

President Shelton's Opening Comments
SAHRA Annual Meeting
Wed., October 11, 2006, Scottsdale, AZ

**“Sustainable Water for Arizona:
The Role of the University of Arizona”**

When I was born in Phoenix in 1948, the city had just reached a milestone - a population of 100,000.

Back then, the state's economy was based on agriculture and resource extraction. School children in the '50s and '60s were taught that Arizona's economy was based on the four Cs: Cotton, Cattle, Citrus, and Copper. Copper brought our family to Arizona. My father worked for the Bureau of Mines.

These industries depended on water, in a water-scarce state. Economic development was inextricably linked with water resources development, as it always has been.

The Valley of the Sun was settled by farmers who, like the Hohokam more than 1,000 years before them, banded together to build diversion works and extensive canal systems. Between 1911 and 1939, major dams and reservoirs were constructed in the Salt River Valley to store water and provide flood protection.

During my entire youth in Phoenix, we were in a drought. It started in 1942 and lasted through 1964. But the state's economy didn't collapse; in fact, it continued to boom, in large part because of the water infrastructure.

The drought ended abruptly in late 1965, with massive floods on the Verde, Salt, and Gila rivers, and on Rillito Creek in Tucson. This event underscored the limits of our ability to control water.

About this time, the University of Arizona recognized the importance of creating a new discipline to address this essential resource, and building on its expertise in geology, chemistry, public policy, fluid dynamics and engineering, it established the Department of Hydrology and Water Resources, which was unique in the United States.

Having left Arizona in the mid-60s, I'm delighted to be back. In one sense, it feels as if everything has changed. Phoenix is one of the fastest-growing cities in the country, with over 1.5 million people sprawled over 500 square miles, the core of an urban area that has become the corporate and industrial center of the Southwest.

A new set of C's are driving Arizona's economy:

- **computer chips** are manufactured where cotton used to grow;
 - **climate** has made the state a world-class tourist destination;
 - **copper** is still mined, but new technologies are used to extract and refine the ore;
- and

- **construction** of new housing has barely kept up with demand, as high-tech companies recruit new employees and retirees relocate here, all attracted by our quality of life.

Despite all the growth and economic changes, though, much remains the same. We still have droughts - much of Arizona has been in severe drought for 7 of the last 8 years.

And we still have floods. Just two months ago, monsoon storms in the fire-ravaged Catalinas north of Tucson triggered floods that permanently altered Sabino Canyon and overflowed the banks of the Rillito.

The biggest constant, and the reason we're all here today, is that our economy and the quality of life necessary to maintain it, still depend on water.

In fact, some new industries place even greater demands on our water supplies. For example, the electronics and semiconductor sectors that are creating many of the state's high-paying jobs require huge amounts of ultra-pure water. Tourism and endangered species issues have made riparian habitat and water-based recreation increasingly valuable, while groundwater pumping to support growing populations has overdrafted aquifers and threatened rivers and streams.

At the same time, climate variability & change, tribal water settlements, and transboundary water issues have complicated water planning.

Quite simply, the demands and constraints on our water supply have grown enormously. More than ever, our water needs to be safe, reliable, and long-term - in a word, *sustainable*.

So what role should the University play in assuring water sustainability for Arizona?

The University of Arizona is the state's only land grant university, which creates a unique mission. Traditionally, land grant institutions had colleges of agriculture that worked closely with farmers and ranchers. But being a land grant institution means more today. Land grant universities in the 21st century must address areas of societal interest and issues with which the state is grappling. In Arizona, that means water issues.

No other university in the country, perhaps the world, is as well endowed to take on this challenge. UA has:

- 28 degree programs and concentrations in water-related fields;
- 9 water-related centers and institutes; and
- 10 field sites, labs and other research facilities
- 300 professionals involved in water research, education, and outreach.

We also have close historic working relationships with federal agencies, and were the first to jointly design and build a shared on-campus facility, the Environmental and Natural Resource Building, with the US Geologic Survey and National Weather Service.

ENRB2, which will allow us to expand these working relationships, will be built shortly.

This type of expansion provides an opportunity for us to demonstrate the UA's commitment to sustainability, and not just sustainable water supplies. We need a coordinated sustainability program that taps our expertise campus-wide to focus on practical and cost-effective ways that we can contribute to sustainability both locally and globally. We will do this, not just because it's the right thing to do, but also because doing it positions the UA strategically in key societal and scientific areas.

In the past, many of our water challenges could be met with concrete, rebar, and dynamite. We still need infrastructure, but today, water resource managers require a more diverse tool kit. The UA is involved in research on many fronts, including:

- recycling, reusing and recharging water;
- implementing and evaluating an array of novel conservation programs;
- testing and treating water for emerging pathogens, disinfection byproducts, and trace pharmaceuticals;
- developing technologies for advanced treatment, desalination, and removing heavy metals;
- improving water use efficiency in greenhouse agriculture and copper mining;
- developing models, planning tools, and decision support systems;
- and improving our understanding of hydrologic systems on a variety of scales, from the hill slope to the watershed.

And, most importantly, we are training the next generation of water professionals.

The National Science Foundation recognized this unparalleled concentration of water expertise 7 years ago when it funded a Science and Technology Center focused on sustainability of water resources in the Southwest.

SAHRA, the Center for Sustainability of semi-Arid Hydrology and Riparian Areas, is headquartered at the University of Arizona, but it includes our sister institutions in Tempe and Flagstaff and 9 other universities. SAHRA also partners with federal agencies and national labs. The long-term funding that NSF provides has allowed SAHRA to assemble multi-disciplinary teams of the best talent from across the Southwest to tackle key water challenges in arid and semi-arid lands at the basin scale.

SAHRA's 240 participants are engaged in well over 100 research projects. To date, this work has produced several books and nearly 400 journal articles, including publications in *Science* and *Nature*. The research has also supported some 70 theses and dissertations, and an equal number of new water professionals trained to view water resource issues from a broader perspective.

Research is integrated with programs in education, knowledge transfer, international activities, and stakeholder engagement. Its educational programs improve hydrologic

literacy by creating curricula, resources, exhibits, and websites to benefit today's teachers and students, tomorrow's water professionals, and the general public.

SAHRA's Knowledge Transfer and International activities team disseminates water information to a diverse set of audiences through a wide variety of products and services. These range from a United Nations-supported global water news tracker and international meetings to award-winning trade publications, web applications and database services.

Many of SAHRA's international activities involve partnerships with Mexico, including developing decision-support systems for managing transboundary waters, cross-border educational programs, and alternative futures studies that focus on how development options may affect land use and water resources in Mexico.

Broad research questions being addressed by SAHRA include:

- How do land cover changes triggered by growth, drought, fire, invasive species and increases in atmospheric CO₂ affect surface flows and groundwater recharge?
- How do carbon, nutrients, water and energy cycle through a healthy riparian habitat, and what are the costs and benefits to society of preserving and restoring them?
- What are the social and technological barriers to better allocating our scarce water resources through market mechanisms such as water leases, banking, options, and sales?

The work is ongoing, but already SAHRA has produced research findings, models, and decision support tools that are changing the way water is managed in the Southwest.

Six years ago, voters took direct action to improve education in Arizona, voting overwhelmingly to raise the sales tax to boost K-12 funding. This initiative also provided new monies to Arizona's 3 state universities to invest in areas critical to the state's future.

The University of Arizona has invested these new funds in optics, biotechnology, and **water**. This commitment to water resulted in the **UA's Water Sustainability Program**.

Four water centers coordinate the Water Sustainability Program: the Water Resources Research Center, and three NSF-funded centers:

- the SAHRA Science and Technology Center;
- an Engineering Research Center on Environmentally Benign Manufacture of Semi-conductors; and
- an Industry/University Cooperative Research Center for Water Quality

The UA's Water Sustainability Program has had an enormous impact in its first few years,

- distributing millions of dollars in competitive research projects and directed initiatives;
- providing graduate and undergraduate fellowships;
- supporting targeted hires of eminent scholars in water and sustainable resources; and
- funding a coordinated water education and outreach program

Three years ago, the Arizona Department of Commerce commissioned the Battelle Corporation to study how our 3 state universities could best contribute to the future of Arizona's economy. The Battelle report highlighted the breadth and depth of expertise in sustainable natural resources across the 3 universities and, in particular, the wealth of water resources expertise at the University of Arizona.

This led Governor Napolitano to propose a virtual water university that would span the three universities. Last Spring, the legislature provided \$1.5 million in new funds, and the Board of Regents contributed additional funds, to create the **Arizona Water Institute**.

This unique institution is creating opportunities and incentives for UA water experts to work with colleagues at our sister state institutions. It also has institutionalized interactions with key stakeholders by creating liaison positions within the state departments of Water Resources, Environmental Quality, and Commerce.

As the Battelle report noted, water issues that are tackled by researchers in Arizona generate scientific understandings and management tools that have broad application to the rest of the semi-arid world. Others look to us as leaders.

The water programs at the University of Arizona attract students from around the world, and our alumni hold key water management and research positions in dozens of countries.

The research projects being conducted by SAHRA, the studies funded by the Water Sustainability Program, and the work to be funded by the Arizona Water Institute span a remarkable array of water issues and challenges.

But they all have one thing in common - they aim to produce science results that provide practical guidance and assistance to water managers and regulators in Arizona and the Southwest - what SAHRA calls "**stakeholder-relevant research.**"

Such real-world research is not easy; it demands a serious commitment to ongoing dialogue and cooperation between scientists and water professionals. This annual meeting is evidence of that commitment, especially this afternoon's sessions devoted to in-depth discussions with stakeholders.

I appreciate the efforts by SAHRA to engage water professionals in their research, and I commend the foresight of the National Science Foundation for providing over \$30 million in initial funding for this innovative Center, which will be a vital part of the UA for years to come.

Most of all, I applaud you, the water professionals, who have taken the chance and become involved in this ground-breaking collaborative effort.

These are the kinds of partnerships that epitomize how the University of Arizona intends to contribute to the well-being of the state, and beyond.