

Divining Rod

Vol. XXXVII, No. 1 • January 2014

Water Budget: “Water in” = “Water out” ± “Storage”

By Will Keener

A team from New Mexico's Water Resources Research Institute, aided by a national and international field of scientists, is taking on the difficult job of establishing a water budget for the state. Measuring and modeling water coming into the state and water going out offers plenty of challenges and the potential to help better manage this scarce resource.

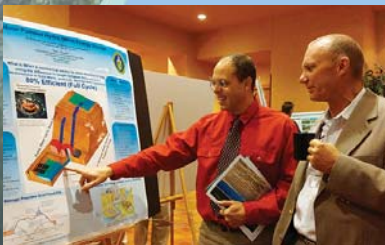
A team of researchers from New Mexico's Water Resources Research Institute (NM WRI), with help and advice from other scientists around the globe, are taking on the challenge of creating a measurable water budget for New Mexico.

“The idea is to account for the water coming in and the water going out,” explains Tom Schmutge, who is lending his more than 40 years experience in water-related

continued on page 3



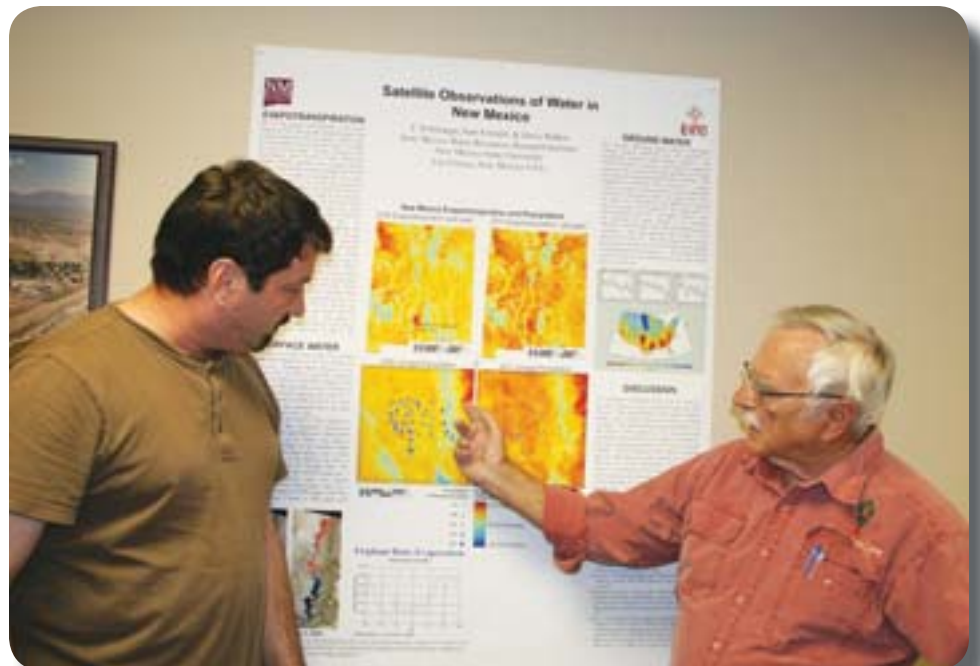
Page 6 Subcommittee on Drought meets in Las Cruces



Page 12 NM WRI 58th annual water conference held in Albuquerque



Page 16 Roundtable on transformative solutions for water in the West



Steve Walker (left) and Tom Schmutge discuss some research options for their New Mexico water budget project, based on maps showing variances in total evapotranspiration by year across the state. (Photo by Will Keener)



Divining Rod

Published by
The New Mexico Water
Resources Research Institute

Alexander G. "Sam" Fernald
Director

Catherine T. Ortega Klett
Program Manager

Will Keener
Writer

Asma Jalis
Accountant

Steve Walker
GIS Analyst

Annette McConnell
Administrative Associate

Jesslyn Ratliff
Grants Coordinator

Peggy Risner
Publications Assistant



NEW MEXICO
WATER RESOURCES
RESEARCH INSTITUTE

MSC 3167
PO Box 30001
Las Cruces, NM 88003-8001

575-646-4337
nmwrrri@wrrri.nmsu.edu
<http://wrrri.nmsu.edu>

Director's current topics

Greetings from the New Mexico Water Resources Research Institute (NM WRRRI). This year brings great opportunity to invigorate water research to help resolve looming water challenges facing New Mexico. Snowpack is below normal following trends of the last couple years, reservoir storage is mostly low, and the entire state is in drought of various extremes. Demand in excess of supply portends water scarcity that impacts the well-being of communities, the environment, and the economy. This challenging water picture has presented important new opportunities for the upcoming legislative session. This year there is a convergence of interest in making meaningful strides toward improved water management. The focus on water has been taken up by legislators and the Governor alike, opening opportunities to fund significant improvements in New Mexico's water situation through coordinated research. Below are additional details of research response to drought and a request to send letters of support for pending legislation.

The last time New Mexico found itself in the grip of a prolonged drought, lawmakers at the state and federal levels responded. After a relatively wet period in the 1940s, New Mexico experienced severe drought in the 1950s. To improve understanding of water issues, Dr. Ralph Stucky collaborated with water experts from throughout the state and initiated in 1956 the New Mexico Annual Water Conference that continues to this day. The annual water conferences led to the establishment in 1963 of the NM WRRRI, further bolstered by a memo of understanding between New Mexico State University,



the University of New Mexico, and New Mexico Tech and with bi-partisan support of the New Mexico Legislature. A nationwide network of water institutes modeled largely on the New Mexico example was established via the federal 1964 Water Resources Research Act sponsored by New Mexico Senator Clinton P. Anderson and New Mexico Representative Thomas G. Morris. A major impetus of the act was the desire to go beyond project specific water funding and spawn coordinated basin-wide water management through research at state-based water research institutes.

Today we find ourselves in a situation analogous to New Mexico in the 1950s with regard to drought. For example, Elephant Butte Reservoir, a multi-year integrator of river flow, is experiencing very low levels not seen since the 1950s. In contrast to those days, we have a larger population and a more diverse economy with more water-use sectors that depend on scarce water. Some of our water resources such as fossil groundwater are increasingly limited. Our state leaders have recognized the critical importance of water, and the New Mexico Legislature as well as the Governor have placed

continued on page 11

continued from page 1

research to the project. (See more on Schmutge on p. 4) “We want to look at and estimate the amount of water coming in through rivers and rainfall and water going out,” he said.

Joining Schmutge on the project are NM WRRI Director Sam Fernald and Steve Walker, the institute’s GIS coordinator. “This statewide water assessment will provide a yearly update of New Mexico’s water situation to better plan for a sustainable water future,” said Sam Fernald. “A hydrologically based water budget will help resource managers make better decisions about water use to better serve water users, the environment, and all citizens of New Mexico to whom the water belongs.”

As part of the effort, a workshop took place mid November in Albuquerque funded by the National Science Foundation New Mexico Experimental Program to Stimulate Competitive Research (EPSCoR) IV “Energize New Mexico,” and building upon foundations of previous EPSCoR projects on New Mexico’s Mountain Sources of Water. The workshop brought together scientists from

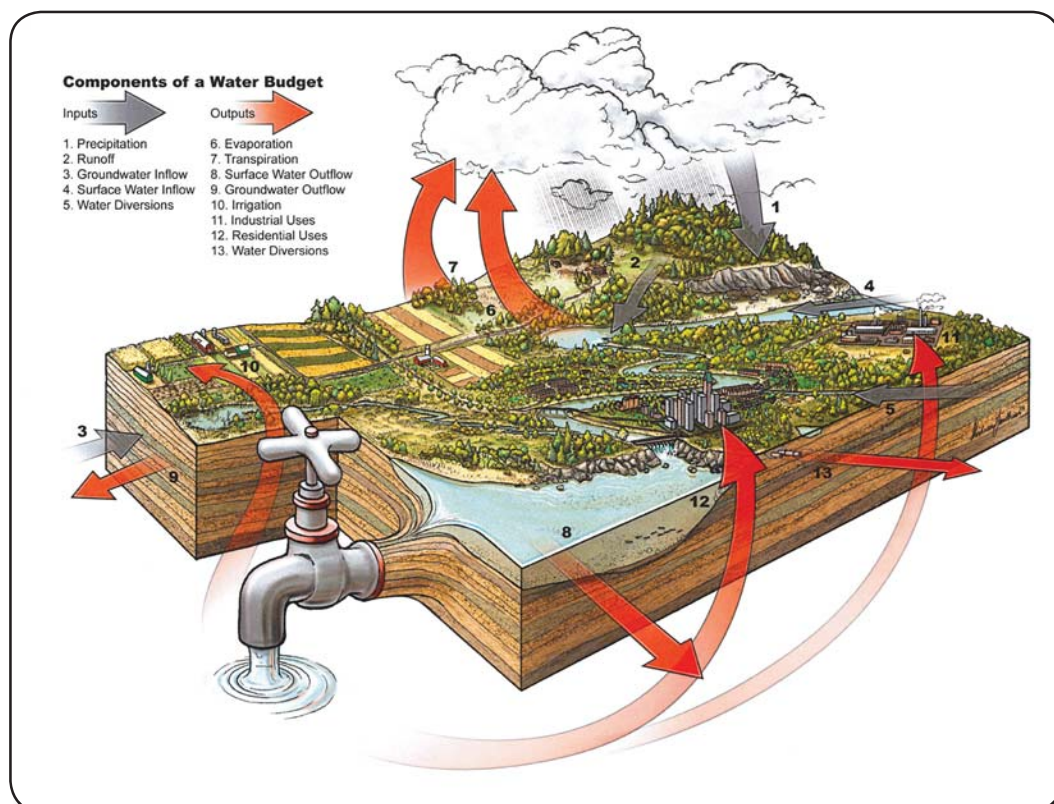
within New Mexico and across the U.S. to collaborate on ideas and planning strategies for generating a working statewide water budget. The budget will support New Mexico’s water resource sustainability and inform future sustainable energy development. Researchers and water managers from community, state and federal governments in the fields of hydrology, geology, geohydrology, civil engineering, water planning, remote sensing, geography, and meteorology attended the workshop to set the stage for determining what information and data are available, what deliverables and structure are required, and what best practices for crafting a water balance model and resource usage scheme exist.

Schmutge said the U.S. Geological Survey recently published a research paper calling for states to consider creating water budgets. The paper suggested

some limits on what should be attempted and urged states to develop this information, after a successful pilot effort in three U.S. river basins. “One of the maps in the USGS report showed evapotranspiration (ET) levels for the Colorado River Basin for one year. To me, that was eye-opening,” Schmutge said. “I had worked with remote sensing to estimate ET for small localized areas, but here they applied it to a total basin.”

The budget’s “water in” is estimated using a variety of means, including ground-based rain gauges, river gauges, and radar- and satellite-based data. Measuring “water out” requires an estimate of ET, the main mechanism for water loss. Water is lost in the budget through evaporation, groundwater and surface water flows, and the “breathing” or transpiration of water from plants into the air. All of these are components of ET.

Schmutge was able to get ET estimates for the years 2000 through 2012 from the USGS scientist who produced the estimates. The maps show variation in total ET by year, color-coded with blues and greens to show high ET levels



This diagram from the U.S. Geological Survey illustrates the components of a water budget, including surface-water and groundwater inflows and outflows, precipitation, and evapotranspiration (ET), which combines surface evaporation and plant transpiration losses to the system.

and yellows and reds indicating drier circumstances and low ET in different parts of the state. Data gathered from the National Oceanic and Atmospheric Administration (NOAA) for total annual precipitation in New Mexico shows some interesting numbers. As much as 40 inches of rainfall was recorded in some mountain ranges in 2006, a wet year. Using maps of the rainfall data, Schmutge and Walker are able to compare the rainfall with the ET maps. They also plan to make use of a dense network of ground-based rain gauges at the Jornada Experimental Station to compare data collected there with data from other sources.

With as much as 95 million acre-feet of rainfall in one recent year, it is clear that precipitation is the dominant “water in” mechanism, Schmutge said. “Right now, the uncertainties in the calculations are larger than the total surface water flows. Precipitation dominates the rivers’ contributions.”

Quantifying the components of a water budget will let resource managers ask and answer important questions to determine the best use of water resources. “Is there a way to capture the rain and use it to recharge our aquifers or use aquifers to store more water? Are there ways we can reduce the ET?” Some water experts compare a water budget with the withdrawals, deposits, and changes in the balance of a checking account. Knowing where, when, and how much water or money is flowing into or out of the account can help determine how much is left—water availability—and what stresses may exist, in the form of unpaid bills or water shortages.

“The kinds of questions you can ask, address real world problems,” said Schmutge. “It makes this work very interesting.”

Schmutge's skills a good match for state water budget

By Will Keener

After a career of understanding how remote sensing instruments can be used to detect soil moisture, evapotranspiration (ET), and other water-related phenomena on the Earth's surface, Tom Schmutge is turning his attention to understanding and measuring how these various components fit together in New Mexico.

After earning his PhD in solid-state physics at the UC-Berkeley in 1965 and teaching for six years in Connecticut, Tom Schmutge fell victim to economics and fell off the tenure track. “It was the best thing that ever happened to me,” the 76-year-old researcher said, sitting in his office at the New Mexico Water Resources Research Institute (NM WRRI) in Las Cruces.

Schmutge looked at his options, moved to the National Aeronautics and Space Administration’s Goddard Space Center in Greenbelt, Maryland, and never looked back. “They were searching for someone with experience in microwave instrumentation,” he explained. “NASA was preparing to launch their first microwave sensors in 1972 and they wanted to learn more about the Earth’s surface with microwave sensors.” His research concentrated on the remote sensing of soil moisture, while others studied sea ice.

“We were trying to determine the best wave lengths and instrument parameters with the goal of launching an unmanned satellite to gather soil moisture information,” he said. It took a long time, but in 2009 the European Space Agency launched a satellite, which is now being used to estimate soil moisture and ocean salinity globally. “It was personally rewarding for me to see the thing I had worked on for so long come to reality,” he said.

In 1986, Schmutge made another career decision, moving to the USDA Agriculture Research Service’s Hydrology Lab in Beltsville, Maryland, to do research in thermal infrared remote sensing. “It is used for surface temperature determinations, which serves as input for various models to estimate ET,” he said. ET is the sum of evaporation from the soil and plant transpiration from the land surface to the atmosphere. It is a key part of the Earth’s water cycle.

In the mid-1990s, while conducting field experiments at the Jornada Experimental Range north of Las Cruces, Schmutge first became acquainted with southern New Mexico. These experiments compared remotely sensed data against Jornada’s network of ground-based instruments. One of Schmutge’s colleagues transferred to the Jornada Range in 2001 and later prevailed upon him to move to Las Cruces as well. He persuaded Schmutge to put in his bid for the Gerald Thomas Chair in Natural Resources at New Mexico State University.

Schmutge held that position for three years and followed it with two more years of research at the NMSU’s Physical Science Laboratory. He moved to NM WRRI as a volunteer researcher this year.

Governor Martinez holds press conference at NM WRRI

For the first time in its history, the NM Water Resources Research Institute hosted a sitting Governor at its home in Stucky Hall on the NMSU campus. Governor Martinez announced her proposal to the legislature for \$2 million in research dollars to the institute. “Without a safe and secure water supply, our economy cannot continue to grow,” she said during the news conference.

The proposed funding would help pay for faculty and student research grants, a yearly assessment of the state’s water supply (see statewide water budget story on page 1), a water policy and research applications scientist, and hydrologic data acquisition, synthesis and delivery.

NMSU President and former NM WRRI Acting Director Garrey Carruthers attended the event and said involving student scientists in New Mexico’s water future is the right move. “These grants to get young people to understand water, how to manage water, are going to be so important,” Carruthers said.

NM WRRI Director Sam Fernald praised the governor’s plan. He said the funding will elevate the statewide institute to meet additional water research needs associated with drought, water scarcity, water planning, and water quality. He encouraged everyone to contact their legislator to support the proposal in the upcoming 2014 legislative session. 💧



Governor Susana Martinez announces her proposal to provide \$2M to NM WRRI that would support more grants to researchers at New Mexico’s colleges and universities, expand staff and data operations, develop an annual statewide hydrologic assessment, and foster New Mexico’s next generation of water scientists, engineers, and managers. NMSU President Garrey Carruthers supported the proposed funding at the press conference.



Media gathered to listen to NM Governor Susana Martinez’s water research proposal to NM WRRI. After the announcement, the Governor met with several students who described their current water research projects.



NM WRRI Director Sam Fernald gives an interview in Spanish to El Paso KINT Univision TV on the initiatives to be undertaken with Governor Martinez’s support.

Photos by Peggy Risner

Dino Cervantes, Sam Fernald, J. Phillip King, Stephen Wilmeth, Gary Esslinger and Scott Verhines testified before the Drought Subcommittee to New Mexico's Water and Natural Resources Committee hearing in October in Las Cruces. Articles and photos by Will Keener



Conservation: variable meanings, variable approaches

Water conservation for those engaged in crop irrigation in New Mexico can be like a mirage, shimmering over a playa in the distance. It promises a bounty of water in arid country, but when you get there, it may not be what it seems.

“Conservation is a term with many meanings,” said Phil King, professor and associate department head of New Mexico State University’s Department of Civil Engineering and a consultant to the Elephant Butte Irrigation District. Kicking off an informational session with New Mexico legislators in Las Cruces in mid-October, King’s comment became the theme for others who contributed to the meeting as well. An expert panel emphasized to the legislators that a wide range of water conservation options are being actively pursued by the New Mexico agricultural community.

King told members of the Drought Subcommittee to New Mexico’s Water and Natural Resources Committee that more efficient water delivery results in better utilization and less return flow to the river. He described two basic philosophies for irrigation:

- Extensive irrigation, with low management levels, lower investment, and low unit production, and
- Intensive irrigation, with high management involvement, higher investment (such as drip irrigation), and higher unit production.

Taking an example of New Mexico chile, King said that NMSU studies have shown that chile responds to intensive irrigation with an increased yield and higher water depletion rates. With 100 acres of chile, 36 inches of irrigation water, and a 65 percent efficient system, 23.4 inches of the water is depleted and 12.6 returns to the river or groundwater system, yielding 8.1 tons of chile. Using drip irrigation with 95 percent efficiency, the yield is boosted using only 30 inches of water. But 28.5 inches are depleted and only 1.5 inches returns to the river.

Intensive irrigation, often considered a desired conservation measure, means more effective use of the water by plants and less water returned to the river system for downstream or environmental uses, he said. Similarly in a drought situation, when groundwater is pumped to the plants because surface water is not available, farmers are essentially capturing water that would normally return to the river, he noted. “There can be unintended impacts to groundwater quantity and quality and riparian ecosystem losses from increased depletions,” he said.

Irrigators must consider the local impacts of their actions as well as impacts on the larger-scale system,” King told the legislators. “One size does not fit all.”

Another variable in the conservation equation from a hydrologic perspective

is location, said Sam Fernald, director of the New Mexico Water Resources Research Institute. In some parts of the state groundwater is isolated and not connected to the area's river systems. The Ogallala aquifer system, stretching north south through the Great Plains, is an example of a "relict" groundwater system, with very little recharge compared to the amounts of water being withdrawn for irrigation. "In that system, if you let water go past the plant roots, you are losing it," Fernald said.

The Rio Grande offers different aquifer systems types along its reach through the state and into Mexico. In the north, many of the rivers have connections to the groundwater and are called "gaining rivers," Fernald said. In southern New Mexico, rivers can be either gaining or losing, depending on the location, season, and climate, he explained.

A study conducted by Fernald and other researchers, showed that after irrigation season there was more flow downstream from the Alcalde acequia system because of recharge from the acequias to the river. "In these systems, water is not lost when it goes below the root zone," he said.

The 2013 irrigation season marked the latest start for irrigation in the history of the Elephant Butte Irrigation District (EBID), said Gary Esslinger, EBID Treasurer-Manager. The year also marked the earliest shutdown in irrigation with member farmers receiving only 3.5 inches of water for the season, compared to a normal allotment of 36 inches received by farmers in the 1980s and 90s. The Elephant Butte reservoir was at its lowest level since 1972 and salinity in the local aquifers was increasing when a strong monsoon season began, he said.

Recent floods reveal weakness in controls and runoff capture

By Will Keener

Floods following the August and September monsoons demonstrated that more can be done to conserve water for agricultural use and to protect the growing population in the Lower Rio Grande Valley. "Our watersheds are impaired and they need major improvements," Gary Esslinger, Treasurer-General Manager for the Elephant Butte Irrigation District, told state legislators in a mid-October meeting. (See Conservation, on page 6.)

More than 30 "PL566" flood control dams were built in the early 1960s, but many wild arroyos were not dammed due to the high cost at that time, Esslinger told members of the Drought Subcommittee of New Mexico's Water and Natural Resources Committee. "What was a good idea for flood control to protect agriculture lands was not expanded to include urban development and that brings us to where we are now," he said. "With climate change we can expect more intense monsoon storms and less snowpack runoff. We need more ecologically sensitive ways to control storm runoff and manage the impaired watersheds around us."

State Engineer Scott Verhines told legislators that the flood control dams were designed for one purpose—protecting agriculture—and now are being used to protect residential development—another purpose. This is an example of what is called "hazard creep," he said. Deferred maintenance of many of these structures adds to the risk, he noted.

"Often these low hazard dams are reclassified to high hazard because of the urban development below them," said Esslinger. "There are dire consequences for their failure." He also noted that the designation of monument or wilderness status to portions of the lower Rio Grande watershed can impact future restoration and improvements for appropriate water control structures in some of these areas and this should be taken into consideration by lawmakers before these designations are introduced.

"If water is slowed and spread out, the impacts on the valley are lessened by flooding. It makes environmental sense to do this upstream in the watershed," said Stephen Wilmeth, representing the South Central New Mexico Stormwater Management Coalition at the meeting. Wilmeth told legislators about the Bureau of Land Management's Restore New Mexico program, which has focused on controlling invasive brush species and improving streambed environments. So far more than 1.8 million acres have been restored to healthy levels in the program. "Results in Doña Ana County have been positive," he said.

"The release season was shorter than the monsoon season this year," Esslinger told the committee. He said the strong monsoon resulted in an increase of 130,000 acre-feet in the reservoir. The rains caused a 21-foot rise in the level at

Elephant Butte Reservoir and a 17-foot rise in the level of Caballo Reservoir, downstream of Elephant Butte, he said.

Esslinger said an early warning system, which detects incoming storm patterns and alerts district personnel to react so canals can receive storm water and irrigation water can be evacuated, was instrumental in maximizing capture of the monsoon moisture. The district has also widened drainage channels within its rights-of-way to slow down and capture monsoon events thus increasing aquifer water quality and recharge and improving the habitat within the area. With the cooperation of several farmers, the district worked to infiltrate monsoon runoff on the fields this year even after they were saturated with rain. The result was that water infiltrated back into the aquifer on 4,000 acres within the district. “This was a huge benefit and a win-win situation for everyone,” he said.

Dino Cervantes, general manager of Cervantes Enterprises Inc., a New Mexico agribusiness told the committee farmers are taking action to optimize

their operations. Cervantes said his company has about 1,200 acres in New Mexico and grows chile, cotton, corn, silage crops for the local dairy farms, and pecans. About 95 percent of the company’s water is supplied by EBID. Because of recent low allocations, he estimated about 20 to 25 percent of the company’s land is fallow at a time when commodity prices have been at record levels. “We haven’t been able to take advantage of that,” he said.

“When we don’t get surface water, we have to pump and that comes at a significant cost. Our EBID assessments help keep the facilities maintained and we pay those annually even when we have to pump water. This is the heart of New Mexico agriculture,” Cervantes said of the area. “About 65 percent of New Mexico’s agricultural revenues come from the area south of Elephant Butte.”

Cervantes said technologies like laser leveling of fields and satellite-based navigation tools have resulted in major water savings. “Drip irrigation directs water to where it is needed and we now

have plant tissue sensors that turn on and off water as plants needs it,” he said. Some pecan farmers are removing clay soil layers in their fields to improve infiltration and root zone health. “Agriculture has taken these steps because it behooves us economically and environmentally. Sometimes, agriculture gets a bad name as a huge water user, but we are not wasting the resource, we are actively taking steps to use it wisely.” 💧



“When we don’t get surface water, we have to pump.” Dino Cervantes outlines conservation practices for local farmers.

To divert or not to divert? The clock is ticking.

Time is winding down on a decade-long process to provide needed water to southwest New Mexico with the help of the federal government. Project selection is mandated by 2014 and proponents of two opposing views of how to accomplish this goal appear to be more entrenched than ever.

To one group of advocates for the Gila River, the question is “should the river be destroyed in order to save it?” To another group, the question is “should water be moved efficiently from high in the river to where it is needed downstream?” These two different frames for the same action—diverting Gila water at high flow periods into side

canyons to feed a system that will aid the environment, preserve the history and culture of the region, and keep impacted agricultural communities viable—are the source of a difficult problem for New Mexico.

Meeting in Las Cruces in mid-October, the Drought Subcommittee for the New

Mexico Legislature’s Water and Natural Resources Committee heard a frank discussion of the pluses and minuses of some 16 proposals now being examined for the Gila region.

The approaching deadline was set by the Arizona Water Settlement Act of 2004, a measure designed to right a

wrong that occurred earlier when New Mexico didn't receive fair treatment in a California and Arizona settlement, according to Estevan Lopez, director of the state's Interstate Stream Commission (ISC). The act calls for evaluating Gila and San Francisco River projects for up to 14,000 acre-feet of water and provides as much as \$128 million to fund water supply projects in Southwestern New Mexico. The funds can be used only in the southwestern New Mexico region (Grant, Luna, Hidalgo and Catron counties), and a decision on projects must be forwarded to Washington by the end of 2014, according to provisions of the act.

Craig Roepke, deputy director of the ISC, has worked with a broad group of interested stakeholders and coordinated technical investigations in tackling the problem of identifying appropriate projects. He said a preliminary selection will be made by next August so that a final decision can be forwarded to the Secretary of Interior by year's end. Roepke said meetings in Washington with the Bureau of Reclamation have made it clear that the decision needs to be project-driven to gain the support it needs.

Projects suggested for funding fall into two general categories: conservation or diversion projects. Conservation projects make more effective use of existing waters, but do not bring new water resources to the area. Examples are recycling, effluent treatment and reuse, and ditch and watershed improvements. Currently the ISC is considering 13 conservation projects and three diversion projects, Roepke said.

Using a computer animation, Roepke showed the committee a diagram of the river with stream-bank areas and the diversion channels used by area

farmers. He told the group that 150 cubic feet per second is considered the minimum ecological flow for the river, but currently the flows are lower than that 90 percent of the time. Agricultural diversions in the Cliff-Gila Valley cause the riverbed to be dry at times, he said, as the animation sections of the river diagram turned to a dotted line. "The question is do you use the ditches and have a dry riverbed and risk loss to the riparian systems or do you use the river with no diversions and risk the losses to agriculture and communities," he said.

The largest of the diversion projects proposed would use off-stream reservoirs, filled during high flow events, to release water to protect the minimum stream flow requirements and environment of the river. "With enough storage you could also move water to some municipalities. We are trying to achieve a synergy between protecting the environment and helping water users at the same time," Roepke said.

"With this funding, we have an opportunity to change dry beds to stream flows," he said, while showing a photo with several dead cottonwoods standing out along a stream bank. "If we use the reservoirs to keep the river from drying out and at the same time release water to agriculture, we can have a vibrant economic agriculture community, which is the best defense against unbridled



Las Cruces High School student Marco Charrez speaks at a meeting of the New Mexico State Legislature's Drought Subcommittee in October. Charrez was one of several students who spoke against diversion projects on the Gila River after he and his youth group visited the river on a field trip.

growth for the future," Roepke told the committee.

Several groups disputed Roepke's vision however. John Cornell, spokesman for the Doña Ana County Associated Sportsmen and the New Mexico Wildlife Federation, opposed any solution that would divert water from the river. "Instead, we support locally sponsored projects that "are smart, cost-effective, and long-term solutions to meeting water needs," he said. Cornell said sportsmen contributed more than \$579 million to the state's economy in 2011. That is "more than combined receipts for pecans, hay, cotton, corn, and chile peppers" for the same year, he said.

Also speaking against diversion projects were members of the Youth for the Gila River, part of the Santa Rose de Lima Catholic Church youth activities in Las Cruces. The group showed a short video of a recent river visit followed by comments from several members. "If they were to make a diversion in the river, it can affect the things around

Costs, endangered species, selection process among legislative concerns

Members of the Drought Subcommittee expressed concerns on a number of fronts about the ongoing process of choosing projects to take advantage of federal funding under the Arizona Water Settlement Act. During a mid-October meeting in Las Cruces, members cited vague cost estimates, impacts on endangered species, and the selection process itself as areas of concern.

"I want to know our authority in this," said Subcommittee Chairman Joseph Cervantes, when he was told that the Interstate Stream Commission (ISC) would make the project decisions. "We [elected officials] are accountable to the voters for what happens." Cervantes, Senator for New Mexico's District 31 in Doña Ana County, said the next legislative session, a 30-day session in January, comes far in advance of the decision deadline. "It has been my experience that decisions made at the last minute even after a long process are bad ones," he said.

Peter Wirth, Senator from New Mexico District 25 in Santa Fe, told the committee that questions from interested sportsmen's groups need to be answered before construction proceeds on any project. He urged the ISC to include a conservation module in the animation model the agency is using. The work on mitigating environmental damages in the National Environmental Policy Act does not begin until a contract is signed with the government, Wirth noted. "A lot of negotiation on the environment will happen after we make a decision in this approach," he said.

In response to another question, Craig Roepke, deputy director of the ISC, told the committee that as many as five species may be at risk in the dry stretches of the Gila

River being created by existing agricultural diversions. "The declines are precipitous and we need to do something fairly soon," he said. Traditional approaches (through the courts) typically end with water being shut off to irrigators, Roepke said. "That is something the ISC would not like to see happen."

Legislators questioned the presenters about payment mechanisms for the construction of projects exceeding the federal grant amounts. "It seems these projects are more costly to the state than we think," said Mimi Stewart, Representative from New Mexico District 21 in Albuquerque. "After all these years, (planning began in 2001) if the ISC cannot bring diversion and non-diversion interests together, can we move on the non-diversion projects?" she asked. "If we don't choose diversion, can we choose the conservation path and invest our money in that?"

ISC Director Estevan Lopez said the state can decide if there will be one project or multiple projects. Such projects could involve a diversion project and simultaneous establishment of a conservation program, he said.

Jeff Steinborn, Representative from District 35 in Las Cruces, was also critical of the process. "The ISC has to make a decision by the end of next year. They have to put the state on the path of a diversion or not. There are some significant issues here, cost, endangered species, opportunity costs vs. conservation choices. My concern is at the point of decision we won't know the specifics of the projects. That seems like a crazy way to make a decision." Questions about how diversions will be governed are also unanswered, Steinborn noted. A diversion that will improve the environment and have an overall positive impact on the economy is "easier said than done," he noted. "There are a lot of interests in water." ♦

it greatly," said Paola Rivera, 17. "There are animals, plants, trees, insects that need the river. . . making a diversion could help at moments, but in the long run it wouldn't have been worth it."

Richard McInturff, city administrator for Deming, told the committee that his city, which has an effluent reuse project under consideration, is also keenly interested in a diversion project involving 10,000 acre-feet of water. The diversion would capture water then pump it by pipeline through the mining district between Silver City and Deming. The ISC has received statements of support for this plan from all the counties in the southwest region, many municipalities and other water-related organizations, he said. The opposition to the plan "favors stretching existing reserves. But this is a one-time opportunity to get a new source," he said. If there are environmental issues, the National Environmental Policy Act process can be used to resolve them later, he suggested.

McInturff was critical of a recent survey suggesting widespread public opposition to the diversion projects, citing questions that were leading and some containing misinformation. He also questioned the description of the Gila as a free-flowing river, a description used by several

groups in the dispute. “The Gila has three diversions in the Cliff-Gila valley, 12 dams including a dam for the Bill Evans Reservoir and three diversions below Redrock,” McInturff said. “I don’t know how it could be considered a wild river.”

Lori Weigle, a partner with Public Opinion Strategies, defended her company’s statewide survey of voters conducted this summer. The 500-person sample has a margin for error of 4.4 percent, she said. Released in July, the poll shows that New Mexicans value their rivers and fear river diversion projects on the Gila. Eighty-five percent favored conserving water, using new technology to reduce wasted water, and increasing recycling rather than diversions, she said.

Alex Thall, Grant Soil and Water Conservation District, spoke to the committee on behalf of 18 government entities who support a diversion. “We need water and there will be demand for water into the future,” he said. “We want to secure it in a sustainable and ecological way.” Thall traced the efforts to provide water in the region from the Mimbres and Anasazi cultures to acequias built by Spanish settlers in the 1700s. More recently, Steve Reynolds, then state engineer for New Mexico, took on the challenge to show Congress the unintended consequence of a California-Arizona Supreme Court decision. His work led to the Arizona Water Settlement Act. “The water awarded to New Mexico in the settlement act is not a subsidy,” Thall said. “It is an equity.” The proper question for the region should be “what are the impacts of not securing this water available to us?” he told the committee. 💧

Director’s current topics continued from page 2

water at the top of the priority list. Of particular importance is a \$2M initiative for water research in NM proposed by Governor Martinez and sponsored in House Bill 25 by Representative Rudy Martinez and Senator Tim Keller. The \$2M in recurring funding would dramatically improve water management in New Mexico by providing public water managers and private stakeholders the resources needed for innovation and the development of research-based tools to better assess, enhance, and manage our water supply, particularly recognizing the importance of both surface water and groundwater.

The \$2M per year initiative has been carefully crafted to provide a spectrum of vitally needed water information. The funding will allow NM WRRI to respond by supporting water research primarily by university faculty throughout New Mexico, while working closely with state agencies and the impacted stakeholders such as agricultural producers, pueblos, traditional acequias, and small community water suppliers to name a few. Specifically, this initiative will support NM university research by faculty-student teams (\$120K) and individual students (\$60K). To further support cutting-edge research, the funding will provide for the remote sensing of the spatial distribution of water (\$100K), and for the acquisition and analysis of data (\$70K) related to that research. A data applications scientist will be supported (\$100K) to translate

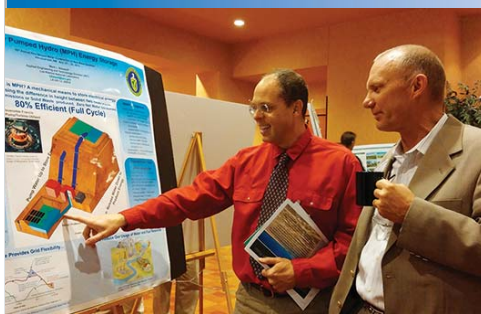
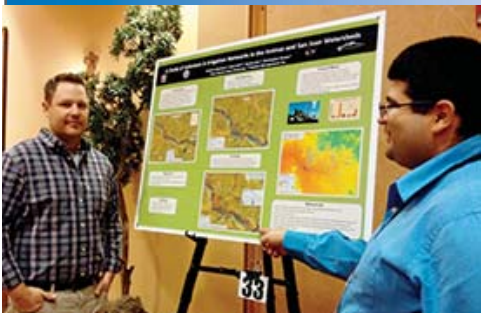
data intense products to policy relevant analyses. Moving to prepare New Mexico for a healthy sustainable future, the initiative will support a statewide water assessment (\$800K) that is hydrologically based (as further explored on page 1 of this issue), annually updated, and that complements state agency hydrology programs without duplicating existing programs. The initiative will also establish long-term research coordinated between agencies and academia (\$450K) in order to provide critical feedback on water resources issues from the universities to the agencies and stakeholders needing it. Innovation for private sector commercialization and water related job creation will be supported starting with a new early college high school (\$150K) focused on water and smart urban development and with a New MeXico water prize (\$150 K) to bring the best new ideas to the surface for addressing water scarcity.

This is an important year for NM WRRI to help all of our water invested stakeholders to grab the reins of history, elevate research, and improve New Mexico water management for the next 50 years. This new mindset can start this year. Please write your legislators to support the HB 25 and the Governor’s water research initiative. 💧

Legislating Water Issues: A Note of Optimism

Finding the Time to Get It Right

By Erin Ward, NM WRRI



The New Mexico Water Resources Research Institute (NM WRRI) opened the second day of its 58th Annual Water Conference with experts sharing their ideas on how to overcome obstacles preventing more efficient and flexible ways of managing the state's water. With New Mexico in its fourth year of drought, the messages were often bleak. One speaker ventured a note of optimism.

State Sen. Peter Wirth (D-Santa Fe) told about 180 people attending the morning's first session that the State Legislature is preparing to address a number of water issues during this year's 30-day session. He noted the state's two major political parties are equally engaged in the process.

"Things have changed," he said. The Legislature is at the "start of a different direction."

Issues likely to be discussed:

- How to sustain groundwater supplies during long-term drought
- How to administer senior vs. junior water rights and the potential for priority calls
- A Texas lawsuit that seeks to enforce a Lower Rio Grande groundwater pumping agreement
- Use of New Mexico's acequia system as a cultural model for other communities
- How to balance the "economic component" of water with the need to reduce demand

Wirth said some progress was made last year when the Legislature passed two bills that altered the state's domestic well laws. The changes make it harder to separate water from farmland, build a housing development on the detached land, and then sink onsite "domestic" wells to support the new homes. "We stopped that practice of double-dipping," Wirth explained.

Wirth urged New Mexicans to learn from the mistakes of its neighbors. Colorado's San Luis Valley, as an example, has allowed groundwater pumping to the point that valley residents now question the region's future for farming. In New Mexico, he said, "We want to fix this ourselves." Some options include the creation of irrigation sub-districts for allocation of water and the ability of the state or its water districts to tax the excessive use of groundwater. Other options include payments to farmers to fallow land, a more aggressive use of priority calls in support of senior water right holders, and promotion of a "culture of conservation" throughout the state.

NM WRRRI's 58th Annual New Mexico Water Conference, "New Water Realities: Proposals for Meaningful Change" drew nearly 300 participants from throughout the state and region. The day-and-a-half conference featured water experts and stakeholders and included 40 posters.

On the issue of groundwater adjudication, Wirth and others said it was a good long-term strategy, but was unlikely to solve immediate problems with interstate delivery requirements. "Adjudication can't happen in enough time" to solve our problems, he said.

Session moderator and *Albuquerque Journal* reporter John Fleck provided a journalist's perspective on how water is legislated in Santa Fe. He called on the Legislature to find the time to update its members on state water issues. He noted that elected officials have an enormous range of issues to understand and are often faced with making important decisions in short periods of time. The result, he noted, has been a reluctance to fix the larger "major league" issues and a willingness to support only "small ball" repairs.

The Conference morning session included a review by Kris Polly of Water Strategies, LLC on federal water issues. Top federal water issues include:

- Fixing a federal agency "disconnect" over how to license and approve small hydropower projects
- Allocating funds to support programs and infrastructure projects authorized under the federal Water Resources Development Act
- Defining EPA's jurisdiction under the Clean Water Act, particularly in reference to what is known as "navigable waters"

Polly highlighted his organization's success in reversing an FDA measure that would have required treatment of agricultural irrigation water to the sanitary standards of urban drinking water. While the idea was impractical from the start, he said, reversing the FDA's position was not easy. Water Strategies arranged a tour of a Washington state irrigation system to show FDA officials how a system worked. The end result was a reversal in the agency's position.

Hilary Brinegar, a New Mexico water expert with Marron and Associates, opened the day's second session with a far-ranging panel discussion on the economic impacts of water use. Much of the discussion centered on the state's progress in managing New Mexico's portion of the Pecos River to support deliveries to Texas at the state line. Greg Lewis, Pecos River Basin Manager with the New Mexico Interstate Stream Commission, said heavy rains this past September augmented the river system, allowing the river to remain full, guaranteeing at least for the short term, that New Mexico will fulfill its delivery obligations to Texas.

The session closed with a humorous and charming dual-keynote presentation, "Reflections from Water Careers in the Ivory Tower," by retiring professors Dr. Bruce Thomson of UNM and Dr. Adrian Hanson of NMSU.💧



NM WRRI hosts legislator reception in Stucky Hall

Following the New Mexico Legislative Subcommittee on Drought's meeting held in Las Cruces on October 14, 2013, committee members and all meeting attendees were invited to NMSU's Stucky Hall, home to the NM Water Resources Research Institute. Over 65 people gathered to mingle after the committee meeting and to learn more about the research sponsored by the institute. Senior Hydrogeologist John Hawley talked with attendees about his long-term ongoing effort to develop a basin-wide hydrogeologic framework for the transboundary aquifer systems in southwestern NM and reaching into adjacent parts of Arizona, Chihuahua, and Sonora (see lead story in the May 2013 *Divining Rod*). Several students also presented water-related research posters.



In Memoriam

Frank Titus

April 10, 1928 - December 21, 2013

John Fleck, journalist for the *Albuquerque Journal*, recalls Frank Titus taking to the Albuquerque Convention Center stage in November 1994 at the New Mexico Water Resource Research Institute's annual water conference to warn of the community's looming water problems. By his own description, Titus was being "purposefully pessimistic." Fleck added that at the time, newly emerging science suggested Albuquerque, with a growing population and declining groundwater, faced a problem. The risk, Titus told the audience at the fall water science and policy gathering, was a "water crisis."

Fleck added that the comment seemed odd for an optimist, a man rarely seen without a smile. "He was pretty much always like that," Rebecca Taylor told Fleck of her father's perpetually sunny disposition.

At a recent get-together following his death on December 21, friends and colleagues of Frank Titus recalled his cheerful demeanor. They also were aware of this long distinguished career as a first-rate geologist and water expert that spanned nearly 50 years.

"He was, in many respects, sort of the conscience of the water community," said Bruce Thomson, recently retired head of the University of New Mexico's Water Resources Program.

Born in Los Angeles on April 10, 1928, Titus arrived in New Mexico in 1956 to work at the U.S. Geological Survey and earned a doctorate in geology

at the University of New Mexico. He specialized in hydrogeology, the study of how water moves through the ground. Titus worked as a professor at New Mexico Tech and as a groundwater adviser at the New Mexico Bureau of Mines and Mineral Resources. He left New Mexico in the early 1970s to work as a consulting geologist, but returned to the state in the late 1980s.



Photo courtesy of Rebecca Taylor

According to Fleck, at the time of Titus' 1994 Albuquerque speech, his former colleagues at the USGS had just delivered a devastating analysis of the Albuquerque area's groundwater resources. City leaders had long claimed Albuquerque's great advantage over other desert cities was a seemingly limitless aquifer: "an underground lake larger than Lake Superior," as boosters claimed in a 1984 magazine

ad. The USGS work showed the "Lake Superior" claim was dangerously wrong. The trick was to get the community's politicians and policy-makers to accept what the researchers were telling them.

While the scientists involved had to guard against overt advocacy, recalled former USGS scientist Mike Kernodle, Titus, then working in the private sector, was under no such constraints. "We definitely needed him to keep things going," Kernodle said.

Titus worked in the public sector at various times, including as a science adviser to the New Mexico State Engineer for a three-year period. But he always spoke out according to John Fleck. "There is no source of water available to us outside of the supply we now have so we've got to learn to live with what we've got," Titus said at a 1997 public forum on regional water planning.

One of Titus' key contributions was leadership in a group that in the late 1990s developed a "water budget" for the Albuquerque metro area and surrounding communities. When he died, he was beginning to work on a 21st-century update, according to Thomson.

Frank Titus attended many annual New Mexico water conferences over the years as well as NM WRRI's technical research symposia held during the 2000s. He will be missed. 💧

Bridging the Gap: Transformational Solutions for Water in the West

Howard Passell, Ecologist, Sandia National Laboratories (hdpasse@sandia.gov)

Are there transformational solutions that will help us bridge the gap between future water demand and supply in the West, and if so, what are they?

Those were key questions at the Transformational Solutions for Water in the West Roundtable Sept. 5, 2013, hosted by Sandia National Laboratories (SNL), the Atlantic Council, and the New Mexico Water Resources Research Institute. The conference attracted more than 200 attendees to the University of New Mexico in Albuquerque and opened with an assertion and two questions posed by the organizing committee.

The assertion was that current incremental efforts at water conservation, demand reduction, supply augmentation, policy approaches, educational programs, and others in the western U.S., do not place the region on a trajectory to meet projected water demand in the coming decades. This view, long largely ignored, has become more and more widely argued in the last few years as the realities of drought, climate change, and water scarcity in the West have become increasingly prominent. It's uniquely important because it presents the threat that current lifestyles and economic growth in the West may not be sustainable in the decades to come.

The counter argument to that forecast is that human ingenuity will find a way. This optimistic view raises the first of two questions: If we are not on a trajectory to meet future demand, but we assume that future demand will somehow be met, then will it be met by some set of transformational solutions? In other words, are there game changers—technical, social, political, or others—that can boost us in a non-linear way toward meeting projected future demand? And what would they be?

And the second question is this: If we are not on track to meet water demand in the West, and there are no viable

transformational solutions, then what are we going to do? What is Plan B?

These questions originally arose, well before the Roundtable, because SNL scientists began looking at their own work for signs of transformational solutions. They discovered some that appeared, at first glance, to be transformational. However, on closer examination, it became clear that these solutions only tended to *shift the supply-demand gap* from water to some other sector. SNL's Dr. Jesse Roach described at the Roundtable his work with Dagmar Llewellyn, from the US Bureau of Reclamation, showing that water supply problems in the Middle Rio Grande Valley of central New Mexico might be addressed in decades to come by—for example—reducing acreage in irrigated agriculture, or in the *bosque* (the riparian cottonwood/willow forest), or by paving the river with cement to prevent leakage. But in all those cases, the gap simply shifts from water to cultural, economic, and ecological sectors. In other words, the solutions present a zero-sum game, in which gains in one sector lead to losses in another.

Other work from SNL showed similar results. Dr. Vince Tidwell from Sandia showed at the Roundtable how future water demand for thermoelectric power production across the West could be met by exploiting alternative water sources—including some water currently used for agriculture, unallocated fresh water, municipal wastewater, and saline groundwater. However, Tidwell's work suggests that the price for water in the West could increase dramatically as a result. In that case, we shift the gap from water to the economy in another zero-sum game.

The call went out. Send us your transformational solutions. Water experts from across the West gathered to identify transformational solutions that did not simply shift the gap. Albuquerque Mayor Richard Berry gave the keynote

The Transformational Solutions Roundtable highlighted the idea that truly transformational solutions are difficult to find and may be even harder to implement. Most solutions appear to be incremental, leaving open the possibility of real and dramatic water shortages impacting New Mexico livelihoods, environment, and communities in the not-too-distant future. Instead of 'silver bullets', accelerated, intensified, and comprehensive approaches coordinated across all water use sectors might provide a sustainable path forward.

introduction, New Mexico State Engineer Scott Verhines made brief keynote comments in the afternoon, and Senator Tom Udall (D-NM) delivered the keynote speech and moderated a panel that explored ways to address the future supply/demand deficits. Seventeen other speakers from New Mexico, Texas, Arizona, Nevada, and California made expert presentations. The Roundtable was moderated by Sandia Center Directors and Climate Program leads Marianne Walck and Rob Leland.



Roundtable attendees were given an opportunity to ask questions and provide their own views on transformational solutions for bridging the gap between water supply and demand in the West. Photo by Peggy Risner.

All the presentations made at the Roundtable offered ideas that could have important impacts on the supply-demand equation. Representatives from municipal water utilities in Albuquerque, El Paso, and Las Vegas, Nevada showed how municipal water consumption has already been reduced dramatically. Various speakers showed how shortage sharing agreements and other improvements in water governance, science, and engineering can improve water resource availability. And some presentations were indeed transformational, depending on how one interprets the term. Reed Benson from UNM School of Law argued for the federalization of water resources management. Max Yeh from the Percha/Animas Watershed Association in New Mexico's Sierra County argued that it is the language itself that we use to describe and define water resources in the West that must be changed. Benjamin Ruddell from Arizona State University described how importation of 'virtual' water could have important impacts. And there were others. The agenda from the conference and some of the presentations can be viewed at this Atlantic Council website: <http://www.atlanticcouncil.org/events/past-events/transformational-solutions-for-water-in-the-west>.

But overall, few of the presentations and little of the following discussion directly tackled the opening questions. In the words of one observer, a UNM professor:

The talks I heard were largely expositions on current research and policy. The growing demand and availability deficit for freshwater seemed to be totally missing in the presentations I listened to. It is easier to stay with tried and true materials presented in the past. Not many rose to your challenge. Seems like denial until crisis rules as usual. Scientists are conservative by nature.

Another UNM professor, Dr. Bruce Thomson, who recently stepped down as Director of UNM's Water Resources Program, told a similar story, and in a message following the conference offered a few transformational solutions of his own, for publication here. Some of these ideas have been considered informally, but rarely in writing and with attribution. Here are excerpts of his message:

At least in NM, I think the whole water system is so ossified that the obvious solutions, those which I would consider transformative, are considered by most water managers to be impossible. There is so much infrastructure built around the current system that the whole thing is set in 9,000 psi high strength kryptonite concrete, to use a civil engineering metaphor.

By infrastructure I mean everything: physical infrastructure (reservoirs, irrigation systems, utilities, etc.), economic infrastructure (land prices, water rights prices, bank loans, state and federal grants/loans, etc.), social infrastructure (communities, towns, schools, roads, etc.), cultural infrastructure (agrarian, urban, acequia, environmental lifestyles, etc.), and of course political infrastructure (all of the laws and regulations that have been passed over the last ~100 years). The entire system of water management and use is so constrained that the changes needed to make the whole system function rationally would be considered catastrophic by folks with an interest in the game, at least by my sense of rational.



Participants of the Transformational Solutions for Water in the West Roundtable included from left to right: Reed Benson, UNM Law; Benjamin Ruddell, ASU; Vince Tidwell, SNL; NM Senator Tom Udall; Marianne Walck, SNL; Rob Leland, SNL; and John Lyman, Atlantic Council. Photo by Peggy Risner.

Dr. Thomson went on with a short list of what he called transformational ideas that he said “will never happen.”

1. Get rid of the prior appropriation system. Basing water rights on uses of 100 years ago is stupid, antiquated, and doesn't work. It allows no incentives for conservation or shared shortage in times of drought, and it does not provide water for environmental services such as maintaining flows for aquatic and riparian species. Furthermore, without adjudication the State Engineer can't enforce it.
2. Require all new development (municipal, ag, industry, etc.) to demonstrate a sustainable water supply before development is allowed. Current law requires developers to submit documentation that there's 40 years of supply; some county planning ordinances require longer. The Office of the State Engineer (OSE) can accept/not accept documentation but has no authority—the counties approve/deny subdivisions and are not constrained by OSE findings. This one change would eliminate all desalination projects because saline water isn't sustainable. It would also severely constrain development in places like Rio Rancho, the fringes of Albuquerque, and elsewhere.

3. Establish watershed-based water markets and require full disclosure of the value of transactions. The current system, or more properly the lack of a system, leads to crazy speculation, transfers of paper water without real water, and inhibits rational water transfers.

4. Change the interstate river compacts to allow water management strategies that are consistent with 21st century hydrologic understanding and water uses. The distribution of water among the state partners should remain the same, but flexibility is needed to allow management strategies such as eliminating the requirement to store water in Elephant Butte [a southern reservoir with very high evaporation losses]. In addition, Texas and Colorado should have to share in providing water to keep the Rio Grande Silvery Minnow

[protected under the federal Endangered Species Act] alive.

5. Develop incentives for conserving water among water rights holders, especially the agricultural community. The prior appropriation system requires water rights owners to use their full allotment of water to protect their right. This is commonly referred to as “use it or lose it.” State water law should be changed so that owners retain their full right even if they don't use it. This would allow them to lease or sell conserved water.

Dr. Thomson wrote, “None of these will happen in my lifetime because there are too many vested interests among people with too much influence.” He closed his thoughts on transformational solutions with this:

I maintain that water management in NM and the West is not a zero-sum game. In other words, it's not a system where there will be winners and losers. It's a situation where there will be losers and bigger losers. Hence nobody has the will or courage to make transformative changes because every sector of the community has vested interests that will likely be impacted.

Why weren't more of these kinds of ideas addressed more directly at the Roundtable? It became evident, even as abstracts for presentations came in as the event was being planned, that truly transformational ideas were less common than presentations of ongoing work. The short turnaround time between the call for abstracts and the Roundtable may have left potential presenters little time to develop out-of-the-box ideas and favored talks that were extensions of existing research. Perhaps discussion of the supply/demand gap is still too uncomfortable.

It is possible too that truly transformational solutions are infeasible or nearly impossible, almost by definition alone. Experience has shown us that there generally are no 'silver bullets,' that solutions to complex resource scarcity problems are generally distributed with small contributions across many sources. But also, truly transformational solutions disrupt the *status quo*—they disrupt social, political and economic systems, and are opposed by the many individuals and groups with special interests and investments.

Perhaps the only way to address the future water supply/demand gap is with incremental approaches after all—but with efforts that are accelerated, intensified, and comprehensively coordinated and integrated across all water use sectors.

But perhaps too, what seem like impossible transformational solutions today may become possible tomorrow. Or, an idea considered today in its raw form may be impossible, but over years, with modifications, and with changing social, ecological, political, and technological conditions, derivatives of what was once impossible may become possible. As Dr. Thomson wrote about western water issues, "every sector of the community has vested interests that will likely be impacted." As members of the community broadly recognize that the challenge has impacts for all, and that the challenge can only be met with all (or at least many) members of the community acting together, then perhaps important transformations will occur.

So it may be useful to identify transformational solutions now that could one day tip the balances, and begin the discussion. And meanwhile, we might want to be thinking about Plan B, as well. 💧

Sandia National Laboratories is a multiprogram laboratory managed and operated by Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, for the US Department of Energy's National Nuclear Security Administration under contract DEAC04-94AL85000.

Excerpts from Senator Tom Udall's remarks

The reason for today's meeting is sobering. Our water supply and our consumption is out of balance, even with ongoing efforts at conservation. Many water professionals who are here today know this in very technical and precise terms. Farmers know this in very real and personal terms.

Today's meeting stresses a crucial point. We have to think outside the box. Solutions need to be "transformative."

A Sandia study estimated the economic impacts state-by-state looking at the expected impacts of climate on water supplies. The total costs of climate change due to water supply impacts are staggering. They are estimated at \$1 trillion dollars for the nation as a whole over the next 40 years. The total cost to New Mexico would be over \$25 billion dollars.

A recent Los Alamos study was equally alarming. Looking at the effects of climate change on Northern New Mexico's forests, it found that they could be nearly all gone in 50 years. That's a major impact on our water supplies as well.

These are big concerns, big challenges. So last year, I teamed up with the NMSU and the NM WRRRI to co-host a water conference in Las Cruces. We listened to experts with different perspectives... Earlier this year, we released a white paper on what we had learned. That paper is available on my website [and on NM WRRRI's website]. I would like to flag a couple of the most interesting points.

- First, water information is lacking—especially with groundwater. Even worse, water information is at risk of being lost [due to] Federal funding cuts.

- Second, there is great untapped potential for water conservation. But a key question often goes unasked — and unanswered — is: where do the water savings go?

- This last point raises hard questions: what are the water resource limits to growth in the West? How do we make our communities resilient? What are the transformative solutions?

NMSU chemical engineering doctoral student awarded \$10,000 scholarship

By Yadira Corral, NMSU's Institute for Energy and the Environment

Leila Karimi, a Ph.D. candidate who researches brackish water desalination at New Mexico State University's Institute for Energy and the Environment, has been awarded the International Desalination Association's 2013 Channabasappa Memorial Scholarship.

The \$10,000 scholarship is designed to encourage engineers and scientists to pursue education in subjects related to desalination and water re-use. Applicants are required to be from the top 10 percent of their class in science or engineering and exhibit leadership and achievement potential.

"She was selected from a pool of applicants from around the world. The entire chemical engineering family is incredibly proud of her accomplishments and efforts in the area of brackish water desalination," said David Rockstraw, NMSU chemical engineering department head.

Karimi has been conducting her desalination research since August 2011 under the supervision of Abbas Ghassemi.

"Receiving this scholarship will not only help me overcome financial challenges, but it will also make my resume stand out when I am looking for a job," Karimi said. "Without the great support from my generous supervisor, Abbas Ghassemi, and my coworkers, this could not have happened."



Photo courtesy of Institute for Energy and the Environment

After earning her bachelor's and master's degrees, Karimi taught for two years at the Sahand University of Technology before deciding to continue her education.

"I chose NMSU because of its international leadership in the field of water treatment and the opportunity to work with distinguished researchers from academia, government and industry," Karimi said. "IEE provided me the opportunity to search for new water resources for people suffering from fresh water scarcity." ♦

USGS 104G Water Research Competitive Grants Program RFP, FY 2014

If you are interested in submitting a proposal, contact NM WRRRI Director Sam Fernald (575-646-4337; afernald@ad.nmsu.edu). Proposal and budget should be reviewed by NM WRRRI no later than **February 10, 2014**.

The U.S. Geological Survey in cooperation with the National Institutes for Water Resources requests proposals for matching grants to support research on the topic of improving and enhancing the nation's water supply. The RFP includes specific priority areas of inquiry.

This program provides university researchers with up to \$250,000 for projects of 1 to 3 years in duration. It requires

a 1:1 non-federal match. The intent of the program is to encourage projects with collaboration between universities and the USGS. Funds have not been appropriated for this program but the USGS is proceeding with the proposal solicitation process in case an appropriation is received. The RFP at https://niwr.net/public/get_RFP/?type=%31%30%34G gives information on past year funding including award amounts and funding success rates.

Researchers must submit their proposal online at the NIWR.net website. The deadline is February 20, 2014, by 4PM Eastern Time.