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Automated meters research could save consumers water and money

What if an app on your phone could tell you how much water you are using when you take a shower or water your lawn and even calculate how much that water will cost? Would knowing that information change your water habits?

These questions and more are what a new Texas A&M AgriLife and Texas A&M Engineering project is hoping to answer, according to **Dr. Kelly Brumbelow**, associate professor in Texas A&M University's Zachry Department of Civil Engineering and the project's principal investigator.

"The project is investigating the best approaches for achieving household water conservation by using automated water meters," Brumbelow said.

Automated meters are digital water meters that can wirelessly transmit household water usage information to the water provider.

"Working with meter manufacturers and three Texas cities — Georgetown, Round Rock and Arlington — that have installed automated meters in residential neighborhoods, we will determine the best ways to communicate daily, personalized meter information back to homeowners so they become more efficient in their household water use," said Brumbelow, who is also a research engineer for Texas A&M Engineering Experiment Station.

The two-year project, *Achieving Household Water-Use Efficiency Using Automated Metering Infrastructure*, is one of several projects recently funded by money provided to Texas A&M AgriLife Research, Texas A&M AgriLife Extension Service and Texas A&M Engineering Experiment Station by the Texas Legislature. The legislature charged the agencies to address the critical nexus for water-use efficiency as part of addressing the future water needs of Texas.

Other investigators in the project are **Dr. Kevin Wagner**, associate director of the Texas Water Resources Institute; **Dr. Scott Cummings**, associate department head and associate professor of the Texas A&M Agricultural Leadership, Education and Communications Department; and **Joel Andrus**, AgriLife Extension associate with the institute.

"Household water-use efficiency is a crucial piece of the effort to achieve adequate water supplies in Texas' future," Wagner said. "The 2012 state water plan forecasts that municipal water demands (of which household use is the core) will have the fastest rate of growth among all demand categories and be greater than all other categories by 2060. The demands in the water plan cannot be achieved without the development of new technologies and programs for household water-use efficiency."

The team expects to have several thousand homes participate in the project, and they will separate the homes into groups for testing based on location, lot size, demographics or other factors, Andrus said. Each participant will take a survey asking how they want to receive their information and what additional information they want, such as effects on the e

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cost of the water used. The team will analyze the information gathered during the project to determine the communication method that most increases conservation.

Brumbelow said the team will develop a website and mobile app that will automatically push notifications to consumers daily during the test period. “These notifications will provide a summary of water use for that consumer,” he said.

“We are hoping that by providing daily personalized feedback to homeowners on their water use, they can better understand how they use their water and, in turn, change their water conservation behaviors,” Brumbelow said. “We expect to see participants in the project reduce their water use by 5 to 20 percent. This level of water use reduction would constitute a significant fraction of municipal conservation goals in the state water plan.”

Andrus said the study may also help water utilities reduce infrastructure and energy costs.

“Encouraging household water users to use less water during peak demand periods would minimize energy use and reduce the need to spend on more infrastructure,” he said.

Wagner said an outreach and education program directed toward water utilities will teach them how to use the meter technology to reduce water consumption.

IRNR researchers begin statewide quail decline modeling project

Across Texas, wild quail populations have been decreasing. Wildlife scientists continue to study many important aspects of the decline, such as habitat loss and disease occurrence. Researchers at the Texas A&M Institute of Renewable Natural Resources are taking another approach: stepping back and looking at the decline on a larger scale.

The research effort is one of the 13 projects funded by a $2 million biennial exceptional item from the Texas Legislature to support integrated approaches by the Texas A&M AgriLife Extension Service, collaborating with Texas A&M AgriLife Research, to use the resources of The Texas A&M University System and partner with other research institutions to address quail decline.

According to a recent U.S. Fish and Wildlife Service study, quail rank third among the state’s most popular game species, behind deer and dove. Quail hunters contribute to the $1.8 billion in annual hunting-related expenditures in Texas, as reported by the 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation.

“Many quail studies have been more focused regionally or even within a county, but we’re attempting to look at explanatory factors that may explain quail declines, at landscape, ecoregion and statewide scales,” said **Dr. Roel Lopez**, IRNR director. “We hope to integrate not only changes in land demographics, land fragmentation and changes in agricultural land use, but also how population declines correlate with other factors, such as the spread of fire ants, disease occurrences and so forth.”

Using geospatial analysis and computer modeling, the researchers will conduct a meta-analysis, combining results from several other research efforts to create a wider look at population dynamics and spatial factors of quail decline, Lopez said. IRNR has undertaken large-scale analyses like this before, such as the Texas Land Trends project, Lopez said. This effort will be similar, analyzing trends in land use and habitat loss, but through the lens of quail population dynamics, he said.

“Quail have been studied for many years, and despite efforts to maintain populations, numbers continue to decline,” Lopez said. “I think that many quail biologists would recognize that loss and/or changes in habitat quality are a signi[illegible] declines. But, very few studies have tried to quantify that at regional or landscape scales.”

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In addition to using geospatial analysis to identify important links between statewide land use changes, incidences of disease in different quail populations and declines in quail abundance, the *Statewide Landscape Model Evaluating Quail Declines in Texas* project will also provide management and policy recommendations for quail conservation and identify areas in Texas to concentrate those conservation efforts. Habitat restoration and management, and public-private partnerships, for both short-term and long-term management needs, at landscape and statewide scales, are some quail conservation options, Lopez said.

More information about IRNR's wildlife and land conservation research is available online. To learn more about the entire quail decline initiative, see this AgriLife TODAY article, and for more information on projects funded by the initiative, see this article.

Learn about Environmentally Friendly Drilling Systems program in new video

Dr. Susan Stuver, research scientist for the Texas A&M Institute of Renewable Natural Resources (IRNR), works to help reduce the environmental impact of oil and gas development in Texas as part of the Environmentally Friendly Drilling (EFD) Systems program. The EFD program recently released a new video about its work, narrated by Stuver and filmed in DeWitt County in South Texas.

Stuver interviews several researchers from The Texas A&M University System who are conducting field trials on new technologies in air emission measurement and water screening as well as soil and manure sampling in the Eagle Ford Shale region. South Texas shale plays are experiencing unprecedented energy development, and hydraulic fracturing is being used to complete the many wells being drilled in the area, Stuver said.

The EFD program is a partnership of universities, nonprofits, industry and others formed to reduce the environmental footprint of oil and gas operations. The Houston Advanced Research Center (HARC), a nonprofit organization in The Woodlands, manages most of the projects under the program. IRNR and the Texas A&M Engineering Experiment Station's Global Petroleum Research Institute are also part of the program.

The video is one component of several IRNR energy program projects funded under the EFD umbrella, Stuver said. **Jesse Alonzo**, IRNR program manager, also works with her on these projects.

EFD's Technology Integration Program (TIP) was initiated in 2012 to identify and facilitate the integration of various projects that can lower costs, improve performance and reduce the environmental footprint of oil and gas operations. More than 30 universities, 11 national labs, more than 25 oil and gas companies and several consulting firms participate in the TIP Program. Stuver manages and coordinates the 20 plus TIP research projects west of the Mississippi as part of the West Regional Center.

Stuver said IRNR is working with others to develop a better and more advanced air emissions inventory method for oil and gas production. Emissions inventories, which are compilations of pollutant quantities measured over time, are used to help simulate airshed models, much like water sample information is fed into watershed models. Oil and gas production activities can produce such air pollutants as nitrogen oxides, hydrogen sulfide and even particulate matter such as dust and frac sand, Stuver said.

"If the inventories are too conservative and you are overestimating emissions, you are introducing a lot of error into those regional airshed models," she said. "This project's main focus is to improve the models by collecting more accurate data from the oil and gas industry."

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Stuver said there are two ways to collect an inventory of air emissions: by directly measuring emissions with instruments or by estimating emissions with math. Since direct measurement is expensive, much of the emissions are estimated. These emission estimations are calculated using engine load, which includes horsepower and other factors, and multiplying the load by an emissions factor. However, Stuver said, research has shown that these calculations usually overestimate the actual emissions. “If you don’t have proper data for engine load and you assume 100 percent engine load, you can introduce 600 percent error in the regional airshed models for a fracturing operations,” she said.

“We are creating an entirely new calculation system based on fuel consumption instead of horsepower,” she said. “We have found that calculations based on fuel consumption are much more accurate since engines hardly ever run at 100-percent engine load. In fact, for drilling, some engines may not run at all and are there only as back-up.

“Assuming idle engines are running at 100-percent load introduces extreme error whereas fuel consumption gives a much better picture of how much these engines were actually working during a job.”

In another project, IRNR researchers are actually measuring the air emissions. GSI Environmental Inc., a consulting firm, is the contractor for the project; its goal is to establish and develop a protocol for ambient air quality sampling at oil and gas sites. “Currently there is no protocol for sampling air emissions with open path infrared beam technologies from oil and gas sites,” Stuver said.

The group is using advanced field-site equipment called an open path Fourier Transform Infrared or FTIR spectrometry, which is a giant laser that emits harmless infrared beams. “Different air pollutants absorb the infrared spectra differently, so the equipment creates a fingerprint of different pollutants in the air,” Stuver said. “The laser not only detects the air pollutants but also measures them by how much is being absorbed.”

What is not known, she said, is exactly how to use the equipment at oil and gas sites, so IRNR’s researchers are developing a protocol for its use. Stuver said they hope to answer such questions as: Where you put the FTIR? How far downwind you put it? How long do you collect information? How do you calibrate it for testing different chemicals? And how do you best analyze the data with three dimensional weather stations and inverse modeling?

Stuver said this project will help establish what emissions are in the field and if they are significant, and then the team will identify best management practices needed to maximize reductions of those significant emissions.

In another project, which falls under EFD’s Coastal Impacts Technology Program, Stuver said they are conducting a comparison study of emissions released by diesel-powered rig engines and fracture pumps with the same engines equipped with dual-fuel or bi-fuel kits.

IRNR is also working to identify best management and remediation practices and engineering solutions, Stuver said, to address problems because of the introduction and proliferation of invasive plants by oil and gas equipment in the Eagle Ford shale region.

Since oil and gas companies travel to different sites, they sometimes transport nonnative plants and soil on the equipment. “Ranchers are starting to see plants such as tree tobacco, which is poisonous to cattle, or other plants that cattle can’t eat, take over the grass,” she said.

“We are evaluating different types of mobile wash technologies such as equipment wash racks that capture and reuse waste water for cost effectiveness, mobility, water use and reuse, and seed capture.”

Although IRNR’s energy program is currently researching projects associated with fossil fuels, its scope is mu

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“Our energy program also deals with reducing or eliminating any environmental impacts associated with providing power to people, whether you are talking about producing it, which means extracting it from the ground, or generating it, which includes renewable energy such as solar, wind and hydro-thermal,” Stuver said.

Saltcedar leaf beetles prove vital control to invasive tree

Beetles used as biological control of the invasive saltcedar tree in West Texas had another successful year in 2013 as large numbers returned despite late spring freezes last year. The saltcedar leaf beetle population numbers continue to increase and disperse in new areas, said **Dr. Allen Knutson**, Texas A&M AgriLife Extension Service entomologist at Dallas.

Since 2004, when the saltcedar leaf beetles were first established in Big Spring by the United States Department of Agriculture’s Agricultural Research Service and Texas A&M AgriLife entomologists, this biological control strategy for saltcedar has been successful in all of the major watersheds of West Texas, from the riverbanks of the Rio Grande and Pecos to the Upper Colorado and Brazos Rivers and north to the Canadian River in the Texas Panhandle, Knutson said.

There were even reports in October 2013 that the beetles had made their way from the Texas Panhandle into western Oklahoma and north to Kansas, he said.

Beetles are not effective in all areas though, Knutson said. The biological control provided by the leaf beetles requires several years so is a slow method. Where beetles are absent or there is a need for a more rapid control of saltcedar, herbicides and mechanical control are important methods.

Saltcedar invades an estimated 450,000 acres in Texas and often grows in dense thickets along waterways and around reservoirs in West Texas. These thickets crowd out native plants and forage grasses, compete for water and can cause flooding by blocking stream flow. Saltcedar thickets degrade riparian habitats and invade agricultural land enrolled in the Conservation Reserve Program (CRP) managed by the Farm Services Agency (FSA), Knutson said.

Knutson said that in summertime conditions, the beetle larvae will defoliate a saltcedar tree in about 12-14 days by feeding on its leaves and tender bark. The continuous defoliating period every year helps to exhaust the tree’s energy resources, eventually resulting in its death.

The beetles have even been seen to return to prescribed burn areas to feed on portions of saltcedar regrowth, according to Knutson.

The efforts of the saltcedar biological control team and success of the saltcedar beetles as a control method earned the team the Texas A&M AgriLife Vice Chancellor’s Award in Excellence, awarded in January 2014. AgriLife team members include Knutson; **Dr. Jerry Michels**, Texas A&M AgriLife Research entomologist, and his research assistant, **Erin Jones**; and **Dr. Mark Muegge**, AgriLife Extension entomologist.

See this AgriLife TODAY article for more information on the team’s award.

Earth-Kind landscaping school draws variety of green industry, other professionals

More than 40 green industry and other professionals attended the recent Texas Water Star Program presentation of an Earth-Kind landscaping school at the San Antonio Garden Center in San Antonio.

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Attendees included representatives of commercial nurseries, professional landscaping businesses, landscape designers and irrigators, the San Antonio Water System, Master Gardeners and homeowners.

Jared Beaver, Texas A&M AgriLife Extension Service program coordinator for water and natural resources for Bexar County, and **David Rodriguez**, AgriLife Extension horticulturist for Bexar County, coordinated the program. Earth-Kind and the Texas Water Star program were both developed by Texas A&M AgriLife.

“The workshop was designed for recreational, public, and residential landscape irrigators and contractors, grounds maintenance personnel, retail nurseries and other users of urban water resources,” Rodriguez said. “We focused on Earth-Kind landscaping, which incorporates the best practices of both traditional and organic gardening in an environmentally responsible manner.”

Class instruction included presentations on plant selection and landscaping using Texas Superstar plants; tree selection and placement for energy and water conservation; reducing yard waste and reusing landscaping materials; irrigation efficiency and drip irrigation; and an irrigation audit and evaluation demonstration.

“I came to the program to learn more about landscaping in general,” said **Peter Davis**, owner of Davis Company Landscaping of San Antonio. “And specifically, I learned a lot about proper tree trimming and more about low-water-use plants for the landscape, like esperanzas and mountain laurels.”

Water conservation and proper irrigation were major topics discussed at the school.

“We are providing landscape professionals with instruction and management practices that can help them conserve water in recreational, public and residential landscapes in urban areas,” said Beaver, whose position is joint with AgriLife Extension in Bexar County, Texas A&M Institute of Renewable Natural Resources and Texas Water Resources Institute. “One of the biggest uses of municipal water, and the one with the most potential for increased savings, is water use for commercial landscapes and lawns.”

“This program was a really good opportunity to learn more about irrigation technology and efficiency,” said **Kelly Hall**, co-owner of Hall Irrigation Systems and a member of the Green Industry Alliance.

The next area program related to these efforts will be the Spring Grounds Maintenance Conference from 8 a.m. to 4:30 p.m. on **March 28** at Palo Alto College in San Antonio, Beaver said. For more information on the Spring Grounds Maintenance Conference, contact Beaver at 210-467-6575 or jbeaver@ag.tamu.edu.

Read the full AgriLife TODAY article for more information.

Private well owners invited to educational programs across the state

The Texas Well Owner Network (TWON) is hosting water well screening and educational programs in Longview, San Marcos and Bandera this spring. The programs are presented by the Texas A&M AgriLife Extension Service and Texas Water Resources Institute, in partnership with local AgriLife Extension offices.

TWON’s Well Informed education program is 1 hour long and gives well owners the opportunity to have their well water samples screened for common contaminants and then attend a presentation explaining screening results, water well protection practices, wellhead protection and recommendations for remediating well contamination. TWON w
Informed trainings on **March 9** in Longview and **April 9** in San Marcos.

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The program's Well Educated training is a free, one-day educational workshop for Texas residents who depend on household wells for their water needs. Private well owners who want to become familiar with groundwater resources, septic system maintenance, well maintenance, water conservation, water quality and water treatment are encouraged to attend. Participants can also bring their well water samples to be screened for common contaminants. The next Well Educated training will be on **March 22** in Bandera.

Additional trainings will be held through this year and through 2016, according to organizers. To keep up with TWON's schedule of upcoming educational events and to learn more about private water well best practices, go to twon.tamu.edu.

Support for TWON 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.

EPA WaterSense launches H2Otel Challenge to encourage conservation

The U.S. Environmental Protection Agency (EPA) WaterSense program recently launched the H2Otel Challenge for hotels to assess, change and track their water use through best management practices. By tackling projects throughout their properties, hotels can find ways to improve their water efficiency and performance while providing the highest quality experience for guests, according to EPA.

To help hotels make operational changes and meet growing customer demand for green lodging, EPA will present a series of educational webinars, which are available for free and will provide tools based on the online guide, *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities*. WaterSense will also offer outreach materials for hotels to publicize their efforts.

Find more information at epa.gov/watersense/commercial/challenge.html.

New TWRI and IRNR publications

Preliminary evaluation of VTA effectiveness to protect runoff water quality on small pork production facilities in Texas, **K. Wagner, D. Harmel, K. Higgs**, TR-452, 2013.

Grazing, Hunting, and Endangered Species Management are Compatible Practices: Diversifying Income Through a Multi-species Approach.**M. Marshall, B. Hays, R. Reitz, J. Goodwin, M. Machacek, J. C. Cathey**, SP-WF-007, 2014.

Natural Resources Training Courses

Texas Riparian and Stream Ecosystem Workshop – San Bernard River Basin	March 18
Introduction to ArcGIS 10	March 24–25
Introduction to ArcGIS 10	May 13–14
Texas Riparian and Stream Ecosystem Workshop – Arroyo Colorado	April 24
Introduction to ArcGIS 10	July 29–30

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