



JUNE 2010 NEWSLETTER

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VIEWPOINT: PLAN AHEAD FOR SEPTEMBER

Competent. There are so many meanings attached to this word. For the hydrologist it means the largest particles a stream can entrain under a given set of hydraulic conditions, for the geologist it refers to strata which can withstand the structural pressure of folding without changing original thickness or flowing, and to a manager, it means a person who can pick up more assignments without breaking.

Competent people are confident people. Their abilities are unquestioned. But they know they have to maintain their skill level in order to maintain their confidence level. These are the people you will see at the upcoming Annual Symposium of the Arizona Hydrological Society. They will be networking with other water professionals and learning different

approaches and solutions to the challenges imposed by dryland hydrology. We hope for a large international contingent interested in the same theme. Issues will be discussed informally and in the technical sessions. New business contacts will be formed, and the competent people will emerge with more skills than ever before.

On September 1-4 we will convene at the Westin La Paloma in Tucson to hear papers, renew ties, examine exhibits, and otherwise expand our professional knowledge base. Many members will remember the Westin La Paloma as the site of the very successful 2007 Annual Symposium, and I think we can look forward to another interesting event.

The theme of the Annual Symposium is Dryland Hydrology: Global Challenges and Local Solutions. Abstracts for talks are rolling in, and look very interesting. But there is still room for more, and booths for exhibitors are still available. Rooms at the Westin La Paloma can be had for only \$99 per night, which is incredibly inexpensive for a premier resort. Plan on bringing the family and playing in the pool!

We all know that these are rough times, in which our competence is tested. But now is the time to pick up the heavier load and resist structural deformation, and improve your hydrologic knowledge. This is our Society's big event for the year, and I urge you all to sign up now for a great Symposium and a great time!

Alan Dulaney,

AHS Corporate Board President, 2010

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GOVERNMENT GOINGS-ON

What is happening in Washington often has major implications for Arizona and the semi-arid Southwest. With the many recesses coming up, the current session of the U.S. Congress is running low on workdays, and there are a few trends worth noting.

Representative Jim Oberstar has introduced legislation that clarifies the Clean Water Act, muddied in 2001 by a Supreme Court decision. The "America's Commitment to Clean Water Act" takes out the legally confusing concept of navigable waters in favor of an expanded definition of waters of the United States. Groundwater is excluded, as are wastewater treatment plants. Several other existing exemptions are grandfathered in, and EPA and Corps of Engineers jurisdiction) is restored to what it was prior to the Supreme Court decision. This bill is the House version of Senate bill 787. Democrats support the legislation. Republicans countered with the argument that Clean Water Act reviews could now be extended to almost every piece of property that is wet, an unwarranted intrusion of Federal jurisdiction into private property. The fate of this legislation is yet unknown. If passed, how it might affect permitting in Arizona is not clear, but consultants should be alert.

Appropriations for water-related work by the Bureau of Reclamation and Corps of Engineers have not yet cleared the House. It is possible that a continuing resolution may be needed on October 1st, if appropriations are held up until after the November elections, to be worked on by a lame-duck Congress. Uncertainty in the appropriations process doesn't help planning.

The elephant on the horizon is climate change legislation. Senators Kerry and Lieberman introduced the "American Power Act" on May 12. Caps on greenhouse gas emissions, carbon capture and sequestration, carbon allowances and markets, and nuclear power

and offshore drilling are addressed in the bill. The offshore drilling part of the bill may receive significant shoring up in view of what is happening in the Gulf. Effects on the Southwest will probably revolve around coal-fired power plants that provide electricity to move water, particularly up the CAP canal, as David Modeer, General Manager of CAWCD noted last year in his remarks as Plenary Speaker at the AHS Annual Symposium. Pay close attention to this piece of Federal legislation.

Alan Dulaney,

AHS Corporate Board President, 2010

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2010 AHS-IAH ANNUAL HYDRO SYMPOSIUM UPDATE

The next AHS Symposium Planning Committee meeting is June 16 at 6:00 PM at SAHRA in Tucson, 845 N. Park near the University. The program is coming together, but we still need abstracts, sponsors, exhibitors, and any volunteers to make this event come off successfully. Please contact [Shane Clark](#) or [Al Wynant](#) for additional details.

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CRAIG TINNEY FUNDRAISER: SUNDAY, JUNE 13TH 2:00 – 8:00 P.M.



Throughout his career as a professional engineer in Arizona for over 20 years, Craig has assisted many rural communities develop water and wastewater infrastructure projects. Since 2001, with the Arizona Department of Environmental Quality (ADEQ) and the Arizona Water Infrastructure Financing Authority (WIFA), Craig has helped communities identify their water and wastewater needs, develop proposals, and secure funding for construction. He has provided technical assistance

for design, contracting, and construction as well as helped troubleshoot operation and maintenance problems.

In the nearly 10 years that he has partnered with EPA's Water Border Infrastructure Program, Craig has helped guide 16 projects costing \$230 million and benefiting over 500,000 residents of the Arizona-Sonora border region through development and construction. Most notable has been Craig's devotion and tenacity with the projects to revive the Santa Cruz River. From new wastewater services in Yuma to arsenic treatment for Benson, Craig's selfless commitment resonates throughout the region.

Last November Craig was in a bad motorcycle accident that left him a high-level quadriplegic (similar to Christopher Reeve a.k.a Superman). His friends in Tucson have put together a fundraiser on Sunday, June 13 at the Temple of Music and Art in Tucson to help with the huge expenses that aren't covered by insurance. The fundraiser is being administered by the National Transplant Assistance Fund, a 501(c)(3) nonprofit providing fundraising assistance to transplant and catastrophic injury patients. Contributions are tax-deductible to the extent allowed by the law.

Suggested donation: \$20.00; 16 and under: \$10; 6 and under: free

Celebration T-Shirt will be available, CD's too!

Advance tickets: www.inconcerttucson.com. Silent Auction preview (at same site by June 6th)

Information: Jerry Weinert jrweinert@cox.net or Beth Judd (520) 319-8599

Information regarding Craig: <http://www.caringbridge.org/visit/craigtinney>

[Please view the Fundraiser flyer here for additional details](#)

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PHOENIX CHAPTER NEWS

June Dinner Meeting

Please join us Tuesday, June 8th at the SunUp Brewery near downtown Phoenix to have a beverage, share business cards, and talk water.

Location:	SunUp Brewery 322 E. Camelback Road Phoenix, AZ 85012
Event:	<i>Central Arizona Project (CAP) recovery plan</i> presented by Dee Fuerst, CAP
Chapter Board Meeting:	4:30 PM – 5:30 PM
Happy Hour & Dinner:	5:30 PM – 7:00 PM
Presentation:	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!

May Dinner Meeting Summary

-- Provided by Tom Walker, Phoenix

The Phoenix Chapter thanks to Tim Skarupa of Salt River Project for his interesting presentation “**Revising Reservoir Planning Based On Vulnerability To Sustained Drought In The Past and Future**,” at the Phoenix Chapter meeting on May 11, 2010 at El Peñasco in Tempe. Tim provided insight into modifications SRP has been implementing in its reservoir operation plan for the Salt and Verde River system reservoirs in response to improved knowledge of the climatic history of our region.

Three of the main variables in the operation plan for the Salt and Verde River system reservoirs are the projected demand, the surface water inflows to the reservoirs, and the groundwater pumping component available/required to make up the difference between

surface water inflows and demand. There is considerable variability in the surface water inflows to the system. In the 1970s and 1980s, the reservoir operation plan worst-case scenario was based on the drought of (historic) record, the 7-year drought of 1898-2004, with an overall average of 35 percent of mean annual runoff.

Over recent decades, a long record of climate for the Southwest has become available from the tree ring record, studied by scientists at the U of A and elsewhere. Based on this tree ring record, which now provides information back more than 1,000 years, we now know of a “mega-drought,” an 11-year period from 1575-1585 with an estimated 70 percent of historic gaged median inflow. As this information has become available, SRP has begun to take it into account in developing a revised reservoir operation plan. The possibility of a longer and more severe drought provided incentive for SRP to model combined storage and groundwater pumping scenarios to determine a point at which the SRP reservoir system is unable to meet any demand. For example, if inflow is maintained over a sustained period at only 40 percent of median inflow, reservoir dry-up is predicted by the SRP model in only 4.4 years. However, if inflow is maintained at 64 percent of median, operation of the system can be sustained indefinitely, and dry-up is predicted not to occur.

SRP is exploring options to augment the storage supply before storage reaches a critical level, which allows the supply to be sustained for a longer period of time to preclude the complete loss of storage. Also, this approach of developing a more robust operations model will be applicable should a shift to a warmer, drier Arizona occur, as global warming/climate change predictions suggest. SRPs current operations management uses the 1575-1585 tree ring drought as the new Planning Drought of Record and a conservative 950,000 acre feet demand. If needed, reservoir shortages could be addressed through increased groundwater pumping, reduced allocation to customers, agreements with Central Arizona Project, lease options with Indian and non-Indian agriculture, recovery of long term underground storage credits, conservation, watershed management and increased water-use efficiency.

Tim finished his presentation with 2009-2010 El Nino winter precipitation summaries and statistics. Lakes along the Salt River have reached capacity, and are releasing water, while lakes along the Verde are very near capacity (much of the snowmelt from the northwestern portion of Verde watershed has just begun). Data from SNOTEL sites located in the SRP watershed indicate snowpack levels are much greater than what has been received in recent history. The SNOTEL information is being used to estimate future SRP reservoir inflow. While precipitation from the 2009-2010 winter will not resolve the long term regional drought, storage reservoirs have rebounded, and forests/watersheds have received some much needed moisture and relief.

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2012 Symposium Planning Underway

Ted Lehman, Christie O’Day, and Mike Hulst have been scoping out possible venues for the 2012 AHS Symposium and hope to have a decision this summer. If you have any strong opinions on locations or are interested in helping them with the early stages of the planning for 2012, please contact 2012 symposium planning chair, Ted Lehman, at ted@jefuller.com or 480-222-5709.

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

- July 13th – Monthly Dinner Meeting, Mike Fulton with an update on ADEQ outlook and programs.
- August and September – No regular dinner meetings. Please join us September 1-4 at the Tucson Westin La Paloma for the AHS/IAH annual symposium!
- Oct-Dec Dinner meetings – How 'bout you? Contact [Keith Ross](#) if you're interested in speaking!

SURVEY FOR POTENTIAL SHORT COURSES

The Phoenix Chapter wishes to poll the membership on interest in attending short courses on Isotopes this October and one on Current Mining Issues and Sustainability in February 2011. The courses would be held in the in the afternoon from 3-7 pm for about \$50 which includes dinner. Please visit our online survey today at <http://www.surveymonkey.com/s/KFJ6H7Z>.

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TUCSON CHAPTER NEWS

June Meeting Announcement

The next Tucson chapter meeting will be held on Tuesday, June 8th. Please note the change in the usual meeting location.

Location: National Weather Service,
520 North Park Ave, Suite 304
University of Arizona campus, Tucson

Event: **Tour of the NWS forecasting facilities**

Date: Tuesday, June 8, 2010

Time: 6:00 pm

May 2010 Meeting Summary

- Write up provided by Shane T Clark, Tucson Chapter Secretary (2010): U.A Watershed Hydrology

Desalination of Brackish Groundwater in Arizona

On May 11th at 6:30 pm, the Tucson Chapter hosted a special guest lecture by Edwin McGavock, a Hydrologist with Montgomery & Associates. This talk was attended by 11 people and was held at the Office of Montgomery & Associates 1550 E Prince Rd. Tucson, AZ 85719.

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

Recognizing that desalination of brackish groundwater (BGW) will be an integral

part of Arizona's future water supply, the Central Arizona Water Conservation District (CAWCD) has embarked on a program to identify and prioritize Arizona basins where desalination is most feasible. Brackish groundwater is defined for this study as containing 1,000 to 15,000 milligrams per liter (mg/l) total dissolved solids (TDS). Based on this definition, more than 600,000,000 acre-feet of brackish groundwater is estimated to be stored in Arizona aquifers, generally at depths of less than 1,200 feet. While this volume seems large, it is still modest in comparison to the 1 billion acre-feet of brackish groundwater estimated to be stored in New Mexico's aquifers (New Mexico State Engineer Report, 2004).

The CAWCD program is designed to augment or create a shifting use of CAP waters. The desalination efforts will be focused on various communities in Arizona. Some areas in northern Arizona for example have the largest numbers with the state, with wells recording brackish levels greater than 17,000 (Mg/l)

Brackish groundwater is found throughout Arizona in a variety of hydrogeologic environments (Daniel 1981). Evaporite deposits are responsible for most salinity in northern Arizona aquifers, and agricultural irrigation is primarily responsible for brackish groundwater in southern Arizona. Evaporites are also a factor in southern Arizona basins, such as Safford, Picacho, and the West Salt River. Although dozens of brackish groundwater areas exist in Arizona, results of Phase I investigations indicate that only five or six have sufficient volume in storage to be of near-term interest for development of desalination projects.

There are several reasons why this is an important hydrologic issue. Brackish groundwater is the largest unallocated water resource available in Arizona and the Southwest. More than 600 million AC-Ft are estimated to be recoverable from BGW resources.

Edwin McGavock outlined several BGW examples. One notable example was that of Buckeye, AZ. Buckeye is a large waterlogged area with plenty of brackish water. Surface and ground waters are within the optimal desalinization range. Buckeye also has a growing demand for drinking water and irrigation. This area is also undergoing many land use changes which may affect the BGW supply. The changing ground waters may pose many challenges to Buckeye residents.

Factors to consider for desalinization efforts:

- Changing land uses
- Sources of Salinity
- Energy costs
- Impacts of BGW withdrawals
- Chemistry of the Ground waters
- Waste disposal of desalinization

Brine disposal is one of the many challenges in desalinization efforts. Disposal is done through many measures: Large evaporation ponds, commercial utilization of the brine and by using deep underground injection wells to put the waste back into the aquifer. In Arizona deep well injection may be problematic because all AZ aquifers are classified as drinking water regardless of yield or GW quality. Arizonian ground water managers may be able to overcome these difficulties through new Technologies such as Vibrating Membrane Separation (VSEP).

Edwin McGavock's take home message was that the recoverable supply of BGW is quantitatively more than 200 yrs if AZ CAP allocation. The cost of this desalinization effort would work out to \$1-\$5 per gallon versus bottle water being \$1-\$4 per gallon (plus the virtual water cost of all that plastic). The purposed desalination plant would be co-located with power generation.

DESALINATION IS ARIZONA'S NEXT BUCKET OF WATER!

The AHS Tucson Chapter extends a very warm thanks to Edwin McGavock, for his informative presentation!

Additionally The Tucson Chapter would like to thank Montgomery & Associates for providing the space so that these monthly talks can be held.

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WRRC AWARDS 2010 MONTGOMERY & ASSOCIATES SUMMER WRITING INTERNSHIP

University of Arizona student Tim Glass has been awarded the 3rd Annual Montgomery & Associates Summer Writing Internship at the WRRC. A junior majoring in journalism, Mr. Glass is a non-traditional student who returned to school after serving in the military and working in private industry. His special interest is photojournalism, and he has gained experience in the field by working for the UA Daily Wildcat, the student newspaper. His WRRC internship assignment will be to work on the Arroyo, a WRRC annual newsletter that focuses on a critical Arizona water issue. The 2011 Arroyo will be devoted to desalination and its role in Arizona's water supply.

The Summer Writing Internship at the WRRC was inaugurated in 2008 with support from Montgomery & Associates, an Arizona-based consulting firm specializing in hydrology and water resource issues. The internship provides an opportunity for a student to gain research and writing experience by addressing issues relating to water and environmental science in a style to engage the general public. The intern will be part of the WRRC team conducting research and interviews and working on Arroyo drafts. The finished product is published in the first quarter of the following year and is mailed to subscribers and posted in PDF on the WRRC's web site. The 2010 Arroyo, "The Water-Energy Nexus: In a world of limited resources, water and energy are inextricably linked," released in March, is available at http://ag.arizona.edu/AZWATER/publications.php?rcd_id=88 .

Applications for the 2011 Montgomery & Associates Summer Writing Internship at the WRRC will be solicited beginning in March. Any enrolled student in good standing at the University of Arizona, Arizona State University, and Northern Arizona University is eligible.

For more information, contact seden@cals.arizona.edu .

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LEONARD HALPENNY INTERN SCHOLARSHIP WINNER

David Bernard is the recipient of the 2010 Leonard Halpenny Intern Scholarship. He is a junior in Environmental Hydrology and Water Resources at the University of Arizona. He was recently accepted and honored as a student member of the highly prestigious Galileo Circle Scholars at the U of A. During the Halpenny Internship, he will be working with

Tucson Water, Metro Water District, Haley & Aldrich, and Montgomery & Associates

Leonard Halpenny Intern Scholarship Committee

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

Montgomery & Associates

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Tucson, AZ 85711

Telephone: (520) 881-4912

Fax: (520) 881-1609

FLAGSTAFF CHAPTER NEWS

June Chapter Meeting: Peabody Energy

Location: 3001 W. Shamrell Blvd., Suite 110
Flagstaff, AZ 86001

Date: June 16, 2010

Time: 6:00 PM

Pizza Dinner!

May 2010 Meeting Summary- Flagstaff

The Flagstaff Chapter is continuing to focus on summer field trip planning and the 2011 symposium.

FLAGSTAFF CHAPTER SUMMER FIELD TRIP

Save the Date! Flagstaff Summer Field Trip – Saturday July 10, 2010

Hops, Stops and Rocks: Hydrology, Geology, and Volcanology of the Mormon Lake area

Remember the good ol' days...when AHS put you on a bus with your best buddies, took you to interesting sites and talked hydrology all day long, while keeping you properly hydrated? Well, the Flagstaff Chapter would like to offer something similar this summer. You can now reserve your spot for the Flagstaff Chapter Summer Field Trip *Hops, Stops and Rocks: Hydrology, Geology, and Volcanology of the Mormon Lake area*. Together, Dr Richard Holm, Volcanologist and NAU Geology Faculty Emeritus, and Dr. Abe Springer, Hydrogeologist and NAU Geology Professor, will take us to the best kept secrets in the region, presenting hydrology, structure, and volcanology from vistas and at outcrop. Dr. Holm said that he will even talk petrology, for enthusiasts; don't be caught off guard, come prepared! The field trip costs \$25 for members, \$30 for non-members, and includes van transportation from Mormon Lake, lunch, beverages, and, of course, hops at each stop. We will meet near Mormon Lake July 10th at 9:30 am (departing at 10:00 am), and return by 4:00 pm.

Following the field trip and before dinner at 6:30, you can relax at the camp site we will

have established, play some horseshoes, or engage in the quarterly Corporate Board Meeting! Dinner is catered BBQ from Flagstaff's delicious Big Foot BBQ. Pulled Pork and Pulled Chicken Sandwiches, Tater Salad, Cole Slaw, BBQ Beans, Green Garden Salad, Cornbread and Cobbler, plenty of drinks, and continued libations. Cost for dinner is \$15 for members, \$20 for non-members, and \$5 for Kids. If you choose to set up camp with us (free) you can opt for bagels, spreads, and juice the next morning for \$5. Mormon Lake Lodge is also an option for breakfast. The camping will be "rustic" but we are going to provide some sort of a private toity! If you would like to be cozier, consider the cabins at Mormon Lake Lodge. They also offer RV and camp sites with facilities. Book now as these fill up quick at www.mormonlakelodge.com!

Please RSVP by Wednesday June 30. Call (928) 606-8422 or Email Erin Young eyoung@flusol.com. While we really do trust your word, we still need a check (payable to Arizona Hydrological Society) or cash by June 30 to completely guarantee and hold your spot. Please mail checks to: Erin Young

1055 Hano Trail,
Flagstaff, AZ 86001.

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FLAGSTAFF CHAPTER 2009 INTERN SCHOLARSHIP SUMMARY

By Christian Meinhardt



In June 2009 Miss Erin Young informed me that I was chosen as the 2009-10 Arizona Hydrological Society Intern Scholarship recipient. The idea was to work a total of 320 hours with four different entities: United States Geological Survey's Water Resources Center (99 hours), Coconino County's Stormwater Department (81 hours), City of Flagstaff's Cinder Lake Landfill (66 hours), and City of Flagstaff's Utility Department Water Resources (74 hours).

Up-front, I must say, my experiences have been invaluable, life changing, and I believe they have helped prepare me for my future career.

At the USGS I had the pleasure of working under hydrologists Margot Truini, Jamie Macy, and Kurt Schonauer, and hydrologic technician Jessica Gardner. Margot taught me how to read well logs, from which I designed a spreadsheet with information on groundwater wells in western Arizona. Additionally, I was taught how to prepare sampling equipment for water quality measurements. Jessica, Kurt, Jamie, and I went on two trips to take surface water volume, river cross sectional measurements, and water quality measurements on the Colorado River at Lee's Ferry, Arizona. I was also part of a similar excursion to Diamond Creek and the Colorado River near Peach Springs, Arizona. Here, Kurt taught me how to create a perfect cross section to achieve best estimations of flow measurements. Jessica took me on day trips to take groundwater measurements throughout the Black Mesa area. To teach me how to take water samples for quality analysis according to stringent USGS protocols, Kurt took me on a two-day trip to the Verde River near Cottonwood, Arizona.

As my second internship opportunity, I was honored to work with hydrologist and stormwater program manager Ted Smith of Coconino County. Together with Ted, I developed two analytical models in Microsoft Excel. The first model, essentially a flood

frequency analysis tool for instantaneous annual-maximum peak flows, calculated different possible floods for a rain only, rain on snow, and a combination of both events using new (to me) statistical methods. USGS' PeakFQ served as an example but the challenge was to develop the same functions in excel. The second model for determining run-off based on area was developed using streams throughout northern and eastern Arizona that had similar climate to Flagstaff. In the finishing model one could determine an estimate of the run-off, again for a range of recurrence intervals, simply based of a known area.

Third, I enjoyed working with NAU Master Candidate in the Department of Geology and Project Manager at Cinder Lake Landfill, Ken Robinson. One of the things I learned from Ken is the geology of Cinder Lake Landfill, geologic terminology, and some hydrogeology mechanisms in soil matrices. Some of the research done with and for Ken included finding constituents of landfill leachate, hydraulic conductivity of fracture flow in basalt, typical rock designation, permeability, and porosity in basalt flows, and soil moisture sampling. I also learned a great deal of professionalism and time management.

Last but not least, I was mentored by the City of Flagstaff's water resource manager Brad Hill, where I did some of the basic data collection for Flagstaff's water resources sustainability study. One of the first tasks was to update the City of Flagstaff's well data hydrographs. I then compiled data from ten or more reports the City had done over a period of time. I also compiled a long list of references and learned to use ADWR's 55 database, where I looked up and created copies of data reports for over 130 wells. Data research and collection dominated this early stage of the water resources sustainability study. For the already existing Lake Mary data, I developed a conversion formula between percent full and volume as this was not apparent in the provided data.

In conclusion, I was able to gain very valuable experiences throughout the AHS internship experience – mostly because of the great people whom I felt privileged to work with. This was a once in a life time experience, and I am very grateful for this tremendous opportunity. I would like to thank every individual I was honored to meet – you made this experience possible and so wonderful! By encouraging words and examples, I feel prepared to make a difference in the water resources management world as I will continue my education in water engineering. Thank you AHS!

Please direct any questions regarding the Flagstaff Intern Scholarship to Erin Young at eyoung@flusol.com.

AHS Flagstaff Intern Scholarship Program

Erin Young

Phone: (928) 606-8422

E-mail: eyoung@flusol.com

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JOB POSTINGS

Senior Hydrogeologist

[Montgomery & Associates](#) is a water resources consulting firm with a 25-year history of providing effective water resources and environmental solutions to mining, industrial, municipal, and power sector clients, as well as to public and private water entities. The firm has offices in Tucson and Scottsdale, Arizona, and Santiago de Chile.

Job Description: Assist in developing, planning, and executing water-resource and environmental projects in the firm's Scottsdale office.

Requirements:

- Minimum of 15 years professional experience with water resources in southwest U.S., with preference to consulting experience in groundwater resources
- Degree in geology, hydrology, or related discipline, with Masters Degree strongly preferred
- Professional registration in Arizona
- Strengths in team building and leadership, business development, project management, and verbal and written communication skills
- Experience working with regulatory agencies and permitting programs applicable to Arizona projects is preferred

Please submit resumes and/or inquiries to resumes@elmontgomery.com

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HYDRO-NEWS

“GRINDING-MOUTH, WRINKLE-EYE”, A NEW DINOSAUR FROM NEW MEXICO

A team of paleontologists has named a new species of dinosaur based upon an incomplete skeleton found in western New Mexico on land administered by the Bureau of Land Management (BLM). The new species, dubbed *Jeyawati rugoculus*, comes from rocks that preserve a swampy forest ecosystem that thrived near the shore of a vast inland sea 91 million years ago. *Jeyawati* is a member of a remarkable assemblage of dinosaurs and other animals that was totally unknown fifteen years ago and which was featured in the Discovery Channel documentary “When Dinosaurs Roamed America” in 2001. Dinosaurs that coexisted with *Jeyawati* include *Zuniceratops*, the earliest known North American horned dinosaur, and *Nothronychus*, a strange herbivorous beast belonging to a lineage that, until the discovery of *Nothronychus*, was known only from Asia. *Jeyawati* adds another fascinating character to the story of North America’s dinosaurs.

The first part of the name *Jeyawati rugoculus* is pronounced “HEY-a-WHAT-ee”, essentially meaning “grinding mouth”, and is derived from two words in the language of the Zuni people, who have long inhabited western New Mexico. The meaning of the name *Jeyawati* is a reference to the sophisticated chewing mechanism evolved by the herbivorous lineage to which *Jeyawati* belongs. The second part of the name, *rugoculus*, comes from the Latin words *ruga* and *oculus* and means “wrinkle eye”, describing a unique feature of the new species. One of the bones that forms the eye socket exhibits a peculiar rough or wrinkly texture on its outer side; in other dinosaurs, such a texture on skull bones has been suggested to have supported enlarged scales on the top of the skull. Thus, *Jeyawati rugoculus* might have sported one or more large scales above and behind its eye, giving it a strangely striking appearance (see image below).



Jeyawati evidently endured a hard life. Among the many bits of ribs found with the skull bones, several large pieces have a swollen, rough surface, indicating that the animal suffered broken ribs through some misfortune and that those injuries had healed by the time the animal died.

The partial skull and other fragments of *Jeyawati* were discovered in 1996 by paleontologist Douglas Wolfe, principal investigator of the Zuni Basin Paleontological Project, his wife Hazel, and their son Christopher. Subsequent excavation and collection was carried out with the permission of the BLM over the following thirteen years with the aid of Dr. James Kirkland (State Paleontologist with the Utah Geological Survey), volunteers from the Southwest Paleontological Society, and many other volunteers from around the country. The fragile fossils were then carefully freed from the remaining rock by preparators Harold and Phyllis Bolan and are now stored at the Arizona Museum of Natural History in Mesa.

In 2006, senior author Andrew McDonald, then an undergraduate Geology student at the University of Nebraska (Lincoln) under the supervision of Dr. David Loope, began a project to describe the fossil. McDonald's analysis revealed that the bones were sufficiently distinct from those of other dinosaurs to warrant the naming of a new species. It also became clear that *Jeyawati* is a close relative of the duck-billed hadrosaurs, which were immensely abundant across the Northern Hemisphere for much of the Late Cretaceous Epoch, between 80 and 65 million years ago. However, *Jeyawati* retains some primitive features of the teeth and jaws that preclude it from being a fully-fledged hadrosaur. McDonald, now a Ph.D. student at the University of Pennsylvania (Philadelphia) working with Dr. Peter Dodson, has a more extensive project underway to determine the evolutionary relationships of *Jeyawati* and many of its relatives.

McDonald, Wolfe, and Kirkland have published their findings in the May issue of the *Journal of Vertebrate Paleontology*.

Full article citation: McDonald, A. T., Wolfe, D. G., and Kirkland, J. I. 2010. A new basal hadrosauroid (Dinosauria: Ornithopoda) from the Turonian of New Mexico. *Journal of Vertebrate Paleontology* 30:799-812.

Paper describing *Zuniceratops*: Wolfe, D. G., and Kirkland, J. I. 1998. *Zuniceratops christopheri* n. gen. & n. sp., a ceratopsian dinosaur from the Moreno Hill Formation (Cretaceous, Turonian) of west-central New Mexico; pp. 303–317 in S. G. Lucas, J. I. Kirkland, and J. W. Estep (eds.), *Lower and Middle Cretaceous Terrestrial Ecosystems*. New Mexico Museum of Natural History and Science Bulletin 14.

Paper describing *Nothronychus*: Kirkland, J. I., and Wolfe, D. G. 2001. First definitive therizinosaurid (Dinosauria; Theropoda) from North America. *Journal of Vertebrate*

ARIZONA BUDGET CUTS HURTING WATER AND AIR AGENCIES

by **Shaun McKinnon** - May. 4, 2010 12:00 AM
The Arizona Republic

Deep budget cuts have shaken up two state agencies charged with protecting Arizona's natural resources, raising permit fees and a raft of questions about how well water and air will remain protected.

Hardest hit was the Department of Water Resources, whose budget and workforce was slashed by more than half. The statewide planning division, responsible for helping secure future water supplies, was reduced to just two people and funding was eliminated for remote sensors that can alert communities to flood threats.

The Department of Environmental Quality also lost significant funding and staff as the governor and the Legislature tried to erase a state budget deficit that topped \$3 billion. The department will be forced to double many regulatory fees and issue some air- and water-quality permits with little or no review of specific pollution risks.

Directors of both agencies say their only choice is to work with the money allocated. Critics of the budget cuts warn that if too much is left undone, the consequences could reach far into Arizona's future.

Read more: <http://www.azcentral.com/arizonarepublic/news/articles/2010/05/04/20100504arizona-budget-cuts-hurting-water-and-agencies.html#ixzz0p48eiJ3l>

WATERBLOGGED BY SHAUN MCKINNON, ARIZONA REPUBLIC

Water 101: Why AZ can't just keep LA's water

May 19, 2010 at 12:12 PM

As city councils up and down California debate the merits of boycotting Arizona to protest the immigration bill, the chatter online (and in my e-mail inbox) has included demands that if Golden Staters don't want to do business with Arizona, that should include the water and electricity that pass through here.

It's like the old water saws about how it's no fun to be the last guy on the ditch.

The outrage intensified in recent days with the release of a letter from Arizona Corporation Commissioner Gary Pierce to Los Angeles Mayor Antonio Villagairosa. (The letter was reported by the blog Hot Air and has since gone practically viral.) In short, Pierce suggests that if LA wants to boycott Arizona, it should stop using power generated here. (He did not, as a flurry of blog posts suggests, threatened to turn out the lights; the ACC has no such authority.)

My colleague at the Republic Ryan Randazzo explains nicely here why Arizona can't just go out and cut the wires heading west out of Palo Verde.

But based on blog posts, story comments and a few e-mails, lots of folks also think Arizona could - and, they say, should -- withhold water from California. The suggestion is usually linked to the Colorado River, which the wags in question seem to think is Arizona's to give and take.

Read more: <http://www.azcentral.com/members/Blog/ShawnMcKinnon/83776>

There's bare ground at end of snow melt

May 6, 2010 at 05:07 PM

The lower **Salt River** through **Tempe** and **Phoenix** will start to dry up as the flow of runoff from the upper Salt diminishes in the coming days.

Salt River Project will stop spilling water over **Granite Reef Dam** sometime Friday, marking a sort of unofficial end to the winter snowmelt in the high country. There's still snow yet to melt in the highest elevations, but increasing water demand by SRP's [customers](#) will help offset whatever finds its way to **Roosevelt Lake**.

Since Jan. 21, SRP has spilled 666,353 acre-feet of water (about 217 billion gallons) from the Salt and Verde rivers, runoff that couldn't be stored in any of the six reservoirs, all of which filled early in a winter juiced up by **El Nino**.



The water flowed down the lower Salt and into the **Gila River**, but it wasn't by any means wasted or even lost. A decent amount of the runoff seeped into the ground along the way, which is good for the riparian habitat. River ecologists say a good seasonal burst like this one can do wonders for a desert system, so you'll see rejuvenated vegetation along the river through the summer.

Read more:

<http://www.azcentral.com/members/Blog/ShawnMcKinnon/80342>

EPA cites uranium mine near Grand Canyon

May 4, 2010 at 04:37 PM

The owner of a recently re-opened uranium mine north of **Grand Canyon National Park** has been cited by the **U.S. Environmental Protection Agency** for violating federal regulations.

The EPA says **Denison Mines Corp.** [reopened its Arizona 1 mine](#) without the proper permits and failed to comply with rules related to its handling and release of radon. In all, the EPA cited Denison for five violations. (You can read the full notice [here](#) in pdf form.)

Denison re-opened [Arizona 1](#) in December with plans to extract as much as 182,000 tons of uranium a year. The operation is about 70 miles north of the [Grand Canyon](#) and is at the [center of a debate](#) over whether the federal government should allow uranium mining in the area.

Critics say the mines could contaminate the ground and seep into the regional water supply,

including the **Colorado River**, a source of water to millions of people downstream. [Mining companies](#) say their methods have improved and pose no such risks.

The **Arizona Department of Environmental Quality** [issued an air quality permit](#) to Denison Mines last September, but the EPA, in its notice to the company, said that permit was not valid because ADEQ lacks authority in this instance.



For associated links and other timely water blogs on Shaun McKinnon's Arizona Republic site – **Waterblogged** visit

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

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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/>

Your membership may be renewed for 2010 by credit card through the AHS website or by mailing a check to the Arizona Hydrological Society, c/o Christie O'Day, 3317 S. Higley Road, Suite #114, Box 120, Gilbert, Arizona 85297. Dues remain at \$45.00 year for regular membership and \$15.00 for students. Looking forward to a great 2010 with your continuing support. For those who attended the 2009 Water Symposium, be reminded that membership dues for 2010 were included in the registration fee.