DECEMBER 2011 NEWSLETTER

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VIEWPOINT: 100 YEARS OF SUPPLY

When the Groundwater Management Act was passed in 1980, the concepts of adequate and assured water supply were almost an afterthought. Far more attention was paid to agricultural irrigation rights and types of groundwater withdrawal permits. But over time, the Assured Water Supply program, and its junior partner for areas outside the AMAs, the Adequate Water Supply program, became pre-eminent at ADWR.

Embedded in both is the core concept of a water supply for subdivisions and municipal providers that is physically, legally, and continuously available for 100 years. A decline in water levels down to 1000 ft below ground surface (1200 ft outside the AMAs) over that 100 year time period is seen as acceptable. That century-long planning period seems perfectly acceptable to most decision-makers now, and has even bled over to other areas besides residential supply. But what happens in a century?

Climatic variability seems likely to increase. Over the course of the next 100 years the Colorado River is likely to experience shortages that will be felt first in Arizona. Droughts severe enough to adversely impact flows along the Salt-Verde River system are not unthinkable; they have occurred before. If aquifers are depleted up to the allowances built into the Assured and Adequate Water Supply programs, where will the water come from? What will be the collateral consequences of that much pumping?

Hydrologists know that water supplies can be manipulated and extracted only so much and for so long. Hydrologists can predict physical effects. Planners in Arizona need to consult more seriously with hydrologists about what will happen with groundwater and surface flows with increasing economic growth and decreasing climatic stability. The 100 year number seemed long enough when programs were first set up, but we are already well into that century. And we must get ready for the next one.

We already have a homegrown example of what can happen when a desert civilization no longer has a reliable water supply. In Piman languages the word Hohokam translates loosely as “all used up.”

Alan Dulaney,

AHS Corporate Board President, 2011

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GOVERNMENT GOINGS-ON

At the most recent meeting of the Central Arizona Water Conservation District (CAWCD) Board of Directors, the people who run the CAP canal, the ADD Water program received a lot of attention. ADD Water stands for Acquisition, Development, and Delivery. This program was thought up by CAWCD staff as a means of utilizing the CAP canal to bring more water into central and southern Arizona in the coming decades. Meetings with stakeholders began in 2008, and ran regularly up to this year. Several concepts have been put forth, debated, and some discarded, but a program acceptable to the Board has not yet emerged.

Basically, the situation is this: the canal capacity is currently about 1.8 million acre-feet per year, but only about 1.5 million acre-feet of CAP water actually goes down it. The unused 300,000 acre-feet per year capacity sits idle. The idea is to find an additional 300,000 acre-feet

of water and use the canal to wheel it down to those entities that need that water and can pay for it. The CAWCD is the obvious agency to run the program since they run the canal (the United States government owns it). The tricky questions have been how to dole that water out, how to pay for it, and how to operate the program.

The looming question that has not been truly addressed yet is where is that water going to coming from and how much will it cost. Agricultural prices are up and fields are in production, and it is unlikely in any event that holders of water rights along the Colorado River (such as the farmers in Yuma) would ever permanently relinquish their senior rights. They see very clearly what is coming. But groundwater basins exist near the CAP canal in western Arizona, and that source is under consideration. Legislative changes would be necessary, but that is not impossible. Desalinization plants have also been suggested.

Presentations to the Board were made by CAWCD staff and by a stakeholders' coalition that includes municipal providers, developers, mining interests, and power generators. CAWCD planners are less enthusiastic than at the beginning, tired from the long process. The stakeholders' coalition has support,, but not buy off from CAWCD staff. Divisions were apparent amongst the Board members, as discussions revolved around how much time and money has been spent already, whether the program has a good chance for success, and how it might affect the Central Arizona Groundwater Replenishment District. In the end, the consensus of the Board was that ADD Water should continue, with regular reports to the Board.

The reason ADD Water is important is that it could be not just the next, but maybe the last big bucket of water to move across Arizona. Keep your eye on this one.

Alan Dulaney,

AHS Corporate Board President, 2011

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AHS FOUNDATION SEEKS END-OF-YEAR DONATIONS

As the newly elected President of the Arizona Hydrological Society Foundation (AHSF), I want to share with you what an honor it is to be part of the AHSF Board of Directors. Since 2006, I have had the pleasure of serving the Foundation with a very distinguished group of scientists who have contributed much to the field of hydrology, and to AHS and AHSF. Our current Board includes original members Monte Montgomery (Vice President), Howard Grahn (Treasurer), Mike Pearce, and Gary Small in addition to Ted Lehman (Secretary), Chuck Graf, Marvin Glotfelty (Past President), and Mike Hulst (AHS rep.). All of us are committed to the goals of the Foundation, namely to safeguard and increase the assets of the Foundation and distribute those assets in a manner that promotes hydrology-related education.

AHSF raises monies through fundraising and solicitation of available grants to help fund the AHS scholarships, Halpenny and Bouwer Internships, and prizes for annual school science fairs. AHSF is working to grow its endowment fund to cover the scholarships and internships in perpetuity and increase its educational support in Arizona.

YOU can help us move toward our goal of a sustainable endowment by closing out 2011 with a **tax-deductible donation to the Foundation.** We don't toot our horn often, but consider the value of the AHS internships. We've all heard the praise for and from our student interns who have moved on to hydrology or related jobs in our community and around the world thanks to their AHS internship experience.

Please help us ensure that the internships, scholarships, and science fair awards can continue to be an AHSF/AHS legacy. Your donation can be earmarked for the long-term endowment, scholarships, or either the Halpenny or Bouwer Internships. Go to http://www.azhydrosoc.org/ and click on AHS Foundation online donations at the bottom of the left column.

I look forward to continuing to serve AHSF and AHS as President of the Foundation. I hope you will show your support by making a donation for 2011.

Many thanks,

Gail E. Cordy

President, AHS Foundation

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AHS MEMBERSHIP 2012 RENEWAL REMINDER

It's the new year and it's time to renew your AHS membership if you were not able to attend this year's annual symposium! 2012 Membership was included for both full registration and a one day registration fees. Membership dues can to be renewed online at:
http://www.azhydrosoc.org/join_ahs.html

Or by mail to:
Arizona Hydrological Society
P.O. Box 1882
Higley, AZ 85236

Thank you for your continued support of the Arizona Hydrological Society!

PHOENIX CHAPTER NEWS

The next Phoenix chapter dinner meeting will be held **on Tuesday, December 13, 2011**, at SunUp Brewing Co., in midtown Phoenix (on the north side of Camelback Road, just east of Central Avenue). Please join us for a beverage, to share business cards, and talk water!

Location:	SunUp Brewery 322 E. Camelback Road Phoenix, AZ 85012
Event:	An Introduction to the Proposed New Arizona Pollutant Discharge Elimination System (AZPDES) General Permits Marnie Greenbie, ADEQ Surface Water Section, Permits Unit Supervisor
Chapter Board Meeting:	4:30 PM – 5:30 PM

Happy Hour & Dinner:	5:30 PM – 7:00 PM
Program:	7:00 PM – 8:00 PM
Cost:	$15 member, $20 non-member, $5 student

RSVP with Kirk Creswick at kcreswick@eecphx.com or 602-248-7702.

Hope to see you there!

Marnie Greenbie of ADEQ will give a presentation at the December Phoenix Chapter meeting on the Proposed New Arizona Pollutant Discharge Elimination System (AZPDES) General Permits.

Marnie Greenbie is the Permits Unit Supervisor in the ADEQ Surface Water Section. She has been in the Permits Unit since October 2007. Prior to this, she spent five years in the ADEQ Air Quality Division and seven years as a hydrologist in the ADEQ Water Permits Section (now Groundwater Section). Marnie has a Bachelor of Science degree in Geology from the University of the State of New York and did post-graduate work in geology at Arizona State University.

Abstract

In an effort to improve permitting processes and increase efficiency wherever possible, the Arizona Department of Environmental Quality (ADEQ) is in the process of developing several new Arizona Pollutant Discharge Elimination System (AZPDES) general permits for discharges which are currently regulated under individual AZPDES permits. These include general permits for minor wastewater treatment plants discharging to ephemeral or effluent dependent waters, infrequent dischargers, arsenic treatment plants, and treatment works treating domestic sewage (biosolids). Minor wastewater treatment plants are those that have a design capacity of less than 1 million gallons per day. Infrequent dischargers are wastewater treatment plants with a design capacity of less than 20 mgd which discharge on a routine basis no more frequently than two times per calendar year with a duration of no more than 14 consecutive days per discharge event and/or may have emergency discharges occurring no more frequently than three times per permit term with a duration of no more than 14 consecutive days per discharge event. Additional general permits will be proposed in 2012, including treated groundwater from groundwater remediation systems, discharges to canals, and riparian habitat restoration.

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Future Event Calendar (see also calendar on www.azhydrosoc.org)

- January 2012 – Planning meeting
- February and beyond – maybe you? Please contact Tom Walker, Phoenix Chapter Vice President, if you would like to give us a presentation or if you know anyone else who could use an audience.

AZAEP, A&WMA AND AHS HOLIDAY MIXER AT DECEMBER 15, 2011!

Join your fellow Arizona environmental professionals for a fabulous Holiday networking event with hors d'oeuvres at the Terroir Wine Pub in Scottsdale!

AZAEP, A&WMA (Grand Canyon Section) and AHS members are invited for light appetizers along with a no-host wine tasting and cash bar – and an opportunity to expand your network!

December 15, 2011 (THURSDAY)

6-8 PM

Please RSVP by Tuesday, December 13th to: azaep@azaep.org

Attendees are requested to bring a non-perishable food donation for St. Mary's Food Bank.

PHOENIX CHAPTER OFFICER ELECTION RESULTS

A big THANK YOU to our dedicated Phoenix Chapter officers for 2012 – we appreciate your service!

- President: **Keith Ross**, Atwell, LLC
- Vice-President: **Tom Walker**, Fleet-Fisher Engineering, Inc
- Treasurer: **Kirk Creswick**, Engineering and Environmental Consultants, Inc.
- Secretary: **Angela Bond**, Salt River Project

Phoenix Chapter Board Members

- **Vicki Mills**, Engineering and Environmental Consultants, Inc.
- **Rich Siegel**, Salt River Project

Phoenix Chapter Corporate Board Members

- **Beth Proffitt,** Accutest Laboratories
- **Summer Waters,** University of Arizona Cooperative Extension, Maricopa County

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2012 AHS SYMPOSIUM: CONFLUENCES – 25 YEARS BRINGING WATER, PEOPLE, AND IDEAS TOGETHER

Our next planning meeting is **December 13, 2011 at SunUp Brewery on Camelback at 4 pm**, just prior to the regular Phoenix Chapter Board meeting. Be prepared to brainstorm about advertising, field trips, workshops, another plenary speaker or two, entertainment, etc.

If you have questions or want to get involved please contact Ted Lehman at ted@jefuller.com or 480-222-5709. Looking forward to putting together another successful symposium. This will be the 25th!

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TUCSON CHAPTER NEWS

Please join us for the next Tucson Chapter meeting, **Tuesday, December 13, at 6PM** when **Dr. Richard Greenberg**, University of Arizona, Lunar and Planetary Laboratory, discusses his new book.

Location:	Montgomery and Associates 1550 East Prince Road Tucson, AZ
Social half hour:	6:00 PM
Program:	6:30 PM

Unmasking Europa: The Search for Life on Jupiter's Ocean Moon

Richard Greenberg, University of Arizona, Lunar and Planetary Laboratory, Tucson

The second-outward of Jupiter's four major moons, Europa is covered with ice, as confirmed in views from modern telescopes and the thousands of images returned by NASA's Voyager and Galileo missions. But these higher-resolution views also showed that the ice is anything but smooth. In fact, Europa's surface is covered with vast criss-crossing systems of mountain-sized ridges, jumbled regions of seemingly chaotic terrain, and patches that suggest upwellings of new surface materials from below.

How scientists think about the underlying forces that shaped this incredibly complex, bizarre, and beautiful surface is the subject of this book. In Unmasking Europa, Richard Greenberg tells the story of how he and his team of researchers came to believe that the surface of Europa is in fact a crust so thin that it can barely hide an ocean of liquid water below. He shows how the ocean is warmed by the friction of tidal movements in this small moon as it orbits around immense Jupiter. The implications of this interpretation—which includes the idea that there are active intermittent openings from the liquid ocean to the frozen surface—are immense. The warmth, the chemistry, and the connections from ocean to surface provide the conditions necessary for the existence of life, even at this relatively remote locale in our solar system, far beyond what's normally thought of as its 'habitable zone.'

TUCSON CHAPTER OFFICER ELECTIONS

A big THANK YOU to our dedicated Tucson Chapter officers for 2012 – we appreciate your service!

President: **Damien Gosch,** Masters Student, Department of Hydrology

Vice-President **Greg Hess,** Clear Creek Associates

Treasurer: **Dan Guido**, Montgomery & Associates

Secretary: **Shane Clark**, Student, Watershed Hydrology and Management

Tucson Chapter Board Member (1): **TBA** (thank you for all the write-ins!)

Tucson Chapter Corporate Board Member (1): **Marla Odom**, Montgomery & Associates (two-year term)

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OCTOBER 2011 MEETING SUMMARY

- Write up provided by Shane T Clark. Shane has been an AHS member since 2009 and is the Tucson Chapter Secretary (since January 2010). He is soon to graduate from the University of Arizona with a B.S. in Watershed Hydrology.

Central Arizona Project's Artificial Recharge Program with Emphasis on the Tonopah Desert, Superstition Mountains, and Pima Mine Road Recharge Projects

On Tuesday, October 11th, 2011 the Tucson Chapter hosted a special guest lecture by Timothy L Gorey, who is the Senior Hydrogeologist for the Central Arizona Project (CAP). The talk was attended by 15 people and was held at the offices of Montgomery and Associates, 1550 East Prince Road, in Tucson.

Here is a brief summary of his lecture for those AHS members unable to attend.

Timothy Gorey gave a presentation on the development and management of CAP recharge projects. One of CAP's incumbent roles is to build and operate groundwater recharge projects for Maricopa and Pima Counties. In accordance with the 1986 Arizona Underground Storage and Recovery Act, CAP has constructed and currently operates six recharge facilities for a combined annual capacity total of nearly 300,000 acre-feet per year (AF/yr) of underground storage for future recovery. Each CAP recharge project has unique features and operational requirements. Initially, all projects were designed to be operated manually. As each program grew, it became imperative due to staffing requirements and distance of recharge locations, that the system become remotely operated from CAP headquarters.

A seventh recharge facility, Superstition Mountains Recharge Project (SMRP), has just begun operating in September 2011. CAP is currently expected to provide 25,000 acre-feet (AF) of recharge to its 40-acre basins. The official siting for the SMRP began in 2001 and was completed in 2003. The field investigation and study was conducted by GeoTrans, Inc. A study area, 410 square miles in the East Salt River Valley, was selected based on proximity to the CAP canal, and land availability. An initial fatal flaw analysis and reconnaissance level field investigation was conducted. The field investigation included: 31 backhoe trenches dug to 10-15 foot depths, 8 sonic borings drilled to 99 feet, 3 borings drilled to 300 feet, 1 boring drilled to 500 feet , 4 basin infiltration tests conducted, and 10 cylinder infiltration tests conducted. The

results of the field investigation were that the site was deemed suitable for a large-scale recharge facility.

The SMRP is on 40 surface acres with the land owner being the US Bureau of Reclamation. The SMRP is permitted to recharge in two phases: 1) 40 acre basins at 25,000 AF/yr, 2) 155 acre basins at 56, 500 AF/yr. The initial site design stipulated 155 acres for the basin area but was decreased due to disagreements with the Arizona State Land Department. The SMRP is operated by six 250 hp electric pumps with variable frequency drive controls. The pumps are contained in a 42 inch protective steel casing which is mounted on bridging across the canal. Each of these pumps produces a 25cubic feet per second (cfs) capacity totaling 150 cfs, and feed into a 20 inch discharge pipe manifold. A 5-inch HDPE pipe carries the water over the Sonoqui dike and is delivered to each basin via a 30 inch pipe. The delivery system for each basin is remotely operated by a SCADA system (Alan Bradley Programmable Logic control) through a control center at CAP headquarters. The approximated cost of the facility is $6.9 million

CAP operates other recharge facilities such as the Pima Mine Road Recharge Facility (PMRRF) and the Tonopah Desert Recharge Project (TDRP) which administers groundwater aquifer recharge. PMRF is 37 acres of surface basins and is permitted to recharge 30,000 AF/yr. TDRP is 220 acres of surface basins and is permitted to recharge 150,000 AF/yr.

CAP maintenance of these facilities includes removal of sediment infill, weed control, control of algae growth, air entrainment issues, and opening clogged valves. CAP's solution to the clogged valves by clam shells was to redesign inlet structures. The Ross values were replaced with Hilton jet flow gate valves that now allow the clam shells to pass through.

CAP is not the only entity that utilizes Colorado River water via the CAP canal. There are 20-30 publically and privately owned recharge facilities drawing off the CAP canal system in addition to CAP.

The AHS Tucson Chapter extends a very warm thanks to Timothy Gorey for his informative presentation.

Additionally, the Tucson Chapter would like to thank Montgomery and Associates for providing the space for our monthly talk.

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NOVEMBER 2011 MEETING SUMMARY

- Write up provided by Shane T Clark. Shane has been an AHS member since 2009 and is the Tucson Chapter Secretary (since January 2010). He is soon to graduate from the University of Arizona with a B.S. in Watershed Hydrology.

ADWR Tucson AMA Model Updates

On Tuesday, November 8th, 2011, the Tucson Chapter hosted a special guest lecture by Dale Mason, a hydrologist with Arizona Department of Water Resources (ADWR) modeling team. This talk was attended by 14 people and was held at the offices of Montgomery and Associates, 1550 East Prince Road, in Tucson.

Here is a brief summary of his lecture for those AHS members unable to attend.

ADWR continuously updates their published groundwater flow models in order to provide the best tools possible in the long-term management of water resources in the state Active Management Areas (AMAs). The Prescott, Salt River Valley, Pinal, Santa Cruz, and Tucson AMA groundwater models have been updated in order to help plan for the agency's goal of

achieving safe yield by 2025. The updates to the Tucson AMA model were the main focus of Dale Mason's presentation.

The original published Tucson AMA model simulates groundwater conditions with annual stress periods starting in 1940 and ending 1999. This published model is now updated to simulate reported pumping, recharge, streamflow and boundary conditions through 2009. The model domain remains the same with 0.5 by 0.5 mile wide cell grids.

The Tucson AMA model incorporates historical reported pumping from the ADWR 55-well registry database. The model also incorporates reported annual recharge for underground storage facilities and other permitted projects, as well as including improved historical agricultural recharge volume calculations. Model calibration is evaluated with residual analysis and comparison of observed and simulated groundwater level hydrographs, using the latest well specific head data. (*This is the Phoenix model. SUB WT might be implemented in the future on the Tucson AMA model.*)

A significant improvement to the Tucson AMA model is that that it now includes a defined layer bottom for model layer 3. The previous model simulated a 1-foot thick model layer which effectively specified transmissivity rather than hydraulic conductivity. The newly assigned model bottom is based on regional depth to bedrock maps, and a cap is placed on the maximum layer bottom altitude to better represent known regional transmissivities.

Additionally, measured episodic stormflow events are now added to the model as total annual streamflow and are distributed along the major drainages according to the Burkham equation (USGS Water Supply Paper 1939-B).

The model updates for all AMA models will aid in long-term planning and will help address future stream flow recharge uncertainties. These changes will help to provide realistic future planning scenarios in the respective AMAs. See the November AHS newsletter for a brief description of updates to the other ADWR AMA models.

The AHS Tucson Chapter extends a very warm thanks to Dale Mason for his informative presentation.

Additionally, the Tucson Chapter would like to thank Montgomery and Associates for providing the space for our monthly talk.

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FLAGSTAFF CHAPTER NEWS

For information regarding the next Flagstaff Chapter meeting please contact Brad Hill or Dana Downs-Heimes.

FLAGSTAFF CHAPTER OFFICER ELECTIONS

A big THANK YOU to our dedicated Tucson Chapter officers for 2012 – we appreciate your service!

President: **TBA** (thank you for the write-in votes!)

Vice-President: **Paul Whitefield**, National Park Service

Treasurer: **Dana Downs-Heimes**, CH2M Hill

Secretary: **John Cochran**, Peabody Investments Corporation

Flagstaff Chapter Board Member (1): **Erin Young**, Fluid Solutions

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2012 AHS GRAND CANYON RAFTING TRIP

Searching for the PERFECT holiday gift? Search no more! Join AHS for our

2012 COLORADO RIVER TRIP!!!!

Guided by Wayne Ranney, Geologist &

Author of "Carving Grand Canyon"

See Wayne's blog for most recent Colorado River trip:

http://earthly-musings.blogspot.com

Dates: June 10 to 16, 2012 (7 days and 6 nights) with a mandatory orientation meeting in Flagstaff on the evening of June 9.

Type of Trip: A two-boat, motorized "Geology Charter Trip" from Lees Ferry to Peirce Ferry at Lake Mead.

With lots of cool day hikes!!!

Deposit: $500 per person and is due upon making your reservation. Space for you and any accompanying guests cannot be reserved until the deposit is made. The deposit is fully refundable (minus a $50 cancellation fee per person) up to 90 days prior to the start of the trip (March 10, 2012). **Please be sure you fully understand the deposit**

Outfitter: Canyoneers, Flagstaff, AZ

Total Cost: $2,395 per person, Flagstaff to Flagstaff inclusive

Includes: All boating equipment and guides, all food, use of waterproof bags and ammo cans, tent, sleeping pad, and transportation to and from the river from Flagstaff.

Not Included: Sleeping bag (can be rented from Canyoneers); transportation to and from Flagstaff, hotel costs (special rates will be available to you at the Holiday Inn Express in Flagstaff for this trip), $12 entrance fee per person to Grand Canyon N.P. (unless you have a National Park Access card), gratuities to the guides, and any items of a personal nature.

Note: Please make all payments directly to Canyoneers. You will receive all official correspondence from Canyoneers in preparation for the trip but **Wayne Ranney will be sending personal e-mails to all members of our group in advance of the trip in addition.** These e-mails will contain important pre-trip information in about 6 week intervals.

requirements before making your deposit.

Booking Procedure: Call the Canyoneers office directly at 928-526-0924 and tell them specifically that you are: **"Referred to Canyoneers by Wayne Ranney for the June 10th Geology Rafting Trip With the Arizona Hydrological Society." After making your deposit, please send an email to:** wayneranney@earthlink.net. **Wayne will send further updates about gear, expectations, and pre-trip reading.**

Balance: A final bill will be mailed to you on or about February 10, 2012 and the balance of $1,895 per person is due to Canyoneers on or before March 10, 2012

Other details: Individuals may take only one river trip per year in Grand Canyon. Canyoneers solicits a $7 donation ($1 per day) for the Grand Canyon Conservation Fund. Should you choose opt out of this solicitation, the $7 will not be required.

Please note that Canyoneers reserves the right to promote this trip in their regular advertising venues and there is no guarantee that the trip will fill exclusively with AHS members, friends and family

Please join your AHS friends and colleagues in what promises to be a memorable trip

and the perfect holiday gift!!!

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HYDRO-NEWS

WATEREUSE RESEARCH FOUNDATION RFP DUE JANUARY 4, 2011

Real Time Monitoring Tools to Characterize Microbial Contaminants in Reclaimed Water: State of the Science Assessment

WateReuse-11-06

Technologies for detecting microorganisms in water, assessing viability and infectivity, and evaluating

microbial community structure continue to advance at a rapid pace. The purpose of this project is to provide a state-of-the-science assessment of tools for monitoring pathogenic microorganisms or surrogates in reclaimed water systems. The goal is to describe and compare approaches that are commercially available, emerging, and/or under development with an emphasis on real-time or near-real-time microbiological monitoring of water reuse applications.

The results of this project should be delivered in an easy-to-use format such as an electronic catalogue, database, or other product chosen by the proposer. Please note that this project is targeted as an assessment of existing information and, as such, proposals should not include research aims designed to generate new data through the conduct of laboratory or field investigations.

Proposals Due: January 4, 2012

VIEW RFP

The WateReuse Research Foundation conducts and promotes applied research on the reclamation, recycling, reuse, and desalination of water. Under the Foundation's Solicited Research Program and Feasibility Studies Program, research contractors are selected through a competitive process. To view all open RFPs, click here.

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ARIZONA GEOLOGICAL SOCIETY MEETING

Metals and the History of Societies

Spencer R. Titley
University of Arizona, Professor Emeritus

Sheraton Four Points Hotel Wildcat Room
1900 East Speedway (SE corner of Campbell and Speedway)
Tucson

Lecture at 8:00 PM
Tuesday, December 6, 2011

Reservations are required for the dinner. Admission to the talk only is free. Please also note that although there is limited surface parking around the hotel, there is ample parking in the garage beneath the hotel.

Special Meal Deal for Students! Dinner is *FREE* for students who make a reservation online at the website below. Please bring a student ID with you.

SCHEDULE: CASH BAR @ 6:00 PM, DINNER @ 7.00 PM, TALK @ 8:00 PM. WITH RESERVATION: MEMBER = $24.00, GUEST = $27.00. If you do not have a reservation, an extra $3.00 will be charged. Also, without reservations you may not get dinner. To make dinner reservations please call the AGS answering machine at (520) 663-5295 or reserve online at http://www.arizonageologicalsoc.org/meeting-information/dinner-reservations by 5:00 P.M. on the Friday before the meeting. Leave name, number of attendees, and whether a vegetarian or low-salt meal is required. This number can also be used for field-trip reservations and leaving messages for Society officers. Please cancel your reservation via the answering machine if you find that you will be unable to attend.

Abstract

The evolution and dissolution of human societies is closely linked with the use of metals. The earliest dated associations are in the first "cities" where archeological remains in the Anatolia of Turkey comprise primitive tools, made of Copper nearly 10,000 years ago. Copper was overcome by bronze following the discovery of smelting, possibly in the firing of painted pottery. The age of bronze closed about four thousand years ago in the middle east when the source(s) of tin were no longer accessible. The first Iron implements aside from Iron meteorites were the implements of nearly 5,000 years age. These uses followed the attainment of high temperatures from advances in creation of efficient bellows and Iron became the source of weapons and tools. Gold, rarely found in burials, is recorded in sites fiver thousand years old. It has been reasoned that because of its value, only kings could afford its burial; the artistry of its wealth is found in burials of kings and in Egyptian Tombs and much Gold is inferred to have been recycled. .

From these starts, a continuous evolution of both use and discovery of Copper, Iron and Gold has traced the expanded and increasingly complex societal demands for metal. Nations have formed and disappeared in patterns that reflect the influence of this triad of metals, together with mercury, tin, lead and silver. It is the malleability and conductivity of Copper, the strength of Iron, and value of Gold, however, that represent the most material, most useful, and most consistent reins of societal evolution over ten thousand years. And their utility and use has not diminished.

Professor Titley can be reached at stitley@email.arizona.edu

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2011 ANNUAL MEETING OF THE SME

Arizona Conference
December 4-5, 2011
JW Marriott Starr Pass Resort
Tucson, Arizona
www.smenet.org

New Short Course this year!

GARD Guide and Beyond

Sunday, December 4, 2011

OVERVIEW

Acid rock drainage (ARD) is one of the mining industry's most significant and potentially enduring environmental problems. ARD results when sulfide-bearing rock is exposed to oxygen and water, and combined with metal leaching can result in pervasive water quality impacts. Methods are available to prevent ARD formation, but unfortunately these are not applicable to all existing ARD sources. In older closed mines, where ARD has and continues to occur, we are not always able to apply these modern approaches and long-term collection and treatment approaches may be required. These sites can

continue to produce ARD representing a significant liability to mining companies, host countries and surrounding communities.

One recent development to support sustainable management of ARD is the Global Acid- Rock Drainage (GARD) Guide. This Internet-based global best practices guide for the prevention and mitigation of ARD was recently published by the International Network for Acid Prevention (INAP). The GARD Guide's objectives are to promulgate best practice in the prediction, prevention and mitigation of ARD. It endorses a risk-based, proactive and consistent approach by encouraging the reduction and control of ARD at its source by incorporating best-management practices into a mine's operation throughout its lifecycle, as part of a "cradle-to-cradle" approach.

COURSE CONTENT
9:00am – 9:15am I. Introduction to the Short Course: *Tom Wildeman*
9:15am – 9:45am II. Introduction, Objectives, and Development of the Guide:
V.T. McLemore
9:45am – 10:15am III. Acid Rock Drainage and Mining Influenced Water:
Tom Wildeman
10:15am – 10:30am **Coffee Break**
10:30am – 11:15am IV. Structure and Content of the GARD Guide: *V.T. McLemore*
11:15am – Noon V. Development of an ARD Management Plan:
V-A. Description of the Model Mine: *V.T. McLemore*
V-B. Prediction Overview: *Tom Wildeman*
V-C. Prevention and Mitigation Overview: *V.T. McLemore*
Noon – 1:15pm **Lunch**
1:15pm – 2:30pm Development of an ARD Management Plan, Continued.
V-D. Treatment Overview: *Tom Wildeman*
V-E. Monitoring Overview: *Tom Wildeman*
V-F. Management and Performance Overview: *V.T. McLemore*
2:30pm – 2:45pm **Coffee Break**
2:45pm – 4:00pm VI. Application of the GARD Guide to the Model Mine:
V.T. McLemore and *Tom Wildeman*.
4:00pm – 5:00pm VII. Future of the GARD Guide
VII-A. Trends in Prediction: *V.T. McLemore*
VII-B. Innovative Technology Needs and Future Research:
Tom Wildeman
VII-C. Owner and Stakeholder Evolution: *V.T. McLemore*
VII-D. Management and Direction Vision: *V.T. McLemore*

INSTRUCTORS
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CONNECTING ENVIRONMENTAL WATER NEEDS TO ARIZONA WATER PLANNING

This is a friendly reminder to RSVP if you will be joining us for either of the meetings next week for the University of Arizona Water Resources Research Center's project, **Connecting Environmental Water Needs to Arizona Water Planning,** where we will share our project plans and provide you the opportunity to give feedback on project design. This project is funded by the Nina Mason Pulliam Charitable Trust. The Trust's investment will allow us to assist members of the public and decision makers in applying available information about desert rivers and riparian areas to regional and statewide water planning. To that end, we specifically encourage people that are participating in water planning

regionally or statewide to attend this meeting so we can coordinate efforts, avoid redundancy, and incorporate your input and perspectives into our work. The draft meeting agenda is below. Please see the attached fact sheet (also included as text at the end of this e-mail) for more details on the project.

Tuesday, December 6, 2:00-4:00 PM

Water Resources Research Center
350 N. Campbell Ave
Tucson, AZ 85719

or

Wednesday, December 7, 10:00 AM -12:00 PM

Maricopa County Cooperative Extension
4341 E. Broadway Road
Phoenix, AZ 85040

Please RSVP to Brittany Choate (email: bchoate@email.arizona.edu) and let us know if you will attend.

DRAFT AGENDA

- Introductions and Agenda Overview
- Overview and Findings from the Arizona Environmental Water Needs Assessment
- Goals and Planned Activities of the **Connecting Environmental Water Needs to Arizona Water Planning** project
- Give Feedback on Project Approach
- Discuss Opportunities to Coordinate Efforts
- Wrap Up

Joanna B. Nadeau, Analyst

Kelly Mott Lacroix, Graduate Associate

Dr. Sharon B. Megdal, Director

Visit our website at http://ag.arizona.edu/azwater/programs/AzEWNA/index.html

The University of Arizona Water Resources Research Center has begun a three-year project titled **Connecting Environmental Water Needs to Arizona Water Planning**. The project will engage water stakeholders across Arizona to further understand environmental water needs and build upon continuing efforts to address the increasing water demands of our state. Through this project we will endeavor to identify voluntary, stakeholder-driven options for addressing the environment in the context of limited water supplies and existing water rights. The first step in this process is to:

Support inclusive water planning

- *Connect* – Identify and coordinate with local, regional, and state water planning efforts
- *Share* – Describe existing information about Arizona's environmental water needs
- *Explain* – Provide scientific data on environmental flows in a format useful to decision makers and the general public

The team will develop 15 regionally-focused bulletins based on the WRRC's recent compilation of information about environmental water needs, the *Arizona Environmental Water Needs Assessment*. The bulletins will place environmental flows in the context of regional water demands and regionally important policies and laws. These materials will be made available to water professionals, educators,

and the public through a series of outreach presentations throughout the state.

These regional meetings and outreach materials will help us to:

Establish dialogue among water users

- ü *Listen* - Invite individuals from all perspectives to conversations about the role of the environment in water planning and management
- ü *Explore* – Assist regional stakeholders with science and policy tools to assess options for preserving valued environmental water uses alongside key economic activities

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WATER RESOURCES RESEARCH CENTER'S ANNUAL CONFERENCE

REGISTRATION IS OPEN!

For WRRC conference information and early bird rates go to http://cals.arizona.edu/AZWATER/programs/conf2012

Please join us on **Tuesday, January 24, 2012**, for The University of Arizona Water Resources Research Center's annual conference, *Urbanization, Uncertainty and Water: Planning for Arizona's Second Hundred Years*, organized in collaboration with the ASU Morrison Institute for Public Policy. The conference will be held at the University of Arizona Student Union Memorial Center, Tucson.

Our opening keynote speaker Robert Lang, Director of Brookings Mountain West and author of *Megapolitan America*—released this fall, will set the stage for discussions with an exposition on growth and adaptation of megapolitan areas. Historian Jack August, author of *Vision in the Desert* and *Dividing Western Waters*, will speak at lunch on the history of water in Arizona's first 100 years.

Grady Gammage will discuss the Morrison Institute's report, *Watering the Sun Corridor, Managing Choices in Arizona's Megapolitan Area*. David Brown and Karen Smith will each present and answer questions about other recently released reports – the *Water Resources Development Commission Final Report* and the Grand Canyon Institute's *Arizona at the Crossroads: Water Scarcity or Water Sustainability?* Knowledgeable speakers, panelists and discussants will offer a variety of perspectives throughout the program. An interactive session at the end of the day, moderated by Grady Gammage, can be expected to generate a lively discussion.

An optional pre-conference workshop, sponsored by the Sonoran Institute and the Lincoln Institute of Land Policy, on Monday, January 23, 2012 will offer a chance for in-depth discussion on the policy options related to *Watering the Sun Corridor*.

We look forward to your participation in this timely forum, to share in shaping Arizona's water future.

If you have any questions, please contact Jane Cripps at jcripps@cals.arizona.edu or call 520-621-9591.

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UPCOMING ADWR WATER LEVEL DATA COLLECTION SURVEY

ADWR is seeking to focus groundwater level data collection activities within areas of the state that are considered to be of the highest priority and interest and would like public feedback on this effort. The Department is gathering information on the feasibility of collecting supplemental water-level data from collaborative monitoring partners to assist with ADWR's groundwater Level Monitoring program. Please click on the following links for overviews of the Department's Statewide Hydrologic Monitoring Program and Basic Data groundwater-Level Collection Unit

To foster collaboration and improve efficiency, the Department is currently developing a new online data submittal portal that will facilitate annual reporting by designated water providers, Community Water Systems (CWS) and permitted recharge facilities. The Department is also working to develop new online database tools and services that will provide enhanced public access and querying capabilities to select and download reported water level data.

Additionally, the Department also seeks feedback and suggestions on developing a voluntary water level data reporting program, a program that would be comprised of individuals and organizations that may collect water level data, but are not required to report that data to ADWR, and would be willing to report and share that data with the public. Existing data sharing cooperators include the USGS, USBOR, and the Tucson Water among others.

The survey is designed to collect information and opinions about the water- level data needs, uses and data collection activities of participants. The survey is currently live on the ADWR website and will remain posted through the end of 2011. Individuals or organizations who are interested in participating in the survey should check for the survey's announcement under the "Hot Topics" section of the ADWR website at www.azwater.gov. Results will be tabulated and provided on ADWR Web site early in 2012.

Anybody who may have questions about the survey or any other aspect of ADWR's Water level data collection or Hydrology program can contact Frank Corkhill at 602-771-8537.

Your participation in this survey is greatly appreciated!!

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ARIZONA WATER-FEE MEASURE MAY BE REVISITED

Lawmakers: Passage of bill was too hasty

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*by **Parker Leavitt** - Nov. 27, 2011 09:35 PM*
The Arizona Republic

The state Legislature next year may reconsider a new law requiring municipalities to share a $7 million burden to fund the Arizona Department of Water Resources, Republican lawmakers say.

Senate Bill 1624, a budget bill that shifted some state costs onto municipal budgets, may have passed too quickly and under an inaccurate pretext, legislators told *The Arizona Republic* last week.

The proposal came from Gov. Jan Brewer's office and passed last April with broad support from Republicans. The bill drew opposition from Democrats and has sparked criticism from municipal officials.

"The Legislature doesn't like to have the federal government give them things to do with no funding, and then they turn around and do it to municipalities," Gilbert Councilman John Sentz said. "It's kind of an easy way out. They need to take responsibility."

The law allows municipalities to decide for themselves how to come up with the additional cost. Some cities, including Mesa, Gilbert and Avondale, have added a new fee to residents' utility bills. Others, including Scottsdale and Chandler, are using existing revenue to cover the bill.

Read more: http://www.azcentral.com/news/articles/2011/11/22/20111122arizona-water-fee-measure-revisited.html#ixzz1fG58njkA

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EXPERT: HACKERS FROM RUSSIA HIT ILLINOIS WATER SYSTEM

System at plant in Illinois tampered with from Russia; may be first such reported attack in U.S.

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*by **Ellen Nakashima** - Nov. 18, 2011 11:53 PM*
Washington Post

WASHINGTON - Foreign hackers broke into a water-plant control system in Illinois last week and damaged a water pump in what may be the first reported case of a malicious cyberattack on a critical computer system in the United States, according to an industry expert.

On Nov. 8, a municipal water district employee in Illinois noticed problems with the city's water- pump control system, and a technician determined the system had been remotely hacked into from a computer in Russia, said Joe Weiss, an industry-security expert who obtained a copy of an Illinois state fusion-center report describing the incident.

The city affected was Springfield, according to the U.S. Department of Homeland Security.

Problems with the system had been observed for two to three months.

Recently, the system "would power on and off, resulting in the burnout of a water pump," the Nov. 10 report from the statewide terrorism and intelligence center stated, according to Weiss, who read the report to the *Washington Post*.

"This is a big deal," Weiss said.

The report stated it is unknown how many other systems might be affected.

Read more: http://www.azcentral.com/news/articles/2011/11/18/20111118expert-russia-hackers-hit-illinois-water-system.html#ixzz1fG8stA6Z

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TRIBE: BILL TO STOP CASINO NEAR GLENDALE MAY SPARK WATER BATTLE

*by **Cecilia Chan** - Nov. 22, 2011 09:36 AM*
The Arizona Republic

Legal challenges to stop a proposed tribal casino near Glendale haven't worked so far, but an attempt to kill the project in Congress made headway this week.

Rep. Trent Franks, R-Peoria, in September introduced a bill to stop the Tohono O'odham Nation from moving forward on its project at 95th and Northern avenues.

House Bill 2938 or The Gila Bend Indian Reservation Lands Replacement Clarification Act would modify a 25-year-old settlement between Congress and the tribe. It would ban most gambling, including bingo, slot machines and blackjack, on any replacement lands in Pinal, Pima, and Maricopa counties that are taken into the reservation system for the tribe.

The House Natural Resources Committee on a 32-11 vote last week sent Franks' bill to a full floor vote. The committee also overwhelmingly approved an amendment by Rep. Paul Gosar, R-Flagstaff, that would specifically exclude a casino on reservation land in the Phoenix metropolitan area.

It is not yet clear when the House might consider the bill, but the GOP-controlled chamber is likely to

approve it. The measure faces an uncertain future in the Democrat-led Senate. The legislation is opposed by President Barack Obama's administration.

Read more: http://www.azcentral.com/news/articles/2011/11/22/20111122glendale-casino-bill-congress.html#ixzz1fG9biWDe

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COURTS PUT HUGE CALIFORNIA WATER PACT IN LIMBO

*by **Elliot Spagat** - Nov. 20, 2011 08:03 PM*
Associated Press

SAN DIEGO - A landmark accord that ended decades of acrimony over how Southern California gets its water is in jeopardy, with potential ramifications for several other Western states, including Arizona.

A California appeals court is considering whether to overturn a 2003 pact that created the nation's largest farm-to-city water transfer and set new rules for dividing the state's share of the Colorado River. If a lower court ruling stands, consequences could ripple to six other Western states and Mexico, which also rely on the 1,450-mile river that flows from the Rocky Mountains to the Sea of Cortez.

Farmers and environmentalists involved in the lawsuit argue the pact is deeply flawed, while water agencies say it is critical to keeping an uneasy peace on the river. A three-judge panel of the 3rd Appellate District in Sacramento will hear arguments today and is expected to rule within three months.

California long used more of the Colorado River than it was granted under agreements with Arizona, Colorado, Nevada, New Mexico, Utah, Wyoming and Mexico. Its overindulgence was never a big problem until Sunbelt cities like Phoenix witnessed explosive growth and other states clamored for their full share. Drought only exacerbated tensions.

Eight years of negotiations between California's warring water agencies culminated in the 2003 accord that reined the state to its limit established 80 years earlier of 4.4 million acre-feet of water a year -- enough to supply about 9 million homes.

Read more: http://www.azcentral.com/arizonarepublic/local/articles/2011/11/20/20111120california-water-pact-limbo.html#ixzz1fGAIsajJ

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U.N.: WATER POLLUTION, DROUGHT THREATEN WORLD'S POOR

Nov. 2, 2011 07:23 AM
Associated Press

COPENHAGEN, Denmark - Prosperous countries have not lived up to their promises to help the poor, the U.N. declared Wednesday, saying poor people often go hungry because of polluted water, drought and other environmental factors that are increasing poverty.

In its annual report on the quality of life worldwide, the United Nations Development Program said more should be done to address international environmental concerns and that sustainability must become a way of life as the world population grows above 7 billion.

"Sustainability is not exclusively or even primarily an environmental issue," UNDP Administrator Helen Clark said in the report's introduction. "It is fundamentally about how we choose to live our lives, with an awareness that everything we do has consequences for the seven billions of us here today, as well as for the billions more who will follow."

The report noted that although aid to poorer countries grew 23 percent from 2005 to 2009, it was not enough.

"Rich countries have consistently failed to meet their stated pledges," including promises made by the G-8, the European Union and the United Nations to give $100 billion a year by 2020 to fight the impact of climate change in developing countries.

"The pledges fall well short of estimated needs, and disbursements fall well short of pledges. Most of the new and additional' funds pledged at the 2009 U.N. Climate Change Conference in Copenhagen have not been delivered, and less than 8 percent of pledges for climate change were disbursed in 2010," the report said.

Read more: http://www.azcentral.com/news/articles/2011/11/02/20111102world-pollution-drought-threatens-poor.html#ixzz1fGC2EKpS

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WATERBLOGGED BY SHAUN MCKINNON, ARIZONA REPUBLIC

Mining foes want new studies at canyon

Monday, November 28, 2011 at 05:55 PM

A coalition of advocacy groups and Indian tribes asked an appeals court Monday to overturn a lower court ruling that allowed a uranium mine near the **Grand Canyon** to re-open without new environmental studies.

The groups had sued the **Bureau of Land Management** in 2010 over its decision to let **Denison Mines** resume operations at a long-dormant uranium mine without updating a two-decade-old environmental impact statement.

A federal court in **Phoenix** sided with the BLM in the dispute over the **Arizona 1** mine, one of several existing operations near the canyon. The mines have become profile symbols in a drawn-out debate over whether uranium mining on public lands near the canyon threaten water supplies and other natural resources.

In **documents** filed Monday with the **Ninth U.S. Circuit Court of Appeals**, the environmental groups and tribes asked judges to rule on the Arizona 1 issue as a way of setting a precedent for the other existing mines.

Read more: http://www.azcentral.com/members/Blog/ShaunMcKinnon/149636

For associated links and other timely water and environmental blogs on Shaun McKinnon's Arizona Republic site – **Waterblogged** visit http://www.azcentral.com/members/Blog/ShaunMcKinnon.

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ADDITIONAL INFORMATION

For more information about the Arizona Hydrological Society, or to view current job listings and announcements, please visit our regularly updated web site at:

http://www.azhydrosoc.org/

Membership may be renewed by credit card through the AHS website or by mailing a check to the Arizona Hydrological Society, P.O. Box 1882, Higley, AZ 85236. Dues remain at $45.00 year for regular membership and $15.00 for students. Please remember that your 2011 membership was included in the 2010 Symposium registration fee!