



March 2009 Newsletter

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Viewpoint: Hydrologic Extremes

Last week Salt River Project announced that increased runoff had raised water levels at Lake Roosevelt to a height that meant that SRP now must operate under flood control rules, until water levels drop. Roosevelt Dam is now a flood control structure instead of a water storage structure. This news reflects a second year of good precipitation and favorable hydrologic conditions. Water users receiving surface water from SRP are delighted with the supply in the system. Cities and farms enjoy the benefits of low cost spill water, providing some relief to their budgets

.In contrast, our neighbor to the west has received bad news. In February, the Bureau of Reclamation announced cutbacks to water users served by the Central Valley Project, by as much as 77% for some contract holders. The Statewide Water Project may only deliver 15% of normal allocations to farms and cities in southern California. The San Joaquin Valley may experience 20% unemployment as the direct result of the lack of water, warns Congressman Devin Nunes, who further offers the dire prediction of the collapse of civil society as the result of chronic water shortages. While the California Congressional delegation is well-versed in the ways and means of influencing water policy, including occasional hyperbole, the drought in California clearly remains severe with no end in sight. There can be no doubt that lack of water will adversely impact California's economy, augmenting the lack of money at the worst possible time.

Feast or famine, flood or drought: hydrologic extremes often characterize water in the western United States. The current news from two not-so-distant regions emphasizes the relevance of the topic of the 2009 Annual Symposium, "Managing Hydrologic Extremes."

This year the Arizona Hydrological Society is partnering with the American Institute of Hydrology to produce a meeting that will feature state-of-the-art technical sessions, good field trips, and a variety of excellent workshops. This event will be the national meeting of the AIH, and should draw attendees from across the United States. AHS has had great success in partnering with other like-minded organizations in putting on recent Symposia, and we look forward to another banner event. The Symposium will be held at the Westin Kierland Resort and Spa in Scottsdale from August 30 through September 2, 2009. The Westin Kierland offers championship golf, a spa, multiple pools, water slides, and a lazy river. At first glance it seems incongruous to hold our AHS Annual Symposium at a water park, but given the good rates the planners negotiated, it makes for a great family vacation at a time when other destinations are out of reach. The Web site is now up and running: www.hydrosymposium.org, and content is being added daily. The Call for Abstracts is already out. I urge you to block out the dates of August 30 through September 2 and attend this year's AHS-AIH Annual Symposium in Scottsdale.

We don't have to look far to find real-world consequences to hydrologic extremes.

Alan Dulaney,

AHS Corporate Board President, 2009

ARIZONA HYDROLOGICAL SOCIETY
2009 ANNUAL SCHOLARSHIP ANNOUNCEMENT

The Arizona Hydrological Society (AHS) and the AHS Foundation will award three \$3,000.00 student Scholarships in 2009. The purpose of the award is to encourage full time students in hydrology, hydrogeology, or any other water resources related fields at any Arizona university, or college to excel in their area of study. Any junior, senior or graduate student who fits into this category is qualified to apply for the Scholarship. Applications for the Scholarship must be submitted to Dr. Aregai Tecele at the address below by April 30, 2009. The Scholarship will be awarded during the Annual Symposium of the Society that will be held during August 30 - September 2, 2009 at the Westin Kierland Resort & Spa, Scottsdale, Arizona.

The Scholarship award will be based upon the following criteria:

1. Grade Point Average based on at least two full-year courses work
2. Strength of Recommendation letters (at least one)
3. Application letter describing the applicant's interests and career goals in hydrology and water resources
4. Background in hydrology and water resources related activities (provided in the applicant's resume), and
5. Degree of need explaining the need & how the scholarship would help meet the need.

The Scholarship application must include at least the following documents to be considered:

1. Application letter
2. Official transcripts (graduate & undergraduate for graduate applicants)
3. Confidential recommendation letters (at least one)

Mail all Scholarship applications for consideration by April 30, 2009 to:

Professor Aregai Tecele
Northern Arizona University
School of Forestry
P. O. Box 15018
Flagstaff, AZ 86011-5018

Phoenix Chapter

March Dinner Meeting

Our next dinner meeting will be held March 10th when Dr. Abe Springer, NAU, and Steve Flora, ADWR, will discuss ADWR, aridland springs of western North America – diverse yet abused! Their presentation will highlight work recently published in a new book, Aridland Springs in North America, edited by Lawrence Stevens and Vicky Meretsky.

Please join us March 10th at El Penasco at Mill & Broadway in Tempe. Hope to see you there!

Location: El Penasco Mexican Kitchen
19 E. Broadway Road
Tempe, AZ 85282

Speakers: Abe Springer & Steve Flora – Aridland Springs of western North America – Diverse Yet Abused

Chapter Board Meeting: 5:00 PM – 5:40 PM

Happy Hour & Dinner: 5:45 PM – 7:00 PM

Dinner Speaker: 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.

February Meeting Summary

Thanks to Keith Ross, of Hydro Geo Chem for his presentation on February 10, 2009. Keith discussed Preliminary Source Identification using Passive Soil Gas (PSG) Survey techniques. Keith explained that source identification is sometimes needed in areas that have known groundwater contamination from dry cleaners, auto repair shops, chemical manufacturing or storage facilities. This technique is low in cost, defensible, minimally invasive and maximizes the

amount of data that can be collected. The data is time integrated, reported as mass instead of concentration and needs confirmation of results. An active soil gas survey provides a snap shot of site conditions, may need a drill rig, but allows for depth-specific sampling at multiple depths. Routine target compounds include chlorinated solvents, aromatic compounds, complex mixtures such as Stoddard solvent, fuels, and paint thinners.

Two case studies were presented. The first (in central Phoenix) was used to help identify current businesses that might be contributing, along with historical information and a City Directory search. Keith explained the installation and retrieval methods used for the PSG sampler. The samplers can easily be placed by hand to 10 cm – 30 cm below the surface. It took approximately 6 hours to deploy 67 samplers, which were left in the ground for two weeks. Contour maps were prepared based on the original data. A second PSG deployment placed 24 additional samplers to look at property identified by the initial phase. The results helped to identify one strong and one weaker potential source.

The second case (Tempe commercial development) was more complicated by having more potential sources. Once again, two rounds of deployment were involved, with PCE and TCE found in the ranges of 5-145 nanograms. Two potential sources were identified for further groundwater investigation. PSG is a good screening tool with low cost and is minimally invasive and allows for a more focused source investigation or confirmation studies.

The Phoenix Chapter would like to thank Keith for sharing his work with us. Now we know what he's doing when he's not planning for the symposium...

January 26th – Call for Abstracts, 2009 Annual Symposium

It's official! Abstracts are being accepted for the 2009 Annual Symposium. Get your talk or poster abstract in early and begin your commitment to attend another great AHS event. We have room for dozens of technical presentations and posters. Presenters and their presentations are the central component of every Annual Symposium. So, come be a central part of the action. Show off your work, yourself, and your firm. This is an excellent chance to remind the water community about your expertise and mine new clients interested in the kind of work you do. If that's not enough, we will have a published volume of the proceedings this year. So if you're looking to add to your vita or just love the idea of seeing your name in print, here's a great chance! Abstracts can be submitted online and will be accepted until March 27th.

2009 AHS Annual Symposium Sponsors Sought

The 2009 Symposium, "Managing Hydrologic Extremes", will be held at The Westin Kierland Resort & Spa August 30 through September 2, 2009 in Scottsdale. The event will be a joint symposium with the 2009 national conference of the American Institute of Hydrology (AIH). Thanks to our volunteers we already have several pledged sponsors! Our thanks to:

- Freeport McMoRan Copper & Gold
- ACS
- ACZ Laboratories
- Clear Creek Associates
- Columbia Analytical Services
- EEC
- E.L. Montgomery & Associates
- Golder & Associates
- Southwest Hydrology
- TAM International.

We look forward to helping you help us promote your firms and the 2009 Symposium. Take a look at the exhibitor hall setup below. See where you would like to set up your booth and market new clients in Scottsdale. Reserve your space now and let everyone know you are supporting another outstanding AHS event. Please contact Mike Hulst, EEC, at 602-248-7702 or mhulst@eecphx.com or Keith Ross, Hydro Geo Chem, at 480-421-1501 or keithr@hgcinc.com and ask for a sponsorship package. More information is also available at our website, www.azhydrosoc.org or www.hydrosymposium.org. Check it out! I think you'll be impressed.

Available sponsor locations



Planning for 2009 Symposium continues, March 11th at Hydro Geo Chem

Planning for the 2009 AHS Symposium continues and we will be meeting regularly to hammer out details of program, speakers, sponsorship, marketing, proceedings, workshops, field trips, etc. The next planning meeting is scheduled for Wednesday, March 11th at 5 PM at the offices of Hydro Geo Chem (6370 E. Thomas Rd, Ste 200Scottsdale, AZ). We have a great group already, but we can definitely use more help. If you are interested in helping with the planning process or just listening in, please contact Keith Ross at keithr@hgcinc.com or 480-421-1501, Lee-Anna Walker at LeeAnna.Walker@arcadis-us.com, Christie O'Day at coday@acstempe.com or 480-894-5477 or Ted Lehman at ted@jefuller.com or 480-222-5709. We'd love to have you and we can really use your help.

Herman Bouwer Internship Program This year marks the 10th year the Phoenix Chapter will solicit applications for the Herman Bouwer Internship Program! The Herman Bouwer 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. This scholarship acknowledges the extensive contributions of Dr. Bouwer to the science of hydrology and to the AHS. Recipients are chosen after a rigorous selection process and serve their internship with employers in the Phoenix area. The Intern is required to complete 320 hours of service with three organizations of his or her choice in government, private industry, and environmental, and water-resources consulting.

The employer organizations provide a meaningful training experience that will better prepare the intern for employment in their chosen career goals. A \$4,800 monetary scholarship is included as part of the award. The application deadline is March 16, 2009. Check out the [AHS website](#) for if you would like more information about the Herman Bouwer Intern Scholarship Program and to download an application form.

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

- March 10th – Dr. Abe Springer, NAU, & Steve Flora, ADWR, Aridland Springs of Western North America: Diverse Yet Abused
 - March 10th – 1 – 4 pm – Municipal Conservation Workshop - How to Evaluate and Improve Your Distribution System: Audits, Meters, and Leak Detection – to be held at ADWR, contact Michelle Moreno, mamoreno@azwater.gov, or 602-771-8530 for workshop registration, more info at http://www.azhydrosoc.org/docs/TempAnnouncements/ADWR_Conservation_3_10_09%20Flyer.pdf
 - March 16th – Application deadline for Herman Bouwer Internship Program
 - March 18 – 20 – [HEC-RAS Hands on Training Workshop](#), Pima CC, Tucson, sponsored by Arizona Floodplain Management Association
 - March 21-24 – Arizona Science & Engineering Fair (AzSEF), Phoenix Convention Center
 - March 24th – Channah Rock, Water Recycling and Reuse, UA Coop Extension Office, noon, Brown Bag Water Speaker Series
 - April 2nd – AEG/AHS Student Night, Career Fair & Student Presentation Competition, UA Student Union
 - April 14th – Stan Leake, USGS, Use of Models to Map Potential Capture of Surface Water by Ground-Water Withdrawals
 - April 27 – 30 – Parameter Estimation (PEST) Workshop, ADWR
- **Aug. 30- Sept. 2, 2009 – *Managing Hydrologic Extremes*, Joint Symposium of AHS & AIH, Westin Kierland Resort & Spa, Scottsdale, AZ**

Tucson Chapter

AHS Tucson Chapter March Meeting Announcement

A Very Special Night!

Dinner Meeting and Book Signing!
Note the venue change

Location: Four Points by Sheraton Tucson University Plaza
1900 East Speedway Blvd
Tucson, AZ 85719

Dinner: A Touch of Italy – Buffet
Traditional Caesar salad, antipasto salad, linguine pasta with marinara and Alfredo sauce, beef lasagna, stuffed shells with marinara and seasoned breadsticks
Dessert: Mini cannoli
Cost: \$15 dollars per person
Please R.S.V.P. with Jeff Gawad (jgawad@elmontgomery.com, 520-881-4912) by March 6th, 2009. Payment accepted at the door.

Date: Tuesday, March 10th 2009. Dinner will be served at 6:00 pm, and Dr. Webb will begin his talk at 7:00 pm

Speaker: Dr. Robert H. Webb, United States Geological Survey

Presentation Abstract:

Long-term ecosystem change in the southwestern United States is difficult to document, but repeat photography, as contained in the Desert Laboratory Collection of Repeat Photography, is useful to determine time series of change at specific locations. Change in riparian vegetation can be well documented using repeat photography, particularly because of extensive historical photography at stream gaging stations and other sites along watercourses in the region. A collection of over 3,000 replicate images was used to determine gains and losses in the region. The places with the largest declines typically are associated with ground-water overdraft in large alluvial basins. Many reaches have had gains in riparian vegetation. A conceptual model of arroyo downcutting and filling is presented with an emphasis on the interrelation with riparian vegetation. The Santa Cruz River at Tucson, a reach with substantial losses in riparian vegetation, currently is aggrading because of sedimentation associated with newly established riparian vegetation.

Bio:

Robert Webb has worked on long-term changes in natural ecosystems of the southwestern United States since 1976. He has degrees in engineering (B.S., University of Redlands, 1978), environmental earth sciences (M.S.,

Stanford University, 1980), and geosciences (Ph.D, University of Arizona, 1985). His dissertation concerned late Holocene and historical flooding of the Escalante River within Grand Staircase – Escalante National Monument and the relation of that flooding with arroyo downcutting. Since 1985, he has been a research hydrologist with the U.S. Geological Survey in Tucson and an adjunct faculty member of the Departments of Geosciences and Hydrology and Water Resources at the University of Arizona. Webb does interdisciplinary work merging history, climate change, desert vegetation ecology, hydrology, geomorphology, and Quaternary geology to attempt to understand long-term change in the desert regions of the United States and Mexico. Webb as authored or edited 12 books, including Environmental Effects of Off-Road Vehicles (with Howard Wilshire); Grand Canyon, A Century of Change; Floods, Droughts, and Changing Climates (with Michael Collier); The Changing Mile Revisited (with Raymond Turner); Cataract Canyon: A Human and Environmental History of the Rivers in Canyonlands (with Jayne Belnap and John Weisheit); The Ribbon of Green (with Stanley A. Leake and Turner), and most recently, the Mojave Desert: Ecosystem Processes and Sustainability (with 5 other editors).

Special Book Signing Event!

Books will be available immediately following the talk:

The Ribbon of Green, Change in Riparian Vegetation in the Southwestern United States, by Robert H. Webb, Stanley A. Leake, and Raymond M. Turner

The Changing Mile Revisited, An Ecological Study of Vegetation Change with Time in the Lower Mile of an Arid and Semiarid Region, by Raymond M. Turner, Robert H. Webb, Janice Emily Bowers, and James R. Hastings

Robert H. Webb, Stanley A. Leake, and Raymond M. Turner have graciously made themselves available in the lobby after the talk to sign books for any person interested in purchasing a copy.

February Meeting Summary

by Marla Odom

Errol L. Montgomery & Associates, Inc. Lisa Shipek of Watershed Management Group (WMG) presented her talk titled "Water Harvesting and Community-based Watershed Management" to 18 attendees representing consultants, agriculture, private water companies, and the University of Arizona. WMG works with community groups, schools, businesses, government agencies, and individuals through participatory projects to improve resource management and conservation, mainly in the areas of water harvesting and urban stormwater retention. Their mission is to improve people's lives through grassroots projects that integrate conservation and community development. They envision making Tucson an example of successful water conservation, enabling everyday citizens to effectively manage natural resources, and improving quality of life in urban areas by connecting people with their environment.

The objectives of WMG are:

- 1.) Making conservation affordable and accessible
 - 2.) Creating community models
 - 3.) Building capacity at all levels through K-12 education, adult education, training additional educators, working with professionals, and developing economic incentives to conserve water
- WMG is a non-profit organization that relies on grant funding, fees for services, and private donations to support their community programs.

Lisa reviewed individual water harvesting and storm water retention projects that WMG has installed. A large part of the talk was devoted to programs that help individuals capture rainwater in their yards and put it to effective landscaping uses through use of cisterns, mulching, and water-retention landscaping features. According to Lisa, 30 to 50 percent of average residential water demand is used for landscaping. WMG hosts water harvesting demonstration sites and a water harvesting co-op. The co-op helps individuals install cisterns, water harvesting earthworks, and greywater systems at home through an affordable, educational cooperative. Participants need to fulfill volunteer hours at other homeowner workshops, and then they qualify to have a workshop run at their own home, where a trained instructor leads the design and implementation of water harvesting features and organizes the crew of other volunteer homeowners to assist with implementation. More information on WMG, their co-op, and on-going projects, can be found at the following website: www.watershedmg.org

AHS extends their thanks to Ms. Shipek for a very informative and well-received presentation.

Last Chance to Submit Applications for the 2009 Halpenny Internship If you plan on applying for the Halpenny Intern-Scholarship for 2009, please have all materials submitted by 11:59 pm on March 13th. Please visit our website (http://azhydrosoc.org/internship_Halpenny.html) to download an application.

2010 Symposium Planning Committee

Final selection of the venue is underway. Please contact Kate Duke of Montgomery and Associates (kduke@elmontgomery.com) or Jeff Gawad of Montgomery and Associates (jgawad@elmontgomery.com) if you would like to get involved. Any help is greatly appreciated! Thanks!

2009 Walk for Water Event

To sign up for this event, or to make a donation please visit:

<http://www.firstgiving.com/process/raisemoney/default.asp?did=2692&skip=home>Select "Carry 5-University of Arizona"

19th Annual El Dia Del Agua Showcase

March 26, 2009

The Department of Hydrology and Water Resources along with the Hydrology and Water Resources Student Association (HWRSA) are co-hosting the 19th Annual Hydrology Research Symposium, "El Dia del Agua," on March 26, 2009. This event is a symposium of oral and poster presentations of Hydrology and Water Resources' Student research. We plan to have 10 student speakers during the day-long event, as well as many exciting posters to view. Monetary awards are presented for the best student presentations. The symposium will be held at the Student Union's North and South Ballrooms. The symposium begins at 8 a.m. and includes a lunch at 12 p.m. Our luncheon speaker is Department of Hydrology & Water Resources Alumni Charles "Chuck" George, Jr., Chief Meteorologist for KOLD TV News 13. Following lunch both Oral Presentations and Posters will continue. Our afternoon keynote speaker is Dr. Eric Barron, Director, National Center for Atmospheric Research, NCAR. Registration is \$35 and includes lunch. Your attendance is highly valued as students look forward to presenting material and meeting with professionals in the field throughout the course of the day. Please share this invitation with other members of your organization; all are invited. We encourage members of the hydrologic community and, especially, prospective graduate students to join us for this event. Further details, and associated forms can be found through the links provide below.

Schedule and Location

El Dia del Agua is held in the [North & South Ballrooms](#), upstairs (third floor) of the [Student Union Memorial Building](#). For those coming from off campus, here are [directions](#) to the Student Union (1303 E University Blvd, Tucson) and to the University of Arizona campus.

[El Dia del Agua Flyer](#) for 2009 is available here.

Registration

A catered buffet lunch ([registration required](#)) will be provided. Registration deadline is March 16, 2009.

Hydrology and Water Resources March 2009 Seminar ScheduleDate: 3/4/2009 - TBADate: 3/11/2009 - TBADate: 3/18/2009 – Spring BreakDate: 3/18/2009

Location: TBA

Title: TBA, El Dia del Agua Presentation

Speaker: Chuck George, Erin

Barron<http://hwr.arizona.edu/calendar/Seminars/Seminars%202008/HWR%20%20Fall%202007%20Schedule%20-%202.htm>

WRRRC Brown Bag Seminars: March 2009 Schedule

No Brown Bag Seminar will be held in March. See Annual Conference Announcement

All seminars and events are held at the Sol Resnick Conference Room, Water Resources Research Center, 350 N. Campbell Ave.

Information for additional seminars can be found on the WRRRC web site: www.cals.arizona.edu/azwater

All seminars and events are held at the Sol Resnick Conference Room, Water Resources Research Center, 350 N. Campbell Ave., Tucson, AZ

Water Resources Research Center 2009 Annual Conference In collaboration with the Morris K. Udall Foundation and Arizona Water Institute

Best Practices for Stakeholder Engagement in Water Resources Planning
The University of Arizona
Student Union Memorial Center Ballroom

Tuesday, March 17, 2009

Plan to attend this year's conference and share in lessons learned about stakeholder engagement in water resources management. A dedicated poster session will enhance the sharing of information and participants will have the opportunity to choose one of three interactive workshops to share experiences and craft new ideas. See **CALL FOR POSTERS** on the website noted below.

Betsy Rieke, former Assistant Secretary of the Interior for Water and Science and Director of the Arizona Department of Water Resources, will present the opening keynote address on her experiences with major water negotiations. Planners, stakeholders and engagement professionals will share their knowledge and experiences in the field. We will also hear about new technologies and innovations applied in a range of water planning processes. Luncheon speaker, Grady Gammage will share his thoughts on the challenges facing Arizonas water planners and stakeholders.

Anyone with an interest in water resources planning is encouraged to join us for this informative and engaging event.

All participants, including students, must register.

Early Bird Registration ... \$55.00

Regular Registration ... \$65.00 (after Feb 16, 2009)

Student Registration ... No Charge for current students (must register to attend)

Fee waivers are available upon request thanks to the generous support of our sponsors.

Registration, Call for Posters, Agenda and conference information can be found at:

cals.arizona.edu/azwater/programs/conf2009

Contact Jane Cripps at jcripps@cals.arizona.edu for information.

Tucson HydroNews

Marana water rates go up on March 27

8% boost to raise typical home's cost by \$2.15 a month

By Shelley Shelton

Arizona Daily Star

Tucson, Arizona | Published: 02.28.2009

Customers of the Marana water utility will begin paying more for their water on March 27.

The Marana Town Council on Tuesday approved an 8 percent increase in rates for the Marana Water Department, which serves about 5,000 customers.

It is the first water-rate increase for the town in more than 10 years, said Brad DeSpain, town utilities director.

The average residential customer, who uses 7,000 gallons of water a month, will see a \$29.05 water bill after the change, compared with \$26.90 currently.

<http://www.azstarnet.com/allheadlines/282216.php>

City votes to sell big chunk of CAP water

By Rob O'Dell

Arizona Daily Star

Tucson, Arizona | Published: 02.04.2009

To help bridge a \$6.5 million budget hole for Tucson Water this fiscal year, the City Council voted unanimously Tuesday to sell more than one-third of its Central Arizona Project water share to pay it off.

The council also approved Tucson Water's plan to sell 50,000 acre-feet of CAP water — enough to serve up to 150,000 households for a year — to the Arizona Water Banking Authority for next fiscal year as well. The fiscal year begins on July 1.

Tucson's allocation of CAP water — which comes from the Colorado River — is just over 144,000 acre-feet a year. An acre-foot is about 324,000 gallons.

Tucson Water's financial plans call for the department to restructure debt along with making numerous internal cuts.

<http://www.azstarnet.com/allheadlines/278797.php>

Water research institute of UA, ASU, NAU is axed

By Tony Davis

Arizona Daily Star

Tucson, Arizona | Published: 02.14.2009

The shutdown of a three-university water research institute will hurt the state's ability to prevent or deal with a water crisis, several researchers and outside officials say.

The Arizona Water Institute, headquartered at the University of Arizona, will close in July because of the major budget cuts the Legislature ordered recently for universities.

University officials said they eliminated the institute and its \$1.2 million annual budget because of the magnitude of the statewide cuts — \$142 million total. Some of the institute's work can continue under other university programs, at a reduced scale, they said.

The institute plans and supports research on some of the state's major water-supply issues and water-quality problems. It's noted for drawing on the expertise of a wide variety of agencies and other groups.

<http://www.azstarnet.com/allheadlines/280255.php>

Some Suggested Reading for Hydrologists from Mike Block:

http://online.wsj.com/article_email/SB123483638138996305-1MyQjAxMDI5MzE0NzgxMzc2Wj.html

and

<http://verdenews.com/main.asp?SectionID=1&subsectionID=1&articleID=29428>

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Flagstaff Chapter

The City of Flagstaff Makes Significant Progress Diversifying Its Water Supply.

From the 1890's through the 1950's, the City of Flagstaff relied upon surface water from springs in the San Francisco Peaks and from Upper Lake Mary. During the 1950's drought, the surface water sources dried up, while at the same time the City's population began to steadily grow. To provide a reliable supply, the City began drilling water wells to tap the deep regional Coconino and Supai Aquifers. Over the last 50 years, more than 20 wells have been drilled in two nearby wellfields, along with a few more within the town limits. Flagstaff has again experienced drought conditions since 1996, including a period of extreme drought from 2000 through 2002 which left the City with very little surface water reserves and led to the activation of emergency water conservation measures.

Under the current climatic trend, the City has been increasingly dependent upon pumping groundwater from the network of wells. The City has been keeping meticulous hydrologic records on water table levels in the wells since 1949. A review of this data shows the water table began declining in some wells around 1990. These declines can be either attributed to declines in natural recharge during the ongoing drought or possibly from over-drafting the local groundwater basins. These groundwater level declines have occurred during the same time the City has implemented wide-ranging water conservation measures that have decreased per capita water use by 40%. In 2004, the citizens of Flagstaff recognized the need to diversify the community's water resource portfolio when they

voted to approve a \$15 million bond to acquire and/or develop additional public water supplies. Objectives for a new water supply were to provide for system redundancy and for drought protection both today and into the future.

In 2005, the City used revenue from the bond to purchase the Red Gap Ranch from a willing seller at an acceptable price. The purchase included two large water wells, and the property has sufficient groundwater to sustain the City's long-term water needs. The Ranch is located 40 miles east of Flagstaff north of Interstate 40 (see map). Last year the City hired JACOBS Engineering to identify the most feasible route for a water pipeline from Red Gap Ranch to Flagstaff. For more information on the Pipeline Alignment Feasibility Study and water planning process, see the City of Flagstaff website at: www.flagstaff.az.gov/index.asp?NID=1385

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

<http://www.azhydrosoc.org/>

Your membership may be renewed for 2009 by credit card through the AHS website at <http://www.azhydrosoc.org/> or by mailing a check to the Arizona Hydrological Society, PO Box 32898, Tucson, Arizona, 85751. Dues remain at \$45.00 year for regular membership and \$15.00 for students. Thank you all for a great 2008 and for your continuing support in 2009. For those who attended the 2008 Flagstaff Symposium, be reminded that membership dues for 2009 were included in the registration fee.