



National Wetlands Month, a Time to Value All Wetlands

May is American Wetlands Month, and the Environmental Protection Agency urges us to get involved by conducting appropriate activities and special events to celebrate the auspicious occasion. An obvious question to answer when planning a party is who gets invited. Not all wetlands are the same; do all get invited and have an equal place at the table?

American Wetlands Month might be a good time to ponder the issue.

For example, consider the case of constructed wetlands. A constructed wetland is essentially a water treatment facility. Duplicating the processes occurring in natural wetlands, constructed wetlands are complex, integrated systems in which water, plants, animals, microorganisms and the environment — sun, soil, air — interact to improve water quality.

Although its primary purpose is to treat wastewater, constructed wetlands serve other purposes as well. A wetland can serve as a wildlife site, providing suitable habitat for waterfowl, mammals, amphibians and insects. They also provide a site to conduct research for studying and evaluating the workings of the wetland process. Also a wetland can be a public attraction welcoming visitors to explore its environmental and educational possibilities.

It was not too long ago that constructed wetlands were sufficiently new to the water treatment scene that

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May is American Wetlands Month

A great blue heron, a great white heron and egrets find habitat at La Cienega de Santa Clara amidst the cattail. For National Wetlands Month the Environmental Protection Agency is promoting activities and events to help raise awareness of the critical role wetlands and other aquatic resources play in our environment and to build support for their protection and restoration. EPA is posting wetlands information at <http://www.epa.gov/owow/wetlands/anwm>. Photo: Mark Lelouch, Sonoran Institute

Arizona-to-Nevada Water Export Plan Proposed, Contested

by Joe Gelt

Arizona Law Allows Exports Under Certain Conditions

As if Arizona did not have enough water-supply worries due to population growth and drought, the state is now contending with an application to transfer groundwater from Arizona to Nevada. Of the varied and perplexing issues the requested out-of-state transfer raises, one the most significant and far-reaching is whether Arizona law can protect state water resources from such transfers.

This is the first time the state water export law has been put to the test; it very likely won't be the last.

The controversy is being played out in a remote, rugged and sparsely populated corner of Arizona, in the far northwest part of the state, an area where Arizona, Nevada and Utah lie in close proximity. Sides in the controversy are drawn along the Arizona-Nevada border, with the Arizona Strip communities of Beaver Dam, Littlefield and Scenic on one side. Population in that area is estimated to be between 4,000 and 5,000, mostly retirees and ranchers. On the other side of the dispute, ten miles away and across the stateline, is the rapidly growing town of Mesquite, Nevada.

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Water Export Plan...continued from page 1

Other players include the Wind River Resources, a Nevada-based Arizona limited liability company, and Virgin Valley Water District. VVWD covers 312 square miles within Clark County, Nevada, serving 18,000 customers, most living in the Mesquite area. It also has provided water to Scenic, Arizona. Some estimates indicate that Mesquite's population could increase to 40,000 in as little as four years.

Exporting water from Arizona

At issue is whether WRR can export groundwater from Beaver Dam Wash in the Littlefield area across the stateline to Mesquite, Nevada. Although an out-of-state transfer, this would not be an interbasin transfer since the Lower Virgin River hydrographic basin underlies both states.

The proposal calls for WRR to drill three wells in the Mormon Wells area along Beaver Dam Wash, a tributary of the Virgin River, and withdraw high-quality groundwater to pipe to the VVWD in Mesquite. WRR seeks to initially transport 800 acre-feet of groundwater per year, annually increasing the volume until it reaches a maximum of 14,000 acre feet between 2045 and 2055.

The immediate issue is whether Littlefield, Arizona can prevent its groundwater from being pumped to Nevada; the broader issue has to do with Arizona's ability to prevent other such incidents occurring, not only along its border with Nevada, but also along borders shared with the neighboring states of California, Utah and New Mexico.

This is considered a groundbreaking case, taking up an issue that has not yet been addressed, whether an out-of-state applicant can dip into, or more stringently stated, raid Arizona's water resources. A March 4 *Arizona Republic* editorial stated, "The Wind River proposal is an audacious assault on Arizona's precious groundwater."

This situation which is seemingly made-to-order for controversy did not disappoint. Controversy flared. Opposing the application are mostly residents in the Beaver Dam or Littlefield areas, owners of the area's businesses, houses and land. They fear for their water supplies. Favoring the application are developers in Mesquite, Nevada, and Scenic, Arizona.

Laws pertaining to interstate water transfers

Those whose knowledge about the interstate movement of water is based on the Colorado River and its seven basin states know of the prohibitions and restrictions that can apply to such transfers; they would likely expect that the WRR request would confront formidable legal hurdles. And indeed the request does in fact meet legal challenges, although how formidable these are is the question. The WRR situation is much different than what confronts the seven Colorado River Basin States as they share the river's resources per a

Water Determined to be Article of Interstate Commerce

The U.S. Supreme Court was at first supportive of state efforts to restrict the export of water from sources within a state for use outside the state. In 1908, the U.S. Supreme Court responded to a challenge to a New Jersey statute prohibiting the export of water by ruling that the law did not violate any provision of the U.S. Constitution. The decision, *Hudson County Water Co. v. McCarter*, prompted many states, especially arid western states, to pass laws prohibiting the interstate export of water.

State efforts were checked in 1982 when the U.S. Supreme Court decided *Sporhase v. Nebraska ex. rel. Douglas*. Owning adjoining tracts of land in Colorado and Nebraska, the defendants in the case pumped well water in Nebraska to irrigate land in both states. The State of Nebraska brought suit to enjoin the defendants from exporting groundwater from Nebraska into Colorado without a permit. Court cases followed: the lower court granted the injunction; the Nebraska Supreme Court upheld it; the US Supreme Court reversed the state court's decision on constitutional grounds.

Nebraska law allowed a party to withdraw groundwater from an in-state well and export it to an adjoining state upon receiving a permit from the Nebraska Department of Water Resources. The permit could be issued if the NDWR director determined that the requested withdrawal was (1) reasonable; (2) not contrary to the conservation and use of groundwater; and (3) not otherwise detrimental to the public welfare. Reciprocal rights also were required; i.e., the state receiving the exported water also had to grant rights to transport water for use in Nebraska.

The Court determined that groundwater is an article of interstate commerce subject to congressional regulation. It found that the first three conditions of the Nebraska statute did not impermissibly burden interstate commerce. The Court, however, determined that the reciprocity provision was unconstitutional because it unduly interfered with commerce between Nebraska and adjoining states, and it lacked a conservation or preservation rationale.

federal compact.

The seemingly obvious solution would be for Arizona to adopt legislation to prohibit out-of-state transfers of water. This, however, is not an option. Whatever legal action Arizona takes must abide by a U.S. Supreme Court ruling that held that groundwater is an article of interstate commerce subject to congressional regulation. States, therefore, cannot regulate it in a manner that interferes with the Commerce Clause. (See above sidebar)

Arizona Revised Statutes § 45-292 states, "A person may withdraw, or divert, and transport water from this state for a reasonable and beneficial use in another state if approved by the director pursuant to this article." According to statute the ADWR director decides whether to approve the application after considering such matters as potential harm to the public welfare of Arizona citizens; Arizona's water supplies and its current and future demands statewide and in particular the proposed source area; and the availability of alternative sources of water in the other state.

An initial step was a three-day administrative hearing that began on March 2 conducted at the Beaver Dam High School. The various interests testified before Thomas Shedden, the administrative law judge hearing the case. Closing briefs are due Sept. 7, after which the judge submits his recommendation to ADWR Director Herb

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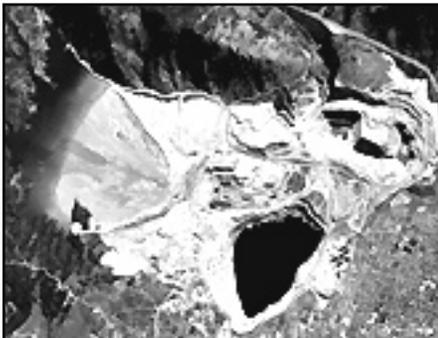
Water Vapors

Making the Best of a Bad Situation

Achieving success at making the best of a bad situation is deserving of special note since such an achievement usually involves beating the odds.

For example: an abandoned open pit mine with 36 billion gallons of water laden with arsenic, copper, cadmium, cobalt, iron and zinc and covering 500 acres, as deep as 900 feet, and blamed for the deaths of 342 migratory snow geese that made the mistake of landing on its toxic waters would by most accounts be considered a very bad situation.

Yet the Berkeley Pit in Butte Montana, once a copper mine, now on the federal Superfund list and considered one of America's largest bodies of toxic water, has



NASA satellite photo of the Berkeley Pit in Butte Montana

become a major tourist attraction drawing visitors willing to pay to gaze at its tainted waters and take pictures. The attraction has proven sufficiently successful that the admission price of \$1 charged in 2005, its initial year of operation, was doubled to \$2 last year. Between June 15 and Sept. 30, 2005, the site netted about \$18,600

Present tourist amenities include an observation deck and a souvenir shop. On the drawing boards are a pavilion, playground, food service and flush toilets.

Farmers of small California farms are coping with a bad situation by trying to stay afloat in the face of increased regulations and foreign competition. To survive, some farms are catering to urbanites' longings for a farm experience, combining it with their

The 20th Anniversary of the Environmental Quality Act WRRC's Annual Conference, June 5



is the time to register to ensure your attendance at the Arizona water community's premier event of the spring season.

Titled "The 20th anniversary of the Environmental Quality Act and ADEQ: Assessing and Protecting the State's Water Quality," the June 5 event is cosponsored by the Arizona Department of

Only weeks away, the WRRC conference has attracted a wide range of interest. With final details being settled and necessary arrangements seen to, now

Environmental Quality and the Arizona Water Institute. It will be conducted at the Hyatt Regency, Phoenix at Civic Plaza.

The one-day conference will feature panels on the genesis and history of the Environmental Quality Act and ADEQ, the water quality assurance revolving fund (WQARF), emerged and emerging contaminants, emerging policy challenges, and the future of ADEQ. Also included will be a luncheon presentation on the state of ADEQ by Director Steve Owens and insights from former directors. Governor Napolitano has been invited to kick-off the day.

Please check the WRRC web site at (<http://ag.arizona.edu/AZWATER/>) for additional information about the conference and to register on-line.

cravings to be entertained.

Called agritourism or agritainment, this convergence between agriculture and entertainment is ensuring the survival of some farms, generating about \$75 million annually throughout California — without increasing water use.

Showtime down on the farm includes wagon rides, stacked hay bales to climb, pony rides, and petting zoos. Some farmers are opening dude ranches or carving mazes in their cornfields. One farmer charges \$7

per adult, \$5 for children to wander the maze he cut into his cornfield. Dwarfed by towering corn stalks, they roam the narrow paths through green filtered light.

Also noteworthy in this context are the sentiments expressed in a U.S. National Park Service press release encouraging tourists to visit Lake Powell despite its low water level due to drought: "Current water levels allow one to rediscover the beauty of Lake Powell and Glen Canyon National Recreation Area from a different perspective."



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News Briefs

Yuma Desalting Plant on Test Run

A special event celebrated the startup of the Yuma Desalting Plant for a 90-day trial period, from March 1 to May 31, operating at 10 percent capacity. This was a significant achievement for a facility once viewed as a white elephant, a relic of a bygone era, but now viewed as a project worth revisiting during drought-struck times. This is the first time in 14 years that the \$250-million, reverse-osmosis facility has been operating.

The desalter startup was the latest chapter in a complicated water resource tale that began when highly saline water of insufficient quality to deliver to Mexico per treaty obligation was carried via a bypass canal to the Gulf of California. Construction of the plant was completed in 1992; its was not needed, however, because those were flush times on the Colorado River. The abundant flow enabled U.S. to meet Mexican obligations without operating the plant.

The test will determine whether the plant can in fact be restarted. Some question whether it can since it has been mothballed for so long. Also, the demonstration run will test various technological refinements that have been incorporated into the plant since 1993. It will also validate cost estimates for operating the plant.

Operating the plant full-time would have a significant water resource payoff of about 78,000 acre feet per year, left in Lake Mead for use by Lower Colorado River states.

The U.S. Bureau of Reclamation has not yet decided about the future of the plant which is one among several options being considered to extend water supplies in the Colorado River Basin.



U.S. Bureau of Reclamation Commissioner Bob Johnson speaks at the March 20 ceremony marking the startup of the Yuma Desalting Plant's 90-day run.

Arizona Takes Stand Against Invading Quagga Mussels

It has been a quiet invasion, the quagga mussel slipping into Arizona waterways with hardly a splash heard, probably conveyed undercover on a boat that had floated in the mollusks-infested waters of the midwestern or northeastern United States. Now that it is here, officials in Arizona are organizing a high-stakes battle to halt the invasion that threatens water delivery and canal operations in the states.

The quagga mussel is related to the notorious zebra mussel that has been a scourge in the Midwest and Northeast, breeding in the Great Lakes, along the Mississippi River and in other lakes and waterways and costing millions of dollars in efforts — all unsuccessful — to control and eradicate them.

Their arrival in Arizona has been a threat long anticipated, with wildlife officials taking actions and issuing warnings in the hope of preventing the mollusks from infesting state waters.

First noticed in Make Mead earlier in the year the quagga have since migrated down the Colorado River into Lake Mohave and Lake Havasu. That quagga are in Lake Havasu is particularly ominous to Arizona since the lake is the direct source of Central Arizona Project's Colorado River water. Water from the lake is pumped into the aqueduct to flow 336 miles to Phoenix and Tucson. The quagga mussel has been found at the Lake Havasu CAP intakes and the first

National Wetland Month...continued from page 1

regulatory agencies generally regard them as non-traditional. A constructed wetland was a nontraditional water treatment method. At the same time, however, constructed wetlands might be considered nontraditional wetlands.

There is another exception to the wetland rule to consider: an accidental or unintended wetland. Arizona water officials are well acquainted with a such a wetland that has figured prominently in discussions about restarting the Yuma Desalting Plant. The Cienega de Santa Clara was an unintended consequence of shutting down the desalter; saline water then flowed in the bypass canal to the dried-out Colorado Delta, creating the cienega. Plans to restart the plant would shut off this essential water source to the wetland.

Officials in favor of operating the plant argued that the cienega was not truly natural but was instead an artificial water body formed when the desalter was shut down. Preserving it therefore was not a priority when considering plans to operate the plant. Environmentalists disagreed.

(The plant is now operating on a test run with due consideration given to the cienega after various interests worked out their differences and identified a set of management alternatives agreeable to all.)

National Wetlands Month might be a good time to give pause and consider the line dividing naturally formed wetlands from manmade constructed wetlands. Is it a solid line, dotted line, wavering line or maybe no line at all?

Karl Flessa, a University of Arizona conservation biologist studying the Cienega de Santa Clara, questions the existence of such a line. He says, "We need to face the fact that there are no natural habitats left anywhere on earth. They are all modified to some degree by human activity, intentional or otherwise. We need to face the fact that we are going to live in managed landscapes. It's just a matter of what the landscape is managed for: among the choices are ecological values — as in a constructed wetland — recreation, agriculture, cities ... And it's also a question of how well that landscape is managed."

Flessa adds, "Who cares if the wetland is 'constructed?' The wildlife don't know, and they don't care."

section of the aqueduct. This is worrisome to the Salt River Project; its system connects with the CAP at Granite Reef Dam.

With much of the state's water supplies conveyed through canals, officials are very concerned that the rapidly breeding mussels can be a major and expensive nuisance if they build up along concrete-lined canal surfaces and encrust submerged pipes and equipment.

The Salt River Project has adopted a biological control strategy and introduced 38,000 redear sunfish to its canals. The redear sunfish can crush the shell to feed on the mollusk. It is not expected to eradicate the quagga but to control the nuisance to some extent. Native to the southeastern region of the country, the redear sunfish will share the SPR canal with two other fish that had previously been introduced to manage the canals: the western mosquito fish whose task is to control mosquitoes and the white amur introduced to control weeds.

The CAP has adopted the same strategy of introducing redear sunfish to control the mussel in its system, with about 30,000

fish released in its canal in Parker.

Some scientists offer a hopeful note by theorizing that the warmer waters of Arizona may not be conducive to the breeding of quagga who have mainly thrived in the cooler waters of other regions. The approaching summer months will test this proposition.

Less Toxics Released to Arizona Water

Arizona industries scored a seven percent decrease in toxic releases to water from 2004 to 2005 according to new data released by the U.S. Environmental Protection Agency. Water releases declined from nearly 7,000 pounds in 2004 to approximately 6,000 pounds in 2005. The same data shows that Arizona industries reported a 3 percent decrease in toxic chemicals released into the air.

The data comes from the EPA's Toxics Release Inventory, an annual measure of toxic chemical releases, transfers and waste generated by facilities in the United

States. Total releases include toxic chemicals discharged to air, water, underground injection, land (including landfills), and the amount transferred off-site for disposal. Data provided does not mean that facilities with elevated levels are out of compliance with state, local or federal environmental regulations.

The reporting of data to the Toxics Release Inventory is required under the federal Emergency Planning and Community Right-to-Know Act, passed in 1986.

This program has been credited with arming communities with valuable knowledge and encouraging facilities to reduce their releases of toxic chemicals into the environment through source reduction or pollution prevention measures.

Fact sheets and additional information on the 2005 TRI data for Arizona are available online at <http://www.epa.gov/region09/toxic/tri/report/05/arizona.pdf>. The following web sites also provide useful information on TRI: <http://www.epa.gov/triexplorer> and <http://www.epa.gov/enviro>

ASU's Pervious Concrete Parking Lot is Water Smart

A new celebrated installation at the Arizona State University Art Museum is not in a gallery but is its parking lot which has recently been redesigned to showcase a state-of-the-art environmental-friendly alternative to conventional pavements. The featured attraction is pervious concrete

Pervious pavement has various environmental advantages over the conventional asphalt parking lot. A mixture of Portland cement, coarse aggregate (stone), water and admixtures, pervious concrete is highly porous, containing 15 - 25 percent void space that interconnect within the pavement to form channels. These enable water and air to pass through the paved area.

This high porosity accounts for its environmental advantages over conventional lots. One advantage is that pervious concrete naturally filters storm water, reducing or eliminating pollution through natural biological processes. Larger pollutants in water infiltrating the soil beneath the pavement are filtered out. Microorganisms further control pollution by breaking down pollutants until they are inert. The result is a reduced pollutant load entering streams, ponds and rivers.

Groundwater recharge also benefits; instead of flowing off a surface to a storm water drainage system, water infiltrates the



pervious concrete, eventually reaching the aquifer. Trees and other plant life surrounding a pervious concrete parking lot better and live longer, their root systems benefitting from the improved access of air and water. This is a natural amenity achievable even in densely developed urban areas.

The storm water management applications of pervious concrete are especially useful. Faced with stricter storm water runoff regulations, property owners will likely be burdened with increased cost for installing an adequate drainage system when developing real estate. By reducing runoff from paved areas, pervious concrete lessens the need for separate storm water retention ponds and enable the use of smaller capacity storm sewers. Property owners are thus able to develop a larger area of their property at less cost.

The U.S. Environmental Protection Agency recognizes the proper utilization of pervious concrete as a Best Management Practice for first-flush pollution control and storm water management. Pervious concrete also earned kudos from the U.S. Green Building Council's Leadership in Energy and Environmental Design program for integrating paving and drainage. This reduces the amount of land needed to manage storm water.

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Guest View

ADEQ's Border Strategy Evolved to Confront Emerging Issues

Plácido dos Santos contributed this Guest View. He is associate director of the Arizona Water Institute at the Arizona Department of Water Resources. He formerly worked as Arizona Department of Environmental Quality's border environmental manager.

The Arizona Legislature's creation of the Arizona Department of Environmental Quality in 1987 led to changes in the way the United States and Mexico would address border environmental issues. The changes were incremental, lasting and could not have been foreseen by legislators at the time.

Before ADEQ was established, border environmental issues were almost exclusively the realm of the federal governments. In 1983, Ronald Reagan and Mexico's President Miguel de la Madrid signed an executive agreement for cooperation on environmental issues within 100 kilometers of the international boundary. The La Paz Agreement has been the foundation for ongoing efforts on water quality, air quality, waste management, environmental health, enforcement and emergency response on the border.

Foreign corporate investment in Mexico was stimulated with establishment of the maquiladora program in the 1960s. For decades, American industries operating in the border region have capitalized on tax incentives and ready access to inexpensive Mexican labor. Claims of lax environmental enforcement and pollution led to widespread concerns along the border. Free trade negotiations that were in full swing by the early 1990s sparked concern that accelerated growth would lead to more contamination.

Because of these concerns, the North American Free Trade Agreement was accompanied by an environmental side agreement that focused on the border. It established the North American Development Bank and its project-approval counterpart, the Border Environment Cooperation Commission to address environmental infrastructure deficiencies.

Meanwhile, in Arizona a lupus cluster was reported in Nogales in 1992. Five years earlier the Arizona Department of Health Services had sampled Arizona wells along Nogales Wash and detected perchloroethylene, an industrial solvent also used by dry cleaners. The community was also plagued by serious air pollution due to frequent fires at a nearby municipal dump in Mexico. There was a widespread belief that the lupus was caused by the pollution. The EPA provided funding to have ADEQ study air and water quality. After years of study, an environmental link was suspected but never demonstrated. But the problem, and other known environmental issues such as particulate matter air pollution and tracking of hazardous waste, solidified ADEQ's presence on the border.

ADEQ's organizational approach to border issues evolved over time. During ADEQ's early years, requests for ADEQ attention to border issues were handled individually based on available

expertise. In 1992 EPA border funding started to flow to the agency as part of the federal Integrated Border Environmental plan. In 1993, ADEQ Director Ed Fox established a management-level Border Liaison position to coordinate the issues of this geographical region. In 1996, when the Border 21 Program was established, ADEQ Director Russell Rhoades created a formal ADEQ Border Team unifying air, water, waste and emergency response personnel as a subset of the Southern Regional Office in Tucson. During 1999-2002, ADEQ Director Jacqueline Schafer enhanced collaboration with the Governor's Office and pursued state funding for inspections of transboundary hazardous waste shipments. ADEQ focused efforts at this time to shape the latest federal program, Border 2012, which spans 2002-2012.

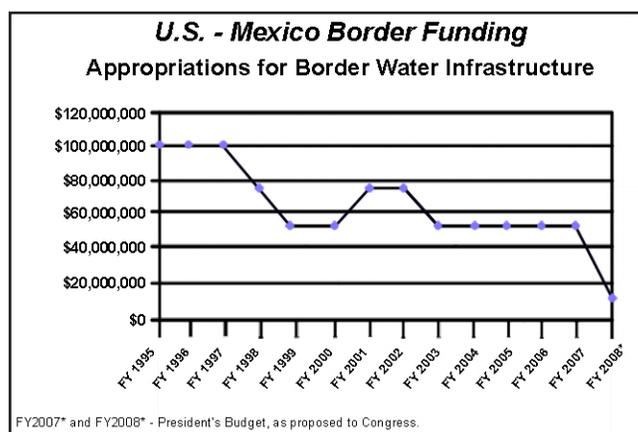
In 2004, ADEQ Director Steve Owens, elevated the Border Program by shifting the group into the Office of the Director and deploying ADEQ's Administrative Counselor in a border-support role. He publicly declared border issues to be an agency priority and included the Department's Border Manager as part of the agency's Leadership Team. Director Owens also tasked the team with emerging issues such as climate change and solid waste associated with illegal immigration and has continued pursuit of legislative support for border hazardous waste inspections.

Each of these agency heads increased the scope, role and effectiveness of the ADEQ's border efforts. Arizona's presence and expertise resulted in a blend of technical and policy work that enriched the federal approach. Through participation in influential forums such as the Border Governors' Conference, Arizona-Mexico Commission and the EPA-administered Good Neighbor

Environmental Board, ADEQ has become an influential force at the international level. By working closely with the other Border States and the Western Governors' Association, coalitions have been forged to align efforts. One ex-

ample is the Border 2012 Program that is now in place as a partnership among federal, state and tribal governments along the border.

While the network of partners is broader and stronger than ever, funding has decreased for on-the-ground work. EPA Office of International Affairs support for local projects is now just \$1 million for the entire US-Mexico border region.



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Legislation and Law

Water Export Plan...continued from page 2

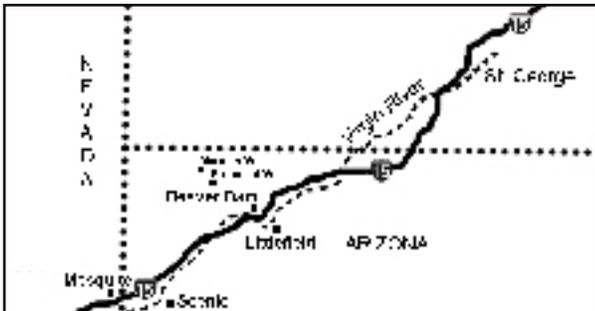
Guenther. The director then decides whether or not to approve the application. His decision could be appealed in the courts.

AZ regulatory agencies critical of application

ADWR's position during the administrative hearing was that the application should be denied because WRR failed to prove as required by statute that water diverted to Nevada would be for a reasonable and beneficial use. Further, ADWR contends that WRR failed to demonstrate that diverting the water would not pose a potential harm to the public welfare of Arizona citizens. ADWR does not believe WRR properly studied the possible adverse effects the transfer might have on water supplies of the area, including its wells and stream flow as well as water quality implications. Nor according to ADWR has WRR carefully considered the effect on wildlife, riparian areas, recreation, and the economic viability of the Beaver Dam Wash area.

In its application WRR states its withdrawals from the Muddy Creek Formation would have a minimal impact on water resources and users in the area, claiming that a confining layer separates the aquifer from other water sources. ADWR remains unconvinced, stating that WRR failed to provide site-specific hydrogeologic data or analysis as required by statute.

ADWR also faulted WRR for not demonstrating that alternative sources of water are not available on the Nevada side of the



border nor that the current and future water demands of those residing on the Arizona side would continue to be met if the application were granted.

Another state regulatory body, the Arizona Corporation Commission, which has jurisdiction over the quality of service and rates charged by public service utilities, is taking an interest in the water exportation proposal.

ACC Commissioner Kristin K. Mayes says, "We are concerned because there are at least four private water companies we believe could be negatively impacted by the proposal. ... They sit upon the aquifer that would be the water source exported into Nevada.

"You can imagine a scenario in which this proposal dewater the [water companies'] wells and that puts us in the position of potentially having to raise rates to find new sources of water. Not only is that not fair to the existing rate payers, it is not good public policy. The commission does not want to be in the position of having to do that. Or even being asked to do that."

Mayes says ACC commissioners went to Beaver Dam to conduct a public comment session. She says, "We are involved in attempting to protect the public interest in Arizona, and the public interest is not protected by allowing our water company wells to be dewatered by an exportation proposal like this."

Suggested remedies

What strategies might be adopted to protect Arizona's water resources? Michael Pearce, former ADWR chief counsel, suggests that Arizona law could be made more restrictive to prevent out-of-state transfers. He says state law now prohibits transferring water across basin lines. He says, "When we drew the basins we had to stop at the state boundary because we have no business drawing basins in other states. But our basins, for state law purposes, stop at the state lines and Mesquite is across the state line and out of the basin. Not out of the physical basin but out of the legal basin."

He adds. "The basins-end-at-the-border is an important legal concept. If you are going to transport water out of an Arizona basin, different water management standards should apply."

Pearce suggested another possibility. He says, "A state law could be passed that says you can't come into Arizona with the intention of exporting groundwater if what you are trying to do is bolster your water supplies beyond what you could get out of the same basin in your own state. If Arizona had such a law [others] would have to look first to their own resources."

The WRR application was an event waiting to happen, with similar events likely in the offing. Even before WRR's application, Arizona officials were aware that sooner or later they would have to address the issue of out-of-state water transfers. Some view the current situation as a day of reckoning.

An indication of what was to come was a 1990 application that the Mesquite Farmstead Water Association submitted to ADWR to pipe Arizona water over the state line for use in Nevada. The Mesquite utility hoped that for the cost of a relatively short pipeline it could gain access to quality groundwater.

The request attracted strong opposition. Bruce Babbitt who represented an interest in the area at that time went so far as to propose that the Beaver Dam Wash area become an active management area to restrict groundwater pumping. The vigorous opposition from residents in the Littlefield area, however, carried the day, and the application was never acted upon.

Rumor mill churns

Any out-of-state effort to acquire Arizona water would be unwelcomed and likely viewed as impertinent; that the present applicant is Nevada is particularly galling. It is the kind of situation to add grist to the rumor mill.

For example, some opposed to the deal hear a giant sucking sound from the direction of Las Vegas. Suspicions have been voiced that VVWD plans to provide water to the Southern Nevada Water Authority to keep it from exploiting resources in the Mesquite area. Another rumor has it that whatever Arizona water WRR acquires will be pumped into the Virgin River to flow downstream to Las Vegas. ■



Publications & On-Line Resources

Atlases Display Arizona Water Information

ADWR Issues Draft Vol. 4 of Arizona Water Atlas

The Arizona Department of Water Resources has completed draft Volume 4 of a nine-volume set of the Arizona Water Atlas. Volume 4 covers the Upper Colorado River Planning Area, from Peeples Valley southwest of Prescott, to Lake Havasu City, Bullhead City, and Hoover Dam on the Colorado River, as well as the southern shores of Lake Mead. The eastern boundary of the planning area takes in Grand Canyon West south to Skull Valley. There are nine groundwater basins in the planning area and parts of Yavapai, Coconino, La Paz and Mohave counties.

For study purposes, ADWR staff divided Arizona into seven planning areas, each containing multiple groundwater basins. There is a separate Atlas volume for each planning area, an introductory volume composed of background information, and an executive summary volume. The primary objectives in assembling the atlas are to present an overview of water supply and demand conditions in Arizona, to provide water resource information for planning and resource development purposes, and help identify the needs of communities.



The first four volumes are available on the ADWR website – www.azwater.gov ADWR plans to complete drafts of all Atlas volumes by the early 2008 and will make printed copies and CD-

ROMs available.

The atlas staff is seeking substantive public and professional comment on the work in progress. Staff plans to revise the Atlas, based on comments received. An electronic comment form is available on the website.

For additional information, contact: Linda Stitzer, Project co-manager lstitzer@azwater.gov (520) 770-3815.

Create Maps Using UA Arizona Electronic Atlas

The Arizona Electronic Atlas is a dynamic web-based interactive state atlas that allows users to create, manipulate, and download accurate and current maps and data through an easy-to-use interface. The data are arranged in four map themes: natural resources, which includes lakes, streams and riparian areas, people and society, business and economics, and environment and population. The map and associated data can be printed or downloaded. The web site includes a learning module that demonstrates the types of maps that can be developed. The module shows the spatial relationship between EPA Superfund Sites and Hispanics in the Phoenix area. The atlas is available at atlas.library.arizona.edu

The University of Arizona Library led the effort to create this resource, with the collaboration of the Arizona Department of Library, Archives and Public Records, Arizona State Cartographer's Office, Arizona Geographic Information Council and Arizona State University. The Institute for Museum and Library Services awarded the initial grant to create the atlas.

Report Warns of Hazards of Excess Groundwater Pumping

In many areas of the West, groundwater is being looked to as a new water source to make up for insufficient river flows. This is not a good water resource decision because groundwater and surface water are not separate and will rise and fall together. Ultimately, rivers bear the burden.

A recent report published by Trout Unlimited's Western Water Project, *Gone to the Well Once Too Often: The Importance of Groundwater* provides basic information necessary for citizens, leg-

islators and others to understand issue. It explains the relationship between groundwater and surface water and the adverse effects that groundwater pumping can have on surface ecology. It describes the current regulatory management of groundwater in a dozen western states including Arizona. Finally, it makes a set of recommendations for wise ground water management. Interspersed throughout, there are stories of rivers in the region that have been adversely affected as a result of ground water pumping. The report is available at the Trout Unlimited web site: <http://www.tu.org>

ADEQ's Border Strategy...continued from page 6

Of even greater significance, grants for water and wastewater infrastructure projects have steadily decreased and are on the verge of elimination. Annual appropriations were \$100 million for the Border Environment Infrastructure Fund. These EPA grants financed projects in many communities and are the lifeblood of today's improvements of the Nogales International Wastewater Treatment Plant. Projects have also been implemented in Naco, Agua Prieta, San Luis Río Colorado, Ambos Nogales, Douglas, Bisbee, Patagonia, Somerton, Gadsden and Yuma.

However, the future of BEIF is bleak. President Bush's proposed budget for FY08 is \$10 million, one-tenth of the original level. This cut is especially painful because Mexico often provides a 50/50 match for projects. The estimated grant needs are over \$300 million. (See figure on page 6)

Federal funding coupled with ADEQ's technical assistance, policy advice and advocacy have made a difference. Many issues remain and new problems have emerged. Progress has been considerable and ADEQ has improved the international approach to these tough challenges. ■■



Special Projects

ASU's Decision Theater Offers Varied Views on Policy Issues

Facility is high-tech tool useful for envisioning water policy options

Considering its function Arizona State University's Decision Theater is aptly named since it demonstrates that in ancient Greek the words theater and theory derived from a common root. The Greek ancestor of the word theater is theatron, a place for seeing; Greek theri is the root of theory and means among other things contemplation and speculation.

Far removed from the Classical World, Decision Theater utilizes an advanced visualization technique that provides a special way to see and contemplate public policy and other issues.

Decision Theater has been likened to an IMAX™ cinema. Its core component, called the Drum, is a 260-degree, faceted screen with seven rear projection passive stereo sources displaying panoramic computer graphics or 3D screen video content. Up to 25 people can participate, interacting with each other and the on-screen scenario.

The Decision Theater, also called a policy visualization center, is a resource that enables public officials, entrepreneurs, business leaders and other decision makers to "see," in three-dimensional detail, the outcomes of decisions they might make about various issues. Complex issues are visualized through computer modeling and simulation, and the virtual reality enables viewers to contemplate policy implications and make more informed decisions.

Decision Theater can offer multiple scenarios with different perspectives on such issues as the urban heat island effect, use patterns, urban growth, air quality, homeland security, public health as well as other environmental and social challenges. Also, Decision Theater can serve as a water planning and management tool.

Decision Theater Research Scientist Jessica Block emphasizes another aspect of the operation in its goal to link researchers at the university with community members and their needs. She says this was especially evident in the work they did with the East Valley Water Forum.

Consisting of a partnership of tribal, public and private water agencies and stakeholders, EVWF is facing the challenge of explosive growth resulting in the need for a proactive approach to water management. The forum wanted to translate and integrate a large number of water datasets into a visual form to promote more informed planning decisions.

More specifically EVWF was concerned about managing its groundwater resources. That aquifers were common to many users

necessitated a regional approach to planning, especially since EVWF member communities bordered Phoenix, a rapidly growing urban center. Decision Theater assisted the forum by creating 3D models showing the long-term impact of development on the aquifer. A geopolitical decisions making process was developed incorporating visual modeling and simulation activities.

Although all forum members shared an interest in water they were not at the same level in their understanding of some of the technical information related to hydrology. For example, ADWR, contracted to do groundwater modeling, provided color-coded contour maps that some members were unable to read. Block says Decision Theater helped with this situation.

She says, "We were able to generate surfaces out of data and animate them through time. The entire group was then able to discuss where groundwater overdraft should be mitigated and how population growth was going to affect the aquifer. They got the gist of it more quickly, and within 10 minutes everyone was on the same page and the discussion could move forward."

Also participants were able to employ interactive strategies to simulate/evaluate the effects of potential water management policies on water supply. This viewing of simulations and models provided a basis for group discussions.

The resulting analysis assisted the East Valley Water Forum in efforts to develop guidelines and policies to manage both groundwater and surface water in the future.

Another water protect utilizing Decision Theater is being conducted by Dr. Mark Schmeckle and his graduate student, Ryosuke Akahori. They are studying the interaction between turbulence structures and suspended sediment in rivers to determine how to prevent sandbars in the Colorado River from washing away. They are working with the Grand Canyon Monitoring and Research Center.

Decision Theater also benefits ASU researchers by enabling them to compose visualization representations of their projects or work. Attractive, informational representations are invaluable in clarifying ideas and concepts for presentations, whether in a research proposals or when explaining research results. Also, audience reception to complex and detailed information is likely to be greater with the use of visualization. ■



On-screen inside the Decision Theater shows changes in groundwater models (center) and satellite imagery 1983 (left) and 2002 (right) of greater Phoenix over time. The satellite imagery shows the growth in urbanized land over this time and can be linked to its influence on groundwater resources shown in the models.



Announcements

UCOWR Conference on Water Resource Hazards

The theme of the Universities Council on Water Resources and the National Institutes on Water Resources annual conference is "Hazards in Water Resources." Scheduled July 24 - 26 in Boise, Idaho, the conference's technical program includes sessions on hazards and policy planning, water and land markets and values, water quality management, ecosystems hazards and services. Plenary speakers feature Gerry Galloway and Chuck Howe on national hazards policy perspectives; Jesus "Chuy" Reyes, Jim Simmonds, and Vic Baker on floods and flood responses; and John Walton, Jay Lund, and George Horne on state and regional policy. For additional information about the conference check the UCOWR web site: www.ucowr.siu.edu There you will find information on speakers, the technical program and special events along with being able to register for the event.



Winkelman Flats during 1993 floods. Photo: B. Tellman

Call for Papers: Sustainability in Higher Education

Coconino Community College is presenting its annual teaching and learning conference: "Transforming Learning into Action, Sustainable Initiatives in Higher Education" Aug. 16 - 17, on the Northern Arizona campus. Papers are invited that address the conference's three primary tracks: (1) Initiating Applied Learning; creating opportunities for real-life learning and experiential education; (2) Innovations in Sustainability; topics include economic sustainability, resource management, energy conservation and community-based models; and (3) Investigating Sustainability through Curriculum; within your discipline how do you address the concept of sustainability? any cross disciplinary projects? Papers are due June 30. Conference organizers invite participation in its Community Sustainability Expo on Aug. 17; booth space is available. For additional information contact Robin Rickli, Coconino Community College, 928-226-4380; robin.rickli@coconino.edu or check the web site: <http://www.coconino.edu/tlc/conference.html>

Call for Abstracts: New Mexico Research Symposium

Abstracts are requested to be considered for presentations and/or posters at the New Mexico Water Research Symposium, to be conducted Aug. 14 at New Mexico Tech, Socorro. Abstracts will be accepted through July 6. Abstracts related to any and all water research and management topics will be considered, but abstracts exhibiting multidisciplinary work are strongly encouraged. Topics to be addressed at the technical sessions include water and wastewater treatment and reuse; erosion and sediment control; reservoir evaporation; economics and policy analysis; watershed assessment, planning and management; wetlands and riparian issues; and agricultural, industrial, and municipal water use. For a complete list of topics as well as additional information about the symposium and submitting abstracts check the web site: <http://wri.nmsu.edu> The

symposium is sponsored by the New Mexico Water Resources Research Institute at New Mexico State University.

Call for Papers: Colorado Plateau Research

A call for papers has been issued for the 9th Biennial Conference of Research on the Colorado Plateau to be conducted Oct. 29 - Nov. 1 at Northern Arizona University. This conference provides an interdisciplinary forum for research and land management issues related to the biological, cultural and economic resources of the Colorado Plateau. Researchers who have been involved with land management issues on the plateau are encouraged to take part.

In addition to the special sessions and invited presentations, the conference will include contributed presentations from researchers, managers, and others involved in science and resources management on the Plateau. Anyone interested in presenting an oral paper or poster is invited to submit an abstract, following the guidelines at: http://sbsc.wr.usgs.gov/cprs/news_info/meetings/biennial/2007/call.asp The tentative deadline for abstracts is September 7.

AWRA Conference on Emerging Contaminants

The American Water Resources Association's conference titled "Emerging Contaminants of Concern in the Environment" will be conducted in Vail, Colorado, June 25 - 27. The conference dialogue will provide an interdisciplinary forum on contaminants of emerging concern (ECs) and a diverse group of participants is expected. The conference is structured around 4 major themes: (1) EC detection and sources; (2) EC fate and transport; (3) EC receptors and effects; and (4) EC solutions and communication.

Each day will start with a plenary session that will focus on the issues to be covered in the day's oral sessions, and some time will be provided for open-discussion of the information being presented. For additional information about the conference check: <http://www.awra.org/meetings/Vail2007/program.html>



Public Policy Review

by Sharon Megdal

Next Generation of Water Experts Explore Varied Real-World Issues



We in the water world are all familiar — perhaps too familiar — with the distinction often made between whiskey and water, that one is for drinking and the other is to fight over. Another distinction often promulgated is that work is the real world and the university is not as real. Consequently it is thought that students leave the university well versed in theory but are not necessarily well ground-

ed with exposure to real-world issues.

Whatever truth there may be to this debatable proposition I know from experience it does not generally apply to the water policy courses taught at the University of Arizona where efforts are made to integrate theory with practice. A course I teach can serve as an example of how we are covering important real-world issues; students are not just getting ivory tower perspectives.

For the past three years I have been teaching a three-unit spring graduate course titled Arizona Water Policy. Co-developed with my colleague, Kathy Jacobs, we team taught the course the first two times it was offered. With Kathy now at the helm of the Arizona Water Institute, I am now solo teaching the course.

Not confined to a single departmental cubbyhole, my course is cross-listed in four colleges and five degree programs and has attracted students with a wide variety of backgrounds and interests. Listed in the colleges of engineering, law, agriculture and life sciences, and social and behavioral sciences, the course has attracted students from a variety of programs. These programs include soil, water and environmental sciences, hydrology and water resources, planning, geography, agricultural and resource economics and arid lands studies. One student was not yet enrolled in a graduate degree program, and I allowed a senior to enroll in this graduate course.

Varied are the students and varied are the guest lecturers featured during the first ten weeks of the classes. Active in the water resource field, these authorities share with students the challenges they face in taking on real-world policy making. This semester the guest lecturers included Ken Seasholes, director of the Tucson office of the Arizona Department of Water Resources, Cliff Neal, general manager of the Central Arizona Groundwater Replenishment District, and Corporation Commissioners Kris Mayes and Bill Mundell.

To further broaden the students' experiences, Saturday field trips are conducted each year to supplement in-class learning. This year's stops included Tucson Water's (idle) Hayden-Udall Treatment Plant, two major artificial recharge sites, and the Sweetwater Wetlands. Surely by any standards these are real-life, on-the-ground experiences.

During the 10 weeks of formal class meetings, we covered a variety of important topics. In addition to covering the fundamentals of the Groundwater Management Act, we focused also on water management issues of non-AMA areas, drought and climate

change, water quality regulation, private water company matters, effluent re-use, recharge and environmental needs for water.

Student participation is an important component of the learning experience. Students are required to complete a research paper on a water policy matter and then make a class presentation. Presentations fill out the remainder of the semester. To select a topic and complete a paper within a semester is not an easy assignment, especially when students are new at policy analysis.

I assisted some students by focusing their attention on topics that interest them and identifying resources to tap, particularly experts to contact for perspective and information. But the papers are theirs, and it is exciting to see how much the students are able to research in a relatively short period of time.

Students selected topics covering a wide range of important issues; the 15 students chose the following topics: effluent use in Pima county; property rights implications of groundwater use regulation; quality and usage of reclaimed water; managing groundwater in the Prescott Active Management Area; growing water demands in Mohave County; draft EIS: for Colorado River interim guidelines for lower basin shortages and coordinated operations for Lake Powell and Lake Mead; preservation and restoration of riparian areas in Arizona; Navajo water rights and Colorado River Compact challenges; protecting water resources in Native America: case studies of drought mitigation in Northern Arizona; water needs for electricity generation; Sonoran Desert Conservation Plan: water needs; the Yuma Desalting Plant: recent issues; the Lower Colorado River Multi-species Conservation Program; culture of conservation: a statewide strategy for water conservation; and the CAGR: insurance policy, bridge or life support?

No arguing with the relevance and importance of these topics. Working with individuals both within and outside the UA, I realize that policy analysis and translation of scientific findings useful for applying to real-world decision making are increasingly expected in research. Just as it is important to introduce physical scientists to policy, it is essential to expose policy-oriented students to the challenges of real-world policy making.

I am pleased that my course is now part of a recently approved graduate Certificate in Water Policy, an option available to students in degree programs as well as students wanting to enroll only in the certificate program. Approved in March, the program aims to strengthen the water policy expertise of both graduate students and working professionals in a wide variety of fields.

I thank all those who helped train the next generation of water professionals, whether serving as guest lecturers, field trip assistants and/or resources for students working on papers; all contributed to the team effort to develop and deliver a meaningful student experience. While its focus was on water policy, I hope the class offered information and provided a policy analysis framework useful to students regardless of career paths followed. I am already looking forward to spring 2008! ■

ASU Concrete Parking Lot...continued from page 5

Another bonus of using pervious pavement is reduced maintenance. It is expected to last about six times longer than conventional pavement.

The ASU project includes alternative water and landscaping design to mitigate the effects of the Urban Heat Island. By absorbing and storing less heat, pervious surfaces reduce urban heat buildup and heat radiation caused by conventional asphalt and concrete pavements. Urban heat buildup has been shown to indirectly affect water use. Planners also considered aesthetics to ensure an enhanced visual appeal.

The parking lot also serves as a demonstration project enabling researches to study its performance. Kamil E. Kaloush, co-director of EPA-designated National Center of Excellence on SMART Innovations for Urban Climate and Energy at ASU says "We wanted to sample the material, know more about its strength characteristics and durability."

Research will be ongoing at the ASU lot, with temperature and moisture sensors measuring its environmental performance for comparison with other non-pervious ASU parking lots. ASU researchers will use the data to develop technical guidelines for installing pervious parking lots.

One result is already obvious. Kaloush says that the parking lot area had problems with drainage. "When it rained it quickly

flooded, and parking services would pump the water. It is quite an improvement this year because a lot of that water can go through the pavement."

The cost of pervious surfaces, which is about twice as much as traditional forms of pavements, will likely discourage its widespread use. ASU researchers expect, however, that its cost will lessen as developers and communities take an interest in the product.

Although available for 20 or 25 years, pervious concrete has not been extensively used in Arizona. Kaloush says research results will be shared with local communities since many cities have expressed an interest in the surface.

He says one project getting serious consideration is surfacing a lot outside the Tucson zoo; he invites researchers in the Tucson area who might want to participate in the project to contact him. (Kamil.Kaloush@asu.edu)

The project is a cooperative effort involving ASU's National Center for Excellence. The center is an extension of the university's Global Institute of Sustainability and the Department of Civil and Environmental Engineering in the Ira A. Fulton School of Engineering. Other program partners include ASU Parking and Transit Services, the Arizona Cement Association, the CE-MEX USA company, Progressive Concrete Works Inc, and Border Products. ■■