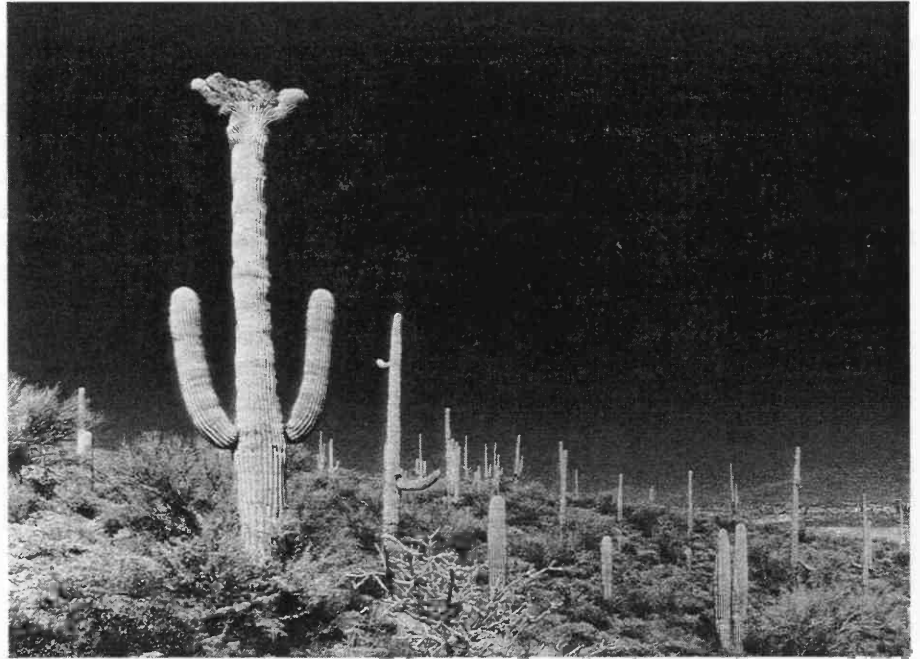


Cost of CAP M&I Water May Double

Major increases in the cost of Central Arizona Project water may go into effect by January 1994, Central Arizona Water Conservation District board members learned at their January meeting. Continued disappointing water sales might cause the current \$52/acre-foot price for municipal and industrial water to be elevated into the \$65-\$125 range. Other revenue-enhancing options are limited. The CAWCD's property tax levy is at its legislatively-mandated limit, and the state's new super-majority requirement makes any tax increase a hard sell.

A doubling in the cost of CAP water might not trigger rate shock for municipal water users. Raw water constitutes a relatively small part of total municipal water costs, and most providers continue to use other supplies in addition to CAP. Customers of Tucson Water, which is converting almost entirely to CAP water, would see a rate increase of some 8 percent. (See box, page 2, for a comparison of municipal water rates across Arizona.)



Saguaros find slippery footing in rain-saturated desert soil, making the shallow-rooted giants more prone to being toppled by wind. Experts differ over the effect of recent heavy rains on spring flowering. A bumper crop of grasses and shrubs is expected this spring, heightening fire risks this summer. (Photo: UA Graphics)

Developers, Private Water Companies Team Up for Assured Water Supply Legislation

While the Arizona Department of Water Resource's (ADWR) draft Assured Water Supply rules are not facing the kind of hostile responses that caused the original AWS rules to be withdrawn, developers, private water companies, and others have expressed concerns over details of the rules. Betsy Rieke, ADWR director, has conceded that despite near universal acceptance of the underlying principal of reaching safe yield, the rules will not fly without some understanding over how reallocation of CAP water will occur and establishment of entities in both Phoenix and Tucson Active Management Areas (AMAs) to allow groundwater pumping offset by recharge of renewable supplies elsewhere in the AMA.

With the City of Phoenix more openly opposed to establishment of a Phoenix AMA Groundwater Replenishment District (GRD), and east and west valley municipalities deadlocked over the concept, the search is on for a new legislative solution. Bills introduced this session propose eliminating the Phoenix GRD, allowing for two GRDs to be established in the Phoenix AMA and creating substitute bodies (see Legislation and Law, p. 10). Attempts to strip ad valorem taxing authority and significantly alter the board make-up of the Santa Cruz Valley Water District (SCVWD) in the Tucson AMA also are afoot.

Most discussions, however, are centering on soon-to-be introduced legislation
continued on page 2



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AWS Legislation cont. from page 1

that combines features of S.B. 1425's Central Arizona Groundwater Replenishment District, drafted by Robson Community's Karl Polen and water attorney Jim Johnson, and a legislative concept proposed by Bob O'Leary of the Water Users Association of Arizona (WUAA).

As originally drafted, S.B. 1425 provided subdividers with the option of voluntarily joining a new Central Arizona Groundwater Replenishment District (CAGR) and continuing to pump local groundwater, in exchange for being subject to a special district tax to replenish the groundwater pumped. The tax, which would be backed by a lien on individual lots, would provide revenue for the CAGR to use existing artificial and underground recharge acts to recharge elsewhere in the AMA the amount of groundwater pumped by its members in excess of AWS guidelines. The CAGR would be a sub-district operated by the Central Arizona Water

Conservation District (CAWCD).

In contrast, WUAA's approach was based entirely on private water companies financing continued CAP water usage by central Arizona agricultural irrigators and using the indirect recharge credits to satisfy the AWS rules requirements. S.B. 1425 is being re-drafted to permit indirect recharge as an option and to allow water companies who contract with the CAGR to receive designations of 100 years assured supply. Also, a planning requirement for the CAGR has been added, along with provisions to allow the SCVWD, if it becomes permanent, to assume some or all of the recharge functions of the CAGR within the Tucson AMA.

Important details in the CAGR-SCVWD relationship remain unclear. Other thorny issues include the fate of the original Phoenix GRD and how to deal with Santa Cruz County, which lies mostly within the Tucson AMA and the SCVWD, but is outside the CAWCD.

A key difference between the CAGR and the apparently defunct

Phoenix GRD is that membership in the CAGR, like the SCVWD, is voluntary. This arguably reduces the degree to which the costs of growth are shouldered by existing residents and businesses. Still, how the proposal will fare with the municipal members of Arizona Municipal Water Users Association and the City of Tucson is unclear. Regardless of whether the opposition of Phoenix and others to the GRD reflects sincere concern over the costs of urban sprawl or merely a desire to capture growth that otherwise might go to satellite cities, opposition is expected.

ADWR is working with the drafters to come up with a bill it can support to facilitate acceptance of the Assured Water Supply rules. Meanwhile, some water lawyers are wondering aloud whether the Department has sufficient statutory authority to enforce its draft rules. The situation is fluid and the outcome uncertain, but with the legislature apparently determined to stick to a 100-day schedule, the wait to see how it all turns out may be brief.

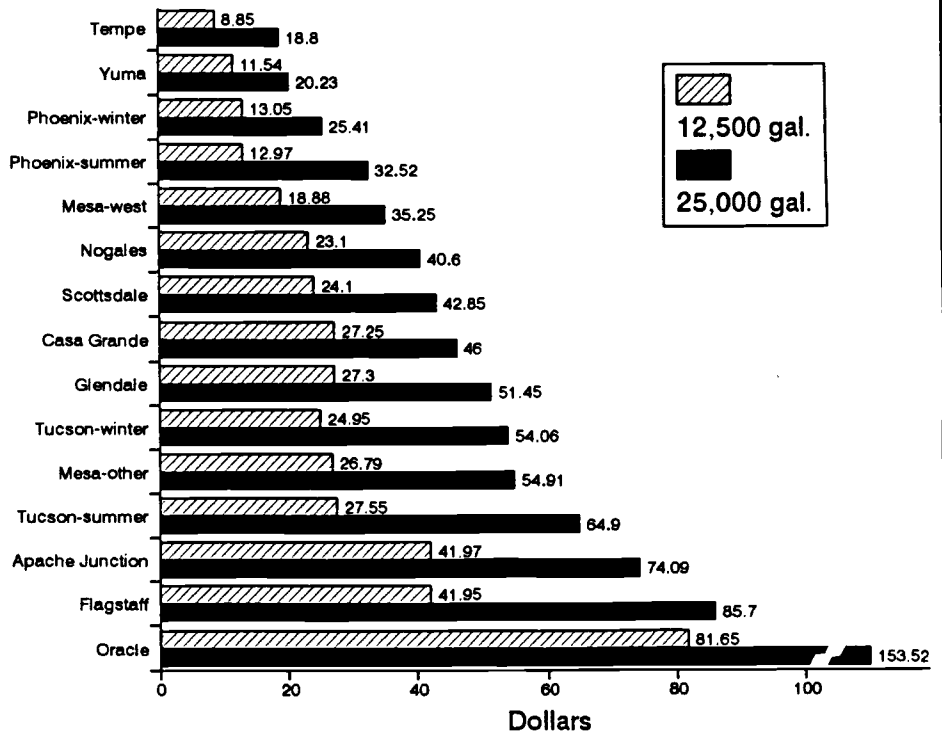
Municipal Water Rates Vary Across Arizona

A comparison of water rates for municipal providers across the state reveals a wide range without any definite patterns (see bar chart, right). Metropolitan Phoenix has some of the cheapest water in Tempe and Phoenix, as well as higher-priced water in Apache Junction and in Mesa outside the Salt River Project. Note that 12,500 gallons of water is cheaper in Phoenix in summer than in winter.

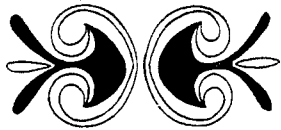
Cheap water is harder to find in metropolitan Tucson, with Tucson Water's summer rates among the highest, and Oracle having the dubious distinction of most expensive water. The price of water outside the two metropolitan areas varies considerably from very affordable in Yuma to quite costly in Flagstaff.

Actual water bills do not vary as much across the state as the "typical" bills in the figure suggest. Higher rates almost always are correlated with lower usage levels, and vice versa.

Water Bills for Selected Arizona Providers*



* Monthly minimum and commodity charges only. Taxes, fees, surcharges and sewerage not included.



Communications

We've managed to break two recent promises to our readers with this latest issue — getting the *AWR* to you on a more timely basis, and limiting issues to 12 pages. Blame it all on the weather.

No, the Floods of '93 didn't wash out the Water Resources Research Center or damage the University's printing presses. But they did unleash a torrent of flood-related news items. One of our intrepid staff members took it upon herself to visit several sites threatened by flooding to record the scene for *AWR* readers. Her endeavors merit special recognition since she pulled it off without a press pass. Bluffing her way past various law enforcement officials ("I'm a scientist and this is research, so back off!"), she captured most of the images illustrating our special four-page flood supplement.

CAP and its underuse continue to be the state's leading water controversy. The Governor's CAP Advisory Committee is being monitored by at least three "shadow CAP committees" composed of various water interests that are preparing to take issue with, or offer alternatives to, the official committee's recommendations.

That CAP controversies have gotten out of hand is evidenced by a growing debate over what CAP stands for these days. Revisionists claim it stands for "Central Arizona Pays." Dave Iwanski of the Agri-Business Council has his own reading of CAP — "Creating Agricultural Paupers." Will urban interests ride to the rescue? AMWUA's Bob McCain, no Friend of Farmers, still chants the mantra, "Cities Ain't Putzes." Meanwhile Congressman George Miller of California is quick to remind everyone that "California's Always Parched."

The arrival of CAP water in Tucson provides another opportunity for the

locals to complain that Phoenix, their uncouth neighbor to the north, is dumping on the Old Pueblo. An *AWR* staffer actually overheard one customer in the Bay Horse Tavern explaining to another in all seriousness that CAP water is Phoenix wastewater being delivered to Tucson — "Crap A la Phoenix." Right concept, wrong city. It's Las Vegas that gets return flow credits on its Colorado River diversions.

Our first letter to the editor in several months addresses a current water issue of importance. As always, we invite views on this and other water issues.

The current crisis in financing the Central Arizona Project provides an opportunity to the State of Arizona to improve both equity and efficiency among state residents while raising sufficient funds to repay the required federal loans.

Since the CAP was built to benefit water users in the multi-county area served by the project, it seems entirely appropriate for all water users in these areas to help pay for the project in proportion to their water use. A simple mechanism for this purpose is a use tax on water, applied to all non-CAP water used in this area.

A tax on non-CAP water would provide the revenue needed to meet the State's obligations to the Federal Government, and at the same time begin to deal with a longstanding anomaly in the

cost of water. Under current policies, the best water (groundwater) often is the lowest cost water, while the lower-quality CAP water is more expensive. Thus, many irrigation districts have chosen to continue using groundwater and depleting the aquifer rather than using their allotments of CAP water. A tax on groundwater withdrawals would shift these costs, making groundwater more expensive — reflecting its increasing scarcity — and the tax-subsidy to the CAP could make CAP water less expensive, thus encouraging its greater utilization.

A user tax on water rather than an increase in property taxes or other taxes would also make the CAP financing fairer, since it would require water users, who are the beneficiaries of the CAP, to pay for part of the project cost in proportion to their water use. Imposing the user tax on both groundwater and non-CAP surface water would help reduce the economic disparities between those who have been blessed with cheap sources of water due to prior appropriation of water sources and those who use CAP water.

Bruce Billings, Department of Economics, University of Arizona

We are pleased to announce that the Arizona Municipal Water Users Association has become an *AWR* sponsor. Our sincere thanks to AMWUA, and to all our other sponsors, for providing the funds necessary to publish *Arizona Water Resource*.



Arizona Water Resource is published monthly, except for January and August, by the University of Arizona's Water Resources Research Center. *AWR* accepts news, announcements and other information from all organizations concerned with water. All material must be received by the 14th of the month to be published in the following month's issue. Subscriptions are free upon request.

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News Briefs

FDA Proposes Stiffer Rules for Bottled Water

Recently proposed rules by the Food and Drug Administration expand regulation of the bottled water industry by imposing stiffer labeling criteria and setting the same water quality standards for bottled water that now apply to regular tap water. Issued on Dec. 31, the rules are to take effect in about six months.

The proposal sets uniformity for such labeling terms as "spring," "mineral," "distilled" and "purified" water. Also mineral water guidelines are set for the first time.

The proposal defines spring water as coming from an underground source and flowing naturally to the surface. Mineral water also must originate from a protected underground water source and have at least 250 parts per million in total dissolved minerals.

Water from municipal water supplies must be labeled as such unless it were processed and treated and then it could be labeled as "distilled" or "purified."

The current federal standards for tap water are to apply to bottled water, with the exception of allowable lead levels. Bottled water could have no more than five parts per billion (ppb). Tap water is allowed up to 15 ppb.

The regulations were partly prompted by a 1991 General Accounting Office report urging FDA to set stiffer health standards for bottled water. The industry also favored uniform federal rule setting as preferable to individual states adopting various standards.

Commenting on the new standards, FDA Commissioner David A. Kessler stated, "We want to ensure bottled water is labeled truthfully. If the label says it's mineral water, it should be mineral water. If it's from a municipal water source, the water should be so labeled."

(See following related news item.)

Arizona Ranks Sixth in Bottled Water Use

Bottled water may be replacing canteens as a portable water source among desert dwellers. The International Bottled Water Association ranks Arizona sixth in the country in bottled water use, with a per capita use of almost double the U.S. average.

Arizonans purchased 67.9 million gallons of bottled water in 1991, an average of 17.6 gallons per person. The national per capita average is 8 gallons.

IBWA reports that most people indicate taste is the deciding factor for using bottled water. This is heartening news to bottled water vendors in Tucson, a city in the process of converting to CAP water use. Early reports from CAP water users in the Tucson area indicate dissatisfaction with its taste.

Comments Invited on ADWR Draft Rules, Assessment

The comment period for Arizona Department of Water Resources' Assured and Adequate Water Supply draft rules officially ended February 19. DWR staff is still accepting comments and answering questions about the proposed rules. A summary of comments received at workshops and other briefing sessions has been prepared. Contact the Tucson AMA Office (602-628-6758) for information on presentations and to receive copies of the summary.

The economic impact assessment information that was to be available for comment prior to the deadline was not completed. Rather than delaying the present comment deadline to accommodate the forthcoming economic impact assessment, DWR announced that an additional comment period will be arranged. The agency will notify all parties on its current mailing list when the assessment is complete, and allow six weeks from the date of that notice for responses.

The economic impact assessment will include two components: an analy-

sis of cost impacts of the rules on representative developments and water companies in each AMA and a regional impact analysis.

DWR is to review all comments on the rule package and the economic impact analysis before revising the proposed rules prior to submitting them for formal rule-making review. Public hearings are anticipated in the fall of 1993, with adoption targeted for the spring of 1994.

To be included on the DWR mailing list, contact call the Tucson AMA office, 602-628-6758.

Arizona State Parks Begins SCORP II

Arizona State Parks has begun work on a second 5-year Statewide Outdoor Recreation Plan (SCORP). Arizona is required to develop the plan to qualify for federal recreation funding.

The process began when approximately 135 invited participants attended the Governor's Outdoor Recreation Institute December 4 in Mesa to identify issues affecting the future of outdoor recreation in Arizona. The participants included a cross section of concerned Arizona citizens with representation from private industry, nonprofit organizations, advocacy and interest groups, government agencies and others.

Six groups were formed each to focus on an identified area of concern: community recreation, resource protection, education, socio-economic concerns, operation and maintenance, and expanding opportunities. The groups were to identify issues related to each area of concern.

The next phase of the planning process will involve 80 participants working to develop action plans to resolve the issues. The action plans will be the core of the 1994 SCORP report that is to be submitted for Governor Symington's endorsement in September 1994.

A copy of the 1994 SCORP issues is available by contacting R.J. Cardin, Statewide Planning, Arizona State Parks, 800 W. Washington, Suite 415, Phoenix, AZ 85007; 602-542-1996.

Land Agency to Pay Defaulted CAP Levies

Further justifying the interpretation that CAP means Central Arizona Pays, the Arizona State Land Department must come up with \$1.8 million for delinquent tax and assessment payments that were guaranteed by the state.

The amount is the result of land users not able to pay levies on state trust lands leased within four CAP irrigation and drainage districts. The districts levied the taxes and assessments to help pay for CAP water. With users defaulting, the state then must pay the taxes on the leased lands.

The Land Department will seek the \$1.8 million as part of its 1993 legislative agenda. Legislative approval also is sought for the agency to require bonds to cover defaults. This would help avoid such problems in the future.

Arizona Shrimp Concession Up for Grabs

The likely response to saline water is desalinization to render it fit for general use. But in work of possible relevance to Arizona, Texas researchers are leaving the salt in groundwater in an attempt to raise shrimp and redfish in the West Texas desert.

The effort is called the West Texas Aquaculture Project (WTAP) and is a joint venture between Texas A&M University, the General Land Office, the Pecos County Water Improvement District No. 3, and the Pecos County Commissioner's Court.

WTAP consists of six ponds, four containing 400,000 shrimp and two containing 40,000 redfish. Future plans call for up to 44 ponds for research and demonstration projects involving such species as redfish, speckled trout, sturgeon, bass, blue crabs, and oysters.

WTAP allows researchers to avoid conditions that at times afflict the Gulf of Mexico; e.g., low salinity, red tide, or oil spills. The project's goal is to determine the economic viability of a commercial-scale operation. For more information about the project contact Jim Davis, 409-845-5777.

CAP Advisory Committee Work Plan Proposed

The Arizona Department of Water Resources issued a proposed study process outlining a modus operandi for the Governor's Central Arizona's Project Advisory Committee. Appointed on 17 December, this advisory committee continues the work of a previous CAP task force that completed its work in July without making any major recommendations. (See December 1992/January 1993 *AWR*, p. 6)

A study organization made up of various components is proposed. Central to the organization is the Advisory Committee. Also included is an Inter-Agency Steering Committee to ensure the overall progress of the studies and maintenance of schedules. An Inter-Agency Study Team also will be involved composed of members with a variety of technical disciplines including engineers, lawyers, hydrologists, economists, planners, and data processing specialists. Public and Native American Involvement groups are also part of the proposed plan. The multi-unit organizational structure is to ensure wide and varied involvement in the process.

An eight-step planning process is proposed building upward from data base analysis to the recommendation of a preferred course of action. Also, a work schedule is worked out, with a May completion date for the formulation of recommended solutions.

The report alludes to the "White Paper" as a failed effort to resolve CAP problems. Not mentioned is the report "An Economic Assessment of Central Arizona Project Agriculture" by Paul Wilson of the University of Arizona. Commissioned by state government, this study attracted controversy for its critical analysis of CAP agriculture.

For copies of the proposed CAP study process contact Ana Marquez-Guerrero, ADWR, 602-542-1520.

RAAC Membership Increases

The membership of Governor Symington's Riparian Area Advisory

Committee was reported in the November issue of *AWR*. Additional members have since been appointed. Following are their names and interest areas: Martin Jakle (Arizona Riparian Council), Clinton Pattea (Ft. McDowell Indians), Jim Slingsluff (recreational users), Dave Smutzer (Pima County), and Lewis Tenney (timber).

The committee's charge is to study the components of a riparian protection program suitable for the state and present legislative recommendations to the Governor and the legislature by 1994.

CAWCD Board Slot Filled

Governor Symington has appointed Marvin Andrews to fill out the term of Mary Ann Nicoli, who resigned from the Central Arizona Water Conservation District board last fall. The term expires in 1994. Andrews, a retired Phoenix city manager and past chair of the Phoenix Groundwater User Advisory Committee, ran unsuccessfully for a seat on the board last November, finishing eighth in the 11-candidate field.

Miscellaneous Items

The City of Phoenix is the first Arizona member of the Western Urban Water Coalition. Initiated by the Las Vegas Valley Water District, the Coalition has supported California Congressman George Miller in his efforts as chairman of the House Interior Committee to change federal water policy.

The Santa Cruz Valley Water District board elected Mark Myers as its Chairman at its January board meeting. Myers represents private citizens and environmental interests on the District's appointed board.

Tucson's City Council has voted to replace Tucson Water's increasing block rate pricing structure with a flat rate/summer surcharge combination and to reduce the number of customer classes from seven to three. The Council also voted to again delay a bond election. Lack of bonding capacity is hindering Tucson Water's conversion to CAP water and slowing expansion of its reclaimed water system.

Floods of '93: Déjà Vu All Over Again?

Heavy rain began falling on January 3, and over the next 16 days, a series of storms pounded Arizona. By the time the storms abated on January 20, over six inches had fallen on much of central Arizona. As the flood waters began to recede, all but the northern tier of counties were declared disaster areas.

Floods of '83 and '93

Observers were quick to compare the flooding with the flood of '83. Both produced serious flooding, but differences outweigh similarities. The October 1983 flood resulted from a dying tropical storm. Flooding caused over a dozen deaths, washed out many major bridges, and inflicted massive private property damage. Total damage across the state was estimated at \$500 million.

By contrast, the floods of '93 resulted from an unusual storm track over the Pacific that caused a series of storms spawned off the coast of Alaska to drift south toward Hawaii and then swing abruptly to the east to pass over southern California and south-central Arizona, melting snowpacks. There was minimal loss of life this time, few major bridges were destroyed, and private property damage was much less.

The spatial distribution of rainfall differed from 1983, with record flows in some river stretches and flows well below 1983 levels in others (see graph, p. 8). Comparisons were hampered by gages being washed out in both floods.

Still, damage estimates ranged from \$60 million to upwards of \$100 million. There was considerable debate over whether the lessons of 1983 had taught us anything or whether we were making the same mistakes. While progress clearly has been made in designing and constructing bridges able to withstand flood events, some acted as "dams with holes in them," with embankments and approaches diverting water or being washed out. Less private property damage along rivers was due partly to government purchases of flood plain land and partly to structures destroyed in '83 not having been rebuilt.



Vehicles surf through flooded streets in mid-town Tucson. Water-filled streets proved mostly an inconvenience, with almost all "flood" damage in the Phoenix and Tucson metropolitan areas resulting not from out-of-bank flooding but from bank erosion along major rivers and washes. (Photo: Barbara Tellman)



The bridge over the Rillito River at Dodge on the north side of Tucson typified dozens of crossings closed by high waters. While some embankments were damaged and approaches washed out, few bridges were destroyed, although several were damaged. (Photo: Barbara Tellman)

Bank Protection Debate Renewed

Bank erosion continued to bedevil flood planners in the Phoenix and Tucson metropolitan areas. In Tucson, an incomplete patchwork of soil cement projects funded by post-'83 bond elections withstood the flood flows with few exceptions, but was accused of increasing damage to downstream unprotected banks. To flood control engineers, the lesson was clear — apply soil cement to both banks along all major washes.

Environmentalists saw the same results as support for restoring washes to a more "natural" state, full of meanders and riparian vegetation to slow flood flows, and with no structures allowed in the flood plain or near river banks. Extensive bank protection was labelled "flood-guarantee projects," a description that hit a nerve in downstream communities like Marana, where flood risks are increased by upstream development.

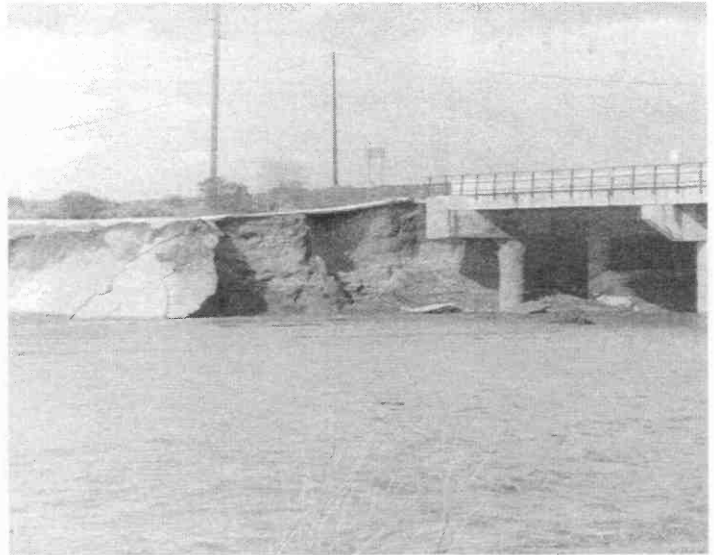
Leaving rivers and washes undeveloped and banks unlined may be a plausible strategy in the Tucson metropolitan area, where the flood plain comprises less than 10 percent of urban land. In the Phoenix metropolitan area, however, the flood plain is vast, and structural solutions are less controversial. Unfortunately, some vulnerable banks were inadequately protected, with disastrous results. The banks of the Tri-Cities Landfill along the Salt River on the Salt River Pima-Maricopa Reservation had been protected by the federal government, but not enough to withstand the nearly 100,000 cubic feet per second flows that occurred. Huge chunks of the landfill peeled off, like icebergs calving from a glacier, carrying thousands of cubic yards of municipal waste downstream to be deposited along a hundred miles of river. The cities of Mesa, Scottsdale and Tempe were evaluating alternative disposal sites, as Arizona Department of Environmental Quality attempted to sort out overlapping federal, tribal and local jurisdictions to determine who was responsible for the clean-up.

Environmental Damage Widespread

Other environmental consequences of the flooding includ-



The new Tempe Bridge currently under construction over the Salt River suffered extensive damage. (Photo: Barbara Tellman)

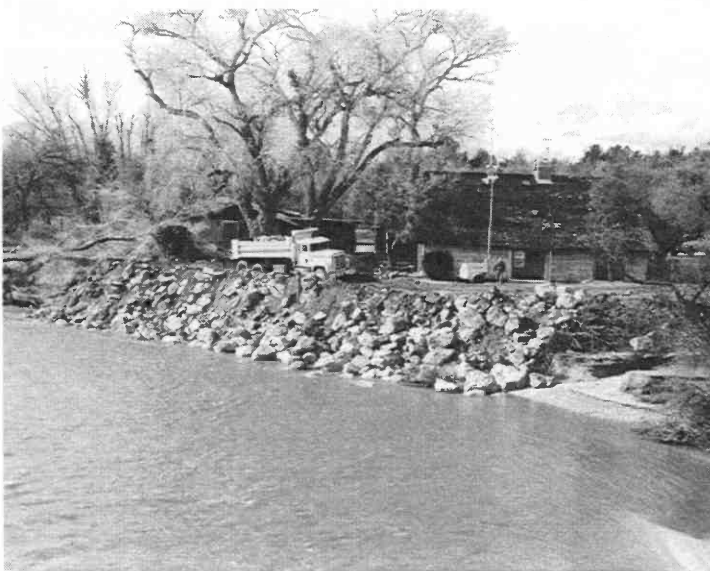


Storm waters eroded soil cement protecting the Ina Road Bridge over the Santa Cruz River north of Tucson. Most soil cement held, but its patchwork use was blamed for damage along unlined river stretches. (Photo: Barbara Tellman)

ed ruptured lines carrying treated effluent across the Santa Cruz and Rillito Rivers to Tucson-area golf courses, and some damage to the International Wastewater Treatment Plant just north of Nogales. Leaching ponds at at least two copper mines reportedly were spilling leachate containing large concentrations of heavy metals into rivers. Riparian habitat along the Verde River was heavily damaged, and the Nature Conservancy's Hassayampa River Preserve just downstream from Wickenburg lost a third of its trees and all of its trails.



The raging Salt River washed away one-third of the Tri-Cities Landfill on the Salt River Pima-Maricopa Indian reservation east of Phoenix. (Photo: Barbara Tellman)

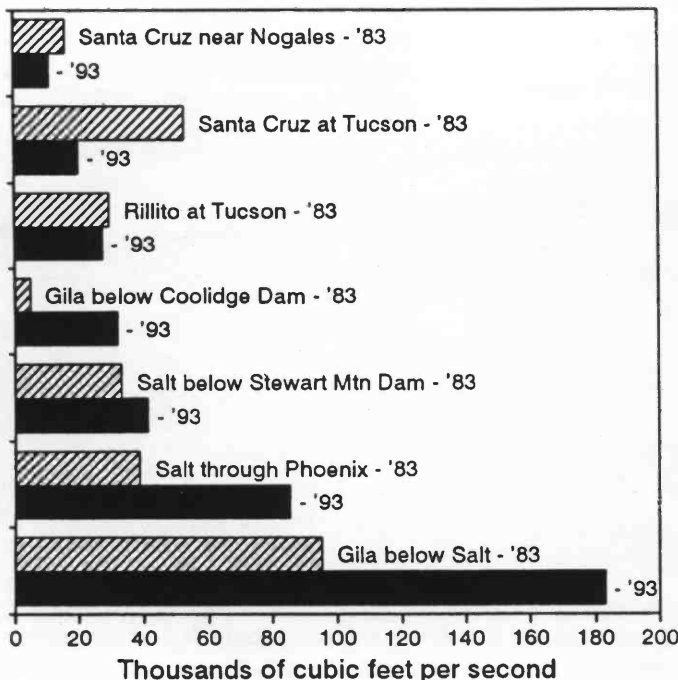


A home owner protects his home from encroaching water during a break in the weather. Two hundred feet of cottonwood-mesquite grove between the home and the Rillito were lost. (Photo: Jack Elder, USDA Soil Conservation Service)

It Might Have Been Worse...

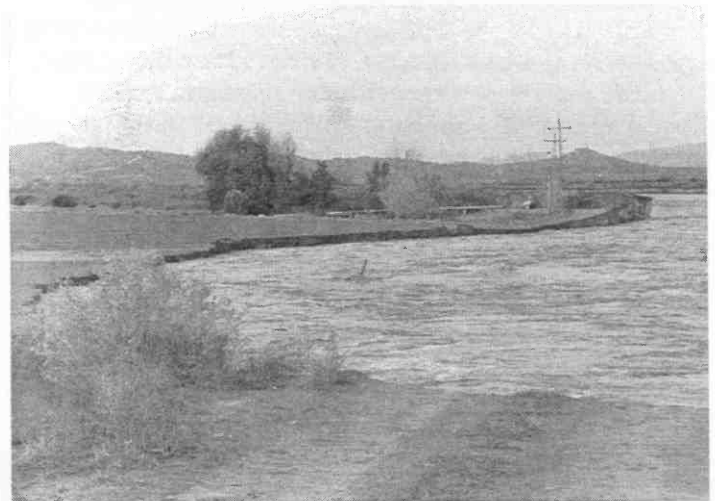
Two of the bigger stories from the Flood of '93 involved disasters that failed to occur. The Central Arizona Project's aqueduct system suffered only minor damage, with its defective siphons under the Gila and other rivers holding up. The CAP may in fact have come out of the floods a net winner, with over six inches of rainfall producing nearly a quarter-million acre-feet of runoff, partially filled Lake Pleasant

Flood Flows, 1993 vs 1983



behind the New Waddell Dam and saving the CAP an estimated \$7 million in energy costs to pump Colorado River water behind the newly constructed dam on the Agua Fria. The fortuitous timing also allowed CAP to take credit for reduced flood damage downstream. On the down side, the storms have left all reservoirs in the state full to overflowing, potentially reducing demand later this year for CAP water.

The other big non-event was Coolidge Dam not collapsing. Proclaimed "the most dangerous federal dam in the U.S." in a report issued in 1987, the aging structure, which was undergoing extensive repairs at the time, nevertheless withstood record water levels that sent over 30,000 cubic feet per second crashing over its previously untested spillways. Built in 1931 and operated by the Bureau of Indian Affairs (BIA) to store water for irrigation and not to provide flood protection, the dam managed to hold back San Carlos Lake, but spilled enough water to cause catastrophic flooding in the downstream communities of Winkelman, Hayden, and Kearney. Residents of these communities were second-guessing the BIA for not lowering levels in the reservoir more during fall months and were threatening to sue. Given the unprecedented precipitation in the San Carlos Lake watershed that occurred, some experts felt that lower initial reservoir levels would have only delayed the inevitable flooding by a day or two. BIA and Bureau of Reclamation officials have promised a thorough review of how dam operations were handled.



Muddy waters flow where a dirt road used to be. Hundreds of acres of land were lost to erosion, with most damage occurring to public infrastructure and not private property. (Photo: Jack Elder, USDA Soil Conservation Service)

While no major dams in the state gave way, serious flooding occurred in Winslow when a levee failed on the Little Colorado. And residents of Yuma County below the confluence of the Gila and Colorado Rivers were working with assistance from National Guard units to raise levees in anticipation of flood waters working their way downstream. Saturated ground throughout most of the state left open the possibility that additional storms could lead to flash flooding.

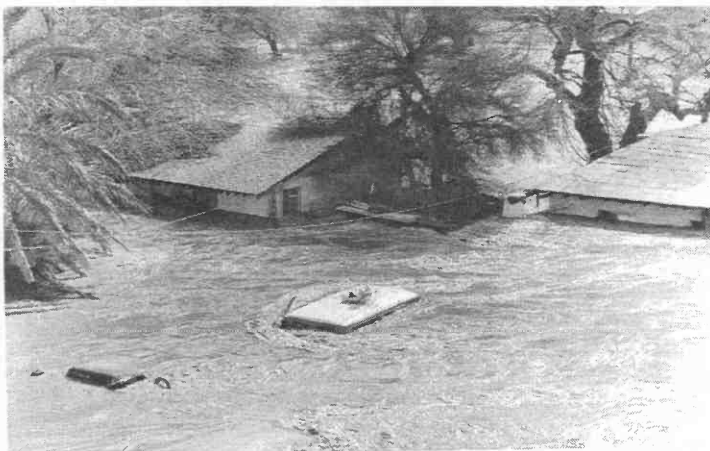


Coolidge Dam withstood record water levels, but flows over its spillways inundated downstream communities along the Gila River. Repair work on the dam is scheduled to resume as soon as water levels drop. (Photo: Barbara Tellman)

Gila River Inundates Mining Communities

The communities of Winkelman, Hayden and Kearney, located downstream of Coolidge Dam, were spared catastrophic flooding that would have occurred if the dam had failed, but nevertheless experienced the worst flooding in the state. Releases of water from Coolidge Dam never before had exceeded the capacity of its outlet tube. But when San Carlos Lake reached the level of the dam's spillways, releases rose to several times the previous record flows (see chart, p. 8).

Hardest hit was the Winkelman Flats area of Winkelman. Located on relatively flat ground immediately adjacent to the Gila River and home to some 250 people, the Flats experienced flood levels that reached toward rooftops. The ample warning provided to residents prevented serious loss of life, but property damage appeared to be almost total. As the waters finally began to recede, residents wondered what if anything would be left. Others wondered whether anyone



Winkelman Flats along the Gila River was hardest hit, with an infant seat on the van evidencing the haste with which residents abandoned their homes. Whether the community can, or should be rebuilt, is unclear. (Photo: Barbara Tellman)

should live on that particular spot again. Adding insult to injury, the copper mine that employed the residents of these small towns was closed pending repairs to its rail line.

Flood Lessons Interpreted, Debated

Even before Arizona dries out, various groups are interpreting what happened to support their views on how people in the arid Southwest should live with, and make use of, our rivers. Those who live downstream of dams and who were flooded may conclude that human error on the part of dam operators or an over-emphasis on water storage and/or hydro power at the expense of flood protection are to blame. It seems unlikely, however, that many will write off the recent events as an "Act of God," something unlikely to occur for centuries, and so to be forgotten. There have been six presidential declarations of flood disaster in Pima County alone since the late 1970s.



A stretch of the Gila River just upstream from Winkelman illustrates how flood damage can be minimized by not building in the flood plain. The flood has renewed debate over construction near rivers and washes. (Photo: Barbara Tellman)

Rather, the debate increasingly is focussed on whether development in flood-prone areas should be allowed, how to protect development already there without increasing downstream erosion, and whether to compensate the owners of land declared to be undevelopable due to flood risks. While the technology of bank protection has progressed, more people are accepting the argument that rivers and washes should be left in, if not returned to, as natural a state as possible.

In the end, the argument may come down to economics. The flood of '83 came at the start of a long period of economic expansion, with Arizona experiencing rapid growth. Prices for raw land, even parcels perched on the edge of washes, skyrocketed. The economic and fiscal realities of today are different. Federal assistance is increasingly difficult to obtain, and convincing voters to approve bonds for local flood control or flood plain acquisition projects will be difficult. Interpreting the lessons of the Flood of '93 will be the first battle.



Legislation & Law

Following is a summary of water-related bills introduced in the Arizona Legislature as of late January.

S.B. 1053 - Omnibus Water Amendments. This annual bill introduced by the Department of Water Resources addresses various technical and non-controversial changes in water-related statutes. Its contents were reported in December 1992/January 1993, *AWR*.

S.B. 1260 - Water Augmentation Authority. This bill allows formation of a Water Augmentation Authority in counties such as Pinal that lie within Active Management Areas and have populations less than 150,000.

S.B. 1359 - Water District Directors. This bill provides that the 12th and 13th members of the Santa Cruz Valley Water District will be elected at large from Pima and Santa Cruz Counties instead of being appointed by county supervisors.

H.B. 2073 - Artificial Groundwater Recharge Projects. This is an amendment to the initial and oldest recharge statute in the water code and appears to essentially eliminate the requirement that a recharge project must be a facility designed and constructed for that purpose. The amendment merely provides that the facility must be capable of being used to provide for the seepage or injection of water or effluent, thereby eliminating the "designed and constructed" requirement.

DWR staff indicates that this bill likely will be amended to eliminate the "designed and constructed" requirement contained in the Underground Storage and Recovery Act. DWR historically has opposed the elimination of that condition. This bill is intended to address inadvertent recharge occurring from leaky artificial residential lakes in the Phoenix Area.

H.B. 2116 - Underground Water Storage Credits. This bill amends the Underground Storage and Recovery Act so as to permit the issuance of a permit and the accrual of credits for recharge that might occur in a natural channel of a stream while recharge water is being conveyed to an underground storage and recovery project. The impetus for this bill is the desire of the City of Phoenix to transport recharge water in the Agua Fria stream channel to a designed and constructed underground storage in the Phoenix area.

H.B. 2026 - Repeal of Statewide Water Efficient Plumbing Act. This bill repeals the Statewide Water Efficient Plumbing Act that was passed in the 1992 session and eliminates the provision from the groundwater enforcement fund statute which permits the use of those funds for the enforcement of the Act.

H.B. 2100 - Repeal of Groundwater Replenishment Districts. This bill repeals the groundwater replenishment district legislation passed in 1991 which is applicable to the Phoenix AMA.

H.B. 2103 - Groundwater Replenishment District Split. This bill provides that two separate groundwater replenishment districts may be formed in the Phoenix AMA. The two replenishment districts which could be formed would split out the "west valley" interests from the "east valley" interests. The impetus for this bill and H.B. 2100 appears to be the dissatisfaction of the "west side" water interests with the existing provisions of the Replenishment District Act. (See cover story.)

H.B. 2253 - Small Municipal Water Provider. This bill would amend certain provisions relating to future management plans and redefines small municipal providers to mean cities, towns, private water companies or irrigation districts that supply less than 10,000 acre feet of water for non-irrigation use in a calendar year. The current definition is less than 100 acre-feet.

This amendment effectively exempts many cities, towns, private water com-

panies and irrigation districts from more stringent aspects of DWR management plans since under the existing statutes, small municipal providers are largely exempt.

H.B. 2251, 2255 and 2254. These bills relate to a number of concerns of private water companies regulated by the Arizona Corporation Commission (ACC). H.B. 2254 provides a method for water companies to recover increases in expenses beyond their control, such as the cost of power or CAP water and taxes, without ACC approval. H.B. 2255 allows interim rate increases under bond and sets time limits for ACC consideration of rate increases. H.B. 2251 simplifies certain project review functions of ADEQ with regard to small water system improvement projects.

S.B. 1336 and S.C.M. 1004. This bill allows the DWR director to designate a Santa Cruz International AMA if groundwater supplies in the Santa Cruz River basin near the Mexican border are threatened. An advisory council is created.

DWR opposes this bill, but supports S.C.M. 1004, which call on the president and congress to negotiate with Mexico for cooperative management of waters in the upper Santa Cruz River basin.

ADEQ Sued Over Water Law Enforcement

The Arizona Center for Law in the Public Interest has sued the Arizona Department of Environmental Quality on behalf of the Sierra Club and Arizona Toxics Information, claiming lax enforcement of laws against water polluters. The suit seeks to have the court order ADEQ to issue cease and desist orders against known violators.

ADEQ director Ed Fox defends the agency's approach of working with violators, claiming that cease and desist orders should be used only for serious repeat offenders, since such action can result in businesses being shut down.



Publications

Long-Awaited CAP Delivers Troubled Waters to State

Joe Gelt. The above is Volume 6 Number 3 of *Arroyo*, a quarterly publication of the Water Resources Research Center. The development of the Central Arizona Project is traced, from its optimistic beginnings to its current status as a project of uncertain and indeterminate usefulness. Arizona now seeks a strategy to better utilize CAP to benefit the state and serve its water needs.

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

1992-1993 Tribal Directory of the 21 Federally Recognized Indian Tribes of Arizona.

Arizona Commission of Indian Affairs. Indian water rights are a critical water issue in the state. This directory is a valuable resource for people seeking to contact appropriate tribal officials or offices for information.

Federal, state, tribal and local government agencies receive free copies of the directory, but \$5 is charged to a person from a non-governmental entity. Contact the Arizona Commission of Indian Affairs, 1645 W. Jefferson, Phoenix, AZ 85007; 602-542-3123.

The federally funded water centers at Arizona and New Mexico each have put out a publication with general water information for the lay readers of their states. Following are descriptions of the two publications:

Water Supply and Demand in Arizona

Susanna Eden and Mary Wallace. This issue paper discusses important elements of water resource management in Arizona. Described within are the sources of the state's water supplies, their uses, and management. The publication also discusses the major water policy issues challenging Arizona's water managers.

Water Resources Research Center, University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721; 602-792-9591. Up to two copies free. Call for pricing on larger orders.

New Mexico Water Rights

Linda G. Harris, with 1992 update by Leslie Blair. This publication describes the history, laws and administration of New Mexico's water rights and includes a list of sources for additional information on the state's water resources.

It is available from the New Mexico Water Resources Research Institute, Box 30001, Dept. 3167, Las Cruces, NM 88003; 505-646-1813. (\$3.50 including postage)

America's Waters: A New Era of Sustainability

Report of the Long's Peak Working Group on National Water Policy. In early December, 30 water policy experts gathered at a Rocky Mountain Retreat to work out national water policy recommendations intending to influence the new Clinton administration. This report is the result of that meeting.

Copies are available for \$12 (\$10 and a \$2 handling charge) from the Natural Resources Law Center, University of Colorado School of Law, Campus Box 401, Boulder, Colorado 80309-0401; 303-492-1288.



Transitions

Phil Regli has been hired by the Las Vegas Valley Water District as its new Water Conservation Manager. He assumed the position in mid-January, shortly after leaving his position as Water Resources Analyst with the City of Scottsdale, where he was responsible for conservation programs. Previously, he was with the City of Phoenix's Department of Water Conservation and Resources. Regli was known in Arizona for his efforts to promote and coordinate municipal water conservation programs.

Jack Conovaloff has been hired by the Metropolitan Domestic Water Improvement District to be its general manager as of February 22. The position has been vacant for two months since the departure of **Bob Logan**, who guided the transition from private water company to water improvement district. Mr. Conovaloff comes to MDWID from the Inter-Tribal Council of Arizona, where he served as an environmental specialist. Prior to that, he was project manager for the Salt River-Pima-Maricopa Indian Community. He also served for six years as general manager of Roosevelt Irrigation District.

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 AMA Water Augmentation Authority
Tucson Water
USGS Water Resources Division
Water Utilities Association of Arizona

Their contributions help make continued publication of this newsletter possible.



Special Projects

The management of the nation's rivers and wetlands is a topic of increasing importance and is gaining recognition at the local, state, and national levels. A recent conference, "Riparian Management: Common Threads and Shared Interests," which was sponsored by the Water Resources Research Center, explored the topic at a western regional level. The following three projects demonstrate concern with riparian areas in Arizona, Mexico, and the Navajo Nation.

Study Assesses Arizona River Planning

The value of Arizona's free-flowing rivers and their riparian habitats is a topic of growing interest. Recent research at Arizona State University contributes information to this topic by studying river corridor planning issues for two Arizona Rivers. Case studies using the Verde River and the Agua Fria River assess the effectiveness of the state's first river corridor planning project and propose a method for evaluating stream corridors for future corridor projects.

The researchers examined the effectiveness of the Verde River Corridor Project from its inception to implementation. The VRCP was based on a multi-objective citizen-based planning process. The researchers used U.S. Environmental Protection Agency criteria to assess implementation of VRCP objectives, and they detail strengths and weaknesses of project goals. The VRCP is the first attempt in Arizona to protect a riverine resource to satisfy multiple interests in the Verde River and its uses.

The project also involved examining the Agua Fria River to determine an evaluation method for riparian areas that may be incorporated into a corridor project similar to the VRCP. The evaluation method provides a means for

ranking river segments based on natural functions, values, and benefits and is modeled after the U.S. Soil Conservation Service's agriculture land evaluation and site assessment system. The evaluation method may also be used to determine appropriate buffer widths for stream corridor protection.

The Agua Fria River study examines ten transects and includes a summary of previously used riparian classifications and recommended buffer widths for stream corridor protection. Although no corridor projects are currently planned for the Agua Fria, the river serves as a case study for smaller intermittent streams in Arizona that support riparian habitats.

Both the Agua Fria River, which is an intermittent stream, and the Verde River, which flows year round, possess important riparian areas. The planning of these rivers therefore is important to Arizona and other arid and semi-arid regions.

The study titled "Arizona River Corridor Projects: Assessment and Proposal" was funded by the University of Arizona's Water Resources Research Center, under the Water Resources Research Act, Section 104. Principal investigators are Jana Fry, Elaine Averitt and Frederick Steiner of the Department of Planning at Arizona State University. For additional information contact Frederick Steiner, Department of Planning, College of Architecture

and Environmental Design, Arizona State University, Tempe, AZ 85287-2005; 602-965-7167.

Agencies Join to Survey Mexican Wetland

In an international effort, scientists from various institutions have begun a vegetation and wildlife survey of the Cienega de Santa Clara, one of the last remnants of the Colorado River Delta in Mexico. Project participants include the University of Arizona's Environmental Research Laboratory (ERL), Mexico's Centro de Ecologico in Hermosillo, Sonora, Mexico, UNAM University's Centro de Ecologia in Mexico City, U.S. Fish and Wildlife Service, Arizona Game and Fish, and the Drylands Institute. U.S. Fish and Wildlife Service and the Bureau of Reclamation funded the study.

An area of environmental importance, the Cienega de Santa Clara, or the Santa Clara Slough, is habitat for between a quarter and a half of the total U.S.- Mexico population of an endangered bird known as the Yuma Clapper Rail and for diverse other bird species. The cattail wetlands also host the largest single population of the endangered Desert Pupfish and supports rare and endemic plants.

Biologists want to inventory the wetland species before the Yuma



Waterfowl at Cienega de Santa Clara. (Photo: Lori Stiles)

Desalting Plant goes into full operation and triples the salinity of water flowing into the slough. The methodology includes ground surveys and overflights using remote sensing technology. A hydrological-biological model of the area is to be developed to help predict what will happen when the Yuma desalting plant operates at full capacity.

The present study is accomplishing preliminary work to support a three-year proposal to be submitted for funding to the International Boundary and Water Commission and its Mexican counterpart, the Comisión Internacional de Límites y Aguas. This project would be directed by Mexico, with invited support from U.S. agencies. Mexico has identified the Santa Clara Slough as one of the 14 areas to be preserved along the Gulf of California.

For additional information contact Edward P. Glenn, Environmental Research Laboratory, University of Arizona, 2601 E. Airport Drive, Tucson, AZ 85706; 602-741-1990.

Navajos Study Wetland Protection, Regulation

The Navajo Tribe received EPA funding to conduct a wetland protection project titled *Identification of Ecological Significant Wetlands and Development of a Wetlands Protection Plan*.

Because the approximately 25,000-square mile Navajo Reservation is outside the jurisdiction of most federal and state agencies, natural resource inventories usually stop at the reservation boundary. Most of the reservation has not been platted.

The boundaries of the Navajo Nation encompass riparian areas of the San Juan, Colorado, and Little Colorado rivers. The majority of tribal wetland areas, however, result from montane ponds and streams, vernal pools, springs and seeps, and areas of aquifer discharge known as "hanging gardens." Such areas may be refuges for many rare, endemic plant and animal species. Two rare species of plant life located on Navajo land are Navajo sedge (*Carex specuicola*), which is only found in the Navajo Nation, and Parish alkali grass

(*Puccinellia parishii*). Also the San Juan River provides the breeding habitat for several important fish species.

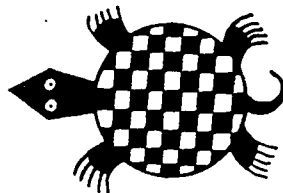
The small scale of the wetland areas and the immense size of the Navajo Nation, with its varied topography and difficult access complicate the traditional surveying process.

Agriculture, ranching, development as well as industrial activities threaten Navajo wetland areas. For example, oil and gas extraction along the San Juan River has raised the levels of polyaromatic hydrocarbons in areas to levels comparable to those of Galveston Bay, Texas. Another concern is the extensive invasion of exotic plant species in major riparian areas. Tamarisk or salt cedar is the most widespread invader. Russian olive has invaded the San Juan Basin and is gradually migrating into upper drainage areas.

The project's initial phase is to search the Navajo Natural Heritage Program's database for information on locations, conditions, and ecological importance of threatened and endangered plants and animals within the Navajo Nation. Arizona, New Mexico, and Utah state officials will be consulted for information not found in the NNHP's database.

Also remote sensing data will be entered into a GIS database. A work plan is to be established, in coordination with NNHP, to ensure the maximum sharing of data and the effective utilization of personnel. This will provide enhanced capabilities when prioritizing, inventorying, and classifying wetlands. A later phase of the program involves developing and implementing regulations designed to protect Navajo Nation wetlands.

For additional project information contact the Navajo Natural Heritage Program, 602-871-6472, or the Navajo Environmental Protection Administration, 602-729-4005.



Announcements

ARWA Elects Officials

Newly elected officials of the Arizona Rural Water Association were announced at its January 7 annual business meeting luncheon. Fred Zumwalt of Clifton was elected president, Carlton Camp of Prescott is vice president, Roger Gingrich of Yuma is secretary, and Kim Haws of St. Johns is treasurer.

DWR Sets Water Exchange Procedures


Passed by the State Legislature in 1992, House Bill 2407 became effective September 30, 1992. The law allows one type of water to be exchanged for another type under certain conditions. The Department of Water Resources has established forms and procedures for enrollment of water exchange contracts, permitting water exchanges and providing notice of water exchanges as required by Title 45 of the Arizona Revised Statutes.

All parties who want to conduct water exchanges greater than 50 acre-feet in any 12-month period must be enrolled, permitted or provide notice to DWR, unless all of the water in the exchange is effluent. Parties needing to enroll a pre-1992 water exchange contract with DWR must do so by December 31, 1993.


An example of a water exchange would be party A giving party B surface water in exchange for party B's effluent. The ability to exchange water provides more flexibility in meeting the requirements of Arizona's Groundwater Management Code.

Copies of water exchange forms and procedures are available from the Arizona Department of Water Resources' Operations Division, 15 S. 15th Ave., Phoenix, AZ 85007; 602-542-1581.

continued on page 16



Calendar of Events



RECURRING



Arizona Hydrological Society. 2nd Tuesday of the month, 9 February 7:30 p.m. "Flood Footage" Meetings held at Water Resources Research Center, 350 N. Campbell Ave., Tucson. Contact: Laurie Wirth 602-670-6231.

Arizona Water Resources Advisory Board (formerly the Arizona Water Commission.) 25 February, 9:00 a.m. Meetings held at ADWR, BO44, 15 South 15th Ave., Phoenix. Contact: Beverly Beddow 602-542-1553.

Casa Del Agua. Water conservation tours hourly, 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. Central Arizona Project 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: Trish Williamson 602-791-4331.

Phoenix AMA, GUAC. 3 February, 9:00 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. 3rd Thursday of the month, 9:30 a.m. 177 N. Church Ave., Tucson. Contact: Gail Kushner 602-792-1093.

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

Pinal AMA, GUAC. 18 February, 7:00 p.m. Pinal AMA Office, 1000 E. Racine, Conference Room, Casa Grande. Contact: Dennis Kimberlin 602-836-4857.

Prescott AMA, GUAC. No meeting scheduled at this time. Prescott City Council Chambers, 201 S. Cortez, Prescott. Contact: Phil Foster 602-778-7202.

Santa Cruz Valley Water District. Special meeting 5 February, 7:30 a.m. Regular meeting 12 February 7:30 a.m. Meetings held at the Water Resources Research Center, 350 N. Campbell Ave., Tucson. Contact: Warren Tenney 602-326-8999.

Tucson AMA, GUAC. 12 February, 9:00 a.m. Tucson AMA offices, 400 W. Congress, Suite 518, Tucson. Contact: Linda Stitzer 602-628-6758.

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

FEBRUARY



10 (Wed) **Global Change: Dr. Berrien Moore, Institute for the Study of Earth, Oceans, and Space, University of New Hampshire, The Changing Global Carbon Cycle.** 3:00 p.m. UA Center for Creative Photography, Tucson. Contact: UA Global Change Coordinating Committee 602-621-7120.

10-14 (Wed-Sun) **1993 Mountain States Ground Water Expo.** St. George, Utah. Contact: 801-996-2730.

11 (Thu) **Impact of the Federal Wild and Scenic Rivers Act.** 7:00 p.m. Eastern Arizona College Little Theatre-New Activity Center (Off of Highway S 60/70), Thatcher, AZ. Contact: BLM 602-640-5504.

13 (Sat) **Impact of the Federal Wild and Scenic Rivers Act.** 7:00 p.m. Davis Monthan AFB, NCO Club, Craycroft Rd. and Golf Links Rd., Tucson. Contact: BLM 602-640-5504.

16 (Tue) **City of Tucson Stormwater Master Plan public meeting.** 6:30 - 8:30 p.m. Valencia Library, Tucson. Contact: Tucson Stormwater Mgmt Study 602-622-1933.

17 (Wed) **City of Tucson Stormwater Master Plan public meeting.** 7 - 9:00 p.m. Nash Elementary School, Tucson. Contact: Tucson Stormwater Mgmt Study 602-622-1933.

18 (Thu) **Governor's CAP Advisory Committee.** 2:00 - 4:00 p.m. 1 Arizona Center, 400 E. Van Buren, The Events Suite, 4th Floor, Phoenix. Contact: ADWR, Ana Marquez-Guevvero 602-542-1520.

20 (Wed) **City of Tucson Stormwater Master Plan public meeting.** 10:00 a.m. - Noon, Wilmot Library, Tucson. Contact: Tucson Stormwater Mgmt Study 602-622-1933.

25-27 (Thu-Sat) **National Research Council, Committee on Ground Water Recharge.** Tempe, AZ. Contact: Water Science and Technology Board, National Research Council, 2101 Constitution Ave., HA 462, Washington, D.C. 20418.

UPCOMING



1-3 March (Mon-Wed) **Bioremediation of Organic Constituents in Soil and Ground Water and Corrective Action for Containing and Controlling Ground Water Contamination.** Denver, CO. Contact: Connie Safreed, National Ground Water Association, 6375 Riverside Drive, Dublin, OH 43017; 614-761-1711.

2 March (Tue) **Governor's CAP Advisory Committee.** 2:00 - 4:00 p.m. 1 Arizona Center, 400 E. Van Buren, The Events Suite, 4th Floor, Phoenix, AZ. Contact: ADWR, Ana Marquez-Guevvero 602-542-1520.

3 March (Wed) Dr. David Goodrich, USDA, **Monsoon 90: An Interdisciplinary Field Campaign in the USDA-ARS Walnut Gulch Watershed, Tombstone, AZ.** 4:00 p.m. UA Geology Building, Room 206, Tucson. Hydrology and Water Resources. Contact: Fran Janssen 602-621-7120.

4-5 March (Thu-Fri) **Golf Course Wastewater Symposium.** Newport Beach, CA. Contact: Dr. Kimberly Erusha, U.S. Golf Assoc., P.O. Box 708, Far Hills, NJ 07931; 908-234-2300.

10 March (Wed) **Global Change: Dr. Piers Sellers, NASA/Goddard Space Flight Center, Biospheric Sciences, Greenbelt, MD, Modeling Terrestrial Energy-Water-Carbon Fluxes.** 3:00 p.m. UA Center for Creative Photography, Tucson. Contact: UA Global Change Coordinating Committee 602-621-7120.

12 March (Fri) **Seventh Annual Xeriscape Conference "CAP: Tapping the New Source."** Tucson. Contact: Tucson Water Conservation Office, P.O. Box 27210, Tucson, AZ 85726-7210; or Melaney Seacat 602-791-4331.

12-13 March (Fri-Sat) **Environmental Education Resource Fair.** Arizona Interagency Committee on Environmental Education. Deer Valley High School, 18424 N. 51st Ave., Glendale, AZ. Contact: Chris Williams, 201 E. Indianola, Suite 200, Phoenix, AZ 85012-2054; 602-640-5183.

16-18 March (Tue-Thu) **Water Quality Association Convention.** San Antonio, TX. Contact: AWQA, 6819 E. Diamond St., Scottsdale, AZ 85257; 602-947-9850.

17-19 March (Wed-Fri) **Southern California Tour.** Water Education Foundation Tours visits Las Vegas and San Diego County. Contact: Valerie Holbomb 916-444-6240.

21-24 March (Sun-Wed) **WATERSHED '93: A National Conference on Watershed Management.** Alexandria, VA. Contact: WATERSHED '93, c/o The Terrene Institute, 1000 Connecticut Ave., NW, Suite 802, Washington, DC 20036; 202-833-8317.

24 March (Wed) **Governor's CAP Advisory Committee.** 2:00 - 4:00 p.m. 1 Arizona Center, 400 E. Van Buren, The Events Suite, 4th Floor, Phoenix. Contact: ADWR, Ana Marquez-Guevvero 602-542-1520.

30 March - 2 April (Tue-Fri) **13th Annual Hydrology Days.** Fort Collins, CO. Contact: Janet Montera, Hydrology Days, Civil Engineering Dept., CSU, Fort Collins, CO 80523; 303-491-7425.

31 March (Wed) **12th Annual memorial Kisiel Lecture.** 3:00 p.m. UA Center for Creative Photography auditorium, Tucson. Sponsored by the Hydrology and Water Resources Dept. Contact: Nathan Buras 602-621-9132.

31 March (Wed) **El Dia del Agua.** 7:45 a.m. Arizona Ballroom, UA Student Union Building, Tucson. Hydrology and Water Resources Dept. Contact: Gray Wilson 602-621-9108.

2 April (Fri) Carol Rose, Yale University, Law, **Environmental Ethics.** College of Law Faculty Seminars. 4:00 p.m. UA Law School Faculty Library, Tucson. Contact: Lakshman Guruswamy 602-621-1373.

10 April (Wed) **Global Change: David Schimel, Project Scientist from Climate System Modeling Program (UCAR), Soil Carbon: Global Variation in Storage and Turnover.** 3:00 p.m. UA Center for Creative Photography, Tucson. Contact: UA Global Change Coordinating Committee 602-621-7120.

14-16 April (Wed-Fri) **National Research Council, Committee on Planning and Remediation for Irrigation-Induced Water Quality Problems.** Phoenix. Contact: Water Science and Technology Board, National Research Council, 2101 Constitution Ave., HA 462, Washington, D.C. 20418.

16-17 April (Fri-Sat) **7th Annual Meeting of the Arizona Riparian Council.** Rio Rico, AZ. Contact: Arizona Riparian Council, Center for Environmental Studies, ASU, Tempe, AZ 85287-3211.

19-20 April (Mon-Tue) **Environmental Compliance for Federal Facilities.** Seattle, WA. Contact: Tim Hohman, Government Institutes, Inc., 4 Research Place, Suite 200, Rockville, MD 20850; 301-921-2345.

25-28 April (Sun-Wed) **9th Annual International Conference of the American Backflow Prevention Association.** Phoenix. Contact: Kathy Keim, Arizona Chapter, American Backflow Prevention Association, P.O. Box 60548, Phoenix, AZ 85082; 602-788-5411.

2-7 May (Sun-Fri) **Management of Water Resources in North America III: Anticipating the 21st Century.** Hotel Park Tucson, AZ. Sponsored by the Engineering Foundation and the International Water Resources Association. Contact: Engineering Foundation Conferences, 345 E. 47th St., New York, NY 10017; 212-705-7835.

4-7 May (Tue-Fri) **Arizona Water & Pollution Control Association 1993 Annual Conference.** Doubletree Hotel, Tucson. Arizona Water & Pollution Control Association. Contact: Jon Schladweiler 602-740-6539.

12-14 May (Wed-Fri) **Central California Tour.** Water Education Foundation Tours focuses on the San Joaquin Valley. Contact: Valerie Holcomb 916-444-6240.

16-20 May (Sun-Thu) **Second USA/USSR Joint Conference on Environmental Hydrology and Hydrogeology.** Washington D.C. Contact: Secretariat, Second USA/USSR Conference, American Institute of Hydrology, 3416 University Avenue, S.E., Minneapolis, MN; 612-379-1030.

19-21 May (Wed-Fri) **The 6th Symposium on Artificial Recharge of Groundwater Purpose, Problems, and Progress.** Phoenix. Contact: Technical Committee, 1993 ARGS, Water Resources Research Center, UA, 350 N. Campbell Ave., Tucson, AZ 85721; 602-792-9591.

Announcements continued from page 13

Call for Abstracts for AWRA Conference

AWRA's annual conference and symposium is to be held in Tucson August 29-September 2, 1993. The deadline for submitting abstracts for the conference, "Innovations in Ground Water Management," is open until March 5, 1993. The abstract cannot exceed 250 words and must include the title of the paper, all authors' names, and their affiliations. Three copies are to be submitted.

For more information on the conference and the submitting of abstracts, contact Conference Technical Co-Chairperson Hanna J. Cortner, Water Resources Research Center, 350 N. Campbell Ave., University of Arizona, Tucson, AZ 85721; 602-792-9591.

Western Wetlands Conference Set

The Society of Wetland Scientists, Western Chapter, announce its first annual conference, "Western Wetlands: Diversity and Practice," to be held March 25-27 at the University of California at Davis. The goal of the conference is to attract a diverse group of wetland professionals to discuss such topics as wetland delineation, wetland restoration, biological diversity, and local efforts. The conference will emphasize the diversity of wetland management practices employed throughout the region, and field trips are to be scheduled to local points of ecological interest. For additional information contact Leslie Gecy 916-852-1300 or Don Kent 818-544-5734.

Call for Papers

The Arizona Riparian Council is seeking papers for its seventh annual meeting to be conducted at Rio Rico, Arizona April 16 and 17, 1993. Papers on border rivers are encouraged; however, all abstracts will receive equal consideration. Abstracts must be submitted by March 1 and should be between 250 and 500 words. For forms and additional information contact J. Stromberg, Arizona Riparian Council, Center for Environmental Studies, Arizona State University, Tempe, AZ 85287-3211.

DWR Offers Funds for Conservation Programs

The Arizona Department of Water Resources is accepting applications for funding under the Conservation Assistance Program. The program is to assist water users within the AMAs in meeting the conservation requirement contained within the Second Management Plan and in reaching AMA goals. DWR will consider funding requests for the Information and Education Program, the Agricultural Users Program, the Municipal Users Program and the Industrial Users Program. Approximately \$419,000 is available for projects. The application deadline is April 15, 1993.

For more information about the program contact the Program Planning and Management office at 602-542-1546 or an Active Management Area office: Phoenix AMA 602-542-1512; Tucson AMA 602-628-6758; Pinal AMA 602-836-4857; Prescott AMA 602-778-7202.

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