ARIZONA
WATER RESOURCE

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Managing Water to Preserve Species

Dedicated to saving plants and animals from extinction, the Endangered Species Act (ESA) also has complicated and far-reaching effects on water policy. As stated by a speaker at a recent conference at the Natural Resources Law Center, University of Colorado, "The ESA is behind much of what is happening and will happen in water law."

Brian Gray professor, of law at the University of California, noted that the ESA has more intricate and complex effects when concerned with water than when just land is involved. For example, Portland, Oregon area river issues could affect areas 200 miles upriver.

This concept was evident in the spotted owl dispute. The protection of the northern spotted owl closed large sections of land to timber interests. A later declaration that four subspecies of salmon were endangered affected a far greater area, from the fishes' spawning grounds in Idaho to

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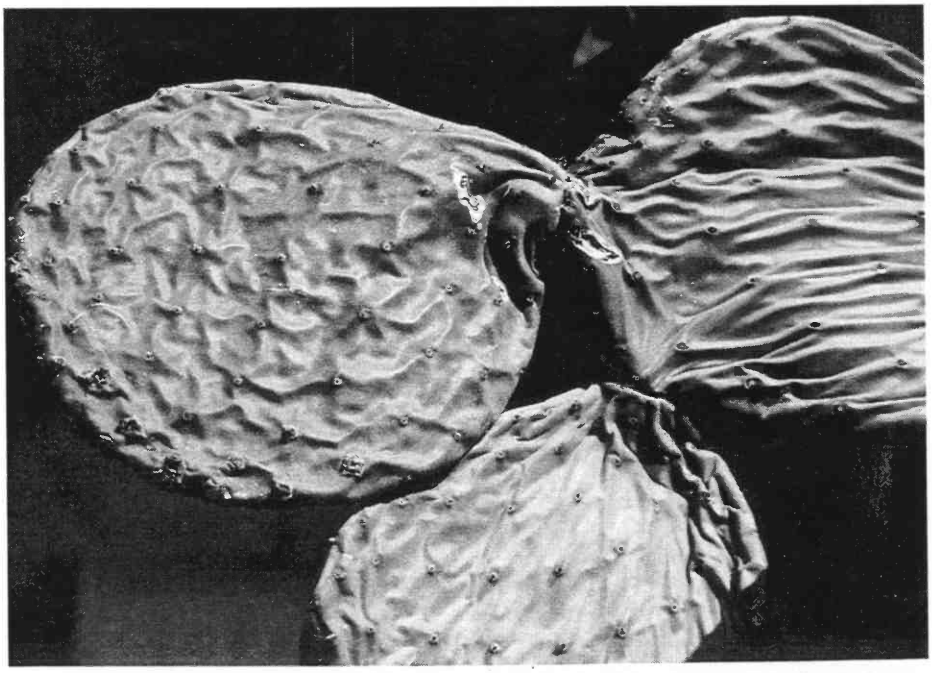

Drought-puckered pads of the prickly pear cactus, that most stalwart of dryland plants, show strain of high temperatures and low precipitation. (Photo by Holly Ameden)

Arizona Among States Lacking Statewide Drought Plan

Drought happens. Drought planning, however, is a deliberate process, mostly done at the local level in Arizona. The state does not have a statewide drought management plan, although a regional plan is in place in the Salt River Valley.

Some states have such plans. Helping to bridge the gap between climatology and policy, the National Drought Mitigation Center (NDMC) assists states in adopting drought management plans. The Center reports a growing number of states with drought plans, from three in 1982 to 27 in 1996. Another four states currently are in the process of developing plans.

The Center's statistics, however, may not be entirely accurate. Arizona is listed as one of the 27 states to have submitted a state drought management plan to the Center. (See NDMC map, p. 2, for the status of drought planning among states)

"According to our latest survey, we list Arizona with a plan," said Donald A. Wilhite, NDMC director. "However, plans come in all shapes and sizes, and it is sometimes difficult to decide if what exists is a plan or not."

The Arizona submission is not a state-wide plan. Tom Carr of the Arizona Department of Water Resources says, "As good planners we have reviewed the idea of a state drought plan, but there has not been a priority to put in place a

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standardized approach for the entire state. Most of our recent water management policies have focused on long-term overdraft of our aquifers."

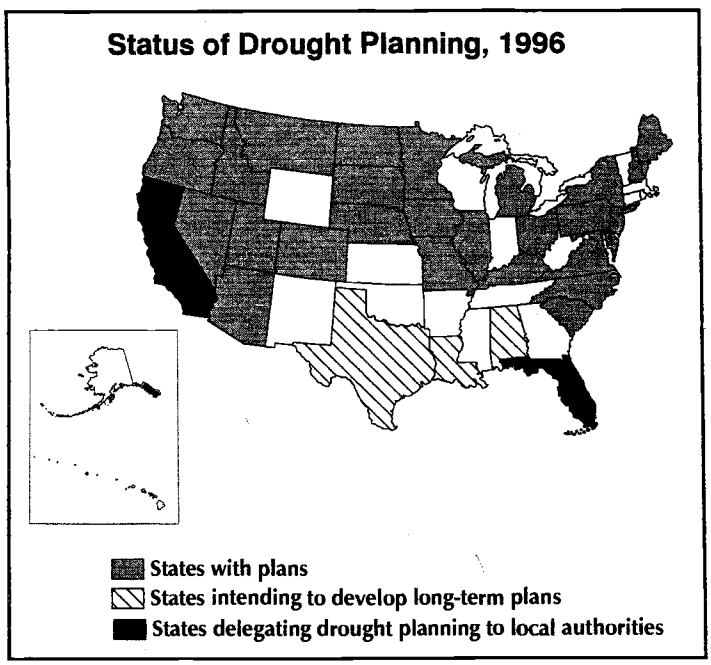
Drought planning currently is done mostly at the local level in Arizona. The town of Williams, which relies on surface water supplies, adopted a drought management plan. At a much broader local level, the Central Arizona Water Conservation District, the Salt River Project, the Arizona Department of Water Resources and the Arizona Municipal Water Users Association worked together to develop a drought planning document for the Phoenix Active Management Area. The 1990 document defines drought and drought trigger points for the Salt-Verde River system and the Colorado River.

An underlying premise of drought management plans is that stress and loss from drought can be as much the result of management practices as climatic and hydrologic conditions. A drought management plan can help identify drought early and designate actions to mitigate adverse effects.

Arizona has not had the strong incentive to develop such a plan at the state level. Carr explains that, "In the past, drought in Arizona has mainly affected the agricultural community, and they dealt with it by reducing water allocations for certain sections of land and by relying on groundwater to supplement the surface water supplies."

Also, some officials believe that Arizona does not need an extensive drought management plan. They say the state is immune to the serious effects of drought because of its heavy reliance on groundwater. A document prepared by the Western States Water Council stated, "Drought is not a major problem in Arizona due to the State's primary dependence on groundwater reserves." In a state where many citizens now feel protective about groundwater, this sentiment may not be widely shared. And, besides, Arizona's reliance on groundwater is lessening.

"We are moving toward a more surface-water-based system and economy as we use CAP water," said Carr. "Drought planning then becomes more important. We will find it is important to have backup capacity to take care of drought situations."



... stress and loss from drought can be as much the result of management practices as climatic and hydrologic conditions.

A state drought management plan would help Arizona cope with such situations. According to Wilhite the basic goal of these plans is to improve the effectiveness of state response efforts by enhancing monitoring and impact assessment, as well as preparedness, response and recovery programs. These plans also are directed at improving coordination within state agencies and between state and federal government.

Various conditions in Arizona complicate any effort to develop a state drought management plan. For example, the state is divided into three water provinces — the plateau uplands, the basin and range lowlands and the central highlands — each with its distinct geographic, geologic and climatic conditions. Precipitation varies from mountainous, forested areas to low-lying desert. A single drought management plan for all provinces would need to cover a lot of ground, both literally and figuratively.

New and changing conditions affecting Arizona, however, provide reasons for the state to adopt a state drought management plan. Arizona might be more vulnerable to the effects of drought and prolonged dry periods because of its expanding population. Population growth has resulted in an increased demand on its natural resources, especially water. Dry periods that at one time might have had negligible effects could now have more serious consequences on the state's population, wildlife and native vegetation.

Also, the effects of climatic change, an issue that is provoking debate and controversy, may need to be reckoned with. Will a greenhouse effect, caused by an increase in carbon dioxide emissions, influence global and regional climate, and how will this potential change be manifested? Might Arizona experience more frequent and intense drought as a result? A state drought management plan could help Arizona prepare for such a possibility.

Further, now that new major water projects are unlikely to be built to develop and deliver additional water resources, more comprehensive water management planning is the preferred strategy. Statewide drought planning could be a component when comprehensive water plans are developed.

Present dry conditions may test Arizona's readiness to respond to drought and help determine whether additional drought planning is needed.

Water Vapors

"Small is Beautiful," a book by E.F. Schumacher, rebukes modern economic thinkers for relying too much on abstract theory and purely quantitative data. Whatever virtues the book has — and it has many — its most memorable contribution to popular culture is its title: "Small is Beautiful." The title is catchy, even warmly satisfying, prompting ready agreement and a nod of approval. Small is beautiful.

The Bottled Water Solution

That title again came to mind when reading a guest comment piece by Cornelius Steelink, professor emeritus of chemistry at the University of Arizona, printed in *The Arizona Daily Star*. Tucson Water officials per Proposition 200 cannot deliver CAP water for drinking unless treated to ensure its quality is equal to or better than present groundwater.

City officials seek The Big Solution to The Big Problem. Big Solutions include recharging CAP water. This would involve building a $60-million recharge facility. Other Big Solutions include filtration and de-mineralization of CAP water, involving capital costs ranging up to $300 million and annual operating costs up to $30 million.

Steelink offers a suggestion. He asks readers to consider other figures. According to the U.S. Department of Agriculture, the average citizen of the Southwest consumes 1.3 quarts of tap water per day for drinking and cooking. This means that Tucson's service area population of 600,000 consumes about 70 million gallons annually of drinking and cooking water. If Tucson Water subsidized its customers ten cents a gallon to purchase bottled water, the cost would be about $7 million a year, a bargain price compared to Big Solution costs.

According to Steelink, "The costs of this proposal are no more daunting than many of the current multimillion dollar CAP scenarios.... The benefits are considerably more attractive. There is no massive capital outlay, implementation is fairly straightforward and the consumers have a choice over the type of drinking water used in their homes."

The Bottled Water Cure

Whether bottled water will solve Tucson's CAP woes is debatable, but for some bottled water sellers, their product holds answers to many of life's other problems. For example, promotional material for Catalyst Altered Willard Water (XLR-8 and XLR Plus) — Willard Water for short — claims it is a beauty aid, has farm and garden use, cures animals of assorted afflictions, not to mention its beneficial effects on humans, curing various ills from pink eye to stress, while breaking down waste materials and toxins.

A South Dakota kennel used Willard Water to cure some of its dogs of a virus. The results: "Not only did the virus appear to be cured but the kennel showed a significant increase in victories the first week the greyhounds started drinking the water."

Willard Water's secret is to use Micelle (tiny electrically-charged particles) to cause "unusual characteristics" to occur in water. As described in the literature: "The molecular structure is changed from the very stable tetrahedron structure into chains of water molecules attracted to the colloidal micelle by strong electrostatic bonds." A gallon of Clear Willard Water XLR-8 Concentrate is $190. It is added to regular water.

The Bottled Water Boost

If Willard Water does not do the job, there's Aqua Resonance. According to the Aqua Resonance literature, our bodies' water, critical to the health of our approximately ten trillion cells, is called biowater. Unlike tap water, rain or mineral water, biowater has a particular "clustered" characteristic, with water molecules held together in small bunches by shared hydrogen atoms. This allows the water to freely pass through cell walls, delivering nutrients and removing toxins.

Problems develop as we age and the characteristics of our biowater changes. Instead of free-flowing in small clusters, the water becomes bound to other cell material and is less able to move nutrients and waste. The result: sluggish cell metabolism.

The good news is that "using sophisticated magnetic resonance, laser and ceramatic technology, researchers have succeeded in producing clustered water, with the same properties as youthful biowater." Called Aqua Resonance, this water will "improve metabolic efficiency and nutrient absorption back into our cells."

Aqua Resonance is concentrated; two tablespoons converts a gallon of distilled water. A four-ounce bottle costs $34.95, plus postage.

Correction

March-April *AWR*: the last sentence of the first full paragraph, col. 3, pg.5 should read "The fees collected subsequent to July 11 are protected under the agreement."

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News Briefs

CAP Water Demand Increases

If dry conditions persist in the state, Colorado River water deliveries by the Central Arizona Project easily should exceed one million acre-feet this year, CAP General Manager S. "Sid" Wilson said.

"Through May 8 the CAP provided more than 350,000 af of surface water from the Colorado River to cities, farmers and Indians of Maricopa, Pinal and Pima counties. This is about 100,000 af more than in the same period in 1995," Wilson said.

"Even without the dry conditions, we anticipate Colorado River water deliveries to climb above one million af in 1996. One reason is that the demand for water has been rising steadily since 1991. The dry conditions have added to the demand," Wilson noted.

Factors contributing to the higher 1996 deliveries include farmers cultivating more land due to an expected good market for wheat and other grains and more water supplied for direct recharge into the ground, particularly to the Granite Reef Underground Storage Project. GRUSP, located northwest of Mesa, is managed by the Salt River Project for the benefit of the Salt River Valley cities.

In 1995, CAP delivered about 60,000 af of Colorado River water for recharge. Through April, GRUSP received almost 39,000 af of the 60,000 acre-feet ordered for 1996. In addition, CAP anticipates beginning deliveries to the first Pima County recharge site this summer.

Due to sparse rain the past winter and spring on the Salt and Verde river watersheds, reservoir storage on those rivers is low and SRP hopes to receive Colorado river water from CAP this summer and fall. The Colorado River water would be in lieu of water the SRP would otherwise pump from the ground to meet customer needs.

When allocations are fully utilized, the CAP expects to deliver an average of 1.5 million af of Colorado River water per year.

Tribes, BuRec Agree on CAP Cost Funding

Historic "self governance" agreements signed by the Gila River Indian Community and the Salt River-Pima Maricopa Tribe with the Bureau of Reclamation provide for funding the design and construction of the delivery system for their Central Arizona Project water allocations. Instead of contracts being reimbursed quarterly, the new funding agreement will provide money up-front based on annual budget requests for project design and construction, and it will be renewed annually.

The Gila River Indian Community is designing a distribution system for 77,000 acres of historically irrigated lands. The total cost of the 15-year project is estimated at $238 million, with construction expected to begin next year.

The Salt River-Pima Maricopa Tribe is completing its $10-million delivery system for Salt River Project water. The tribe has leased its entire CAP allocation to cities in the Phoenix area. Deliveries are to begin in the year 2000. A water rights settlement also provides the tribe an annual allotment of 38,000 acre-feet of water from the Salt and Verde rivers.

New EPA Policy "Empowers" States

A new U.S. Environmental Protection Agency policy allows states more flexibility in assisting small communities meet environmental regulations.

"With this policy we intend to empower the states," said Kenneth Harmon of the EPA Office of Enforcement and Compliance Assurance. "We are telling the states that EPA will accept responses other than traditional enforcement."

According to the new policy if a small community cannot correct its environmental violations within 180 days of a state's commencement of compliance assistance, the community and the state should negotiate a compliance schedule the community can reasonably meet. In certain circumstances, EPA will allow small communities to prioritize and correct their worst problems first.

Also, according to the new policy, EPA will defer to a state's decision to waive part or all of the usual noncompliance penalties if a small community demonstrates good faith and makes reasonable progress toward compliance.

Not covered by EPA's policy are criminal violations or circumstances or violations presenting an "imminent or substantial" public health or environmental danger. Nor does the policy mandate that states must offer compliance assistance to small communities.

This policy on Flexible State Enforcement Responses to Small Community Violations implements part of the Clinton Administration's *Reinventing Environmental Regulations Initiatives* efforts announced March 16, 1995.

BuRec Seeks New Turf in Water Reuse

In response to its mission priorities and budgetary constraints, the U.S. Bureau of Reclamation is increasing its involvement in water reuse. Its reuse interest is reflected in a number of bills pending in Congress to authorize BuRec to participate in the construction of water reuse projects.

To help define its reuse mission BuRec recently conducted a series of "brainstorming sessions." According to a BuRec official the brainstorming sessions were to allow "Reclamation the opportunity to fashion its reuse program in a manner that moves the agency out of the reactive mode in which we so often find ourselves." BuRec's ultimate aim is to develop policy regarding the scope and implementation of its authorities relative to reuse.

The agency's immediate task is to address the level of funding for reuse and identify criteria for selecting and setting priorities among the many

reuse proposals BuRec receives. BuRec also is planning to open channels of communications between the agency and the general public. For further information on this effort, contact Shannon Cunniff at 202-208-5007; email: scunniff@usbr.gov.

ACC Faults Pine Utility

The Arizona Corporation Commission has accused a Pine, Arizona water utility of ignoring its order not to extend water mains to serve new customers. The ACC issued this order to the E&R Water Co. in 1989 because of recurring water shortages in the area.

The ACC, however, allowed a limited number of new customers to be added to existing lines to protect the area's real estate market.

Despite the ruling, new extensions have been discovered in at least three areas served by E&R, according to an ACC report. This aggravates a developing problem. "A water shortage situation is already developing in the Payson area generally, and in the E&R Pine System specifically," said the report.

"Storage levels in the E&R Pine system at the time of inspection were less than 25 percent. The addition of new subdivisions will exacerbate a perennial water supply shortage that exists within the service territory of E&R-Pine."

A May 30 hearing was held in Payson, and a hearing officer is preparing a recommendation for the ACC. At issue is whether the company is to be fined up to $5,000 per violation.

E&R is a unit of Utilities Systems Group of Payson, a utility with water companies in Strawberry, near Payson and on the Mogollon Rim.

EPA Says Clean Water Pays

In its ongoing efforts to encourage an appreciation of clean water and the legislation promoting it, the Environmental Protection Agency recently released a report stressing the economic benefits of clean water. Titled "Liquid Assets: A Summertime Perspective on the Importance of Clean Water to the Nation's Economy," the report states that clean water contributes billions of dollars to the economy each year by supporting tourism, shellfishing, manufacturing, irrigation and technology. "Economic prosperity and environmental protection go hand in hand," said EPA administrator Carol Browner.

Highlights of the report include the following:

The public takes more than 1.8 billion trips to beaches, rivers, and lakes, contributing to the $380 billion spent on recreation and tourism.

The value of real estate along desirable water areas is nearly 30 percent greater than at similar inland properties.

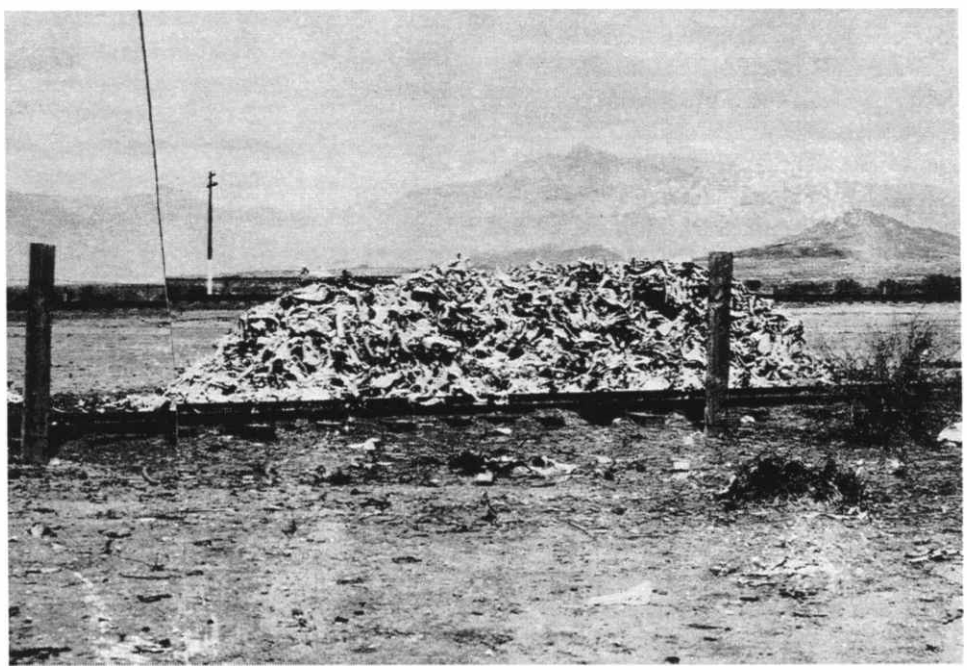
Manufacturers use about 13 trillion gallons of water each year, including the soft drink industry, which uses more than 12 billion gallons of water annually to make products valued at more than $50 billion.

Warning that the value of clean water should not be taken for granted, Browner indicated that 40 percent of rivers, lakes, and streams surveyed remained too polluted for fishing or swimming and that 20 percent of drinking water systems report violations of health standards.

Low Runoff Stress SRP Supplies

The Salt River Project's reservoirs will get only about one-fifth as much water from runoff, to make this one of its driest years ever. Winter runoff will total only about 130,00 acre-feet compared to the normal 650,000 acre-feet. Runoff is about 80 percent of SRP's water supply.

SRP officials say the last time they received so little winter runoff was back in 1955. Sufficient reservoir capacity is available, however, to serve water customers' needs for this year and the next. Also, additional groundwater will be pumped to supplement surface water supplies.



Attempting to salvage something from the 1898-1904 drought that killed many livestock in Arizona, ranchers collected bones to ship to factories to make fertilizer. Rancher J.P. Gray described the situation: "The years following the drought brought forth a new vocation which the cowboys looked upon with much disgust, almost akin to grave robbing. That was the business of the sun-bleached bones of the drought victims. Near almost every railroad station there were accumulated great stacks of bones hauled in from cattle ranges." The above scene was at Vail Station, about 15 miles east of Tucson, November 1902. (Photo courtesy of the National Archives, Washington, D.C.)

Legislation & Law

1996 AZ Legislature Enacts Water Bills

The most significant piece of water legislation, if not the most significant piece of legislation of the entire 1996 legislative session, HB 2494 (Chap 308 H 2494) created the Arizona Water Banking Authority. This piece of legislation represents the latest maneuver to ensure that Arizona gets its fair share of Colorado River water.

Arizona has never used its full allotment of 2.8 million acre-feet of Colorado River water and is not expected to do so until about 2030. California and Nevada consider this unused water up for grabs, and they argue for its redistribution to increase their allotments. HB 2494 is based on the premise that using its water is Arizona's best response to its neighboring states' maneuvers.

HB 2494 establishes the AWBA which annually will purchase a portion of Arizona's unused Colorado River allotment. The water will flow through Central Arizona Project canals to be stored in underground aquifers in central Arizona. The stored water can be used for drought protection, as well as to help replenish depleted aquifers in the state and to help settle Indian Water Right claims.

Three sources make up most of AWBA's funding: existing groundwater pumping fees in the Tucson and Phoenix areas and in Pinal County; a previously authorized water storage tax levied by the Central Arizona Water Conservation District; and a State General Fund appropriation. This year $2 million was appropriated from the General Fund for the effort.

HB 2494 contains a provision allowing water transfers of specific quantities of unused water to similar authorities in California and Nevada. The contracting state would pay to store water in Arizona thus helping to replenish the state's aquifers. They then can make future withdrawals of a similar quantity directly from the river. Under this bill, no future Arizona water rights would be jeopardized by the transfers.

A five-member commission made up of the ADWR director, president or designee of Central Arizona Water Conservation District and three governor appointees will run the AWBA.

Water was also the subject of other pieces of legislation. Brief descriptions of some water legislation follow, with additional pieces of water legislation to be discussed in the next *AWR*: (Abstracts are from the "Capitol Times" and are reprinted with permission).

Chap 28 S 1152
Water Authority; Mohave County
The statute controlling distribution of revenue from county water authorities is amended to reduce to $7.5 million from $10,250,000 the amount of the required grant for the right to 18,500 acre-feet of Colorado River water transferred in connection with the authority's formation and to exempt some subcontractor payments from having to be deposited in a grant fund. Reference title mentions Mohave County. The $7.5 million can be augmented by any additional amount agreed to by the authority and the member receiving the grant.

Chap 101 H 2549
Flood Control District Study
A committee of 3 senators and 3 representatives is created to compare advantages and disadvantages of city and county flood control districts, taking testimony from specified officials and studying such issues as how tax revenue would be affected if city districts replaced part of county districts. A report is due by December 1, 1996 on the best way to solve flood- and stormwater problems in Arizona. Self-repealing February 1, 1997.

Chap 103 S 1293
Water Amendments; Omnibus
Numerous changes are made in state water law, including: conditions on substitution of acreage that is irrigated with land that is not irrigated; eliminating the requirement for payment when groundwater is transported for mineral extraction and processing; notice requirements for a certificate of assured water supply; restrictions on funds collected in Active Management Areas to purchase and retire grandfathered rights. The director of water resources shall debit from each long-term shortage account an amount equal to 5 percent of the balance, with certain exceptions. As Passed by House, March 28.

Chap 149 S 1368
Water; Semiprivate Agricultural
The regulatory authority of the Department of Environmental Quality does not extend to semiprivate agricultural water systems unless a health hazard is identified. The quality of water provided by such systems shall comply with maximum contaminant levels for nitrates, nitrites, and total coliform bacteria. Annual tests are required. Tests every three years are required for inorganic chemicals, asbestos, volatile organic chemicals, radiochemicals, and synthetic organic chemicals. Procedures are established for actions if exceedences are found. Private agricultural water systems are defined. Effective July 1, 1997.

Chap 207 H 2191
Water System Viability Study
A joint legislative study committee on the viability of small water systems is established. The committee is to report by December 31, 1996, on: the ability of small water systems to comply with and recover through rate hearings water quality testing requirements, state water policy and water conservation statutes; the feasibility of coordinated water quality testing; development of a program to assess small water systems in meeting regulatory requirements. Self-repealing at end of 1996.

Chap 84 H 2243
County Wastewater District
Purposes for which a county can establish an improvement district are expanded to include construction and operation of wastewater treatment facilities.

Special Projects

Water Protection Program Funds University Projects

The Arizona Water Protection Fund was established for "protecting and restoring this state's rivers and streams and associated riparian habitats, including fish and wildlife resources that are dependent on these important habitats." Legislators set program priorities for in-the-field, hands-on projects that promise tangible results. Projects for "research and data collection, compilation and analysis" — i.e., the type of project most likely to be submitted by university researchers — are not to receive more than 5 percent of available funding. Five of the following university projects fit within that category and received AWPF funding last year. The Northern Arizona University (NAU) project is a capital project and also received funding.

AWPF application workshops are currently taking place; applications are due August 1 (see Ann., p. 10). Program officials suggest that a good university strategy when submitting an application is to link up with a city, county or other entity involved in a hands-on or field project in order to be eligible for funding in categories other than research.

Stable Isotope Assessment of Groundwater and Surface Water Interaction: Application to the Verde River Headwaters, Arizona State University (ASU), $21,508

This one-year study of naturally occurring stable isotopes is to assess the hydraulic connections between the aquifers of the Chino Valley and the headwaters of the Verde and hence what effects, if any, groundwater pumping has on flow of the upper Verde River. In cooperation with state agencies and local water users, a data base is being compiled from sampling of the headwaters of the Verde and other streams, wells, and springs in the Chino Valley. Different recharge sources will be identified using distinct signatures in the stable isotopes of oxygen and hydrogen.

Regeneration and Survivorship of Arizona Sycamore, Center for Environmental Studies, ASU, $34,617

The two-and-a-half year project involves collecting field data at perennial, intermittent, and ephemeral streams within the Huachuca Mountains of southern Arizona. The project's goal is to better understand the influence of natural and human factors (e.g., site hydrology, climatic variability, cattle grazing) on the Arizona sycamore (*Platanus wrightii*). The study is examining the influence of these factors on the age structure of Arizona sycamore, rates of regeneration from seed and from asexual sprouting, growth rate, plant-water relations, and anthracnose development on mature trees. Arizona sycamore is a dominant species riparian forest, and provides habitat for breeding birds.

Assessment of the Role of Effluent Dominated Rivers in Supporting Riparian Functions, Center for Environmental Studies, ASU, $46,750

This study's objective is to compare some of the functions of riparian ecosystems along effluent-dominated and non-effluent dominated streams to determine whether effluent-dominated discharges produce different responses of some of the major components of the riparian ecosystem, including vegetation, bird and terrestrial invertebrate communities, river surface and hyporheic processes and biota, and surface and groundwater relationships. Three paired reaches, located along the Salt, Gila, Santa Cruz, and Agua Fria rivers, are being studied.

Quantifying Anti-Erosion Traits of Streambank Graminoids, Center for Environmental Studies, ASU, $14,910

The purpose of this one-year study is to measure and compare the physical traits of streamside grasses and grass-like plants (graminoids) that determine their potential capacity to stabilize streambanks. The study is focusing on streambank graminoids at Buck Springs, a riparian meadow in the Coconino National Forest. Field sampling is quantifying shoot density, height, percent cover, and biomass. Soil sampling is measuring root depth, strength, volume, biomass, distribution, soil bulk density, and texture.

Autecology and Restoration of *Sporobolus wrigtii* Riparian Grasslands in Southern Arizona, Center for Environmental Studies, ASU, $53,734

The purpose of this two and a half year study is to acquire ecological information necessary to understand the natural processes allowing for regeneration and maintenance of *Sporobolus wrightii* (giant sacaton) riparian grasslands along alluvial rivers in southern Arizona, and to use this information to determine natural recovery and restoration potential of this type of community on abandoned agricultural fields. Relationships between seedlings and environmental factors (e.g., groundwater depths, site elevations, time since abandonment) will be assessed via field observations and controlled laboratory and field studies. Relationships between environmental factors and mature *S. wrightii* will be defined through field studies.

Critical Riparian Habitat Restoration Along a Perennial Reach of a Verde River Tributary, NAU, in coordination with The Nature Conservancy, the U.S. Forest Service, and the U.S. Geological Service, $102,535

This project is to restore riparian habitat critical to the successful regeneration of a Bebb willow-mixed graminoid riparian plant community in the area of Hart Prairie, Coconino County, Arizona. The project involves removing a surface-water diversion and monitoring changes to surface and subsurface water quantity and quality, and to the plant community in the affected riparian ecosystem. Factors to be monitored include precipitation, stream flow, water levels, spring and seep discharge, plant water status, species regeneration and early growth and plant species distributions.

Publications

The following two publications are recent issues of Arroyo, a quarterly newsletter of the University of Arizona's Water Resources Research Center. Individual copies, as well as subscriptions are available without charge from the Water Resources Research Center, University of Arizona, 350 N. Campbell, Tucson, AZ 85721; 520-792-9591; fax 520-792-8581; email wrrc@ccit.arizona.edu.

Voters Influence Water Policy With Initiatives, Referenda
Joe Gelt, Vol. 8, No. 4. Arizona citizens have taken advantage of the initiative and referendum option to influence water policy, both at the state and local level. The history of "ballot box lawmaking" in the state is discussed, along with several recent examples of its application to affect water and natural resource policies.

Consumers Increasingly Use Bottled Water, Home Water Treatment Systems to Avoid Direct Tap Water
Joe Gelt, Vol. 9, No. 1. Householders increasingly are turning to bottled water and home water treatment systems to ensure good quality water in their homes. The justification for this trend is examined, as well as regulatory and public policy implications.

The following two publications are available free from the Water Resources Research Center (see information above).

Where to Get Technical Information about Water in Arizona
Barbara Tellman. This booklet is a revised, second edition with new sources added. Written for the water professional, research specialist, consultant and interested others, the publication lists sources such as maps, databases, photo collections and libraries with specialized water information.

Where to Find Information About the History of Arizona Rivers: Supplement
Barbara Tellman, Rick Yarde, Mary G. Wallace. This is a supplement to the original library edition and provides 200 new entries in addition to the 1,500 sources of historical information listed in the original document. A complete new version with all 1,700 plus sources is available on self-executing computer disk.

Severe Sustained Drought: Managing the Colorado River in Times of Water Shortage
This is a report of the results of an interdisciplinary research project examining the effects of a severe and sustained drought on the Colorado River and its users. The analysis assessed the hydrologic, social and economic impacts under the current law of the river and explored possible institutional changes in river management that could mitigate the impacts of drought. Copies are available from the Powell Consortium for $15, plus shipping costs. Contact: Water Resources Research Center (see information above).

The Watershed Source Book: Watershed-Based Solutions to Natural Resource Problems
This source book defines watershed management, examines characteristics of watershed-based efforts underway in the western states, and contains detailed descriptions of 76 watershed-related efforts in the West. The book is $25, plus $3 for shipping. For copies contact the Natural Resources Law Center, University of Colorado, Campus Box 401, Boulder, CO 80309-0401; 303-492-1286; fax 303-492-1297.

Divided Waters: Bridging the U.S.-Mexico Border
Helen Ingram, Nancy K. Laney, and David M. Gillilan. The authors analyze the politics of water management along the U.S.-Mexico border, concentrating on Nogales, Arizona and Nogales, Sonora. The book examines many water problems associated with border communities including surface and groundwater contamination, inadequate and insecure supplies, inequitable distribution of resources, flooding, and endangered riparian habitat. The book is $17.95, paperback, $35 hardcover and can be ordered from the University of Arizona Press, 1230 N. Park Avenue, Tucson, AZ 85719.

Hydrology and Water Resources in Arizona and the Southwest
Proceedings of the 1995 meeting of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona-Nevada Academy of Science held April 22, 1995 at Northern Arizona University (NAU) in Flagstaff. To order, send $10 (make checks payable to NAU) to: R. Sayers, School of Forestry, Box 15018, NAU, Flagstaff, AZ 86011; fax 520-523-1080. The document is available on disk.

Limited copies of the following two USGS reports may be obtained by contacting Pat Rigas, Water Resources Division, USGS, 375 S. Euclid Ave., Tucson, AZ 85719-6644; 520-670-6120, ext. 257. Copies of the report are available for examination at the USGS offices in Tempe, Flagstaff and Yuma.

Water Resources Data for Arizona, Water Year 1995
This U.S. Geological Survey report presents data relating to both surface and groundwater resources from October 1994 through September 1995. The data include discharge records for 182 streamflow-gaging stations; annual peaks for 22 crest-stage, partial-record stations; content only-records for eight lakes and reservoirs; water-quality records for 20 continuous record stations; etc. Report (AZ-95-1)

Activities of the Water Resources Division in Arizona, 1995-96
Publication provides general information about the Water Resource Division, U.S. Geological Survey, and water conditions in Arizona. Specific projects funded in fiscal years 1995-96 are summarized. Report (95-772)

Species continued from page 1

the ocean, and could have restricted hydroelectric generation, irrigation, potable water use, logging in stream watersheds, cattle grazing, and development; in effect, almost any land use activity in the Columbia River Basin.

Gray discussed the court case, *United States v. Glenn-Colusa Irrigation District*, that attempted to establish water as a different classification than land and therefore not under the jurisdiction of the ESA. The district argued that state water law should prevail over the ESA. The court ruled against the district.

The ESA provides various opportunities for federal involvement in water regulation. For example, state or local governments careless about a water quality concern could be forced to take action by federal officials enforcing ESA provisions.

Mary Christina Wood, professor of law at the University of Oregon, described how endangered species listings sparked conflict over the use of Colorado River water by Upper Colorado River Basin states. Action taken by the U.S. Fish and Wildlife Service in the 1970s to protect endangered Colorado River fish included flow recommendations that would have limited the Upper Basin states' use of water guaranteed by the Colorado River Compact.

In response, water users sought to amend the act to exclude Colorado River fish from the provisions of the ESA. The program director of the Colorado fish recovery program, lacking the political support and the funding to implement fish recovery, negotiated a recovery program. Wood expressed concern that the benefits of ESA enforcement often are reduced by the need to negotiate with political interests.

Stanford Professor of Law Barton H. Thompson speculated that it is only a matter of time before a court hears a claim that the federal government has taken a water right through application of the ESA. A specter of regulatory takings thus would arise.

Barton noted that, increasingly, the federal government is using the ESA to require reduced water use of surface streams or groundwater aquifers. The ESA has even been used to block proposed new water projects. He expects that at some point an affected water users will bring a takings claim and litigate the case to final judgement.

At present no published opinions exist addressing the constitutionality of ESA regulation of private water rights. Barton believes that since courts generally have been deferential to government regulations in takings cases involving wildlife protection and water rights, it may be tough for a water user to challenge the ESA.

Chips Barry, manager of the Denver Water Department, provided an urban water utility perspective of the ESA. He noted that western water utilities are confronting increased water demands at a time when they have less water supplies available.

Confronted with an insecure water supply-caused in part by federal regulations, public objections to water storage projects and the exploitation of surface water supplies, and the lack of new available water rights — utilities seek assurances that their present water supplies are secure. To the extent that ESA threatens this certainty, utilities do not welcome its interference.

Barry said that accommodating ESA regulations to leave sufficient water to protect a species is possible when a new project is being built. Older established projects, however, face many obstacles in meeting such ESA requirements.

Several speakers urged that a reauthorization of the ESA include a shift in emphasis from a species-by-species approach to a broader ecosystem management strategy. This would encourage regional planning, with a focus on protecting important vanishing habitats needed for many species, instead of a plan that concentrates on a single listed species. Obviously water resource managers would have a central role in planning and implementing such an approach.

ESA now is being considered for reauthorization. At one time many observers believed that ESA's future was dim indeed, its fate in the hands of the 104th Congress, with its evident anti-environmental bias. To its critics ESA represented much that was wrong with the environmental movement — it was called the pit bull of environmental statutes — and they considered ESA fair game.

ESA, however, survived threats of immediate dismantlement. John Leshy, Solicitor of the Department of the Interior, described the situation as the showdown gunfight that never happened. He added that the ESA is in better shape now than it was a year ago, and that the act will gain in importance in the future. Other ESA supporters were not as optimistic, fearing that a reauthorized ESA still may include provisions to "water down" the act.

The 17th annual summer conference of Natural Resources Law Center was entitled, "Biodiversity Protection: Implementation and Reform of the Endangered Species Act."

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

Arizona Department of Environmental Quality
Arizona Department of Water Resources
Arizona Hydrological Society
Arizona Municipal Water Users Association
Central Arizona Water Conservation District
Geraghty & Miller
Metro Water District
Salt River Project
Tucson Water
USGS Water Resources Division
Water Utilities Association of Arizona

Their contributions help make continued publication of this newsletter possible.

Announcements

Groundwater Tech Center Opens

The National Ground Water Remediation Technology Center (NGWRTC) has been established to promote innovative technologies for cleaning up contaminated groundwater. As part of its mission the center will compile, analyze, and disseminate information on new groundwater remediation technologies. The U.S. Environmental Protection Agency selected the National Environmental Technical Applications Center to establish and operate NGWRTC. The center can be reached at 800-373-1973; or on the WEB: http://www.gwrtac.org.

Funds for Water Protection

The Arizona Water Protection Fund invites applications for projects to protect water of sufficient quality and quantity to maintain, enhance, and restore Arizona's rivers, streams, and associated riparian or aquatic habitats, including fish and wildlife that depend on these habitats. Categories are: 1) water acquisition, capital projects, and other specific measures; 2) water conservation; and 3) research and data collection. Deadline is August 1. Contact Tricia McCraw, Arizona Water Protection Fund Commission, Arizona Department of Water Resources, 500 N. Third St., Phoenix, AZ 85004; 602-417-2400, ext. 7310; fax: 602-417-2423.

Hydro Vision Conference

Hydro Vision '96, a conference sponsored by Hydro Review magazine, the National Hydropower Association, and Hydro Review Worldwide, will be held August 20-23, in Orlando, Florida. The focus of the conference is on better understanding the current and future issues that affect hydro resources. Topics to be covered include: operations, maintenance, and rehabilitation; regulation and legislation; sharing water resources; and international opportunities. Contact Hydro Vision '96, 410 Archibald St., Kansas City, MO 64111-3046; 816-931-1311, ext. 131.

ADEQ Seeks Water Quality Input

The Arizona Department of Environmental Quality is conducting public meetings to discuss the reclaimed water quality standards that apply to the reuse of treated wastewater as described in an ADEQ concept paper. Copies of the concept paper can be obtained by calling Steve Pawlowski at 602-207-2227 or the Rule Development Section Request Line, 602-207-2224; or the paper may be obtained at public meetings scheduled for July. The dates and locations of these meetings, to be held at 1:30 p.m., are as follows: July 11, ADEQ Public Meeting Room, 3033 N. Central Ave., Phoenix; July 17, State Office Building, Room 222, 400 W. Congress, Tucson; and July 24, Flagstaff City Council Chambers, 211 W. Aspen Ave., Flagstaff.

AWRA Fall Meeting Set

The American Water Resources Association is holding its 32nd Annual Conference and Symposium on GIS and Water Resources on September 22-26, in Fort Lauderdale, Florida. Conference sessions cover all aspects of water resources. Early-bird registration deadline is July 29. Contact AWRA, 950 Herndon Pkwy, Suite 300, Herndon, VA 22070-5531; 703-904-1225; fax: 703-904-1228; email: awrahq@aol.com.

UCOWR Meeting

The theme of the Universities Council on Water Resources' (UCOWR) annual meeting in San Antonio, Texas July 30 through August 2 is "Integrated Management of Surface and Ground Water." Topics include legal and policy issues that may constrain integrated use of ground and surface water, water quality impacts of integrated use, how to incorporate groundwater supplies into watershed protection efforts, and artificial recharge. For more information contact Camille Hedden, UCOWR Executive Director's Office, Faner Hall, Room 4543, Southern Illinois University, Carbondale, IL 62901-4526; phone 618-536-7571; fax 618-453-2671; email hedden@uwin.siu.edu.

WWW Water Directory

The Center for Environmental Studies at Florida Atlantic University and the Universities Water Information Network are collaborating to create the *Directory of Water Resources Organizations in North America and the Directory of Water Related Training Opportunities in North America for the Inter-American Water Resources Network* (IWRN). The IWRN is a network of people and information dedicated to improving water management in the Western Hemisphere. It's Technical Secretariat is headquartered at the Organization of American States in Washington, D.C.

These Directories will be publicly available on the World Wide Web and will be fully searchable with hotlinked email addresses and URL's. You can include your organization's information in these Directories by filling out the on-line forms at http://www.uwin.siu.edu/FORMS/ or by requesting that these forms be mailed to you. Contact Faye Anderson, fax 618-536-7571; email faye@uwin.siu.edu.

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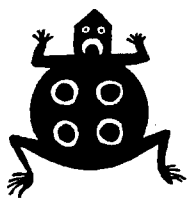

Calendar of Events

RECURRING

Arizona Hydrological Society (Flagstaff). 2nd Tuesday of the month, 7:00 pm NAU, Southwest Forest and Science Complex, 2500 S. Pine Knoll Dr., Room 136, Flagstaff. Contact: Don Bills 520-556-7142.

Arizona Hydrological Society (Phoenix). See picnic information under "Upcoming" below. Contact: Rich Petrus 602-966-2337.

Arizona Hydrological Society (Tucson). See picnic information under "Upcoming" below. Usually held the 2nd Tuesday of the month, social hour begins at 6:30 pm, WRRC, 350 N. Campbell Ave., Tucson. Contact: Jeanmarie Haney 520-881-4912.

Arizona Water Protection Fund Commission. 4th Tuesday, 10:00 am, Springerville (if meeting is held in July). Contact: Tricia McCraw 602-417-2400, ext. 7310.

Arizona Water Resources Advisory Board. To be scheduled. Contact: Tina Maranda 602-417-2400.

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

City of Tucson Citizens Water Advisory Committee. 1st Tuesday of the month, 7:00 am 310 W. Alameda, Tucson. Contact: Karen Alff 520-791-2666.

Maricopa Assoc. of Governments / Water Quality Advisory Committee. Contact: Wendy Bower 602-254-6308.

Maricopa County Flood Control Advisory Board. 4th Wednesday of the month, 2:00 pm 2801 W. Durango, Phoenix. Contact: 602-506-1501.

Phoenix AMA, GUAC. July 3, 9:30 am Conference Room A, 500 N. 3rd St., ADWR, Phoenix. Contact: Mark Frank 602-417-2465.

Pima Assoc. Governments / Water Quality Subcommittee. 3rd Thursday of the month, 9:30 am 177 N. Church St., Suite 405, Tucson. Contact: Gail Kushner 520-792-1093.

Pima Co. Flood Control District Advisory Committee. 3rd Wed. of the month. 7:30 am Room A, 201 N. Stone, Tucson. Contact: Carla Danforth 520-740-6350.

Pinal AMA, GUAC. 3rd Thursday of the month, May 16, 3:00 pm Pinal AMA Conference Room., 1000 E. Racine, Casa Grande. Contact: Dennis Kimberlin 520-836-4857.

Prescott AMA, GUAC. July 8, 10:00 am, 2200 E. Hillsdale Rd., Prescott. Contact: Phil Foster 520-778-7202.

Santa Cruz AMA, GUAC. June 26, 9:00 am, Santa Cruz AMA Conference Room., 857 W. Bell Rd., Suite 3, Nogales. Contact: Placido dos Santos 520-761-1814.

Tucson AMA, GUAC. June 26, 9:00 am, Tucson AMA Conference Room., 400 W. Congress, Suite 518, Tucson. Contact: Kathy Jacobs 520-628-6758.

Verde Watershed Association. Contact: Tom Bonomo, VWA Newsletter Editor, c/o Verde R.D., P.O. Box 670, Camp Verde, 520-567-4121.

Yavapai County Flood Control District Board of Directors. 1st Monday of the month in Prescott, 255 E. Gurley St.; 3rd Monday in Cottonwood, 575 E. Mingus. Contact: YCFCD, 255 East Gurley, Prescott, 520-771-3196.

UPCOMING

July 18 - 20, **42nd Annual Rocky Mountain Mineral Law Institute,** Santa Fe, New Mexico. Contact the Rocky Mountain Law Foundation, phone 303-321-8100.

July 20 & 21, **AHS Annual Picnic in the Pines,** begins Saturday 10:00 am at Rancho Ponderosa, northwest of the San Francisco Peaks. All AHS members are invited and encouraged to attend. Contact persons listed under each AHS chapter listed above.

September 12 - 14, **Wanted: Water for Rural Arizona,** the Ninth Annual AHS Symposium, Prescott Resort, Prescott. Proposed topics include shallow aquifers/bedrock aquifers, riparian, mining and tribal issues, and climate change. Contact persons listed under each AHS chapter listed above.

October 9 - 13, **The Future of Arid Grasslands: Identifying Issues, Seeking Solutions,** Grasslands Conference at the Quality Inn, Tucson and selected grasslands in Southern Arizona, Southern New Mexico and Northern Sonora, Mexico. A conference blending working grasslands tours, workshops, lectures, discussions and an evening of grasslands poetry and music. Abstracts for posters accepted until September 1, 1996. For more information contact Barbara Tellman at the WRRC, University of Arizona; phone 520-792-9591; fax 520-792-8518; email bjt@ag.arizona.edu.

Submit calendar, announcement, or publication information to Holly Ameden at the WRRC; 520-792-9591; fax 520-792-8518.

Announcements, continued from page 10

Task Force Formed

A Groundwater Cleanup Task Force dedicated to protecting groundwater quality while ensuring an adequate supply of groundwater to meet future demands has been organized. The Arizona Department of Environmental Quality and Arizona Department of Water Resources, in cooperation with representatives of local government, water providers, industry, citizen groups, academia, and the general public, assembled the task force. A specific issue to be addressed by the Task Force is improvement of the Water Quality Assurance Revolving Fund (WQARF).

The Task Force began working in February and meets on a regular basis. Public participation is encouraged at both the regular Task Force meeting and subcommittee meetings. The Task Force will meet on July 11, and 25, August 8, 22, and 29 from 10 a.m. to 4 p.m. at Salt River Project, Mohave Room, 1521 Project Drive, Tempe. Contact Jim Mathews, 602-207-2215.

Subcommittee meetings are as follows: Liability and Federal Law, every Wednesday except week of Task Force meeting, 1:30 p.m., contact Pat Cunningham, 602-542-3881 or Dave Kimball, 602-530-8221; Site Prioritization, July 10, 9:00 a.m., ADEQ, 3033 N. Central, Rm. 117B, Phoenix, contact Ethel DeMarr, 602-207-2381 or Phil Lagas, 602-840-3333; Funding, every Monday, 2:00 p.m., contact Sandy Price, 602-240-2629 or Scott Davis, 602-250-3225; Public Participation, every other Wednesday, 6:00 p.m., contact Peggy Wenrick, 520-577-0029, or Jay Spehar, 520-473-7161; Remedy Selection, every other Tuesday, 1:30 p.m., contact Tom Suriano, 602-244-6656 or Chris Thomas, 602-528-4044; End Use, July 12, 9:00 a.m., ADWR, 500 N. 3rd St., 3rd Fl., Phoenix, contact Greg Witherspoon, 602-236-2717 or Phil Lagas, 602-840-333; Well Design and Use, every Tuesday, 10:00 a.m., contact Andrew Stahl, 602-861-7437 or Steve Ruppenthal, 602-932-1637.

ARIZONA WATER RESOURCE

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