

# Conservation Matters

## THE TEXAS LAND, WATER AND WILDLIFE CONNECTION

A publication of the Texas Water Resources Institute and the Texas A&M Institute of Renewable Natural Resources

### [Water Conservation and Technology Center to focus on statewide water issues](#)



Texas A&M University System Chancellor **John Sharp** recently announced the formation of a new A&M system center to address multiple water issues in and develop solutions for Texas.

[Texas AgriLife Research](#), [Texas AgriLife Extension Service](#), [Texas Engineering Experiment Station](#) (TEES) and [Texas A&M University—San Antonio](#) are collaborating on the development of the Water Conservation and Technology Center, which will support high priority projects that focus on Texas' water issues.

"The state of Texas has a rich history that has always been linked to water—rights, conservation and control. This unique agency collaboration will lead to development of more efficiency and effectiveness in managing this vital resource," Sharp said.

Administered by the [Texas Water Resources Institute](#) (TWRI), the center will increase the System's ability to meet existing and emerging statewide needs in water conservation and technology, according to **Dr. Neal Wilkins**, TWRI director.

"The center will accelerate the development and adoption of new and innovative technologies to solve emerging water problems and meet future water supply needs," Wilkins said.

The center includes a collaborative relationship with TEES through the [Texas Center for Applied Technology](#) (TCAT) and will be located at the TEES South Presa campus in San Antonio.

**Cindy Wall**, TCAT executive director, said the center will target its work on four high priority efforts: water conservation, water reuse, groundwater desalination and energy development and water use.

"The center will establish a team of scientists, engineers and water professionals dedicated to applied research and development, testing and validation, technology transfer, and training and extension education in these four areas," Wall said.

The center will work with industry, state and federal agencies, municipalities, trade associations, and other research institutions to undertake projects and develop solutions within these four areas.

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### [Experts urge further progress towards water security at Texas Water Summit](#)

The state should not waste the attention the 2011 drought has brought upon water security, said experts at a recent water conference in Austin. The need to move forward in research, planning and policy and to diversify Texas' water

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were the common threads voiced.

Water resources scientists, agency staff and industry experts spoke to a packed house last week at the [2012 Texas Water Summit](#) in Austin. The summit, organized by the [Academy of Medicine, Engineering and Science of Texas](#), focused on water security for Texas' future. The Water Conservation and Technology Center, a center of the [Texas Water Resources Institute](#) and [Texas Center of Applied Technology](#), was a sponsor.

**Dr. Ron Kaiser**, a Texas A&M University professor, said the state should not waste a bad drought, but use this opportunity to make substantial changes to water policy. He cited major changes made to water planning regulations after previous droughts, including changes in integrating different water laws into a prior appropriations system after the 1950s drought, known as the drought of record, and Senate Bill 1 in the 1990s, which instituted the current state water planning process.

While most acknowledged that the state's water planning has advanced since the drought of record, it was also noted that the recent drought has exposed areas in which the state needs to improve.

**Dr. Todd Votteler**, executive manager of science, intergovernmental relations and policy for the [Guadalupe-Blanco River Authority](#), said the state no longer has the surplus of water supplies it had from the reservoirs built after the drought of record. "(Building those reservoirs) created this cushion, which peaked in the early 1970s and is now gone," he said.

Votteler said Texas has the same amount of surface water storage capacity per capita available now that it had in 1953.

Although the current water plan calls for more than \$53 billion in water management strategies and projects to meet the needs of the projected population in 2060, several speakers did not think state funding for those improvements will happen in the next session.

Votteler noted that there is no financing mechanism to fund these strategies and projects. "And the prospects for that happening in next legislative session are not good, since it has started to rain," he said.

**Dr. Robert Mace**, [Texas Water Development Board](#) deputy executive administrator for water science and conservation, who gave the keynote speech during lunch, said cost is the biggest obstacle in getting the water plan funded. "It's expensive and the challenge is convincing rate payers and politicians that it is worth the cost."

Kaiser acknowledged that Texas will struggle to find solutions to integrate surface water and groundwater management. One of the challenges in managing Texas water, Kaiser said, is so much is already spoken for. Twelve of the fifteen rivers are fully used, according to his presentation.

"90 percent of surface water rights are controlled by 200 permit holders," he said.

**Robert Puente**, [San Antonio Water System](#) (SAWS) president and chief executive officer, spotlighting his agency's successful efforts in managing its limited water supplies, said SAWS has reduced its per capita water use by conserving its available water and reducing demand.

"Water conservation is probably the cheapest source of additional water supplies," he said.

Unlike most business models, Puente said, "Our business model for San Antonio is to convince the customers to buy less of our product."

The city has also diversified its water supplies by recycling its treated wastewater, using aquifer storage and recovery and planning desalination of brackish water. The water system has seen success in that model from 1984 to 2009. "We have 67 percent more customers and use zero percent more water," he said. "If we had not had water conservation, we would need an additional 121,000 acre-feet to deliver water to those customers."

The drought of 2011 exposed the state's limitations and understanding of drought and water supply planning, speakers said.

While the public focuses on the amount of rainfall the state gets, temperature is just as important when considering how much water Texas will have in the future, said **Dr. John Nielsen-Gammon**, the state's climatologist and a Texas A&M professor. Last year broke the record for highest average temperature by 2 ½ degrees, he said.

Higher temperatures increase evaporation from lakes, decrease runoff and stress plants, which then need more water. "Temperature affects everything that happens to water once it reaches the ground," he said. "It's the big uncertainty as far as our water supply."

**Dr. David Maidment**, professor at the University of Texas at Austin, said the state does not have a good handle on its ability to predict water supplies in the near future.

He believes building a real-time information system for water in Texas can help project what will happen 6–18 months into the future. He is working with a drought technology steering committee—a group of Texas university researchers and water agency staff "to move forward with the best insight and understanding of what the future conditions are going to be," he said.

Mace said available water is decreasing, in part due to the drainage of the Ogallala Aquifer and sedimentation of the state's reservoirs, while the demand is going up. "We lose about 90,000 acre-feet a year from sedimentation coming into our reservoirs," he said.

Advanced water conservation or using existing water resources more efficiently, "constitutes a large part of where we think our future water supply is going to come from," Mace said.

Other countries that have faced severe water shortages such as Australia and Israel have diversified their supplies and this diversification for Texas is essential, Mace said. "Just like you diversify your financial portfolio, you want your water portfolio diversified."

Both Mace and **Dr. Ellen McDonald**, principal of Alan Plummer Associates, Inc., pointed to the Colorado River Municipal Water District's plans to build a direct water reuse plant in Big Spring as an example of what Texas will need to do more of in the future.

The Big Spring project will be "one of three direct reuse projects in the world," McDonald said. "Texas is really on the forefront with this project."

McDonald said water reuse, or the beneficial use of treated wastewater "is not the answer to everything, but can play an important role" in future water supplies.

Desalination of brackish and seawater is the other big answer on Texas' horizon, according to several speakers.

**Ed Archuleta**, [El Paso Water Utilities](#) president and chief executive officer, said its Kay Bailey Hutchison Desalination Plant can produce 27.5 million gallons a day and increases fresh water production for El Paso by 25 percent.

See [tamest.org](http://tamest.org) to learn more about the summit and view the speakers' [presentation slides](#).

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## [Arroyo Colorado Partnership receives Texas Environmental Excellence Award](#)



The Texas Water Resources Institute (TWRI) was recently selected as the winner of the [Texas Environmental Excellence Award](#) in the civic/community category for its [Arroyo Colorado Watershed Partnership](#). Presented annually by the governor of Texas and the [Texas Commission on Environmental Quality](#), the award spotlights the state's highest achievement in environmental preservation and protection.

Representatives from the institute accepted the award during the commission's annual awards banquet **May 2** as part of its Environmental Trade Fair and Conference at the Austin Convention Center.

"This award is definitely an honor for the institute, but the real credit goes to the farmers, the cities, the work group members and other project participants who have made this partnership such a success," said **Dr. Neal Wilkins**, TWRI director.

**Jaime Flores**, TWRI program coordinator and watershed coordinator for the Arroyo Colorado Watershed Protection Plan Implementation project, said the watershed partnership is made up of more than 700 people representing federal, state and private organizations, agricultural producers and other individuals concerned with water quality problems in the Arroyo Colorado in the Lower Rio Grande Valley.

The partnership published its Arroyo Colorado Watershed Protection Plan in 2007, making it one of the first watershed protection plans in the state, he said.

"Through multiple projects and cooperation of many stakeholders, the institute and partnership have achieved 75 percent of the goals set forth in the plan," Flores said. "University scientists and city officials are working alongside farmers and schoolchildren to monitor, clean up and educate others about the Arroyo."

Three cities have constructed wetlands that receive effluent from their waste water treatment plants. The wetlands reduce bacteria, nutrients and biochemical oxygen demand loads entering the Arroyo, Flores said.

"These wetlands also provide an excellent educational opportunity to teach those interested about their natural functions," he said.

"Cooperating farmers have implemented agricultural best-management practices that have reduced nitrogen, potassium and phosphate amounts entering the Arroyo," he added. "We have educated more than 30,000 adults and students about the watershed, their impact on its water quality and how they can be better stewards. We have also installed storm drain markers and watershed boundary signs, which have reduced trash and pollutants from entering storm drains."

TWRI began coordinating the Arroyo Colorado program in 2007, working closely with the partnership, commission, [Texas State Soil and Water Conservation Board](#) and Texas General Land Office to implement practices to improve water quality, according to **Allen Berthold**, an institute project manager.

"The institute and partnership have submitted or supported submission of more than 39 proposals since 2005," Berthold said. "Currently, the institute manages five projects for the partnership, totaling approximately \$2.3 million in funds, with other projects beginning in September."

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For more information on the Arroyo Colorado Watershed Partnership, go to [arroyocolorado.org](http://arroyocolorado.org).

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## [IRNR military sustainability program receives superior service award](#)

The [Texas A&M Institute of Renewable Natural Resources](#) (IRNR) recently received the Texas AgriLife Extension Service's 2012 Superior Service Award in the team category for its [Military Sustainability Program](#).

Team members are **Brian Hays**, AgriLife Extension program specialist; **Roel Lopez**, IRNR associate director; and **Todd Snelgrove**, AgriLife Extension program specialist; **Bill Ross**, natural resources policy consultant with Brooks, Pierce, McLendon, Humphrey and Leonard, LLP; and **Justin Tatum**, program specialist with the Texas Watershed Management Foundation.

The annual Superior Service Awards recognize AgriLife Extension faculty and staff members who provide outstanding performance in Extension education or in service to the organization.

"Although relatively new, the Military Sustainability Program has accomplished much through the innovation and diligence of each of its team members," said **Dr. Neal Wilkins**, IRNR director. "Each member has used his expertise to help develop numerous programs that ensure military readiness while also protecting natural resources."

"Military readiness ensures our troops are ready for combat and is dependent on the ability for the military to test and train on its land," Lopez said. "Issues such as urban development near installations, loss of wildlife habitat and other natural resource problems facing military installations can limit or prevent the military from using their land to the fullest extent.

"This program supports the military's training mission through improving land management practices, training military natural resource professionals and developing regional partnerships," Lopez added.

He said it is a collaborative effort of the institute with federal natural resource agencies, state agencies, private landowner groups and the U.S. Department of Defense.

"Keeping our troops well-trained while promoting land conservation and natural resource sustainability requires a collaborative, regional approach," he said.

In the award announcement, **Dr. Ed Smith**, AgriLife Extension director, said the award winners are "demonstrating leadership and commitment in our mission to improve the lives of people, businesses and communities across Texas and beyond through high quality, relevant education."

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## [Private-public partnerships foster land and water conservation in Trinity River Basin](#)



The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) [announced](#) on **May 8** the launch of a new Water Quality Initiative dedicated to improving impaired waterways in Texas. NRCS will manage the initiative by making \$2 million in financial assistance available to farmers, ranchers and forest landowners in the Chambers Creek watershed. This stream is a Trinity River tributary, flowing into Richland-Chambers Reservoir, a water source for roughly 1.6 million people in Fort Worth and surrounding communities through the Tarrant Regional Water

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Through this initiative, eligible producers in the Chambers Creek watershed in Ellis and Navarro counties will implement voluntary conservation practices to help provide cleaner water for their neighbors and communities. Although not impaired at the present time, Chambers Creek has been impaired in the past and is still noted for undesirable levels of turbidity, siltation, dissolved oxygen and high nutrient levels. Some examples of voluntary conservation practices include cover crops, riparian buffers, cross fencing for rotational grazing, filter strips and terraces.

"The Chambers Creek watershed is the only watershed in Texas to receive funding from this national initiative, and the landowner organization Trinity Waters is proud to partner with NRCS," said **Blake Alldredge**, Texas AgriLife Extension Service associate who serves as the education and outreach coordinator for [Trinity Waters](#).

"This is a great example of building cooperative partnerships to accomplish conservation goals as part of the overall Trinity River Basin Environmental Restoration Initiative," he said.

The *Building Partnerships for Cooperative Conservation in the Trinity River Basin* project is funded by the Texas State Soil and Water Conservation Board through Clean Water Act §319(h) funds from the U.S. Environmental Protection Agency to advance the restoration and protection of water quality within the middle Trinity River basin through sound science, effective outreach and well-monitored ecological restoration. It is a partnership between the [Texas Water Resources Institute](#), [Texas A&M Institute of Renewable Natural Resources](#), Trinity Waters and [AgriLife Extension](#).

Using funds from the Environmental Quality Incentive Program, NRCS will provide financial and technical assistance to producers for implementing conservation practices in watersheds with impairments where federal investments can make a difference in improving water quality.

"The benefits to landowners are tremendous as these practices will enhance the sustainability of their land by increasing infiltration of rainfall while reducing erosion," Alldredge said. "It's a win-win for landowners and society."

**Gary and Sue Price**, owners of the 77 Ranch in Navarro County and active members with Trinity Waters and the Texas Wildlife Association, [hosted a media day](#) on **May 17** with NRCS and other partners to announce the initiative. "When you boil ranching down, it's all about water and grass," said Gary Price. "I can't make it rain, but there are things I can do to keep water on the land."

NRCS accepts applications for financial assistance on a continuous basis throughout the year. All applications for funding consideration during this fiscal year must be received by **June 15**. This summer, NRCS will notify all applicants of the results and begin developing contracts with selected applicants.

Additional partners with NRCS' effort are the Tarrant Regional Water District, Texas State Soil and Water Conservation Board, Texas Parks and Wildlife Department, Texas AgriLife Extension Service as well as the Navarro and Ellis-Prairie Soil and Water Conservation Districts.

For more information, read the NRCS [news release](#) and visit [trinitywaters.org](#).

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## [Singh awarded Bush Excellence Award for International Research](#)

The Bush Excellence Award for faculty in International Research was presented to [Dr. Vijay P. Singh](#), professor and Caroline and William N. Lehrer Distinguished Chair in Water Engineering in the [Department of Biological and Agricultural Engineering](#) at Texas A&M University. Organizers say for more than 30 years, Singh has dedicated his scientific and intellectual efforts for the betterment of humanity through national and international contributions to water resources engineering.

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The research he pioneered in entropy theory in hydrology now has its roots in collaboration with distinguished scientists and engineers from 15 countries, representing every continent of the world. According to his colleagues, his hundreds of published articles, 18 textbooks and 17 chapters have made a tremendous educational impact making him sought-after as a keynote speaker all over the world.

Singh has received more than 100 honors, awards and fellowships including honorary professorships and foreign memberships of academies of engineering and sciences from universities, national academies and government entities representing several European countries, India, China, Australia, Canada and Mexico. One nominator wrote that "Singh's leadership, dedication and commitment are unmatched in the U.S. and outside. He has put the Texas A&M University water program on the world map."

Read the full Texas A&M [news release](#).

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### [College students invited to submit design plans to EPA's Campus RainWorks Challenge](#)

The [U.S. Environmental Protection Agency](#) (EPA) is launching a new design competition called the [Campus RainWorks Challenge](#) to encourage student teams on college and university campuses across the country to develop innovative approaches to stormwater management.

Stormwater runoff is a major cause of water pollution in urban areas in the United States, and this competition will help raise awareness of that while training the next generation of landscape architects, planners, and engineers, said challenge organizers.

According to EPA, student teams, working with a faculty advisor, will submit design plans for a proposed green infrastructure project for their campus. Challenge registration opens **Sept. 4**, and entries must be submitted by **Dec. 14** for consideration. Winning entries will be selected by EPA and announced in April 2013. Winning teams will earn a cash prize of \$1,500–\$2,500, as well as \$8,000–\$11,000 in funds for their faculty advisor to conduct research on green infrastructure. In 2013, EPA plans to expand Campus RainWorks by inviting students to design and complete a demonstration project assessing innovative green infrastructure approaches on their campus.

"Reducing stormwater pollution requires innovative approaches and America's college students are incredibly creative and talented," said **Nancy Stoner**, acting assistant administrator for [EPA's Office of Water](#). "The Campus RainWorks Challenge will engage students across the country in tackling one of the toughest challenges to clean water and show them the opportunities in environmental careers."

EPA is encouraging the use of green infrastructure as a solution to help manage stormwater runoff. Green infrastructure uses vegetation, soils, and natural processes to manage stormwater runoff at its source and provide other community benefits, including economic development.

Read the full EPA [news release](#) for more information.

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### [Cook's Branch Conservancy receives Texas' highest award for private land conservation](#)

The transformation of a clear-cut, overgrazed working ranch into Cook's Branch Conservancy has earned a Texas family the 2012 Leopold Conservation Award, the state's highest honor recognizing habitat management and wildlife conservation on private land.

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Operated as a program of the [Cynthia and George Mitchell Foundation](#), Cook's Branch Conservancy is located on 5,650 acres in Montgomery County north of Houston. The property offers a rare glimpse into what a century of regeneration looks like in the Pineywoods region of East Texas.

The Leopold award is conferred each year by [Sand County Foundation](#), an international nonprofit organization devoted to private land conservation, in partnership with the Texas Parks and Wildlife Department (TPWD), as part of its [Lone Star Land Steward Awards](#) program. In Texas, the Leopold award is

sponsored by the Lynde and Harry Bradley Foundation, Silver Eagle Distributors and the Lee and Ramona Bass Foundation.

"The Mitchell family's commitment to restore and enhance the land, water and wildlife in their care demonstrates that Aldo Leopold's philosophy of land management is still vibrant in Texas," said **Dr. Brent Haglund**, Sand County Foundation president. "Their determined, innovative approach to private lands conservation is exemplary."

Businessman and philanthropist **George P. Mitchell** and his family accepted the Leopold crystal award and a check for \$10,000 at the annual Lone Star Land Steward Awards dinner in Austin on **May 22**.

"The Mitchell family made a commitment many years ago to demonstrate that private landowners and federal land management agencies in East Texas can support and grow habitat suitable for use by the federally endangered red-cockaded woodpecker through the use of sound forest management practices," said **Jeffrey A. Reid** of the U.S. Fish and Wildlife Service. "Such management practices have also increased the habitat suitability for bobwhite quail, eastern wild turkey, white-tailed deer, and myriad migratory bird species."

The Mitchells acquired the property in 1964 and, in the mid-1990s, started a process to return the area to pre-settlement condition—back to its piney woods roots—through conservation and restoration initiatives. In nominating Cook's Branch Conservancy, TPWD pointed out that pre-settlement ecology is virtually absent from all southern pine forests, and that Cook's Branch is an exemplary demonstration of Piney Woods ecology.

"The Mitchell family has taken a piece of degraded land and, using basic principles, with the best available technology, reclaimed a healthy and sustainable example of our natural heritage," said **Dan Jones**, the TPWD wildlife biologist who nominated Cook's Branch for the award.

Read the full TPWD [news release](#) or watch this [TPWD video](#) for more information.

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## [Reduced tillage doesn't mean reduced cotton yields under drip irrigation](#)

Loss of production may be one concern cotton producers have on the Rolling Plains when considering switching to reduced- or no-tillage systems, said **Dr. Paul DeLaune**, [Texas AgriLife Research](#) environmental soil scientist in Vernon.

However, not only will cotton growers not lose production with subsurface drip irrigation, but their economics will also improve, according to DeLaune's latest research article that will appear in the July-August issue of [Agronomy Journal](#).

DeLaune's study on cotton production as affected by irrigation level and transitioning tillage systems was designed to identify water management strategies that conserve and protect water resources within semiarid environments.





"We found that tillage has no impact on yields, the net returns are greater and, because we can deficit irrigate, we can save energy and water," he said.

The three-year study included five irrigation regimes, from 0 percent to 133 percent of evapotranspiration replacement, and evaluated four tillage systems — conventional till, reduced till, no-till and no-till with a terminated cover crop, he said. Treatments were replicated three times in a randomized complete block design.

The results showed lint yields were not affected by tillage or the interaction of tillage and evapotranspiration replacement, DeLaune said. The greatest lint yields and net returns were achieved at 100 percent evapotranspiration replacement. Optimum lint yields and net returns were achieved at 104.5 percent evapotranspiration and 102 percent evapotranspiration, respectively.

However, he said the models showed that producers could irrigate at 83 percent evapotranspiration and maintain optimum yields. The net returns were significantly higher for no-till systems compared with conventional till because of reduced labor and inputs.

"We concluded the adoption of conservation tillage systems should not negatively affect lint yield or net returns in deficit-irrigated subsurface drip irrigation cotton systems within the Rolling Plains, particularly during the transition from intensively tilled systems to conservation tilled systems."

Read the full AgriLife TODAY [article](#).

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## [June 22 seminar to cover decision support for sustainability of Mexico's Calera Aquifer](#)

**Dr. Francisco Mojarro**, research fellow professor at the Autonomous University of Zacateca, will present a seminar titled "A Decision Support System for the Sustainability of the Calera Aquifer in Zacatecas, Mexico" **June 22** on the [Texas A&M University](#) campus. The seminar will begin at 3 p.m., in Room 305 of [Scoates Hall](#).

Mojarro will be discussing a recent study that applied models to the Calera Aquifer to make several simulations quantifying the effects of five hypothetical scenarios over a 20-year period. In Zacatecas, during the period of 1965 to 1980, the attention of government and farmers was turned to the exploitation and use of Calera groundwater, according to Mojarro. Due to the lack of a plan for long-term aquifer sustainability, said Mojarro, severe problems in groundwater availability, soil, natural vegetation, and water degradation became a concern of state and federal governments.

The [Texas Water Resources Institute](#) and the Texas A&M [Department of Biological and Agricultural Engineering](#) are jointly hosting the seminar.

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## [Invasive plant and pest workshop to be held June 9 in Junction](#)

The [Invaders of Texas](#) program is conducting an invasive plant and pest [workshop](#) in the Texas Hill Country to train citizen scientists to identify and report invasive pests of regulatory concern, such as the cactus moth and onionweed. Free and open to the public, the workshop is scheduled for **June 9**, from 9 a.m. to 4 p.m. at the Texas Tech University [Llano River Field Station](#) (TTU-LRFS) in Junction.

According to organizers, this workshop supplements the Invaders of Texas program by training participants to identify and report invasive pests while looking for invasive plants. The workshop includes a half-day refresher course of the Invaders of Texas program, with sessions on identification of regional invasive plants, website navigation, and data reporting. Participants are asked to provide their own transportation and bring a camera and GPS (if available).

Contact **Dr. Tom Arsuffi**, TTU-LRFS director, at [tom.arsuffi@ttu.edu](mailto:tom.arsuffi@ttu.edu) for more information and to register for the workshop.

This workshop is coordinated with the development of the Upper Llano River Watershed Protection Plan. Facilitated by TTU-LRFS, the [Texas Water Resources Institute](#), and the [South Llano Watershed Alliance](#), the watershed protection plan effort is funded through a federal Clean Water Act 319(h) grant from the [Texas State Soil and Water Conservation Board](#) and [U.S. Environmental Protection Agency](#).

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## [AgriLife researchers working to pinpoint wheat drought-tolerance mechanisms](#)



Texas AgriLife Research scientists are on a quest to find where different wheat varieties popular in the High Plains get their drought tolerance.

**Dr. Shuyu Liu**, AgriLife Research small grains geneticist in Amarillo, is working with a group of scientists on an [Ogallala Aquifer Program](#)-funded project to identify key genetic regulators of drought tolerance.

"We are trying to understand the drought-tolerant mechanisms in wheat varieties," Liu said. "In this study, we are looking at three widely planted varieties in the High Plains, TAM 111, TAM 112 and TAM 304.

"Based on breeders' observation, they found that TAM 111 is very good at both irrigated and dryland," he said. "TAM 112 is much better under prolonged dryland conditions, such as 2011. TAM 304 is very good under irrigated conditions, but not under dryland."

Breeders' observations from the field and the physiological traits collected in the last few years show these three cultivars have different responses to water stress; however, the basis of their adaptation remains unknown, he said.

Determining the mechanisms of adaptation to drought conditions is very important, Liu said, because in 2011 alone, drought stress resulted in the loss of more than 240 million bushels of winter wheat with a cost of about \$1.33 billion in the Southern Great Plains.

"We conducted this experiment in the greenhouse to understand how these three varieties respond to water differently and at different stages," he said.

Liu said at the same time they have been conducting this greenhouse experiment, all these three varieties have been growing in the field and many data will be collected by the AgriLife Research stress physiology and breeding groups at Amarillo, such as yield and its components and canopy temperature.

"At the end, we will combine the greenhouse data, field data and lab data together to figure out what the difference is for the drought-tolerant mechanism among these three varieties," he said.

The Ogallala Aquifer Program is administered in part by the [Texas Water Resources Institute](#). For more details on the research, read the full story at [AgriLife TODAY](#).

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## [New Projects](#)

### New TWRI/IRNR Projects

The [Texas Water Resources Institute](#) and [Texas A&M Institute of Renewable Natural Resources](#) recently acquired funding for the following new projects:

#### **State Water Resources Research Institute Program Funds**

The USGS Base Funds provides support for Program Administration and Information Transfer for the Texas Water Resources Institute as part of the National Institutes for Water Resources. This grant will also fund one Water Resources Assistantship graduate student who will work with Institute staff and university faculty to research priority water issues within the state.

**Principal Collaborators:** Texas Water Resources Institute, Texas AgriLife Research, Department of Wildlife and Fisheries

**Funding Agency:** U.S. Geological Survey

#### **Potential Impacts of Highway Construction Noise & Activity on Birds with Emphasis on the Golden-Cheeked Warbler**

The Performing Agency will conduct a study to determine if construction activity ("impacts" below) alters the spatial distribution, breeding success, and behavior birds, with an emphasis the golden-cheeked warbler.

**Principal Collaborators:** Institute of Renewable and Natural Resources, Texas AgriLife Research

**Funding Agency:** Texas Department of Transportation

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### New TWRI and IRNR publications

[A Multivariate Water Quality Investigation of Select Drainage Ditches in the Arroyo Colorado River Watershed, Texas](#), V. Uddameri, S. Singaraju, Texas Water Resources Institute, TR-424, 2012.

[Evaluation of BMPs to Reduce NPS Pollution at the Farm Level](#), J. Enciso, Texas Water Resources Institute, TR-423, 2012.

[Education Program for Improved Water Quality in Copano Bay](#), A. Berthold, E. Moench, K. Wagner, J. Paschal, Texas Water Resources Institute, TR-422, 2012.

### New Extension publications

[Facts about Fracking](#), Kristine Uhlman, Diane Boellstorff, Mark L. McFarland, John W. Smith, Texas AgriLife Extension Service SP-463, 2012

[Well Owner Drought Response](#), Kristine Uhlman, Diane Boellstorff, Mark L. McFarland, Texas AgriLife Extension Service SP-465, 2012

[Private Drinking Water Well Basics](#), Kristine Uhlman, Diane Boellstorff, Mark L. McFarland, John W. Smith, Texas AgriLife Extension Service SP-464, 2012

### TWRI and IRNR Training Courses

<a href="#">ArcAPEX Training Course</a>	June 13–14
<a href="#">2012 International SWAT Conference</a>	June 16–20
<a href="#">Texas Watershed Coordinator Roundtable</a>	July 26



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