



MARCH 2012 NEWSLETTER

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VIEWPOINT: JUST ONE

Well this is my first addition to the AHS Newsletter as your Corporate Board President. I am excited about the future of the Society, but before I jump into my view for the month, I would like to extend a hearty thank you to Alan Dulaney who stood at the helm for 5 years as the President of the Society during times of financial challenges. He is truly a dedicated member to the Society, and I would encourage all that know or run into Alan on a day to day basis to thank him for all the excellent work.

Now on to my point of view, in late January the Chapters gathered at the Offices of Montgomery and Associates in Tucson to select the next Corporate Board of Directors. Once we had the new board installed we got right down to the business of looking at the Society and developing some goals for 2012. We discussed several ideas and decided to narrow down our focus and find one priority. The first realization is that as a Society we are limited by our number of volunteer members and with the shifting economy it seems we are losing ground on the membership and participation front. It would seem to me that we as professionals are being asked to do more with less. Increasing Society membership and involvement has to be one of our key goals if we are to implement other goals for the Society. In that vein I believe that we need to begin simple by building our membership base, so for this month's view I am focusing my efforts around "**Just One.**"

Just One – as a Society we are stronger in numbers so I am calling on every member to invite **Just One** new person to the monthly meeting. Introduce **Just One** new face to our crowd. AHS is one of the most friendly and accepting organizations that I know. It is easy to become involved and help out or just attend the monthly meetings, network and learn what is going on in the industry. Give a paper if you are doing something cool. Invite a friend or colleague to give a talk at the monthly dinner meeting or present at our Symposium. This year we are in Phoenix, September 18-21 at the Desert Willow Conference Center.

The **Just One** goes beyond new members but how about members that have been sitting on the sidelines and have let their membership lapse or maybe you're on the side reading our newsletters and you have some excellent ideas and suggestions to improve the Society. As I move around day to day I see many past active members of the Society and I would like to see them re-engage with the Society, you have so much to offer. I know your time is limited and like I said earlier, "you have more and more to do with less and less every day," but know this, your ideas are welcome and we would really love to have you back.

How about Students? Isn't one of our objectives to educate and engage our future hydro professionals? Let's extend our reach to getting students involved. We are doing a good job of this but how can we reach more of the students and educators? If you know of some students and educators ask **Just One** (or more) to the next AHS meeting or event.

In closing, I am honored to be the President of the Society. I welcome your comments and suggestions. Come on out to the next dinner meeting or event and remember to bring **Just One** guest with you.

Mike Hulst

AHS Corporate Board President

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GOVERNMENT GOINGS-ON

House Bill 2337 establishes continuing education requirements for licensed well drillers. It would apply to all license renewals beginning July 1, 2013. This idea first surfaced about a dozen years back. The Arizona Water Well Association was concerned that poor drilling practices amongst a few drillers were producing some problem wells that reflected badly on all drillers, and felt that a continuing education requirement might address the issue. And they back the current bill.

If the bill passes the Senate, and if the Governor signs it into law, then well drillers will need to get continuing education credits somewhere. I don't know that ADWR has thought much about what a continuing education program might look like. The bill sets up a Continuing Education Advisory Committee to advise ADWR on what courses and seminars would be acceptable. The ADWR Director could also accept programs developed by other institutions that would increase the technical skills and abilities of licensed drillers. But if ADWR approves, there could be an opportunity here for the Arizona Hydrological Society.

If a continuing education program worked similar to those at ADEQ for water and wastewater operators, drillers could attend specific events to get their credits. Specific events like the AHS Annual Symposium or any special seminars we organize would be a great venue to get credits. If this approach proved acceptable to ADWR, AHS might get a few dozen extra attendees at our Annual Symposia, and relations between hydrologists and drillers could take a significant upturn.

That's a lot of "ifs." Even though no one spoke against it, HB 2337 barely got out of the House, which indicates only tenuous legislative support. It could easily die in the Senate. I hope not. AHS might get a chance here to provide some education to a specific target group (drillers) which already has great interest in hydrology and water resources from a practical viewpoint. And that could be beneficial for everyone.

Alan Dulaney

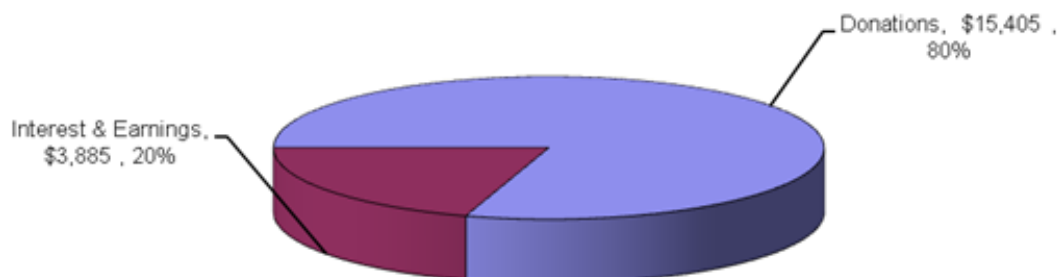
City of Peoria

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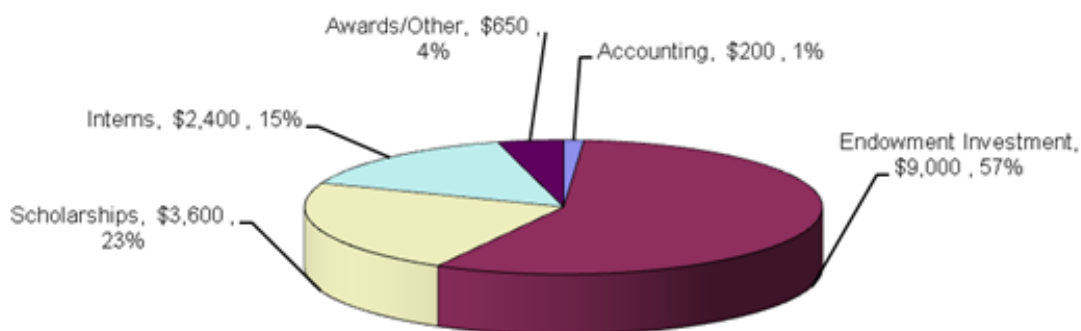
AHS FOUNDATION UPDATE

Thanks to individual, corporate, and CAP donations, and to earnings on investments, the AHS Foundation Endowment Fund ended the year with over \$80,000, an increase of \$12,863 for the year. Our goal is for the restricted permanent endowment fund to eventually grow into a self-sustaining investment that can support all AHS charitable activities into the future. In addition, in 2011 the Foundation contributed \$6,650 to AHS internships, scholarships, and science fair awards. Operating expenses for 2011 were only 1% of expenditures, thanks to the volunteered time and effort of our nine directors. Details of our revenue and expenses for 2011 are shown in the charts below.

AHS Foundation 2011 Revenue



AHS Foundation 2011 Outflows



The Arizona Hydrological Society Foundation is a 501(c)(3), non-profit, charitable organization, so your donation is 100% tax deductible as a charitable contribution. You can help us continue these programs, or grow our endowment fund, by donating to the Foundation on the AHS website, azhydrosoc.org, or mail a donation to AHS Foundation, PO Box 65690, Tucson AZ, 85728. Thanks to all our supporters.

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AHS MEMBERSHIP 2012 RENEWAL REMINDER

This is the last reminder – I promise! If you haven't renewed your AHS membership, please do so now! Thank you to all our members who have already renewed – we truly value your support!

Also, please remember that membership dues are included in both full registration and one day registration fees for the AHS Annual Symposium, so if you attended the 2011 Symposium, your dues are paid through 2012.

Membership dues can to be renewed online at: http://www.azhydrosoc.org/join_ahs.html

Or by mailed to:

Arizona Hydrological Society
P.O. Box 1882
Higley, AZ 85236

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

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SEVENTH ANNUAL ARIZONA AEG AND AHS STUDENT NIGHT

MONDAY APRIL 2, 2011 5:30PM TO 9:00
University of Arizona

Please join the Association of Environmental and Engineering Geologists, Arizona Section (AEG), and the Arizona Hydrological Society (AHS) at the Seventh Annual Arizona AEG/AHS Student Night event on Monday April 2, 2012.

The event will begin at 5:30 pm and will be held in the Tucson and Catalina Rooms of the Student Union on the Campus of the University of Arizona in Tucson. For maps, directions, and parking information please refer to <http://union.arizona.edu/>.

Click [here for flyer](#) with full details!

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PHOENIX CHAPTER NEWS

Phoenix Chapter's March Dinner Meeting

The next Phoenix chapter dinner meeting will be held **on Tuesday, March 13, 2012**, 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: **Water Reuse: A State and National Update**
Guy Carpenter, Vice President, Carollo Engineers; Member of the Board of Directors of the WaterReuse Association.

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!

Guy Carpenter of Carollo Engineers & the national WaterReuse Association will give us an update on water reuse in the U.S. & in Arizona.

Guy Carpenter is a native Arizonan with eight years of municipal utility and twelve years of engineering consulting experience. Guy graduated from Northern Arizona University in 1990 with a bachelor's degree in Chemistry, and became a registered professional civil engineer in December 2006.

Guy began his career in Southern California, working for an environmental engineering and consulting firm on large environmental remediation and monitoring projects, including those for oil refineries and wastewater treatment plants. In 1993, he moved back to Arizona and began working for Gilbert, Arizona where he served as the industrial pretreatment program coordinator, then as the wastewater superintendent, and then as the water resources manager. In 2001, Guy became a consultant with Carollo Engineers and currently serves as the firm's Vice President of Water Supply and Reuse. Two of Guy's favorite projects include Gilbert's Riparian Preserve (groundwater recharge project) and the work he did for the SROG cities in support of the reclaimed water lease rate negotiations with the owners of the Palo Verde Nuclear Generating Station.

Guy has been a leader in the water and wastewater industry and within his employer organizations nearly his entire career. He currently serves on the Board of Directors of the national WaterReuse Association, the Board of Directors for the Phoenix Branch of ASCE, and recently wrapped up responsibilities on the Arizona Governor's Blue Ribbon Panel for Water Sustainability.

Abstract:

The presentation will highlight current state and national trends in water reuse, treatment costs of responding to the presence of trace organic compounds (endocrine disrupting compounds), and current events in water reuse in Arizona.

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

- April 10, 2012: Nello's in Tempe, 1860 E. Southern Avenue, topic to be announced.
- May and beyond – maybe you or a colleague? 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.

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

The Symposium Planning committee is in full swing! We held our last planning meeting at Boulder's on Broadway in Tempe on March 1.

Where were you?

Symposium Chair, Ted Lehman, has a goal to get every AHS member involved in this year's symposium in some capacity – organize a field trip, teach a workshop, moderate a session, give a talk, exhibit your firm, sponsor a student or teacher, or just show up and see what your colleagues have been up to recently!

Sponsorship fundraising is getting in gear too. Society President, Mike Hulst, or one of his subcommittee assistants will be calling you soon looking for your support of this year's event. Please give generously!

The next planning meeting will again be at Boulder's on March 22 at 5 pm. Email or call Mr.

Lehman if you'd like to participate. Ted can be reached at ted@jefuller.com or 480-222-5709.

We're looking forward to your participation!

Check out the developing symposium at <http://www.azhydrosoc.org/2012symposium.html>.

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2012 AHS HERMAN BOUWER INTERN SCHOLARSHIP

The Phoenix Chapter of the Arizona Hydrological Society (AHS) is seeking applicants for the **2012 AHS Herman Bouwer Intern Scholarship Program**. This program is open to students enrolled in a hydrology related discipline at any Arizona college or university. The program provides an opportunity for a student to gain experience with several water resources and environmental organizations in the Phoenix area between May 1, 2012 and September 1, 2012. Participating organizations will include government agencies, private industry employers, and environmental consulting firms. The student may elect to obtain OSHA 40-Hour Hazardous Waste Operations Training as part of the internship. This will allow the student to enter hazardous waste sites. The program also includes a monetary scholarship award of \$3,000.

The Tucson and Flagstaff Chapters of AHS also offer similar award programs. Interested applicants must complete the application and forward all materials in hard copy or PDF electronic format to:

AHS Herman Bouwer Intern Scholarship Program
c/o Stephen Acquafredda
Jacobs Engineering Group
101 North 1st Ave. Suite 3100
Phoenix, Arizona 85003

Inquiries:

E-mail: sacqua@jacobs.com

Phone: (602) 650-4007

Fax: (602) 253-1202

Website: www.azhydrosoc.org

Description of Intern Scholarship Program:

Applications and all related materials must be received by 5:00 PM March 26, 2012.

- Candidates must be available for an interview in April (time to be determined). The AHS Intern Scholarship Committee will select an intern by April 30, 2012.
- The selected candidate will be required to complete 200 hours of service with at least three organizations chosen from a list of participating employers. Included in the 200 hours is an optional OSHA 40-Hour Hazardous Waste Operations Training course. The student will serve 40 hours with each organization, and additional hours will be served with participating employers at the student's and the organization's discretion.
- Scheduling will be flexible and will be negotiated by the student and the participating organizations. Service can be completed anytime between May 1, 2012 and September 1, 2012.
- The selected candidate may be required by participating organizations to sign liability and confidentiality waivers or submit to drug testing prior to service.
- The student will be invited to attend the May 2012 Phoenix Chapter dinner meeting and the Arizona Hydrological Society Annual Symposium in September 2012 to formally receive the award. After completion of the program, the student will be expected to submit a short article to the AHS monthly newsletter describing his or her experience.

- Prior AHS Intern Scholarship winners are not eligible for this award.
- The monetary award of the scholarship will be \$3,000. Payment may be made to the student in several increments, with a final sum to be awarded after submission of the newsletter article.

Student inquiries should be directed to the contact information provided above.

Employers interested in supporting in the program by hosting the intern please visit the [Herman Bouwer Intern Scholarship web page](#) for information on how to participate.

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ARIZONA SCIENCE AND ENGINEERING FAIR

Each year since 2004, AHS and CAP awards cash prizes to deserving students at the Arizona Science and Engineering Fair <http://azsef.org/>. These prizes are awarded to elementary, junior and senior high school students for outstanding projects focusing on geology or hydrology. The AHS awards are considered “Special Awards”, separate from the awards given by AzSEF.

I would like to put out a request for AHS volunteers to help with judging at AzSEF. The date for judging is Tuesday April 3, 2011. I request that interested parties contact me by email pplato@clearcreekassociates.com or by phone 480-659-7131 (office) or 602-750-4237 (cell). Judging will involve several hours of time on the afternoon of April 3, 2011. As a group we will review the hydrologic projects and interview students (if available). Generally, I have met with the volunteers at 3PM and completed judging by 6PM.

This judging is separate from the AzSEF fair itself, and I encourage AHS members to also consider volunteering for judging at AzSEF. I have volunteered since 2004 and found it to be a fun and rewarding experience.

If you are interested, please contact me by phone or email. Thanks

Paul R. Plato, R.G.
Senior Hydrogeologist
Clear Creek Associates
(480) 659-7131
(602) 750-4237 (cell)

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TUCSON CHAPTER NEWS

Please join us for the next Tucson Chapter meeting, **Tuesday, March 20, 2012**, at the **Nimbus American Bistro & Brewery, 6464 E. Tanque Verde Rd.** Social hour starts at **6pm** and lecture will begin approximately 6:45pm. Reserved rooms are located to the left as you enter the bistro, or just inform the greeter that you are with Arizona Hydrological Society. If there are any questions/concerns about location and/or food preferences contact Damian Gosch @ 201-978-9844 or dgosch@hargis.com. Thank you all for your support for this month's special guest, Shlomo Neuman.

N I M B U S B I S T R O

DIRECTIONS

NIMBUS AMERICAN BISTRO & BREWERY
6464 E. TANQUE VERDE RD.
TUCSON, ARIZONA 85715
NEW! PHONE: 520.269.6309

MAP YOUR ROUTE HERE ►

From Interstate 10
 I-10 to Kolb (N) to Tanque Verde.
 We are on the Left at 6464 E. Tanque Verde

From Airport
 Take Tucson Blvd (N) to Valencia (turn right).
 Then Valencia (E) to Kolb (turn left).
 Take Kolb (N) to Tanque Verde (turn left).
 We are on the Left at 6464 E. Tanque Verde

From Brewery
 44th St (W) to Palo Verde (turn Right).
 Palo Verde (N) to 22nd (turn Right).
 22nd (E) To Wilmot (turn Left).
 Wilmot (N) to Nimbus Bistro (will be on the right side).

THE BISTRO
BEVERAGES
OUR MENU
DIRECTIONS
MERCHANDISE
THE NIMBUZZ
EVENTS

GO TO NIMBUS BREWERY

Pumping Test Characterization of Saturated and Unsaturated Unconfined Aquifer Properties

Shlomo P. Neuman

Regents' Professor, Department of Hydrology and Water Resources

University of Arizona, Tucson

Abstract

Dr Neuman will describe a new analytical solution due to Mishra and Neuman (2010, 2011) that allows inferring saturated and unsaturated hydraulic properties of unconfined aquifers from drawdown and recovery data recorded below and, preferably but optionally, above the initial water table. The solution accounts jointly for horizontal and vertical flows in both the saturated and unsaturated zones toward a partially penetrating well with storage in a uniform but anisotropic compressible aquifer. Storage capacities of piezometers and observations wells are also considered. Examples will include a synthetic pumping test simulated by a three-dimensional numerical code and two tests conducted at Cape Cod, Massachusetts and Borden, Ontario, Canada.

References:

Mishra, P. K., and S. P. Neuman (2010), Improved forward and inverse analyses of saturated-unsaturated flow toward a well in a compressible unconfined aquifer, *Water Resour. Res.*, 46, W07508, doi:10.1029/2009WR008899.

Mishra, P.K. and S.P. Neuman (2011), Saturated-unsaturated flow to a well with storage in a compressible unconfined aquifer, *Water Resour. Res.*, 47, W05553, doi:10.1029/2010WR010177.

THE 2012 TUCSON FESTIVAL OF BOOKS

- Saturday, March 10, 2012, from 9 a.m. to 5:30 p.m.
- Sunday, March 11, 2012, from 9 a.m. to 5:30 p.m.
- The University of Arizona Campus, Main Mall (map)
- General attendance is free!
- Parking on the U of A campus is free on the dates of the Festival. All garages and surface lots are free except the Second Street Garage, which is reserved for authors and moderators.
- The Festival's program will be a special section inserted into the Arizona Daily Star on Sunday, March 4. Additional copies will also be available at Information booths at the Festival.
- [Join the Institute of the Environment both on Sat. 3pm for a groundwater demonstration with Damian Gosch, AHS Tucson Chapter President. Help cheer on K-12 students as they pump contaminants through their first heterogeneous anisotropic media, scale dependent of course!](#)

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2012 LEONARD HALPENNY INTERN SCHOLARSHIP

Deadline for Application (Students): 5:00 PM, **April 6, 2012**

Information for Students

The Leonard Halpenny Intern Scholarship is open to graduate and undergraduate students in the fields of hydrology, geology, civil, environmental and geologic engineering, renewable natural resources, wastewater management, soil and water science, and other hydrology-related studies. Students from the U of A, ASU, NAU, Pima College, and other Arizona colleges can apply to participate in the program. The scholarship provides an opportunity to gain practical experience at multiple hydrological work environments in Tucson. The scholar will be required to complete 200 hours of work in 2012. The scholarship carries a stipend in the amount of \$3,000. The student will be required to keep and submit a record of hours worked. Upon completion of the intern scholarship, the candidate will be required to submit an article summarizing his or her own experience that will be published in the AHS newsletter.

Those who wish to apply should obtain an application form from the AHS web site:
http://www.azhydrosoc.org/internship_Halpenny.html.

E-mail modom@elmontgomery.com for more information about the Leonard Halpenny Intern Scholarship Program.

Information for Interested Employers

The Tucson Chapter is seeking employers from government, private industry, non-profit agencies and environmental consulting firms to host the Leonard Halpenny Intern Scholar and provide practical hydrological experience to a student pursuing a degree in hydrology, geology, environmental science, civil and environmental engineering, or other hydrology related fields. The Halpenny selection committee will interview qualified candidates the week of **April 16th, 2012**, and will announce the selection of the Intern Scholar by **April 30, 2012**. The Intern must complete 200 hours of service by December 31, 2012 with at least 40 hours service at each participating

organization.

Candidates must be willing to sign liability and confidentiality waivers for participating organizations prior to commencing their intern scholarship

Interested organizations who wish to apply should obtain an application form from our web site: http://www.azhydrosoc.org/internship_Halpenny.html and send it to the committee by **March 23rd, 2012**.

Leonard Halpenny Intern Scholarship Committee

[Marla Odom \(modom@elmontgomery.com\)](mailto:modom@elmontgomery.com)

Montgomery & Associates

1550 E. Prince Road

Tucson, AZ 85711

Telephone: (520) 881-4912

Fax: (520) 881-1609

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THE 22ND ANNUAL EL DIA DEL AGUA

The University of Arizona Department of Hydrology and Water Resources and the HWR Student Association are proud to announce

The 22nd Annual El Dia del Agua

Wednesday, March 28, 2012

The Department of Hydrology and Water Resources and the HWR Student Association (HWRSA) will co-host the 22nd Annual El Dia del Agua on Wednesday, March 28, 2012. El Dia 2012 will showcase graduate and undergraduate research and is a major event in the School of Earth and Environmental Science's EarthWeek 2012 calendar.

Overview: El Dia will feature oral presentations during morning and afternoon sessions and poster presentations for viewing throughout the day-long event. Juried competitions will see several substantial monetary prizes awarded to the best oral and poster presenters. The student awards ceremony will conclude with presentation of the Aqua Man (or Woman) of the Year Awards. The Aqua Awards are HWRSA-sponsored and student-selected and will recognize the department's most outstanding junior and senior faculty instructors.

Invited Speakers: El Dia del Agua will feature two invited speakers, a luncheon speaker and an afternoon keynote speaker. This year's keynote speaker will be HWR Alum, Dr. Walter Illman, from the University of Waterloo, Ontario, Canada.

Location & Agenda: El Dia will be held in the University of Arizona Student Union North Ballroom beginning at 8:00 AM with a continental breakfast. After a brief welcome by the department head, HWRSA officers, and student moderators, the oral and poster presentations will begin. A light buffet lunch, served at 12:00 noon, will feature a guest speaker. After lunch, oral and poster presentations resume, followed by the keynote speaker, the awards ceremony, and the final wrap up reception.

Registration: Registration for the day's events is \$35 and includes continental breakfast, a light buffet lunch, refreshments throughout the day, and the hors d'oeuvre and drinks reception following presentation of the awards. The Registration deadline is March 15!

Join Us! Your attendance is highly valued because students look forward to making public presentations of their research to members of the university community, HWR alums, potential employers, and working professionals in the field of hydrology and water resources.

The activities of El Dia del Agua support the educational and professional components of students' degree programs -- Senior Capstone Experience and Graduate Professional Development -- and help strengthen students' communication skills. El Dia also serves to highlight the department's research excellence within the larger context of EarthWeek 2012.

We encourage all members of the hydrology and water resources community, especially prospective students, to join us for El Dia del Agua!

Details: For more details go to the [El Dia 2012 website](#). Registration and Sponsorship forms are due **March 15!**

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WRRRC BROWN BAG - WED. MARCH 21 BROWN BAG - GARDENROOTS: THE DEWEY-HUMBOLDT, ARIZONA GARDEN PROJECT

Unless otherwise noted, all seminars are held at the Sol Resnick Conference Room, Water Resources Research Center, 350 N. Campbell Ave., Tucson.

If you have any questions, contact Jane Cripps at jcripps@cals.arizona.edu or 520-621-2526

Wednesday, March 21

Time: 12:00 – 1:30 pm

Speaker: Monica Ramirez-Andreotta, M.P.A., Ph.D. Candidate, Department of Soil, Water and Environmental Science, University of Arizona

Title: Gardenroots: The Dewey-Humboldt, Arizona Garden Project

There is a growing need to accurately evaluate the toxicological risks to resident food gardeners neighboring contaminated environments. Gardenroots: The Dewey-Humboldt, Arizona Garden Project was designed to determine the uptake of arsenic and lead in commonly grown vegetables in Arizona and evaluate the possible health risks to the local population. The project comprised a greenhouse study and a citizen science program conducted with a community neighboring a national Superfund site. A comparative analysis was conducted between the concentrations of arsenic and lead found in the soils, irrigation water, edible tissues of crops from the greenhouse and residential gardens. Vegetable intake rates were calculated to determine how much could be safely consumed at these measured concentrations. The citizen science program will be discussed in terms of recruitment, training, informal science learning opportunities, sample collection, communication efforts, and potential participant educational outcomes.

Project web link is: <http://garden-roots.org/>

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THE WATER FESTIVAL: SYNERGY OF ART, SCIENCE, AND COMMUNITY

Sunday, March 18, 2012

10am – 4pm

Armory Park Community Center

220 South 5th Avenue (5th Ave. & 13th St.)

Tucson, AZ

YOU'RE INVITED to participate in Tucson Arts Brigade's 3rd Annual celebration of The Water Festival, an integration of art, science, and culture to raise awareness, promote stewardship, and foster creative expression about our water future.

In conjunction with the United Nation's **World Water Day**, The Water Festival is a prime

opportunity to engage the public through diverse activities for learning, networking, family-friendly fun, and creative interactions with water and community issues.

- Exhibitor Fair
- Art Show
- Dance/Theater Performances
- Panel Discussions & Speakers
- Workshops
- Music
- Films
- Kids Activities
- Spiritual Water Practices
- And more!

This year's theme is "WATER & COMMUNITY: A CENTENNIAL JOURNEY - Then, Now & Into the Future", with added focus on water-related themes:

- Agriculture - Food security, farmers markets, water use
- Health & Wellness - Technology, holistic practices, body water
- Cultural Connections - Century of water stories and future visions

The Water Festival is a fun and engaging opportunity to promote your work while supporting creative community. With finite water supply and growing demand, The Water Festival raises awareness about our water reality while celebrating community through fun participatory activities for all ages.

The Water Festival is working together with 2 other simultaneous events at the same location: **Cyclovia** (5mi. loop of car-free family-friendly activities) and **Solar Rock** (solar-powered music fest). The combined estimated attendance is over 10,000 people.

REGISTER TODAY by downloading the attached Water Festival Participation Form or register online to become a Sponsor, Exhibitor, Activity Leader, Artist, or Volunteer:

<http://www.WaterFestivalTucson.org>

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FLAGSTAFF CHAPTER NEWS

The next Flagstaff Chapter meeting will be on Wednesday March 21, 2012 at 6:00 PM, at the Peabody offices, 3001 W Shamrell Drive (near the Flagstaff airport). For additional information please contact [Dana Downs-Heimes](#) or [Erin Young](#).

BIRDSALL-DREISS DISTINGUISHED LECTURER FOR 2012

On March 7 at 4:00 in Room 103 of Frier Hall (Geology Building) at NAU, the Arizona Hydrological Society and the Hydrogeology Division of the Geological Society of America is co-sponsoring the Birdsall-Dreiss Distinguished Lecturer for 2012. There will be a reception to follow at the Lumberyard Brewing Company, 5 South San Francisco Street, Flagstaff.

Water Cycle Change and the Human Fingerprint on the Water Landscape of the 21st Century: Observations from a Decade of GRACE

Jay Famiglietti

UC Center for Hydrologic Modeling

Over the last decade, satellite observations of Earth's water cycle from NASA's GRACE (Gravity Recovery and Climate Experiment) mission, have provided an unprecedented view of global hydrological change and freshwater availability. Since its launch, the mission has helped to confirm that precipitation, evaporation and continental discharge rates are increasing, that the mid-latitudes are drying while the high and low latitudes are moistening, and that the hydrologic extremes of flooding and drought are becoming even more extreme. Importantly, GRACE has exposed the human fingerprint of water management practices such as groundwater use and reservoir storage, which raises many important issues for climate, water, food and economic security. Moreover, the GRACE mission has enabled us to peer beneath Earth's surface and characterize the worldwide depletion of groundwater aquifers, raising significant concerns about the potential for heightened conflict over transboundary water resources. In this talk I review the basics of how the GRACE mission observes terrestrial and global hydrology, what new information the mission has provided since its launch in 2002, and the implications for the future of water availability and sustainable water resources management.

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FLAGSTAFF CHAPTER INTERN SCHOLARSHIP 2012

- ▶ Deadline for Application (Students): March 30, 2012
- ☐ Deadline for Application (Employers): April 20, 2012

Information for Students (for 2012)

The Flagstaff Chapter Intern Scholarship gives students enrolled in a hydrology-related discipline at any Arizona college or university the opportunity to gain practical experience in the multidisciplinary field of hydrology and water resources.

Recipients are chosen after a rigorous selection process and serve their internship with employers or organizations in the Flagstaff area. The Intern is required to complete 200 hours of service with three organizations of his or her choice in government, private industry, environmental services, and water-resources consulting. The employer organizations provide meaningful training and job experience that will better prepare the intern for employment in their chosen careers. A \$3,000 scholarship is included as part of the award.

[E-mail us](#) if you would like more information about the Flagstaff Intern Scholarship Program. [You can also download an application by clicking here.](#)

Information for Interested Employers

The Flagstaff Chapter of the Arizona Hydrological Society is seeking interested employers from government, private industry, and environmental consulting firms in northern Arizona to participate as a host to the Intern Scholarship. The selected student recipient of this award will be in pursuit of a college degree in hydrology, geology, environmental science, civil engineering, environmental engineering, or a related field of study. The awarded student will have the opportunity to complete 200 hours of service between the dates May 1 and August 31 with at least three government or private industry organizations in the environmental, geological, or water resources field of study. The selected student will be required to complete a minimum of 40 hours of service at each organization. Part of the 200 hours of service will include the opportunity for the student to obtain their HAZWOPER training for entrance on hazardous waste sites. The scholarship program also provides a monetary award to the student FULLY funded by the Arizona Hydrological Society.

This is an excellent opportunity for government or private industry organizations to try out a potential employee. Participating host organizations reserve the right to have the scholarship recipient sign a liability and confidentiality waiver. The Intern Scholarship Recipient will have the opportunity to choose from a list of interested government or private industry organizations that are in line with the student's career goals. For this reason, the Intern Scholarship Committee wants any interested organization to respond by completing the [Employer Interest Survey Form](#) and e-mail it to [Erin Young](#).

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HYDRO-NEWS

ARIZONA GEOLOGICAL SOCIETY MEETINGS

The Future of Geothermal Energy

Colin F. Williams, USGS, Menlo Park, Calif.

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

Lecture at 8:00 PM
Tuesday, March 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 U.S. Geological Survey (USGS) recently assessed the electric power generation potential of conventional geothermal resources in the United States. These resources are concentrated in the States of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, which contain all 241 identified moderate-temperature (90 to 150°C; 194 to 302°F) and high-temperature (>150°C) geothermal systems located on private or accessible public lands. Electric-power potential was also determined for seven low-temperature (<90°C) systems in Alaska for which local conditions make electric power generation feasible. In addition, the assessment also includes a provisional estimate of the power generation potential from the application of unconventional, Enhanced Geothermal Systems (EGS) technology for creating geothermal reservoirs in regions characterized by high temperature, but low permeability, rock formations. The assessment indicates that the electric power generation potential from identified geothermal systems is approximately 9000 Megawatts-electric (MWe),

distributed over these 13 States. The mean estimated power production potential from undiscovered geothermal resources is approximately 30,000 MWe. Another estimated 518,000 MWe could be generated through successful implementation of EGS technology in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

The presence of significant undiscovered geothermal resources as well as the large potential from breakthroughs in EGS technology relative to the currently installed geothermal production capacity of approximately 3000 MWe highlights some critical needs for future exploration and development activities by both the government and private industry. One critical need is for new techniques to improve geothermal exploration and the acquisition of diverse types exploration data over a broader geographic area. A second is to develop improved occurrence models for quantifying the nature and extent of undiscovered resources. A third is to expand our understanding the geothermal resources in the conductive thermal settings of sedimentary basins, which are important components of the geothermal resources in the central and eastern United States. A fourth is to address the major issues surrounding the development and implementation of EGS. These include uncertainties in (1) the estimated geothermal recovery factor, which is the ratio of produced thermal energy to the thermal energy contained in the fractured EGS reservoir, (2) the likely spatial pattern of EGS development, and (3) the relative effects on productivity of declining fluid viscosity with increasing temperature, fracture closure at higher levels of effective stress, and the increased rates of mineral precipitation and dissolution at higher temperature. In support of ongoing efforts by the DOE Geothermal Technologies Program to advance the geothermal energy utilization, USGS is collaborating with the DOE to address this needs in future geothermal resource assessments, develop new geothermal resource classification standards and assist in the establishment of the National Geothermal Data System.

Biographical Sketch for Colin Williams:

Colin Williams is Director of of the USGS Geology, Minerals, Energy and Geophysics Science Center in the western region of the USA. Until recently, he was a Supervisory Research Geophysicist with the Earthquake Science Center at the U.S. Geological Survey (USGS) in Menlo Park, California. He also currently served as Chief of the Geothermal Resource Investigations Project with responsibility for assessing the geothermal energy resources of the United States and conducting research on improved methods for characterizing and evaluating geothermal resources. His primary research interest is in measuring and modeling the flow of heat and fluids through the Earth's crust and using those measurements to understand hydrothermal processes, earthquakes, and groundwater flow. He is the USGS representative on the Federal Interagency Geothermal Working Group and is a member of the USGS Energy Resources Program Council, the Science Advisory Board for the Department of Energy's (DOE) National Geothermal Data System, the expert panel for the DOE Innovative Exploration Technologies Road Map, and the Environmental Protection Agency's Technical Advisory Committee overseeing the City of Los Angeles Digested Sludge, Biosolids and Brine Injection Project. Colin joined the USGS in 1989 after earning degrees in Geophysics and Engineering from Columbia University, UC Berkeley, and Harvey Mudd College. He has authored or co-authored more than 100 technical papers and abstracts and has received the Department of Interior's Meritorious Service Award.

Dr. Williams can be reached at colin@usgs.gov

Special Luchtime Brown-Bag Talk

Permeability in the Earth's Upper Crust and Challenges in the Development of Enhanced Geothermal Systems

Colin Williams, U.S. Geological Survey, Menlo Park, CA

Tuesday, March 6, 12:10 PM

Environment and Natural Resources Building, Room 353

Abstract

The successful implementation of Enhanced Geothermal Systems (EGS) technology has the potential to dramatically expand both the magnitude and spatial extent of geothermal energy production, and the U.S. Geological Survey (USGS) has been working to develop a comprehensive EGS resource assessment for the United States. However, a number of outstanding scientific and technical issues must be resolved in order to ensure the accuracy and reliability of this assessment. Among these are determining those conditions under which it is possible to replicate the high average permeability (approximately 10×10^{-15} to 10×10^{-12} m exp-2) characteristic of natural hydrothermal reservoirs, evaluating the likely heterogeneity of fracture permeability within EGS reservoirs and its influence on the geothermal recovery factor, R_g , which is defined as the ratio of produced thermal energy to the thermal energy contained in the stimulated volume comprising the reservoir, and improving estimates of temperature in the upper crust to better quantify the thermal energy available at those depths viable for EGS reservoir creation. Models for the development of fracture permeability from the shear slip along pre-existing natural fractures induced by hydraulic stimulation indicate that production from EGS reservoirs will be sensitive to the influence of effective stress and rock properties on the processes of shear fracture formation and closure. Calibration of model parameters with results from EGS field experiments and demonstration projects suggests that sufficient permeability may be difficult to attain through shear stimulation at depths greater than approximately 6 km, particularly in regions characterized by high normal stress on pre-existing faults and fractures. In addition, the expected heterogeneity of fracture permeability within EGS reservoirs may limit R_g to values on the order of 0.05 to 0.1, which is at the lower end of the observed range for producing natural geothermal reservoirs. Although there are significant gaps in the spatial coverage of heat flow measurements in much of the United States and some uncertainty in the estimation of thermal properties at depth, analysis of the existing thermal data indicates that even with the possible constraints outlined above, large areas of the western United States will be suitable for EGS development. However, this preliminary interpretation is compromised by the limited number of cases in which model predictions can be compared to laboratory or in situ data. The key challenge for improved EGS resource assessments is acquiring and interpreting comprehensive laboratory and field data that can provide quantitative constraints on the recovery of heat from EGS reservoirs in diverse settings.

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ARIDLID 2012 CONFERENCE: GREEN INFRASTRUCTURE AND LOW IMPACT DEVELOPMENT IN ARID ENVIRONMENTS



March 27-29, 2012

Tucson, Arizona

AridLID.org

Registration: Early registration is now open! To register and for all information, go to:
http://www.aridlid.org/?page_id=277

Sponsorship opportunities are available. Download the Call for Sponsors at: http://www.aridlid.org/wp-content/uploads/2011/10/AridLID_call_for_sponsors.pdf

Confirmed Keynote Speakers:

Benjamin Grumbles, President, Clean Water America Alliance

Andy Lipkis, Founder and President, TreePeople

To download a complete agenda, including speakers and schedule, [click here](#).

Conference Highlight: Developing a Southwestern Research Agenda for GI and LID

On the second day of the conference, we'll engage in a series of presentations and facilitated break-outs to develop an agenda of research needs and opportunities specific to the arid southwestern U.S. We'll identify areas for collaboration, and seek to answer this question: what are unique questions about Southwestern GI/LID that cannot be answered by research from other regions? This session, co-sponsored by the University of Arizona's Water, Environmental and Energy Solutions (WEES) Initiative, will include staff of the US EPA's Office of Research and Development Green Infrastructure program.

About the conference:

For the past two years, the AridLID Workshops held in Albuquerque, New Mexico have built a growing discussion and exposition of Green Infrastructure (GI) and Low Impact Development (LID) practices that are appropriate to the unique climates of the southwestern U.S. In 2012, we are holding the conference in Tucson, Arizona, with the twin goals of sharing best practices and building professional networks across a wider swath of the region, and of developing a clearer Southwestern vision and voice in the growing national discussion on GI/LID.

For more information, visit AridLID.org.

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SANTA CRUZ RIVER RESEARCHERS' DAY: FOURTH ANNUAL, MARCH 29, 2012 – CALL FOR ABSTRACTS

What: Tumacácori National Historical Park and Friends of the Santa Cruz River invite you to participate in the fourth annual Santa Cruz River Researchers' Day.

- Presentations on research, monitoring, and restoration being conducted along the Santa Cruz River, an opportunity to share research and foster collaboration and idea sharing.
- Poster Session on new or proposed research along the Santa Cruz River.

When: Thursday, March 29, 2012, 9:30 – 4:00 pm

Where: Lower level meeting room at the Joel D. Valdez Main Library, downtown Tucson

Deadlines: Abstract Submission: March 8, 2012

****Please submit abstracts via email to Jason Welborn at jason_welborn@nps.gov**

Call for Posters and Papers for the Researchers' Day:

Individuals interested in presenting a poster, paper or update, are invited to submit abstracts by **Thursday March 8, 2012** on research, monitoring, or restoration being conducted along the Santa Cruz River.

We envision that time slots for presentations will be 15 to 20 minutes. A computer and projector will be available for powerpoint. Note: powerpoint is not required if brief update with handouts etc. is preferred. Posters will be displayed throughout the day with time designated for questions and answers with poster participants.

Please submit abstracts to jason_welborn@nps.gov

Abstract Guidelines: We will be compiling abstracts and producing the annual Proceedings of the event. The abstract should be a single paragraph, 12-point type, single-spaced, the body of the abstract should be no more than 300 words. Use all capital letters to designate the presenter's name. Please include an

affiliation after each author's name. Abstracts should be short and informative. Authors alone are responsible for correct spelling and grammar in their abstracts. Other than italics for scientific names, do not use any formatting such as tabs, bold, etc.

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**ARIZONA RIPARIAN COUNCIL 25TH ANNUAL MEETING AND WORKSHOP MARCH 29-31,
2012**



Come learn what's involved in planning a stream restoration project at our workshop, conducted by Natural Channel Design.

For more details go to <http://azriparian.org>.

Call for abstracts is until March 1, 2012.



Photos courtesy of Kris Randall.



**Join the Arizona Riparian Council's
25th Annual Meeting and Workshop
at Eastern Arizona College
Thatcher, Arizona
March 29-31, 2012**

***People and the Upper Gila River Riparian
Ecosystem: Past, Present, and Future***



cosponsored by the Gila Watershed Partnership



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2012 SOUTHWEST WILDFIRE HYDROLOGY AND HAZARDS WORKSHOP

The University of Arizona is hosting the 2012 Southwest Wildfire Hydrology and Hazards Workshop this coming April 2 – 5, 2012. There is a strong contingent of land management and other government agencies

involved in the planning for this conference, so it is a good opportunity for agencies and academics to share results and prepare for research and early-warning response to the upcoming fire season in the Southwestern U.S. We are particularly interested in increasing the dialogue among academic researchers (including students!) and the various government agencies that are tasked with responding to wildfires. As many post-fire researchers are aware, this coordination is often difficult in the short time available after landscape-altering fires, and as such we hope to use this workshop to make new connections among the various research entities.

Please consider joining us at the University of Arizona's Biosphere 2 for this workshop, you can find more information here: <http://register.b2science.org>

Feel free to contact me with any questions. The workshop is limited to about 80 participants, so please register soon.

Steve DeLong

Assistant Research Professor

Biosphere 2

University of Arizona

520-838-6148

sdelong@email.arizona.edu

leo.b2science.org

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48TH FORUM ON THE GEOLOGY OF INDUSTRIAL MINERALS – CALL FOR ABSTRACTS DEADLINE MARCH 23RD

You are invited to the 48th Forum on the Geology of Industrial Minerals 2012

Hosted by: Arizona Geological Survey

Event Date: **Tuesday, May 1, 2012 – Saturday, May 5, 2012**

geologyofindustrialminerals.org

Location: The Scottsdale Cottonwoods Resort & Suites

6160 North Scottsdale Road Scottsdale, AZ 85253

scottsdalecottonwoods.com

EVENT DETAILS

Registration Information:

Full registration for three days: \$250.00

One-day registration: \$100.00 (does not include banquet)

On-site registration at the Scottsdale Cottonwoods conference center:

Tuesday, May 1, 2012, 5:30pm – 9:00pm

Wednesday, May 2, 2012, 7:30am – 7:00pm

Hotel Information, Ground Transportation, and Parking:

Scottsdale Cottonwoods Resort & Suites

Phone: 480-991-1414

Registrants must contact the conference hotel for their reservations. The conference hotel rate is \$84.00 for single/double occupancy for the Tucson Suites and \$94.00 for single/double occupancy for the Phoenix Suites. Ask for the 48th Forum on the Geology of Industrial Minerals rate.

DEADLINE for ABSTRACT submission: *March 23, 2012*

Abstracts are now being accepted on all aspects of industrial minerals for the 48th Forum on the Geology of Industrial Minerals. Talks and poster presentations are invited on the following topics:

- important and potential industrial rocks and minerals;
- the geology of commodities such as lithium, rare earths, mineral sands, magnesite, clays, fertilizer minerals, zeolites, manganese, silica, and gemstones;
- aspects of the usage of construction materials and building stones;
- exploration case histories and techniques, greenfield operations, reclamation examples and techniques;
- outreach and education programs, societal and legislative challenges to mineral production; and reports on state, regional, and national developments.

A session on Strategic and Critical Minerals and their role in a technological society is planned. Authors will be notified by March 30 of acceptance of their submittals.

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BREWING STORM COULD HELP CALIFORNIA'S WATER WOES

Feb. 29, 2012 06:56 AM

FRESNO, Calif. -- Heavy snow and strong winds have rushed into California's Sierra Nevada, finally giving the area a long-overdue blast of winter.

A winter storm carrying the prospect of up to 5 feet of snow for the Northern Sierra began to hit late Tuesday and was expected to last well through Wednesday, putting state road crews on alert while brightening the state's water outlook heading into spring.

"After tonight, you probably don't want to [travel](#) in the Sierra until Thursday," said George Cline, a forecaster with the National Weather Service.

Read more: <http://www.azcentral.com/news/articles/2012/02/29/20120229brewing-storm-could-help-californias-water-woes.html#ixzz1ntlmDhjc>

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DEAL COULD BRING RUNNING WATER TO NAVAJO, HOPI HOMES

by *Shaun McKinnon* - Feb. 14, 2012 10:56 PM
The Republic | [azcentral.com](http://www.azcentral.com)

Thousands of people on the Navajo and Hopi Indian reservations would gain access to running water under terms of a proposed settlement in a decades-old dispute over the rights to Arizona's water resources.

Sen. Jon Kyl, R-Ariz., introduced the settlement Tuesday from the floor of the U.S. Senate, calling it inconceivable that in 2012, members of the two tribes still must haul water in tanks and barrels just to meet their daily needs.

His legislation, co-sponsored by Sen. John McCain, R-Ariz., would authorize spending more than \$300 million on three groundwater-delivery projects on the Navajo and Hopi reservations. In exchange, the two tribes would give up their claims to water in the Little Colorado River system, giving towns and farmers on the river certainty about their water supplies.

Read more: <http://www.azcentral.com/news/articles/2012/02/14/20120214deal-could-bring-water-navajo-hopi-homes.html#ixzz1ntKaAQ3l>

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[Groups sue to stop uranium mining ban](#)

Monday, February 27, 2012 at 04:01 PM

[ColoRiver pipeline backers lose permit bid](#)

Thursday, February 23, 2012 at 03:48 PM

[Two native AZ fish are now endangered](#)

Thursday, February 23, 2012 at 03:05 PM

[Extreme weather risks growing, report says](#)

Thursday, February 23, 2012 at 02:30 PM

[GreenZone: the Yuma Siphon; ozone studies](#)

Monday, February 13, 2012 at 02:51 PM

[Drought conditions persist in AZ, West](#)

La Niña has cast her dry spell over most of Arizona this winter, deepening drought conditions in the lower desert ranges and in the high country, where the hit-and-miss storm track is clearly evident in the winter

snowpack and spring runoff projections.

In its Feb. 1 **snow survey**, the **Natural Resources Conservation Service** found the driest conditions in the **Chuska Mountains** in northeast Arizona (with a snowpack of 56 percent of average) and on the **Verde River** (63 percent), a source of water for **Phoenix** and its suburbs. The **San Francisco** and upper **Gila** rivers on the Arizona's eastern edge produced the highest numbers, but the snowpack, at 102 percent of normal, is still just average.

Statewide, the snowpack on Feb. 1 was 71 percent of the long-term average for the date.

(The photo at right is from NRCS and shows a snow survey in progress at the **Baker Butte Summit** snow course on the **Mogollon Rim** north of **Payson**. Snowpack on the Rim was a relatively decent 85 percent of average on Feb. 1.)

But the more important number at this point is the streamflow forecast and that one's not good.

Monday, February 13, 2012 at 12:12 PM

Read more: <http://www.azcentral.com/members/Blog/ShawnMcKinnon/155063>

[Mexican wolf died from gunshot wound](#)

Thursday, February 9, 2012 at 02:33 PM



[Bills offer unique views of AZ environment](#)



So far, Arizona's lawmakers haven't introduced anything as

blatantly...blatant as last year's "**Freedom to Breathe**" bill, the one that would have let the state chase the EPA out of the air quality regulation business.

But that doesn't mean the **Legislature** has altered its unique approach to protecting natural resources.

Thursday, February 9, 2012 at 01:06 PM

Read more: <http://www.azcentral.com/members/Blog/ShawnMcKinnon/154810>

[Green Zone: On uranium, January weather](#)

Monday, February 6, 2012 at 05:32 PM

[Grand Canyon bans bottled water sales](#)

Hikers headed down one of the trails at **Grand Canyon National Park** or visitors who know the value of hydration will need to bring their own bottled water or, if they want to be as sustainably minded as the park itself, their own refillable water bottle.

The **National Park Service** announced Monday it would ban the sale of water bottled in plastic containers within the park boundaries, more than a year after the move was first announced and then delayed amid rumors that water bottler Coca Cola

opposed the decision.

The restrictions, which take effect within 30 days, are in line with a new park service policy spelled out in December under which all parks are to stop selling plastic water bottles within their boundaries. Each park will develop its own timetable.

"Our parks should set the standard for resource protection and sustainability," said **John Wessels**, director of the park service's Intermountain region.



The Grand Canyon has installed [10 water filling stations](#) on the South Rim and three on the North Rim. Some of the park's concessionaires have installed similar facilities at hotels or restaurants.

The new policy applies only to bottled water. Retail outlets within the park can still sell soda and juice in plastic bottles. And visitors can still bring plastic bottles into the park from other sources.

Monday, February 6, 2012 at 03:44 PM

Read more:

<http://www.azcentral.com/members/Blog/ShawnMcKinnon/154530>

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/ShawnMcKinnon>.

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JOB BOARD

Check these jobs out on the [AHS Jobs web page](#):

1. [Hydrogeologist/Geologist - DBS&A](#)
2. [Geologist, Scientist or Engineer - GES](#)
3. [WATER RESOURCES SPECIALIST IV - Arizona State Land Department](#)
4. [AZ W/B AUTH TECH ADMINISTRATOR - Arizona State Water Resources](#)
5. [Environmental Section Leader - APS](#)
6. [Bilingual Hydrogeologist - SRK Consulting](#)
7. [Hydrogeologist II, Remediation - Freeport-McMoRan](#)

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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 2012 membership was included in the 2011 Symposium registration fee!

The AHS Newsletter is edited by Christie O'Day, AHS Executive Director.