TWRI Mills Scholar finds high flow events critical for lower Brazos fish

Tony Rodger, who graduated earlier this month with a master's degree from the Department of Wildlife and Fisheries Sciences at Texas A&M University, studied minnow species in the lower Brazos River Basin to determine how environmental flows affected early life stage survival. His study concluded that high flow events help maintain the biodiversity of fish within the lower Brazos River.

Rodger is a 2014–2015 Mills Scholarship recipient. These scholarships, funded by the W.G. Mills Scholarship Memorial Endowment and administered by the Texas Water Resources Institute, support graduate students at Texas A&M, Texas A&M at Galveston and Texas A&M at Qatar who are pursuing water-related research with the potential to help Texas solve future water problems.

He found that high flow events in the Brazos River were critical for successful survival of shoal chub, a species representative of fluvial specialists, a group of minnows particularly responsive to flow variation. These minnows have semi-buoyant eggs and larvae that drift with the current. Shoal chub larvae had higher survival when hatched during flow pulses compared to base or subsistence flows, Rodger said.

Environmental flows have been a complicated aspect of Texas water management for decades. The state determines the amount and timing of water that must move through rivers to maintain a sound ecological environment, and those requirements are considered environmental flows.

Mills Scholar Tony Rodger studied Shoal chub in the Brazos River.

Photo credit: Tony Rodger.

"An environmental flow regime tries to balance human needs for freshwater and the conservation of aquatic ecosystems within the state," Rodger said. "My research is part of an on-going effort to evaluate these environmental flow regimes to determine if they are fulfilling key ecological functions that maintain the integrity of these systems."

According to Rodger, environmental flow recommendations in the past maintained only certain baseline flows that did not include aspects of discharge variability that typically characterize Texas streams and rivers. In addition to affecting spawning and survival of fish eggs and larvae, environmental flows also influence aspects of water quality, such as dissolved oxygen, pH and nutrients, which are critical for survival of virtually all aquatic organisms.

“Now scientists understand the importance of the natural flow regime — a historical pattern of streamflow prior to any human modification, such as water withdrawals, dam construction, land use changes, etc. — in maintaining the biodiversity and native species within these systems,” he said. “This research helped demonstrate the validity of including high flow pulse events in environmental flow regimes.”

Another reason high flow pulses are important to the Brazos is because they establish connections between the river channel and oxbow lakes in its floodplain, Rodger said. Oxbow lakes form when a meander in the main river channel is cut off during the normal processes of sediment erosion and deposition, he said.

Rodger’s study found significant relationships between large magnitude flow events and abundances in the river of certain fish species that tend to be common in oxbows but often rare in the main channel.

Mills Scholar Tony Rodger. Photo credit: Tony Rodger.

“These temporary lateral connections not only replenish oxbows with water and aquatic organisms, but certain fish species subsequently build up large numbers in oxbows,” he said. “During subsequent high flow pulses, many of these organisms move back into the main river channel, which perpetuates what ecologists have termed metapopulation dynamics. These dynamics are critically important, because, without migration between oxbows and the active channel, certain species probably would experience major population declines in the river.”

Dr. Kirk Winemiller, regent’s professor in the Department of Wildlife and Fisheries Sciences, served as Rodger’s advisor. See the Mills Scholarship page to learn more about Rodger’s research and read his full thesis.

Texas A&M policy internship program celebrates 25 years

Since 1990, top students from the College of Agriculture and Life Sciences at Texas A&M University have launched their careers with internships that allow them to directly interact with policymaking at the state, national or international level.

This year marks the 25th anniversary of the Agricultural and Natural Resources Policy (ANRP) Internship Program providing students this opportunity through agricultural policy internships in Austin, Washington, D.C. or Rome, Italy.

To celebrate, the ANRP program hosted a reception July 9 on Capitol Hill in Washington, D.C. to commemorate its supporters, staff and alumni. ANRP program cofounder and former U.S. Rep. Greg Laughlin received the National Capitol A&M Club’s distinguished alumni award. Several other guests made remarks, including U.S. Rep. Bill Flores and Dr. Mark Hussey, Texas A&M’s vice chancellor and dean for agriculture and life sciences.

The program was established in 1990 by Texas A&M professor Dr. Ron Knutson in response to a request by Laughlin for advice regarding agricultural policies at the Texas Capitol. Since the success of its first intern, the program has expanded to boast more than 900 alumni in nearly 50 hosting offices and has reached an international level through its partnership with the Food and Agriculture Organization of the United Nations.

Part of the continued success of the program can be attributed to the many benefits interns can expect upon completing it.

The internship is very progressive and developmental, beginning with the application process, said Stephanie McMillen, director for policy internship programs in the College of Agriculture and Life Sciences. The entire process is focused on continuously challenging the student, she said.

Working alongside policymakers and other government officials also allows students to develop their networking skills, she said, and helps launch their professional careers.

“The single greatest experience was getting to work with someone who became a mentor,” said Allison Smith, former Texas Capitol staffer and intern for Rep. David Swinford in 2003. “It gave me a career at the state capitol for over 12 years.”

Through a rigorous selection process, roughly 45 students a year are chosen for the D.C. program, 10-15 for Austin, when the Texas Legislature is in session, and one each semester for Rome. Applicants must undergo a series of interviews and essays before a final decision is reached, McMillen said.

Students are not necessarily expected to have a 4.0 GPA and many extracurricular activities to be considered, she said. Ideal candidates display a willingness to learn from the experience and challenge themselves in new environments.

The program is expected to continue to expand in the future, McMillen said. One goal is to increase the number of interns in Austin and Rome, while still ensuring interns receive quality attention. She said the program is also considering pursuing additional scholarships for students.

The ANRP 25th anniversary celebration in College Station is set for the annual College of Agriculture and Life Sciences tailgate, Oct. 17 on the front lawn of the Agriculture and Life Sciences Building before the Texas A&M and the University of Alabama football game.

More information regarding ANRP and its 25th anniversary events is at anrp.tamu.edu, and photos from the Washington, D.C. event are on Facebook.

TCEQ: Watermaster program for Brazos has begun

The Brazos Watermaster Program office officially opened June 1, with Molly Mohler serving as the first watermaster for the Brazos. She has nine years of experience in managing the Concho River in West Texas, according to the Texas Commission on Environmental Quality (TCEQ), which oversees the program.

In 2013, holders of water rights in the Brazos River Basin petitioned TCEQ’s commissioners to appoint a watermaster to monitor, regulate and control withdrawals of water from the basin, according to TCEQ. Following a hearing at the State Office of Administrative Hearings, the commission directed the executive director to appoint a watermaster over the middle and lower Brazos River Basin, affecting water rights holders in the portion of the basin from Possum Kingdom Lake to the Gulf Coast.

The commission officially established the program on April 21, 2014. That fall, TCEQ conducted public meetings throughout the basin to answer questions and educate water rights holders on the new watermaster program, according to TCEQ.

Nominations were sought for service on the Brazos Watermaster Advisory Committee at these meetings. The committee’s 15 members were appointed in March 2015. Their duties include making recommendations about water administration and

distribution, and reviewing and commenting on the annual operating budget. The committee can bring issues forward from water rights holders for discussion and consideration by the watermaster or the executive director.

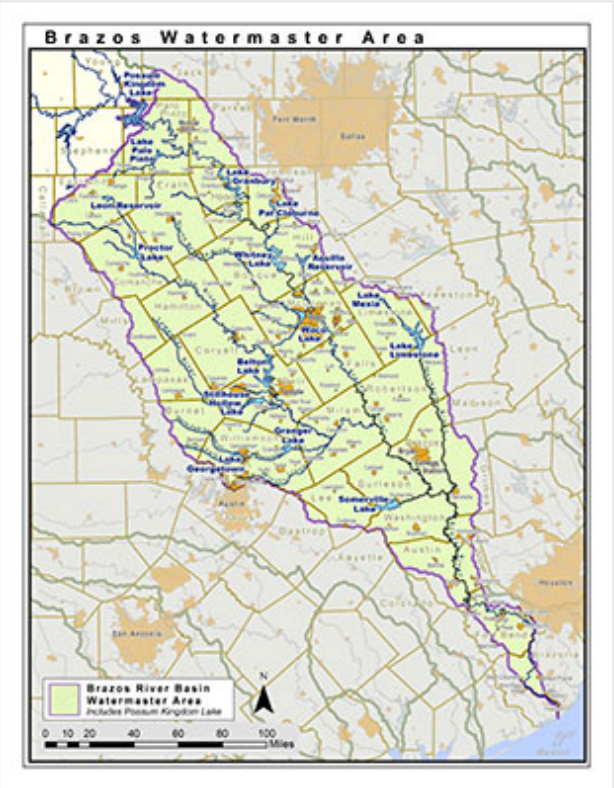
"Water in the Concho is diverted primarily for agricultural and municipal uses," Mohler said. "Here in the Brazos you have so many more industries and different uses for water."

Mohler visits various industries and water rights holders within the basin to better understand their processes and water uses, she said.

"If we discover there are times where they may need more water than is available, we can work with them to identify alternative sources, before there is a crisis," Mohler said. "Good contingency planning, coupled with conservation, is in the best interest of all water rights holders in the basin."

Visit the Brazos Watermaster Program for more information.

Information in this article is from the August issue of TCEQ's Natural Outlook newsletter. Read the full article for more information.



The Brazos Watermaster Program area. Image credit: TCEQ.

New IRNR-supported feral hog video series offers management expertise

The Texas A&M AgriLife Extension Service is taking steps to help landowners manage the state's ever-increasing feral hog population. A recent step is the Wild Pig Management Video Series.

Mark Tyson and Josh Helcel, AgriLife Extension associates with the Wildlife and Fisheries unit, collaborated with Texas Wildlife Services personnel in compiling the series. Tyson said it consists of an all-inclusive trailer and the following five videos: How to Corral Trap Wild Pigs; Corral Trapping Wild Pigs: A Success Story; How to Box Trap Wild Pigs; Shooting Techniques for Wild Pigs; and How to Snare Wild Pigs.

Tyson said his unit's staff came up with the idea when they realized the need for a comprehensive video resource on feral hog, or wild pig, management.

"With feral hogs in 99 percent of Texas counties now, causing upwards of $52 million in annual agricultural damages, managing their expanding populations is a real challenge," Tyson said. "Our job is to provide landowners with the tools they need to get the job done, and we trust this will be another very useful tool in their feral hog management toolbox."

Tyson said his department is confident the videos will clarify many management points not always easily understood through other media. Doing so should help land managers effectively manage this destructive nuisance species and reduce its impacts on native habitat, wildlife, livestock, water quality and agricultural production, he said.

Tyson said the video series came about after he and Dr. Jim Cathey, the unit's associate department head, applied for and received a Renewable Resources Extension Act Grant. The grant was funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture and administered through the Texas A&M Institute of Renewable Natural Resources.

Additional information on feral hog management is available at feralhogs.tamu.edu. For more information, contact Tyson at 979.845.4698 or mark.tyson@ag.tamu.edu. Read the original AgriLife Today news release.

AgriLife Research study shows population changes cause woodlands encroachment

Woody plant encroachment is one of the biggest challenges facing rangelands worldwide, but it consistently has been under-measured and poorly understood, according to Dr. Matthew Berg, a Texas A&M AgriLife Research postdoctoral research associate in the Texas A&M University Department of Ecosystem Science and Management. He is trying to change both the understanding and measurement with his latest study, which was published in the July issue of *Rangeland Ecology and Management*.

Berg used time-series aerial imagery and historical census data to quantify changes in population, land ownership patterns and woody cover between 1937 and 2012 in three different settings in Central Texas: a semi-urban watershed almost entirely within the city limits of Lampasas, rural watersheds in Lampasas County and a portion of Burnet County, and the adjoining rural watersheds in Mills County.

Joining Berg in this study were Dr. Bradford Wilcox, AgriLife Research and Texas A&M Department of Ecosystem Science and Management; Dr. Michael Sorice, Virginia Tech; and Dr. Jay Angerer, Dr. Edward Rhodes and Dr. William Fox, all with AgriLife Research.

The research was funded by grants from the U.S. Department of Agriculture – National Institute of Food and Agriculture and the National Science Foundation, and a Tom Slick Graduate Research Fellowship from the Texas A&M College of Agriculture and Life Sciences.

Berg said most past research focused on environmental and ecological connections. This study documents for the first time the relationship between human demographics and the conversion of grassland to woody plant cover, shrubs and woodlands.

In this effort, the scientists were able to document the changes in grassland along with population, and for some, the results might be surprising.

“What we found was unexpected,” Berg said. “What makes these relationships remarkable is the strength of the correlations for all three settings, despite large differences in both the direction and timing of changes.”

Typically, it is thought that when people move into an area, they clear off the land to build their homes and eventually to build cities. But the reality is, unless they are in the agriculture business, the widespread clearing does not occur, the scientists found.

“Where people moved, woody plants followed,” he said. “Only when the size of farms increased did the amount of woody plant cover decrease.”

Read the full AgriLife TODAY article or the research study for more information.

USGS model provides better understanding of Edwards Aquifer

Scientists have a better understanding of how water flows throughout the San Antonio, Texas, segment of the Edwards Aquifer because of a new U.S. Geological Survey (USGS) groundwater flow model, developed in cooperation with the San

Antonio Water System (SAWS), according to USGS.

The Edwards Aquifer is one of the most prolific aquifers in the world, and it provides more than 50 percent of the drinking water consumed in the San Antonio and Austin areas, according to USGS. The aquifer supplies water to south-central Texas for residential, recreational, industrial and agricultural uses. Several endangered and threatened species are also sustained by groundwater discharged at Comal, San Marcos and Barton springs.

“Understanding how groundwater moves is critical in order for decision-makers to protect this finite resource,” said Darren Thompson, SAWS director of water resources. “You can’t manage what you don’t measure.”

The focus of the new USGS model is to simulate the interaction between freshwater and saline (salt) water and where the two mix, called the brackish-water transition zone. Model results indicate that effects on freshwater quality during a severe drought, such as the drought-of-record during 1950-56, would be minor, according to USGS. This model improves on a previous USGS model that did not include analysis of the transition or saline zones.

“While the model shows little potential for movement of brackish water into freshwater, the research suggests there is a need for an improved understanding of some parts of the Edwards Aquifer flow system,” said USGS scientist Linzy Brakefield. “Better knowledge of how the aquifer is recharged and the relationship between recharge, pumping and springflow is needed. With the new developments from this study there is potential to develop more accurate models in the future.”

For more information, read the full USGS report or the full USGS news release.

SWAT Conference set for Oct. 12-16 at Purdue University

Purdue University will host the 2015 Soil and Water Assessment Tool (SWAT) Conference Oct. 14-16 in West Lafayette, Indiana. Five workshops will also be held prior to the conference, Oct. 12-13.

SWAT is a river basin-scale computer model developed to quantify the impact of land management practices in large, complex watersheds. The public domain model, jointly developed by U.S. Department of Agriculture’s Agricultural Research Service (USDA-ARS) and The Texas A&M University System, is widely used in hydrology and water quality assessment, including nonpoint source pollution for all sizes of watersheds, from local to large river basin-scale watersheds.

Registration is available online, and early bird pricing applies until Aug. 31. There is also a discount available for those registering for both the conference and a workshop. Workshops on Introductory and Advanced SWAT as well as APEX (Agricultural Policy/Environmental eXtender) will be offered Oct. 12-13. A Climate Change for Watershed Modeling workshop will be on Oct. 12, and a SWAT-MODFLOW workshop will be available Oct. 13.

The deadline to submit an abstract is Aug. 31. Conference topics include large scale applications, climate change applications, biofuel and plant growth, environmental applications, model development, GIS application and development, urban processes and management, instream sediment and pollutant transport, EPIC/APEX modeling system, hydrology and others.

Visit the conference website for more information. The SWAT community is also on Facebook and Twitter.

AgriLife Extension quail experts anticipate big 2015 season, offer habitat tips

From seemingly teetering on the brink of extinction to roaring back with a vengeance, wild quail seem to have made a miraculous comeback across Texas, said one wildlife expert.

“The 2015-16 quail season is going to be the best we’ve seen since at least 2008 and in some areas even longer than that,” said Dr. Dale Rollins, Texas A&M AgriLife Extension Service coordinator for the statewide Reversing the Quail Decline Initiative. “It’s shaping up to be a good to great year depending on where you are.”

Rollins said the populations of both bobwhite and scaled or “blue” quail have benefited in most cases from the widespread and timely rains last fall that returned and continued through early summer. The relatively mild, wet winter also contributed to the quail boom, he said.

The rains helped quail on several fronts, Rollins said, including better nesting habitat and cover from predators. May and June provided perfect hatching conditions and set the stage.

“We’re seeing strong numbers in a lot of areas. Some of the best areas are parts of South Texas and from just northeast of San Angelo on up into the lower part of the Rolling Plains, roughly anywhere west of U.S. Highway 83.”

Rollins said blue quail, like bobwhites, have “come back with a vengeance,” with reports from the Permian Basin and Trans-Pecos region touting good quail numbers.

“So if the wheels don’t fall off — and anybody you’ll talk to adds that caveat — this should be a banner year,” he said.

Maintaining a healthy wild quail population hinges on the success of their annual production, because they are short-lived and have a high mortality rate, said Becky Ruzicka, AgriLife Extension wildlife associate.

“Without large numbers of new birds being added to the population each year it can quickly disappear,” she said. “The importance of prime nesting sites cannot be overstated as quality nesting cover is essential for quail to successfully hatch chicks, because it provides protection from predators and the elements.”

Ruzicka said in Texas, nesting cover is quite often the weakest habitat-related link on most properties.

“We discovered just how limiting proper nesting sites can be through data collected by cooperators in the 2014 Texas Quail Index,” she said. “The Texas Quail Index is a statewide AgriLife Extension program using private land managers, volunteers, AgriLife Extension agents and other agency personnel to collect data on both quail populations and current habitat conditions.”

She said the Texas Quail Index teams used formal habitat evaluations to assess quail habitat statewide and found the most commonly identified deficiency in quail habitat was nesting cover.

“Quality nesting habitat for quail are commonly bunchgrasses, such as little bluestem, that’s at least basketball-sized in diameter and three feet tall,” she said. “However, quail may use other nesting cover types such as prickly pear and yucca if they are available. Even in the presence of excellent bunchgrass nesting cover, quail may select prickly pear nesting locations. Nesting in prickly pear obviously offers more mechanical protection in the form of cactus spines, and thus may give the birds a slightly higher nest success rate compared to bunchgrass nests at the same locations.”

She said quality prickly pear nesting cover is a mature, dense patch typically the diameter of a hula hoop and at least three pads tall or about 18 inches high. When assessing yucca for nesting suitability, she advised looking for large clumps with dead growth at the base that’s big enough to conceal a nesting hen.

“To visualize what it takes to hide a nesting hen, use the toe of your boot,” Ruzicka said. “If you can hide the toe of your boot within the nesting cover in question, whether it is bunchgrass, prickly pear, or yucca, then most likely it will be suitable to conceal a quail’s nest.”

Ruzicka said managers should strive toward having at least 250 to 300 suitable nesting sites per acre to provide adequate nesting cover on their property.

For more information on the quail season forecast, read more from Rollins in AgriLife Today. Read the full AgriLife Today article on quail habitat for more land management tips.

To catch up on the latest in quail management, register for the Statewide Quail Symposium Sept. 16-18 in Abilene.

Water, energy, food symposium to be held Nov. 19 in Austin

Organizers of the Navigating Agriculture through the Water-Energy-Food Nexus Symposium plan to get the agricultural industry talking about how to feed 9 billion people by 2050, in a time of increased competition for limited natural resources, according to David Smith, Texas A&M AgriLife Extension Service program specialist.

The event will be held Nov. 19 at the Omni Austin Hotel Southpark, 4140 Governors Row, in Austin.

The program is for AgriLife Extension educators, technical service providers, regulatory agencies, academic institutions, agricultural commodity groups, producers and agricultural science teachers, Smith said.

Some questions to be addressed include: What are the linkages between water, energy and food systems? What are the interdependencies and tradeoffs that will influence future policy and sustainability of agriculture? How does the water-energy-food nexus function from local to regional scales, and can it be a useful tool for future planning? Is agriculture prepared to manage risks from climate variability and does it have a voice in climate change policy?

“This will be a unique opportunity to hear from a distinguished panel of experts as they discuss these and other issues facing agriculture and the rural communities that support this vital industry,” Smith said.

Registration is limited and is available at agriliferegister.tamu.edu/Nexus.

This event is sponsored by the U.S. Department of Agriculture – National Institute of Food and Agriculture project “Animal Agriculture in a Changing Climate” led by Smith and Dr. Saqib Mukhtar, former AgriLife Extension engineer and associate head of the Texas A&M University department of biological and agricultural engineering.

Read the full AgriLife Today article for speakers and topics, symposium agenda and more details.

For more information, contact Smith at DWSmith@ag.tamu.edu. For more background on the water-energy-food nexus, see this recent *txH$_2$O* article.

As wildfire season continues, landowners can watch for these potential fire situations

Wildfire season is here, and there is fuel to burn, said Dr. Morgan Russell, Texas A&M AgriLife Extension Service range specialist.

During the week of Aug. 9, the Texas A&M Forest Service responded to 68 fires on 22,519 acres, and large fires were reported in Kimble, Edwards, Tom Green and Crockett counties, according to Russell.

“Extremely hot temperatures, low humidity, large amounts of dry grass and increasingly windy conditions are the perfect recipe for cooking up a very busy fire year,” she said.

The National Preparedness Level that monitors fuel and weather conditions, fire activity and resource availability for the Texas Interagency Coordination Center at Lufkin was increased to Level 5, the highest level, on Aug. 13.

“Given the continuing hot and dry weather and the major increase in fire activity, the decision to move to Preparedness Level 5 shows the complexity fire managers are facing to assure adequate firefighting resources are available to protect life, property and our state’s natural resources,” she said.

Russell advised watching out for the following potential wildfire situations over the coming months if dry weather lingers:

- Watch for fires starting in bar ditches along roadways, often caused by cigarettes or idling vehicles. Report the fire immediately to local authorities and clearly state the location.
- Watch for dragging trailer safety chains that can easily spark roadside fires.
- Watch for sparks coming from tire rims running on flat tires.
- Keep all firefighting resources, such as slip-in pickup pumper units and sprayers, filled and ready.
- Be aware of active county burn bans in your area.
- Be careful when welding and when using a chainsaw.

“Hunting season is about to start and with it will come an onslaught of off-road vehicles,” she said. “When driving anything — pickups, utility task vehicles or UTVs and ATVs — through pastures, be aware that idling the vehicle in tall, cured grass can quickly spell disaster. Also, know that grass seed heads impacting the exhaust manifold can start fires.

“If conditions remain as they are, there will probably be some fires set by Mother Nature, but as a rule, most fires start from human carelessness,” she said. “Or, simply not realizing that some common practices, given the right conditions, can actually spark a fire.”

For more information, read the full AgriLife Today article or contact Russell at 325.657.7317 or morgan.russell@ag.tamu.edu. View the Living with Texas Fire video series for more information on prescribed burning and wildfire mitigation.

Public invited to water quality training Sept. 9 in Rancho Viejo for Brownsville-Resaca watersheds

A Texas Watershed Steward workshop on water quality issues related to the Brownsville-Resaca watersheds will be held from 8 a.m. to noon Sept. 9 at the Rancho Viejo Resort and Country Club, 1 Rancho Viejo Drive.

The workshop is presented by the Texas A&M AgriLife Extension Service and the Texas State Soil and Water Conservation Board (TSSWCB), in cooperation with the Texas Water Resources Institute (TWRI).

The training is free to anyone interested in improving water quality in the region. Participants are encouraged to preregister at the Texas Watershed Steward website: tws.tamu.edu.

“This training is designed to help watershed residents improve and protect their water resources by becoming involved in local watershed protection and management activities,” said Michael Kuitu, AgriLife Extension program specialist and coordinator for the Texas Watershed Steward program.

Kuitu said the workshop will include an overview of water quality and watershed management in Texas but will primarily focus on area water quality issues, including current efforts to help improve and protect the Brownsville-Resaca watershed. The workshop will address issues related to the Brownsville-Resaca watershed but will be applicable to all waters in the region.

The training will include a discussion of watershed systems, types and sources of water pollution, and ways to improve and protect water quality. There also will be a group discussion on community-driven watershed protection and management.

“The supportive role local resacas play in regard to wildlife habitat, fresh water storage, stormwater management, recreation, aesthetics and the surrounding cities in general are vital,” said Jaime Flores, TWRI program coordinator for the Arroyo Colorado Watershed Protection Plan Implementation project. “They are truly important water features.”

“Participating in the Texas Watershed Steward program is a great opportunity to get involved and make a difference in your watershed while receiving program materials and even continuing education credits at no cost,” said Dr. Enrique Perez, AgriLife Extension agent for Cameron County.

The Texas Watershed Steward program is funded through a Clean Water Act nonpoint source grant from TSSWCB and the U.S. Environmental Protection Agency.

For more information, read the full AgriLife Today article or contact Kuitu at 979.862.4457 or michael.kuitu@ag.tamu.edu. For more information about watershed protection efforts for the Brownsville-Resaca, contact Flores at 956.969.5607 or jjflores@ag.tamu.edu.

Private water well screening set for Sept. 9 in Hillsboro

The Texas Well Owner Network is offering a water well screening 8:30 –10 a.m. Sept. 9 in Hillsboro to give area residents the opportunity to have their well water tested.

The screening will be held at the Hill County Texas A&M AgriLife Extension Service office, in the Hill County Annex, 126 S. Covington St. in Hillsboro.

A meeting explaining screening results will be held at 6:30 p.m. Sept. 10 at the annex. The Prairielands Groundwater Conservation District will also discuss ongoing programs.

“Private water wells should be tested annually,” said John W. Smith, AgriLife Extension program specialist.

The screening is presented by AgriLife Extension and the Texas Water Resources Institute, in partnership with the AgriLife Extension office in Hill County.

Smith said individuals submitting well water samples should use only sampling bags and bottles from the AgriLife Extension office in Hill County and should properly follow instructions to ensure accurate results. A $10 per sample fee will be collected when bags and bottles are picked up by participants.

The samples must be turned in by 10 a.m. on the day of the screening. Samples will be screened for common contaminants, including total coliform bacteria, *E. coli*, nitrates and high salinity.

Smith said the presence of *E. coli* bacteria in water indicates that waste from humans or warm-blooded animals may have contaminated the water. Water contaminated with *E. coli* is more likely to also have pathogens present that can cause diarrhea, cramps, nausea or other symptoms.

“Water with nitrate nitrogen levels of 10 parts per million is considered unsafe for human consumption,” Smith said. “These nitrate levels above 10 parts per million can disrupt the ability of blood to carry oxygen throughout the body, resulting in a condition called methemoglobinemia. Infants less than 6 months of age and young livestock are most susceptible.”

He added salinity as measured by total dissolved solids will also be determined for each sample. Water with high levels may leave deposits and have a salty taste, and using water with high levels for irrigation may damage soil or plants.

Smith said it is important for those submitting samples to be at the meeting to receive results, learn corrective measures for identified problems and to improve their understanding of private well management.

For more information, contact the AgriLife Extension office in Hill County at 254.582.4022. To learn more about Texas Well Owner Network programs, publications and resources, visit twon.tamu.edu.

Support for the Texas Well Owner Network is provided through Clean Water Act nonpoint source funding from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

Read the full AgriLife Today article.

Natural Resources Training Courses

- Texas Riparian and Stream Ecosystem Workshop – San Gabriel River Watershed, Sept. 3, Georgetown, TX
- Texas Watershed Planning Short Course, Oct. 19-22, Bandera, TX
- Introduction to ArcGIS 10, Oct. 21-22, College Station, TX