



Raising High-Rise Crops

Agriculture faces a conundrum: populations needing food are increasing and the necessary land and water resources to produce crops are not. What to do?

The perplexing situation was addressed recently in an article in the November *Scientific American*, titled, "Growing Skyscrapers: The Rise of Vertical Farms." Author Dickson Despommier says an insufficient supply of arable land is available to feed a projected 9.5 million population by 2050. Agricultural practices causing environmental harm contribute to the problem.

His solution is to grow food indoors in glass high-rises; he figures that a 30-story structure located on one square block could be as agriculturally productive as 2,400 outdoor acres, with less spoilage. Crops could be grown year-round on these vertical farms under rigorously controlled conditions.

He is proposing an agricultural revolution with an urban twist: high-rise vertical farms would be located in urban areas on now vacant lots and multi-story greenhouses constructed on rooftops. Food would be grown using non-mechanized farming techniques and relying on recycled urban wastewater in areas with the greatest demand, thus reducing transportation costs. This means less fossil fuels consumed and less emissions. Urban life would become more sustainable.

Techniques for growing crops in-doors — drip irrigation, aeroponics and hydroponics— have been successfully applied throughout the world. Despommier singles out for special notice the 318-acre Eurofresh Farms located in Arizona that produces bountiful and varied crops 12 months a year.

He mentions the Southwest with its abundant sunshine as being especially hospitable to vertical farming. He would modify his structures in the region to two or three stories, 50 to 100 yards wide and miles long to maximize natural sunlight for growing and

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Are vertical farms in Arizona's future? High-rise greenhouse-like structures are a suggested solution to the problem of ensuring sufficient land and water for agriculture's future. See side story. Graphic: Kenn Brown, Mondolithic Studios.

Decentralized Treatment Promises More Delivery and Use of Recycled Water

by Joe Gelt

The growing public acceptance of reclaimed water is overcoming one hurdle to maximizing the use of this valuable and, at times, maligned resource. Another hurdle to be vaulted is providing the means for delivering reclaimed or recycled water from water treatment facilities to various users, for irrigation, landscape and domestic purposes, even for possible in-home use.

Many say that decentralized water treatment facilities are the best means for getting over hurdle number two. They view the design and operation of such plants as a key strategy for efficient and economic delivery of reclaimed water to users.

Decentralization has lately been getting a lot of press. It is a key concept in the ongoing quest to increase supplies of clean energy and water. It is a strategy to downsize infrastructure, thus reducing the cost of maintaining a grid, whether an electric power grid or the subsurface pipes delivering water and removing sewage. Decentralization offers a counter argument to the

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bigger-is-better idea.

A remedy to ineffectual concentration, decentralization occurs at different scales. Some systems are located onsite, treating relatively small volumes of water and serving individual or groups of dwellings and businesses located relatively close to each other. At a much different scale, decentralization also can serve relatively large communities and subdivisions.

Wastewater is not waste

Ever watchful for ways to increase the state's water supplies, the Arizona Department of Water Resources is committed to increasing the state's use of reclaimed water, which is now at about four percent of total water supplies. Karen Smith, ADWR deputy director, says "One way we can do that is to make sure when we are sitting our wastewater treatment plants, we do it strategically, thinking about how we are going to use that wastewater productively."

A strategically sited wastewater treatment plant gains the advantages of decentralization. Advantages include a significant reduction of overall capital costs, phased construction and the potential for local water reuse in dual plumbing, thus ensuring a supply of treated water for irrigation and other non-potable uses.

Designing and operating a decentralized water treatment system, whether for a large city or a local development, means changing the way business has been done. The first order of new business then is to get over what Smith calls "the legacy of wastewater as waste."

She says, "It is a movement away from the legacy of wastewater as waste when all that was looked at was economies of scale — the building of a plant of sufficient scale and with enough partners to treat wastewater and dispose of it as inexpensively as possible — to realizing its value as a resource."

AZ and decentralized water treatment

A system built with economies of scale foremost in mind might be a large wastewater treatment plant fed by an extensive and costly regional collection infrastructure and ideally located down-gradient of its sources of wastewater, not a plant favorable to using reclaimed water.

USGS Sponsors Newsletter Supplement

This edition of the AWR included a four-page supplement describing work being done by the U.S. Geological Survey. The USGS's sponsorship of the supplement helps pay the expenses of publishing this newsletter. We appreciate the opportunity to work with USGS and the agency's generous support.

For example, such a system does not serve the reclaimed water needs of Vail, Arizona, a community located about 25 miles from Tucson's water treatment plants. The town's wastewater is moved via pump stations at a significant energy cost to the Tucson plants for treatment. If Vail wants to conserve water supplies by using recycled water, treated water would then have to be pumped back to Vail from the treatment plant at further cost. This is a disincentive to reclaimed water use.

In effect, water would be making a long round-trip journey, arriving at the plant as wastewater, then treated and pumped back to Vail for reuse. Decentralized plants would shorten the round-trip journey, from water users to treatment plant and back to reclaimed water users.

Smith says efforts are underway to encourage small-scale water treatment plants in the state. In response to a directive from Governor Jan Brewer ADWR, the Arizona Department of Environmental

Project Considers Decentralized Wastewater Treatment

Decentralized wastewater treatment is an issue of concern in a University of Arizona research project. Treated water for reuse and potable supplies now have their own infrastructures, and a research question is whether they could be integrated into a single system to be more sustainable and resilient.

This could involve a decentralized wastewater treatment system consisting of multiple satellite treatment plants and a dual distribution system providing potable water for consumption and nonpotable water for reuse. Research will consider the location of such decentralized plants as well as their operation, whether they are reliable and cost effective and at what scale.

A goal is to develop a computer model to guide water managers concerned about energy

use and increased water demand. The research also will address the question of the public's willingness to use treated wastewater and to what extent. Researcher Kevin Lansey, head of the UA department of civil engineering and engineering mechanics, defines the project as having a "triple bottom line:" economic cost, environmental cost and social costs or social acceptability.

The National Science Foundation awarded \$2 million to Lansey and four of his colleagues; the project is titled "Optimization of Dual Conjunctive Water Supply and Reuse Systems with Distributed Treatment for High Growth Water-scarce Regions." The UA researchers will work with the City of Tucson, Pima County and Global Water, a private water utility.

Quality and the Arizona Corporation Commission are forming a blue ribbon committee to address water sustainability.

She says, "The group will look at impediments to the increased use of recycled water ... We are looking at a goal of getting to 30 to 40 percent of reclaimed water use by 2030. Decentralized plants would be a big part of it, to look at how we could maximize the use of smaller scale water treatment plants in an area as vast as the Salt River Valley and metropolitan Phoenix."

Decentralization strategies

The topic of decentralized wastewater treatment raises some important questions: How can the strategy be adapted to areas already served by large centralized treatment facilities? Can such areas be retrofitted for decentralized wastewater treatment and to what extent? What is involved in adapting and installing such systems in areas being planned and developed?

Some cities in the Phoenix metropolitan area with large centralized wastewater treatment systems have achieved to some degree decentralized operations by "water scalping."

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WRRC News and Information

Annual WRRC Conference to Have Leadership Theme

Planning is underway for the 2010 WRRC annual conference to be held June 9-10 at the University of Arizona's Student Union. The theme for this year's conference is the critical need for environmental leadership in Arizona, where the challenges are pressing but the political will to confront them is too often lacking. The conference, titled "Creating New Leadership for Arizona's Water and Environment in a Time of Change," is being planned to engage young and old in looking for fresh approaches to filling the leadership gap.

The WRRC is collaborating with the Morris K. and Stewart L. Udall Foundation, the Flinn Foundation and the UA Water Sustainability Program to organize the conference. Current and past Udall and Flinn Scholarship winners will be recruited to participate, along with other young leaders with strong interests in water and the environment. In addition, more experienced participants will be invited to be Mentors and provide the benefit of their greater knowledge throughout the conference in panels, roundtable discussions and workshop sessions.

The intent of the WRRC conference is to build connections between people of different ages and experience levels, different backgrounds and perspectives, in the spirit of mutual support and learning. In keeping with tradition, participation in the conference is open to all. A low registration fee and availability of fee waivers are planned to promote participation by students, teachers, young professionals and interested individuals from across the state.

Two On-line Programs Announced

Two new on-line programs, one having to do with K-12 education and the other community outreach are now available to the public.

In the area of education, Arizona Project WET, a WRRC component that promotes water education in the schools — WET stands for Water Education for Teachers—

WRRC Awarded Prestigious Grant



Top row, left to right: Kelly Holt, UA Foundation; Sharon Megdal, WRRC Director; Suzanne Ornelas, UA Cancer Center. Front Row: Pulliam Trustees Nancy and Frank Russell and Carol Peden Schilling.

The Water Resources Research Center is the recipient of a Nina Mason Pulliam Charitable Trust award to fund a one-year study entitled "Arizona Statewide Environmental Water Needs Assessment." The \$73,000 grant will enable WRRC to compile data and identify information important for future water management planning. It is expected that the assessment will improve public awareness about environmental water needs in Arizona. This is the first NMPCT award given to the University of Arizona.

is offering an on-line interactive module, "Learning It By Living It: A Wild Ride Through the Water Cycle." (<http://project-wet.arid.arizona.edu/>)

Students using the self-paced learning module share the adventures of two sixth-grade students who become water molecules. The UA's Water Sustainability Program provided funding for the project; the module was developed by Theresa Crimmins at UA Arid Lands Information Center.

A second on-line module on simple techniques for backyard water harvesting is accessible free of charge to the public at <http://rwh.arid.arizona.edu>. It makes use of "how to" video clips, photos, demonstrations, animations, and interactive quizzes to communicate simple principles of capturing rainwater for landscape use.

Funded by the Water Sustainability

Program, the learning module was created by Theresa Crimmins and Katherine Waser and the team at the UA Arid Lands Information Center.

Emerging Waterborne Pathogens Workshop

A UA Water Sustainability Program workshop on emerging waterborne pathogens will discuss the latest research findings on emerging pathogens, detection and treatment issues, new real-time technologies, source tracking, regulatory issues and a special session on *Naegleria* and *Behmuthia*.

The targeted audience includes researchers, water professionals, agency personnel and public health professionals. The event will be conducted March 9, 2010 in Tucson. On-line registration and program information are available at www.wsp.arizona.edu.



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Arizona Water Resource Staff

Editor: Joe Gelt
kgelt@cals.arizona.edu

Layout: Patrick Hayes

Newsletter link:

<http://cals.arizona.edu/azwater/awr>

WRRC web site:

<http://cals.arizona.edu/azwater>

WRRC Director: Dr. Sharon Megdal

Arizona Water Resource

Water Resources Research Center
 College of Agriculture and Life Sciences
 The University of Arizona
 350 North Campbell Avenue
 Tucson, Arizona 85719

520-621-9591 FAX 520-792-8518
 email: wrrc@cals.arizona.edu



News Briefs

ADEQ Chief Proposes Permitting Fee Increases

Cutbacks in the state budget have prompted the Arizona Department of Environmental Quality chief to propose that businesses pay more for permits needed from his agency. Current fees fall far short of covering the cost; until now tax dollars have supplemented fee payments. ADEQ head Benjamin Grumbles wants the new fees to take effect beginning July 1, the start of the budget year.

The ADEQ program that would be most impacted by proposed fee hikes would be the Aquifer Protection Program. Anyone planning to discharge water that might reach groundwater must go through the APP process. Research fees for an applicant, now set at \$61 per hour, would double.

Grumble's proposal to raise fees has met with general approval, even among business interests who would end up paying the higher costs. Many are supportive of the rate increase fearing that without it the state agency would lose primacy over programs, such as the Arizona Pollutant Discharge Elimination System (AZPDES) program, mandated by the Environmental Protection Agency. If ADEQ cannot do the job, then the federal agency would take over the programs or at least be more directly involved in their operations. A Dec. 9 editorial in *The Arizona Republic* posed the situation as "fees or feds," very much espousing the former.

According to the editorial, state funding

for ADEQ has been cut 60 percent from 2007, down to \$13 million, with money also swept from its dedicated funds. More cuts are likely.

Court to Consider if NEPA Applies to Loans to Build Along San Pedro

Federal housing agencies have argued in court that they should not be required to conduct environmental assessments when guaranteeing loans to military veterans building houses outside Fort Huachuca along the San Pedro River. The case was heard by the 9th U.S. Circuit Court of Appeals on Nov. 5.

The case first went to court in 2005 when Earthjustice, the Center for Biological Diversity and Maricopa Audubon Society sued the Department of Housing and Urban Development, the Small Business Administration and the Department of Veterans Affairs to force them to conduct environmental assessments under the Endangered Species Act and the National Environmental Policy Act.

The environmental groups say that the increased water use resulting from construction poses a threat to the Southwest willow flycatcher and the Huachuca water umbel, a flower found only in wetlands along four Mexico and Arizona rivers.

The federal agencies argued that granting loan guaranties is not a "major federal action" that requires a NEPA evaluation.

They say the agencies are not legally empowered to require veterans to conserve water. Further, they argued that housing loans cannot be said to cause groundwater depletion and that there is no direct link between them.

Development in the area along the San Pedro River is a longstanding issue. Legislation passed in 2003 exempts Fort Huachuca from responsibility for water use outside the base. According to Earthjustice, the Department of Veterans Affairs has guaranteed more than 4,000 home loans in the area.

EPA Report Ranks Arizona as High Water User

A recent U.S. Geological Survey report shows western states as the top per capita water users in the nation, with Arizona ranking among the top five. Nevada had the dubious distinction of ranking first with a consumption of 303 gallons of water per person per day; Utah follows consuming 245 gallons, then Idaho with 244 gallons, Arizona with 204 gallons and Colorado with 198 gallons. Nevada and Utah are considered the nation's most arid states.

The report, undertaken every five years, indicated that Americans used 410 billion gallons of water per day in 2005, a 5 percent drop from 1980 peak levels despite a 30 percent population increase over the same period. U.S. water use was about 1 percent less in 2005 than in 2000.

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The most efficient and economic way of disposing of wastewater was to cooperate with the City of Phoenix and pump all wastewater to the Phoenix's 91st Avenue Wastewater Treatment Plant. Second thoughts occurred when the value of wastewater was recognized. The cities then began operating small-scale plants, called scalping plants, located in strategic locations in the community to better distribute and use reclaimed water. The plants scalp water from the treatment process and send the solids to the 91st Avenue plant.

The City of Tempe for example built the Kyrene Reclamation Plant as a water scalping facility. The plant treats water scalped from the city's wastewater to class A+ effluent quality for use on turf, with the solid waste then going to the 91st Avenue plant.

Small-scale decentralization

A possibility for a large city to ponder, decentralization is more adaptable at a smaller scale, when a small or modest-sized area is planned and developed, an area as small as 36 square miles. It is not retrofitting to be done, but ground-level labor. At this level, a better view of the workings and potential of decentralized treatment is evident.

Graham Symmonds is the chief technical officer of Global Water, a utility at the forefront in Arizona in promoting the use of small-scale decentralized wastewater treatment facilities. He says the best time to install a decentralized system is before development occurs.

For example, Global Water is involved with the city of

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Guest View

Journalists and Scientists Have Different Roles, But They Share a Goal — An Informed Public

Melanie Lenart teaches a University of Arizona course on environmental writing in the department of Soil, Water and Environmental Science. Her book, Life in the Hothouse: How a Living Planet Survives Climate Change, is scheduled for release in April by the University of Arizona Press.

Sometimes a 900-word column in a major newspaper can bring more attention to the nation's pending water shortage than a year's worth of scientific papers. When *Unquenchable* author Robert Glennon of the University of Arizona's law college wrote a Washington Post column called "Our Water Supply, Down the Drain," his words potentially reached some three-quarters of a million readers—with internet access expanding potential readership by millions.

The hope of reaching more people is one reason some scientists and policy experts are writing for newspapers and other public venues. Another reason involves a growing tendency among grant-providing agencies to require public outreach. Finally, internet access is inspiring more scientists to share their thoughts directly with the public by posting details about their research and writing blogs.

Meanwhile, the number of working journalists keeps dropping as newspapers and magazines succumb to the overall economic downturn as well as hardships specific to publishing—which include the internet's tendency to ignore copyrights.

With that in mind, I'd like to consider the many similarities and yet defining differences between science and journalism, and how we support practitioners. As a newspaper reporter who trained and worked as a scientist and now blends this into a science writing career, I have been exposed to the inner workings of both professions.

At their best, scientists and journalists both seek truth. This guiding principle enlightens research investigations, whether in the field and lab, or through legwork and interviews. Any type of research involves loads of background reading. In their articles, journalists and scientists both strive to set their own perspectives aside to consider other sides of an issue, with the understanding that new evidence could overturn a presumed truth.

The writing style they use differs greatly, with scientists favoring statistical analysis, passive voice and abundant journal references while journalists sprinkle their writing with anecdotes, quotes and real-world examples.

For writing to qualify as journalism, the writer should have no vested interest in the topic. In practice, a vested interest usually boils down to monetary terms—no payoff for a certain slant, no job with the organization featured, no stock in the company garnering the headlines. If conflicts exist, journalists are expected to mention them.

Articles are the product by which journalists make a living. Reporters receiving a weekly paycheck need to churn out daily articles to keep their jobs. Magazines thrive on freelance writing, typically paying by the word rather than the hours invested. Editors value

independence more than affiliation.

Thus the source of support creates a big difference between scientists and journalists. Scientists often earn money from research grants or university appointments. Articles, they usually write for free. Journalists traditionally thrived indirectly on advertising dollars, for ads running in publications or broadcasts.

The easy access of the internet makes it challenging to raise enough money from advertising dollars, so publishers are looking for other avenues of support.

One avenue involves the so-called New Media approach. It incorporates the non-profit method to raise money, including by seeking grants and donations to research and write stories or support publications. *High Country News* and *Mother Jones* have courted donations for years, but most publications have relied only on advertising dollars and subscriptions for support.

It's interesting that this latest twist on the media landscape would increase the similarities between journalists and scientists. At the moment, though, far fewer grant opportunities exist for those doing journalistic research than for those doing scientific research.

Yet we can't expect scientists and policy experts in academic institutions to meet the need for informing the public. These scholars are busy doing research and writing papers for peer-reviewed journals, organizing conferences and workshops, and training and educating students. Generally, those in charge of promotions rank science writing and other types of outreach efforts far behind peer-oriented work.

And we can't expect the media to provide the depth of scientific information needed to keep the public informed. Journalists are busy keeping an eye on government, with a constitutional role as government watchdogs.

Somewhere between science and traditional journalism lies the art of communicating about science beyond or behind the issues of government policy. The internet suits this mode. It can provide depth by allowing readers to "drill down" into a topic by following links to increasingly specific details.

People seek accessible information. This struck me again when I bumped into Robert Glennon at the Paradise Café while working on this guest view. His book *Unquenchable* has made a splash on the public scene, even landing him an interview with Jon Stewart on *The Daily Show*.

When I asked how the book was doing, Glennon noted *Unquenchable* had passed a mark reserved for the top 2 percent of books by selling more than 5,000 copies. Not necessarily big bucks, considering that authors typically earn \$1 or less per copy. Still, it has other rewards for those interested in spreading a message. "I get an invitation to speak maybe once a day," Glennon said. "I have to do triage."

Books for the general public and the internet both offer

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Special Projects

Water Bills Could Be Better Used to Promote Water Conservation

Karen Smith, Arizona Department of Water Resources deputy director, examined water bills from around the state and concluded that bills as a water conservation tool have a generally untapped potential. She believes top-bloc water users, those consuming water in excess of a certain base amount, might change their water-wasting ways if water bills appropriately reflected excess usage. Also, she says bills could provide more water-use information that would encourage conservation among all water users.

Her inquiry about Arizona water billing was prompted by work done in Aurora, Colorado. She says, "I saw they were doing some interesting pricing with the top bloc ... The city found that when prices got to about \$8 per 1,000 gallons behaviors changed."

She then turned her attention to drought-stricken Australia. She says, "We talked to some people from the University of Adelaide in South Australia, and they had a similar experience, that when the price of water in the top bloc got to a certain level - \$8, \$9, \$10 per 1000 gallons - it changed behavior, but less than that, it did not."

Smith decided to look at water bills from different Arizona cities to find out what kind of information was provided, how the rates broke down and what they charged top-bloc water users.

"I discovered how very little we charged for the top bloc of water," she says. "Tempe, for example, might charge \$1.93 per 1,000 gallons over 25,000 gallons used... its top bloc. We need to look at a much higher dollar amount for the top-bloc of water. Colorado and Australia learned that typical top bloc pricing is not sufficiently high to create an economic disincentive."

Smith also says she was "stunned to find the lack of informa-

tion on Arizona water bills. She says information is needed on bills to provide a context for water users to interpret their use relative to houses of the same average size to determine if their use is above average. She says, "If we told people how their water use fit with the average I wonder what would happen. ... This could hopefully change water use."

Considering ADWR's role in promoting water billing to encourage conservation she says, "Our conservation program includes a best management practice matrix. ... One of the things it looks at is pricing. We don't have a BMP on bills but I think that is a great idea, to provide a model bill to show the kind of information that would make a difference."

Report Discusses Agriculture, Water in Arizona

The Council for Agricultural Science and Technology recently published an issue paper titled "Water, People, and the Future: Water Availability for Agriculture in the United States." Water Resources Research Center

Director Sharon Megdal wrote the Arizona section of the issue paper and also was the chair of the task force of eight scientists, educators, and resource analysts who worked on the CAST publication.

Through case studies, the issue paper discusses the diverse demands for water resources

of four specific areas of the United States—California, Arizona, Florida, and the High Plains—with particular focus on the implications for agriculture.

One of the largest water users, agriculture will undoubtedly be significantly affected by changes in water availability and cost. Agriculture may not be able to take for granted an abundant, reliable supply of water.

Increased water use by the industrial and residential sectors will continue to be at the expense of agricultural water supplies. Less future available water means that irrigated agriculture must make substantial efforts to be more productive and water efficient.

The full text of the issue paper can be accessed free of charge at the CAST website (<http://www.cast-science.org/>); hard copies are available for a shipping/handling fee.

She cautions that her sample of water bills is rather limited, obtained from about 12 cities. Yet she says, "I have been surprised. These are frankly the most sophisticated cities. It is probably reflective of the nature of existing billing systems, but a model bill could assist in identifying needed criteria for the next generation of water billing software."

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photovoltaics for power.

Despommier also describes the paths best not to take. He says that intensive, highly mechanized industrial farming capable of producing a greater yield of genetically-modified crops fertilized by agrochemicals is not the answer. Nor is the further deforestation of land to produce farmland. Both have severe environmental consequences.

Despommier summarizes: "Vertical farming could revolutionize how we feed ourselves and the rising population to come."

For another, more here-and-now perspective of Arizona agriculture and its future water needs see above sidebar. It notes a recent CAST issue paper (Council for Agricultural Science and Technology) titled "Water, People, and the Future: Water Availability for Agriculture in the United States."



Public Policy Review

By Sharon Megdal

Now's the Time to Fit Together the Pieces of an Arizona Water Plan



Over time, I have become more and more convinced that Arizona needs to do a better job of planning for our water future. We face water challenges within and outside of the Active Management Areas. I suspect no person knowledgeable about our complex water issues would deny we face challenges associated with growth and limited water supplies. Significant uncertainties abound, including

those associated with flows of the Colorado River.

A recent survey suggests that Arizonans recognize water as a major issue needing investment. The Center for the Future of Arizona's Gallup Web survey of 831 Arizonans asked that they prioritize six options for the best use of their tax dollars. The greatest number of respondents (28 percent) chose: "Adopt a water management plan that protects water supplies for the entire state." Rural areas and small cities registered greater support for water management planning than other sectors, at 28.7 and 29.6 percent respectively. Otherwise, little difference existed in the opinions by geography, attachment level, or age when it comes to water.

The next most popular policy option (21.5 percent) was "balancing population growth with preserving open space and recreational opportunities." Other options included mass transit systems, new highways and roads, improved interstate transportation and high speed Internet. Admittedly, survey results merely suggest what policies or investments citizens are likely to support in the future. Results clearly depend on the structure of the survey instrument itself. Nevertheless, they suggest that citizens recognize the need for investment in water infrastructure.

What do I mean by water planning? I recently responded to this question by stating that I would begin simply by identifying (1) what water needs have been identified by jurisdiction/water provider; (2) which entities may be looking at the same water sources (such as the Colorado River); and (3) where economies of scale could be realized for infrastructure investments. It was suggested that I call the exercise a "Needs Assessment" rather than a "State Water Plan." I have no problem with that; that is exactly what I am suggesting we do. One has to know the needs before one can identify the solutions.

So, by all means, let's get people together to talk about their needs and see where solutions overlap. Let's engage in a sustained discussion — in other words, we don't go home after collecting data — about water sustainability in Arizona. Let's discuss the water needs of current and future residents, agriculture and industry (including energy), as well as water needed to support the environment. Let's also talk about issues that may not be on the horizon for many of us. For example, the May issue of *Southwest Hydrology* iden-

tified carbon sequestration as an issue. What if efforts to sequester carbon in deep aquifers limit our future ability to use aquifers? Very few experts are discussing the treatment of poor quality groundwater as well as efforts to sequester carbon.

The Arizona Department of Water Resources has worked long and hard to collect the data presented in its water atlas. We need to take a collective look at that data and see what additional information we need to gather. We need communities throughout Arizona participating, much as they do with transportation planning.

Resources necessary to support a needs assessment, however, are limited since Arizona is cutting agency budgets. This makes it difficult to carry out existing tasks, let alone take on an assignment as significant as a statewide needs assessment/planning exercise. But all the work does not have to be done by ADWR. If we put our heads together, we can perhaps come up with a strategy involving the universities, and loaned executives from local governments, water agencies, industry and non-governmental organizations.

Arizona Cooperative Extension will be visiting some of Ari-

zonia's communities to conduct water listening sessions. County Extension and campus personnel will listen to communities' questions and concerns about water. This winter, we will host a visit by the director of the Oklahoma Water

Megdal on Blue Ribbon Panel

WRRC Director Sharon Megdal has been invited to join the Blue Ribbon Panel on Water Sustainability, established to provide advice to the Arizona Department of Water Resources, Arizona Department of Environmental Quality and the Arizona Corporation Commission. A prime task of the multi-agency collaboration will be to focus on increased water conservation and water recycling.

Resources Research Institute to hear about their participation in Oklahoma's water planning. At the WRRC, we recently received a grant from the Nina Mason Pulliam Charitable Trust (see page 3) to assess methods used to quantify the water needs of the environment, which will enable us to work more closely with stakeholders currently involved in this important work. Numerous stakeholders, including those outside the three-county Central Arizona Project service area, are participating in the ADD water process. Future needs of water providers and Central Arizona Groundwater Replenishment District are being considered. The Arizona Investment Council funded a study of water-related infrastructure needs that is posted on its web site.

The point is that many pieces of the puzzle are already being assembled. What we need is an overlay to bring the parts together for a comprehensive look at water and water-related infrastructure needs.

I continue to use the half-full, half-empty glass to summarize our water management situation. Some may say we cannot afford to undertake a needs assessment/planning exercise with the economy in a slump. Knowing that growth and prosperity will return to Arizona, I can only ask the question: Can we afford not to? 

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wonderful ways to share information on complex issues such as science. Scientists and journalists consistently agree that we need more science stories. So let's make sure we find a way to support writers, both official journalists and other writers who help fill in the details on science topics.

That's one way to help citizens understand the science of complex issues, including water policy. Quenching the public's thirst for knowledge can lead to better decision making about these important issues of sustainability. 

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Maricopa and new development around Eloy; both communities are expecting new growth and are located on the fringe of municipalities. Symmonds says the concern is not to build the 120-million gallon treatment facility Maricopa will need 100 years down the road but the one-million gallon facility that serves current needs and that could be expanded incrementally. The key to establishing such a system is installing suitable, appropriately-sized infrastructure rather than taking a one-size-fits-all approach.

He says, "The daily flow is now about 2 million gallons and getting that down a monster pipe designed for a 150 million gallon flow presents a tremendous number of operational problems from a sewer design perspective.

"We put in the infrastructure as the community is growing ... a kind of a just-in-time infrastructure solution. This saves us from having to put in monster infrastructure; we get the scale of infrastructure that is quite efficient."

Global Water's regional planning is based on townships of 36 square miles, with each planning area having a water reclamation facility, located on about 35 or 40 acres of land, with the capacity

to grow to treat 10 to 12 million gallons per day. Water distribution sites throughout the area distribute the treated water.

Symmonds says, "You don't have to worry about transporting recycled water back from a huge facility to where you are going to use it. We save money on the redistribution of the recycled water because it is closer to the end users."

He says there is not much difference in the technologies used by small-scale and large-scale plants. "There was a time when some of these technologies did not scale all that well, but they do now. You can have these small facilities that produce the right water quality and do it efficiently."

Progress of decentralization

Symmonds believes a business, not a technological breakthrough spurred interest in decentralized plants. He says, "The economics of the regionalization have become a real decision factor. Utilities are no longer willing to accept — or should not be willing to accept — inefficient infrastructure."

He says the next step is to deliver the treated water to a homeowner's property. "Initially it will be used outside for irrigation. But there is no reason it could not eventually be used in the house for toilet flushing." Using a nonpotable water source that way will save 50 to 55 percent of actual demand. A further advantage is that since not all water supplies will need to be treated to meet drinking water standards a considerable reduction in treatment costs will result.

The rebuilding of the country's water/wastewater infrastructure, an identified national priority, presents an opportunity to decentralize operations. Symmonds says this would be the time to think about laying a third pipe for recycling and installing small recycling plants to scalp water from sewer systems to provide recycled water to communities.

He says, "We will have an opportunity as infrastructure changes over the next 25 to 50 year to rethink it and redo it right." 