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A Publication of the Texas Water Resources Institute

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Land and water stewardship

Inside: Landowners, organizations, educators – committed to conservation

Texas A&M AgriLife Research
Texas A&M AgriLife Extension Service
Texas A&M University College of Agriculture and Life Sciences

Working to make every drop count

In my current position as Institute Director, I spend many "windshield" miles driving across our state. It is not hard to find a new construction project along the way during these trips. You can't help but wonder how fast is rural Texas changing and why? Thanks to the new *Texas Land Trends* data, we now know that from 1997 to 2012, Texas experienced a net loss of more than 1 million acres of private farms, ranches and forests to urban development and other nonagricultural uses. That acreage is larger than the state of Rhode Island. In fact, Texas is losing working lands faster than all other states, and this rapid loss of working lands has tremendous implications for our state's water — both its quality and quantity.

In this issue of *txH2O*, we examine this key connection between rural private lands, and land and water stewardship. The lead story looks at what private land stewardship means and the importance of private lands to our state's water resources. We spotlight three award-winning landowners committed to conserving their land and a unique program that markets water as a crop.

Another story highlights a few of the many Texas A&M AgriLife Extension Service programs that promote good stewardship practices to rural landowners, and the following story presents research findings from three researchers studying the barriers to landowners adopting best management practices on their land.

This issue also covers the Texas Water Observatory Network, a Texas A&M University initiative in development by a group of Texas A&M researchers that will help predict and plan for Texas' water future.

Finally, we look back at TWRI's history. This year is the 50th anniversary of the federal Water Resources Research Act, which formally established water resources research institutes in all 50 states. Following the act, Gov. John Connally and the Texas Legislature designated TWRI as the state institute for Texas.

Like the Texas landscape, we likely will continue to see changes and associated challenges. As always, let's continue to make every drop count.

Roel Lopez
Interim Director

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Texas Water Resources Institute
make every drop count

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Trinity River in Anderson County. Photo courtesy of Texas A&M Institute of Renewable Natural Resources.

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Story by Kathy Wythe

Conserving private lands conserves water

Stewardship starts where the first raindrop falls

Former President and Texas native Lyndon B. Johnson once said: "Saving the water and the soil must start where the first raindrop falls."

In Texas, where about 95 percent of the land is privately owned, and 83 percent of that land is rural farms, ranches and forests, it is essential that all Texans understand the interconnection of land and water to ensure the healthy stewardship of both, according to natural resource professionals.

Defining private land stewardship

After 35 years of observing successful rural landowners while working for the U.S. Department of Agriculture–Natural Resources Conservation Service, Steve Nelle is convinced land stewardship is a belief inside a person. "It's a deeply held inner conviction that motivates a landowner to take good care of the land entrusted to them," he said. "It is much deeper than just what they actually do day-to-day, but rather it is what motivates and inspires what they do."

Nelle, who is now retired and works with the Hill Country Land Trust, believes that good stewards take care of the land, not just for their own personal benefit or even for their future generations. "It goes beyond that," he said. "What they do has a benefit to society. I think that is what really sets apart the highest form of stewardship. They are not just

Photo courtesy of Austin Water Utility - Water Quality Protection Lands.

doing this for their own gain, but they realize what they do on a piece of property affects other people downstream; it benefits people they don't even know."

Dr. Neal Wilkins, president of the nonprofit East Wildlife Foundation, also sees private rural land stewardship as more than just taking care of the land.

"It's making sure you have set up a durable, sustainable process of land management that has both elements of productivity and conservation on any one piece of land," Wilkins said. "The real land stewards have figured out how to put land to work but still have it provide the conservation benefits that we consider public benefits. Those public benefits are those things that end up accruing to everyone."

Blair Fitzsimons, chief executive officer of the Texas Agricultural Land Trust (TALT), defines land stewardship in simple terms, echoing what many mothers say to their children: 'Leave something in better shape than you find it.'

"The question is how do we as landowners leave our land in better shape than we find it, and what are the obstacles to doing it?" she said.

Understanding the interconnection

Rain falling on land helps replenish groundwater and surface water supplies. When land is properly managed, rainfall soaks into the ground, recharging aquifers and springs, or flows into streams, rivers and lakes.

"We have no control of how much it rains, where it rains, when it rains," Nelle said. "But good land stewards understand that one of their jobs is to make the most out of every drop that does fall."

Making the most of every drop means making sure every square foot of land has vegetation on it, Nelle said. "So when that rainfall hits, it is hitting a leaf, or it is hitting plant litter and mulch on the ground. It is not hitting bare soil," he said. "Each individual drop is slowly seeping down into the soil surface."

Nelle said for ranchers, making every drop count means responsible and conservative grazing to ensure there is a cover of grass at all times.
For farmers it may mean using cover crops, reducing tillage and retaining standing crop residue after harvest. ⇨

If the land has this cover of vegetation, Nelle said, when it rains hard enough for runoff to occur, the runoff happens gradually, being slowed and filtered by vegetation, reducing floods and producing higher quality water feeding into streams and rivers. "When the runoff leaves the property, it will tend to be clear water, not laden with sediment," he said.

"It makes a critical difference how that land is managed and stewarded and how its soil resources are cared for as to whether that water becomes available as groundwater or as clean surface water, or whether it is squandered and polluted or subjected to excessive evapotranspiration," Wilkins said.

Fitzsimons agreed that stewardship of private rural working lands "is critically important to sustaining our water resources.

"How that private land is managed directly impacts the people who live in San Antonio, Austin, Houston and Dallas. Certainly how the land is managed allows that water to infiltrate and recharge our springs and aquifers, so if the land is not properly managed then the water runs off, and there is no recharge," she said.

Stopping rural land loss

Good land stewardship is not enough to fully protect water resources in Texas, the experts said; the problem of rural land loss must also be addressed. Texas is losing agricultural land to urban development at a rate that is one of the fastest in the country.

"In Texas, where our booming economy is attracting people from all over the country, we lose 250 acres of open space for every 1,000 new residents," Fitzsimons said. "When we lose open space, when land is paved over or divided into smaller and smaller pieces, it can have profound impacts on the recharge zones of our aquifers or the health of our rivers and streambeds."

Dr. Roel Lopez, Texas A&M Institute of Renewable Natural Resources director, agreed that rural land loss and fragmentation need to be reduced, which he believes will happen when people recognize the value of those lands. "Many see rural open land as an empty lot," he said. "We have to be able to change their perspective and tell the story of the interconnectedness between land and water."

Connecting with the urban public

Changing the perspective of the 86 percent urban population who need to recognize and appreciate the connection of private land stewardship to quality urban water supplies is important, the experts said.

Fitzsimons said an increasingly urbanized public needs to be educated on the role of private land stewardship. She said the urban public needs to understand that empty land in rural areas is not land waiting to be developed, but instead it is land already providing essential public benefits, such as drinking water, clean air, quality of life and wildlife habitat.

"Making that connection for the urban public between the role of private land stewardship and maintaining our water resources and where that water comes from is really, really important," she said. "Water doesn't just come out of the tap or bottle. Somewhere it is dependent on some sort of stewardship."

Wilkins said those who understand private lands in rural America and their contribution to the rest of the United States have done a terrible job of translating that to the rest of the people. "Therefore, rural America doesn't get the support it needs.

"I thought my job is to educate landowners and policymakers. Maybe my real job is to find those people who are part of the 86 percent — urban America — and reacquaint them with the vital importance of private land stewardship and what those public benefits are."

Overcoming obstacles

TALT, along with other land stewardship organizations, works with private landowners to help them permanently protect and preserve their land and its natural resources, Fitzsimons said.

Conservation easements are one tool that TALT uses. A conservation easement is a perpetual legal agreement that allows landowners to retain title and management of their property, while forfeiting, donating or selling certain development rights to a land trust to protect the land from commercial or residential development.

"Landowners retire the development rights so the property can never be commercially developed, but it can be used for ongoing agricultural operations," Fitzsimons said.

The cities of San Antonio and Austin are both using land purchases and conservation easements to protect land in the Edwards Aquifer's recharge and contributing zones. (See *Protect our land, protect our water* in *txH2O*, Summer 2014.)

Recognizing the linkage of land stewardship to Texas' water supply and the importance of conservation easements, Texas Speaker of the House Joe Strauss issued an interim charge to the House Committee on Natural Resources to "explore opportunities to encourage voluntary protection

and stewardship of privately owned lands in support of the state's water supply and to protect environmental flow needs in Texas rivers."

He also told the committee to "examine methods in which state agencies, water rights holders and nongovernmental organizations can work together through programs like the Texas Farm and Ranch Lands Conservation Program and the Texas Water Trust."

The Texas Farm and Ranch Lands Conservation Program was created within the Texas General Land Office in 2005 by the 79th Texas Legislature to provide grants to organizations to purchase conservation easements. Its intent, according to its website, is to assist private landowners in protecting land from development and maintaining their land under private ownership and in agricultural production.

"The landowner benefits from the proceeds of the sale, the designated land trust oversees the management of the conservation easement, and the citizens of Texas reap the reward of keeping open space open for generations," according to the program's website.

The program, however, isn't fully funded, and without being compensated for the development rights, many landowners can't afford to donate the conservation easement. TALT and others are hoping the program is funded by the Legislature during the next legislative session.

"It will be a game-changer for Texas if it is," Fitzsimons said.

She said the program offers a solution to the problems of fragmentation and loss of rural land. Many landowners don't want to sell their land for development. "It's their legacy; they love it," she said. "But they need some help to be able to do this, and this program gives them an alternative to holding out or selling out."

Lopez believes the connection of private land stewardship to water stewardship is getting more attention because, as the state is trying to address its water issues, many are looking at new water infrastructure improvements and other water projects.

"But I think there is a realization that a lot of approaches to water supply and sustainability also can come through practices on private lands," he said. "In some cases, it can be a much cheaper approach than other projects. Poor land stewardship results in the squandering of water; good land stewardship results in capture and proper use of water via land management practices.

"There are tremendous opportunities on private lands to optimize the amount of water supply in the state," Lopez said. "There are things that we can do from a water conservation perspective via land management practices that we haven't optimized. Eighty-three percent of raindrops fall on a private farm, ranch or forest in this state. So doesn't it make sense that a significant effort should be made in trying to ensure that lands are in such a condition that we can optimize the amount of water that is captured? I think the answer is yes."

For more information and resources, visit *txH2O* online at twri.tamu.edu/txH2O.

Blanco Creek. Photo courtesy of City of San Antonio Edwards Aquifer Protection Program.

Story by Leslie Lee

COMMITTED TO CONSERVATION

Award-winning landowners share their stewardship strategies

Successful land stewardship requires patience, commitment, innovation and financial investment — especially in Texas, landowners say.

The sprawling 25,000-acre Tanksley Land Company is located in Brewster County. Image credit: TPWD video.

In a state where rainfall is often unpredictable and generating income from wildlife or agriculture can be risky business, the challenge of conserving rural land and water resources is a passion project for many Texas landowners.

"If I was a billionaire, I would buy as many ranches as I could and preserve them all," said Ruthie Russell, owner of Sycamore Canyon Ranch in Val Verde County. "But all I can do is keep doing my best to preserve the land I do have.

"Especially for legacy landowners, land stewardship starts with the deep passion that you have for the land; you're so bonded to it," Russell said.

Russell is a third-generation cattle woman and one of the landowners recently recognized by the Texas Parks and Wildlife Department (TPWD) with a 2014 Lone Star Land Steward Award.

Because land conservation is essential to protecting the state's natural resources, TPWD annually honors land managers and owners in various ecological regions for their accomplishments in land, water and wildlife stewardship, according to TPWD.

"You can always make something better than you received it," said Betty Tanksley, owner of Tanksley Land Company in Brewster County and another award recipient. "As a landowner and rancher, you have to be patient in a lot of respects, and you have to be an optimist and look long-term into the future."

"We demonstrate at Bear Creek Ranch how to use livestock as a tool to improve the land and watershed health," said Robert Potts, president of the Dixon Water Foundation. Located in Parker County near Fort Worth, the ranch is owned by the foundation, which, along with ranch staff, was also recognized with one of the awards.

After years of consistent and innovative conservation, these landowners and managers were each recognized with one of the regional land steward awards. (Three other groups also received awards; see sidebar for the full list of winners.) Each has employed conservation strategies that can help landowners throughout Texas preserve land and water resources.

Strategic grazing benefits more than pastures

The grazing system used on Bear Creek Ranch may seem complicated, but it actually harkens back to simpler times, Potts said. Today the 2,000-acre ranch accommodates 180 head of cattle by using a grazing program that imitates the grazing of native herbivores, he said.

Three of the six 2014 Lone Star Land Steward Award regional winners, clockwise from top left: Ruthie Russell and family; Betty Tanksley and family; staff of the Dixon Water Foundation and Bear Creek Ranch. Photo courtesy of TPWD.

"We use high-intensity, low-duration grazing, where we're moving the cattle every couple of days, mimicking the grazing patterns that you would have had on this landscape when bison were there," Potts said.

The land sits on the shallow soils of the Fort Worth Prairie and has never been plowed, he said. Its native grasses were historically grazed by wild bison and pronghorn.

"The herds would stay in one place for a short time, beat up that land, leave their manure on the ground, fertilize the soil and then move somewhere else and not be back for a while," he said.

The ranch is divided into 32 grazing units, and each is grazed for five to 15 total days each year.

"We keep all our cattle together, in a relatively small part of the ranch, and we move them often," Potts said. "That's the way grasses in this area evolved, and that's the way we've found they do best."

The many conservation benefits of this grazing strategy helped Bear Creek Ranch win the Lone Star Land Steward Award for the Cross Timbers and Prairies region this year. Clint Josey, foundation board chairman, and ranch managers Robbie Tuggle and Danny Parker were also recognized by TPWD with the award.

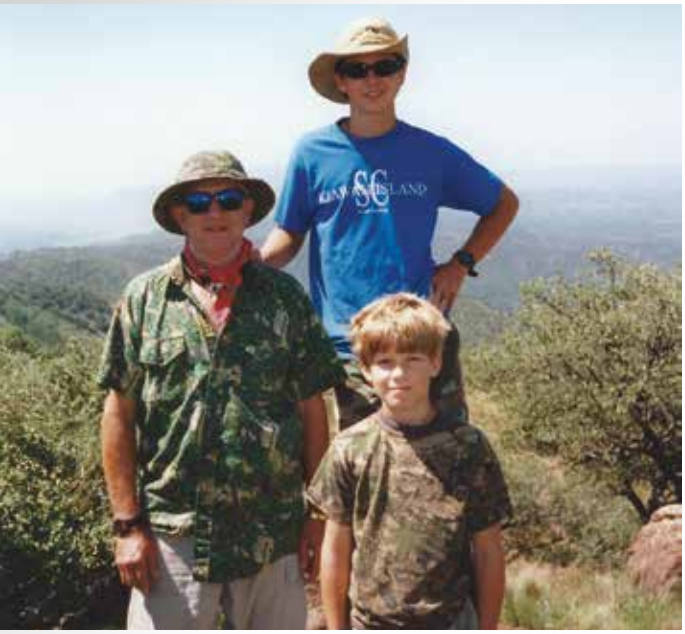
Resting parts of the ranch for long periods helps the grasses build a healthy root system that creates organic matter and nurtures the soil, Potts said, and giving pastures a break also improves water infiltration and decreases runoff and erosion. Healthier pastures and riparian areas have resulted from the foundation's efforts on the ranch, as well as improved wildlife habitat and populations.

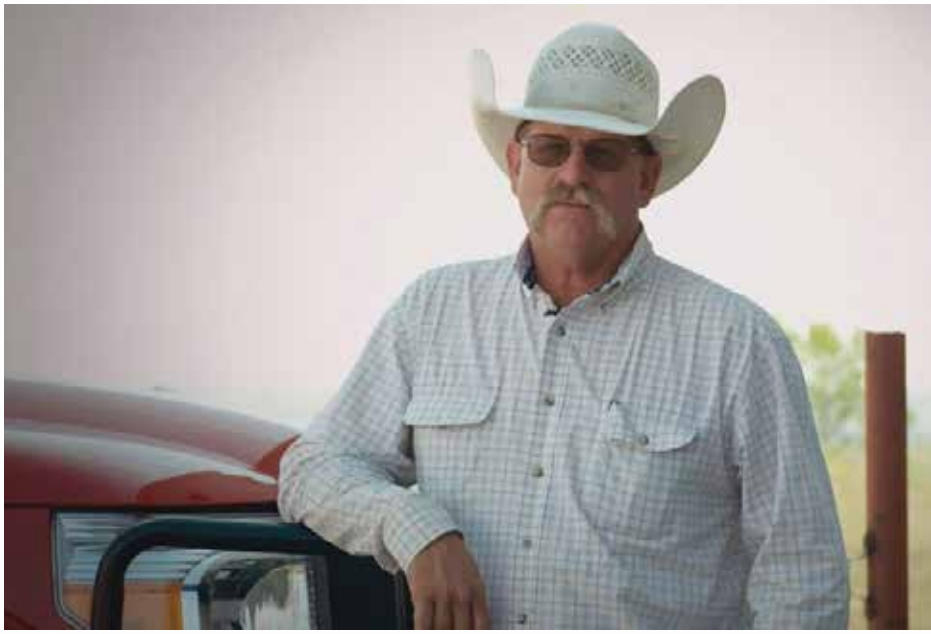
Though the grazing system does require some upfront financial investment for infrastructure, such as fencing and additional water sources for livestock, there is minimal labor involved once the routine is established, and cattle easily adapt to it, Potts said.

"It's not really labor-intensive at all, because the cattle are used to it; all we have to do is open a gate and blow a whistle, and the cattle go through it, because they know there's fresh grass on the other side," he said. "You do have to be out there every day or two, but in terms of moving the cattle, it's very easy.

"In fact, probably in the long term it reduces labor, because our cattle are so used to being around people and being moved, they are very tame and easy to handle when you have to herd them to do vaccinations and those kinds of things."

Educating landowners and the public about economically and environmentally sustainable ⇨





Left Photo: The Russell family has owned and managed their Val Verde County ranch since 1974. Photo courtesy of Ruthie Russell.

Right Photo: Robbie Tuggle is a ranch manager for Dixon Water Foundation's Bear Creek Ranch. Photo courtesy of Dixon Water Foundation.

management practices is a mission of the Dixon Water Foundation, which owns three ranches in North Texas and one in West Texas, each used for research and educational demonstrations. Founded in 1994 by the late Roger Dixon, the foundation began managing Bear Creek Ranch, a Dixon family ranch, in 2005.

Foundation staff members encourage landowners to recognize the benefits of strategic grazing, including the creation of pastures that are more drought-resistant and recover more quickly from drought, Potts said.

"As we're in this drought, and who knows how persistent it will be, it's very important to make the most of every drop of rain," he said. "By keeping the ground covered and giving the grass a chance to recover and build up healthy soil that absorbs water, you make much better use of what water you do get and much better range conditions for your cattle, even in dry times.

"That's what encourages people to do this — the fact that it makes much better use of the rainfall than a continuous grazing system. The question for ranchers is, are you coming into rains with your pastures in good enough shape to respond to it, to hold the water and grow the grass? Or is it so beaten down that the water all runs off?"

A legacy of conservation

Deep in Southwest Texas lies another award-winning property and management team — Tanksley Land Company. Recognized with the 2014 Regional Lone Star Land Steward Award for the Trans Pecos region, the 25,000-acre Tanksley ranch has been in the family since the 1920s. When Betty Tanksley and her late husband, Ben, began managing it in 1989, much of the land was covered by creosote and tarbush. They began using innovative conservation practices to restore the ranch's grasslands and water resources.

"It's typical West Texas high desert," Tanksley said. "Some of it is flat, but it's a varied landscape, and some of it is more receptive to growing grass than other parts. Since we started working it, we have tried to increase the number of native forbs and grasses through land and grazing management."

Tanksley credits her husband for successfully increasing water retention and conservation all across their ranch.

"We built and rebuilt a lot of dams, some spreader dams and some larger dams to hold the water," she said. "Ben also made a lot of divots to hold water and stop so much runoff. I think we certainly improved the grazing capability of the ranch."

To make divots, he used a bulldozer to dig out an area of soil and create an indention, then threw out a native grass seed mix at each divot to increase forage growth. When rains came, the divot would capture and hold water, eventually turning into a small oasis of grass and forbs that provides grazing for livestock and habitat for wildlife.

They also employed spreader dams to capture runoff and carefully planned each water conservation improvement. "Ben studied the land and the way the water flowed," she said.

"Before you can start building these things, you have to really know the lay of the land and the water so that you can put them in the right places and get the most bang for your buck."

Successfully using conservation techniques to improve your land also requires patience and investment, she said.

"Your resources are limited, so you can't afford to do as much as you'd like in a year; you have to say, 'Okay this year we're going to build this dam, or this year we're going to make these divots,'" Tanksley said. "And then of course some years you have good rainfall, and that helps your grass production, and some years you don't. Maybe the next year you'll have pretty good rainfall, and the grasses will appear where they weren't before.

"Some years you'll kind of despair, but then all of a sudden the grasses will respond to rain."

Currently, a portion of the ranch is leased to a cattle operation, sustaining about 220 head, Tanksley said.

"In good years, the ranch could carry more than that, but we're being conservative, because we've been pretty dry the last few years, and we're trying to keep the grass we've grown," she said.

Tanksley advised other landowners to take on conservation improvements as they're able to, because "you can't do everything all at once."

"Don't over-graze," she said. "Try and improve the water retention; maybe build some dams or spreader dams so that you can keep the water that you're getting."

She also emphasized the importance of effective wildlife management and income from wildlife hunting leases, as well as the importance of creating a heritage of conservation.

"I hope that our children and grandchildren will continue the heritage that Ben began with the improvements that we've tried to make," Tanksley said. "I attribute most of the improvements that have been made to my husband's foresight. I think they see that as a heritage that they need to continue, and that's my hope — that they continue with the conservation practices that we began."

Letting wild spaces stay wild

Two counties east of the Tanksley's land is the uniquely situated Sycamore Canyon Ranch. Bordered by the Devils River and holding land transitioning over three ecoregions — Edwards Plateau, Trans Pecos and Chihuahua Desert — the 8,700-acre South Texas ranch has been owned by Russell and her family since 1974.

"It's a beautiful place," Russell said. "We thought that it was key to protect and conserve this land because not only is it a transitional zone for different ecoregions, it also has multiple springs and 3 miles of riparian land along the Devils River."

The river is considered by many as one of the most pristine and remote rivers in Texas, and interest in it has increased in recent years, she said.

"The Devils is a beautiful turquoise color, because the riverbed is limestone rock; it's just gorgeous," Russell said. "So many more people canoe and kayak it these days, and that footprint can cause us ⇨

2014 LONE STAR LAND STEWARD AWARD WINNERS

The annual awards recognize and honor private landowners for their accomplishments in land, water and wildlife stewardship. TPWD's partners in the 2014 awards program were the Sand County Foundation and Texas Parks and Wildlife Foundation, with Toyota as the presenting sponsor.

- Cross Timbers and Prairies region: Bear Creek Ranch, Parker County. Dixon Water Foundation, Clint Josey, board chairman; Robbie Tuggle and Danny Parker, managers.
- Edwards Plateau region: Sycamore Canyon Ranch, Val Verde County. Ruthie Russell and sons McLean and William Russell, owners/operators.
- South Texas Plains region: Laborcitas Creek Ranch, Brooks County. Berdon Lawrence, owner; David Kelly, operator.
- Trans Pecos region: Tanksley Land Company, Brewster County. Betty Tanksley and her late husband, Ben, owners/operators.
- Landowner Cooperative: Hillingdon, Laurels and Leslie Ranches, Kendall County. Owners/operators: Robin, Carol, Grant and Misty Giles; David and Myrna Langford; Roy and Jessica Leslie; Patty Leslie Pasztor and Greg Pasztor.
- Education and Outreach: Sky Lewey, Nueces River Authority and the Open V Ranch, Uvalde County.

Leopold Conservation Award, statewide winner: Winston 8 Ranch, Nacogdoches County. Virginia H. Winston, owner.

problems every now and then, if trash is left or if there's fire damage, but one positive thing about it is that more people care about the river now and want to protect it."

To protect and conserve their land, the first and primary strategy the Russells employed was deferred grazing.

"When we got the ranch, it was very over-grazed from a hundred years of sheep and goats," she said. "So our main strategy was just letting the grass come back, deferring grazing, so that it could filter the water and slow it down and stop erosion. The better grass cover you have, the more water soaks in and the less sediment you get running down into your rivers.

"We've had no livestock on the land and have had it under a wildlife tax exemption for about eight years now. Unlike potentially high-production ranches desiring intense livestock grazing, the steep, stark and rocky slopes of the Devils cry out to be left wild and untouched. Our strategy also has been to control invasive plants like the monocultures of prickly pear moving in as well as huge herds of aoudad (wild Barbary sheep)."

Not having livestock on the land has been essential during drought years, she said.

"A drought limits your options," Russell said. "With conservation, you need to know when to act and when to step back. A landowner always wants to do something, but sometimes the land can heal itself best.

"For instance, if we would have done any bulldozer work during this drought, nothing would have grown back, and the soil would have washed away."

Other strategies the family uses include leasing the land for hunting, which helps manage wildlife populations. Russell said that the hunter currently leasing the land has also put out numerous wildlife watering tanks, taking some grazing pressure off of the riparian areas along the river. To coordinate conservation efforts on the ranch, they also follow a management plan developed under TPWD's advisement, she said.

Another tactic the Russell family has used to preserve their ranch is a conservation easement. Working with the Texas Agricultural Land Trust, the Russell family decided to place their land under an easement and protect it forever from development and fragmentation. A conservation easement is a perpetual legal agreement that allows landowners to retain full title and management of their property, while forfeiting (as in the Russell's case), donating or selling certain development rights to protect the land from commercial or residential development.

"The first thing I wanted to do was get my whole family on board with me on the easement," she said. "I wanted my two sons to really believe in it, and we involved them throughout the whole process."

Russell said that she advises other landowners considering easements to make sure their family, children and heirs are in agreement and participate in negotiating an easement.

"Our whole family has been lucky enough to have grown up on ranches and to have inherited ranches from my grandfather, so my kids are just as passionate as I am about keeping wide-open spaces open and fighting land fragmentation," Russell said.

Although many people might think the Russell's far end of Texas would be immune to fragmentation, that's not the case, she said, and she worries that continued development will stress local water and natural resources.

"The Devils River seems so remote, but along our county roads, in what you think is the middle of nowhere, there are actually subdivisions," she said. "This is barren, stark land; it can't support many people or water wells.

"I'm hoping that other landowners will consider conservation easements and protect the land, water, air, wildlife and habitats here."

Conserving and protecting private lands provides many benefits to the public, Russell said, including natural beauty and open space.

"Some of the other huge benefits are clean air, clean water and wildlife habitat," she said. "Here on the Devils, if you're canoeing the river and you look up, you don't see a bunch of houses — you see wildlife and wide-open land.

"What open space does for the soul is just immeasurable."

For more information and resources, visit *txH2O* online at twri.tamu.edu/txH2O.

Story by Sara Carney

Can we start thinking of water as a crop?

Organization promotes water conservation incentives

Water is not traditionally thought of as a crop, but Water As A Crop® and its partners are hoping to change that. This organization promotes the idea that water falling on private, rural land can be effectively conserved and marketed in a manner similar to crops. In exchange for implementing conservation practices, rural landowners receive financial incentives to reimburse their costs. These conservation practices benefit investors and landowners and preserve water for rural and urban communities alike.

Water As A Crop was founded in 2009 by the Sand County Foundation, a private, nonprofit organization based in Madison, Wisconsin. The organization works nationwide to promote land and water stewardship.

Following the foundation's mission "to advance the use of ethical and scientifically sound land management practices and partnerships for the benefit of people and the environment," Water As A Crop bridges gaps between rural and urban, private and federal, and corporate and individual. The program brings together landowners, local partners and stakeholders interested in funding water conservation in water-stressed areas, said Craig Ficenec, Water As A Crop program director.

Water As A Crop connects watershed stakeholders, including corporations and various conservation groups, interested in providing financial incentives to landowners who implement best management practices (BMPs). These incentives are then used to mitigate the costs of implementing conservation practices.

"The concept is to just get urban investors to reinvest in their water supply by targeting land management practices that will enhance that water supply," said Blake Alldredge, former Texas A&M AgriLife Extension Service associate.

"The premise of Water As A Crop is that much of the land is privately owned, especially in the state of Texas, meaning that the majority of the rainfall falling on the land is on private land," Ficenec said. Therefore, its quality and quantity is, in part, subject to the management practices of that land.

However, there are barriers to proper water stewardship. For instance, urban water users often recognize the importance of clean water but may not fully understand private, rural landowners' critical role in helping produce a clean, plentiful water supply. Some landowners may not be aware of BMPs that help maintain high water quality, or they may not have the financial resources to implement them. ⇨

The Trinity River, which supplies water to a significant portion of Texas, is the site of Water As A Crop's efforts in Texas. Photo by Blake Alldredge.

Water As A Crop emphasizes the responsibility and potential impact both urban and rural residents have in water conservation. By implementing strategies that reduce runoff and conserve water, rural landowners provide clean water for urban residents, Ficenec said. In turn, urban residents and corporations should recognize the contributions of private landowners by investing in these conservation strategies.

"The overall idea with Water As A Crop is that if I [a landowner] save the folks in Houston — downstream from the Trinity — money by not having to clean up the water so much, then how can those dollars and those savings find their way back to the landowners in the watershed to do more conservation work and do it faster? That's the whole concept," said Gary Price, owner of the 77 Ranch in Navarro County.

Using partnerships to protect Texas water

Although the Sand County Foundation and Water As A Crop have nationwide interests, the struggle for water in Texas drew the program here.

"Texas is facing a lot of water issues and is going to need to depend on private lands and how landowners manage their private lands as a major component of how Texas delivers its water needs sustainably into the future," Ficenec said.

Currently, the state water plan does not include recommendations on land management strategies to improve water conservation. Therefore, Texas is a prime candidate for a program wanting to test conservation and management strategies.

The amount of private land ownership, commercial interest and cooperative landowners are the three elements that led to Water As A Crop's work in Texas, Ficenec said.

Because commercial water users' profit margins can be greatly affected by water quality and quantity, there is potential for investments in water stewardship by corporations and other organizations, sources said. Seeing this potential, Water As A Crop partners with companies, such as MillerCoors, which uses water from the Richland-Chambers Reservoir to manufacture and brew beer.

"We started working in Texas and in partnership with MillerCoors, a water user in Fort Worth, who had interest in the watershed, how land is managed in the watershed and how that affects the water quality and quantity in the Richland-Chambers Reservoir, which in turn affects the water supply for its operations," Ficenec said.

Besides MillerCoors, Water As A Crop has also helped coordinate funding from organizations such as the Dixon Water Foundation, Meadows Foundation and Knobloch Family Foundation to support conservation efforts in the Trinity River basin. A significant amount of funding was also provided by the U.S. Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS)'s National Water Quality Initiative and Tarrant Regional Water District.

Workers install a fence on the 77 Ranch as part of Water As A Crop's cost-share program to promote sustainable land management. Photo by Craig Ficenec, Water As A Crop.

Using this funding from collaborators, Sand County Foundation facilitated reimbursement to landowners for the costs of conservation practices such as building fences for rotational grazing and planting riparian buffers, sources said.

The 77 Ranch leads the way

One of the most significant factors in the implementation of Water As A Crop is the cooperation and involvement of local landowners, such as Gary and Sue Price of the 77 Ranch. Water As A Crop officials got to know Gary Price when he was awarded the Leopold Conservation Award from the Sand County Foundation and Texas Parks and Wildlife Department in 2007.

As a rancher in the Trinity's Chambers Creek Watershed, Price has implemented conservation strategies that have the potential to conserve water. He plants and manages native grasses to reduce water loss, while simultaneously managing forage for wildlife and livestock. The Prices also provide educational opportunities for rural and urban residents to learn about the importance of private lands in water conservation.

"We must work together to try to bridge some of those rural-urban gaps," Price said. "One of the things that intrigued us about Water As A Crop is that we both see opportunity when we say that everybody's drinking water comes across somebody's ranch somewhere. So, that means that I play a vital role in a pretty big product."

Because of his interest in private land stewardship and conservation, Price became the "anchor" for Water As A Crop's work in the Chambers Creek Watershed, according to Ficenec. "He's very cooperative and very interested in the concept of how private landowners can deliver water conservation and off-farm water benefits while they are also doing well for themselves by good land management."

The Prices' collaboration with Water As A Crop has led to continual monitoring and data collection efforts on their land to identify the most effective land stewardship practices for conserving water. This information will be used to help landowners make management decisions and will allow investors to see the success of their investments.

Trinity Waters partnership proves fruitful

Water As A Crop's collaboration with Gary Price also opened the door to a partnership with Trinity Waters, a Texas-based organization dedicated to the conservation of the Trinity River, which supplies water to more than 40 percent of the Texas population, according to the group.

From 2010 to 2012 the two organizations conducted a pilot project in which Trinity Waters served as the local implementing partner within the Trinity River Watershed. The project took place in Mill Creek, a tributary of Chambers Creek that supplies urban residents in Fort Worth and surrounding communities via the Richland-Chambers Reservoir and then joins the Trinity River downstream. There, the organizations collected data and educated local landowners through workshops.

"I think [Water As A Crop's] role was to be the Johnny Appleseed, to help come and seed conservation practices in different areas," said Kenneth Cook, Trinity Waters president and board chair.

The work that was initiated in Mill Creek by Water As A Crop and Trinity Waters led to the watershed being selected to participate in the Chambers Creek Water Quality Initiative, the only program in Texas that was part of the USDA-NRCS National Water Quality Initiative, sources said. This allowed federal funds into the area to assist with improving the water quality in Chambers Creek. Around $5 million was contributed to cost-share programs within the Chambers Creek Watershed in 2012 and 2013, Ficenec said.

"The true benefit of the pilot was to show the success and the conservation potential in that market that drew the federal funding attention to it, which was a large portion of the funds for the program," Cook said.

Current efforts, near and far

In Texas, Water As A Crop is currently focused on monitoring and collecting data to compare the effectiveness of different management strategies in conserving water, Ficenec said. This data will allow the organization to better communicate to landowners and address questions regarding which management practices to implement. "It's a matter of outreach and cooperation with landowners and trying to demonstrate the potential benefits to them, both in terms of production and profit," Ficenec said.

"We try to partner with researchers at Texas A&M University and others to look at monitoring and modeling techniques that can come closer to answering those questions," he said. "Because, obviously, if anyone wants to invest in promoting land conservation, which could be through direct financial incentives or outreach and education or whatnot, anyone investing in that wants to know there will be a return."

Much of the monitoring is currently being done on the 77 Ranch. In particular, the amount of precipitation and discharge is being monitored to estimate how much water infiltrates the soil, said Dr. Bill Fox, Texas A&M AgriLife Research scientist. ⇨

Left Photo: Ranchers Gary and Sue Price, owners of the 77 Ranch, were part of the Water As A Crop program. Photo by Blake Alldredge.

Right Photo: Through workshops given on the 77 Ranch, rancher Gary Price educates landowners and others on the importance of land stewardship and its impacts on both land and water. Photo by Blake Alldredge.

"Currently, we are monitoring three small watersheds on Mr. Price's ranch; they're of different vegetation communities," Fox said. Those areas are a tall grass prairie, a mid-grass prairie and a mesquite savannah, and each one reacts differently to water. The data being collected will calibrate the response of these three systems to rainfall and allow future comparisons to be made, he said.

Price has been actively involved in the continued monitoring and allows visitors to the ranch to gain a better understanding of how the monitoring is being done. He stresses the importance of the research, saying that there is nothing like having a landowner look at the monitoring devices and see the data produced, rather than simply reading about it on paper. Providing this information to landowners is key to empowering them in making important management decisions, he said.

"Our monitoring efforts and our research are not focused on trying to develop something to tell somebody to do what they need to do," he said. "What we try to do is develop information so that people can make informed decisions based on their goals, their land needs, their families, whatever it may be."

In addition to working along the Trinity River, Water As A Crop has been involved in various efforts around the nation, including a project in the central Big Sioux River of South Dakota, upstream of the iconic Sioux Falls. Reducing bacteria and sediments in the river are a primary concern for citizens and for Water As A Crop, Ficenec said.

In this region, Water As A Crop is focusing on local soil conditions, which affect the amount of sediment runoff into these streams. The organization is encouraging landowners in the area to adopt practices such as adding cover crops or practicing no-till farming, Ficenec said.

Water As A Crop is also working in the Midwest, particularly in Iowa and Nebraska, areas also affected by water quality issues. In Nebraska the program is focusing on groundwater recharge and irrigation efficiency, Ficenec said, whereas in Iowa it is focused on cropping practices associated with nutrient runoff.

The Sand County Foundation plans to continue expanding Water As A Crop, helping landowners throughout the country and collecting data to inform management practices.

"Water As A Crop still envisions, as a long-term objective, that those end users of water, be they industrial or residential, though a water district or so forth, would actually see enough value in the contributions that private lands could make, providing an ecological service of clean and quality water that leaves their lands and to see that as something worth investing in," Ficenec said.

For more information and resources, visit *txH2O* online at twri.tamu.edu/txH2O.

Story by Sara Carney

EMPOWERING LANDOWNERS

AgriLife Extension programs promote water and natural resource conservation

When it comes to land stewardship, education is essential to implementing best management practices (BMPs) on private lands. Educational programs not only foster awareness of conservation issues and provide landowners with the information necessary to adopt BMPs, but they also empower and inspire landowners to preserve natural resources.

The Texas A&M AgriLife Extension Service has long recognized the value of conservation education and has developed many programs accordingly. Many of the educational programs collect and consolidate information and make that information more accessible to landowners through conferences, trainings and field days. Additionally, these programs connect landowners to scientists and policymakers, empowering them to actively engage in the conservation process.

Riparian areas are vital resources and a focus of AgriLife Extension's educational programs. Photo by Steve Nelle.

Endowment leaves a stewardship legacy

The Bennett Trust Endowment originated from one landowner's deep appreciation of the Edwards Plateau and desire to preserve it, along with AgriLife Extension's wish to carry on those values. Eskel Bennett, a native Texan who retired in Dripping Springs, provided an endowment for AgriLife Extension to continue his tradition of conservation education and preservation of the Edwards Plateau. Bennett was an advocate for land stewardship and used this endowment to continue that advocacy even after his passing in 2006.

"His desire was for us to have the ability to do land stewardship programs in the Edwards Plateau, because that's where [the Bennetts] lived, and that's a property they loved," said Dr. Larry Redmon, Bennett Trust AgriLife Extension specialist. ⇨

The endowment is the first directly given to AgriLife Extension. "Mr. Bennett's gift is an enduring legacy, and our ability to conduct stewardship programs out there will go on indefinitely," Redmon said.

Funded by the endowment, the Bennett Land Stewardship program uses conferences tailored specifically for land management in the Edwards Plateau, covering issues such as brush control, prescribed burning, estate planning, water management and livestock stocking rates.

The "Protecting the Legacy of the Edwards Plateau" conference, held in Kerrville April 23-25, 2013, was the first funded by the endowment. It educated landowners and ranchers on land management practices and the value of land stewardship and included a keynote presentation from Wyman Meinzer, the official state photographer.

The response to the conference was overwhelmingly positive. "It was a great start to what is going to be a long, long series of programs in that part of the state," Redmon said. A second conference is planned for April 22–24, 2015, at the Inn of the Hills Resort and Conference Center in Kerrville.

Learn more about the Bennett Trust at bennetttrust.tamu.edu.

Rookie ranchers learn from the best

For a new or novice landowner, taking on all the responsibilities associated with maintaining a ranch can be intimidating. To help ease this transition, Ranch Management University serves as an introductory course and one-stop shop for beginning ranchers. The workshop covers a wide range of topics associated with ranching and provides a support network to its participants.

Ranch Management University is a five-day event held each April and October in College Station and is paid for by participants. A number of subjects are covered, including livestock and wildlife management, pasture management, natural resource stewardship and water quality issues.

Participants receive specific training on livestock management practices, such as administering vaccinations and dehorning, as well as land management practices, such as introduced and native forage management. Ranchers also learn about issues related to land stewardship, including stocking rates or the amount of livestock a particular piece of land can support.

"When they go home, they actually have the resources to go back and do what we discussed during the week," said Redmon, program coordinator.

The workshop also provides a unique opportunity for participants to interact with experts, including Texas A&M University faculty and AgriLife Extension specialists. This mentorship does not end when the workshop ends; faculty and specialists make themselves available to participants if they need additional support.

"We don't expect them to be perfectly knowledgeable when they come out, but at least they know some questions to ask and some things to be aware of," Redmon said. "And they know who they can contact, because we give them a list of all the faculty involved in the workshop, and they can contact those people at any time and ask them questions."

Ranch Management University attracts various people from different walks of life, including people from outside of Texas, he said. Many participants develop connections while in the program that continue beyond the workshop, and some use the program's Facebook group to continue discussions and share information.

"At the end of the first day, they're all good friends even though they were strangers when they started," Redmon said. "It's amazing how these groups come together and really start to share."

Over their years of running the workshop, Redmon and his colleagues noticed a need for a similar program designed specifically for women who have unexpectedly become landowners. They will be developing such a workshop in the future, he said.

Learn more about Ranch Management University at forages.tamu.edu/workshop.

Lone Star Healthy Streams educates, protects

Currently, there are 273 water bodies in Texas that are considered impaired by bacteria, affecting Texas' ecosystem health and Texans alike. Lone Star Healthy Streams (LSHS) is combating bacterial contamination by educating farmers and ranchers on the impacts of bacterial runoff and how to reduce runoff caused by feral hogs, horses, beef cattle, dairy cattle and poultry. LSHS provides resources for rural landowners, such as presentations, manuals, an interactive website and an online course.

The program was developed in 2007 through a partnership between the Texas State Soil and Water Conservation Board (TSSWCB), the Texas Water Resources Institute (TWRI) and AgriLife Extension, with funding from the U.S. Environmental Protection Agency's (EPA) Clean Water Act 319 program.

Since its inception, LSHS has sought to equip rural landowners with the tools necessary to manage land to support healthy waters. The educational materials provided by LSHS allow landowners to understand the risks of bacterial contamination and how to voluntarily implement BMPs, such as proper grazing, feral hog management and riparian area protection.

Livestock producers can more easily make wise choices for reducing pollution from their operations if they know the benefits of clean water to agricultural operations, current water quality laws and policies, ways bacteria can enter water and solutions available for reducing water quality problems, said Redmon, who also leads the LSHS program.

"A lot of those things are either zero-cost or very low-cost and easy to implement in many cases, so it's basically a matter of making people aware of the issues and the solutions," he said.

"This educational program is a tremendous tool that has been helping landowners throughout the state to reduce bacterial loading from livestock operations and feral hogs," said Dr. Kevin Wagner, TWRI's associate director. "It provides an assortment of resources for the livestock industry, stakeholders and natural resources agencies on bacterial water quality issues related to livestock, as well as measures that can be implemented to improve water quality."

Each manual produced by LSHS has been endorsed by natural resource agencies and industry associations, including the Texas and Southwestern Cattle Raisers Association, U.S. Department of Agriculture-Natural Resources Conservation Service (USDA–NCRS) and Independent Cattlemen's Association of Texas. These manuals are available online at lshs.tamu.edu/publications.

To learn more about LSHS, visit its website at lshs.tamu.edu.

Learn riparian basics, protect a vital resource

Riparian areas are vegetation zones along streams, rivers and lakes that are a vital, though often overlooked, resource. These areas support water for wildlife, livestock and human use. Degradation and erosion of riparian zones often reflect poor ecosystem health of the surrounding area. Through statewide educational programs, the Texas Riparian and Stream Ecosystem Education Program recognizes the importance of riparian areas and the role of landowners and ranchers in conserving them.

Specifically, the riparian program explains how stream and riparian areas function and their benefits. The program also discusses available assistance to implement BMPs, giving participants practical knowledge. "Riparian education programs lead to informed landowners, land managers and public citiz ens who will be more inclined to use practices that improve the management of riparian and stream ecosystems," said Nikki Dictson, TWRI extension program specialist.

"Proper management, protection and restoration of these vital areas directly influence water quality and quantity as well as stabilize stream banks to reduce erosion and improve fish and aquatic habitats and communities among other things."

The riparian program offers resources via trainings, tools on its website, publications and social media outreach. Trainings not only provide general information on riparian areas, but they also address concerns at the local level, Dictson said. Typically, trainings are in locations with impaired watersheds where stakeholders are working on a watershed protection plan (WPP) or total maximum daily load (TMDL).

Workshops are generally one-day events and include both classroom and outdoor presentations along local rivers, streams and bayous. Dictson said the training events connect landowners with local technical and financial resources to improve management and promote healthy watersheds and riparian areas on their land.

"Restoring and protecting riparian areas through improved management is one of the most important things a landowner can do to protect the streams and rivers running through their land," Wagner said. "This program educates landowners on how streams and rivers work and how important riparian area management is to stream health."

The Texas Riparian and Stream Ecosystem Education program is funded by an EPA Clean Water Act 319 grant through TSSWCB and is managed by TWRI.

For more information on the program, visit texasriparian.org. ⇨

Bringing together watershed stakeholders

A vital part of watershed protection and management includes the participation and education of the watershed's stakeholders. The Texas Watershed Steward (TWS) program aims to do just that by hosting events and workshops that provide communities with the necessary know-how to actively engage in protecting and restoring their watersheds.

The program was developed through a partnership between AgriLife Extension and TSSWCB, and since its first workshop in December 2007, TWS has conducted 63 workshops throughout the state.

The critical need for proper education on watershed issues was the primary reason for TWS' genesis, said Galen Roberts, TWS program coordinator. Community members are sometimes unaware of what is needed to protect their watershed or even why the watershed is impaired.

TWS targets areas that have either ongoing or upcoming watershed projects and coordinates with TMDL and WPP efforts, Roberts said. Workshops then coincide with efforts such as TMDLs or WPPs. Additionally, the events are open to anyone interested, from agricultural producers to homeowners, and continuing education credits are offered.

Workshops can be a full or half day and address both general water resource issues and those specific to the local watershed. The course begins by covering watershed basics and then discusses point and nonpoint sources of pollution, and water quality testing and management strategies, among other topics. Lastly, community members currently involved in local watershed protection and management speak about local watershed protection efforts.

The success of TWS is apparent. The program conducts pre- and post-assessments during the workshop, which have shown a 30-percent to 33-percent increase in knowledge related to watershed issues. Additionally, follow-up questionnaires conducted six months after the workshop indicate that participants began to implement some of the practices they learned including soil testing.

Roberts said this illustrates the practical significance of TWS and the impact it has had on watersheds it has reached. "Often times just a simple change in behavior can have a positive impact on water quality, so education is a crucial component of any water quality improvement or management strategy," he said.

For more information on TWS, visit the program's website at tws.tamu.edu.

In a time where future natural resource availability can seem uncertain, the reliability of educational opportunities from AgriLife Extension provides reassurance that Texas land and water can be sustained.

"These programs are tremendously important to helping the state address its water quality issues as well as meet future water needs," Wagner said. "Each of these programs increases the awareness of water and other natural resource issues facing the state but then goes a step farther and shows landowners what they can do to help address these issues."

For more information and resources, visit *txH2O* online at twri.tamu.edu/txH2O.

AgriLife Extension's programs emphasize the effects of conservation practices on water quality and quantity. Plum Creek watershed has benefitted from such programs. Photo by Nikki Dictson, Texas Water Resources Institute.

Story by Kathy Wythe

Learn, see, engage

Motivating landowners to adopt best management practices

Educating cattle ranchers on best management practices helps improve and protect water quality. Photo by Crestock.

For years, natural resources professionals have worked to bridge the gap between research and application by establishing proven best management practices (BMPs) that benefit farms, ranches and working lands as well as improve water quality and quantity.

But what motivates some landowners to adopt these practices while others do not?

Looking at three different scenarios — landowners considering prescribed fire, ranchers adopting conservation practices and farmers using sustainable agricultural techniques —Texas A&M AgriLife experts have found that engagement and education may be the answers.

Motivation requires engagement

Dr. Urs Kreuter, professor in Texas A&M University's Department of Ecosystem Science and Management, studies the human dimensions and social aspects of adoption of land management practices, primarily on rangeland ecosystems. In particular, he looks at land managers' motivations for adopting practices that improve land for nature's benefits, called ecosystem services.

In his research, Kreuter has observed that although education is important in motivating the land manager, the answer isn't always just more education. "So often, the conclusion drawn from research about human actions is that you just have to educate them," Kreuter said. "But education doesn't inevitably lead to behavior change. Putting the message out is important, but more important is getting people engaged."

Kreuter has found that engaging land managers through prescribed burn associations often leads to the successful implementation of one particular BMP: prescribed fire, which restores and sustains healthy rangeland ecosystems. Without periodic fire, woody plants such as the invasive Ashe juniper can overtake rangelands, crowding out herbaceous or nonwoody plants, Kreuter said.

Herbaceous plants, including grasses and forbs, are important because they can inhibit the flow of water over land, therefore improving water infiltration into the soil and helping reduce soil erosion from runoff. "Maintaining that herbaceous component is really critical for maintaining water filtration through the soil and, therefore, water quality, especially in limestone aquifers that supply water to San Antonio, Austin and other towns in the Texas Hill Country," he said.

On the other hand, increasing concentrations of Ashe juniper is detrimental to healthy grasslands and savannas, Kreuter said. "Ashe juniper has a leaf structure that, unless rainfall is heavy, intercepts a tremendous amount of the rainfall, and the rain is evaporated back into the atmosphere and never gets to the ground," he said.

Although fire was previously used in the United States, during the last 200 years many owners and managers worked to keep fire off their land because fire was thought to destroy valuable forage for livestock, Kreuter said. Today periodic prescribed fire is increasingly recognized as necessary for maintaining healthy rangelands and reducing fuel loads that, under the right conditions, can lead to catastrophic wildfires.

The question Kreuter and his graduate students have tried to answer is how to get more landowners to realize the benefits of prescribed fire as a land management tool and reintroduce it on a large scale.

What they found is that the perception of the riskiness of applying fire and other people's perceptions of fire are barriers to land managers adopting the practice.

In recent history, largely because of the Smokey the Bear campaign, Kreuter said, the public has seen fire as unacceptable because it is dangerous.

"This mindset has to change," he said, "from 'fire is bad' to 'fire is necessary.'"

Kreuter said people often think of fire as dangerous, but as their experience with fire increases, perhaps by participating in prescribed burns with other landowners, their perception of risk changes dramatically and they are more likely to use prescribed fire as a BMP.

Research by David Toledo, one of Kreuter's graduate students, found that changing the attitudes of people who influence landowners' behavior and decisions is equally as important as providing opportunities for gaining experience.

Prescribed burn associations help overcome these barriers by providing landowners with both the needed experience and peers' acceptance of fire as a beneficial practice, while creating a vehicle where people can become engaged together, he said.

"The key thing of a prescribed burn association is it provides experience and camaraderie," he said. "It also provides a dynamic where landowners really start working together."

Understanding cattle ranchers' motivations

Dr. Jennifer Peterson became interested in understanding factors influencing the adoption of BMPs through her participation in the Lone Star Healthy Streams program. As former statewide coordinator of the program, Peterson worked with private landowners to educate them about various land management practices to protect water quality and about technical and financial assistance programs that exist to help them.

Peterson, who recently completed her doctorate and is now executive director of Rocky Mountain Field Institute, a nonprofit organization in Colorado Springs, Colorado, chose to research why some Texas beef cattle producers were not adopting the practices promoted through Lone Star Healthy Streams despite the financial assistance programs and the known water quality benefits of the practices. She also hoped to provide recommendations to federal and state natural resource agencies to enhance adoption of BMPs to protect water resources.

Out of the 779 completed surveys, Peterson found that about 89 percent of Texas beef cattle producers were adopting at least one BMP.

Peterson's research also seemed to suggest that engagement — through providing information, demonstrations or one-on-one contact — is important to landowners adopting BMPs.

The biggest barrier for those ranchers not adopting water quality BMPs was that they did not believe they had enough information.

"Not having enough information is very telling," Peterson said. "What that means is if you are Texas A&M AgriLife Extension, there still appears to be some level of disconnect that needs to be filled. What we proposed from this is Extension and the Natural Resources Conservation Service (NRCS) need to work together to have landowners understand the importance of these BMPs and how they are going to work."

Other barriers cited by the ranchers included the practice costing too much out-of-pocket and the rancher not being able to see a field demonstration.

Peterson said that not just her research but also other studies have shown that engaging producers through field demonstrations is important. "Research has shown if they can see the demonstration working, they are more inclined to go back to their property and install a similar practice," she said. "So there has been a big push within Extension with implementing basic demonstration of these practices on the ground so farmers and producers can come and visually see that is how it works."

In addition to looking at the barriers to adopting BMPs, she also studied barriers were keeping them from participating in government-funded cost-share programs. More than 60 percent of the respondents said they did not participate in the cost-share programs.

The biggest reason given was that there were too many requirements for government programs, Peterson said. They were also worried about interference from the government, that the application was too time-consuming and that the practice standards were inflexible.

Peterson investigated 30 unique factors that could influence BMP adoption, including operator's age, farming experience, income, profitability of BMP, risk, attitude towards environment, causes of pollution, total acres, operator's gender, proximity of water body to operation and more.

"We wanted to see if we could predict the adoption of practices and which of these factors more strongly influenced the probability of a producer choosing to adopt a specific practice," she said.

Out of those 30 factors, she said that these four variables were the most telling: gender, education, visits by Extension and visits by NRCS.

Her research showed that the female cattle ranchers surveyed were less likely to adopt practices, particularly ones having to do with planting, such as critical area planting, field borders or grassed waterways, than the male ranchers were. That finding supports the efforts of groups, such as the American Farmland Trust, who are working specifically with women to educate them on these practices and programs.

And although previous research had observed that the more educated a producer was, the more likely he or she was to adopt BMPs, Peterson's research found the opposite. "Those without a bachelor's degree or higher were more likely to adopt practices than those with a degree," she said.

What Peterson said she gleaned from that finding is that informal learning opportunities potentially may be more important to encouraging adoption than formal learning.

Although more than half of the respondents didn't interact with AgriLife Extension in a typical year, when they did, the impact was noticeable, she said.

"When the producer had at least one contact with Extension during the year, Extension seemed to have a huge impact on increasing the probability of that landowner choosing to adopt a practice," she said. "This emphasizes just how significant even one visit per year with Extension can be in helping promote the adoption of conservation practices to protect water quality."

Seeing practice helps agricultural producers

Dr. Allen Berthold, a research scientist for the Texas Water Resources Institute (TWRI), is a recent doctoral graduate in the Agricultural Leadership, Education and Communications Department at Texas A&M University. As part of his dissertation, he examined the barriers that Lower Rio Grande Valley farmers had to adopting sustainable practices. ⇨

Photo courtesy of Texas Parks and Wildlife Department.

Of the 160 respondents, about 47 percent indicated that they had adopted sustainable agricultural practices on their operation and 36 percent indicated that they had not.

Berthold said the barriers identified in his survey of Valley producers were similar to what other research has found: economics and lack of awareness and knowledge. The biggest economic barrier was that the initial costs of installing the BMPs is too high, followed by cost-share levels being too low and no funds were available.

These economic barriers were followed by lack of awareness and knowledge about the practices, Berthold said. "Either the producer didn't know about the cost-share program, didn't know that cost-share funds were available or he or she knew about the practice but didn't know the specifics about it and how it would benefit them," he said.

Berthold said his research results showed consistency with five innovation components outlined in the literature: 1) relative advantage, meaning the new BMP will be better than what was before; 2) complexity, or is it easy to adopt; 3) compatibility, or does it fit my farm; 4) observability, or can you see it work and be successful; and 5) trialability, or can I try it before I implement in full.

Recommendations derived from his research were to better engage stakeholders through education programs and provide them with the information they may need to make decisions about BMPs. Such recommendations included delivering education programs that target producer interests, providing the specifics about practices so that it is clear what the requirements are, lowering cost-share requirements, assisting in funding maintenance costs, and increasing demonstrations about practices and displaying success.

Based on his research findings, Berthold said TWRI is seeking to try to break down the barriers. "We want to provide more technical and complete information on the different BMPs," he said.

Kreuter said some commonalities exist within these studies. "I believe these three case studies showed that education is important but may not be enough for BMPs to be adopted by landowners or land managers," he said.

"Interaction with experienced people — either agency personnel and/or other influential landowners who have adopted these BMPs — is critical to alleviate concerns about lack of knowledge and risk. And finally, informal learning opportunities through on-the-ground demonstrations and peer-to-peer engagement may be more effective for increasing the adoption of BMPs for good land management than formal education efforts."

For more information and resources, visit *txH2O* online at *twri.tamu.edu/txH2O*.

A farmer in the Arroyo Colorado Watershed is applying nutrients to his field at a rate recommended by a soil test as a best management practice. Photo courtesy of the Arroyo Colorado Watershed Partnership.

Story by Amy Buice and Kathy Wythe

TRACKING THE TRENDS

Identifying land use trends can translate into conservation action

Photo courtesy of Texas Parks and Wildlife Department.

If Texans knew the threat that rural land loss and fragmentation posed to their water supplies and recreational activities, would they be more willing to protect those lands and would decision-makers be more likely to support financial incentives for the conservation of those lands?

Through *Texas Land Trends*, the Texas A&M Institute of Renewable Natural Resources (IRNR) is striving to draw clear connections between such threats and their effects by consolidating and analyzing data about property values, land use, land ownership size and population growth.

This data is used to provide timely information to support the conservation of Texas working lands, said Dr. Roel Lopez, IRNR director. Working lands, he said, are privately owned farms, ranches and forests that produce food and fiber, support rural economies and provide wildlife habitat, clean air and water and recreational opportunities.

"Since its inception nearly two decades ago under the leadership and vision of former IRNR Director Dr. Neal Wilkins, the *Texas Land Trends* report has been used in guiding conservation efforts and natural resource policy development," Lopez said. "*Texas Land Trends* has evolved from a paper-based report to an interactive website and database allowing users to query data and better understand changes in Texas' rural landscapes."

Blair Fitzsimons, Texas Agricultural Land Trust (TALT) chief operating officer, said the project provides a valuable source of information for anyone in the natural resources community. "*Texas Land Trends* is a critically important data source for policymakers, conservation organizations, state agencies and federal agencies in terms of looking at what is happening to our land base in Texas," said Fitzsimons, who has been involved in the development of *Texas Land Trends* for years.

Texas Land Trends compares the U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service's Census of Agriculture data, published every five years, to the same period of the Texas State Comptroller of Public Accounts' land use and land value data, said Kevin Skow, IRNR's geographic information systems laboratory manager. Other data used is from the U.S. Census Bureau, USDA National Resources Inventory and the U.S. Department of Commerce/Bureau of Economic Analysis–Regional Economic Information System.

To make the information easier to understand, *Texas Land Trends* uses maps to visualize trends. "Land Trends involves a lot of facts and figures, so we use maps, trends visualizer tools and land trends comparisons to supplement the detailed reports," Skow said.

The interactive website (*txlandtrends.org*) also allows users to compare specific regional and statewide trends, such as population increases between two difference ecoregions or land market values in a particular river basin to the rest of the state, Skow said.

IRNR has recently analyzed the 2012 data and published the first in a series of reports based on the new information. *Status update and trends of Texas rural working lands* (Vol. 1, No. 1) is a five-year trends update of Texas rural working lands. Other reports will examine the status of Texas lands from the perspective of key issues, such as water and energy.

The new data will be incorporated into the interactive website by early 2015.

Current land, population trends

According to Todd Snelgrove, IRNR associate director, the data from the first 2014 report explains factors contributing to Texas' status as one of the leading states in rural farming and ranching land loss.

Snelgrove said Texas had a net loss of 1.1 million acres of working lands to nonagricultural uses from 1997 to 2012, with nearly 100,000 acres lost from 2007 to 2012.

"The loss, however, was significantly lower when compared to previous reporting periods, where the average land loss was nearly 500,000 acres per five-year reporting period, or 100,000 acres annually," Snelgrove said. "The decreased rate of land loss from 2007 to 2012 may be attributed to the economic recession that occurred during this same period. If the economy is a major factor in land loss, the more recent economic growth suggests future working land loss may increase."

The state's increasing population, particularly in and around urban centers, continues to have significant influence on the continued loss of working lands, changing ownership sizes and land values, Snelgrove said.

"From 1997 to 2012, the Texas population increased from 19 million to 26 million residents, an increase of 36 percent or approximately 500,000 new residents annually," he said. "The majority — 87 percent — of the population increase occurred within the state's top 25 highest population growth counties."

These counties are also where most of the rural land loss in the state occurred.

"More than 54 percent of this land conversion was related to development associated with population expansion in the state's 25 fastest growth rate counties," Lopez said. "From 1997 to 2012, approximately 590,000 acres were lost from the agricultural land base in these counties."

The importance of individual decisions

Decisions individuals make about their land, such as selling or converting land for development, are even more important when considering that 95 percent of Texas lands are privately owned and operated, Snelgrove said. Seventeen percent of that private land is developed, while the rest is rural.

Coupled with the increase in population, there are serious implications for the land if private landowners and policymakers are unaware of the importance of rural working lands being kept intact and used sustainably, he said.

"As farms and ranches are increasingly fragmented, people are taking their land out of production because they're not making a living off of it anymore or just because of the pressure from rapid urbanization — large cities growing quickly, a booming economy and people moving to Texas for jobs," Snelgrove said.

He offered the city of Katy as an exemplary case for this trend. Katy, at one time, had some of the best farmland and native prairies in the state, he said. Now, as the Houston metropolitan area grows, these same resources are rapidly being converting to urban uses.

He encouraged Texans — both policymakers and individual landowners — to think about the long-term implications of land loss from a conservation and environmental standpoint.

"These working lands offer many overlooked public benefits; it is imperative we find ways to protect them," Snelgrove said.

Fitzsimons believes that more people are appreciating the value of private lands. "Through *Texas Land Trends*, we have been able to raise awareness that, yes, we have a lot of land in Texas, but we are continuing to lead the country in the loss of working lands, and that loss is having profound impacts on our agricultural base, our water resources and our native wildlife habitat," she said.

For more information and resources, visit *txH2O* online at *twri.tamu.edu/txH2O*.

Photo by istock.

Story by Kathy Wythe

The Texas Water Observatory Network

New Texas A&M initiative will help predict and plan for Texas' water future

Photo by Danielle Kalisek, Texas Water Resources Institute.

Texans who will make future decisions about water — legislators, policymakers and water managers — are grappling with the challenge of better understanding the complexities of water within Texas. A group of Texas A&M University researchers is undertaking that challenge through a planned initiative, the Texas Water Observatory Network.

Still in the development stage, this network would link various types of water data and sensor networks throughout the state and integrate them into computer models. These models would then analyze and assess the state's water availability and quality, which should lead to better informed and more sustainable water management practices, according to the initiative's two leaders.

Dr. Jack Baldauf, executive associate dean and associate dean for research in Texas A&M's College of Geosciences, and Dr. Alan Sams, executive associate dean in Texas A&M's College of Agriculture and Life Sciences (COALS), said the idea for a statewide water network came about through conversations with each other and during the university-wide Grand Challenges and COALS Grand Challenges discussions.

The Texas Water Observatory Network is a spin-off of sorts of the Texas Automated Buoy System, a type of "SmartGulf" network operated by the Texas A&M Geochemical and Environmental Research Group and the Texas General Land Office. The SmartGulf concept uses a network of buoys and gliders — autonomous underwater vehicles — and other tools in the Gulf of Mexico to measure water temperature, water levels, waves and other parameters. Data obtained from the network are used to refine models and better understand such phenomena as the intensity of hurricanes or precipitation coming from the Gulf.

The associate deans envision the Texas Water Observatory Network as eventually being one piece of a future "SmartTexas." Similar to a smart energy grid, SmartTexas would measure and monitor various resources, such as water, energy, air and climate, and their connectivity between each other.

"We have the data and the analytical ability to measure those resources in real time," Sams said. "If you do that enough, you can then model the different resources, which leads to the ability to predict and manage the flow of these resources through society to optimize their use."

The Texas Water Observatory Network would focus on measuring and monitoring the flow of water, Sams said.

The group is currently working on getting funding for the first stage of the observatory network: collecting information. Many federal, state and local water entities collect water data in Texas, ranging from in-stream flows to soil moisture to well contaminants. Baldauf said the group envisions a statewide, web-based data portal that collects this existing data from other networks as well as newly collected data.

The portal will be structured so that the different databases can communicate with each other, and anyone can access the information, Sams said. "The data portal will not be just a place to collect and manage our own data but to interface that with these other existing databases, so we have this one collective database," he said. "It will be a database of databases."

Baldauf said this portal would be a prototype. "If we can demonstrate that it is useful, it has applicability elsewhere."

The next part of the initiative would establish a network of real-time and near-real-time sensors to collect critical information in certain areas of the state, such as a river basin, Sams said. Although there are sensors around the state already collecting water data, there needs to be more sites collecting more information, he said.

Baldauf said they would use the additional data to improve the accuracy and efficiency of existing models, such as climate, precipitation, evaporation and groundwater models. These improved models would then help researchers identify the strategic data needed to keep refining the predictive models.

One question that will need answering, Baldauf said, is "Do you have to collect all the data from the sensors, or can you narrow it down into two or three data streams?"

Baldauf said the researchers may find two data streams that give more insight and can be used as indices for the model, instead of using 16 different data streams, making it more efficient.

Both the models and data would help identify locations within the state that could reveal critical climate or water information. For example, Baldauf said, for predicting drought, there may be changes taking place in West Texas before anywhere else. Additional sensors would then be placed there.

The vision for the network is that it would provide analysis and assessment on the availability and quality of groundwater and surface water as well as forecast climate and weather variability to provide adequate water management planning and technical information.

For example, the network could be used to predict the severity of the next drought, Baldauf said.

Sams said eventually the initiative would establish a dashboard-like tool to help decision-makers make practical management decisions. "A legislator or county judge or water district group isn't going to look at that large database or even the modeling tools that come out of that and be able to make practical decisions out of that," he said. The dashboard would put the information into laymen's terms so it could be used for agricultural planning, policy-setting purposes and municipal water management decisions.

"There are a lot of competing needs for water, and as governmental organizations and regulatory organizations try to make the best policy that they can, they need to have the best information they can get so those policies are appropriate and fair and not harmful to industries," Sams said. "We want to get them the best information."

Baldauf said the observatory network would help provide the data to manage the anticipated, future needs of the state. "We really want to understand what will be the water availability and quality in the future."

For more information and resources, visit *txH2O* online at *twri.tamu.edu/txH2O*.

The Bacterial Source Tracking Team won the 2014 College of Agriculture and Life Sciences Dean's Outstanding Achievement Award for Interdisciplinary Research. Team members are (left to right) Dr. R. Karthikeyan, Department of Biological and Agricultural Engineering (BAEN) associate professor; Dr. Saquib Mukhtar, BAEN associate department head and Extension program leader; Dr. Terry Gentry, Department of Soil and Crop Sciences associate professor; Dr. Raghavan Srinivasan, Spatial Sciences Laboratory director and Department of Ecosystem Science and Management professor; Dr. Roel Lopez, Texas A&M Institute of Renewable Natural Resources director; and Dr. Kevin Wagner, Texas Water Resources Institute associate director. Acting Dean and Vice Chancellor Dr. William Dugas (far right).

Story by Kathy Wythe

50th anniversary

Celebrating the Texas Water Resources Institute: 50 years of the Water Resources Research Act

First established in 1952, TWRI was designated as the water resources institute for the state of Texas in 1964 by the Texas Legislature and Texas Governor after Congress passed and President Lyndon B. Johnson signed into law the Water Resources Research Act (WRRA) of 1964.

"Abundant, good water is essential to continued economic growth and progress," said President Johnson at the time in a prepared statement.

The WRRA established water resources institutes in each state and provided funds for research on solving water issues. Today, TWRI is one of 54 institutes in the National Institute for Water Resources, which serves as the contact between individual institutes and the federal funding sponsor, U.S. Geological Survey.

TWRI today

TWRI helps solve pressing water issues by providing needed expertise and interdisciplinary partnerships. We also deliver important water information to citizens and professionals. Our work centers around three program areas: water quality improvement, water sustainability and security and water resources outreach and training.

1952 Water Research and Information Center established

1963 The Center is renamed the Water Resources Institute

1964 Dr. Ernest T. Smerdon named as Director. Texas A&M University designated as the Water Resources Institute

1968 Dr. Jack R. Runkles named Director

1971 The Institute is renamed the Texas Water Resources Institute

1983 Dr. Wayne Jordan named Director

2000 Dr. C. Allan Jones named Director

2001 Congress funds the Rio Grande Basin Initiative (RGBI)

2005 RGBI receives the Vice Chancellor's Awards in Excellence for the Industry/Agency/University/Association Partnerships

2006 Fort Hood Range Revegetation Pilot Project wins the Texas Environmental Excellence Award (TEEA) in the agriculture category

RGBI wins the Vice Chancellor's Awards in Excellence in the Research Team category

TWRI in 2014

45 news releases
91 media mentions

65 research and extension programs and events with more than **5,000** attendees and **11,880** research and extension contact hours

1,594 Twitter followers and
201 TWRI Facebook likes

16 grants for **$2,795,159**

4 **Texas Environmental Excellence Awards** from the Texas Commission on Environmental Quality

***txH2O* magazine** published twice annually since 2005 with **3,477** subscribers

***Conservation Matters* e-mail newsletter** published monthly since 2005 with **2,538** subscribers

***Texas Water Journal* online peer-reviewed journal** co-published since 2010 with **530** registered users

15 **technical reports published**

*AS OF NOVEMBER 2014

2007
RGBI wins the USDA-CSREES National Water Program Award for Outstanding Integrated Activities for Water Resources

2008
RGBI wins the TEEA in the agriculture category
The Fort Hood Range Revegetation Pilot Project wins the Vice Chancellor's Awards in Excellence - Partnerships/Industry/Agency/University Team

2009
Dr. B.L. Harris named Acting Director

2011
Dr. Neal Wilkins named Director

2012
The Arroyo Colorado Watershed Partnership wins the TEEA in the civic/community category
Dr. Roel Lopez named Interim Director

2013
The Buck Creek Watershed Partnership wins the TEEA in the agricultural category

2014
The Bacterial Source Tracking Team, which includes Associate Director Dr. Kevin Wagner, wins the 2014 College of Agriculture and Life Sciences Dean's Outstanding Achievement Award for Interdisciplinary Research

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