ARIZONA
WATER RESOURCE

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How Much Virtual Water is Needed to Produce a Hamburger?

How much water is needed to produce a hamburger? At one time this was not the type of question many water officials deeply pondered. They were more concerned with the amount of water used to irrigate a lawn or operate a washing machine than worry about hamburgers, sugar, milk, oils and vegetables as significant water-using commodities. This was food that could be purchased, served and consumed, with nary a flow, sprinkle or drip evident to disturb the most devote water-saving consumers and dampen their appetites.

Drought and water shortages disrupted water business as usual; stricter water accountability became the order of the day. A new assessment of water use, virtual water, measuring the amount of freshwater used to produce a commodity, good or service, came into play. The question about the amount of water needed to produce a hamburger now took on greater significance.

Answering the hamburger virtual water question generated real controversy. Carl Bialik who writes the "Numbers Guy" column in *The Wall Street Journal,* provided an account of the dispute. His column purports "to examine the way numbers are used, and abused."

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Santa Cruz River's Navigable Status On Hold Pending Review of Clean Water Act

Santa Cruz River may be test case for national policy on river protection

by Joe Gelt

The U.S. Corps of Engineers seems to have had second thoughts about its May 30 designation classifying two segments of the Santa Cruz River as navigable. Once posted on the Corps' web site under a "traditional navigable water" category, documentation relating to the designation of two months ago has been replaced by the message, "This document has been temporality removed pending further policy review."

Many are asking, "Why is further policy review being conducted?" Efforts to answer that question have raised political issues of significance at the national and local levels. At the national level, what is happening along the Santa Cruz River may have significance in the making of U.S. water policy. Closer to home, the issue has caused concern and controversy in Pima County.

The two Santa Cruz River segments once deemed navigable and now under official review are located south and north of Tucson, with one segment stretching from Tubac to Continental and the other extending from Pima County's Roger Road sewage plant to the Pinal County line. Those river segments, both running year-round with treated sewage effluent, are bright ribbons in a mostly dry Santa Cruz.

Whether or not the Santa Cruz River segments are found to be navigable determines federal regulation of the river; navigable rivers are covered under section 404 of the Clean Water Act. Anyone intending to dump fill material into "navigable waters" must obtain a permit from the Corps. In effect, this means a person wanting to

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construct a project that would alter the river or its significant tributaries must obtain a permit.

What are navigable waters?

Defining navigable waters became problematic after a 2006 Supreme Court ruling muddied the navigable water concept, a decision that federal officials have been laboring ever since to incorporate into their rulemaking. Their task is complicated by the Supreme Court's split 5-to-4 decision in the double cases of Rapanos v. United States and Carabell v. U.S. Army Corps of Engineers, hardly a decisive statement.

Most acknowledge, however, that the Court disagreed that "navigable waters" could be broadly defined as the "waters of the United States," a definition that generally prevailed at one time. A question was left unanswered: what then are defining features of navigable waters? Actions taken along the Santa Cruz River reflect this regulatory limbo.

In response to the Supreme Court decision, the Corps is undertaking a national review of its policies, a process expected to continue at least 60 days. Since the process is underway, the Corps decided to suspend its already granted Santa Cruz River navigable designation as well as refrain from making further decisions about whether projects along the river or its tributaries need to meet federal regulations.

Navigable waters in the West

As is true of some other water issues, the navigability of rivers and streams is an issue that plays out differently in the West than in other, more watered areas of the country. Western officials are concerned that western waterways with their intermittent flow would not live up to a designation requiring perennial flows and therefore be left unprotected.

Also left vulnerable would be many western wetlands that are not connected to a navigable waterway. Whereas about 60 percent of the nation's streams are nonpermanent, according to the National Hydrology Dataset, between 80 and 95 percent of streams in arid western states like Arizona, Utah and New Mexico do not flow year-round.

Some view events along the Santa Cruz as representing an important test case for new CWA guidelines that may ease development constraints along the nation's waterways. The outcome of pending issues along the Santa Cruz may be a harbinger of regulatory things to come to other western rivers. A July 7 *Arizona Daily Star* article quotes Craig Schmauder, a deputy general counsel for the Corps in Washington D.C., as saying that the agency's decision on the Santa Cruz will be one of its first major calls in the Southwest.

The Corps's actions have raised anxieties at the local and state level. Many were counting on the Santa Cruz as being designated as navigable — some considered the designation as a given — for the environmental benefits. For one, the designation would restrict the proposed and controversial Rosemont mine that would discharge waste into a tributary of the river. Also developers, whether of industrial sites, shopping centers, housing developments or any other kind of projects affecting the river or its tributaries, would need to obtain a federal permit. Also affected would be county roads, flood-control and sewer projects near waterways.

Although local government can issue wash ordinances, such ordinances are very limited compared to the CWA regulatory reach that can review such big-issue items as endangered species and pollution.

In a letter to John Paul Woodley, assistant secretary of the army for civil works, Arizona Congresswoman Gabrielle Giffords noted that if the "suspension were to become permanent, it would leave the entire Tucson watershed without protection under the Clean Water Act. This possibility is of great concern to me and my constituents."

Giffords also noted that she understood that EPA and the Department of the Army had issued a joint legal memorandum over a year ago containing guidance on determining CWA jurisdiction in response to the Rapanos decision and that the Santa Cruz designation was consistent with that guideline. This led her to believe that the issue of nationwide consistency had been addressed.

Controversy stirs

Recognizing a river as navigable is often a contested designation, with development interests on one side and environmental groups on the other. Any legislative effort therefore to establish nationwide consistency will likely draw fire and controversy.

A political tug of war has played out at the national level as lawmakers work on legislation intending to define and strengthen regulatory authority weakened by federal agencies' response to the Supreme Court rulings. Proposed legislation replaces the term "navigable waters" with "waters of the United States" and would further clarify the law's intent by indicating that it would apply to intermittent streams, wet meadows and several other types of non-navigable waters.

The bills' sponsors say the bill would bring the law back in line with the intent of the CWA when it was passed and before judicial decisions confused the issue. All US waters would then be protected, not just those that are navigable. Arizona congressman

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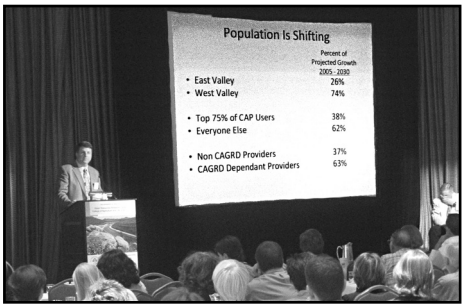
Water Vapors

Arizona and the Colorado River — Yesterday, Today and Tommorow

The Water Resources Research Center's June 24 conference, "The Importance of the Colorado River for Arizona's Future," served as a forum to discuss Colorado River affairs. Attending the event were 315 participants including representatives from government, academia, non-profit groups, private business along with interested citizens.

The importance of innovation and cooperation was an important theme for the day, which began with an address by Sid Wilson, the general manager of the Central Arizona Project, who said, "Innovation is the keystone to what has enabled Arizona to enjoy the benefits we enjoy today and is the cornerstone of what will enable us to continue the quality of life we know in the desert and in the future."



Ray Jones discusses water use in Maricopa County in 2048.

Fittingly the program began with a look at the past, with Marvin Cohen, an attorney for Sacks Tierney P.A., recalling the history of the political give-and-take that led to the passage of the 1968 Colorado River Basin Project Act and the construction of the Central Arizona Project. He emphasized that a willingness to innovate has allowed CAP's purpose to evolve from an agricultural rescue to municipal and industrial use.

Tribal representatives also offered historical views, recalling their ancient tribal roots. They also reflected about the future of water in their economies.

Governor William R. Rhodes of the Gila River Indian Community said recent water settlements benefitted his community in various ways, especially agriculture, but said his people face the same challenges as other CAP customers, including the threat of shortages and concerns about environmental issues and supply and demand.

Chairman Ned Norris Jr. of the Tohono O'odham Nation concurred with Rhodes about the importance of agriculture to tribal economies. He also noted other uses for tribal water. He said, "I have surrounding municipalities knocking on my door talking lease. ... I have heard tribal leaders talking about water as the next slot machine."

The state's larger counties, confront some of the same issues, the foremost being the need for sufficient water supplies to support anticipated growth. All the county representatives said they would be able to meet demand through 2048, but some were more confident than others.

Yuma County expects to grow from about 200,000 to 370,000 without impacting regional agriculture, said Wade Noble, general counsel for the Wellton-Mohawk Irrigation and Drainage District.

Mohave County has the potential to become a bedroom community to Las Vegas and experience spectacular growth, and water resources to support such development must be considered, said Maureen George, general counsel for the Mohave County Water Authority. Increased conservation, recharge and reclaimed water are among the options being considered to gain additional water supplies.

Chuck Huckelberry, Pima County Administrator, said that in his home region water plans are not particularly new or novel but include a more extensive use of recycled water including its use as potable water. He also emphasized water harvesting on a flood control scale, recharge and recovery, and planning for water shortages during time surpluses.

Pinal County Board of Supervisor David Snider said the county's present population of 325,000 would increase to top Pima County's population by 2030 but that the western side of the county has sizable groundwater reserves that can be used to support population growth. He said, "We are heavy into augmentation, and we are working with our wastewater utilities to recharge as much as possible, minimize water features in real estate and work with our Native American neighbors and friends."

Maricopa County will likely experience pronounced growth through 2048, and WESTMARC Chairman Ray Jones predicted that "exploding" growth in the western part of the county in areas like Buckeye would present a challenge to water planners. The increased interest in acquiring new and permanent water supplies will result in pressure

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Looking Into the Water Future: Arizona in 2048

Conference speaker Tom McCann, Central Arizona Project, offered a speculative view of the future of Arizona water when he discussed elements of the CAP annual report for 2048. Developments that he foresees occurring include:

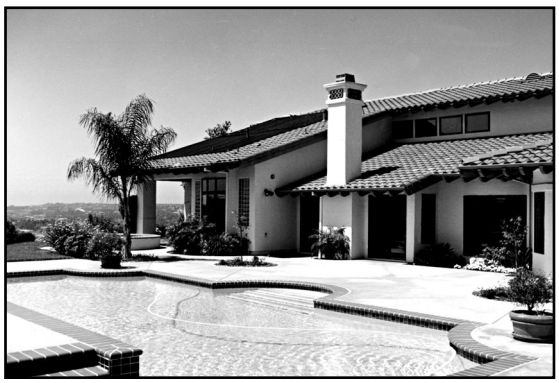
- Desalination is big, with three plants on line, two in the Buckeye and Gila Bend areas that treat brackish groundwater and one in Mexico, along the Gulf of California, to treat ocean water. Desalination provides the state 300,000 acre feet.
- The CAP and Salt River Project gain greater efficiency by managing their canals as a single system.
- Per capita water use drops 5 percent over the past 40 years, with recapture rate up to 35 percent and 40 percent of reclaimed water reused.
- Work begins to expand CAP aqueduct capacity to allow delivery of up to 2.2 million acre feet.
- Phase-out of grandfathered groundwater use in Active Management Areas is almost complete, with groundwater mining down to about 50,000 acre-feet annually.
- Colorado River yield increased to 15.5 million acre feet by weather modification.
- Only three Colorado River shortages declared thus far, with only one lasting more than two years.

News Briefs

Pools of Foreclosed Homes Raise West Nile Fears

Along with the trauma and hardships resulting from the rash of home foreclosures is another related and troublesome situation, one that is posing a possible health hazard. Swimming pools in many foreclosed, uninhabited houses have become mosquito breeding grounds. Where homeowners once enjoyed a brisk dip, mosquitoes now breed in the green stagnant waters of neglected pools. Officials fear the spread of mosquito-borne diseases such as West Nile Fever.

Arizona officials share the concern about abandoned pools. An Associated Press story reports that as of late May, the number of complaints about problem pools in Pinal County exceeded the total number of complaints in 2007, with 117 complaints thus far compared to last year's total of 115.



Abandoned pools can become breeding grounds for mosquitoes.

A story in the *East Valley Tribune* reports a more dramatic increase in the number of complaints in Maricopa County. During the first five months of this year, 4,069 complaints have been received compared to 2,379 during the same period last year. Pima County reports not having received more than the normal number of complaints about abandoned pools.

Problem pools are becoming a serious issue because months may pass before a bank starts caring for the property of a foreclosed home after an owner leaves.

The Gambusia affinis or mosquito fish offers a way to manage the problem of abandoned swimming pools. Providing an environmentally friendly option to spraying with pesticides, the fish, which are about an inch long, thrive in the green waters of oxygen-depleted swimming pools. Hearty eaters and good breeders, the fish devour up to 500 larvae a day and give birth to 60 fry a month.

The City of Chandler is using mosquito fish, releasing about 15 to 20 fish into the murky waters of abandoned pools.

Health officials fear an increase in the number of West Nile cases this year due to the likely increase in the mosquito population carrying the disease. The West Nile season begins as temperatures rise and can continue until November.

Feds Approve SRP's Habitat Conservation Plan

The U.S. Fish and Wildlife Service has accepted Salt River Project's Horseshoe and Bartlett reservoirs habitat conservation plan (HCP) outlining actions the utility will take to minimize and offset harm its operation of two Verde River reservoirs may pose to federally threatened and endangered wildlife and other sensitive species. Operation of the of the Horseshoe Dam results in extreme fluctuations in the reservoir's water level possibly posing harm to habitat.

At possible risk are about 200-400 acres of endangered southwestern willow flycatcher and rare yellow-billed cuckoo habitat at the upper end of Horseshoe Reservoir. Further, reservoir operations can favor nonnative fish species to the disadvantage of Verde River's native fishes, leopard frogs and gartersnakes.

Species listed under the Endangered Species Act are protected from "take," including harassment or harm resulting from altering or destroying their habitat, although the Service may issue permits to take such species under certain conditions: for example, when such a taking is incidental to — and not the purpose of — otherwise lawful activities and the taking does not jeopardize the continued existence of the species. The reservoirs' operations fit this criteria.

The Service evaluated SRP's 415-page HCP and issued a permit for the incidental take of the endangered southwestern willow flycatcher, razorback sucker, Colorado pikeminnow and Gila topminnow as well as the threatened spikedace and loach minnow and threatened bald eagle.

Also included in the plan are nine as-of-yet unlisted species: the yellow-billed cuckoo, roundtail chub, longfin and speckled daces, Sonora and desert suckers, northern Mexican and narrow-headed gartersnakes and lowland leopard frog.

Remedial actions to be taken as part of the HCP include the acquisition of river-side habitat along the Verde and Gila rivers for covered bird species; the construction of a fish barrier to exclude nonnative fish from Lime Creek to protect native fish and leopard frogs; and support of the Page Springs Bubbling Pond Fish Hatchery and its work in producing and stocking native fish.

SRP and the City of Phoenix are committing $6.5 million — if necessary, the amount could increase to $9 million — to acquire and manage habitat, produce and stock native fish, and monitor over a 50-year period. The City of Phoenix is a partner in the HCP because of its substantial water rights in Horseshoe Reservoir.

Few Rural Counties Adopt Water-adequacy Rules

Not many Arizona counties have taken advantage of the opportunites provided by SB1575, a law passed last year to enable boards of supervisors in rural counties to adopt water-adequacy standards that developers must meet by providing proof of adequate water supplies.

In brief, the law states that new adequacy requirements must demonstrate that a sufficient supply of groundwater, surface water or effluent of "adequate quality" will be "continuously, legally and physically available to satisfy water needs of a proposed land use for at least 100 years." Also, financial resources must be proven adequate to ensure the availability of the water supply for the proposed use.

One of the reasons that rural areas have not adopted water-adequacy rules may be the provision in the law stating that a board of supervisors must vote unanimously to adopt water-requirement standards. In other words, one dissenting vote derails an effort to deny new developments if water supplies are found inadequate. Sen. Tom O'Halleran believes this to be the case. He sponsored legislation introduced this year intending to change the requirement to a majority rather than a unanimous vote. The effort came to naught when SB 1403 failed to reach committee. Sen. O'Halleran said he would reintroduce the legislation next year.

Thus far, Cochise County is the only county in the state to have mustered the unanimous vote to adopt the new rules that took effect April 18. The town of Patagonia, located in Santa Cruz County, also adopted new rules. Patagonia was able to take the initiative since the law allows cities and towns to adopt new water-adequacy standards if the county in which they are located has not yet enacted them.

SB1575 applies to all Arizona jurisdictions outside the state's active management areas. Established in 1980, the Tucson, Prescott, Phoenix, Pinal and Santa Cruz AMAs already require proof of a 100-year assured water supply. The new law allowed the means to extend this legal obligation to areas that had hitherto lacked the explicit legal authority to halt development due to a lack of sufficient water.

Rather than one law fitting all, SB 1575 allows rural Arizona the option to adopt water-adequacy definitions relevant to the condition of their aquifers.

Floaters Used to Protect Water Quality, Water Supply

Applying a strategy reminiscent of work done by University of Arizona researchers about 20 years ago, the Los Angeles Department of Water and Power dropped 400,000 black balls into its 10-acre, 58-million-gallon Ivanhoe Reservoir. This was the first launch of what is to be 3 million black balls that will eventually cover the reservoir to protect the drinking water supply.

The massive flotilla of black balls will prevent sunlight from infiltrating the water and mixing with bromide and chlorine in the reservoir causing the carcinogen bromate to form. Bromide, naturally present in the water, and chlorine, added to kill bacteria, are a benign combination that can become a potentially harmful mix in the presence of sunlight.

The Los Angeles project calls to mind work once done in Avra Valley. In 1985, Martin Karpiscak, a researcher from the UA Office of Arid Lands Studies, was involved in a project that covered the surface of a 80-foot diameter pond with a quarter of million Kodak film canisters.
Karpiscak says, "We were trying to reduce evaporation, and the university had done work at Page Ranch where they floated Styrofoam, milk bottles and other materials. We were looking for something that would readily adjust to the height and depth of the water and something we could afford to get.

"We thought of things like ping pong balls, but a quarter of a million ping pong balls would cost a bit of change."

They discovered that the film canisters were particularly suitable for the job. Kapiscak says, "We found that the carbon black in the containers in the base of the old Kodak film canisters prevented them from breaking down rapidly. We got in touch with Kodak, and we worked out a deal."

He believes the project was fairly successful, although he is not sure of the exact figures. He says, "I believe it reduced evaporation by about 50 percent."

He says, "This is the first time I have heard of something that is an offshoot [of the Avra Valley Project.]"

Quagga Mussels Spread in Western Waters

One of the worst fears of western water managers has been realized with the arrival and colonization of quagga mussels in rivers and reservoirs of the West. The bivalve mussels are now in the Colorado River, despite efforts to protect western waterways. They pose a threat to the operation of many hydroelectric plants and water-supply works along the lower Colorado River, as well as the ecology of the lower river itself.

Warnings about the possibility of the unwelcome species' migrating westward have been voiced for about a decade. Efforts to halt its spread included inspecting recreational boats before they are launched on western waters; quagga often hitch rides in the bilge pumps and live bait wells of such boats.

The California Department of Fish and Game are using five state-certified quagga-detecting dogs to locate mussels attached to boats. Also trained for firearms, drug searches and manhunts, the dogs completed a four week training course to detect quaggas. The goal is to have 24 such dogs throughout the state within the year. California is the first state to adopt this cutting-edge approach.

A July 17 New York Times story reported that quaggas are well on the way to taking over Lake Mead. They have also been found as far south as the Imperial Dam, near the Mexican border.

The quagga breed by forming clouds of microscopic veligers which are free-swimming larvae. The veligers are able to float up to five weeks before attaching themselves to a hard surface. According to the NYT article, veligers have traveled via the Colorado River Aqueduct and the Central Arizona Project canal, as far west as San Diego and as far east as Phoenix and Tucson.

Quagga mussels attached to a surface. Photo by Dave Britton USFWS

A U.S. Geological Survey map is available that shows confirmed quagga mussel sightings in the United States and Canada from 1988 though 2008. Updated daily, the map provides geographical and historical information showing distribution over space and time. The reports came from a variety of federal, state, and municipal agencies, universities, public utilities, engineering and private consultant firms. The map is available at http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/quaggamusseldistribution.asp

Guest View

"ADD Water" Invites Input About CAP's Future Water Delivery Role

Tom McCann, resource planning and analysis manager for the Central Arizona Project, contributed this Guest View

Where will municipal providers get the water they need to meet future demands? How will they pay for those new supplies? What role will the Central Arizona Project play in developing new water supplies for its three-county service area? These questions lie at the center of a public stakeholder participation process led by CAP and known as "ADD Water" — the Acquisition, Development and Delivery of Water.

Projections show that long-term water demands in CAP's three-county service area will someday exceed the water supplies that are currently available. When that day will come is a matter of much debate, and will depend on many variables, including population growth, conservation and reuse of reclaimed water. But whether our current supplies will last 20 more years or 50, it makes sense now to develop a comprehensive strategy for the acquisition and delivery of water to meet future demands. That's what ADD Water is about.

The ADD Water process is an outgrowth of the Strategic Plan adopted by the CAP Board of Directors in 2006. The Plan directed CAP staff to establish a collaborative process to address the issue of developing new water supplies for central Arizona — one that encourages fair competition and eliminates perceptions of unfair advantage. The Plan presumed that the most efficient and cost effective way to develop new water supplies would be for CAP to be the single point of acquisition.

CAP's role in transporting additional water into central Arizona has been a frequent topic of discussion over the years. In 2002, it was at the heart of another CAP-led public stakeholder process — Project Wheel. In that process, stakeholders were asked to consider a continuum along which CAP's role ranged from a "delivery agent" for water acquired by others to a "water provider" that developed its own supply for delivery to water users in its three-county service area.

Project Wheel ultimately adopted a hybrid approach that called for "interim set asides" to transport water supplies already acquired by CAP providers and recommended further exploration of the water provider model, including a public process to address how to allocate any new water supply acquired by CAP.

Historically, water providers have worked independently to acquire and develop their own water supplies. But over the past few years, Arizona Municipal Water Users Association cities, Tucson and others met with CAP Board members to discuss a broad framework and public process for developing a wholesale water supply program. That emerging view was reflected in the 2006 CAP Strategic Plan.

In keeping with the CAP Strategic Plan, the ADD Water process is focused on the following question:

Assuming CAP is to be the primary entity that acquires, develops and delivers new water supplies for its three county service area, how should the water be shared and paid for?

Admittedly, there are other questions that will also have to be answered eventually to implement an ADD Water program, such as how much water is needed, when it is needed, and where it will come from. But we already have a good idea of the answers to those questions.

We know from our first ADD Water stakeholder meeting on May 21, 2008, that water users will need significant new supplies to meet future demands (including Assured Water Supply requirements), to replace existing non-renewable supplies, to provide back-up supplies in time of shortage and to meet Central Arizona Groundwater Replenishment District obligations. These new supplies will be used for direct delivery, recharge/recovery and replenishment.

We also know that there are significant quantities of water potentially available. The Central Arizona Groundwater Replenishment District most recent plan of operation identified more than 900,000 acre-feet that could be acquired to meet municipal and industrial demands within central Arizona. And that total did not include the new water that could be developed through desalination of ocean water or brackish groundwater.

There is ample capacity to move these new supplies through the CAP. Long-term CAP contract entitlements total 1.415 million acre-feet. Yet the CAP system, as it exists today, can readily deliver 1.8 MAF annually. And with reasonable improvements, CAP could be expanded to deliver 2.2 MAF each year.

In short, CAP is confident that it can implement an ADD Water program. But first we must seek consensus on what such a program would look like — i.e., how an ADD Water program might fairly and equitably make new water supplies available to those that need them and how the program would be financed. Hence the focus of the ADD Water stakeholder participation process.

There are five steps in the ADD Water process. The first step was to gain a better understanding of stakeholder interests and expectations and identify information needs. That was the purpose of our May 21 public meeting.

The next step in the process is to define and prioritize the criteria that will be used to evaluate ADD Water alternatives. This will be the subject of at least two public meetings this fall, likely in September. Specific information on these meetings-including date, time and location-will be posted on our website: www.projectaddwater.com.

Future public meetings will allow stakeholders to develop alternatives, evaluate those alternatives against the criteria established in step 2, and develop recommendations to be presented to the CAP Board.

The ADD Water process could lead to a fundamental change in how water providers within central Arizona develop new water supplies and could redefine CAP's mission. With stakes that high, all interested parties should plan to participate.

Legislation and Law

EPA Rule: Clean Water Permits Not Needed to Transfer Water

The Environmental Protection Agency announced a rule clarifying that permits are not required for transfers of water from one body of water to another. Such transfers include routing water through tunnels, channels or natural stream courses for public water supplies, irrigation, power generation, flood control and environmental restoration.

The ruling is in response to an issue that had gone before the Supreme Court in 2004 about whether a pumping station in South Florida needs a Clean Water Act permit to pump storm water runoff into the Everglades. The Miccosukee Indian Tribes argued that such a permit is needed to protect the wetlands from runoff that often contains contaminants.

The South Florida Water Management District, operators of the pumping station, disagreed, arguing that its operation is not the actual source of the pollutants; it is merely transferring water from one side of a levee to another.

The case was closely watched especially by western water managers since it had possible major implications to the operations of water transfer projects. Water transfers are a major western water supply strategy: water moved to supply urban and other needs is a common practice.

For example, consider Arizona: Arizona dips into the Colorado River for one-third of its annual renewable water supplies, delivered via the Central Arizona Project. What would be the effects of additional permitting requirements to allow Colorado River water, naturally high in salinity and with sediments from runoff, to enter receiving bodies of water? What would be the effects of needing to take further measures to blend CAP water with Agua Fria water in Lake Pleasant? Or to recharge water downstream of Waddell Dam? Or to mix CAP water with Salt and Verde river water? Water officials feared new regulations to bedevil water transfer operations.

The court, however, did not rule directly on the issue, leaving many uncertain about the need for an NPDES permit. EPA issued an interpretive statement in 2005 explaining that Congress intended water resource-management agencies and other state authorities to oversee water transfers, not the NPDES permitting program. The recent rulemaking codifies that position.

The final rule defines water transfers as an activity that conveys or connects waters of the United States without subjecting the transferred water to intervening industrial, municipal, or commercial uses.

Pollutants introduced by the water transfer activity itself to the water being transferred would still require a NPDES permit under the new rule. Furthermore, this rule does not prevent states or tribes from using their own authorities to address water transfers, including the use of non-NPDES permits.

It is expected that more than likely the rule faces a court challenge. More information on the rule is available at epa.gov/npdes/agriculture.

Court to Decide if Cost-Benefit Can Determine Environmental Protection

Court's decision likely to fuel post-election debate on CWA standards

The U.S. Supreme Court has agreed to hear an environmental case on the use of cost-benefit analysis when establishing standards under the Clean Water Act. The decision, which is not expected until after the national elections, has broad political and environmental implications.

At issue is the Clean Water Act's regulation of intake structures used by power plants and manufacturing facilities that take in cooling water from rivers or lakes, with the water used to absorb heat generated by the industrial process. Because both the water intake and the subsequent water outflow have an environmental effect on aquatic organisms, Section 316 of the CWA states that the design of structures used for cooling water must "reflect the best technology available for minimizing adverse environmental impact."

In 2004, when the Environmental Protection Agency proposed rules for existing power plants, the agency allowed the industry varied options for meeting "national performance standards." EPA also allowed operators, on a plant-by-plant basis, to request a variance if the compliance cost was significantly greater than resulting environmental benefits.

The industry then had an option to having to install the most expensive solution which is closed-cycle cooling systems. Requiring the nation's 550 generating units including 104 nuclear power plants, which together provide 40 percent of the country's energy production, to install such systems would have cost billions of dollars. Industry was pleased with the new ruling; environmentalists were not.

Objecting to what they perceived to be another industry-friendly regulation crafted by the Bush administration, environmental groups filed suit, claiming that EPA's cost/benefit analysis violated the CWA by permitting structures that fail to effectively protect aquatic organisms as required by the CWA.

The U.S. Court of Appeals for the Second Circuit, in Manhattan essentially agreed, holding that the CWA did not allow EPA the option of engaging in the proposed type of cost-benefit analysis. According to the court, cost could only be taken into account if used to enable a plant operator to apply "a less expensive technology that achieves essentially the same results" as the "best" technology. Finding EPA's method unclear when considering costs, the appeals court sent the regulation back to EPA to reconsideration.

The appeals court was not convinced by EPA's contention that industry could not reasonable afford the cost of closed-cycle cooling systems. Also, the ruling restricted the adoption of environmental

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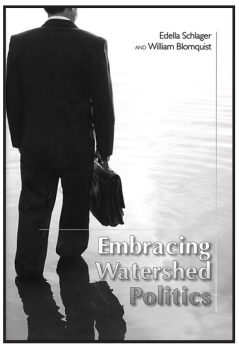
Publications & On-Line Resources

Watershed Politics Explored

Embracing Watershed Politics *William Blomquist, Edella Schlager. University Press of Colorado, $55 cloth. Available though www.upcolorado.com or 800-627-7377.*



The book addresses a timely question: Why does watershed management end up being so political? In response, the authors' discuss why political considerations are essential, unavoidable, and in some ways even desirable elements of water and watershed decision making. They focus on the many contending interests and communities found in America's watersheds, the fundamental dimensions of decision making, and the impacts of science, complexity, and uncertainty on watershed management. Offering case studies of the organizations and decision making processes in major U.S. watersheds (the Delaware River Basin, San Gabriel River, Platte River, and the Columbia River Basin), the authors explain the lack of watershed-scale integrated management agencies and describe the workings of the diverse multi-organizational arrangements found in the vast majorities of watersheds. Although the plethora of organizations representing various interests can complicate watershed management, the institutional arrangement, under certain conditions, is well suited to deal with the complexity and uncertainty of watershed management in the twenty-first century.

Citizens' Water Planning Views Surveyed

Tucson Regional Water Planning Perseptives Study *Sharon Megdal, Aaron Lien. The report can be downloaded from the Water Resource Research Center's web site: http://ag.arizona.edu/AZWATER/*

This Water Resources Research Center publication reports on the perspectives that a representative sample of Tucson stakeholders hold regarding regional water planning. Not purporting to capture all of the opinions about regional water planning in the diverse Tucson region, the report provides a starting point for understanding agreements and differences among stakeholders. Asked a common set of questions, participants were categorized into six groups: elected officials; local jurisdiction managers; water managers; business stakeholders; environmental stakeholders; and miscellaneous stakeholders. The open-ended questions assumed that some sort of regional process would occur, but did not further define the process. Overall, the responses reveal a sincere desire to cooperate on regional water planning.

New Water Journal Calls for Papers

Addressing the full range of issues that water raises in contemporary societies, Water Alternatives: *An Interdisciplinary Journal on Water, Politics and Development (WaA)* provides space for alternative and critical thinking on such issues. A worldwide, peer-reviewed eJournal, WaA welcomes contributions addressing any dimension of water resources development, management and use, and their relations with society and the environment. The first issue came online in June. For more information check: www.water-alternatives.org

Cost Benefit...continued from page 7

restoration strategies as an alternative to power plant alterations for remediating damages to fish populations.

Entergy Corp., utility industry groups and other companies appealed the ruling, seeking to reverse the decision limiting EPA's ability to weigh retrofitting costs against environmental benefits. In its appeal Entergy said, "If not reviewed and reversed, the Second Circuit's decision will extend EPA authority to a panoply of activities not authorized or even contemplated by Congress."

Although industry had raised other matters beyond the cost-benefit issue, the Court limited its review to the question: "Whether 316(b) of the Clean Water Act, 33 U.S.C. 1326(b), authorizes the Environmental Protection Agency to compare costs with benefits in determining the 'best technology available for minimizing adverse environmental impact' at cooling water intake structures." The Court will not address whether EPA could offset environmental harms by restocking fish supplies or improving aquatic habitat nor EPA's right to impose new technology requirements on existing plants as well as new ones.

The Bush Administration initially opposed the Supreme Court's review of the appeal; once the Court decided to hear the case, however, the administration sided with industry, arguing that the appeals court had offered a "wrong answer" to a question of "great significance." According to Solicitor General Paul D. Clement's brief the appeals court engaged in "freelancing" by "usurping the agency's role of construing and filling in an ambiguous statute." Further, in its barring of the cost-benefit strategy, the appeals court is "purporting to micromanage the agency's decision making."

The case, Entergy Corp. v. EPA, 07-588, will be heard during the new term starting Oct. 6, although the case will not likely be heard until December, with a decision unlikely before March or April of the next year, setting the stage for what could become an important post-election debate over environmental policy and determining the environmental credentials of a new administration.

Special Projects

Arizona and the Colorado River...continued from page 3

to shift on-river uses to deliveries to central Arizona. Innovation would be key, Jones said, and that he "believes that the competition is going to lead to cooperation and that we are going to see solutions worked out by 2048 that will please everyone."

Mark Winlkeman, commissioner of state lands, reported that the state must do more to develop state lands in the future. He said additional water resources will be needed to support this future development.

Susan Bitter Smith, CAP Board president, reviewed the likely future of CAGRD providing statistics that defined the activities of the district and its plan of operation.

Luncheon speaker Robert Johnson, Bureau of Reclamation commissioner, provided an overview of West-wide water challenges. He said that what is happening along the Colorado River is not that much different than what is occurring throughout the West, with the "same set of issues, same set of problems, just about everywhere you go in the West." Common problems include population growth, drought, climate change, environmental concerns including endangered species, Indian water rights and aging infrastructure.

Terry Fulp, deputy regional director of the Bureau of Reclamation, said that variability in flow has been a fact of life on the Colorado River, and that collaboration with the University of Arizona Tree-Ring Research Lab has extended the flow record back to year 762, providing a long-term flow average of about 14.6 million acre-feet of water per year. Fulp said despite the current drought Lake Mead is still a full 30 feet above shortage levels, indicating that the storage capacity of the reservoirs "has worked exactly as planned."

Final back-at-the-office event of the annual WRRC conference is the hanging the conference poster in the Sol Resnick Room. Student assistant Keira Corbett does the honor. Photo: Joe Gelt

Besides the reservoirs, one of the best tools Arizona now has to manage shortage is the Arizona Water Bank, said Arizona Department of Water Resources Director Herb Guenther. The AWB is a many faceted tool serving varied water management purposes. For the future, however, Guenther said that Arizona has only one solution: desalination. "The only way we are really going to have a truly sustainable water supply is with desalination. It is the only water supply not subject to the vagaries of drought, and/or climate change," Guenther said.

Larry Kramer, an engineer at Ambient Technologies, provided a case study of the new desalination plants in Israel and added that they could be a model for plants in Arizona. Local facilities would desalinate brackish groundwater or agricultural effluent rather than the seawater that the Israeli plants use.

Kathy Jacobs discussed a research project to improve predictive capacity in the Colorado River Basin. Describing the first phase of the study Jacob said, "We started in phase one to essentially look at the ways the BOR was already using climate information and assessing what ways they could use climate information better." The next phase of the project involves developing new applications and recommendations for improved use of paleoclimate data, climate forecasts, and climate change predictions in BOR modeling and planning. Jacobs said, "We need to get science into the decision-making arena more quickly and efficiently to respond to the challenges we are facing as the world changes at a rate not anticipated in the past.

Lorri Gray, BOR regional director, reported on the Lower Colorado River Multispecies Conservation Program, noting expected accomplishments by 2048. She said by that date the razorback sucker and bonytail chub will have been recovered, with other listed species closer to recovery. Habitat gains will also have been made, with the creation of 5,940 acres of cottonwood-willow, 1320 acres of mesquite, 512 acres of marsh and 360 acres of backwater.

Mark Lellouch, project manager, Sonoran Institute, presented four scenarios for the Lower Colorado River Basin extending to 2050. Included as part of a Sonoran Institute study, *Ecosystem Changes and Water Policy Choices*, the four scenarios are dry future, market rules, Powell's prophecy and a delta and estuary once more. Scenario outcomes will affect the health of the Delta ecosystem and human-well being in the Lower Basin.

Sandy Bahr, Sierra Club Conservation Outreach Director, said that in 40 years, "I am very, very hopeful that the environmental values for the river will be even more of a priority because they are the values that are truly sustainable." Bahr said, "We need to think big, beyond the piece-here-and-piece-there approach." Her vision of the future "is a Colorado River flowing all the way to the Sea of Cortez, a self-sustaining, functioning ecosystem that supports a full complement of endemic species."

Speakers' PowerPoint presentations are available on the WRRC web site: http://ag.arizona.edu/AZWATER/

Project WET Teachers Attend Conference, Get Classroom Ideas

Arizona Project WET (Water Education for Teachers) sponsored 32 teachers to attend the WRRC conference to learn about significant Colorado River issues. A day-two Project WET workshop then discussed teacher classroom strategies for presenting conference ideas and information to their students.

Announcements

Conference: Climate Change Impact on Southwest

The conference, "Adaptation to Climate Change in the Desert Southwest: Impacts and Opportunities," will be held in Tucson, Jan. 22 – 23, 2009. Sponsored by the Institute for the Study of Planet Earth, James E. Rogers College of Law, and the Economics, Law and Environment Program, all at the University of Arizona, this conference brings together an outstanding group of scientists and a diverse range of scholars, policymakers, and regional and national community leaders to look at one of the most powerful and pervasive regional questions of our time: what will climate change mean for the Southwest and what can we do now, in view of predicted impacts, to maximize the potential for a sustainable southwestern natural and human habitat? Information will be available online at http://www.law.arizona.edu after September 1, or email adaptationconference@law.arizona.edu.

ADWR Modeling Workshop

An Arizona Department of Water Resources presentation titled "Numeric Groundwater Model Development" and Review will be conducted Aug.. 26 at the Verde Conference Room, AWDR Main Office, 3550 N. Central Ave., Phoenix from 9:00 to 11:00 AM. Recommended for consultants, water managers and the public, the 2-hour presentation will be centered around the issues of ADWR's Salt River Valley Model Update release and a discussion of ADWR model development and review.

For additional information about the presentation contact Adam Freihoefer, 602-771-8556; atfreihoefer@azwater.gov

Potable Reuse Conference

The WateReuse Association and the International Water Association will present a specialty conference titled "Potable Reuse for Water Supply Sustainability—Critical Today, Essential Tomorrow" Nov. 16 - 19 in Long Beach, CA. This conference will bring together leading experts in the field to discuss critical factors in the success of potable reuse projects, including meeting regulatory hurdles, demonstrating environmental and economic viability, and enhancing public understanding and acceptance. Success stories will be highlighted from Arizona, California, Florida, Texas, Asia, Australia, Europe, and Africa. For additional information contact: Courtney Tharpe, 703-548-0880 x 101; ctharpe@watereuse.org or check: http://www.watereuse.org/conferences/potable-reuse

Rainwater Harvesting Conference

The American Rainwater Catchment Systems Association will hold its annual conference in Santa Monica, Sept. 16 - 18, with an optional pre-conference workshop on the basics of rainwater harvesting on Sept.15. Titled Water "The New California Gold Rush," the conference is directed at the beginner as well to the expert installer of rainwater harvesting systems. ARCSA promotes rainwater catchment systems in the United States through educational opportunities, workshops and the exchange of information at its web site. For additional information about the organization and/or the conference check: www.ARCSA.org

Hamburger...continued from page 1

Bialik reported that University of California Cooperative Extension researchers Thomas M. Aldrich and Herbert Schulbach worked out a figure of 1,300 gallons of water per quarter-pounder from data in various agricultural reports. This was in the 1970s. Various water-related organizations including the U.S. Geological Survey, National Park Service and a bottled-water trade group found the figure sufficiently reasonable to adopt for their use.

The cattle industry, however, raised objections to the figure. The Sacramento-based Water Education Foundation, which had been using the 1,300 figure to educate students about water use, conducted a new study in 1991 that halved the figure to 616 gallons per burger. The California Beef Council then funded a peer-reviewed study in 1993 that came up with the 100 gallons per burger.

The USGS decided there was merit to the various figures and that the range should be included in the agency's webpage showing food's water use. The webpage was reworked to include the various figures. Check http://ga.water.usgs.gov/edu/sc1.html to observe USGS covering all the bases.

Different approaches affected the outcomes of the research efforts. Striving for accuracy, Marcia Kreith, who conducted the WEF research — she is now a program analyst at the Agricultural Issues Center at the University of California — considered the different amounts of water lactating vs nonlactating cows drink. She also considered rain in her computation, a factor not included in the industry-sponsored research. Different input meant different outcomes.

The incident further demonstrates that caution must be the rule whether recycling water or statistics. Although the virtual water concept offers a refinement in determining water use and the means to ascertain greater accuracy, computing the virtual figure could involve greater complications than fixing other water-use figures such as the direct water use of a swamp cooler.

Public Policy Review

by Sharon Megdal

An American in Paris Realizes Arizona Could Do More to Save Water

I traveled to Paris in June to give a lecture sponsored by the Parisian water provider Eau de Paris and Centre National de la Recherche Scientifique. A government-funded research organization administered by France's Ministry of Research, CNRS and the University of Arizona recently entered into a four-year Joint International Unit on Water, Environment and Public Policy. The unit's purpose is to foster international, interdisciplinary and collaborative social science and water policy work.

In preparation for this trip, my first to Paris, I carefully perused my Rick Steve's tour book and was intrigued to read about a tour of the world's first underground sewer system. Located blocks from where my daughter and I were staying, Le Musée des Ecouts de Paris (The Paris Sewer Museum) earned a lukewarm rating — one-diamond signifying it is "worthwhile if you can make it"— yet was described as "fascinating, if slightly stinky."

Descending the steps to the underground museum adjacent to the Seine River, I was eagerly greeted by several young women, their enthusiasm likely the result of the museum often being overlooked by tourists who much prefer Notre Dame, the Eiffel Tower or the Louvre, attractions we also visited. I mentioned that I worked in water resources, prompting one young woman to provide me documentation along with the usual visitors' brochure. The self-guided tour included English translations. A display of special interest to me noted: "In 1977 the City covered about 10,000 hectares ... and had 2.1 million inhabitants. The suburbs, for their part, covered about 76,000 hectares and had almost 8 million inhabitants. This underlined the importance of water policy."

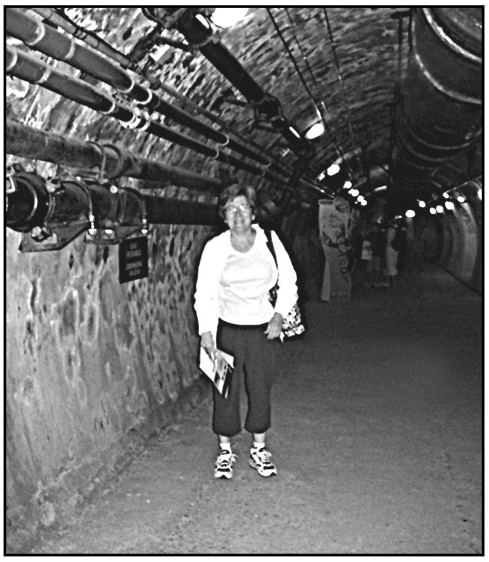
I was very excited to see water policy underscored, and I was struck by Paris' celebration of its water system, including its sewers. I thought the museum was very beneficial, a reminder to the community of its water history and the great engineering feats that have been accomplished. Museum coverage extends to the modern day.

I acquired very useful information from my Sewer Museum tour and a visit with the Directeur de l'Exploitation, Bruno Nguyen, at Eau de Paris. With the perspective I gained, I was struck with the differences between Paris and our state's two largest urban areas. An extremely densely populated city with plentiful water, Paris has long had two systems for potable and non-potable water deliveries, with non-potable water used for street cleaning and other outside uses.

My lecture focused on urban water management in Arizona and highlighted many of the water management challenges associated with living in a water-scarce, rapidly growing area. Challenges include: regional drought; uncertainties associated with climate change; growth in Arizona and the Colorado River region; water management outside the Active Management Areas, including water quantity assessments; water quality; use of effluent for potable and other water needs; access to and utilization of other renewable supplies; interstate and border water issues; the surface water/groundwater interface; riparian areas and other environmental considerations; and implementing effective conservation programs.

Discussion following the lecture focused on pricing of water and conservation efforts. I had no problem discussing pricing, noting that few places in the world incorporate scarcity in pricing of their water. I noted that water prices reflect the cost of extraction/diversion, treatment and delivery. We all expect water to become more costly over time because the cost associated with obtaining, treating and delivering water will increase over time. By how much and how quickly are the questions. Our system of water pricing associates no value to the water molecules themselves.

Questions were raised about conservation programs in Arizona, and although I could speak to some of what we do with tiered pricing and municipal conservation programs, I felt somewhat at a loss in discussing why we were not doing more water conservation. In preparation for my presentation, I did some quick calculations to compare use of potable water by Parisians on a per capita basis and the figures for Tucson Water customers. Although not entirely comparable, on a per capita basis, Tucson water use is easily twice as high as that for the Eau de Paris service area. It seemed to me then and still seems to me that we have considerable capacity to conserve more than we do.



Sharon Megdal at an underground Paris attraction – Le Musée des Ecouts de Paris (The Paris Sewer Museum) Photo: Bryce Megdal

Tucson, Pima County and many other entities around the state are placing renewed emphasis on conservation programs, and the Arizona Department of Water Resources is poised to develop conservation programs for the Fourth Management Plans in the Active Management Areas. I came home thinking that although conservation alone won't solve our water scarcity dilemma, we still need to better educate water users about conservation and the sources of our water supplies.

My Paris adventure served to renew my conviction that convincing Arizona water users to do more to conserve water is a necessary and relatively low-cost way of addressing scarcity.

Santa Cruz...continued from page 2

Raul Grijalva is a cosponsor of the House bill. Arizona Gov. Janet Napolitano and officials of the Arizona Department of Environmental Quality have testified on behalf of the House and Senate bills. Hearings were held on both bills in April.

Various industry groups oppose the bills and are organizing strenuous opposition, believing it will bring a storm of lawsuits that will hinder permitting and real estate development. A news release from the National Water Resource Association stated, "This proposal will expand federal control over every possible type of water body, puddle, moist land area, man-made waterway, storage facility, conveyance system, holding facility, or re-regulating reservoir. The new definition of 'waters of the United States' would include everything from swimming pools and hot tubs to stock watering ponds on private property."

The controversy about navigable waters also is playing out at the local level, in Pima County, although the dramatic, end-is-near press releases issued nationally have not been part of the fray. It has been mainly a bureaucratic affair, with departments within county government faulted for seemingly urging the Corps to deny CWA protection to the Santa Cruz River.

Pima County prides itself on its environmental commitment, with its Sonoran Desert Conservation Plan its most notable accomplishment. Lauded nationally, the plan, adopted in 2000, is a strategy to save open space and control development in environmentally sensitive lands. To some in Pima County, the Corps' suspension of the navigable river designation works against the grain of county environmental polices. That some Pima County officials might have encouraged the suspension added insult to injury.

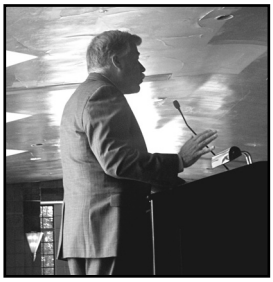
After the Corps recent action, memos came to light that some Pima County officials had urged the Corps and the Environmental Protection Agency to favor policies that would, in effect, eliminate CWA enforcement on Tucson waterways. Some viewed the memos as another example of the public works and transportation departments working at cross purposes with county planners over conservation issues.

Lest there be any doubt where Pima County stands on the issue, the Pima County Board of Supervisors agreed unanimously that the Santa Cruz River and many of its tributaries be protected and regulated under the CWA. The board also voted unanimously to conduct an internal review of county staff to determine responsibility for writing letters and memos opposing the navigable designation.

WRRC Begins Plans For 2009 Conference

The WRRC is following up its successful 2008 conference with plans for its 2009 conference. "Best Practices in Stakeholder Engagement in Water Resources Planning" is its working title, and it will be conducted Mar. 17, 2009 at the University of Arizona Student Union. More information will be available as plans progress.

The 2009 event continues a WRRC tradition of hosting an annual conference addressing a critical state water issue. The conferences serve as a forum providing people with water expertise and knowledgeable an opportunity to present and discus their information with interested participants. The conference series is a WRRC outreach service to the Arizona water community and the public.



U.S. Bureau of Reclamation Commissioner Bob Johnson addresses participants at the 2008 WRRC conference

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