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New Members Share Thoughts and Goals for CAWCD Board

by *Becky Witte, WSP Graduate Outreach Assistant, University of Arizona*

In November 2012, five people were elected to the Central Arizona Water Conservation District Board. The CAWCD and its board members may not be well known to the general public, but they play an important role in Arizona water policy. The CAWCD manages, operates, and directs policy for the Central Arizona Project (CAP), the supplier of approximately 1.5 million acre-feet of water for Maricopa, Pinal, and Pima counties. This water is critical for the people of Central Arizona.

Of the five people elected to the fifteen person board, two were re-elected to the position, Lisa Atkins and Pamela Pickard. The newly elected members are Guy Carpenter, Terry Goddard, and Heather Macre. AWR interviewed the newly elected board members to learn about their goals, expertise, and expected challenges for the upcoming six year term.

Guy Carpenter has over 20 years of experience with water resource planning and policy development in Arizona. Formerly he was a municipal water resource manager but now works as a consultant to help cities develop master water plans. Carpenter believes these experiences provide the understanding needed to deal with issues facing the board.

“My experiences have given me a good understanding of Arizona’s rules and regulations related to water quantity and quality. I understand the engineering and construction requirements necessary for things to get done, and I have a lot of relationships with professionals within the water, engineering, hydrogeology, regulation, and construction industries. All of this will help me anticipate and respond to challenges and constraints along the way” said Carpenter.

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Southern Arizona faces unique challenges in climate change adaptation. Source: Mindy Butterworth, Institute of the Environment, University of Arizona

National Climate Assessment Foresees Alarming Impacts on Southwest

by *Katharine Mitchell, WRRC Graduate Outreach Assistant*

The Southwest is considered one of the most ‘climate-challenged’ regions of North America. The overwhelming heat of summer seems distant to many desert dwellers in Arizona. Residents cannot ignore the great fluctuation in temperatures this season. Scientists are bringing to the public’s attention the fact that changes are affecting Arizona’s climate, and that human activities are the driving force. Projected regional temperature increases, amplified by the way that our growing cities retain heat, will pose increased threats to public health. Rising temperatures and drought conditions will foster more severe wildfires. Snowpack and stream flow amounts are projected to decline, decreasing water supply for cities, agriculture, and ecosystems. These key findings on the changing climate’s effects on the Southwest have been detailed in the recent draft of the National Climate Assessment. The draft of the Third National Climate Assessment Report was approved by the sixty-person National Climate Assessment Development and Advisory Committee and released for public comment. This draft assessment arrived days after the National Oceanic and Atmospheric Administration issued its annual State of the Climate report, noting that 2012 was the hottest year on record.

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The Southwest is one of eight regions assessed in the report, with a chapter dedicated to the most recent science on climate change impacts for Arizona, California, Colorado, Nevada, New Mexico, and Utah. A central component of the assessment process was the Southwest Regional Climate assessment workshop that was held on August 1 - 4, 2011 in Denver, CO. With more than eighty participants, a series of scoping presentations and workshops began the process leading to a foundational report.

Competition over scarce water resources in the Southwest will only intensify over the coming years. Compared to temperature, precipitation levels vary considerably across the Southwest with portions experiencing both increases and decreases. Arizona is predicted to experience significant decreases in precipitation levels, with some uncertainty in the southern areas of the state. The authors state with certainty that there will be a continued decrease in snowpack and stream flows. Rising temperatures and drought have caused earlier spring snowmelt, and shifted runoff to earlier in the year. Precipitation extremes in winter will become more frequent and more intense (i.e. more precipitation per hour). Large portions of the Southwest will experience reductions in runoff, stream flow, and soil moisture in the mid-to-late-twenty-first century. In some areas, surface water quality will be affected by the scarcity of water, higher rates of evaporation, higher runoff due to increased precipitation intensity, flooding, and wildfire. Discussions will need to continue to address demand pressures, and the shared vulnerabilities of ground water and surface water systems.

Both urban and rural populations in Southwestern cities are highly dependent on the supply of drinking water, and irrigation water for agricultural use. The projected decline in snowpack and stream flow will lead to the decrease in recharge and water supply for human and ecological consumption. The report presents evidence of irrigation dependence, and the vulnerability of high value specialty crops to extremes of moisture, cold, and heat. The report points to potential critical changes in key sectors, such as agriculture, energy production, and public health. As high temperatures and more persistent droughts affect southern Arizona, in particular, this will cause a shift in agriculture north, which also poses an economic concern over the loss of jobs.

Excessive wildfires are a concern as they destroy homes, expose slopes to erosion and landslides, threaten public health and safety, and lead to economic losses. Wildfire and bark beetles killed trees across twenty percent of Arizona and New Mexico forests from 1984 to 2008. The conifer forests of Arizona's sky islands are notably threatened. Prescribed burning, mechanical thinning, and retention of large trees can help forest ecosystems adapt to climate change.

The delivery of electricity may become more vulnerable to disruption due to extreme heat and drought events. The threat of rising temperatures, and the effects of the "urban heat island", will make the region's cities uncomfortable places to live. Rapid population growth is particularly a challenge in this region where ninety percent of the population lives in cities. The most vulnerable populations, such as the elderly, will be most at risk. The increased chance of power outages poses a serious threat to safety and mortality. Heat stress has been found to be a recurrent health problem for urban residents, and the highest rates of heat-related deaths have been found in Arizona, notably Phoenix.

The National Climate Assessment has set out to serve as a comprehensive and inclusive overview of the science of climate change and its effects on communities in regions across the country. "If it survives in substantially its current form, the document will be a stark warning to the American people about what has already

happened and what is coming," New York Times reporter, Justin Gillis wrote. The stakeholder participation and communication strategy for the report sets it apart from previous U.S. climate assessments. Efforts to educate will be ongoing and reports will be a continuing effort rather than a periodic report-writing activity. The process will include an evaluation of the Nation's progress in adaptation and mitigation and involve long-term partnerships with non-governmental entities. The continuing process also will build capacity for assessments in regions and sectors. The assessment includes new methods for documenting climate related risks and opportunities, and provide web-based information that supports decision making processes within and among regions and sectors of the U.S.

The assessment will contribute directly to the U.S. climate policy debate, informing the public and key decision makers on how to adapt to a changing climate. Gregg Garfin, of the University of Arizona, Institute of the Environment and the School of Natural Resources and the Environment, led the production of the Southwest Regional chapter along with Guido Franco of the California Energy Commission. Andrew Comrie, University of Arizona Professor in the School of Geography and Development, was among the group of six lead authors for the Southwest chapter, representing the University of Southern California, University of Nevada (Las Vegas), Colorado State University, National Park Service, and NOAA. The authors engaged local stakeholders through regional town hall meetings, to bring together climate change experts and users of climate change information, from academia; local, state, tribal, and federal governments; non-profit organizations; and business and industry.

More than 240 authors have been engaged since the start of this effort. The Global Change Research Act of 1990 mandates that a national climate assessment be conducted every four years. The last assessment was published in 2009. This newly released draft of the Third National Climate Assessment will result in a final report due in the second half of 2013. The third assessment was led by Katharine Jacobs, who took a leave of absence from the University of Arizona for a position as Assistant Director, Climate Adaptation and Assessment, in the Office of Science and Technology Policy. Early in the two-year process, the National Climate Assessment identified stakeholders through a model for organizing and thinking about individuals and groups that may be engaged at various points in the process. Established under the Department of Commerce in December 2010, and supported through NOAA, the sixty-person National Climate Assessment Development and Advisory Committee was assembled to act as a consultative body for the National Climate Assessment. Committee members are diverse in background, expertise, geography, and sector of employment. The draft report is available to download online, and the comment period is open from January 14 – April 12, 2013. During the open public comment period, the report will also be under review by the National Research Council. The authors will use the comments received to revise the report before submitting the final draft to the government for consideration.

Arizona's future under the influence of climate change will be significantly warmer and drier than in the past, and the impacts will affect the regions' water, forests, wildfires, ecosystems, and ability to grow crops. The effects of climate change are already visible across the region. The draft report paints a sobering picture of existing conditions and of the climate future we face if action is not taken by decision makers, and the public at large. The authors state that "Climate change, once considered an issue for a distant future, has moved firmly into the present." 

Terry Goddard also has extensive relevant experience. He served on the CAWCD board from 2000 to 2002 after serving four consecutive terms as Mayor of Phoenix. Then in 2003 he was appointed Arizona Attorney General, an appointment that ended his term on the CAWCD board. As a returning member of the board, Goddard believes that his experience as Attorney General and the contacts that he made in that position will be useful. His decision to return to the CAWCD board was motivated by his perception of the critical importance of the Central Arizona Project at this time. “The CAP is a critical function for the state, and [water issues] need to be handled right, without a political agenda,” Goddard said.



Terry Goddard

Heather Macre is an attorney with a focus on environmental law and policy. In the past she has worked on cases related to water rights, environmental permitting and regulation, and land remediation, so she will be able to bring a perspective on these aspects of the legal system. Her working knowledge of Colorado

River law, as well as with Arizona and Federal statutes, will be beneficial for any policy decisions that the CAWCD must make in the coming years.

Macre said, “As an attorney I often have the job to bring two diverse sides together and try to resolve an issue in a way that benefits all of the parties. I am also charged with breaking down complex issues into a more understandable, resolvable format. When dealing with large complex issues such as those brought before the Board, I believe that these skills will serve me well.”

Macre is also one of the youngest members of the board. She sees her relative youth as both an advantage and a disadvantage. She hopes to bring “energy and enthusiasm to the Board and offer up a different point of view”. According to Macre, it is important for the Board to reflect the community it represents, which includes a younger population. On the other hand, she also thinks that her relative youth will be her biggest challenge during her term on the Board.



Heather Macre

Each of the new board members was posed the question, what do you see as the biggest water issue facing Arizona residents?

Guy Carpenter answered that Arizona will have to grapple with the issue of increasing water prices, which are needed to ensure a safe and reliable supply of water. As infrastructure ages, repairs and replacements will be necessary. Also, the cost of conveyance, storage, recovery, treatment, and recycling could all increase in the coming years, especially if the cost of power increases.

For Terry Goddard, the biggest water issue is a shortage of water supplies from the Colorado River. The Central Arizona Project has the lowest priority for receiving water in a shortage situation. This places an extra burden on Arizona, and Goddard stressed that “planning and contingencies to meet shortfalls are needed.”

Heather Macre sees the biggest water issue as the balance between increasing demand and a limited supply. To deal with this she believes CAWCD needs to do long-range water management planning. Macre says such planning “must include more aggressive drought management planning and shortage sharing agreements.”

Aware that climate change could potentially have a large impact in the Southwest, she wants CAWCD to “prepare to meet these increases in demand in an innovative, comprehensive manner which balances needs with the sensitivity of our environment.”

Keeping in mind the many major issues facing the board, the board members were asked, what is the main goal they would like to accomplish during their term?

Guy Carpenter wants to focus on establishing a plan for groundwater recovery of stored water in preparation for potential shortages on the CAP. The implementation of a recovery plan would mean constructing well fields to deliver stored water to the CAP. Such a plan “would do the most for us with respect to shoring up vulnerabilities associated with drought or CAP system outages,” said Carpenter. While there will be institutional and regulatory hurdles, recovery and conveyance infrastructure is necessary “to provide a level of resiliency and redundancy that is needed as demand approaches available supply,” he said.



Guy Carpenter

Terry Goddard also believes that the immediate goal for the CAWCD should be securing water for a shortage situation.

In the event of a continued drought and worsening of strains on the Colorado River, additional water supplies will be needed to support Phoenix and Tucson.

Heather Macre has the goal of bringing a more sustainability-focused approach to issues and working to engage the community more. She observed a need “for more transparency at the CAWCD” so that community members feel that their voices are heard. She would like to make meetings more accessible and broadcast them online.

The 15-member CAWCD Board consists of 4 members representing Pima County, a member for Pinal County and 11 for Maricopa County. All 3 of the new members are from Maricopa County. Board members are elected to 4-year staggered terms; the terms of the newly elected members will expire January 1, 2018. The Board typically meets the first Thursday following the first Monday of the month. Meetings are open to the public and the meeting minutes can be found online on the CAP website at <http://www.cap-az.com/boardofdirectors.aspx>. 



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NEWS BRIEFS



New Grand Canyon High Flow Experiment Started

On November 18, 2012, the Grand Canyon experienced a high-flow release of water from Glen Canyon Dam. This release was part of a restoration experiment by the U.S. Bureau of Reclamation in cooperation with U.S. Geological Survey's Grand Canyon Monitoring and Research Center, the National Park Service, and the U.S. Fish and Wildlife Service. The purpose of the experiment is to restore sandbars and beaches in the Grand Canyon for habitat and recreation. A new protocol developed by Reclamation calls for a series of simulated floods through 2020. The protocol allows flood releases on short notice and without extensive environmental review when conditions meet predetermined criteria. The floods are expected to redistribute sediments in a manner similar to natural, pre-dam conditions. Before the construction of the Glen Canyon Dam in 1966, spring floods transported large amounts of sediment that created natural sandbars. Since then, beaches have eroded and sandbars have been disappearing, causing negative impacts on native fish and recreation. Similar experiments were conducted in 1996, 2004, and 2008 and yielded findings that indicate a program of well-timed high flows could reverse some of the damage. Monitoring, data collection and analysis will continue throughout the program to contribute to adaptive management of the affected area.

Cooperative Problem Solving Sustains U.S.-Mexico Agreement

On Tuesday, November 20, 2012, the United States and Mexico signed an agreement on management and use of the Colorado River, demonstrating their strong commitment to cooperation. Known as Minute 319, the agreement refines the 1944 treaty that divided flow in the river between Mexico and the United States, allotting approximately 10 percent of the Colorado River flow to Mexico. Minute 319 builds on previous agreements to resolve a number of issues. The agreement was developed and facilitated by the U.S. and Mexico Sections of the International Boundary and Water Commission. Provisions extend for a five-year period, with the expectation that another agreement will be concluded at the end of that time.

Minute 319 brings Mexico into agreements for sharing shortages and surpluses among the users of the river. Its basis is Minute 318, signed in 2011, which allowed water districts in Mexico to store water in Lake Mead while Mexico rebuilds earthquake-damaged infrastructure. In Minute 319, the water-storage terms in the earlier agreement have been expanded. Mexico will continue storing unused Colorado River water in Lake Mead and agrees to voluntarily share in shortages as well as surpluses on the river. In addition, the agreement creates a mechanism for Mexico to store water in the United States resulting from conservation and new water projects. Minute 319 also provides for irrigation improvements in Mexico in exchange for access to conserved water in the United States. Water districts on the Lower Colorado River in the United States: Central Arizona Project, the Metropolitan Water District of Southern California and Southern Nevada Water Authority, will contribute \$21 million to Mexico for

canal lining and land following in the Mexicali Valley. In return, the U.S. districts will receive about 95,000 acre-feet of additional Colorado River water over five years.

Environmental interests on both sides of the border were encouraged by provisions in Minute 319 that provide for restoration of the Colorado River delta. Minute 319 includes the agreement worked out among the U.S., Mexico, non-governmental organizations, and the seven Colorado River basin states to set aside water needed for environmentally sensitive areas in the Colorado River Delta. It is hoped that investments in this five-year pilot initiative will lay the groundwork for extensive future restoration.

HB 2338 Would Help Augment Rural Water Supplies

A bill, introduced in the Arizona legislature as House Bill 2338, provides the framework for creation of voluntary Regional Water Augmentation Authorities, enabling rural Arizona to finance needed water projects. House Speaker Andy Tobin introduced the bill to implement recommendations of the bipartisan Arizona Water Resources Development Commission he initiated in 2010. The WRDC released its Supplemental Report in September 2012 and Tobin's bill deals with the report's major recommendations. In addition to authorizing regional water augmentation authorities, the bill asks for a \$30 million general fund appropriation for the Water Supply Development Revolving Fund. The augmentation authorities could then get low-interest loans from the fund. The Prescott Daily Courier quoted Tobin as stating that the legislature might need to continue to add \$30 million a year for as long as a decade to provide funds for the water supply expansion projects identified by the WRDC. Membership in the regional water augmentation authorities is proposed to be voluntary and may include Arizona cities, towns, private water utilities, other statutorily defined water providers, private entities, counties and State, Tribal and Federal entities.

Major Colorado River Basin Study Released

In December 2012, the Department of Interior released the *Colorado River Basin Water Supply and Demand Study*. This three-year long study found multiple indications that the basin will become more vulnerable in terms of water reliability, hydroelectric power generation, recreation, and river flows over the 50-year planning horizon. Study objectives included assessing Colorado River supply and demand imbalances, considering impacts of climate change, and identifying ways to resolve imbalances.

The study serves as a call to action for an integrated planning process. Forty million people depend on the Colorado River for water and power. Recognizing the importance of the river to the people of the basin, the Bureau of Reclamation engaged with hundreds of stakeholders from agricultural, environmental and energy sectors, tribal groups and water agencies. Their input throughout the study process was incorporated into published interim reports and technical updates, as well as this final report.

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How Should We Understand “Water Security”?

by Robert G. Varady, Udall Center for Studies in Public Policy, and Christopher A. Scott, School of Geography and Development, University of Arizona



Robert G. Varady (left) and Christopher A. Scott (right) Source: Evelyn Varady

WHAT IF you wake up tomorrow morning, tumble out of bed and into the shower, turn on the faucet—and . . . no water comes out? You throw on some clothes, check the main valve outside your house, and find it in the “on” position. A call to one of your neighbors confirms that they, too, have no water.

Then, checking your iPhone, you learn that the city is unable to deliver water on account of [pick one: (a) extended drought and insufficient supplies in the reservoirs, (b) a massive break in the main, (c) extensive leaks in the aging delivery system, (d) electrical outages in the Central Arizona Project’s pumping system, (e) discovery of bacterial or chemical pollutants in the supply, (f) an explosion forcing closing of the main treatment plant, (g) a financial crisis at the utility, or (h) some other, unexplained reason].

Or WHAT IF the local utility announced that due to some combination of the above factors, it would henceforth provide water only between certain hours of the day? Or on alternate days.

The situation described above is in fact one that prevails in many parts of the developing world, where universal access to safe drinking water is not assured. The reasons vary—from actual water shortages, to inadequate infrastructure, to lack of financial resources, to chronic environmental problems, to most commonly, poor governance. But if the causes differ, the results are broadly familiar to residents across the globe, from Afghanistan to Paraguay to Zimbabwe: too few connections to publicly-supplied water, inequitable distribution, sporadic and unreliable service, poor quality—and many of the resulting problems of poor health, time away from more productive activities, unequal gender-division of labor to self-supply water, and a host of other second-order effects.

To paraphrase the famous line from the classic film *Cool Hand Luke*, “What we’ve got here is failure in water security.”

“Water security,” part of the larger notion of “environmental security,” has become a much-talked-about concept in recent years. But how should we understand a term that features the word “security,” which is burdened by its military-cum-diplomatic connotation?

Environment and security—and therefore water and security—are closely intertwined. Each affects the other. Environmental processes involving water such as droughts, floods, sewage flows, and groundwater pollution may become serious enough to harm a

country, a region, or an urban area. Water-resources infrastructure is vulnerable to damage or disruption from attacks, sabotage, poisoning, or other purposeful actions. Conversely, some security-protection measures such as militarization, fortification, construction, and patrolling can themselves adversely impact environment, natural resources, and water availability and quality.

This interrelationship is further complicated by a deeper distinction between hard “traditionalist” or “realist” views of national security on the one hand—and softer, alternative, “non-traditionalist” or “post-realist” interpretations on the other hand.

Adherents of the realist school of thought see security as a critical part of a nation’s sovereignty and therefore as a fundamental, absolute right, with an obligation to preserve it at any cost. According to this interpretation, arising from age-old competition for territory and resources, “national security” is used to justify maintenance of armies, development of new weapons systems, and manufacture of armaments. In this view, military strength and economic power are the key guarantors of security. This perspective carried the day until the collapse of the Soviet Union.

By the early 1980s, although the Cold War still raged, some writers had begun challenging the realist view and, in effect, were “rethinking security.” These non-traditionalists argued for a radical expansion of the concept of security to include social, economic, demographic, agricultural, and natural-resources-related matters. In the forefront of this movement were scholars writing about environmental change. They saw clearly that because security is contingent on stability and peace, environmental problems were critical aspects of national security.

In the years since the initial redefinition of security, the term has broadened to encompass food security and poverty, climate variability and change, energy, and water security. Security has come to be the antithesis of vulnerability. In the case of water, this conception of security emphasizes problems that threaten the health and wellbeing of individuals and communities or their economic security.

So to return to our original question, how should we understand “water security”? We would cast it in the evolving, more holistic view described above. This approach does not ignore raw political and economic power asymmetries, but concentrates instead on peaceful, cooperative solutions to shared problems. It suggests that by overcoming vulnerability and enhancing security, society at large wins.

In attempting a workable definition, we view water as simultaneously productive and destructive. A useful point of departure is the 2007 interpretation offered by D. Grey and C. W. Sadoff in the journal *Water Policy*: “the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies.”

To allow for the dynamic nature of societal-ecosystem-hydroclimatic interactions that characterize insecurity and uncertainty, we have proposed this definition: Water security constitutes the sustainable availability of adequate quantities and qualities of water for resilient societies and ecosystems in the face of uncertain global change.

So the next time your shower fails, you will understand that what you are experiencing is a breakdown in water security. ■■

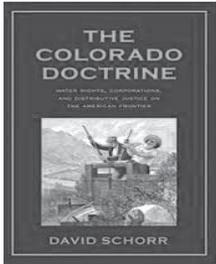
RESOURCES



The Colorado Doctrine: Water Rights, Corporations, and Distributive Justice on the American Frontier

David Schorr
Yale University Press

Review by Susanna Eden



Early Colorado water law has long been recognized as a model for the Prior Appropriation Doctrine as it developed throughout the West. Adoption of prior appropriation was a deliberate rejection of eastern water law, which gave the owners of land located next to or across a stream equal rights to the use of the water. In *The Colorado Doctrine*, David Schorr examines the reasons for this rejection and for the choices embodied in the Prior Appropriation Doctrine in Colorado. His book presents at once a history of the development of western water law and an argument for questioning fundamental assumptions about this radical departure from established water law. With a cast of characters including greedy foreign capitalists, passionate agrarian reformers, intrepid miners and irrigators, and populist politicians, this history captures the human striving embodied in the law.

According to Schorr, prior appropriation as adopted in Colorado derives from two principles. First, everyone should have equal access to the use of water from a stream, not just riparian land owners. In the dry western climate, limiting rights to riparian owners would deprive the vast majority of citizens an essential resource. Second, all users of a stream are entitled to sufficient water to accomplish the purpose for which the water is appropriated. If too many people try to divide the waters of a stream among them, no one would have enough to support a farm or mining claim. Here is a seeming contradiction that is solved by giving priority use of the water to the first users. In this way, a balance is struck between equality and sufficiency.

In addition, the law required that the water must actually be used for a beneficial purpose. This meant that no one could claim more water than needed and, therefore, no one could profit from speculation in a resource that belongs to all.

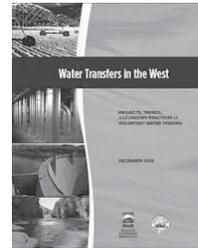
Schorr maintains that these principles express the predominant sentiment in the West at the time, which was embodied in the ideal of “the greatest good for the greatest number”. His interpretation is based on a comprehensive review of relevant documents from the period, and several of the most evocative of these are reproduced in the book. Often, he lets the boosters, politicians and influential writers of the day speak for themselves on the pages.

Schorr’s goal is to turn the common wisdom on its head. He argues that the widespread distribution of resources, rather than economic efficiency, is the foundation of the Colorado Doctrine and therefore much of the water law of the West. This is a distinction that may not concern most readers, but it should not discourage them. Although it is clear that Schorr intends to

contribute to a scholarly debate, the end is not only scholarly. The debate has infused current understanding and discussion on water policy, and his insights have potentially important implications for policy making.

In addition, the language is clear, the argument cogent, and the information full of interest to anyone curious about the history of western water law.

Water Transfers in the West



The report, *Water Transfers in the West* provides an overview on how the region can help meet growing demands for water with voluntary market-based transfers of water rights. The report is a product of a year-long partnership between the Western States Water Council and the Western Governors’ Association, with input from more than 100 state administrators, environmental organizations, farmers, academics, and water resource professionals from across the West. Released in December 2012, the report defines a water transfer as a voluntary sale, lease or donation that can move water among agricultural, municipal, industrial, energy and environmental uses. The authors included only intrastate activities and excluded interstate transfers. According to the report water transfers are one component of a suite of tools western water managers can use to meet new demands from changes in farming practices, energy development, and urbanization. As such, transfers are the subject of intense interest among the western states. After tracing the history, drivers and trends observed in western water transfers, the report describes a range of water policy considerations. Among the major policy issues the report addresses are avoiding and mitigating damaging impacts on agricultural economies, rural communities and the environment. The following chapters look into legal provisions, state perspectives and available mechanisms. Final chapters draw conclusions about what states can do to provide frameworks for beneficial water transfers and look to next steps. The report recognizes that each state’s individual circumstances will determine how it should address transfers and highlights successful transfers and innovative practices as examples. Three case studies illustrate the challenges and innovations that have been used to shape water transfer agreements designed to leave all the parties better off. Appendices provide more in-depth information on rules, regulations, programs and water transfer arrangements for the states covered in the report. The full report is available on line at <http://www.westgov.org/>.

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According to the report, by 2060, without action, there will be significant imbalances between demand and supply with an average gap of 3.2 million acre-feet per year. Water conservation and reuse opportunities are insufficient alone to solve the problem, but the combination of augmentation, conservation, and reuse could significantly reduce risk of future imbalances. The report can be viewed at <http://www.usbr.gov/lc/region/programs/crbstudy.html>.



By Sharon B. Megdal

The Colorado River Basin Water Supply and Demand Study: A Call to Action



In December 2012, the U.S. Department of Interior released the Colorado River Basin Water Supply and Demand Study, with officials referring to it as a “Call to Action”. This massive study, which can be accessed from the web site of the U.S. Bureau of Reclamation, was three years in the making. It involved a diverse set of partners and stakeholders from the seven Colorado River Basin states, many of whom contributed significantly to the data and analyses. Its Executive Summary and 89-page Study Report

summarize the effort’s methodology and findings. The Executive Summary states: “The purpose of the study was to define current and future imbalances in water supply and demand in the Basin and the adjacent areas of the Basin States that receive Colorado River water over the next 50 years, and to develop and analyze adaptation and mitigation strategies to resolve those imbalances.” Most notably, it then states that the study did not propose a set of solutions but rather “a common technical foundation that frames the range of potential imbalances that may be faced in the future and the range of solutions that may be considered to resolve those imbalances.”

The Study Report does a nice job of explaining potential scenarios and their resulting imbalances and summarizing the options for addressing the imbalances, with costs, time frames, and potential water yields noted. The list of solution options is, by and large, not surprising. Some commentary has focused on the very expensive and costly water importation options. However, the cost, legal, political and environmental feasibility challenges of a few of the options are well recognized.

Some have noted that the report documents what we already know. We know that the Colorado River Compact allocations were based on a wet period and that average flows are expected to be lower than the commitments, if we can call them that, of water. Dry periods may be more severe than even the tree ring records suggest due to changes in climate. We know the population and economies of the regions served by Colorado River water have grown and will continue to grow. We know that the economies of some regions, such as Central Arizona, are more vulnerable to Colorado River shortage than others. We know that water utilization and precipitation patterns affect the water demanded by and available to all of the water using sectors – municipal, agricultural, industrial and natural.

The water management challenges of the region have been well studied and documented. Almost 20 years ago, in 1995, the American Water Resources Association published a special issue of *Water Resources Bulletin*. Entitled *Severe and Sustained Drought: Managing the Colorado River System in Times of Water Shortage*, the 13 collected papers cover the following topics: tree ring records, hydrologic scenarios, drought impacts, legal and institutional options, social implications, environmental effects,

competition for water resources and valuing drought damages, hydrologic and economic impacts of drought under alternative policies, and mitigating impacts. The volume’s introductory article by Robert A. Young notes that solution options were divided into three groups: “those pertaining to operating rules presently in effect; those pertaining to potential changes in existing rules; and those which pertain to the feasibility of making such changes via negotiation, litigation, or legislation.” Young’s article concludes with acknowledgement of the following limitations: “Because of the large geographic scale, the technical complexity of the problem, and the limited resources and time available to the research team, the results must be considered as partial and tentative.” Young acknowledged that the broad effects of inadequate precipitation and environmental impacts could not be addressed as well as the authors would have liked, and measures of water demand were generalized based on local data. In 1995, however, the publication represented a comprehensive summary of the state of knowledge.

In the intervening 20 years, the region has grown significantly. Institutional arrangements not anticipated, such as interstate banking, have been enacted. The Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead and the Interim Shortage Sharing Guidelines were adopted in 2007. Minute 319 to the 1944 U.S.-Mexico Water Treaty, which was signed in November 2012, agrees for a five year period to share water shortages and surpluses across the border. We are adapting to a changing and uncertain landscape – or should I say waterscape – but all recognize that we must do more.

Let’s embrace the study as a Call to Action. The study involved many partners, public and private. It was subject to external peer review. It projects 3.2 million acre-feet (3,947 million cubic meters) as the imbalance between water supply and water demand in the study area by 2060. Of course, the 3.2 million figure is only an estimate, and we know that projections are usually wrong – especially those 50 years out. The actual imbalance may be lower or it may be higher. The debate should not be on the figure but on what we do to prepare ourselves. If it turns out that we unexpectedly enter a very wet period and we have over-prepared, we can all congratulate ourselves – or others can congratulate us posthumously – on what an excellent job we did of water management. However, if we do not take action now to develop the strategies to addressing imbalances, we will have failed doing for future generations what past generations have done for us, namely identifying the path(s) to water security. 🏡

Note: The WRRC has a limited number of hard copies of *Severe and Sustained Drought*, *Water Resources Bulletin*, Volume 31, No. 5, October 1995 available for sale at the 1995 cost of \$15 plus shipping. Proceeds support the work of the Water Resources Research Institutes, as authorized by the Water Resources Research Act of 1964 and 1984 as amended, of the Powell region. The WRRC received a copyright release from the American Water Resources Association and a digital version of the volume is posted at <https://wrrc.arizona.edu/publications/other/severe-sustained-drought>.



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Keynote: What is Water Security?
Anthony Cox, Head of Economy and Environment Integration Division, Organisation for Economic Co-operation and Development (OECD) will speak from a global perspective on the meaning of water security.

Featured Report: Colorado River Basin Water Supply & Demand Study
 The Conference will feature discussion of the Bureau of Reclamation's newly released Colorado River Basin Water Supply & Demand Study. The study's program manager, **Carly Jerla** will speak about current and future imbalances in Colorado River Basin water supply and demand over the next 50 years, as well as adaptation and mitigation strategies to resolve those imbalances.

Lunchtime Panel: Future Water Leaders
 The perspectives of students and early career water professionals on the future of water in Arizona will be the focus of the lunchtime panel discussion at this year's WRRC Annual Conference on March 5. A panel of Arizona's future water leaders - UA School of Geography and Development Ph.D. candidate **Jamie McEvoy**, UA Dept. of Agricultural and Resource Economics student **Ross Rayner**, and Carollo Engineers' Process Engineer **Lisa Snyders** - will share their insights and vision.

