



CAP Water Quality Strains Municipal Treatment Plants

Lake Pleasant behind the recently completed New Waddell Dam held some 150,000 acre-feet of water prior to the January-February storms. In early January, the Bureau of Reclamation asked the CAWCD to hold the elevation of Lake Pleasant constant for 30 days so the stability of the New Waddell Dam could be tested. Instead, the dam received a different, real-world test, as runoff from January-February storms increased the volume of Lake Pleasant to nearly 450,000 acre-feet. Reservoir capacity is 800,000 acre-feet.

Some of the water captured behind the dam would otherwise have contributed to downstream flooding. After the storms subsided, CAWCD switched from pumped Colorado River water to gravity-fed Lake Pleasant water as the source for deliveries to municipal customers, thereby saving millions in energy costs (see *continued on page 7*)



This year's high quail population is the result of plentiful rainfall last year. This season's abundant rains bode well for quail next year. (Photo: UA Ag. Communications)

Arizona Seeks Share of Virgin River System

Occurrences in the relatively undeveloped and lightly populated northwest corner of Arizona are not hot items on the state's water management agenda. Yet critical water management issues are to be resolved there, and how they are decided will determine the area's current access to water supplies, its future development potential, and also will affect the natural environment of the area.

Northwest Arizona is located near rapidly expanding population centers in neighboring Utah and Nevada. The Virgin River is a shared resource. Originating high on the Markagunt Plateau above Cedar City, Utah, it flows through the canyons of Zion National Park. The river then cuts across 35 miles of the northwest corner of Arizona before entering Nevada where it empties into Lake Mead on the Colorado River.

Of the three states with interest in the Virgin River, Utah, with its headwaters, obviously is in the best position to develop the river. With no interstate Virgin River compact in place, some observers fear Utah will exploit the river, to the disadvantage of downstream users, possibly diverting the entire flow. Some people argue that a Virgin River compact is late in coming because Utah benefits from the status quo.

Utah plans to use the Virgin River to help support rapid development occurring in Washington County, located in southwest Utah. St. George is the *continued on page 2*



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Virgin River cont. from page 1

fastest growing city in the state, with its present population of about 45,000 expected to increase to between 100,000 to 500,000 within 60 years.

To accommodate this growth the Washington County Water Conservancy District (WCWCD) plans a Virgin River dam and reservoir. Preliminary work involves identifying possible dam sites. If constructed, such a dam could divert the entire flow of the river before it reaches Arizona.

After leaving Utah and passing through Arizona, the Virgin River flows into Nevada. Nevada wants the Bureau of Reclamation to construct a plant to desalinate the highly saline Virgin River as part of the agency's strategy to control Colorado River salinity. Salinity would thus be reduced and, not incidentally, additional water resources would flow to Las Vegas. Any Virgin River water rights allocated to Nevada would ensure instream flow through Arizona.

With active and aggressive interests upstream and downstream planning to use the river, what then is Arizona's stake in the river? Arizona is the source of much of the flow of the Virgin River, with 2,970 square miles of the river's drainage basin within the state. Most of this drainage, however, flows into Nevada and Utah river stretches.

Unlike neighboring states, Arizona does not have a large population center in need of Virgin River water. Littlefield, population of about 800, is located along the river and uses very limited river water for irrigation. Some area residents claim Virgin River water might be needed for future development. A resort and two golf courses presently exist, with plans for possibly four more golf courses.

The Virgin River's high salinity discourages more extensive Arizona use. Upstream in Utah the river is considerably less saline and therefore more potable. The river gains salinity as it heads downstream.

The Virgin River in Arizona is valued mainly for non-consumptive purposes. With rivers, streams, and wetlands occupying less than one half of one percent of Arizona's territory, a perennial flow such as the Virgin River is a rare and valued natural attraction. The river flows through an area of extreme geologic faulting and folding, through canyons 300 to 500 feet deep, revealing numerous layers of the earth and providing varied spectacular scenery.

The Virgin River is home to the woundfin minnow and the Virgin roundtail chub, both federally listed species. Habitat is provided for the peregrine falcon, spotted bat and common black-hawk. Various wildlife, including desert big-horn sheep, drink from its waters.

Noting the river's scenic, geologic, aquatic and riparian attractions, the Arizona Strip Bureau of Land Management (BLM) determined the Arizona segment of the Virgin River to be eligible for Wild and Scenic designation. Further, BLM requested from the Arizona Department of Water Resources (DWR) instream flow rights for almost the entire Arizona segment of the Virgin River.

DWR currently is considering the BLM requests. Any Arizona instream designation would greatly concern Utah.

As a water supply issue, the Virgin River is of lesser importance to most Arizona area residents than Beaver Dam Wash, whose water quality generally is good and lacks the salinity that limits Virgin River water use. Beginning in Nevada it runs south through Utah along the Beaver Dam Mountains, before flowing through a small reach of Arizona and draining into the Virgin River at Littlefield.

The Mesquite Farmstead Water Association (MFWA), a Nevada water company, has purchased land near the Arizona town of Beaver Dam and has filed with DWR for the right to transport water to Nevada. The \$1.3 million pipeline would carry 3,000 gallons a minute from the Beaver Dam Wash aquifer to the rapidly growing Mesquite area. Arizona law allows an out-of-state transfer if Arizona users are not affected. Nevada claims they would not be.

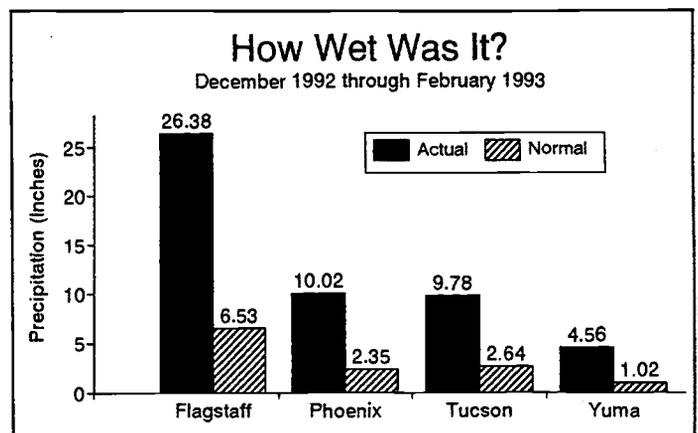
Residents in the Littlefield area do not agree and fear approval of Nevada's request would deplete their existing wells for irrigation and personal use. Some 100 wells in the area pump about 6,000 acre-feet per year (af/yr). Area growth is projected to increase pumping from the aquifer.

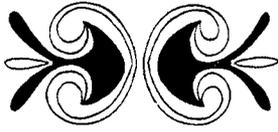
The Arizona Game and Fish Department and the U.S. Wildlife Service also oppose the request, from concern that surface flow in the wash would be impacted. BLM has filed an instream flow request for Beaver Dam Wash and, if approved, would require that sufficient instream water remain. Beaver Dam Wash is perennial in Arizona along a one-mile reach upstream of its junction with the Virgin River and has an annual flow of 5,400 af/yr at its mouth.

A Beaver Dam Wash dam jointly planned by WCWCD and MFWA further threatens Arizona downstream users of the wash. Water from the proposed dam would be for residents of St. George and Mesquite. Consequences of the proposed dam to Arizona residents are being studied. Some fear a dam could dry up the wash for downstream users.

In September officials from Utah, Nevada, and Arizona met to address concerns. A memorandum of understanding was adopted to collect and share water resource information on the Virgin River system. One result of the meeting is a U.S. Geological Survey study to measure the water supply in Beaver Dam Wash and segments of the Virgin River.

Some concerned people consider this a too modest beginning to the critically needed task of establishing a Virgin River compact or management plan among the three states.





Communications

The nomination of Elizabeth Ann Rieke to the position of Assistant Secretary of Interior for Water and Science leaves a void in the Arizona water community. Governor Symington moved quickly to name a new director of the Department of Water Resources (see *Transitions*, page 9); however, Betsy's departure comes at a crucial time for efforts to resolve several of the state's most pressing water issues. *AWR* interviewed the Assistant Secretary nominee as she prepared to depart Arizona for Washington, D.C.

Elizabeth Ann "Betsy" Rieke was appointed director of ADWR in April 1991. She previously had served as Deputy Legal Counsel for ADWR from 1982 to 1985 and as Chief Legal Council from 1985 to 1987. From 1987 until her return to ADWR in 1991, Betsy practiced water law with the firm of Jennings Strouss & Salmon.

Rieke's immediate concern for ADWR is that the transition to a new director be quick and smooth so as not to disrupt or delay a series of ADWR initiatives, including restructuring of the CAP, promulgation of the Assured Water Supply rules, and legislative efforts to create an acceptable alternative to the Groundwater Replenishment District. Other areas of concern mentioned include instream flow rights, the legislatively mandated riparian study, efforts to settle Indian water rights claims, and discussions involving Arizona, California and Nevada regarding lower-basin Colorado River water.

Despite loose ends in Arizona, Rieke looks forward to new challenges in Interior, where she will be responsible for the Bureau of Reclamation, the U.S. Geological Survey, and the Bureau of Mines. She described the other announced Interior nominees as "clearly a forward-looking team of very capable people," and predicted that the team will operate in an exciting atmosphere of intellectual ferment.

As to the major challenges she will face and any objectives she may take to the new position, Ms. Rieke declined to get specific. She did acknowledge that western water use efficiency will be high on the list, and that she will be looking at the natural resource value of recreation and wildlife. In addition, her responsibilities in overseeing the research-oriented Bureau of Mines will thrust her into mining reform issues.

That Rieke was being considered for the position was an open secret for some time, with her qualifications obvious to all. Nevertheless, she insists she never dreamed the job might be offered. Now that she has it, her only lament is that she will miss Arizona, her home for 25 years. Arizona's water community will miss her, too.

Our special flood supplement in last month's *AWR* contained a factual error. We stated that one-third of the Tri-Cities Landfill on the Salt River Pima-Maricopa Reservation was eroded by the Salt River, a figure used in both newspaper and TV coverage of the flood. Efforts to have one of our reporters inspect the landfill to confirm this were rebuffed by authorities.

An employee of one of the landfill's customers called to say that less than five percent of the landfill was washed downstream. He also claimed that water diverted by an upstream gravel operation was partially responsible. He was unwilling, however, to say anything on the record, citing pending litigation over the incident.

We hear many fascinating, usually undocumented stories from "sources" who refuse to be quoted. Usually, we ignore them. This time, however, we contacted Frank Mertely, Manager of the Salt River Pima-Maricopa Community. Mertely described extensive precautions taken to prevent landfill erosion and efforts made to control it once Salt River flows of 80 to 90,000 cfs topped the shot rock berm. He estimated that only two percent of the landfill eroded, far below the one-third figure, and even less than Arizona Department of Environmental Quality's estimate of 140,000 cubic yards.

Mr. Mertely went on to say that bank protection along the landfill is being improved to withstand a flow of 170,000 cfs, well over the estimated 130,000 cfs peak flow of last month. Also, the landfill long has been scheduled to close this October, to be replaced by a new landfill located half a mile outside the flood plain. The existing landfill is to be capped with soil and used for recreational purposes.

Ed Fox, director of ADEQ, agrees the one-third figure was too high, but stands by the department's estimate of 140,000 cubic yards. He also said that the eroded material was not solely construction debris as claimed, but included some municipal waste as well.

Sharp-eyed readers with an appreciation of fonts will notice a change in *AWR*'s appearance. We have switched from Times Roman to Garmond Antiqua and now are printing at 600 dpi.



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News Briefs

Instream Flow Permit Update

ADWR has been active in recent months in the Instream Flow Permit process. Nine permits and two certificates have been issued as of January 1993. The most recent of these are permits on Pinto Creek in Gila County, and Hot Springs Canyon in Cochise County.

Work is progressing on eight applications throughout the state, with a third hydrologist having been assigned to this program. The U.S. Fish and Wildlife Service, the Bureau of Land Management and the Forest Service are actively pursuing numerous permits on their lands as is the Nature Conservancy. Several private landowners also are pursuing applications. There currently are 57 applications pending. Most new prospective applications are in the Tucson and Phoenix AMAs.

Some of the outstanding issues currently under consideration by the Department are: 1) Are cienegas eligible for instream flow protection? 2) Should permits be issued on regulated streams? and 3) Should permits be issued on effluent dominated streams?

For more information, contact Greg Bushner or Tom Harbour at ADWR 602-542-1586.

Tribes Link Gaming, State Water Issues

Efforts by Governor Symington to block casino gambling on Indian reservations and the Legislature's passage of a bill to outlaw casino-type games have led several tribes to withdraw from water-rights negotiations with the state. The boycott was organized by the chairmen of the Tohono O'odham, White Mountain Apache and Pasqua Yaqui tribes, who claim that the governor's refusal to accept the recommen-

dation of former Arizona Supreme Court Judge Frank X. Gordon on resolving the gaming issue proves that the state cannot be trusted to deal fairly with the tribes.

Tohono O'odham attorney general David Frank stressed that while the tribes were pulling out of CAP Task Force discussions and other negotiations with state agencies, discussions with local and federal agencies would continue. The Tohono O'odham Nation is negotiating a lease of its CAP water with Tucson.

Secretary of Interior Babbitt is attempting to resolve the gaming impasse, with talks scheduled with parties on both sides of the issue.

Oro Valley Votes to Consider Water Options

Residents of the Town of Oro Valley voted overwhelmingly on March 9 to authorize the town council to look into the feasibility of purchasing or forming a water utility. The issue was approved by 79 percent of voters, with a turnout for the special election of 25 percent.

The township's 10,000 residents currently are served by four providers: Tucson Water, Metropolitan Domestic Water Improvement District, Cañada Hills Water Company and Rancho Vistoso Water Company. Both private water companies reportedly are for sale.

CAP Contracts Signed, Declined

Another deadline for signing CAP subcontracts has passed, with some signed, others not, and a couple in limbo. Of the 24 outstanding contracts for 120,000 acre-feet per year, 14 contracts for 56,000 acre-feet were signed, including exchange contracts with ASARCO's Ray mine and Cyprus's Miami mine, and the City of Nogales. Rio Rico's acceptance of a CAP contract is conditional pending the sale of Citizens Water.

Among those not signing contracts

but continuing to express interest are the Salt River Project, which got a congressional delay in its deadline until June 1, and ASARCO's Tucson unit, which is expressing interest depending on the price set for the water.

This round of contracting was a prerequisite to reallocating CAP water.

Flooding Continues in Lower Gila Basin

Weather continues to dominate Arizona's water news, with winter precipitation across the state averaging four times normal (see box, page 2). Flooding in central and southern Arizona in January and February was followed by flash floods in the Flagstaff and Sedona areas. Flood flows have reached the lower Gila River, causing considerable additional damage.

Record flows in the Gila created an 85-square-mile lake behind Painted Rock Dam, inundating the Gila Bend Indian Reservation (see photo, page 6). Flows in the normally dry 90-mile stretch of the Gila between the dam and the Colorado River flooded 15,000 acres of prime farm land, closed all bridges, and forced the evacuation of some 3,000 persons.

Preliminary damage estimates suggested that up to \$10 million in produce, much of it lettuce, might be lost to the flood waters. Damage to irrigation canals, bridges, homes and other structures plus the need to re-level fields threatened to bring the total to near \$100 million. In addition, the flood might impede planting of this year's crops, and rising groundwater levels threatened to lift salts up to the root zone.

Some area residents blamed environmentalists for a decision made in 1960 not to supplement the earthen dam with a channelization project that might have handled current flows. The project was killed due to high costs and because it would have eliminated riparian habitat for two species. Others noted that, but for Painted Rock Dam, damage to homes and fields on the Gila Bend reservation might have been minimized.



Legislation & Law

Following is an update of the status of selected water-related bills before the Arizona Legislature. See the February 1993 issue of AWR for descriptions and short titles of bills.

No significant water-related legislation has passed to date. Many bills still are working their way through the system, but a number of bills have died.

S.B. 1053, ADWR's omnibus water amendments, and S.B. 1260, which would allow formation of a Pinal County water augmentation authority modelled after the Tucson AMA authority, both are progressing. S.B. 1359, which alters the way two of the 13 board members of the Santa Cruz Valley Water District (formerly the Tucson Active Management Area Water Authority) are elected, has been amended to remove the district's property tax authority.

H.B. 2073, which would have amended the original recharge statute so as to eliminate the requirement that a re-



Flooded Saguaro in Painted Rock reservoir (Photo: B. Tellman, AWR)

charge project must be a facility designed and constructed for that purpose, is dead. The so-called "leaky lakes bill" was sought by Dobson Ranch Homeowners, which allowed the bill to die after ADWR agreed to changes in the way their lakes were managed.

H.B. 2253, which would have redefined small municipal providers as those delivering less than 10,000 acre-feet per year, effectively exempting most providers from the bulk of ADWR's conservation requirements, is dead, at least for this year.

S.B. 1336, which would have allowed formation of an international AMA incorporating Nogales, is dead; its companion memorial, S.C.M. 1004, is moving and likely will pass.

S.B. 1380 on effluent storage and reuse was never heard. This bill introduced on behalf of Tucson Water would have given credits for in-stream recharge of effluent, but came along too late to generate support.

A bill recommended by last year's CAP Task Force died when the Appropriations Chairman in the House refused to hear it. This bill, which may come back to life, would have allowed the state land department to pay liens on state land imposed when lessees failed to make CAP payments. Such authority is necessary for the land department to sell such land.

H.B. 2015 would require approval by a city or town prior to the sale of any private water company serving that city or town. The bill passed out of the House and had a committee hearing in the Senate, after which it was referred to subcommittee.

Two bills backed by the multi-housing industry have died. H.B. 2334 dealt with water and sewer rates, while H.B. 2309 dealt with development fees. The industry objects to rate structures that effectively discriminate against apartment complexes by providing lifeline

features that fail to take into account the number of residences behind each meter. The industry also wanted retroactive elimination of water development fees not based on projected water demand of the new development, such as Mesa and Phoenix impact fees based solely on the number of residences.

Bills continuing to receive the most attention are H.B. 2100, which sunsets the Groundwater Replenishment District legislation in Maricopa County as of July 1, 2000 if no district is formed by that time, and S.B. 1425, which creates an alternative Central Arizona Groundwater Replenishment District (see February AWR, p. 1). S.B. 1425, which is supported by ADWR, developers, private water companies and the Central Arizona Water Conservation District, passed out of the Senate on a 27-0 vote. Opposition by cities still is expected, and may take the form of a last-minute attempt to form a Groundwater Replenishment District.

Homeowners Challenge Tucson Water's Remote Area Surcharges

Tucson Water has reached a tentative settlement with two subdivisions who filed suit in 1991 alleging that the "remote service" surcharges imposed by the water department discriminated against long-term residents and those using more water. The surcharge was based on water usage despite being designed to recoup system development costs.

Residents of the Ventana Canyon subdivision and Midvale Farms have paid nearly \$2 million in surcharges over the last 10 years. Under the proposed settlement, residents would not be refunded the surcharges, but the 1,800 Tucson Water customers no longer would be assessed surcharges.

Details of the agreement still must be worked out and it must be approved by Tucson's City Council.



Special Projects

Individuals and organizations involved in water-related studies, pilot projects and applied research are invited to submit information for this section.

Tributary Inputs to Colorado River Studied

The Water Resources Division of the United States Geological Survey (USGS), Flagstaff Office, is measuring the magnitude and frequency of streamflow and sediment contributions from major tributaries to the Colorado River in the Grand Canyon. These include the Paria and Little Colorado Rivers and the Bright Angel, Kanab, and Havasu Creeks. USGS also is studying changes in sand deposition and distribution in pools on the main channel of the Colorado River immediately below these tributaries. The collected data are to provide information for a physically-based flow and sediment transport model for the Colorado River in the Grand Canyon.

These tributaries contribute significant amounts of sediment during flood flows from prolonged periods of precipitation. The heavier sand particles are deposited in mainstem pools of the Colorado River below the confluence of the tributaries. Depending upon the frequency and magnitude of the flood flows, significant concentrations of sand particles can accumulate in these pools. The sand then can be re-deposited to eddy and lateral beaches in the Canyon; however, sufficient flows need to exist in the Colorado. Re-deposition of these sediments benefits Grand Canyon camping beaches and its riparian habitat.

The prolonged January storm caused a 100-year flood volume event in the Little Colorado River basin, resulting in the deposition of significant amounts of sediment in the Colorado River. Measurements in the river below its confluence with the Little

Colorado indicate that the sediment transport from the January storms increased the storage volume of sand in this reach of the river. Other reaches of the Colorado River also showed significant changes in sand storage due to sediment inputs from the major tributaries.

For more information on tributary inputs to the Colorado River, contact Bob Hart, USGS, Flagstaff, 602-556-7136.

Salt-Gila Master Plan Studied

A Watercourse Master Plan is in the works for 72 linear miles along the Salt and Gila Rivers from Granite Reef Diversion Dam to Gillespie Dam, the most populated reach of the river. The purpose of the plan is to provide a regional perspective on development along the floodplain. A master plan study effort is the first step.

The master plan will view the river as a continuous system to be comprehensively planned so that future land uses will be compatible with each other and the river system. Nine cities and various state, federal and local

agencies now share jurisdictional authority or regulatory responsibilities along the river. A piecemeal approach to river planning has ruled in the past.

Local interests are represented in the study by a 14-member Executive Committee, a 19-member Management Committee and a 37-member Study Interest Group which includes membership from Maricopa County and city governments, local, state and federal agencies, industry, Indian communities, agricultural interests and environmental groups. Members participate on a regular basis in project activity planning and review.

The Maricopa Audubon Society, the U.S. Fish and Wildlife Service, the Arizona Department of Environmental Quality, and the Arizona Game and Fish Department are represented on the Study Management Committee to ensure that efforts to preserve and enhance the river's environmental values are considered.

The Maricopa Flood Control District is heading the project, and Woodward-Clyde Consultants have been hired to perform the study.

Public involvement is planned, with meetings to be scheduled for March and May, 1993. For more information



Citrus Valley Road disappears into Arizona's newest lake behind Painted Rock Dam. The lake inundated much of Gila Bend Indian Reservation. (Photo: B. Tellman, AWR)

or to be placed on the Salt-Gila River Watercourse Master Plan mailing list, contact John Svehovsky at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, Arizona 85009; 602-506-1501.

Cattails Treat Stormwater Runoff

The effectiveness of using cattails to treat stormwater runoff from a Maricopa County vehicle maintenance yard is being tested. The project relies on a Submerged Vegetative Treatment System (SVTS).

The SVTS is an open concrete box structure separated down the middle with soil, gravel and cattails (*Typha latifolia*) placed inside. The soil/gravel matrix is intended to perform two functions: 1) Provide mechanical removal of oil/grease contaminants; and 2) Support cattails for growth.

The goal of this system is also two-fold. For the first nine to 12 months, the SVTS will mechanically capture and remove oil and grease either by adsorption onto the soil/gravel surface or by slowing the flow and allowing oil/grease laden particulates to settle out. During this time, the cattails will be establishing an extensive root system. This system will allow for oxygen transfer between the plant material and the water column at depth. This aerobic zone (rhizosphere) should promote the establishment of aerobic bacteria capable of using the hydrocarbons as a nutrient source. It is anticipated that the first year of operation will be a seasoning period for the system.

One side of the SVTS was left void of cattails to establish a control for assessing the effectiveness of the ones that were planted. Approximately seven inches of soil were used instead of cattails. Sampling will be conducted along the length of both sides of the SVTS system to compare both sides of the treatment system.

For additional project information contact Roland Ross, Maricopa Flood Control District, 602-506-1501.



CAP Quality cont. from page 1

February *AWR*, p. 8). Unfortunately, the flood waters behind New Waddell Dam contained high levels of solids and organics, causing considerable problems for the operators of municipal water treatment plants.

CAP input water at the treatment plants was described variously as resembling coca-cola or coffee and tests at the plants revealed elevated levels of organics and bacteria. Turbidity levels, which normally are in the range of 2 or less, initially went as high as 28 before decreasing into the 8-12 range.

Cities responded to the lower-quality water in different ways. Those cities with alternative supply sources like Mesa, reduced or eliminated taking CAP water, replacing it with groundwater or SRP water. Other cities like Phoenix, Glendale and Scottsdale, continued accepting some CAP water. Glendale used its settling basins to help deal with the problem by using high levels of alum in the basins, an option that Phoenix and some others did not have. At the end of the canal, Tucson Water was bracing to begin receiving Lake Pleasant water, confident it could handle the turbidity and high levels of organics due to its ability to pre-treat raw water with coagulants in its impoundment reservoir, and the flexibility of its ozonation-chloramination treatment process.

In general, use of chemicals such as chlorine in the treatment process had to be greatly increased, in some cases through jury-rigged setups. Operators had to switch from using low levels of ferric chloride to triple the normal concentration of alum to settle out solids, which both increased treatment costs and produced an alum sludge that is difficult to dispose of. In some cases, the sludge was backwashed into the CAP aqueduct, a practice that affects users further down the canal and which may require a federal permit if water in the aqueducts is declared to be "waters of the United States." Delivered water, while meeting potable water standards, did not look, taste or smell as good as usual.

CAWCD staff planned to release

water from Lake Pleasant into the aqueduct system for up to six weeks. While recognizing the problems being experienced by municipal customers, they point out that the water quality of flood flows in the Bill Williams River at its confluence with the Colorado River immediately upstream of the CAP intake was as bad or worse than water quality of Lake Pleasant. The treatment problems that began in mid-January and persisted through February eventually will abate.

Some municipal water providers, however, are not viewing the current situation as a temporary problem caused by winter floods, but rather as the consequences of CAWCD policy decisions that coincidentally have been exacerbated by the floods. In winter months, when demand is low, water in the CAP canal usually is clear, but in the high-demand months of June through August, the increased velocity of water in the aqueduct erodes the silt that has settled to the bottom of the canal, increasing turbidity and the amount of chemicals needed to clarify and disinfect the water.

CAWCD reportedly plans to pump Colorado River water through the system during winter months when power rates are low, both for direct delivery to customers and into Lake Pleasant. This water then will be released from behind New Waddell Dam for power generation and delivery to customers in summer months when power rates are higher. As a result, water in the aqueduct will switch from Colorado River water to a mixture of Colorado and Agua Fria River water and back each year, producing changes in turbidity, pH, alkalinity, and organics.

One treatment plant manager noted that this mode of operation benefits agricultural and other CAP users by maximizing net power revenues, but burdens municipal users by imposing higher treatment costs on them during seasons of increased demand. Treatment plant operators and managers interviewed for this story were unanimous in calling for discussions with CAWCD regarding water quality impacts of CAP operations.



Publications

Wetlands: Water, Wildlife, Plants and People

This wall-sized (2 by 3 foot) illustrated poster is intended to help grade and middle school students understand what wetlands are and how they benefit humans and wildlife. Copies of the free posters can be obtained from USGS, Books and Open-File Reports Section, Box 25425, Denver Federal Center, Denver, CO 80225-0425. Teachers are asked to write on official school letterhead and to designate the quantity of color (recommended for teacher use) and black-and-white (recommended for student use) copies requested and to indicate grade school or middle school.

The following three U.S. Environmental Protection Agency (EPA) publications are available from the National Small Flows Clearing House. Call 1-800-624-8301 to request publications.

The Andrew W. Breidenbach Environmental Research Center Small Systems Resource Directory

Part of EPA's Office of Research and Development, the center issued this directory to help people access the latest research in drinking water, municipal wastewater, solid and hazardous waste management, and multidisciplinary projects. To receive the free director request Item #FMPCGN11. Allow \$2 for postage and handling.

Wastewater Treatment/Disposal for Small Communities

A general guide for small communities, this manual includes chapters on planning and management of a project, site evaluation considerations for land application systems, wastewater characteristics, and technology options. Request Item #WWBKDM70 and allow \$2 for shipping and handling.

Do More With Score

Published by EPA's Small Community Outreach and Education program (SCORE), this full-color foldout poster-directory provides names, addresses, and telephone numbers for 140 organizations, agencies, and other components of the SCORE network dedicated to helping small communities meet their wastewater treatment needs. Request item #WWBLPE03 and allow \$2 for shipping and handling.

The following four publications are available for inspection at U.S. Geological Survey offices in Tucson, Tempe, Yuma and Flagstaff and may be purchased from USGS, Books and Open-File Services Section, P.O. Box 25425, Federal Center, Denver, CO 80225.

Floods in Arizona, January 1993

R.D. MacNish, C.F. Smith, and K.E. Goddard. The January floods in Arizona were the worst since the turn of the centu-

ry according to a just-released U.S. Geological Survey report. According to R.D. MacNish, senior author of the report and District Chief at the Tucson USGS, the most unusual aspect of the flooding was the total volume of the flow rather than the instantaneous peak flow, which is the more typical measure used to describe flood magnitude. Flood volumes along some stretches of Arizona rivers, e.g., the Rillito Creek in Tucson and the Gila River above San Carlos Reservoir, were as much as three times as large as floods that have one chance in 100 of occurring in any given year. Microfiche \$4; paper \$1.50.

Geohydrologic reconnaissance of Lake Mead National Recreation area — Virgin River, Nevada, to Grand Wash Cliffs, Arizona

J.T. Bales and R.L. Laney. This report describes the geohydrology in the above area and identifies potential locations for developing groundwater supplies in the Lake Mead Recreation Area. USGS Water-Resources Investigations Report 91-4185. Microfiche \$4.75; paper \$12.

Soil moisture and remotely sensed spectral data in a partial canopy cotton field at the Maricopa Agricultural Center, Pinal County, Arizona, 1988

Sandra J. Owen-Joyce. The report describes a comparison of soil moisture and remotely sensed surface temperature collected from an aircraft over a partial canopy cotton field. USGS Water-Resources Investigations Report 92-4133. Microfiche \$4; paper \$5.

Hydrologic data from the study of acidic contamination in the Miami Wash-Pinal Creek area, Arizona, water years 1990-91

S.A. Longworth and A.M. Taylor. This report contains hydrologic data collected October 1989 through September 1991 and includes water-chemistry data from 29 wells and 2 surface water sites. USGS Survey Open-File Report 92-468. Microfiche \$4; paper \$9.50.

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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.



Transitions

Betsy Rieke's nomination to the position of Assistant Secretary of Interior for Water and Science and her departure from the Department of Water Resources is discussed in *Communications* on page 3. A summary of the new lineup at the Department of Interior and update on Arizonans going off to D.C. to serve in the new administration will be provided in the April issue of *Arizona Water Resource*.

The newly nominated director of the Arizona Department of Water Resources is **Rita Pearson**, an attorney who has been serving as Governor Symington's deputy chief of staff and executive assistant for the environment and natural resources.

Pearson, 36, is a three-time graduate of ASU, with B.S., MBA, and Law degrees. A research analyst for the state Senate from 1981 to 1985, Pearson specialized in environmental law while with the firm of Snell & Wilmer from 1988 to 1991 before joining the governor's staff.

The plethora of pressing water issues facing the state will test the new director's reputation as a quick study and skillful negotiator. The water community has been nearly unanimous in its praise of the appointment, with the only concerns voiced being Pearson's relative lack of experience in some water areas and the fact that she may devote less than full time to the position. Pearson will continue to advise the governor on environmental and natural resources issues.

ASU water and environmental law professor **John Leshy** has been nominated by **President Clinton** to be Solicitor of the Department of Interior. Leshy, 48, worked in Interior under **President Carter** and is a long-time advisor to **Bruce Babbitt**. Leshy, an expert on Colorado River law, has been on sabbatical from ASU since June 1992 while he analyzed water issues for the staff of the House Interior Subcommittee on Insular Affairs.



Announcements

International Riprap Workshop Scheduled

The 1993 International Riprap Workshop will be held July 12-16 at Fort Collins, Colorado. It will include technical sessions on forces causing erosion, geotechnical considerations, materials properties, and environmental aspects of riprap. Practical case studies, a hands-on riprap design workshop and a technical/social full-day tour also are planned.

Early registration deadline is March 31, with \$240 fee. For more information contact Janet Lee Montera, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523; 303-491-7727.

Arizona Riparian Council to Meet

The seventh annual meeting of the Arizona Riparian Council will be held April 16-17 at the Rio Rico Resort, Rio Rico, Arizona. The ecology and management of international border rivers is an emphasized topic at the conference. For additional information contact the Arizona Riparian Council, Center for Environmental Studies, Arizona State University, Tempe, AZ 85287-3211; 602-965-2975.

Small System Waste Water Treatment Info Offered

The National Small Flows Clearinghouse (NSFC) offers a wide variety of information to operators of small community wastewater treatment plants. Free or low-cost materials include alternative technology case studies, videotapes, government documents, and brochures. Also available are two free newsletters, *Small Flows* and *Pipeline*, that discuss small commu-

nity wastewater technologies and provide legal information.

The EPA-funded NSFC is part of the West Virginia University National Research Center for Coal and Energy's Environmental Services and Training Division. Call 800-624-8301 for a free information packet with an overview of the NSFC and its services.

Funds Available for Conservation/Ecology Studies

The National Fish and Wildlife Foundation seeks proposals for matching grants for fish, wildlife, and plant conservation programs. Proposal deadlines are the 15th of April, August, and December 1993. For more information contact National Fish and Wildlife Foundation, 1120 Connecticut Ave. NW, #900, Washington, D.C. 20036; 202-857-0166.

Also, the Environmental Protection Agency requests applications to develop and evaluate indicators for estimating the ecological condition of estuarine, forested, and wetland resources to help maintain biological integrity/biodiversity and ecological sustainability. The deadline is April 30, 1993. For more information contact Clyde Bishop, EPA, Office of Exploratory Research (RD-675), 401 M St. SW, Washington, DC 20460; 202-260-5727.

Aquifer Protection Permit Due Dates List Available

A newly revised list of Aquifer Protection Permit (APP) application submittal due dates for facilities now is available for review from the Arizona Department of Environmental Quality (ADEQ). A list of names and locations by county of facilities that submitted APP applications during 1992 also is available, along with a description of the status of each application.

For information call ADEQ librarian Maryalice Waldrip, 602-207-2202.

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Calendar of Events



RECURRING



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

Arizona Water Resources Advisory Board. No meeting scheduled at this time. ADWR, BO44, 15 South 15th Ave., Phoenix. Contact: Beverly Beddow 602-542-1553.

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

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

City of Tucson Citizens Water Advisory Committee. 1st Tuesday of the month, 7:00 a.m. 310 W. Alameda, Tucson. Contact: Trish Williamson 602-791-4331.

Phoenix AMA, GUAC. 3 March, 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 March, 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. 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. 26 March, 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, 86301.

MARCH



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

16 (Tue) **Global Change: Dr. David Maidment, Dept. of Civil Engineering, Stanford University, *The Geographical Information System Approach to Global Hydrological Modeling.*** 4:00 p.m. UA Harvill 318, Tucson. Contact: Fran Janssen, Global Change Coordinator 602-621-7120.

16 (Tue) **Dr. Glen Liston, NASA/Goddard Space Flight Center, *Computing River Discharges Using a Horizontally Coupled Runoff Model in a GCM.*** 3:00 p.m. UA Harvill 318, Tucson. Contact: Dr. Simon Ince 602-621-3424.

16 (Tue) **CAP Indian Involvement Group.** 2:00 p.m. location to be announced. Contact: ADWR, Ana Marquez-Guevvero 602-542-1520.

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

18 (Thu) **CAP Public Advisory Involvement Group.** 1:30 p.m. Arizona Department of Water Resources, Basement Conference Room. Contact: ADWR, Ana Marquez-Guevvero 602-542-1520.

21-24 (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 (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.

24 (Wed) **Prof. Alain Rouleau, Center for Study of Mineral Resources, Univ. of Quebec a Chicoutimi, Canada, *Studies in Fracture Hydrology.*** 4:00 p.m. UA Geology 206, Tucson. Contact: Dr. Simon Ince, 602-621-3424.

24-25 (Wed-Thu) **Innovations in Wastewater Treatment Technology.** Phoenix. Arizona Water & Pollution Control Association. Contact: John Carollo Engineers, 3877 N. Seventh Street Suite 400, Phoenix, AZ 85014, Attn: Brian Peck; 602-924-0644.

25-27 (Thu-Sat) **Western Wetlands Conference.** Society of Wetland Scientists. UC-Davis. Contact: Western Wetland Conference, Division of Environmental Studies, UC-Davis, CA 95616.

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 (Wed) **12th Annual Memorial Kisiel Lecture.** Dr. Vit Klemes, *Water Storage: Source of Inspiration and Desperation.* 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 (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.

UPCOMING



2 April (Fri) **Carol Rose, Yale University, Law, speaks on 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: Fran Janssen Global Change Coordinator 602-621-7120.

14 April (Wed) **Darcy Lecture: Dr. Mary Jo Baedecker, Research Chemist, US Geological Survey, The Fate of Organic Compounds and Geochemical Processes in Contaminated Aquifers.** 3:00 p.m. UA Center for Creative Photography, Tucson. Contact: Dr. Simon Inces 602-621-3424.

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.

24 April (Sat) **Streams in the Desert: The Natural History of Riparian Areas Symposium.** Sponsored by the UA College of Agriculture and the Tucson Audubon Society. Contact: UA Extended University, Ann Forkner 602-621-UOFA.

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, The University of Arizona, 350 N. Campbell Ave., Tucson, AZ 85721; 602-792-9591.

23-25 June (Wed-Fri) **Bay-Delta Tour.** Water Education Foundation Tours travel through the Sacramento-San Joaquin Delta and the San Francisco Bay area. Contact: Valerie Holcomb 916-444-6240.

27-30 June (Sun-Wed) **Water Resources Education: A Lifetime of Learning and Changing Roles in Water Resources Management and Policy.** Seattle, WA. Contact: American Water Resources Association, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192; 301-493-8600.

29 August - 2 Sept (Sun-Thu) **American Water Resources Association 29th Annual Conference and Symposium.** El Conquistador Resort, Tucson, AZ. Contact: AWRA, Mississippi River at Third Ave., S.E., Minneapolis, MN 55414.

Announcements, continued from page 9

International Water Management Conference Set

The Engineering Foundation is sponsoring a conference "Management of Water Resources in North America III: Anticipating the 21st Century," to be held May 2-7 in Tucson. In response to the emerging North-America free trade agreement, the conference is addressing issues having to do with the development and utilization of natural resources and the effect on the environment.

For more information contact the Engineering Foundation Conferences, 345 E. 47 Street, New York, NY 10017; 212-705-7835.

Groundwater Education Consortium at Your Service

The National Groundwater Education Consortium (NGEC) was formed to provide an informal, centralized network of state, regional, and national organizations currently involved with the delivery of groundwater education programs to diverse audiences. Its goal is to provide an informal forum for these organizations to address issues and common concerns, exchange ideas, strategies for success, and lessons learned.

For more information about NGEC contact Susan Seacrest, Nebraska Groundwater Foundation, P.O. Box 22558, Lincoln, NE 68542; 402-434-2740.

Call for Environmental Technical Committee Members

Arizona's Comparative Environmental Risk Project (ACERP) will use scientific information and public values to rank state environmental problems. The two-year project is to help establish statewide priorities for environmental problems.

Three ACERP technical committees are being formed to analyze risks posed by environmental problems to human health, ecosystems, and quality of life. The technical committees will gather existing information, assess risks and rank environmental problems based on risk.

Members of the technical committees must have scientific/technical expertise and a knowledge of Arizona's environmental problems. Each committee is expected to have 9 to 15 members who will meet monthly for six to 9 months.

The Project Steering Committee encourages interested and qualified individuals from government agencies, public organizations, business/industry, academia and the general public to apply for committee membership.

Cover letters and resumes must be submitted by April 22 before 5 p.m. to Richard Hayslip, Chairman, ACERP Steering Committee c/o Commission on the Arizona Environment, 1645 W. Jefferson St., Suite 416, Phoenix, AZ 85007; FAX 602-542-2104.

For additional information contact Program Assistance and Support Section, Arizona Department of Environmental Quality, 602-207-4629 or Commission on the Arizona Environment, 602-542-2102.

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