Arizona in 1979, where he was very influential in ADWR's early years, developing policies still in effect. He retired from ADWR in 1985. Returning to Sacramento, he served on the California State Water Board until 1992.

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

Water Research Letters of Intent Invited

The Arizona Water Resources Research Center (WRRC) is accepting letters of intent to submit proposals from researchers in any of the social, biological, physical, engineering, and management sciences at the state's three universities. The federal Water Resources Research Act, Section 104(b) program provides money to the WRRC to fund small research projects on water-related issues of critical importance to the state and region. Multi-disciplinary projects and projects involving investigators from more than one university may be given some preference, as will projects involving any aspect of riparian and wetlands issues. Other research topics offered as suggestions to researchers include conjunctive management, water quality, conservation, institutional innovation and conflict resolution. Letters of intent not exceeding two pages must be submitted by October 31 to: WRRC, 350 N. Campbell Ave., Tucson, AZ 85719, Attn: Mary Wallace. Direct questions to Mary Wallace at 602-792-9591.

Call for Recharge Papers

The Role of Recharge in Integrated Water Management," the 7th Symposium on Artificial Recharge of Groundwater will be held on May 17-19, 1994 in Scottsdale. Invited and contributed papers will be presented on water reuse and quality, operations, water management, and projects. The deadline for submitting abstracts is November 22. For more information on conference registration and abstract submission contact the Technical Committee, 1995 ARGs, Water Resources Research Center, The University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721; 602-792-9591.

Resnick Internship Applications Sought

The University of Arizona's Water Resources Research Center and the Office of the Special Master, Arizona General Stream Adjudication, are offering graduate research assistantships for 1995. Three students will be selected, one each for the spring, summer, and fall semesters. Spring and fall internships are 16 weeks, 30 hours per week; the summer internship is 12 weeks, full-time. Interns work out of the Special Master's office in Phoenix, with some in-state travel.

These paid internships are open to graduate and law students at the University of Arizona, Arizona State University and Northern Arizona University. Applicants should

be familiar with water resource management issues and have demonstrated research and writing abilities. Students with experience and coursework in the hydrologic and/or environmental science disciplines, public administration, political science, natural resources management and law or related fields will be considered. To apply, submit a letter of application accompanied by a detailed resume and three references by October 31, 1994, to Mary G. Wallace, Water Resources Research Center, 350 N. Campbell Ave., Tucson AZ 85719.

Phoenix AMA Seeks Augmentation, Conservation Proposals


The Phoenix Active Management Area of the Arizona Dept. of Water Resources is accepting applications for the 1995 Augmentation and Conservation Assistance Grant Program. Approximately \$2 million is available to fund projects aimed at supplementing the water supply of the AMA or assisting water users within the Phoenix AMA to reduce water consumption. Application deadline is November 15, with selection of grants to be complete by April 1995. Contact Alan Fehrman, Coordinator, Augmentation and Conservation Assistance Grants, 602-542-1512.

Tucson AMA Seeks Augmentation Proposals


The Tucson Active Management Area of the Arizona Dept. of Water Resources is accepting applications for the 1995 Augmentation and Reuse Grant Program. Approximately \$600,000 is available to fund projects aimed at developing additional water supplies and maximizing the use of renewable supplies. Projects involving underground storage of effluent will be considered; projects involving direct utilization of effluent may apply for conservation assistance funds at a later date. Application deadline is December 2 (*not* November 4 as previously announced), with successful applicants being notified by February 1995. Contact Pat Speyer at the Tucson AMA office at 602-628-6758.

AWRA Symposium to Address Water Quality Initiatives

The 15th Annual Symposium of the Arizona Section, American Water Resources Association will focus on "National and Regional Initiatives: Impacts on Arizona's Water Quality." Keynote speaker is John Bernal, U.S. Commissioner, International Border and Water Commission. The Symposium will take place Friday, October 28, at the Quality Inn, 1601 N. Oracle, Tucson, AZ. Registration fees are \$35, \$10 for students, plus \$11 for the luncheon. Contact Virginia Welford, AZ Dept. of Water Resources, 400 W. Congress, Ste. 518, Tucson, AZ 85701; 602-628-6758.



Calendar of Events



RECURRING



Arizona Hydrological Society. 2nd Tuesday of the month, 7:30 p.m. "Environmental Injustice: Causes and Cures." Meetings held at WRRRC, 350 N. Campbell Ave., Tucson. Contact: Laurie Wirt 602-670-6231.

Arizona Water Resources Advisory Board. No Oct. meeting; Nov. meeting to be announced. 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. Joint meeting in Tucson. See "Upcoming" calendar, Nov. 14.

Pima Association of Governments / Water Quality Subcommittee. Oct 20, 9:30 a.m. 177 N. Church St., Suite 205, Tucson. Contact: Gail Kushner 602-792-1093.

Pima County Flood Control District. 3rd Wednesday of the month. Nov. 19, 7:30-9:30 a.m. 201 N. Stone St., Tucson. Contact: Carla Danforth 602-740-6350.

Pinal AMA, GUAC. Joint meeting in Tucson. See "Upcoming" calendar, Nov. 14.

Prescott AMA, GUAC. Joint meeting in Tucson. See "Upcoming" calendar, Nov. 14.

Tucson AMA, GUAC. Joint meeting in Tucson. See "Upcoming" calendar, Nov. 14.

Verde Watershed Association. Nov. 7th, 7:00 p.m., Camp Verde Town Council Chambers, corner of Main Street and Lane Street. 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. 2nd Monday of the month in Prescott, 255 E. Gurley St.; 4th Monday of the month in Camp Verde, Yavapai County Justice Facility. Contact: YCFCD, 255 E. Gurley St., Prescott, 86301. 602-771-3196.

UPCOMING



Oct. 20, **Symposium on Animal Impacts on Water Quality.** UC-Irvine. Symposium on the water quality impacts of animal agriculture. Registration is \$75. Call 916-752-2320.

Oct. 21, **OSHA Refresher Training.** Sponsored by the Arizona Hydrology Society Tucson Chapter. 8:00-5:00 p.m. Park Inn International, 88 East Broadway, Tucson. Contact: 602-881-4912.

Oct 24 City of Yuma, 18 West 1st Street.; Oct 25, City of Flagstaff, 245 N. Thorpe Rd.; Nov. 1, Phoenix, 3033 N. Central Ave., South Mall; Nov. 14, Tucson, Main Library, 101 N. Stone Ave., 6:00-9:00 p.m. **Arizona Department of Environmental Quality Public Hearings.** Update public on issues presented this year. Contact: 602-207-4539.

Oct. 28, **AWRA AZ Section Conference on National and Regional Initiatives: Impacts on Arizona's Water Quality.** Quality Inn, 1601 N. Oracle, Tucson, AZ. Keynote speaker John Bernal, IBWC. Registration is \$35, \$10 for students, plus \$11 for lunch. Contact Virginia Welford, AZ Dept. of Water Resources, 400 W. Congress, Ste. 518, Tucson, AZ 85701; 602-628-6758.

Nov. 6-10, **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.

Nov. 9-11, **Colorado River Water Users Association's 1994 Conference.** Mirage Hotel, Las Vegas, NV. Contact CRWUA, P.O. Box 1058, Coachella, CA 92236; 619-398-2651.

Nov. 14, **Joint Groundwater Users Advisory Council Meeting.** Includes Phoenix, Pinal, Prescott, and Tucson AMA, GUAC. 8:30-2:30 p.m. Ironwood Gallery, Arizona-Sonora Desert Museum, 2021 N. Kinney Rd., Tucson. Contact: Teresa Klinger, 602-628-6758.

Nov. 18, **Arizona Rural Water Association's Autumn Meeting and Conference.** 9:00-4:00 p.m., Swiss Village, Payson, AZ. Topics include legislation for expediting adjudications and creating a Colorado River water bank, CAP exchanges, and wastewater reuse for rural communities. Advanced registration encouraged. Contact ARWA, 2600 N. Central Ave., Ste. 630, Phoenix, AZ 85004; 602-230-7771.

Dec. 7-8, **Riparian Management: Diverse Values — Seeking Common Ground.** Contact Terry Tindall, University of Idaho, Boise ID, (208) 736-3600.

Announcements, continued from page 10

Navajos Seek Hydrologist

The Navajo Nation's Department of Water Resources Management is seeking a surface water hydrologist to determine watershed characteristics, route flows through reservoirs and stream channels, develop surface water database, evaluate hydrologic models, review technical reports and monitor contractors dealing with water related litigation, and assist in developing water resource management policies. Applicants should have a B.S. in hydrology or civil engineering and three years experience, or an equivalent combination of experience and education. Experience with surface water computer modeling and ARC/INFO GIS preferred. Applications should be sent to The Navajo Nation, Department of Personnel Management, P.O. Box 308, Window Rock, AZ 86515, 602-871-6330. The position will remain open until filled. For more information, contact Mike Foley or Mike Johnson at 602-729-4004.

Water Conflicts Subject of Colorado River Water Users Meeting

The Colorado River Water Users Association's 1994 conference will address urban, agricultural and environmental conflicts, the "Nevada water solution," and "the workings of the seven-day process." The conference will be held November 9-11 at the Mirage Hotel, Las Vegas. For more information, contact CRWUA at P.O. Box 1058, Coachella, CA 92236, 619-398-2651.

ADWR Phoenix Office Relocates, Phone Numbers Change

The Arizona Department of Water Resources is moving its Phoenix offices. As of Monday, October 17, ADWR's main office and Phoenix AMA office will be located at 500 N. Third Street, Phoenix, AZ 85004-3903. (Water groupies will recognize this as the building that used to house AMWUA.)

The move will result in all new phone numbers for the Department. Some key numbers are listed below:

Adjudications	417-2442
Administration	417-2450
Colorado River Management	417-2442
Deputy Directors, Engineering/Water Mgt	417-2440
Director's Office	417-2410
Engineering	417-2445
Hydrology	417-2448
Legal Division	417-2420
MIS Division	417-2452
Operations	417-2470
Phoenix Active Management Area	417-2465
Program Management	417-2460
General Information	417-2400
Public Information	417-2440
Fax	417-2401

Office locations and phone numbers are unchanged for the Tucson, Pinal and Prescott Active Management Area offices.

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