

Can the Valley of the Sun be a Venice in the Desert?

In a brief commentary piece that appeared in the Aug. 23 Arizona Republic titled “Why the Valley could be the Venice in the desert” editorial writer Kathleen Ingles lauds efforts underway in Scottsdale to develop its canal areas as attractive public space. She hopes the completion of the gateway art project, part of the Scottsdale Waterfront, “sparks more interest in taking advantage of the scenic value of our canal system. Excluding the Central Arizona Project, metropolitan Phoenix has 131 miles of major canals. Four times more than Venice.”

Lest one thinks Phoenix may be singularly overreaching itself in claiming kinship with the Italian city, other U.S. cities and places have made similar claims at one time or another. Fort Lauderdale; San Antonio; Lowell, Massachusetts; the Lake Shore Cottages, St. Clair Flats, Michigan; and, of course, Venice, California all have claimed to be the Venice of America.

One of the earliest to stake such a claim was Camden, New Jersey. A Feb. 16, 1896 New York Times article disjointedly states: “City of Many Bridges. Trenton might be called the Venice of America. Has one hundred and four spans intersected and bordered, by a river, canals, creeks, and railroads, with, in many

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Architect Paolo Soleri’s design of a bridge and plaza on the Arizona Canal in downtown Scottsdale was recently unveiled to the public. Inset shows the Rialto Bridge in Venice. Inset photo: N. Barbieri

Wanted: A Viable Biofuel Crop to Grow in Semi-arid Arizona

by Joe Gelt

Dazzled by the gold-rush mentality promising U.S. farmers wealth by growing corn for ethanol production, an article in the Mar. 26 edition of Inside Tucson Business began, “Amber fields of corn growing, as far as the eye can see ... in Southern Arizona? It’s possible, say industry and agricultural research specialists, and it could happen sooner than anyone expects.”

It is indeed a fetching image. Whatever role Arizona may play in the promising field of biofuel production, however, corn is not likely to be the crop to enable farmers and others in the state to cash in on the developing biofuel market. Water and climate, especially water, limits what grows and thrives in the state. Despite alluring possibilities, Arizona is not a big corn-growing state.

What then is the biofuel future of the state? What can be grown in semi-arid Arizona for use in biofuel production?

Researchers at the University of Arizona are considering various crops for bioenergy production that could be grown in Arizona. Don Slack, department head, agricultural and biosystems engineering, says an ethanol group was formed and “We started looking and thinking about crops we might grow. ... We narrowed it rather quickly on sorghum, then we narrowed it further to sweet sorghum as opposed to grain or milo sorghum.”

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Slack says "Sorghum loves heat and loves drought and so is a perfect crop for Arizona." Water quality is less of a problem when growing sorghum. Since sorghum is grown as an industrial plant and not a food crop, effluent can be used for irrigation. Further sorghum is salt-tolerant, able to use marginal waters. Slack says, "It is the kind of crop you can grow in an arid climate where you have water of poor quality."

An acre of sweet sorghum grown this summer at a UA agricultural facility is about ready to be harvested. Slack says, "We are intending to harvest the sweet sorghum and produce the juice from the canes. Pinal Energy will run a batch through its fermentation and distillation process to get an idea of the yield of ethanol per gallon of juice and the ultimately gallons of ethanol per acre."

Stalks of sweet sorghum contain fermentable sugars in the sap equal to 400-600 gallons of ethanol per acre. This is about twice that from corn grain.

Sorghum holds promise for Indian farmers who have rights to a fairly significant amount of CAP water. The San Carlos Apaches and the Yaqui tribes have expressed interest in growing sorghum.

Slack thinks sorghum may interest Arizona cotton growers. He says, "If the US is going to get beat up by the World Trade Organization on cotton subsidies, farmers will be looking for an alternative to cotton. Sorghum might be a good alternative."

Some work remains to be done before sorghum becomes a viable Arizona crop. Slack says, "There is no question that we can grow it and it grows like crazy here. Getting it harvested and the juice fermented are the two big things now. If we can get a food or animal fodder out of it would be another plus. It would have the same appeal as corn."

"I'd say we are a couple of years out before we are producing much of this."

The algae option

Arizona's biofuel future then may not be amber fields of corn as far as the eye can see but sorghum fields stretched off into the distance. Another possibility, although not presenting a very picturesque image, is single-celled pond scum called algae covering pools and ponds. This may be a new bio-farming industry for Arizona, with commercial-scale microalgae production an up-and-coming crop for Arizona farmers.

Algae has been getting very good press lately as the most promising, environmentally-friendly way to produce biofuel, the rising star in the biofuel constellation. Only requiring sunlight, water and carbon dioxide to grow, the single-celled organism can quadruple in biomass in just one day. Depending upon the species, algae can produce oil for use as a biodiesel, starch that can be converted to ethanol by fermentation and hydrogen gas. UA researcher Joel Cuello's main research interest is using algae to produce oil — biodiesel as well jet fuel.

Cuello, from the agricultural and biosystems engineering department, says the desert is very well suited for growing algae. The desert's abundant wastelands or marginally arable lands can be fertile fields to grow algae. This means that hitherto unproductive lands can be put into production. Growing algae does not raise the prickly issue of using land that could be cultivated to grow crops, as

does growing corn.

Algae provides bigger payoff than higher crops. Whereas an acre of corn produces about 300 gallons of ethanol annually, an acre of soybeans about 60 gallons of biodiesel, an acre of algae could produce more than 5,000 gallons of biofuel each year.

Growing algae does not require abundant, high quality water. Water not suited for other uses without additional treatment, such as domestic uses or conventional agriculture, is suitable for algae growth. Secondary treated wastewater, rich in hydrogen and phosphorus nutrients, is excellent for growing algae. Irrigation runoff and dairy wastewater can be used. Also of special interest to Arizona some algae can thrive on non-potable saline and brackish waters.

Also, water savings are significant when growing algae. Cuello says, "If you are growing higher plants like corn or even sorghum you have to water them regularly. Not only is water consumption lower with algae, but there is less of a problem with evaporation." Further water saving result since water not taken up by the algae cells is recycled

Cuello notes another advantage to growing algae in Arizona. "We have a lot of sunlight here as opposed to, say the Northeast. Algae is a photosynthesizing organism so sunlight ultimately is their source of energy."

Along with research conducted at the UA, researchers at Arizona State University also are focused on algae, with work being done to develop industrial bioreactors to mass culture microalgae for biofuel production

Cuello says, "There are lots of different types of algae — myriads, thousands, millions. It is the matter of identifying the ones that are going to be the most productive for biofuels." He added, "And most likely that is going to be proprietary information for companies."

How soon will production plants be up and operating in Arizona to convert algae into biofuels? Cuello says, "I would say it is within striking distance. It is very close."

Cellulosic ethanol

Another option to consider is cellulosic ethanol, a biofuel made from plants or plant waste. Cellulosic ethanol can be produced from agricultural waste, sugar cane residue, timbering slash, wood chips and prairie grasses such as buffalo grass and switchgrass. Some analysts contend that if ethanol is ever to replace gasoline it will have to be produced from these abundant sources. Corn is not going to do the job; it is expected to meet only 10 percent of the U.S. transportation needs.

A recent USDA report on cellulosic ethanol acknowledges that

Global Water Sponsors Supplement

This edition of the AWR contains a 4-page supplement from Global Water titled Total Water Management: Resource Conservation in the Face of Population Growth and Water Scarcity. By sponsoring the supplement, Global Water is supporting the publication of this newsletter. We appreciate the opportunity to work with Global Water and the utility's generous support.

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Water Vapors

Forum: Public Input Key to Good Water Policy

A recent Tucson water forum may have raised more questions than it answered. Some of the questions raised were: Who is in the know about water issues? What do these experts know? What is the role of the public in addressing water issues? What does the public need to know?

Called "A Community Conversation About Water," the event, to give it its due, was as much a colloquium and a dialogue as a conversation. In his introductory remarks, Peter Likins, chairman of the Tucson Regional Town Hall, emphasized the importance of the above questions when he stated, "If people do not understand the problems, the problems are not solved in a democracy."

The first part of the program, titled "Lets get on the same page with some facts," provided facts and information: the sources of Tucson's water supplies were identified and water management and

regulations were discussed. This provided the groundwork for the dialogue that followed.

The first panel session was an opportunity for water professionals, those who, in one way or the other, are involved in the water affairs of the state, to discuss their areas of expertise and interests. These are the people in the water know telling what they know; they included agency heads, public officials at the local, county and state levels and utility personnel.



Forum participant poses question to water panel. Photo: Joe Gelt

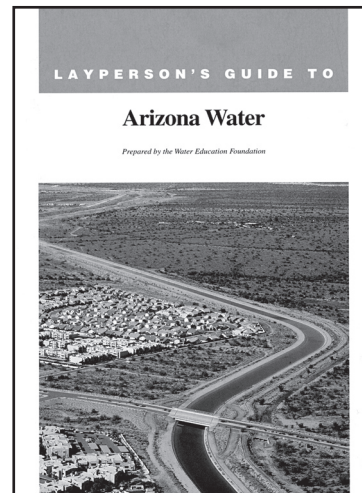
Panels addressed various water issues. These sessions were an opportunity for audience members, many of whom were members of the public, to offer comments and ask questions. Perhaps the drift of the day's sessions could be best summarized

Layperson's Guide to Arizona Water Now Available

As part of its commitment to serve the water education needs of Arizona citizens, the Water Resources Research Center teamed up with the Water Education Foundation to produce the Layperson's Guide to Arizona Water. The publication meets a long-standing need: it offers in a single, reader-friendly source information Arizona citizens need to be well informed about state water issues.

Few would doubt the need for a layperson's guide or primer describing the ins and outs of Arizona water. Arizona is a rapidly growing state attracting people from many different areas who need to be educated about water in a desert and semi-arid environments. The guide is aimed at a wide audience, from water professionals needing a quick reference, to policy makers wanting a reliable summary of the facts, to the water-interested citizen.

The guide is available as a free public service at the WRRC web site: <http://ag.arizona.edu/AZWATER/> or a hard copy can be purchased from the Water Education Foundation, 717 K St., Suite 317, Sacramento, CA 95814; phone: 916-444-6240; web site: www.watereducation.org (\$10 per copy; \$7 for ten or more copies.)



by a comment made by a participant toward the end of the event. He described his response to the day's sessions by stating, "I expected a unified, slick, packaged position;" in other words, an official statement reflecting the views of the state's water experts. Instead, he found "criss-crossing" among the experts, various opinions and even disagreements. He found this encouraging, that an open-ended process was underway seeking solutions to water problems.

Sharon Megdal, director the Water

Resources Resource Center, stated in conclusion, "Today was meant to be a beginning. It was not necessarily meant to be a day of answers." It may seem ironic that by showing that solutions to water problems are often elusive the day's dialogue helped ensure a better informed water conversation in the future.

The Water Resources Research Center cosponsored the event; See Sharon Megdal's column on page 11 for her impressions of the community water conversation.



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News Briefs

Great Lakes States Wary of Western Water Designs

New Mexico Gov. Bill Richardson recently hit a sensitive nerve among some northern states when he said water rich states should share their abundant supplies with states less favored with water supplies. A Democratic presidential candidate, Richardson made the statement while campaigning in Nevada. It is a statement tailored to bring joy to the hearts of Nevada officials, a state where Richardson hopes to show strength in the state's Jan. 9 primary.

Richardson told the Las Vegas Sun that if elected, he would begin regional water discussions to work out strategies for northern-tier states to share their abundant resources with parched southwestern states.

"I want a national water policy," Richardson told the paper. "We need a dialogue between states to deal with issues like water conservation, water reuse technology, water delivery and water production. States like Wisconsin are awash in water."

The interregional water transfer concept is not new. Richardson's statement, however, attracted special attention, even notoriety, since he spoke as a presidential contender and a governor of a western state. Some officials in northern states, especially Great Lakes states, perceived his statement as a threat to take seriously, reflecting a position shared among western states.

They point out that western states do not have a monopoly on drought. Drought has hit Lake Superior which recently re-

corded an all-time low; all the upper Great Lakes, in fact, are significantly below their longtime average levels.

Yet the Great Lakes remain an attractive resource; the lakes including their connecting channels and the St. Lawrence River contain about 20 percent of the world's fresh surface water.

In a previous visit to Nevada, Richardson announced, if elected, he would create a new Cabinet post focused on water issues.

Prescott Valley Auctions Effluent

The Town of Prescott Valley sold 2,724 acre-feet of effluent for more than \$67 million during a two-day auction on Oct. 29-30. The town awarded the effluent to the highest bidder—Water Property Investors LLC, a New York-based water-resource-investment firm—for \$24,650 per acre-foot. Water Property Investors can re-sell or use the water to meet state water supply requirements for new subdivision developments. Local and national bidders responded to the auction.

The town's consultants, WestWater Research LLC, arranged a price-floor bid process. This involved the town setting a minimum-bid price by negotiating a \$53-million agreement with Aqua Capital Management, a Nebraska-based private equity fund. If the town did not receive a higher bid during the two-day auction, Aqua Capital would have got the effluent at \$19,500 per acre-foot.

The purchased rights are expected to be able to support as many as 12,000 new

homes in Prescott Valley where population is projected to increase by 55 percent from 2005 to 2025.

As West Withers East May Bloom

As if western farmers were not already confronting enough problems, what with drought and growing urban water demands, a Sept. 22 New York Times Op-Ed piece argues the nation's agricultural production would be more sustainable with "a return to using the land and water of the East, which dominated agriculture in the United States into the 20th century." The article is titled, "Let the East Bloom Again."

The authors, Richard T. McNider and John R. Christy, professors of atmospheric science at the University of Alabama, note that up to the mid-1900s much of the US food and fiber came from east of the Mississippi River. The authors say this eastern dominance of agriculture came to an end by 1980, destroyed by western irrigation and improvements in transportation.

They claim returning agricultural production to the Eastern United States under irrigation would increase efficiency and result in environmental benefits. They say, for example, western farmers apply three to four feet of water per acre to grow a good crop, whereas eastern farmers, blessed with heavier rainfall, only need a few inches of irrigated water per acre.

The authors also point out that since the rivers in the East are very large and regional irrigation demands rather slight,

Venice in the Desert...continued from page 1
cases, bridges over bridges."

Whatever the references to Venice are worth, Scottsdale's efforts along its waterfront are indeed impressive in their own right. Plans for a pedestrian bridge that the city commissioned internationally famed Italian designer Paolo Soleri to design were recently unveiled to the public. The design of the 120-foot bridge include a 11,000-square-foot plaza with shade and sitting areas. Soleri Studios will create earth cast walls to frame the plaza, and the plaza will include the largest bell ever cast by Soleri.

Pedestrians crossing the bridge on its permeable walkway will

feel breezes and hear the sound of water flowing beneath. A canopy 8 feet overhead and comprised of 22 panels will shade the bridge. Moveable furniture will be located on gathering areas near the water's edge. Two 60-foot-high pylons, will create a shaft of light that will mark the solar events of the equinox and solstice dates and cross-quarter dates.

If approved, construction of the \$3 million bridge could begin as early as July, to be completed by March 2009.

Bridge designer Soleri founded the Cosanti Foundation to promote his concept of "Arcology"—architecture coherent with ecology. The Foundation constructed Arcosanti, located in Cordes Junction, as well as Cosanti in Scottsdale.

Homeland Security's Border River Environmental Record Mixed

The Department of Homeland Security is tasked with securing the U.S. border. Its prime strategy in undertaking this responsibility along the U.S.-Mexico border is to fence areas between the two countries. As the agency plans and builds fences along the Arizona-Mexico border, river issues inevitably arise, with security priorities and environmental values both needing consideration. With this situation comes the potential for conflict but also cooperation as is demonstrated by the following stories.

Border Fencing Project to Proceed

Efforts to halt construction of border fences and barriers through the San Pedro Riparian National Conservation Area were thwarted when Michael Chertoff, homeland security secretary, waived several environmental laws, thereby bypassing a federal judge's restraining order temporarily blocking the project.

Defenders of Wildlife and the Sierra Club filed an administrative appeal with the U.S. District Court in Washington, D.C. arguing that the Bureau of Land Management acted improperly when allowing fence construction within the SPRNCA. They claimed that a fence built across arroyos feeding the San Pedro River would result in erosion, sediment buildup and might even shift the riverbed. They say this, in turn, could adversely affect cottonwood-willow woodlands and the movement of jaguar, ocelot and coati that roam the border region.

U.S. District Judge Ellen Huvelle concluded that the organizations convincingly demonstrated that environmental damage could result if the project is completed as planned. Also, Judge Huvelle was unimpressed with BLM's assessment of the environmental effects of the project, noting that it was completed in three weeks without opportunity for public comment.

The immediate issue is the environmental consequences of a planned wall of up to 17 feet high and some vehicle barriers along a two-mile stretch through the SPRNCA. The broader intent of the appeal is to pressure Homeland Security to undertake an environmental impact statement reporting on the overall impacts of the fencing project along the Arizona border. Such a study was done in conjunction with fencing along the Texas border.

Chertoff's action renders the judge's decision moot. The 2005 Secure Fence Act that mandated the border fence granted him the authority to waive the laws.

Project Restores Riverbed, Secures Border

In what might seem an unlikely partnership, environmentalists and security officials are concerned about the blighted environ-

mental conditions along the 23-mile Colorado River bed dividing Mexico and the United States, near Yuma.

Environmentalists say the dense, overgrown and invasive vegetation within the riverbed crowds out native mesquites and willows needed to provide crucial habitat for wildlife and endangered birds including the Yuma clapper rail, California black rail and bald eagle.

Security officials are concerned because the riverbed, thick with vegetative growth, offers good hiding spots for those seeking to avoid the notice of law enforcement authorities. The degraded environmental conditions have created a high-crime area where smuggling, banditry and sexual assault occur within the overgrowth of concealing vegetation.

Environmentalists desire a return to natural conditions, rich with native vegetation and birds and wildlife; Border Patrol officials want a safety zone where increased visibility will discourage illegal activities.

In what must be a highly unusual description of an environmental restoration project, Yuma Crossing National Heritage Area officials, focusing on the border protection angle, described the project as a "security channel" and "an innovation homeland security" in efforts to attract support. They were highly successful, gaining support from a wide range of agencies and organizations, from Environmental Defense and the Sonoran Institute to the Border Patrol and the Department of Homeland Security.

Expected to cost between \$7 million to \$9 million, the project would restore an approximately 2.2-mile segment of river including 435 acres of wetlands. Fund raising is expected to take about a year, with restoration work to begin within two years.



Homeland security and environment gain when Lower Colorado River segment is restored.

only a small amount of river water would be pumped to support agriculture. For example, although the Tennessee River has twice the natural flow of the Colorado River, less than 1 percent of its water is consumed for various uses; the Colorado River is depleted by the time it reaches Mexico.

Also they say expanding irrigation in the East would not deplete its rivers to the extent that western rivers have been depleted.

For example, they state that three percent of the Alabama River would support one million irrigated acres whereas nearly 30 percent of the Colorado River is needed to irrigate the same acreage.

Whatever water is withdrawn and stored in the East would be imperceptible compared to the West. The West needs huge reservoirs costing billions of dollars and taking years to fill, whereas in the East water

can be stored in inexpensive, off-stream storage ponds without damming rivers.

To meet the cost of a regional shift in agricultural production the authors look to the same benefactors who were so generous to the West — the federal government.

Such a strategy, they argue, would "show the world that irrigation can be done sustainably, by irrigating where water is plentiful."



Guest View

Careful How You Define “Sustainable Yield” and “Safe Yield”

Tom Maddock, department head, University of Arizona's Department of Hydrology and Water Resources, contributed this Guest View.

The U.S. Fish and Wildlife opinion requires that the Fort Huachuca area reduce water use to “sustainable yield” by 2011. Some may interpret this to mean if the annual groundwater pumping equals the annual amount of recharge, the system will be operating in “sustainable yield” mode. Such an operating procedure will not sustain the San Pedro River, its associated riparian ecosystem, or even its groundwater supply.

The San Pedro River Basin hydrology is simple in concept but complex in detail. Basically, precipitation falls in the mountains, flows down the mountain streams to the alluvial fans in the pediment, and infiltrates into the groundwater system where it slowly flows within an aquifer. Ultimately, it discharges to the riparian system, either as base flows to the stream or evapotranspiration from the plants, trees and bare ground.

Prior to development, the natural recharge processes of the San Pedro River Basin were in equilibrium with the natural discharge processes. There were wet years when the recharge exceeded the discharge, but these were balanced by the dry years when the discharge exceeded the recharge. The point is that the river and its ecosystem were sustained by the aquifer discharge which, on the average, was equal to the aquifer recharge. The system was in balance. But consider this: If one pumps all the natural recharge, where is the water for the discharge to the stream and its riparian ecosystem? There isn't any! Rather than saving the riparian system, pumping all the groundwater recharge every year ultimately guarantees its death.

One should not confuse sustainable yield with safe yield, although both concepts lead to the detriment of riparian systems. To define safe yield, we need to define capture. The groundwater pumped by a well from an aquifer is either derived from a decrease in storage in the aquifer, a reduction in previous discharge from the aquifer, an increase in the recharge, or a combination of these changes. Capture is defined as the increase in recharge plus the decrease in discharge. Figure 1 illustrates the sources of capture: 1) an increase in groundwater recharge from losing streams (or increased infiltration), (2) a decrease in groundwater discharge to gaining streams (or interception of baseflow) and (3) the reduction in the component of evapotranspiration that is derived from the saturated zone.

If we restrict the groundwater pumping to the capture, there will no longer be a decrease in storage. Because the loss of storage associated with groundwater pumping manifests itself as cones of depression, no further loss of storage means no further increase in the well's cones of depression. Restricting the ground-

water withdrawals to what may be captured is a definition of safe yield for the aquifer. However, since the capture sources are from the stream and the riparian ecosystem, such a restriction of pumping is not a safe yield for the stream or riparian ecosystem! Not only applicable to issues on the San Pedro, sustained yield and safe yield concepts apply to other basins within the Southwest.

Obviously, there are additional complexities to the hydrologic system and its water balance. Some have suggested that waste waters be treated and either recharged to the aquifer or discharged to the river. However, the waste waters are always going to be less than the waters extracted because of consumptive use, so there will always be a loss in groundwater storage even if all the treated effluent is injected back into the aquifer. The storage loss will manifest itself as a cone of depression that will capture surface water and riparian evapotranspiration. If all the treated effluent is discharged to the river, essentially what we are left with is a great Ponzi game with huge storage losses producing cones of depression that ultimately capture water from the river and its riparian ecosystem. Even after all the wells stop pumping, this capture will continue in order to fill the cones of depression. Regardless of where the treated effluent is discharged, over the long term there will be substantial loss of water in the stream, loss of riparian ecosystem, and loss of groundwater storage. This is neither sustainable yield nor a safe yield for the stream or riparian ecosystem! 🏠

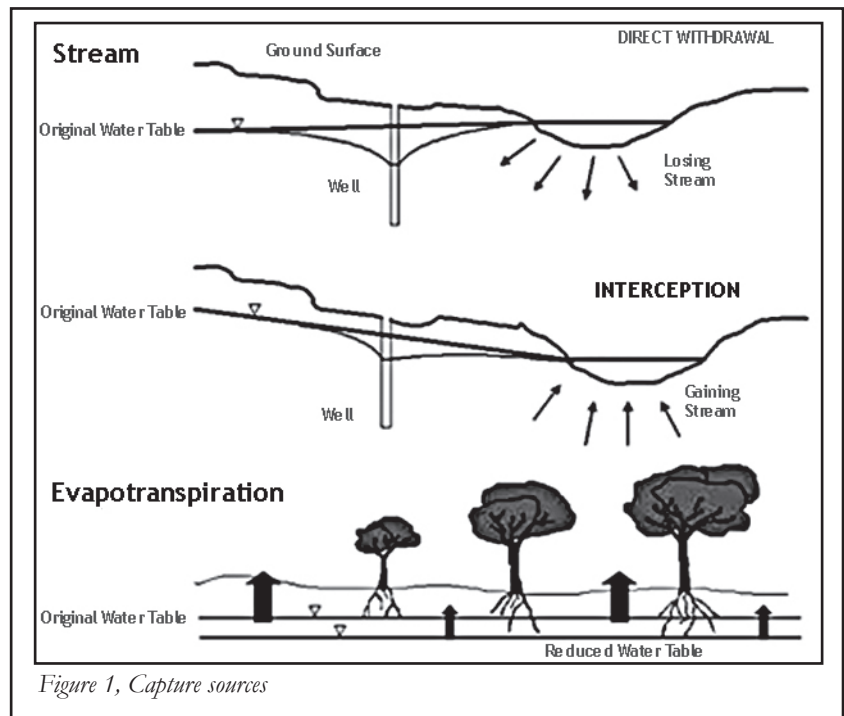


Figure 1, Capture sources

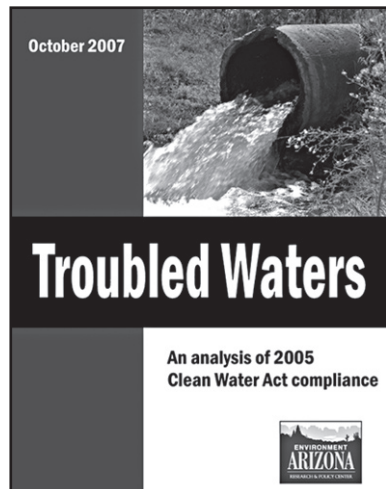


Legislation and Law

Report: AZ Facilities Often in Violation of CWA Limits

A recently released report analyzing compliance with the Clean Water Act finds Arizona is not an exception among states; its industrial and municipal facilities, often having exceeded their CWA pollution limits in 2005, reflect a national trend.

The report, *Troubled Waters: An Analysis of Clean Water Act Compliance in 2005*, found that 57 percent of all major U.S. industrial and municipal facilities discharged more pollution into



waterways than allowed by law at least once during 2005, with the average facility exceeding its pollution permit limit by 263 percent. This is close to four times the legal limit.

In Arizona, over 42 percent of industrial and municipal facilities discharged more pollution into state waterways than their CWA permits allowed in 2005. Twenty-three facilities accounted for 200 of the violations. On average, Arizona facilities in violation

of CWA exceeded their limits by 821.6 percent or nine times the legal limit.

The report further indicates that Arizona polluters in 60 instances exceeded their CWA permit by at least 500 percent over the legal limit.

At the national level, major facilities exceeding their CWA permits surpassed, on average, permit limits by 263 percent or nearly four times the allowed amount. The 10 U.S. states with the highest averages in exceedance of permit limits are New Mexico, Vermont, Arizona, West Virginia, Iowa, Mississippi, Illinois, Indiana, California and Hawaii.

Appendix B of the report lists Arizona facilities that exceeded their CWA permits at least once between Jan. 2005 and Dec. 2005, as well noting the waters receiving the pollutants, the kind of pollutants and the percent of exceedance. Appendix B shows that Arizona's most egregious violator is the International Wastewater Treatment Plant in Nogales. The IWTP has the dubious distinction of being the only facility in the state exceeding limits every reporting period of 2005, scoring a total of 45 violations. Most of the violations were due to high levels of nitrogen and ammonia in effluent discharged into the Santa Cruz River.

Erik Magnuson, program associate with Environment Arizona, says the report's findings only reflect major operations in the states, not the thousands of minor facilities also discharging pollution in waterways across the country. As such, the results, according to

Magnuson, are just the tip of the iceberg.

The CWA was passed in 1972 with the intent to eliminate discharges of pollutants into waterways and ensure that all U.S. waterways are swimmable and fishable. In what has proven to have been an over optimistic expectation, the drafters of the law intended that the discharge of all pollutants to be eliminated within 15 years of the laws passage. In the three and half decades of its enforcement, the CWA, however, has noticeably improved water quality. The report makes the case that much more work remains to be done.

The information was obtained from the U.S. Environmental Protection Agency in response to a Freedom of Information Act request. The year 2005 is the latest year that CWA compliance records of major U.S. facilities are available.

The report was published by Environment Arizona, an advocacy group, and its release was timed to coincide with the 35th anniversary of the CWA. The full report is available at: <http://www.environmentarizona.org/>

House Water Caucus Formed to Collectively Address Issues

The formation of a Bipartisan House Water Caucus is underway, with two Arizona congressmen among the initial members. A Sept. 12 "Dear Colleague" letter, signed by the five co-chairs and 30 members in the House of Representatives, stated that the caucus, "will allow members of congress committed to the goals of promoting dialogue about our nations's water issues to have a meaningful educational venue and forum about how best to realize those goals."

Western states are well represented in the caucus, with three of the five co-chairs and 12 members from California, four members from Texas, two from Arizona, as well representation from Colorado, New Mexico, Wyoming, Nevada and Oregon. The two Arizona congressmen are Republican John Shadegg and Democrat Gabrielle Giffords.

Outlined in the letter are 12 principles defining the caucus' goals including supporting water re-use policies, improving coordination among state and federal regulators, easing the federal barriers and "red tape" facing state-level public works projects, opening new avenues for water infrastructure finance and encouraging federal assistance for groundwater banking.

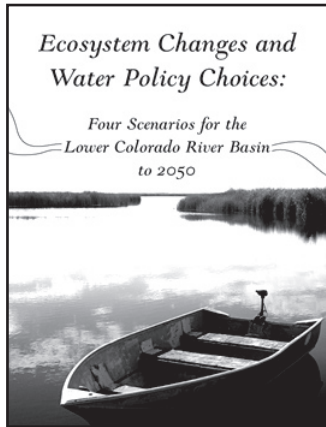
Valentina Valenta from Co-Chair John Linders (R-GA) office says the caucus' co-chairs have agreed that one of the first tasks will be to gather support and pass HR 135. First introduced in the 107th Congress, the bill passed the House in the 108th and the 109th sessions but never made it though the Senate.

H.R. 135 authorizes the president to appoint a nine-member 21st Century Water Commission, made up of national water experts, to study all aspects of water management and develop recommendations for a comprehensive national water policy.



Publications & On-Line Resources

New Report Offers Strategy to Save/Restore Lower Colorado River Delta



Once an amply watered region, its willow thickets, mesquites and cottonwoods providing shelter and habitat to many and varied species of bird and animal life, the Lower Colorado River Delta has become an environmentally troubled area.

A recent Sonoran Institute report calls for an environmental rescue mission to save the delta and restore and protect it as functioning ecosystem.

Despite its present bleak environmental conditions, the 82-page report is hopeful that the delta can be brought back from the brink.

The delta is where the Colorado River once emptied into the sea, south of Yuma; it is literally at the end of the line. Very little flow reaches the delta after upriver diversions to farms and cities and storage behind reservoirs. Drought is further limiting water supplies. All of this has taken their toll; once 3,000 square miles, double the size of Rhode Island, the delta has shrunk 90 percent during the last 50 years.

To sustain remaining Colorado River Delta riparian habitat, the report says a minimum of 50,000 acre-feet of water is needed annually. A very small fraction of the total flow of the river — about three-tenths of a percent of the river's historic annual flow — the amount is nonetheless another draw on a river already overdrawn.

The report says the Colorado River Delta now survives on accidental water that comes its way from leakages and inefficiencies in the Colorado River system and its canals. In these water-tight times efforts are being made to capture this water, further reducing flow to the Delta.

Shortages loom and environmentalists fear its consequences may be fatal to the delta. Proposing action to preserve the delta

is now timely since plans are currently underway for dealing with possible, and increasingly likely Colorado River shortages. In a sense water allocation is back on the table, and environmentalists are concerned that such plans recognize the importance of restoring the delta.

"We have a unique near-term opportunity for bi-national cooperation as these water shortage rules are being developed," said Luther Propst of the Sonoran Institute. "One of the goals of this report is to increase the flexibility of water allocation and delivery within the constraints of the current treaty between Mexico and the United States. All users of water from the river would benefit from additional flexibility."

The report's policy recommendations include: extending proposed water banking and trading mechanism to include Mexico and entities not currently Colorado River contractors; dedicating base and pulse flows to restore key riparian areas in the Colorado River Delta; encouraging water conservation by setting urban and agricultural targets, reducing subsidies on water-intensive crops and sharing best practices across the region; and creating mechanism to safeguard the well-being of rural U.S. and Mexican communities affected by ongoing transfers from agricultural to municipal water use.

The report also looks into the future to stimulate discussion and prompt action regarding Colorado River management. Four future scenarios are presented and are titled: a dry future; the market rules; Powell's prophecy; and a delta and estuary once more. The scenarios are not intended as road maps but fictional narratives intending to stimulate discussion among stakeholders about the desired future of region.

Creating by the Sonoran Institute and Island Press and written by Mark Lellouch along with consultants Karen Hyun and Sylvia Tognetti, the report is available by contacting: The Sonoran Institute, www.sonoran.org / 7650 E. Broadway, Suite 203, Tucson, AZ 85710, (520) 290-0828; or Island Press, www.islandpress.org / 1718 Connecticut Ave., N.W., Suite 300, Washington, D.C. 20009, (202) 232-7933. Copies of the report are available at either web site.

Residents of Salt, Verde Watersheds Can Access Water Data on SRP's New Web Site

Salt River Project has launched a new web site for the public interested in river and stream flows and rainfall events across the Verde River and Salt River watersheds. At www.WatershedMonitor.com, data collected by the United States Geological Survey and SRP is now available in a web-based format that allows watershed stakeholders to check the pulse of the Salt and Verde watersheds. The

web site is to provide flow data at low-flow gages installed by SRP in cooperation with other stakeholders. The Prescott National Forest, Arizona Game & Fish Commission and the Verde Watershed Association provided assistance with the construction and installation of low-flow gage sites along the Verde River and its tributaries. These sites were selected based on input from citizen and agency stakeholders along with certain technical considerations such as stability of the stream channel, access and security. The website will evolve over time as SRP continues to provide watershed information.



Special Projects

New Project Maps Location of Earth Fissures in Arizona

Prescribed by law, maps show home buyers areas to avoid

The Arizona Geological Survey is embarked on a legislatively mandated earth fissure mapping project to provide developers, Realtors, prospective homeowners and others ready access to maps showing the locations of earth fissures in populated counties of the state. According to HB 2639 (2006) earth fissure maps must be made available to the public in both printed and electronic format on request, and updated on a five year basis. The Arizona State Land Department will provide on-line public access to the maps.

This summer AZGS released individual, 1:250,000 scale, earth fissure planning maps of Cochise, Maricopa, Pima, and Pinal counties that are now available on-line. The maps show all currently mapped or reported earth fissures. Compiling and releasing the maps are step one in the process of preparing highly detailed fissure maps to be completed over the next few years. Also available on line is a 25-page report, Earth Fissure Mapping Program: 2006 Progress Report, describing the steps taken to produce the maps and noting future AZGS mapping plans.

Michael Conway, chief of AZGS Geologic Extension Services, says, "We refer to the 1:250,000 maps as planning maps; they are designed to guide us in developing the finer scale mapping." He says, however, that the larger scale maps contain all the earth fissures from previous fissure studies they were able to compile. The finer, 1:24,000 maps will be prepared for specific priority areas.

Conway says, "We have a list of 23 priorities areas within the four counties. We are finishing up Chandler Heights, and that will be coming out shortly. ... We are charged with providing the data to the Arizona State Lands Department. It then has 90 days to get the information out."

The maps identify areas with known fissures. Each area is assigned a name, and the maps are indexed with the designated names of the fissure study areas to facilitate communication among scientists, local governments, real estate agents and the general public.

Study areas were ranked on three criteria: 1) potential for rapid development of communities; 2) the presence of known or reported fissures; and 3) areas where rapid land subsidence has been reported.

Pinal County has the greatest number of study areas because it has the highest num-

ber of reported fissures. Also new construction in the area is rapidly encroaching on fissure zones. Maricopa County has fewer study areas; its fissures are generally located in rural and other areas unlikely soon to be developed. An exception would be along border with Pinal County where developers are rapidly constructing new homes.

"Tremendous" Response to Fissure Maps

On June 4 the Arizona Geological Survey placed its earth fissure county maps on-line at www.azgs.az.gov. Since then, according to Michael Conway, chief of AZGS Geologic Extension Services, "A tremendous amount of attention is being paid to them." Responses vary. For example, Conway says that Maricopa County might have 20 or 40 downloads per day, although if a news article about fissures appears the number might spike to about 700 downloads per day.

Following is the total downloads of the various earth fissure county maps from June 4 to Oct. 31: Maricopa County - 14587; Pinal County - 9851; Cochise County - 2216; Pima County - 2541. Also, there were 8442 downloads of the Earth Fissure Mapping Program report.

AZGS acquired high-resolution recent aerial photography from Maricopa and Pinal counties, and older, lower resolution photography of all known earth fissure areas from the U.S. Geological Survey through a University of Arizona hosted web service. Professional quality GPS equipment and data processing software were purchased to ensure that all disclosure mapping meets exacting standards of accuracy and precision.

The maps will not provide a person with complete assurances that an area will not be threatened by future earth fissures. Conway says, "Just because we have not found fissures in an area doesn't mean fissures cannot appear. We anticipate as we go through these 23 studies finding fissures that have not been previously mapped. It is not at all impossible that new fissures will develop over time, especially if we continue to withdraw water at a rapid pace from the subterranean aquifers."

Arizona is not the only state undertaking an extensive earth fissure mapping program, although it is striving for special recognition in the field. Conway says, "We are trying to take a leadership role in doing some of the mapping and establishing protocols for mapping earth fissures."

Noteworthy accomplishments include developing standards and procedures to ensure earth fissure mapping accuracy, coordinating among involved agencies, and working with affected stakeholders to assist them to deal with the maps when released. The project has provided an opportunity to prioritize mapping areas, evaluate



A fissure that opened unexpectedly near Queen Creek this summer. Photo: Arizona Geological Survey

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Announcements

ADEQ Issues RFP for Water Quality Funding



The Arizona Department of Environmental Quality invites applications to its Water Quality Improvement Grant Program for projects to manage non-point source pollution. Approximately \$1.8 million is available to fund the upcoming cycle, its distribution from the U.S. Environmental Protection Agency pursuant to Section 319(h) of the Clean Water Act. The grant program strives

to fund projects that implement sufficient, economically and scientifically sound management practices resulting in quantifiable improvements to surface water quality. Other outcomes of strong projects include education and public awareness of water quality issues, active citizen involvement, innovative approaches to problem solving, and long-term project maintenance and results. Proposed projects must include: on-the-ground implementation component; 40 percent nonfederal match; education and outreach component with specified projected results; and demonstrated water quality improvements. Deadline for the optional pre-proposal submission is Dec. 14; deadline for final, completed application is Feb. 13, 2008. Grant manual and/or workbook can be obtained by contacting Bertha Thomas, 602-771-4630 or toll-free, 800-234-5677, X 771-4630.

workshops and associated meetings will take place throughout the week of May 19-23, leading into Memorial Day weekend. For additional information check <http://ecr.gov/ecr.asp?Link=604>

Water Conservation/Xeriscape Conference

The Xeriscape Council of New Mexico is completing plans for its 13th Water Conservation/Xeriscape Conference to be conducted Feb. 21-22 in Albuquerque. The conference will focus on Water, Art and the Environment with essentially a day devoted to environmental issues and a day to art and the landscape. Please check web site for conference updates: www.xeriscapenm.com

CAP Award for Water Research

The Central Arizona Project's Award for Water Research offers is an opportunity for students at any college or university in Arizona to win a cash prize for their unpublished research. Papers submitted for this award should focus specifically on water issues that affect Central and Southern Arizona and the Colorado River. Papers can focus on legal, economic, political, environmental, or water management issues, as well as any other issue that might be of interest to CAP or Arizona water users. First place award is \$1,000; second place \$500. Winners will be invited to present their research at the Arizona Hydrological Society's annual symposium, expenses paid. June 1 is the deadline, although papers are accepted throughout year. To apply, submit complete paper along with a one-page abstract to Vicky Campo at vcampo@cap-az.com; for more information or to apply on-line check www.cap-az.com

Conflict Resolution Conference

The U.S. Institute for Environmental Conflict Resolution will be hosting its 5th National ECR Conference in Tucson, May 20-22, 2008. ECR 2008 will provide a forum for exchange of ideas and mutual learning about the field of environmental conflict resolution among government representatives, non-governmental organizations, tribal nations and members, community based groups, environmental advocates, corporate entities, resource managers and users, private individuals, and professionals in the conflict resolution, mediation and consensus building fields. Training events, panel

Water Reuse, Desal Abstracts Invited

The WaterReuse Association, the Water Environment Federation, and the American Water Works Association are inviting abstracts for the 23rd Annual WaterReuse Symposium. Scheduled Sept. 7 - 10, 2008 the event will be conducted in Dallas and is appropriately titled, Water Reuse & Desalination: Solutions as Big as Texas. To be considered for a technical presentation, submit an abstract via the WaterReuse Association's website by January 24, 2008. For additional information and to submit an abstract check: <http://www.watereuse.org/index.html>

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mapping at different scales and levels of detail, and develop consistent standards, protocols and methodologies.

The AZGS mapping program is generally viewed as a long overdue project. Most existing fissure maps were made before the GPS system was available. Further, the existing maps were not digital nor at adequate scales needed by developers and local building officials for detailed planning purposes. Some known fissures have never been mapped at more than regional scale.

The intent of the law requiring the availability of the maps and information is to raise home buyers' awareness about fissures and make information about them more generally available. Coming from out of state, many home buyers are unaware of the earth fissure threat. Home buyers also have been stymied by the lack of readily available information.

Copies of the planning maps and report are available at: <http://www.azgs.gov/>



Public Policy Review

by Sharon Megdal

Water Professionals, Citizens Mutually Benefit at Tucson Water Forum

Goal is common understanding, ongoing dialogue



In my last column, I highlighted the need for broadening and deepening the dialogue on Arizona's water management challenges. On Friday, Oct. 26 the Tucson region took a step in that direction, with almost 300 people attending a community conversation on water, an event co-organized by the Water Resources Research Center, Southern Arizona Leadership Council, Tucson Re-

gional Town Hall, Arizona Department of Water Resources, Central Arizona Project, Pima Association of Governments, and the Southern Arizona Water Users Association.

We carefully planned the event to accomplish several objectives. First, we wanted to attract individuals who do not spend most of their waking hours thinking about water. Second, we hoped to present basic water information in a way to truly interest the audience, without participants suffering what I call the "glazed-over-eyes syndrome." Third, we wanted to include different perspectives on important water issues. Fourth, we desired the event to be conversation-friendly. Fifth, we wanted audience input on questions posed to them. We hoped to do all this and more by employing an interesting and lively format!

I am writing this column two days after the event, on a deadline not allowing time to review written comments and responses to our questions. But I have some immediate thoughts to share about the event and its overriding goal of broadening and deepening the water dialogue. It bodes well for the success of the event that our audience was diverse.

Our first panel helped get us on the same page with information about our current water situation, including progress toward meeting the region's safe-yield goal. Experts included Tucson Active Management Area Director Ken Seasholes, always an excellent source of current information and superb graphics. Our morning panelists encouraged participants to understand that the region's challenges fit into a broader puzzle. They and keynote speaker Rita Maguire provided the backdrop for the day's questions, comments, and, at times, debates.

Even lunch was an opportunity to exchange information, with Tucson City Manager Mike Hein and Pima County Administrator Chuck Huckelberry offering their perspectives and fielding questions. In confronting the future of the Tucson region, both underscored the need for coordinated planning and region-wide discussions. Huckelberry discussed the county's efforts to connect water availability with land-use decision making. In addressing our water conservation ethic, Hein asked the much contemplated question: Why conserve water if we don't know what we're conserving for? (Look for more on this topic in my next column!) The need

for enlightenment, patience and compromise was stressed. With newspapers tending to focus on local interjurisdictional battles, I was heartened by Huckelberry's and Hein's comments; I feel more hopeful that the region's approach to growth and water issues will not be fragmented.

The seven-member afternoon panel shared its sometimes differing perspectives. Figuring prominently in the discussions were climate change and environmental water needs. Madeline Kiser of Sustainable Tucson stressed the importance of improving access to science as well the need to consider the social and economic costs of actions. Andy Laurenzi noted that transportation infrastructure will play a key role in determining the location of people and businesses. Several called for a paradigm shift in our thinking about the future of the region and state. Climate change, coupled with rapid growth, is clearly increasing people's awareness of water management and related uncertainties.

The day's dialogue was truly multi-directional. I look forward to reviewing the audience feedback forms. Participants were asked the following questions: What are the most pressing regional water issues?; What additional water information is needed?; What are the desired outcomes of the meeting?; What type of mechanism do we need to keep the conversation going?; and What message(s) do participants want to convey to regional leaders and decision makers?

I imagine others agree with me that as we devise policy solutions to huge water resource challenges we confront both opportunities and obstacles. Comments about the need for water infrastructure, as well as the fact that water pricing does not reflect resource scarcity, made me think of the possibility of a water use tax, with proceeds going into an infrastructure fund.

Although some shudder at any mention of taxes, it may be time to consider some bold actions to better accommodate the influx of people into the region forecasted by panelist Dave Taylor and others.

The discussion prompted me to think once again about the need for a more diverse economic base. A slump in housing or land development causes the economy of the entire state to suffer significantly. We need to diversify our economic base and recognize that good jobs may be connected to water using activities, like high-tech manufacturing. We should look at an activity's water use as it relates to community goals before judging its acceptability.

End-of-the-day definitive solutions were not expected, nor even possible after a one-day dialogue. We all know water issues are complex and that water is one part, albeit a very critical part, of a larger puzzle. What we hoped to do was emphasize the importance of a common understanding and an ongoing water dialogue. In that we were successful. I thank all involved. 🏡

Biofuel...continued from page 3

cellulosic fuel holds “some longer-term promise,” but maintains that “much research is needed to make it commercially economical.” Therein lies the challenge, to develop an efficient and economic way to produce ethanol from cellulosic materials.

Research on growing switchgrass in Arizona for a cellulosic biofuel is just getting started. UA researcher Mike Ottman of the plant sciences department will be working on a research project next year to study six different types of perennial grasses including switchgrass at different level of evapotranspiration. The same research will be replicated at Washington State University, with USDA funding both projects.

Ottman says, “What we are trying to do is look at the water requirements for perennial grasses in the western United States. ... Washington and Arizona. We are covering a range of possible environments.”

The intent of the research is to determine whether switchgrass and other types of grasses are viable as a biofuel with regards to water use in the West.

Ottman says it remains to be seen whether cellulosic ethanol production will be a viable option for Arizona agriculture. He says, “I imagine we can get pretty good yield because of our sunshine and warm weather conditions; our disadvantages is our production cost A big part of the production cost with irrigated agriculture is the water.”

Ottman sees agriforestry possibilities in the state, with fast growing trees such as the poplar planted for use in ethanol production.



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We look forward to hearing from you.

In fact, U.S. forests are being seen lately as the good source of wood for ethanol. Forest Service Chief Abigail Kimbell recently proposed replacing 15 percent of the nation's gasoline with ethanol made from wood from forests. She said much of this material would be small-diameter trees and underbrush, with most of it obtained during forest thinning efforts to remove underbrush to prevent wildfires.

An Arizona official mentioned that forest thinning for bio-energy could result in a water advantage to the state. Along with providing wood for ethanol, the thinning of forested areas would increase the amount of water flowing from watersheds, thus adding to available water supplies. 🏡