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

Celebrate Protect Your Groundwater Day Sept. 9

Join the Texas Water Resources Institute (TWRI) and the National Ground Water Association (NGWA) **Sept. 9** in recognizing the importance of groundwater as part of Protect Your Groundwater Day.

Protecting groundwater consists of protecting it from contamination and using the resource wisely, and citizens' actions directly impact groundwater quality and quantity, according to NGWA.

Groundwater is a vital resource to both rural and urban populations and makes up about 30 percent of freshwater, according to the U.S. Geological Survey. Groundwater not only provides drinking water to household well owners, who obtain water from privately owned wells, but also to public water systems and customers.

In Texas, more than a million private water wells provide water to citizens in rural areas and to those living in small acreages at the growing rural-urban interface. The Texas Well Owner Network (TWON), an educational training program offered by Texas A&M AgriLife Extension Service and managed by TWRI, delivers science-based, community-responsive education to well owners throughout Texas. The program offers two different educational events.

At Well Informed one-hour sessions, well owners can bring in their well-water samples to screen for contaminants and learn about water well protection practices. Well Educated sessions are no-cost, one-day trainings for private well owners who want to become familiar with groundwater resources, septic system maintenance, well maintenance, water conservation, water quality and water treatment. The next Well Informed trainings will be **Oct. 22-23** in Weatherford.

Read more about TWON and Protect Your Groundwater Day.

Meet a Scientist: Kirk Winemiller

Dr. Kirk Winemiller became fascinated by natural science at an early age. "As a child, I liked the outdoors, and I liked animals," he said. "I grew up in a rural area playing outside in the woods and meadows, especially streams."

Today, Winemiller is an ecologist and Regents Professor in the Department of Wildlife and Fisheries Sciences at Texas A&M University. "It's a privilege to get to do science and explore nature as a profession," he said. He received a masters in zoology from Miami University in Oxford, Ohio, then a doctorate in zoology from the University of Texas at Austin, studying aquatic ecology at both.

Winemiller has been widely recognized for his research and has received several awards, including the George Bush Award for Excellence in International Teaching and most recently the Dean's Outstanding Achievement Award for Interdisciplinary Research.

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Winemiller and members of his Aquatic Ecology Lab study how flow variation affects the ecology of rivers and streams in Texas and other regions of the world. A current project is examining population dynamics of minnow species in the Trinity and Brazos rivers. Because minnows are sensitive to environmental flows, they can serve as bioindicators, meaning that they provide insight into the environmental health of the system. Some minnow species in the upper Brazos River are now federally listed as endangered due to lack of stream flows and connectivity between populations, Winemiller said.

Winemiller has also been involved in research in Southeast Asia, South America and Africa where freshwater ecosystems and the fisheries they support are crucial for the food security and economic well-being of millions of rural inhabitants. Unfortunately, many of these countries lack the science infrastructure to obtain information that would improve management strategies, Winemiller said. “The scientific community hopes that we can gain enough general knowledge that it becomes feasible to extrapolate certain concepts and general principles to regions where there are virtually no data.”

Winemiller is currently involved with an international team of researchers investigating the ecology of Brazil’s Xingu River, which is soon to be the site of a major hydroelectric complex. Although the field research effort will end before the dam is built, he said this study will provide a snapshot of the current biodiversity and ecological functions before a modified flow regime is created by operation of the new dam.

Through his research, Winemiller has witnessed the Earth’s rich biodiversity firsthand. His work has even lead to the discovery of some new fish species, including a large cichlid from the Zambezi River in Africa, and a tiny, worm-like catfish from South America.

Dr. Kirk Winemiller

While discovering new species may be exciting, it can be a reminder of a bitter paradox. “The sad thing is, we may be describing species just before their extinction, which is pretty depressing, but at least we will know they were there,” Winemiller said.

Although there are challenges associated with international research, such as obtaining permits as well as cultural and language barriers, Winemiller enjoys it. “It’s my favorite thing to do,” he said. “We enjoy the rivers and the biota in Texas, and we feel blessed to work in a place like Texas, but the tropical work is just fascinating.”

In addition to his research, Winemiller also teaches a few classes, including an undergraduate introductory ecology class and a graduate community ecology class. “I like teaching the large undergraduate class,” he said, “because it sends the message to the masses of why ecology, as a science, is important for all of us.” The graduate course gives Winemiller the chance to discuss cutting-edge science. “Sometimes I learn as much from them as they learn from me in that graduate course.”

To learn more about Winemiller and his research, watch this exclusive Conservation Matters video interview with him and visit his lab’s website.

Bryan, College Station citizen scientists help map local water impairment issues

The Texas Water Resources Institute (TWRI) created the **Carters Creek Stream Team** in late 2012 to expand the local water quality monitoring work force and collect water samples across the Carters Creek watershed, which encompasses much of the Bryan and College Station area. The team provides water quality data from across the watershe identifying potential sources areas for local bacteria impairments, said **Lucas Gregory, Texas Water Resou**

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(TWRI) project specialist. The team is comprised mostly of Texas A&M University students and members of the local Texas Master Naturalist chapter along with a few other watershed stakeholders.

Carters Creek has been listed as an impaired water body by the Texas Commission on Environmental Quality (TCEQ) since 1999, Gregory said. Monitored E. coli levels in the creek were above and continue to remain above the state's water quality standard established to protect recreation uses of surface water bodies. Burton Creek was also listed as impaired in 2006.

"To address this issue, a process to create a total maximum daily load (TMDL) and TMDL implementation plan were initiated," Gregory said. "These documents establish an allowable load of bacteria that the creeks can carry and still meet water quality standards and also outline a plan to restore water quality," Gregory said.

Through this process, watershed stakeholders realized that a better level of monitoring is needed, he said. "This is where the Carters Creek Stream Team comes in."

Stream Team volunteers were trained and organized to take samples once a month, at 10 sites across the Carters Creek watershed. Gregory said more than 150 volunteers have participated in the volunteer training program and they are currently monitoring 10 different locations across the watershed.

"Volunteers are recording temperature, water transparency, total depth, dissolved oxygen, pH and conductivity," **Matt Brown**, TWRI program coordinator said, "and they are also observing flow level, algae cover, water color, water clarity, water surface, water conditions, water odor, present weather, days since last significant precipitation, rainfall accumulation, and stream velocity."

Drastic changes in one of those components can help pinpoint impairment sites, he said.

Volunteers also collect water samples and deliver them to TWRI staff who in turn delivers them to water quality labs at the city of Bryan and city of College Station. The city labs process these samples for E. coli and transmit the data back to TWRI. These data are later compared to E. coli levels in samples processed by the Soil and Aquatic Microbiology Lab in the Soil and Crop Sciences Department at Texas A&M.

Ultimately, data collected by Carters Creek Stream Team volunteers will be used to develop a watershed pollutant source and loading assessment that will be delivered to watershed stakeholders, Gregory said. "This report will hopefully inform decision makers on future management of local water resources," he said.

To become a volunteer, Gregory said, an individual must go through a five-hour training that the Texas Stream Team, the parent organization, established. The training involves three phases that include trainers demonstrating all monitoring procedures and observational data recording to the volunteers, volunteers working through the analysis process with assistance from the trainers, and finally volunteers working through the monitoring process independently and comparing their results to those of the trainers. To pass the training, volunteer analysis results must be in agreement with the trainers.

TWRI has three certified Stream Team trainers on staff: **Kirsten Hein**, the Carters Creek volunteer monitoring program coordinator; Brown; and Gregory. They conduct trainings as needed and also coordinate monitoring across the watershed.

See the collecting samples videos.

Texas A&M research shows getting energy from oil and gas doesn't require using fresh groundwater

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Oil and gas exploration operations can and must operate under environmentally sound practices and according to a research study at Texas A&M University, hydraulic fracturing in the Eagle Ford Shale in South Texas can lessen its environmental impact by switching from fresh groundwater to abundant supplies of brackish groundwater.

Graduate students at the Bush School of Government and Public Service, under the leadership of **Dr. James M. Griffin**, professor and Bob Bullock Chair in Public Policy and Finance, studied water consumption from oil and gas exploration in the Eagle Ford Shale for Commissioner Christi Craddick of the Railroad Commission of Texas (RRC) and published their findings.

The Eagle Ford Shale is a massive geologic formation spanning 30 Texas counties from Brazos County in the northeast to Webb County in the southwest. More than 200 operators are tapping into previously inaccessible oil and gas reserves in the Eagle Ford Shale with the use of hydraulic fracturing and horizontal drilling.

Approximately 90 percent of the water used in hydraulic fracturing in the area is from fresh groundwater aquifers, according to the researchers. The researchers recommend incentivizing the substitution of brackish groundwater for fresh groundwater at a low cost to the state and operators in the region.

The researchers studied groundwater consumption within the Eagle Ford counties over a span of four years, looking not only at oil and gas exploration water consumption, but also at municipal consumption, irrigation and other categories.

“This analysis showed that fresh groundwater is being consumed at about 2.5 times the groundwater recharge rates,” according to the report. Irrigation is using more water than all the other categories combined, the researchers found, so the water problem reaches well beyond the use of fresh groundwater for oil and gas exploration.

But they found a difference can be made in conserving fresh groundwater in the shale, not through technology, but rather by designing better public policies that incentivize hydraulic fracturing operators to substitute brackish groundwater for fresh groundwater.

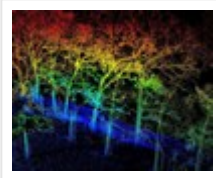
If oil and gas companies in the Eagle Ford Shale switch to brackish water, it would leave more fresh groundwater for farmers and municipalities, the researchers said.

“Operators would receive a ‘Green Star’ recognition from the RRC and possibly the TCEQ (Texas Commission on Environmental Quality) if they take the pledge to avoid using fresh groundwater and agree to be compliant with all other environmental regulations,” Griffin said.

The study also recommends mandatory reporting of all groundwater uses by all classes of water users, bringing more transparency.

For more information on Griffin, see his webpage. Click here for the full TAMUTimes article.

Drought-stricken trees offer study platform



Severe drought across Texas since 2011 has produced a unique opportunity for Texas A&M AgriLife Research scientists to gain a greater understanding of the decaying process of trees and the effects on the surrounding ecosystem.

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Three AgriLife Research scientists in the Texas A&M University Department of Ecosystem Science and Management have been approved for a three-year, $347,426 grant under the Rapid Response and Novel Research in Earth Science program operated by NASA.

Dr. Sorin Popescu will lead the project, titled *Using LiDAR to develop a climate-driven model of the disintegration and decay of trees killed during a severe drought*. He will be joined by **Dr. Georgianne Moore** and **Dr. Jason Vogel**.

Popescu said that 2011 and 2012 were very difficult years for forests due to drought. During that period, precipitation for most of Texas was 50 to 75 percent less than its long-term average.

Popescu said under the new grant-funded project, the rate of tree disintegration will be monitored through a combination of airborne, unmanned aerial vehicle lidar and terrestrial lidar scanning. Lidar, from Light Detection and Ranging, is a remote-sensing technology that uses laser light to measure the distance from sensor to target and create a three-dimensional model of forest vegetation, in this case.

A site network, already designed by **Dr. Chris Edgar** of the Texas A&M Forest Service, will facilitate immediate implementation of the research.

Two of the difficulties are: passive remote sensing cannot easily differentiate a single dead tree from a living forest or accurately depict a change in a tree's three-dimensional structure; and the disintegration and decay of standing trees is difficult to model because the elevated tissues cannot be directly sampled and wood decay may occur at different rates than tissues found on the ground.

Popescu said the technology and modeling structure to overcome these difficulties has been developed.

"Because the newly dead trees in Texas are quickly transitioning to fallen wood, we need to immediately apply these techniques to this extensive, catastrophic event," he said. "By implementing the study immediately, we will be able to leverage an existing study design and take advantage of the large number of dead trees on the landscape."

The scientists expect their research to have a long-lasting impact because it will provide the foundation for understanding how these kinds of events alter future forest structure and function. Also, they said, the remote sensing of tree disintegration and decay will be novel and linked to potential changes in climate, making the results potentially transferable to other forest ecosystems.

For more information, read the full AgriLife TODAY news release.

'Riparian Restoration on Farms and Ranches in Texas' is now available

The Texas A&M AgriLife Extension Service has published a new resource for landowners and managers, "Riparian Restoration on Farms and Ranches in Texas."

The new publication, which has been given the identification number WF-010, can be downloaded for free or purchased at $3 per hard copy through the AgriLife Bookstore, said **Blake Alldredge**, AgriLife Extension wildlife associate at College Station.

"This publication was developed for landowners in the Blackland Prairie and Post Oak Savannah ecoregions of Central and East Texas seeking information on how to properly manage their riparian areas. It's important to note though, that many of the principles and practices discussed are applicable to other parts of the state as well," he said.

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The publication describes ways landowners can evaluate the condition of their riparian areas and then recommends techniques for restoring those sites, he said. Some of the techniques include reseeding native grasses and forbs, proper plant species selection, and proper grazing techniques and management along croplands. The basic monitoring methods used to maintain productivity are also explained.

The publication is a collaborative effort of AgriLife Extension's wildlife and fisheries unit, the Texas Water Resources Institute and the U.S. Department of Agriculture Natural Resources Conservation Service.

The publication was developed as part of the *Building Partnerships for Cooperative Conservation in the Trinity River Basin* project managed by the Texas Water Resources Institute and funded by the Texas State Soil and Water Conservation Board through a Clean Water Act grant from the U.S. Environmental Protection Agency.

See the AgriLife TODAY news release here.

Social media training for natural resource professionals Sept. 10-11 in Austin

The Texas A&M Institute of Renewable Natural Resources (IRNR) will hold a social media training for natural resources professionals **Sept. 10-11** at the Texas Parks and Wildlife Airport Commerce Park, 1340 Airport Commerce Drive in Austin.

"Content, Conversations and Discoverability – Quality Social Media Outreach for Natural Resource Professionals" will be held from 1-4 p.m. **Sept. 10** and from 8:30 a.m.-3:30 p.m. **Sept. 11** in Building 6, Suite 600A.

Participants may register for one or both days. Registration is $50 for **Sept. 10**, $60 for **Sept. 11** and $80 for both. The **Sept. 11** training includes lunch.

The training is sponsored by the Texas Parks and Wildlife Department.

Amy Hays, program specialist for IRNR and workshop trainer, said the first day will be "hands-on" and cover the basics of the social media platforms Facebook and Twitter and how to get more out of them.

"The second day attendees will learn how to make what they do on the web — whether it is on their website, blogs, Facebook, Twitter or other places — more searchable, shareable and liked," Hays said.

She said participants will learn how to use Twitter, listen better to Twitter conservations and discover more information. She also will explain how to use Twitter and Instagram to create better program outreach.

For more information, see the full AgriLife TODAY article or to register, go to https://agriliferegister.tamu.edu/.

Two Texas Parks and Wildlife Department properties achieve international 'dark sky' status

Texas state parks remain among the few public places in one of the nation's most populous and increasingly urbanized states where the starry heavens can be viewed in all their celestial glory with the minimal intrusion of artificial light. Copper Breaks State Park in the Panhandle Plains and Enchanted Rock State Natural Area in the Hill Country are the first Texas state parks to be designated International Dark Sky Parks by the International Dark-Sky Association (IDA).

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Copper Breaks and Enchanted Rock, which were awarded the highest “Gold-tier” night skies status by IDA, join Big Bend National Park and the city of Dripping Springs as the only locations in Texas to have earned the coveted Dark Sky Places recognition. Since 1988, the nonprofit, Tucson-based organization has been promoting night sky conservation and environmentally responsible outdoor lighting throughout the world.

“Texas is rapidly becoming a national leader in the dark sky movement,” said **John Barentine**, manager of IDA’s Dark Sky Places Program. “There are some really dedicated folks in Texas’ parks and communities taking significant steps to protect the night skies and educate policymakers and the public about the importance of preserving one of the state’s most precious natural resources.”

Since IDA established the Dark Sky Places Program in 2001 to recognize excellent stewardship of the night sky, eight Communities, 19 Parks and eight Reserves have received IDA recognition.

For many years, Texas state parks in rural areas, such as Copper Breaks and Enchanted Rock, have conducted regular star-gazing programs and events to engage and educate the public about the importance of preserving pristine night skies that make the viewing of constellations, planets, stars, satellites and other objects possible. In recent years, the Texas Parks and Wildlife Department started recognizing the impact of urban sprawl and resulting light pollution on many of its 95 state parks and is developing policies and lighting management plans to address the issue. Texas State Parks leadership is partnering with the McDonald Observatory and the Texas chapter of the IDA to audit the night skies above the parks and implement their recommendations.

“One of our most valued attributes in Texas is its natural beauty,” said Texas State Parks Director Brent Leisure. “This beauty is not limited to the light of day, but extends into the night sky where Texans can enjoy a front-row seat to the splendor of the universe. State parks and natural areas offer some of our very best public venues to experience this heavenly show.”

To learn more about stargazing opportunities in Texas state parks and night sky darkness ratings here.

For more information about the International Dark Sky Places Program, visit its website. More information about light pollution and the negative effects of light on visibility, wildlife, human health and energy use is available on the IDA website.

Click here to view downloadable, dark-sky images recorded in Texas State Parks. See the full TPWD news release for additional information.

Range and Wildlife Management Field Day set for Sept. 19 in Brown County

The Texas A&M AgriLife Extension Service and Texas Parks and Wildlife Department are hosting a multi-county Range and Wildlife Management Field Day **Sept. 19** in Brown County for landowners interested in managing both wildlife and livestock on their ranches.

The program will run from 8 a.m.-4 p.m. at the McGillivray and Leona McKie Muse Wildlife Management Area, 15 miles northeast of Brownwood off County Road 478.

The morning talks will be followed by lunch, then a tour of the wildlife management area.

Individual registration is $15 and includes lunch. RSVP by **Sept. 14** by contacting the AgriLife Extension office in Brown County at 325-646-0386.

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Three Texas Department of Agriculture continuing education units, two integrated pest management and one general, will be available.

"Many landowners in Texas are beginning to see the value in managing for wildlife on their ranch," said **Brian Hays**, associate director of the Texas A&M Institute of Renewable Natural Resources. "Landowners interested in managing for wildlife can take advantage of various incentive programs to diversify their income through good land stewardship for livestock and wildlife."

Scott Anderson, AgriLife Extension agent for Brown County, said AgriLife Extension staff will discuss quail and turkey biology and management. Texas Parks and Wildlife Department personnel will discuss Texas horned lizards, wildlife management planning and the Proposition 11 wildlife property tax exemption. A U.S. Department of Agriculture Natural Resources Conservation Service expert will discuss rangeland evaluation and proper brush management techniques such as dozing, prescribed fire and herbicide application.

"A particular focus will be given to quail because of their popularity as a game species, their extreme decline in recent years and habitat that produces quail also supports scores of other wildlife species in the rangelands of Texas," said **Mike Marshall**, AgriLife Extension associate for the institute. "The Muse WMA is a perfect place to see quail management in action as they have opened up 60 acres of habitat over the summer and plan to conduct brush removal on additional acreage in September."

"We are excited to share the details of a special project with Texas horned lizards that is taking place at the Muse WMA," said **Devin Erxleben**, Texas Parks and Wildlife area manager for the Muse property.

Other field tour stops will include demonstrations on calculating stocking rates, plant identification, habitat assessment and a preview of a prairie restoration effort now underway on the wildlife management area.

For more information, contact Anderson at 325-646-0386.

Read the AgriLife TODAY news release.

AgriLife Research study: Center pivot does not always mean efficiency

Identifying, but more importantly gaining adoption, of the most efficient irrigation systems is an important step in water conservation within agriculture, according to a recent study conducted by Texas A&M AgriLife Research.

Dr. Nithya Rajan, AgriLife Research agronomist in Vernon, helped complete the study by looking at different types of irrigation systems for their application efficiency. A more efficient irrigation system allows a larger percentage of the applied water to reach the root zone and not be lost to soil evaporation or evaporation from plant surfaces.

The study is a part of the project *An Integrated Approach to Water Conservation for Agriculture in the Texas Southern High Plains*, initiated through funding from the Texas Water Development Board in 2005.

Rick Kellison, project director of the Texas Alliance for Water Conservation, said the study was designed to help producers "put a dollar figure to using the most efficient irrigation systems, because over the years they had shifted away from the efficiency of LEPA."

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This eight-year project led to the establishment of the Texas Alliance for Water Conservation Demonstration Project, which involves about 30 producers' fields in Hale and Floyd counties.

While about 75 percent of the Texas High Plains irrigated acres are under center pivot systems, these systems can be equipped with different types of emitters, Rajan said. These include mid-elevation spray application, known as MESA; low elevation spray application or LESA; and LEPA.

She explained MESA systems use spray emitters positioned at around 4 feet above the ground or higher, and are popular for irrigating taller crops like corn. LESA systems have spray emitters generally located less than 4 feet above the ground, and are popular for irrigating shorter crops like cotton. LEPA systems use emitters in contact with the surface that allow water to flow directly onto the soil, and are generally used in conjunction with furrow dikes.

The primary objective of the Texas Alliance for Water Conservation project has been to identify cropping systems and practices in this region that use less irrigation water while maintaining farm profitability.

Both systems applied the same amount of water, but the efficiency of application of the water is what made the difference, Kellison said. LEPA provides a direct application of water and thus concentrates the water in a smaller area. This reduces surface evaporation.

Kellison said in all three years of the drought conditions, the LESA or spray application was needed to get the crop started, but the producer, **Glen Schur**, switched right back to the efficiency of LEPA for the remainder of the growing season.

Since LEPA is more efficient than LESA, more of the water supplied by the LEPA system reached the plants' roots, resulting in increased growth and yield.

Rajan explained that following an irrigation application, water is predominantly lost through evaporation from the wet soil surface. This is called Phase I evaporation and occurs at the rate determined by potential evapotranspiration. Once the soil surface dries, water is lost from the soil by Phase II evaporation. Phase II evaporation is controlled by the diffusion of water vapor through the soil and is generally much less than Phase I evaporation.

The application efficiency of an irrigation system is related to its ability to place water in the root zone of the crop, she said.

For more information see the full AgriLife TODAY new release.

New TWRI and IRNR publications

River System Hydrology in Texas, **R. Wurbs, Y. Zhang**, TR-461, 2014.

Application of the Recovery Potential Screening Tool in the Matagorda Bay Watershed, **L. Gregory, M. Brown, K. Skow, A. Engeling, K. Wagner, A. Berthold**, TR-460, 2014.

Attoyac Bayou Bacterial Source Tracking Report, **E. Martin, T. Gentry**, TR-456, 2014

Natural Resources Training Courses

Texas Riparian & Stream Ecosystem Workshop – Double Bayou Watershed	Sep 24, 2014
Getting In Step – Top 10 Outreach Tips that Won't Break the Bank	Sep 29, 2014

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Stakeholder Facilitation – Working with Stakeholders to Move the Process Forward	Sep 30, 2014
Texas Riparian & Stream Ecosystem Workshop – Lower Nueces, Petronila, and Oso Creek	Oct 8, 2014
Introduction to ArcGIS 10	Oct 8-9, 2014
Content, Conversations, and Discoverability - Quality Outreach and the Internet for Natural Resource Professionals	Oct 28-29, 2014

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