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The OUTDOOR MAGAZINE of TEXAS

The State of Springs

WHY SPRINGS MATTER

by LARRY MCKINNEY

WHO OWNS THE WATER?

by RONALD KAISER

KINNEY COUNTY WATER WARS

by JOE NICK PATOSKI

CANOEING THE LOWER CANYONS

by E. DAN KLEPPER

SPRINGS AS ISLANDS OF LIFE

by WENDEE HOLT CAMP

EL PASO'S WATER PRESSURE

by ROD DAVIS

TOP TEN SWIMMING HOLES

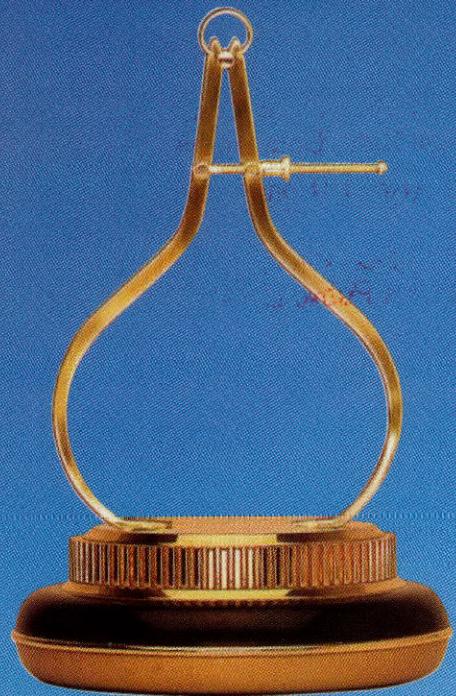
by JOE NICK PATOSKI

REDEFINING THE RANCH

by TOM HARVEY

MEAN GREEN ALIENS

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By *Larry McKinney*

As nourishment for both body and spirit,
springs have no equal.

It's definitely time to get outside! For the latest information on Texas' parks and wildlife, visit the department's Web site: <www.tpwd.state.tx.us>.

You'll find a link to the magazine's Web site (and special subscription offers) on the department's home page.

Covers

FRONT: The Devils River.
Photo © Wyman Meinzer

BACK: Leakey Springs.
Photo by Earl Nottingham.

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Photo © Wyman Meinzer.

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JULY 2005, VOL. 63, NO. 7

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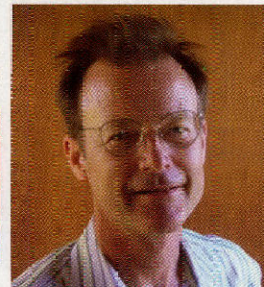
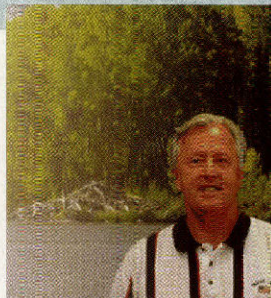
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In the Field



RONALD KAISER, (top left) is a professor of water law and policy at Texas A&M University. He is the chair of the Intercollegiate Water Faculty and helped develop the new graduate water degree program. His research and writing has influenced the development of Texas surface and groundwater law. He is completing a book, *Public Recreation Rights on Texas Lakes and Rivers*, to be published by Texas A&M University Press.

WENDEE HOLT CAMP, (top right) has been a freelance science writer for the past 10 years, with articles published regularly in *Sierra*, *Audubon* and *Discovery Channel Online*, among others. She recently accepted a Research Associate position at the Houston Advanced Research Center in The Woodlands, where she is spearheading Houston's Regional Urban Forests Initiative, a plan to get the residential and business community aware of the benefits of planting trees and conserving forests. She is also writing a Houston Biodiversity Atlas in collaboration with the nonprofit Houston Wilderness.

JOE NICK PATOSKI, (lower right) avid paddler, outdoorsman, conservationist and music aficionado has written extensively about his outdoor adventures for more than 20 years, often in the pages of this magazine. In recent years, he has focused on Texas water issues. He collaborated with photographer Laurence Parent to create the book *Texas Mountians*, published by the University of Texas Press. Patoski and Parent are now working on a book about the Rio Grande, also to come from UT Press.

E. DAN KLEPPER, (lower left) writes and publishes stories on the outdoors, adventure sports, cultural history and the arts. His article on mountain biking Big Bend Ranch State Park, entitled *Solitario Solamente*, won the Gold award for travel writing from the International Regional Magazine Association in 2003. He has authored, under the pen name Edwin Daniels, the book *Wolf Walking*, which won a Texas Outdoor Writers Association Excellence in Graft Award. His latest book is *Spirit Walker ~ JD Challenger and His Art*. Klepper writes from his home in Marathon.

AT ISSUE

FROM THE PEN OF ROBERT L. COOK

Picture in your mind a map of Texas showing only the state's creeks and rivers: no roads, no cities. Notice how the majority of our rivers actually head, or start, far out in West Texas near the Caprock. Only the Rio Grande, the Pecos and the Canadian rivers start in other states. Texas is almost isolated from the "water impacts" of other states by rivers. The Red River blocks off the north, the Sabine protects most of our eastern boundary and the Rio Grande guards our western border. The message here is that, unlike most other states, we control our own destiny when it comes to the future of water in Texas. For all practical purposes, the following rivers and their tributaries start in Texas and flow totally through Texas to reach the Gulf of Mexico: the Devils, the Nueces, the Frio, the Sabinal, the Guadalupe, the Blanco, the San Antonio, the Lavaca, the Navidad, the Concho, the San Saba, the Llano, the Colorado, the Brazos, the Trinity, the Sulphur, the Neches and the Sabine. These are our rivers, the life-blood of Texas — our water supply. If they get messed up or abused, it is our own fault. If they are well-managed and conserved, and if they continue to supply our vast state with an abundance of fresh, clean water for centuries to come, it will be because we made the decisions and took the actions necessary to ensure their continued health and productivity. It is essential to our people, industry and agriculture, as well as to our fish and wildlife, that our rivers continue to flow with an abundance of clean, fresh water through the state and into our bays and estuaries along the Gulf of Mexico.

Follow our rivers upstream from the Gulf and you will see that thousands of small streams, bayous, creeks, tributaries and "draws" feed into the rivers throughout their entire length. From top to bottom, every river is fed by literally hundreds of these small drainages which usually start with a seep, a spring, sometimes dozens of springs. These springs are the result of rainfall soaking into the ground, then reappearing at the surface as cool, clean, fresh spring water. With proper range and habitat management, Texas becomes a huge sponge, soaking up vast quantities of rainfall over millions of acres of land, and, then, slowly, steadily, a portion of this fresh water returns to flow the length of our state in our rivers. Some of the rainfall that is absorbed into this huge sponge which we call Texas accumulates in, and recharges, our aquifers, huge reservoirs of water protected from contamination and evaporation deep underground, and is available for our use as well water.

Now, add today's 20 million people to that map, and make that 40 million Texans in the next 25-30 years, and you will understand why we need to act now ... today ... to conserve, manage and protect every single drop of rainfall that we receive in Texas.

We cannot control when, where or how much it rains. However, we can stop wasting water, we can protect our water supply and we can provide for our state's future water needs if we will properly manage the rangelands and the wildlife habitat of Texas. We can do it. Get involved.

We cannot control when, where or how much it rains. However, we can stop wasting water, we can protect our water supply and we can provide for our state's future water needs if we will properly manage the rangelands and the wildlife habitat of Texas.

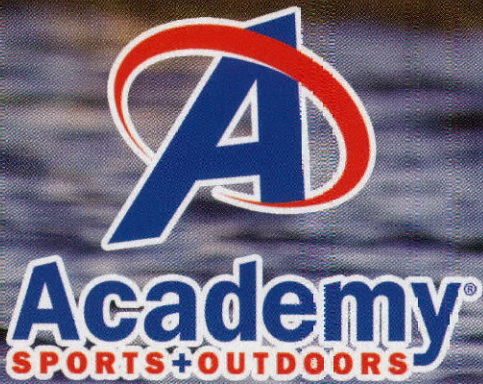


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PICKS, PANS AND PROBES FROM OUR READERS

FOREWORD

Over a period of several weeks this spring, I watched a golden-fronted woodpecker meticulously carve an almost perfectly round hole in a tree near my home. When the work was complete, the edges were so clean it looked as though the hole had been cut with a power saw. After work one evening, I saw a starling dive-bombing the woodpecker, but I figured it was little more than an annoyance to the much larger bird.

A few weeks later, I heard chirping coming from the hole and thought I'd surely see woodpecker chicks poking their little heads out soon. But then it occurred to me that I hadn't seen the woodpecker recently. My suspicions were confirmed one morning when I saw the mother starling feeding its babies.

It's apparently common for starlings to forcibly evict woodpeckers. I was left to wonder: Did the woodpecker build another nest? Did it even reproduce this year? I've never had anything against starlings before, but that woodpecker put a lot of work into that hole. It seemed so unfair.

As we started putting this issue together, I began to see more and more parallels between the opportunistic, aggressive starling and the bully known as *Homo sapiens*. We are like the starlings — loud, obnoxious and consuming everything in sight. Humans are the most destructive and invasive species on the planet. Our unquenchable thirst for water has forcibly evicted countless plants and animals from their native habitats and left parched earth where springs once flowed.

Fortunately, our oversized brains (sometimes) allow us to see the error of our ways. In Texas, we are particularly blessed that many big-brained types — from hydrologists to policy analysts to visionary landowners — have devoted their lives to ensuring that the state has a sustainable water supply. In the course of their work, these professionals produce an unfathomable amount of information — from spring flow studies to satellite maps to relational database models.

We owe a huge debt of gratitude to those experts who've helped us make sense of it all. While many of them are quoted in the stories that follow, others worked tirelessly behind the scenes. I want to offer special thanks to Cindy Loeffler, TPWD's water guru extraordinaire. From our earliest meetings many months ago, she has steadily guided our writers and editors. More than once, she was met with the kind of blank stare that says, "I have no idea what you're talking about. Could you say it again — slowly and with smaller words?" Patiently and with good humor, she did say it again — and again and again — and, in the process, she helped us all learn a lot about the weighty, complex issues related to springs and groundwater. As hard as we've tried to cover the topic thoroughly, there's simply too much information to squeeze into the space available. I hope you'll consider this special issue a jumping-off point for more reading. Then again, maybe all the information anyone needs can be found while sitting beneath a good shade tree, watching the birds and the fish, and listening to the gentle trickle of a spring.

Robert Macias

ROBERT MACIAS
EDITORIAL DIRECTOR

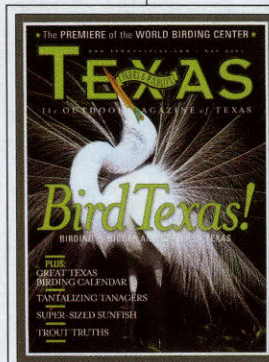
LETTERS

A CURMUDGEON SPEAKS

Being 78, a WWII Veteran, I can at times be a curmudgeon, which is what I choose to be now.

I'm sorry, but I really don't think TP&W magazine needs to be wandering outside Texas to bring us interesting features. Let the birds fly here if you wish to view them. Maybe we should annex Mexico, or let them annex us, since it's hard to tell the difference anymore. Did you have a political agenda with this article?

ROY NAUGLE
Richardson



A dollar spent in Mexico for birdwatching sends a clear message that conservation is good for the birds and for the economy. And that dollar has a much better chance of coming back into the Texas economy than if it were spent in some other country.

**Maria Isabel Araujo
TPWD**

TPW EDITORS RESPOND: Of course we welcome all opinions about the magazine. In order to provide a couple of carefully reasoned responses to this letter, we asked two experts to reply. First, a reply from Maria Isabel Araujo, TPWD's international affairs director, and next from Cliff Shackelford, TPWD's nongame ornithologist.

Texas birdwatchers travel to Mexico because they need to go out of state to add birds to their life lists, and Mexico has about 88 percent of the birds recorded in North America. A dollar spent in Mexico for birdwatching sends a clear message that conservation is good for the birds and for the economy. And that dollar has a much better chance of coming back into the Texas economy than if it were spent in some other country. In the 1990s, TPWD and the state of Tamaulipas offered a South Texas-El Cielo nature tour. The tour was very successful, and the department still gets questions from the public on whether those tours will resume and on the current situation at El Cielo. Last year, Mexico invited Texas to be part of a book on the Tamaulipan Biotic Province, which extends into south Texas. This year, Mexico is pub-

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lishing a book on the shared ecosystem of the Chihuahuan Desert and has invited Texas to participate and showcase the Big Bend region.

María Isabel Araujo

TPWD Director of International Affairs

Species-wise, 52 percent of our state's avifauna winter in tropical America. This includes the El Cielo Biosphere Reserve. My wife and I have participated in two Christmas Bird Counts there (over our holiday break) and I cannot tell you how many of "our" birds overwinter at El Cielo. It's quite amazing. So El Cielo has EVERYTHING to do with our state's avifauna. Without that biosphere reserve and many other protected tropical areas, Texas' birds would be missing part of their home and their life cycle. Many of these species are insect-eating and they benefit us when present. These birds don't respect our political boundaries. These are birds truly without borders!

Cliff Shackelford

Nongame Ornithologist

THRUSH ORTHRASH

Along the chain-link fence at the rear of my office, I have allowed wisteria and another vine to grow, creating an ideal canopy for nesting birds. I have seen cardinals, mockingbirds and other small birds nest in these vines.

Each year, when the leaves begin to appear on the vines, various birds will begin to establish their territory and the mockingbird is very vocal. Just recently, I was listening to what I thought was a mockingbird voicing the various calls usually associated with them and I went to the window, raised it and discovered that the sounds I was hearing were not coming from a mockingbird. The bird was a brown thrush. I was not aware that they could also mimic the other bird's calls. Am I right or wrong? Please advise. Thanks

BILL DENSON

Diana

TPW EDITORS RESPOND: Once again, we're relying on our resident expert, Cliff Shackelford to provide an answer:

You wrote: "The bird was a brown thrush. I was not aware that they could also mimic the other bird's calls. Am I right or wrong? Please advise."

*You must mean the brown thrasher (*Toxostoma rufum*). There is no species in North America by the name of "brown thrush."*

Yes, the brown thrasher is a mimic like the mockingbird and they both belong in the same family,

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Mimidae ("mimic thrushes"). The gray catbird is another well-known member of this family, among others.

Listen to your mimic next time and count the number of repetitions of each note. If a note is done three or more times (rarely twice), then it is a mockingbird. If the note is done twice, sometimes three times, then it is a brown thrasher. Single repetitions sprinkled with little mimicry is typical of the catbird.

So if you hear "chirp, chirp, chirp...dweat, dweat, dweat...zip, zip, zip, zip..." then you have a mocker.

If you hear the above mostly in duos, then it's your

brown thrasher. It's a fun blindfold test because that rule of thumb works quite well.

All three of these birds nest in Texas, often in urban or suburban settings. I have visited some East Texas properties and witnessed all three birds nesting in close proximity.

Enjoy these birds, as their mimicry often reminds you what else is singing nearby. I probably enjoy their rendition of the nocturnal Chuck-will's-widow the most.

Cliff Shackelford

Nongame Ornithologist

FEED THE SQUIRRELS. NOT!

EDITORS' NOTE: In his May "At Issue" column, TPWD Executive Director Robert L. Cook mentioned a "squirrel-proof" bird feeder that he had received as a gift from his granddaughter, Emma. Apparently a lot of our readers are sick of feeding the squirrels via the bird feeder, because we've received several inquiries about this bird feeder. Mr. Cook tells us that the feeder came from an Austin-area company called Beneficial Bug. Here is the Web site: <www.beneficialbug.com/?nd=full&key=10128>

BIRD BLESSINGS

Thanks for a wonderful issue on Texas birds!! We are indeed blessed with a great variety and a never-ending display of color and activity. Birding is growing in popularity, second only to gardening. These tiny creatures add a dimension to our lives unlike any other.

Birds need food, water, nesting sites, and protection from predators. As more and more open areas are swallowed up to make way for housing developments and industry, human assistance in providing these needs becomes necessary. Nuisance species, such as jays and white-wing doves, can be discouraged through the selection of seed offered. Even squirrels can be controlled. Insectivores can be offered suet and meal worms. Specialty feeders are available. I suggest that Mr. Cook visit the nearest Wild Birds Unlimited store to learn about the options available. He may even find a bungee cord for his squirrels!

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TPW MAGAZINE AS FIELD GUIDE

Ed Reznicek from Cedar Creek sent TPWD a sketch of a bird they were trying to identify. Without a photograph it is very tough to help with an ID. Then they opened the May issue of the *Texas Parks & Wildlife* magazine, and on page 25, there is the bird: great kiskadee

They were very excited to identify the culprit and wanted you to know the mystery is solved.

Texas Parks & Wildlife magazine is more than a periodical, it's a field guide!

ELLEN KOTRLA

TPWD Coastal Fisheries Division

BLUE JAY WAY

I have been a subscriber for only a short time but I've greatly enjoyed your



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magazine. The articles about Texas birding are insightful and unique; you can't find those kinds of articles anywhere else. Since I was a kid, I particularly have enjoyed watching the blue jays around my home.

Even as an adult, I still enjoy watching the jays around my house attracted to my feeders. Lately, I have been trying to find whatever materials I could on blue jays, however, I can't seem to find much. I wonder if you could direct me to some sources on books or articles on blue jays. I have been looking for some locally and on the internet but the pickings are slim.

Anything you could direct me to will be greatly appreciated.

DAVID FLORES
Fort Worth

EDITORS' NOTE: Yet again, we call on TPWD Nongame Ornithologist Cliff Shackelford. His reply: Try doing another google.com search but spell the name with two words "blue jay". Use the singular ... no "s" at the end. This is the correct way to type the bird's name (not one word). I just tried it, and literally, there were over 8 million links presented (like this worthy one from Cornell Lab of Ornithology): <www.birds.cornell.edu/programs/AllAboutBirds/BirdGuide/Blue_Jay.html>

This is a very popular and widespread bird across most of Texas and the eastern and central U.S. I'm sure that you'll find lots of worthy info online. Your local library can be a good source of info on the species as well. There are several good books on the Family Corvidae (jays, crows, ravens, magpies and allies). A very neat group of birds indeed. Good luck with your quest.

Sound off for "Mail Call!"

Let us hear from you!

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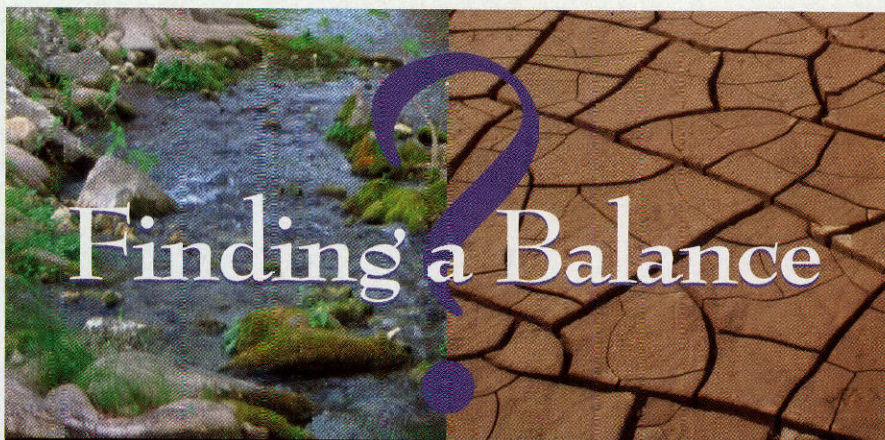
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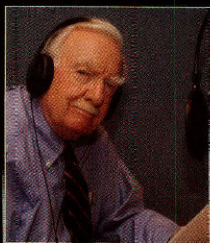
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NEWS AND VIEWS IN THE TEXAS OUTDOORS

FLOATING ON GROUNDWATER

*How spring flows sustain wild rice, fountain darters and *Turisticus aquaticus*.*

In good weather, on holiday weekends, it's easy to spot the burgeoning droves of species *Turisticus aquaticus* along spring-fed rivers and swimming holes.

From Barton Springs Pool in Austin to Balmorhea State Park in arid West Texas, the love affair between Texans and cool, refreshing springs is by no means limited to the Comal, San Marcos and Guadalupe rivers.

But it is here that the connection between groundwater and tourism becomes as crystal-clear as the springs themselves.

"The tourism industry in the immediate New Braunfels area is worth more than \$200 million per year according to state tourism researchers, and 70 percent of that is water-dependent," says Michael Meek, New Braunfels Chamber of Commerce president.

"Our tourism industry has all our eggs in one basket, and that's Comal Springs, Texas' largest natural flowing springs. When they

The spring-fed San Marcos River offers a beautiful setting for recreation, and it is the only known home for endangered Texas wild rice, the underwater grass pictured below.



PHOTO BY EARL NOTTINGHAM

flow it's great for tourism and when they don't, it's not. Periods of drought and low flow have a very negative impact."

Below Landa Park, where the springs emerge, the Comal River is mostly spring water. According to U.S. Geological Survey records, there was no flow in the springs from early June 1956 through November 1956. Even though this is the only time the springs stopped flowing entirely, concerns remain that increasing pumping threatens the Edwards Aquifer, the underground, water-bearing rock layer that keeps the region's springs and rivers flowing.

In response to an endangered species lawsuit, the city of San Antonio has adopted more stringent mandatory water conservation rules that help protect rare plant and animal species — such as Texas wild rice and the fountain darter (a tiny fish) — sustained by the aquifer and springs. The more stringent conservation rules are applauded by spring-dependent tourism communities.

"Our largest industry is tourism, so we want to maintain a constant [spring] flow in order to maintain not only river-based tourism but water for our citizens," says Comal County Judge Danny Scheel. "River recreation is the basis of our economy. We estimate that on any given weekend, we have approximately 300,000 visitors in the county."

So great is the importance of river recreation that the region boasts a unique quasi-governmental body formed to regulate it — the Water Oriented Recreation District, created by the Texas Legislature in 1987. W.O.R.D. issues free permits to water recreation businesses such as B&Bs, motels, canoe and kayak outfitters and campground operators, and they collect taxes to fund the state's only water recreation district. W.O.R.D. pays for law enforcement, litter cleanups, trout stockings and youth fishing events along 40 miles of the Guadalupe River.

Even the region's best-known water recreation business relies indirectly on the springs. Schlitterbahn's founders, the Henry family, started their riverfront resort in 1979. Although the two newer Schlitterbahn areas use city tap water, their original tube slides still rely on Comal River water that is mostly spring flow, recirculating it through the slides and back to the river.

"We're very concerned about the spring flow in the Comal, both the quality and the quantity," says Sherrie Brammall, Schlitterbahn communications director.

"We could use city water, but our guests like that spring water. Protecting spring flow is a critical issue, both for recreational use and for flora and fauna in that river. It's a natural treasure."

— Tom Harvey

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Legislative Highlights

Water was a hot issue for 79th Legislature.

At this writing, a handful of proposed new laws concerning water resources were still alive in the Texas Legislature. Many of these concern groundwater and springs, and all would affect fish and wildlife.

The big one was Senate Bill 3, which was supported by elected leaders and conservation groups, but which died in the House of Representatives. This bill would have set aside a certain amount of water for wildlife and the environment. It would also have allowed existing water rights holders to "voluntarily convert reasonable amounts of existing water rights to use for environmental flow protection," a provision that opens the way for conservation groups to acquire existing water rights and dedicate them for wildlife. The bill sought to balance wildlife needs with other beneficial uses, including provisions to release environmental set-aside water for other needs in emergency situations. SB 3 specifically recognized the importance of land stewardship, stating that "... land stewardship enhances the efficiency and effectiveness

of this state's watersheds by helping to increase surface and groundwater supplies, resulting in a benefit to the natural resources of this state and to the general public." At press time, a last-ditch effort was underway to try to attach some of these provisions to other legislation.

SB 3 was the latest in a series of landmark water laws. Almost a decade ago, SB 1 required for the first time that environmental water needs be considered alongside cities, industry and agriculture. SB 2 in a later session helped clarify the rules and directed state agencies to determine how much water is needed for rivers to protect their ecological health.

A number of bills, if passed, would affect interbasin transfers, allowing senior water rights to remain senior after transfer. Current law requires that when water is transferred from one river basin to another, it becomes a junior water right in the new basin.

Several bills could implement recommendations of the Water Conservation

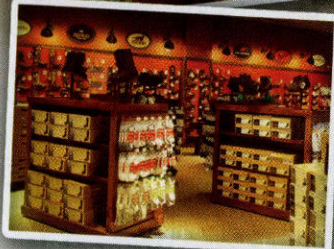
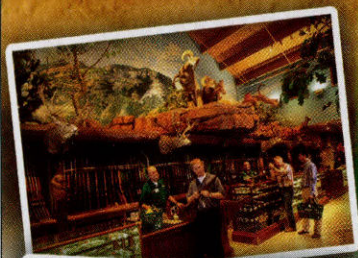
Task Force set up by the legislature last year, a group that included Texas Parks and Wildlife Department Executive Director Robert L. Cook. These include promoting water conservation through public awareness efforts, prioritizing funding for water conservation, requiring conservation plans from some public utilities and reviewing existing rules that tend to work against conservation.

Another suite of bills in the session concerned groundwater, many of them stimulated by controversial proposals to pump and sell water on state land in western Texas. If passed, these would have created a moratorium and a new process for leasing state-owned land for groundwater production, provide ownership rights for groundwater in-place (as opposed to pumped water), make the Texas Water Development Board the ultimate decision maker on groundwater availability, create a conflict resolution process for disagreements on groundwater plans and require state-owned land to be subject to groundwater district rules.

For the latest information on specific legislation, visit <<http://www.capitol.state.tx.us/tlo/legislation/legislation.htm>>

— Tom Harvey

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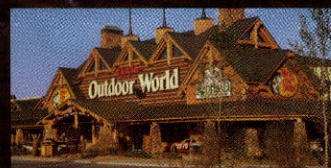
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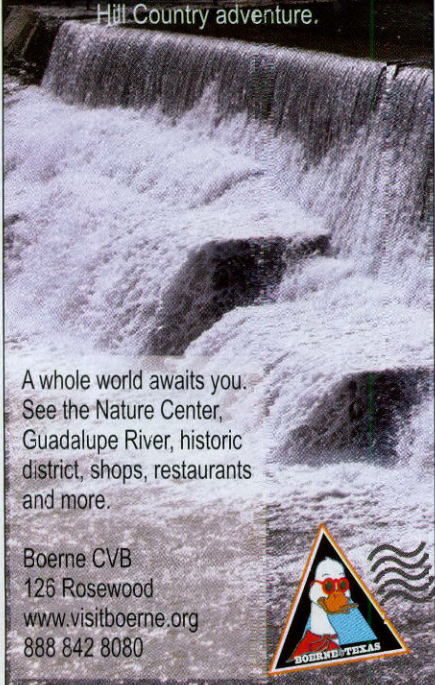
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PICTURE THIS

Our chief photographer shares his insights.

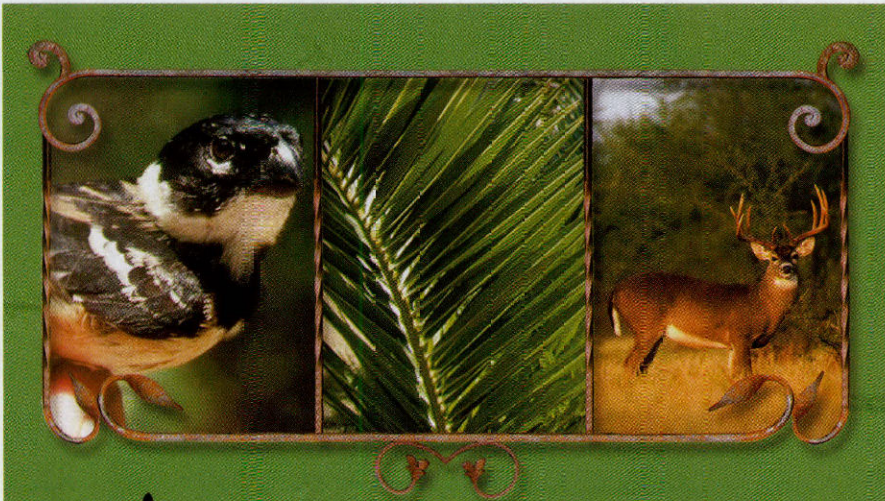
After photographing a spectacular Texas sunset, it just seems natural to put the camera away for the day and head to the house. After all, no more sunlight, no more pictures – right? Wrong. Thanks to today's fast films and

sensitive digital sensors, even the waning minutes of daylight contain plenty of useful light that brings a palette of pastel to the landscape and offers new photographic opportunities to those with the patience to try something just a little bit different.

Although subdued to our human eye, the last few minutes of visible daylight contain an abundance of visual information for the camera, and while the lighting is not as "contrasty" nor the color as vivid as a sunlit photo, it can yield delicate and sometimes unexpected renderings of ordinary scenes, changing minute by minute.

A couple of considerations when shooting at this time of day, however: Be aware that exposures can be very slow, generally ranging anywhere from one second up to one minute, requiring the use of a sturdy tripod or other stable surface to avoid camera motion during exposure. Using a cable release or camera self-timer mode will also help minimize vibration. Also, if using film you will probably need to increase your exposure over and above the camera's indicated exposure in order to compensate for the phenomenon known as reciprocity in which film gradually loses its published sensitivity (ISO rating) as exposure lengthens. Reciprocity factors vary among films so consult the film's information sheet or manufacturer's Web site for compensation data.

—Earl Nottingham



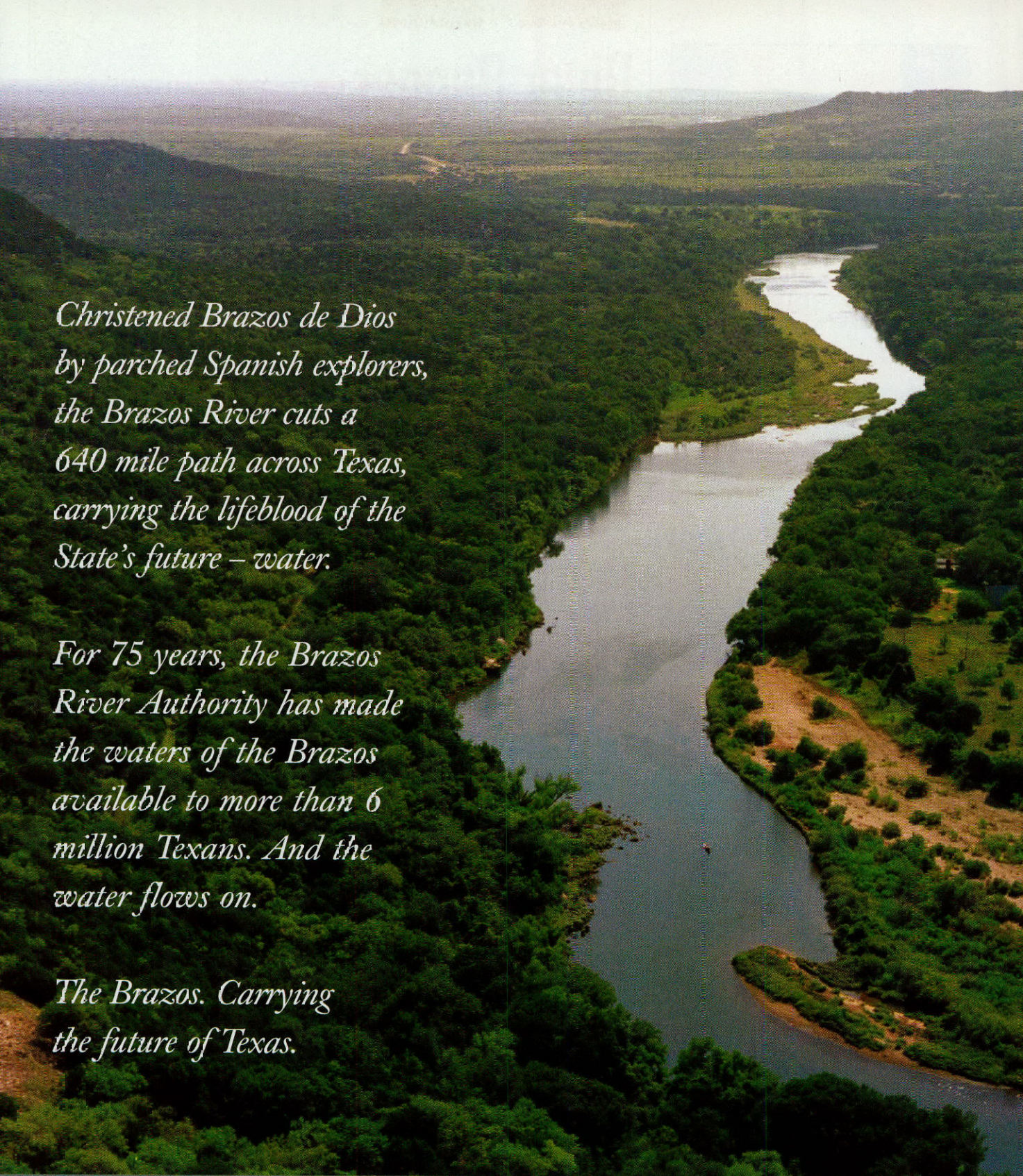
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River Ranger

Marcos Paredes calls the spring-fed stretch of the Rio Grande home.

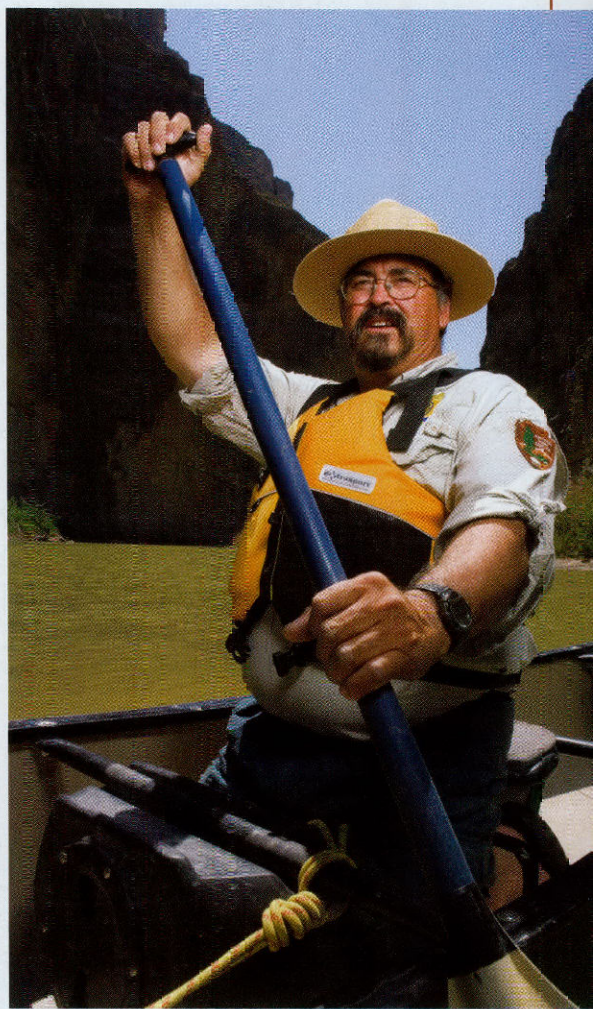
Marcos Paredes is a man who isn't afraid of getting wet — or even of getting thrashed in a hail storm. There may even be a part of him that enjoys it. The National Park Service Ranger believes that our isolation from the weather is one of the reasons we have grown less observant of the natural world. It is, he thinks, possible to be too protected from the environment. So, if in the course of patrolling his 245-mile stretch of the Rio Grande, he dives into the river seeking protection from hail that could beat the hat off his head, he considers it more than part of his job — it's almost an honor to do something day in and out that requires that level of being in the moment. At the very least, it makes a good story around the campfire.

There have been a lot of campfires and as many stories in the 20 years the District Ranger has patrolled the southern boundary of Big Bend National Park from Lajitas to the Terrell/Val Verde County line. Some of the accounts involve capital A adventures: daring river rescues of men washed from horseback while fording the river, eye-to-eye encounters with snakes, skirmishes with saltcedar and canoes lost to flash floods. (The last story he won't confirm. "I would never admit doing that — if I had done it, I'd deny it. Lose your boat," he almost chortles, "that would be embarrassing." His repressed laughter rumbles like thunder as he concedes, "If you do anything long enough, everything will happen to you.")

It's apparent Paredes loves his work. What most delights him, he says, is that his "typical day is not typical." The oldest of 13 children, he bounced from Eagle Pass to Arizona, spending many hours of his formative years on the back

of his Uncle Ray's tractor. It is an experience he credits with opening his eyes to the rhythms of the natural world. And while it may seem ironic that the boy whose teacher labeled him "incorrigible" (Paredes looked it up and thought it was apt) grew up to work for a federal bureaucracy, the ranger who now prefers to think of himself as "independent," considers the river his employer. "The river has given me my livelihood," he says. "I owe the river a lot. I work for the Rio Grande first, and then I work for the National Park Service."

Under the ranger's auspices is the spring-fed stretch of the Rio Grande that's been designated Wild and Scenic and his duties are often set by the river's needs. He is deeply involved in resource management projects but when asked to



describe what he does, the man who can tell you the date he saw his first turkey buzzard this spring, calls himself a “paid observer.” He downplays the more dramatic days and describes his life as one of simple satisfaction where his part as facilitator and witness to more quiet triumphs — increasing numbers of slider turtles and river mussels in the lower canyons, efforts to reintroduce blue suckers and Rio Grande silvery minnows — make the greatest stories of all.

Paredes, 49, worked as a river and horse trail guide in West Virginia, Mexico and Guatemala before settling in at Big Bend. And while he spends a great portion of his time on the river, he can also spend long days in the saddle rounding up trespassing stock. When he's not on horseback, he's most likely paddling a canoe — or aboard a hover craft. His day ends, more or less, when the sun sets. As he says, “I don't come in till I can't see anymore.” Some mornings he rises as early as 5 a.m. because the predawn hours can be his most satisfying. “My favorite time of day is just before the sun comes up — a brand new day nobody has screwed up. Sometimes it takes a while for that to happen; sometimes you get through the whole day and everything is just fine.”

When Paredes is on river patrol, he spends three to 10 days in a canoe; days spent watching the banks, the water, the horizons and the air. It is not a solitary job. “I am always spending days in the back country with people who are specialists in their field. The people I get to hang around with have taught me more than I ever learned in my formal education,” says Paredes, who is remarkably knowledgeable about Rio Grande flora and fauna. “I think that's one of the great benefits of what I do. The people who enjoy doing the same kinds of things I do are the people that I get to hang around with.”

Who he hangs with is easy; where he likes to hang is a more difficult question. “You know people are always asking me ‘Which is your favorite canyon?’ or ‘What's your favorite place?’ I have seven sisters and that is like asking ‘Which of your sisters is your favorite?’ If I have to answer, I'd say I like the lower canyons mostly because more is better and there are more of the lower canyons than anything else. It's way out there ... it is a place where you can travel and not run into other folks sometimes for the whole trip.”

“I think there's very little wilderness left in the world now. All we can hope for is the illusion of wilderness and that's what you

get out there — the illusion of wilderness.”

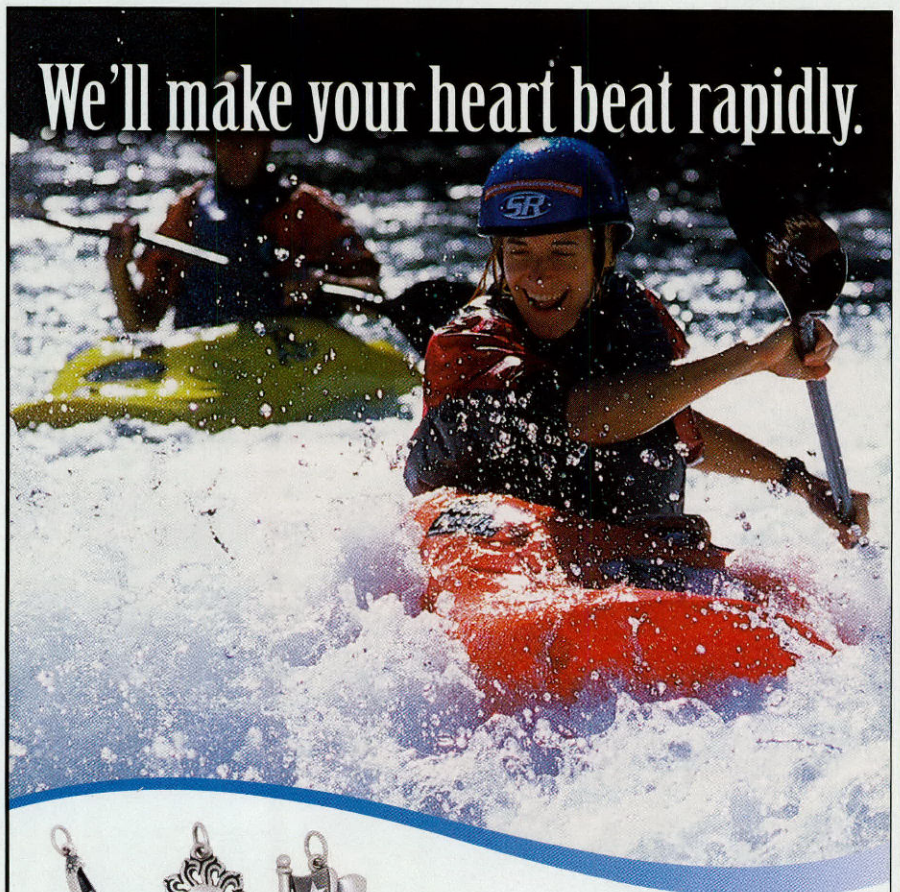
That isn't to say he's not optimistic about the future of the Rio Grande: “One of the things I've been trying to do ... rather than focus on the negative ... I've been trying to show folks that along the Wild and Scenic, we've got a chunk of river that's about as healthy as you could hope to find anywhere. And we should really concentrate on preserving that. I am optimistic. I think that every day more and more people are becoming aware of what we're doing to this river and what needs to be done to protect it.”

When it comes to activism, Paredes not only talks the talk, he walks the walk. He

has been involved in the Forgotten River Action Committee since its founding and also sits on the Texas Rivers Conservation Advisory Board for the Texas Parks and Wildlife Department. Closer to home, he serves on the board of the Terlingua Fire and DMS and is active in private efforts to stop proposed low-grade coal mining in the area. Then there's the home he and his wife have been building for eight years and the little league park he hopes to see finished soon.

“I don't have any spare time. That's by design. Why would you have spare time? You make sure you fill it with something.”

— Barbara Rodriguez



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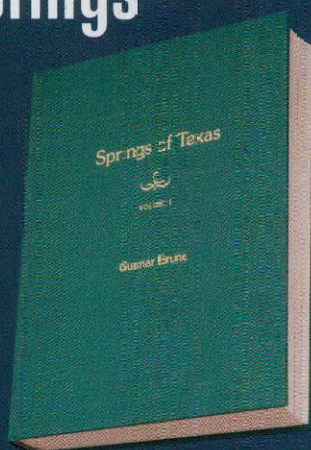
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Reading About Springs

Springs of Texas deserves an exalted status on a shelf all its own in the library of every conservationist, naturalist or even the everyday concerned citizen. Gunnar Brune's encyclopedic tome, resurrected from obscurity by Helen Besse and Texas A&M University Press, describes the state's springs with detailed first-hand history as well as geological and archeological details. Actually, this book, as comprehensive as it seems, is only volume one of an intended two-volume set. Volume two was to describe the springs in the 71 counties not covered by volume one.

Helen Besse has taken on the daunting role of disciple in evangelizing Brune's mission, but credits a community of dedicated individuals and organizations — including Coastal Fisheries Director Larry McKinney of TPWD — for pitching in to make this important book a reality.

Even the endpapers — an 1854 map of the Brazos and Wichita rivers as explored



by Captain R.B. Marcy — point out that springs have long been essential landmarks for the people of the region. The content was compiled by Brune in the course of a 10-year research odyssey, a true life's work that followed 33 years with the U.S. Soil Conservation Service and seven years with the Texas Water Development Board.

Besse's introduction to the second edition emphasizes the importance of

Brune's work, adding essential information such as a "Selected list of 'vanishing species' in Texas that are dependent on springs."

— Charles Lohrmann

Water Follies

What do wild blueberries, perfect french fries and bottled spring water have in common? They've all been linked to the destruction of some of America's most fragile ecosystems by Robert Glennon in his book *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters* (Island Press, 304 pages with photographs and appendices, \$17.95 paper). Glennon, the Morris K. Udall Professor of Law and Public Policy at the James E. Rogers College of Law at the University of Arizona, gives a compelling description of the effect of our society's apparent disregard for a resource every living thing needs to survive: water.

Through a series of case studies that range from groundwater pumping to maintain surface water lakes and rivers in Florida and Texas to pumping treated sewage effluent to maintain aquifers in

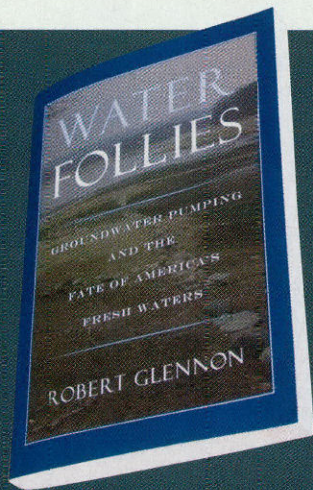
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Arizona, *Water Follies* illustrates that, as a society, we are living beyond our means when it comes to water resources. Population growth, wasteful water practices, and rising consumer demands, combined with antiquated water policy that treats water as a commodity, have led to a number of ecological disasters. Glennon explains in understandable terms the 'tragedy of the commons' and the adverse impacts that result when societies allow its citizens limitless use of common public resources like air, water and wildlife for personal economic gain.

Glennon goes on to describe how existing groundwater policies, namely the Rule of Capture and the reasonable use doctrine, encourage and promote exploitation of a common resource, groundwater, for private economic gain. Unfortunately, our rivers, springs, lakes and estuaries often pay the price.

But there is a bright side. *Water Follies* concludes with a list of eight "avenues of reform" for states to pursue if we are to stop the destruction of our aquatic ecosystems. The list addresses such issues as water conservation, establishment of environmental flow standards, groundwater regulation, data collection, and market-based solutions. Many, if not all, of these issues are being discussed in Texas today.

— Cindy Loeffler

MORE READING

Taking the Waters in Texas: Springs, Spas, and Fountains of Youth by Janet Mace Valenza (University of Texas Press, 265 pages, \$24.95, paper)

The World's Water 2004-2005: The Biennial Report on Freshwater Resources by Peter H. Gleick et.al. (Island Press, 362 pages, \$35, paper)

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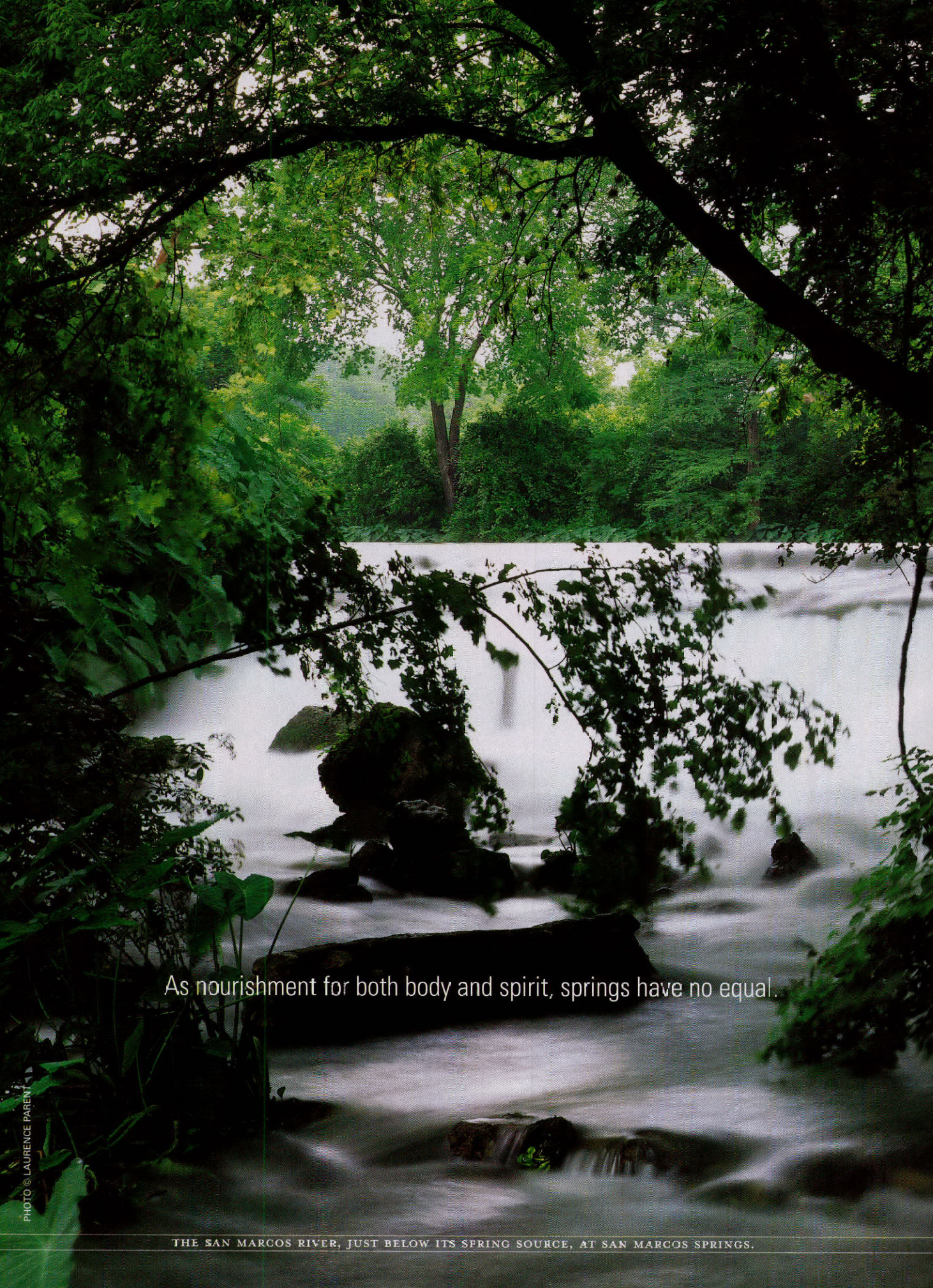
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I was born in Big Spring, Texas, and my wife was born in Spring, Texas. My family and I now live in Dripping Springs, Texas. To that extent my life has been defined by Texas springs, as have the lives of many other Texans both present and past. Early Texans, from Paleo-Indian to Anglo settlers, were perhaps more acutely aware of springs than most of us are today — their lives often depended upon them. I cannot imagine any spring site in Texas that is not also an archeological site. The San Marcos Springs site is one of the best documented and has evidence of human occupation for more than 12,000 years. Carrizo (Dimmit County), San Pedro (Bexar County) and Las Moras (Kinney County) springs are a few of the many with well-known historical significance. The location of springs, especially as one went westward, was knowledge worth dying to protect, and many a fight over and around them are chronicled in our history. Bullets and arrows that protected springs in the past have mostly been replaced by lawyers and legal documents today, but one has to be careful. Old-time Texas can bubble up in a flash over these very special places.

The State of Springs

By Larry McKinney

Why are springs so powerful?

The evident reason is as a source of water, but springs are more than that. The limitless horizons of the sea can overwhelm one at times, as can the raw power of a river, but springs evoke something different, a wonder and renewal — a sense of rightness.

Helen Besse's introduction to *Springs of Texas* quotes Paul Horgan's 1954 book *Great River: The Rio Grande in North American History*. Horgan captured it best in his discussion on the apparent meaning of springs to the earliest Americans:

Gods and heroes were born out of springs, and ever afterward came and went between the above and below worlds through their pools. Every pueblo had sacred springs somewhere near-by. There was every reason to sanctify them — physical, as life depended upon water, spiritual, as they had natural mystery which suggested supernatural qualities; for how could it be that when water fell as rain, or snow, and ran away, or dried up, there should be other water which came and came, secretly and sweetly, out of the ground and never failed.

There remain in Texas places that can still evoke such thoughts and feelings. Standing in the flush of waters exiting from the base of 300-foot-high cliffs and tumbling across exposed limestone rocks into the Devils River for as far as one can see is a wonder. In the quiet of an early summer morning, when the only sound is the rush of water and occasional splash of a fish, one can stand lost in reverie as the growing light of day exposes a tableau that remains unchanged through time. Those flows have never ceased as far as we know.

Gliding across one of the many outlets of San Marcos Springs in scuba gear or on a glass-bottom boat, where millions of gallons of water daily boil out of the Edwards Aquifer to form the headwaters of the San Marcos River, is inspiring. The continuous surge of water constantly renews the river and, in time of drought, sustains it. These

springs remain the most accessible of the largest of Texas historic springs that still exist. History, ecology and the expression of conflicting human values are writ large above and below the surface here.

The springs of West Texas and the Trans-Pecos are special in many ways. Some are well known — Balmorhea, Phantom and Comanche. Some are less well known but have wonderful names that spark the imagination: Big Satan, Slaughter Bend, Agua Fria, Adobe Walls and Black Cat, to name a few. Most are known to only a few, which is perhaps best. One could cross this country in the not-so-distant past only if you knew them — their locations were carefully guarded secrets. One I visited on Big Bend Ranch was typical. It could not be easily seen from any point in the surrounding country, even with the cottonwoods and other greenery that overshadowed it. Water boiled from the rocks beneath a cool canopy of vegetation and created a small pool. Life here was rich and noisy. Outside the surrounding vegetation it was mostly hot and barren. A fast-flowing stream 5 to 8 feet across and a foot deep formed downstream of the pool. It ran swift and clear around a bend or two in the high-sided draw that contained it. Around the next bend, the stream plunged into the sands, completely disappearing within a distance of less than 10 feet. By the next bend, no evidence of its existence was visible. One could have ridden or walked or died of thirst within a quarter mile, or less, of this oasis and never known it was there. Others like it are scattered through the region.

There are fewer places now to experience this "sense of rightness" than at any other time in our past. Springs are drying up in Texas and the loss is more than of historical interest. We do not know the total number of springs that historically existed or currently exist in our state because there is no good census. Perhaps that is because of that historical reluctance to disclose them. Regardless, we do not have a

Where are Our Springs Going?

WHEN SPRINGS DISAPPEAR, we lose more than a piece of our history or a source of water. It is a loss of our natural heritage that we will never recover. Of the 31 large springs once known, only 17 remain, and 63 historically significant springs have altogether failed. Many other springs, perhaps less well-known but no less valuable, have dried up over the last 20 years.

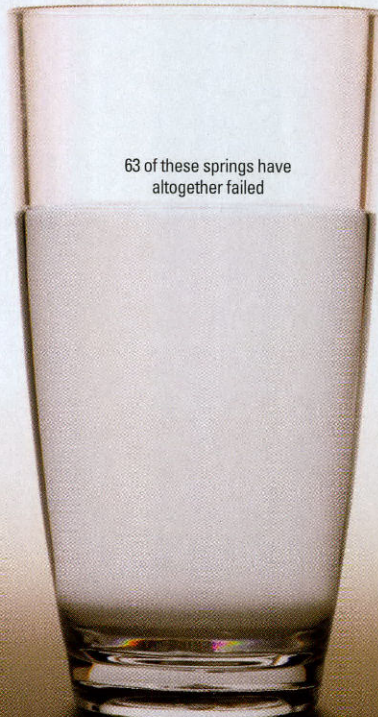
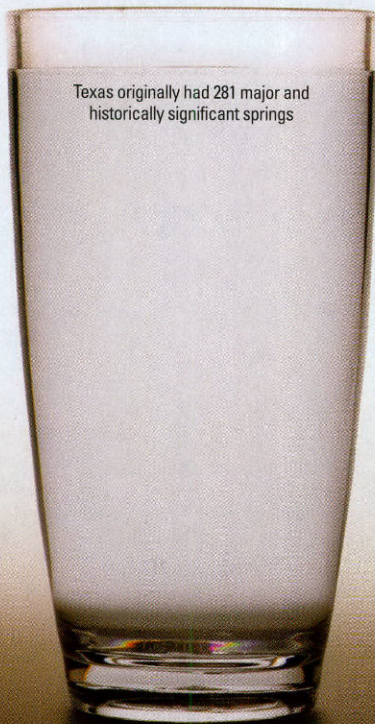




PHOTO © WYMAN MUEHLER

SPRINGS SUSTAIN THE DEVILS RIVER IN SOUTHWEST TEXAS



PHOTO © LANCE VARNELL

SPRINGS SUPPORT DELICATE ECOSYSTEMS LIKE THIS ONE IN GUADALUPE RIVER STATE PARK

good estimate of their number. The best and most current account is a database of historically documented springs assembled by the U.S. Geological Survey in 2004 which lists some 1,891 springs. But even that may fall short. One expert, Chad Norris of TPWD, thinks the number is likely somewhere between 3,000 and 4,000. Based on the ones we do know about, springs are not evenly distributed around the state. All of Texas' largest springs issue from the Edwards Aquifer and associated limestone formations. Looking at a map of the spring locations in the USGS database shows that the majority of springs identified are located within the Texas Hill Country (Edwards Plateau and Balcones Escarpment). Clusters of springs also exist along the upper Rio Grande, in central West Texas and on the eastern edge of the Panhandle region. Few springs have been identified within the Gulf Coast Prairie and South Texas Brush Country regions. Springs in the Pineywoods of East Texas are difficult to assess because they are often incorporated into the sandy margins of rivers and streams, so they may be undercounted.

We may not know where all of our springs are, but we do have some accounting of what has been lost and why. Gunnar Brune was Texas' acknowledged expert on springs, and his work in the 1970s and 1980s is the foundation of our knowledge. In his early works, he described more than 2,000 springs. His book, *Springs of Texas*, published in 1981, remains the seminal work on the subject. Brune surveyed 183 counties out of a total of 254 in Texas. He planned to do the rest in a second volume, but he never completed it. Brune identified 281 major and historically significant springs, excluding saline springs, in his early works. Of these, four were noted as very large springs with flows exceeding 100 cubic feet per second (cfs). Only two maintain that status today: Comal (Comal County) and San Marcos (Hays County). Goodenough Springs (also known as or associated with Hinojosa Springs) was inundated by the Amistad reservoir in 1968. Once the fourth largest, San Felipe Springs in Del Rio has diminished flows today. Of the 31 large springs once known, only 17 remain, and 63 historically significant springs have altogether failed. Many other springs, perhaps less well-known but no less valuable, have dried up over the last 20 years.

When springs disappear, we lose more than a piece of our history or a source of water. It is a loss of our natural heritage that we will never recover. Texas springs, particularly as one travels west from the Hill Country, are more and more isolated, and are often not associated with streams or rivers of any size. They are, for the most part, self-contained aquatic ecosystems with highly endemic (species with limited ranges) plants and animals. The names of many of these organisms read like a Who's Who of Texas springs: the Leon Springs pupfish, Barton Springs salamander, Diamond Y Spring snail, Phantom Spring tryonia and Balmorhea saddle-case caddisfly.

For some, all that is left is a name on a list. The ecosystems of Leon and Comanche Springs, along with the namesake fish, are gone, lost when these springs dried up. Others hang in the balance. San Marcos Springs is a world-class biodiversity site. The springs are home to what is likely the most concentrated grouping of threatened and endangered species on record: the San Marcos salamander (*Eurycea nana*), Texas wild rice (*Zizania texana*) and fountain darter (*Etheostoma fonticola*) to note just a few names from the list. San Marcos Springs is a biological treasure, the fate of which generated the most fierce water war of modern Texas. The conflict revolved around the fact that, in addition to sustaining these springs, the Edwards Aquifer is also the sole water source for the city of San Antonio. The fight was as dirty as it was complex, resulting in the federal courts basically managing the Edwards Aquifer until the Texas Legislature acted to establish a regulatory authority to oversee its fate. The success of those actions to protect the springs continues to hang in the balance. The springs do not hang alone — the ecological health of the entire

Guadalupe River watershed, including San Antonio Bay, hangs with it. Spring flow supplies about 30 percent of the water in the Guadalupe ecosystem during normal times and as much as 70 percent during drought. At the end of that flow lives this country's greatest icon of endangered species recovery — the whooping crane. One of the mainstays of that remarkable bird's diet is blue crabs. The freshwater inflows to San Antonio Bay, primarily from the Guadalupe River, are a key to a healthy population of crabs. As trite as it sounds, there is no better analogy to describe the importance of these springs as that of the canary in the coal mine. The health of the springs heralds the fate of the entire riverine and estuarine ecosystem. Such is the fate of springs in general.

The future of many Texas springs is clearly not assured, and that should be cause for concern for us all. There are numerous reasons for this apprehension, but chief among them is the use of groundwater. As long as we manage groundwater under the Rule of Capture doctrine, the fate of many springs is governed by the biggest straw. That doctrine was based on a 1904 Texas Supreme Court decision in which the court found that the movement of groundwater is "so secret, occult, and concealed that any attempt to administer any set of legal rules ... [would] be practically impossible." Basically that means that whoever has the biggest pump wins — and pumps are a lot bigger today than they were in 1904. Until that issue is addressed, the fate of many springs — and all that is associated with them — will hang in the balance. The war over the San Marcos Springs has spawned other similar battles in Kinney County over Las Moras

The future of many Texas springs is clearly not assured and that should be cause for concern for us all. There are numerous reasons for this apprehension, but chief among them is the use of groundwater.

Springs; the Bone Spring-Victorio Peak Aquifer issue in Hudspeth County in far West Texas; and on to the high plains and the springs associated with the Ogallala Aquifer.

On the positive side of the ledger, many landowners fortunate enough to have springs on their property not only take pride in that fact, but work to protect them. They are becoming more sophisticated in how

to do so and are working with others to add to the body of knowledge on Texas springs. Chad Norris of TPWD is coming to know many of them as is Helen Besse. Norris is currently working to gather much needed baseline biological and hydrological data on smaller spring systems that have historically been understudied. Besse was responsible for the recent republication of Brune's *Springs of Texas Vol. I* and she is also working hard to complete his second volume. That work will include descriptions of springs from the 71 counties not visited by Brune in the 1970s. Because 95 percent of Texas is private property, landowner cooperation is critical to the success of these efforts.

It was only a few years ago that these same landowners might have chased Norris or Besse away, possibly at gunpoint, but no longer. A trust based on common interest and desire has grown there. Some have organized to form the Texas Springs Alliance and the Greater Edwards Aquifer Alliance. Others are working quietly on their own, but it is encouraging. Do they have any hope of success? It does not seem likely in the face of the challenges before them, both political and otherwise, but institutional and legislative interests are also turning their attention to conserving Texas springs. Developing good groundwater models and establishing groundwater management conservation districts are chief among these efforts. It is worth the effort as more Texans recognize the natural, cultural and economic value of Texas springs. There is just a "rightness" about it that naturally appeals to us all. ★



A primer on Texas groundwater law and spring flow.

Who Owns the Water?

By Ronald Kaiser



The interrelationships between groundwater, aquifers and springs are not obvious to the casual observer. When water bubbles up from springs, it appears as though the earth itself is giving birth to cool, clean water. It can be difficult to imagine the convoluted path water takes to arrive at a spring, from the sky down through seemingly solid ground, seeping through minuscule cracks between rocks to land in an aquifer, and then back to the surface again. Yet these days, the water is often diverted or simply used up before it has the chance to make it to a spring. Many factors have contributed to the drying of Texas springs, but groundwater law that encourages pumping of aquifers is a major factor. The drying of Comanche Springs, located in Fort Stockton, is a telling example.



THE ORIGINAL OLD STORE

Comanche Springs in Fort Stockton was, for centuries, a true oasis. The springs stopped flowing in the 1950s after groundwater pumping for irrigation lowered the water table dramatically.



TOP PHOTO COURTESY ANNIE RIGGS MUSEUM; LOWER PHOTO BY EARL NOTTINGHAM

Comanche Springs was a Texas treasure. It was a stopping point for early travelers, and later for residents, tourists and farmers. In 1849, a United States Army reconnaissance party headed by Captain William Whiting reached Comanche Springs and described the water as being clear and abundant in fish and soft-shelled turtles. Soon thereafter, the United States Army established Fort Stockton near Comanche Springs to provide protection from raiding Indians to travelers and mail couriers. As early as 1875, farmers began using the water from Comanche Springs for irrigation. One account measured the 1899 flow at some 500 gallons per second.

By the 1930s, Comanche Springs drew visitors and tourists to enjoy these unique waters in an area of the state noted for its lack of rainfall and rivers. A bathhouse, swimming pool and pavilion were constructed at Comanche Springs in 1933. One day in 1950, children swimming and wading in the pool noticed that the water no longer bubbled up from the bottom of the pool. Alarmed by the fact that Comanche Springs seemed to be drying and dying, the city and farmers that relied on these spring flows hired water experts to identify the cause of the problem. The experts reported that the large number of

irrigation water wells drilled into the aquifer lowered the water level in the aquifer and caused Comanche Springs to go dry. After negotiations with the surrounding well owners failed, a lawsuit was filed to stop the well owners from interfering with the normal flow of water from Comanche Springs. The lawsuit, titled *Pecos County Water Control and Improvement District No. 1 v. Clayton Williams, et al.*, 271 SW2d 503 (1954), sought to regulate overpumping in order to protect the springs. This lawsuit defined Texas groundwater law and the protection, or the lack of protection, of springs.

RESULTS OF THE 'PECOS COUNTY v. CLAYTON WILLIAMS' CASE

In 1954, the Texas Court of Civil Appeals ruled that the groundwater contributing to the flow in Comanche Springs belonged to Clayton Williams while it was under his land. The Court rejected all legal claims of the Pecos County Water Control and Improvement District to the groundwater and said that its right to the springs attached only after the water emerged from the ground and that prior to that time, the defendant could beneficially use any amount of water regardless of the impact

on the springs. The legal principles from the Comanche Springs case were tested again in 1989, in a case titled *Denis v. Kickapoo Land Co.*, 771 SW2d 235. The Austin Court of Appeals again ruled that a well sunk into the underground cavern just beneath Kickapoo Creek was capturing groundwater and thus the well owner was not liable for a reduction in spring flow.

THE IMPORTANCE OF GROUNDWATER

Texans use nearly 17 million acre-feet of water each year. One acre-foot is a common measure used to explain water usage. An acre-foot of water would cover a high-school football field to a depth of one foot. It equals 325,851 gallons, which is about the amount of water a family of five uses in a year.

Groundwater provides about 60 percent of our water, with rivers and reservoirs providing the rest. About 80 percent of our groundwater is used for agricultural irrigation, mostly in the Texas Panhandle, the Lower Rio Grande Valley and areas around San Antonio. Most of the arid western part of the state and a significant part of East Texas rely on groundwater for

municipal and manufacturing uses.

Aquifers are storage basins for ground-water and are the headwaters of springs. Texas aquifers are like droughts; no two are exactly alike. Some aquifers are highly rechargeable and can store large volumes of water, while others have little recharge and have limited storage. Still others have little recharge but store a large volume of water. For example, the Ogallala, underlying the Texas Panhandle and parts of six other states, is a huge aquifer holding water deposited during the Ice Age. Due to limited rainfall and to the caprock layer overlying the Ogallala, the Texas portion of the aquifer receives very little natural recharge. In contrast, the Edwards Aquifer, located beneath San Antonio, is highly rechargeable and subject to rapid depletion but can be quickly replenished by rainfall. Groundwater from the Edwards is responsible for creating many of the springs in the area, including Comal Springs in New Braunfels and San Marcos Springs in San Marcos. Some estimate that nearly 30 percent of the water in the Guadalupe River comes from Edwards Aquifer spring flow.

TEXAS WATER LAW

Texas has linked its law to the geological container holding the water. We recognize three distinct containers for water — natural surface water, diffused surface water and groundwater — and have developed laws for each category of water. In contrast, most western states allocate, manage and protect both surface and groundwater based on the law of prior appropriation.

NATURAL SURFACE WATER

Under the Texas Water Code, all natural surface water found in watercourses is owned by the state and is held in trust for the people. This water includes the ordinary flow, underflow and tides of every flowing natural watercourse in the state (a watercourse has a definite bed and banks). Storm water and floodwater found within natural lakes, rivers and streams is also state water, as is the water in springs that form headwaters of natural streams. This water is allocated under the prior appropriation water law doctrine. A central feature of this doctrine is the “first-in-time, first-in-

right” rule, which gives the water to the most senior water rights holder during times of scarcity and drought.

DIFFUSED SURFACE WATER

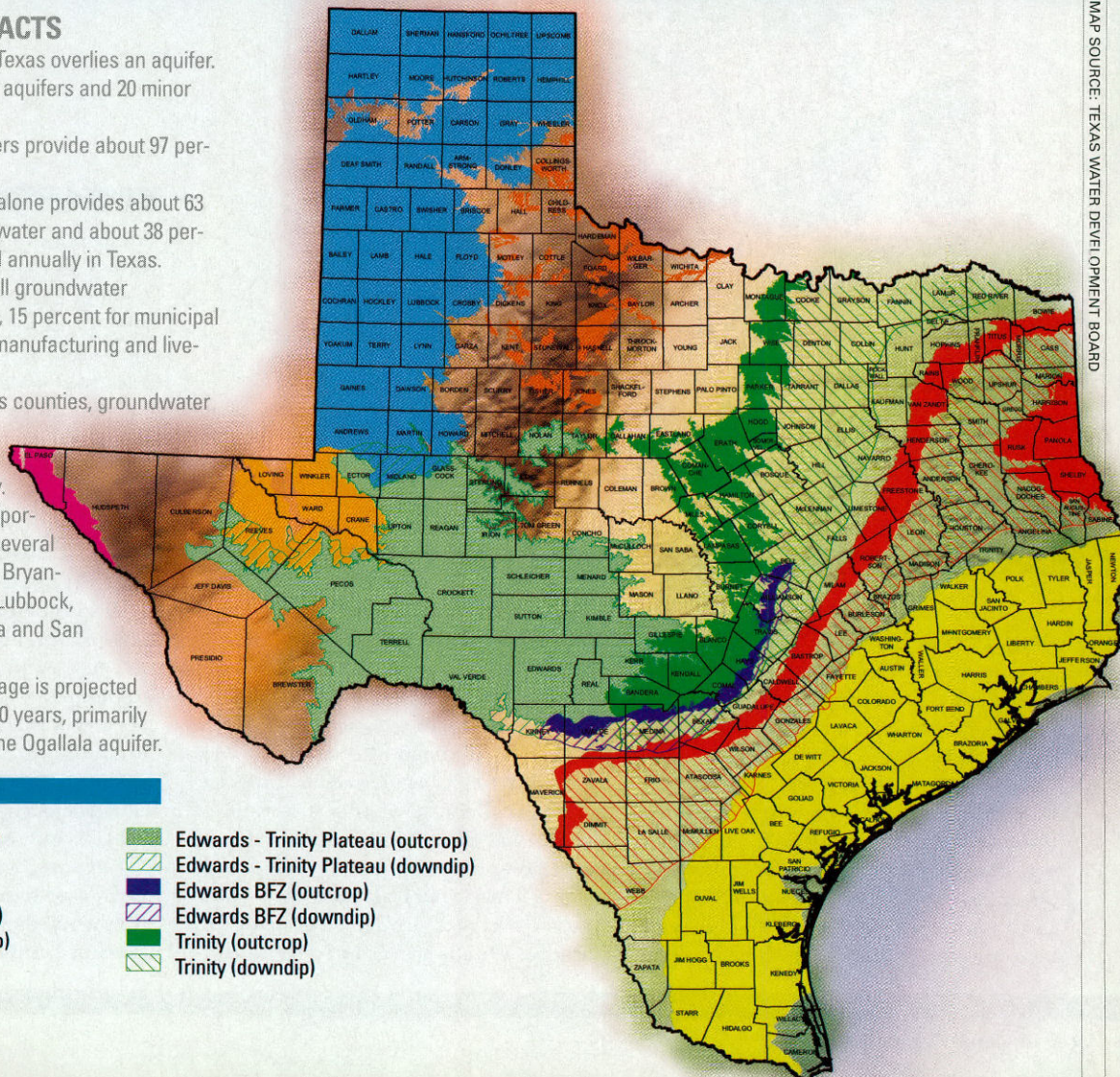
Water that does not flow in a defined watercourse, but flows across the surface of land in a variant and unpatterned way is termed diffused surface water. Generally, this is rain runoff, although water left in upland areas after a flood recedes may also qualify as diffused surface water. Texas courts have ruled that diffused surface water belongs to the landowner until it enters a natural watercourse. When it enters a natural watercourse, it becomes state water.

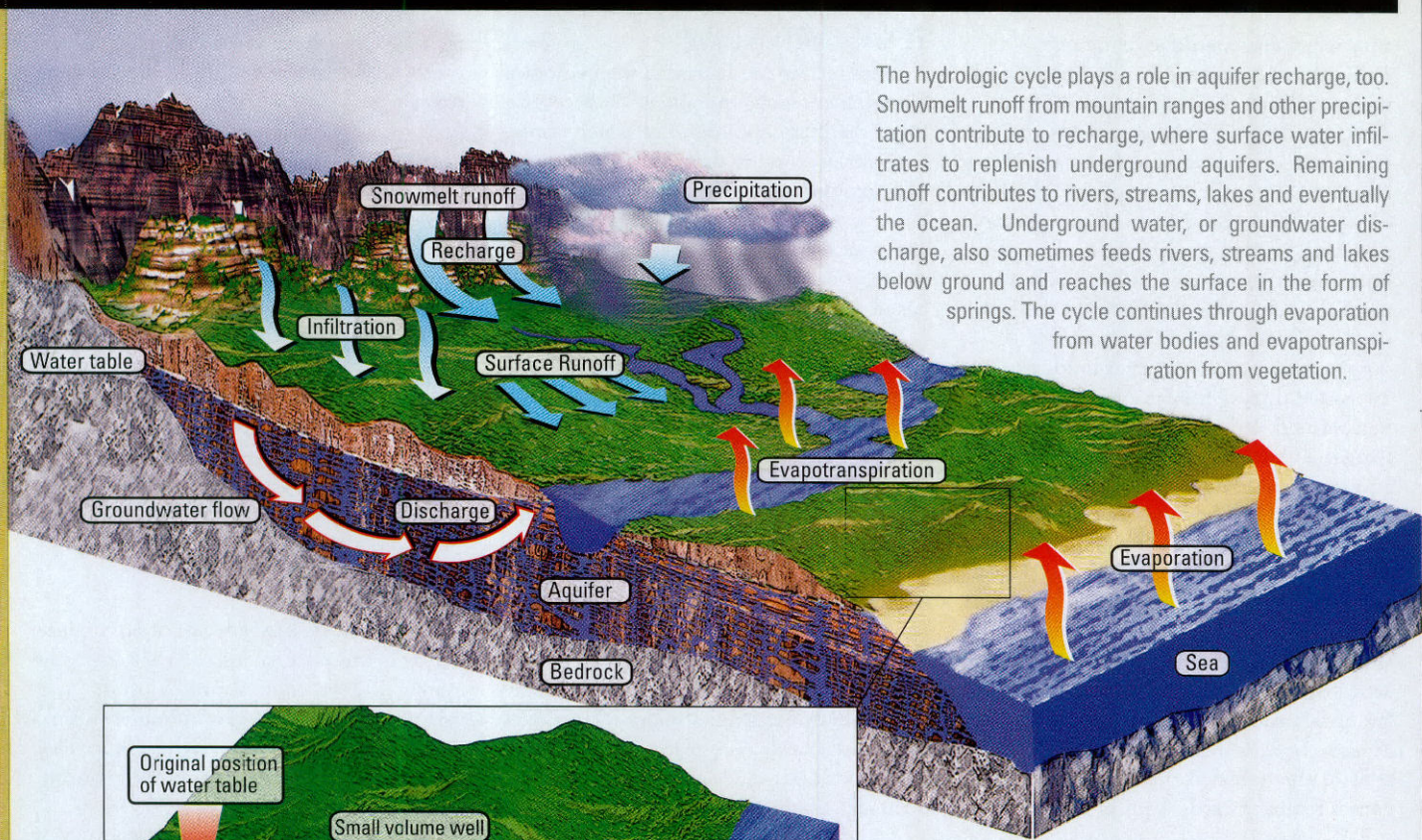
GROUNDWATER

This is water beneath the land surface that fills the pore spaces of rock and soil material and that supplies wells and springs. Texas treats groundwater differently than surface water. Whereas surface water is considered state property, groundwater is private property.

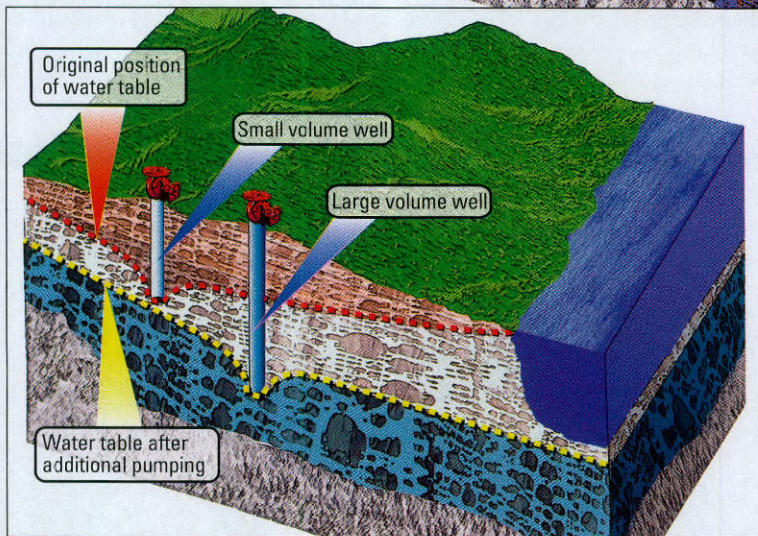
GROUNDWATER FACTS

- About 80 percent of Texas overlies an aquifer.
- Texas has nine major aquifers and 20 minor aquifers.
- The nine major aquifers provide about 97 percent of our groundwater.
- The Ogallala Aquifer alone provides about 63 percent of all the groundwater and about 38 percent of all the water used annually in Texas.
- About 80 percent of all groundwater is used for crop irrigation, 15 percent for municipal use and five percent for manufacturing and livestock production.
- In 134 of the 254 Texas counties, groundwater supplies more than 55 percent of the total water used in that county.
- Groundwater is an important source of water for several cities, including Amarillo, Bryan-College Station, El Paso, Lubbock, Houston, Midland-Odessa and San Antonio.
- Total groundwater usage is projected to decline over the next 20 years, primarily because of depletion of the Ogallala aquifer.





The hydrologic cycle plays a role in aquifer recharge, too. Snowmelt runoff from mountain ranges and other precipitation contribute to recharge, where surface water infiltrates to replenish underground aquifers. Remaining runoff contributes to rivers, streams, lakes and eventually the ocean. Underground water, or groundwater discharge, also sometimes feeds rivers, streams and lakes below ground and reaches the surface in the form of springs. The cycle continues through evaporation from water bodies and evapotranspiration from vegetation.



An aquifer cross-section, showing what can happen when a larger, higher capacity well is located too close to a shallower, smaller well. Pumping by the larger well can lower the water table enough to leave the smaller well high and dry.

PROPERTY RIGHTS

ture groundwater, the second is the right to the water actually brought to the surface and captured and the third is the right to use or sell this water. All three rights can be sold, or leased to others. Once sold or leased, any water captured may be transported off the land, or exported outside a county or region.

THE RULE OF CAPTURE AND TEXAS GROUNDWATER

Texas follows the Rule of Capture in determining ownership of groundwater. Under this rule, groundwater is considered the private property of the landowner. The Texas Supreme Court first adopted the Rule of Capture in 1904 in a case titled *Houston & T.C. Ry Co. v. East* 81 S.W. 279. Just six years ago it reaffirmed the rule in *Sipriano v. Great Spring Waters of America, Inc.* 1 S.W.3d 75, also known as the Ozarka case. In both cases the court said that landowners have a legal

right to withdraw as much groundwater from beneath their land as they can capture. In withdrawing and using this water in a beneficial manner, they have no liability for any harm to neighboring wells. In a practical sense, the surface owner does not actually own the water until they capture it. Because of this, the Rule of Capture has often been called the law of the biggest pump.

Texas landowners actually have three types of rights under the Rule of Capture. One is the right to try to cap-

PUMPING LIMITATIONS AND THE RULE OF CAPTURE

The Rule of Capture is subject to certain limitations developed by Texas courts and the legislature. Each limitation can restrict the amount of groundwater a landowner can pump.

Texas courts have ruled that landowners cannot pump an unlimited amount of water when it is done:

- 1) Maliciously to harm a neighbor;
- 2) In a wasteful manner; or
- 3) In a negligent manner so as to cause nearby land to subside or settle.

In theory, these three exceptions seem to be major restraints on landowner abuse;

yet, as applied by Texas courts they have not limited overpumping and aquifer exploitation. For example, in *City of Corpus Christi v. Pleasanton*, the Texas Supreme Court ruled that landowner pumping, if done in a wasteful or malicious manner, could be halted. However, it refused to find waste in the transportation of groundwater some 100 miles through a surface watercourse even though three-fourths of the original supply was lost in transit due to evaporation and seepage. Correspondingly, in *Friendswood Development Co. v. Smith-Southwest Industries, Inc.*, 576 S.W.2d 21 (1978) the Texas Supreme Court ruled that landowners could recover damages for subsidence losses caused by negligent pumping of groundwater but could not recover if their well went dry.

The capture rule is subject to two legislative restrictions. The amount of groundwater a landowner can capture may be restricted when:

- 1) The water is from the underflow of a river; or
- 2) Regulated by a groundwater conservation district.

These restrictions illustrate that groundwater, while privately owned, may be regulated by the state legislature.

Section 11.021 of the Texas Water Code states that groundwater making up the underflow of a river is state property. Underflow is not defined by statute, but one court has held that it is that portion of the flow of a surface watercourse occurring in the sand and gravel deposits beneath the surface of the stream bed. In order to be underflow, it must be hydrologically connected to the surface flow of the stream.

Even though the Texas legislature has the ultimate regulatory authority over groundwater management, it has delegated this responsibility to local groundwater conservation districts. To date, 83 local groundwater conservation districts have been established throughout the state and four more are awaiting confirmation. Chapter 36 of the Texas Water Code gives districts extensive legal authority. They can register and permit wells, keep drilling and well records, regulate well spacing and production, require a permit for water transfers, buy and sell water, undertake aquifer storage and recovery projects, levy taxes and pumping fees and generally engage in projects to conserve and protect the aquifer. However, most districts only require well registration, or require that new wells be drilled a certain distance from existing wells. Many have not

changed the capture rule by limiting and enforcing the amount of water pumped from any given well. Critics suggest that since few districts actually require meters on wells, they cannot enforce pumping limits because they don't know how much water is actually being pumped. While the Texas Supreme Court has sustained the authority of districts to regulate groundwater, they have not precluded landowners from challenging district rules for the taking of private property.

PROTECTION FOR SPRINGS AND SPRING FLOW TODAY

The law is seemingly well established that once groundwater bubbles to the surface and becomes part of a watercourse, it becomes state-owned surface water. If, however, the groundwater is captured before flowing to the surface, it is the

property of the landowner. Except for the Edwards Aquifer Authority, which regulates groundwater pumping in order to protect springs and the threatened and endangered species that live there, neither the Rule of Capture nor groundwater conservation districts explicitly protect the springs of Texas.

This year marks the 101st anniversary of the Rule of Capture. Suggestions to revise or replace the Rule of Capture have come from a number of landowners, interest groups, citizens, water officials and even some legislators. Just what change will emerge is uncertain. One thing is certain: Unless a consensus emerges from among the many politically active water stakeholders and interest groups, the legislature will be reluctant to make major changes to the Rule of Capture and, under that rule, Texas springs will continue to go dry. ★

WHAT'S A GROUNDWATER AVAILABILITY MODEL ?

GAMs are the legs of Texas groundwater policy. Without Groundwater Availability Modeling, there wouldn't be much science to stand on when dealing with groundwater issues — my guess would be as good as yours. Instead, GAMs are a preferred tool in Texas water planning. Working off geological and hydrological data relating to capacity, usage and recharge of aquifers, GAMs utilize computer modeling to predict just how much capacity a natural resource has to give and how long flows can be maintained when usage and drought are factored in.

The success of a GAM developed for the Hill Country prompted the 76th Texas Legislature to approve initial funding of a statewide GAMs program through the Texas Water Development Board, concurrent with the passage of Senate Bill 1. Groundwater conservation districts are required by statute to use GAMs in developing a district's management plans, as are regional planning groups when developing regional plans.

The 77th Legislature mandated that GAMs be developed or obtained for all major aquifers in Texas by October 2004. That mission was accomplished, reports Robert Mace, director of the Groundwater Resources Division at the Texas Water Development Board. Now minor aquifers need similar study, Mace says, pointing out that all models are subject to change as more data becomes available.

"The science depends on the specifics in question," explains Mace. "And nothing's exact in hydrogeology." According to the TWDB, all GAMs require information on recharge, aquifer geometry (depth and thickness) and aquifer properties (transmissivity, hydraulic conductivity, storativity and water levels). Aquifer geometry and property information can be used to calculate water in storage and drawdown around individual wells. Recent improvements in modeling techniques more accurately reflect the information needs of various stakeholders involved in water issues, Mace says.

Still, in some instances, information that is more site-specific than a GAM can better determine how much a resource can be used without negative impact. He cites Pinto Springs in Kinney County as one example where other methodologies and tools can be implemented to better understand how the springs, the creek and the artesian wells in Pinto Valley interact. A GAM that might provide a reasonably complete overview of the Edwards-Trinity Aquifer, which covers 4,000 square miles over a distance of 180 miles, doesn't necessarily provide the most vivid snapshot for Pinto Valley, which encompasses a few thousand acres.

Any groundwater conservation district, regional water planning group, state agency, legislator or political subdivision can request a GAM run from the TWDB at no cost.

For more information about GAMs and a map of aquifers that have been modeled, visit www.twdb.state.tx.us/GAM.

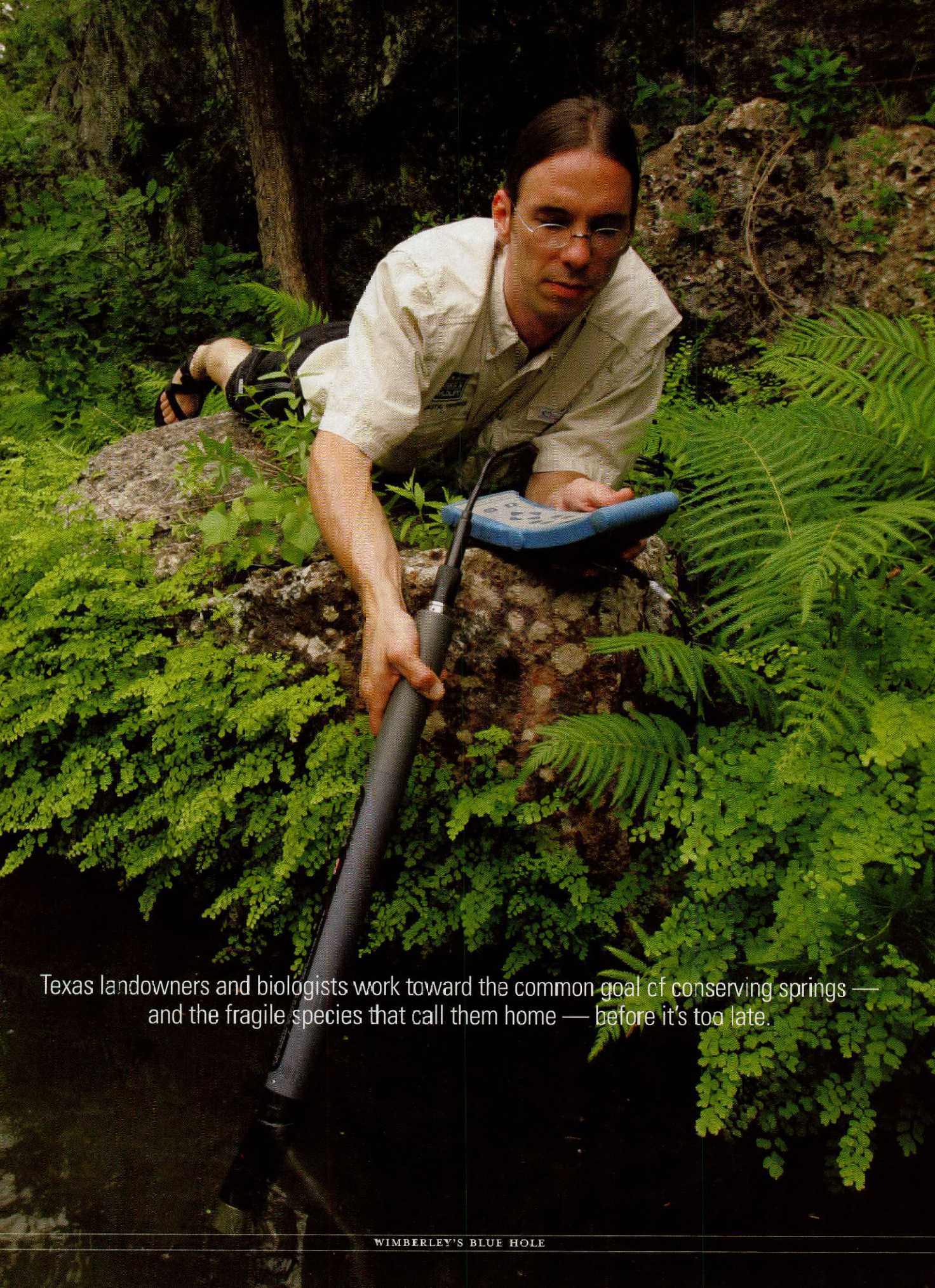
— Joe Nick Patoski

Aquatic Islands in a Sea of Land

By Wendee Holtcamp

I stand at the edge of an emerald spring pool and the creek it feeds with a biologist, an octogenarian land steward, and his son, a real estate broker and land developer, on the largest ranch in Hays County, a semi-arid Hill Country landscape interlaced with spring-fed streams. Lynn Storm wears a handsomely tailored yellow oxford shirt and khaki slacks, and stands quietly observing. His son Scott, tall and stout, sports a red-and-blue plaid shirt and Levi jeans, and stands under a stately live oak at the creek's edge as we talk. Chad Norris, a young biologist studying the springs, has his long brown hair pulled back in a ponytail. We're discussing a hodgepodge of all things springs: their hydrogeology, the flora and fauna that rely on them and how the desire to conserve them has brought together interests historically at odds.





Texas landowners and biologists work toward the common goal of conserving springs — and the fragile species that call them home — before it's too late.



A mayfly perches on a scouring rush. The mayfly larva does not tolerate disturbance or pollution in its spring-fed environment, so its presence is a good indicator of an ecosystem's health.

Q

Cottony gray clouds hang heavy with rain, which will soon come. It's been a year of record rainfall, and the landscape grows as lush as it's ever been. Springs surge and the streams they feed flow strong and steady. "It's been this way before. I remember wet periods, but I remember the dry periods a lot more," says Scott Storm. Increased withdrawal from underground aquifers, which provide the source of spring flow, has led many springs to periodically cease flowing. "Even in the major drought of the 1950s, the springs on the property flowed," says Storm, "but if there is a minor drought now, the springs dry up."

For the first time in recorded history, the ever-gushing spring known as Jacob's Well ran dry for several months in 2000 — as the crow flies, just five miles from the Storm Ranch. It was a wake-up call for many locals, who for the first time realized that people weren't just crying wolf when it came to the serious problems caused by unregulated demands on their groundwater. The "Rule of Capture" says that anyone who puts in a well on his or her land can withdraw unlimited groundwater. This ancient statute, written when Texas' population was far lower, has a lot of people, from landowners to conservation groups to biologists, seriously apprehensive.

"It would be great if no one moved out here and no water was taken out of the aquifers," ponders Storm. "But if they move out, they're going to put a well in, and that's going to take a sip out of the aquifer. You get 20,000 to 30,000 of those ..."

"That's a lot of straws," says Norris.

Like more and more landowners, Storm understands not only how important springs are for wildlife, but also how crucial wise planning will be to maintain the ecosystem. "If we don't have the correct planning, this place could be a desert. They are very, very fragile."

I hear the sound of a single drop of water falling. We walk over toward the edge of the spring pool, and I scan the bluff until I locate a thin stream of water dripping every few seconds into the water below, Fernpool Springs. This drip derives from a fissure in the porous karst limestone, where groundwater from the Edwards Aquifer seeps out of the earth and follows gravity's course over land. The water cascades down a limestone cliff, green with moss and ferns, then runs downstream, forming spring-fed Gatlin Creek, which, like other spring-fed streams throughout the arid and semi-arid west, is the lifeblood of the ecosystem. Without water, nothing can live.

I mention a children's book I read to my kids that shows giant underground lakes, and I ask if the Edwards aquifer is like that. Storm explains that on the Edwards plateau, the limestone bedrock resembles Swiss cheese, with holes throughout in which the water sits. Springs emerge where pressure and gravity force water out of fissures in the earth. I imagine myself standing on a slab of giant rocky Swiss cheese. I think my kids would get a kick out of this.

Something like 3,500 freshwater springs dot the Texas landscape, mostly on private land. Geologist Gunnar Brune spent the last 10 years of his life characterizing the ecology, geology and history of Texas springs, culminating in the hefty tome, *Springs of Texas*. Brune's visits in the 1970s provided the last scientific documentation for many Texas springs. That is, until Norris and other like-minded scientists got involved. "I went to a meeting where they were talking about these water marketing strategies," Norris says, "and that got me thinking of the impact to spring flows, and how that affects river



PHOTO © LAURENCE PARENT

POOL AND CASCADES IN BLUE HOLE, A POPULAR SWIMMING SPOT ON SPRING-FED GYPRESS CREEK



The caddisfly larva, family Helicopsychidae, spends its larval stage in a unique, spring-fed ecosystem. It has a very low tolerance for pollution or disturbance.

flows. I thought, to try to be proactive, we should get out and start getting data now.”

In 2003, Norris received a grant, funded from Keep Texas Wild license plates, to study a handful of the springs Brune characterized in the 1970s. “There is a big void in knowledge,” he laments. “We want to get some baseline biological data so we can come back in five or 10 years, because changes in the biotic community often reflect something that’s changed in the environment.” Norris’ collaborations with landowners have been so successful that his spring research has become part of his regular duties, even though the grant ended.

“I thought it was interesting, because as Chad started that project, and I kid him all the time, he’s this tall, skinny, hippie-type guy and I’ve just been amazed that he’s gone out on this project and the folks that have opened their gates to him, and the stories he comes back with,” says Larry McKinney, TPWD’s director of the division that Norris works under. “Ten years ago he’d have been shot. There were just many places where you couldn’t even drive into the driveway.”

With strong attitudes about property rights prevalent in Texas, fear and loathing of government officials looking for endangered species took over the mindset of many private landowners. A few years back, a biologist who was studying cave fauna, George Veni, was hit by a bullet when a landowner’s warning shot ricocheted. “We shifted our emphasis from basic science to a more applied approach to landowner assistance. We began to lean towards more applied conservation-minded efforts,” explains McKinney. “We’ve been able to turn this thing around, and it’s back where it really used to be, where our biologists can go out and work with these landowners. Part of it may be that landowners recognize the threats to springs on their property, that they need all the help they can get and that we are working toward a common cause.”

Storm, for his part, seems thrilled with Norris’ work. “I’ve learned so much about this place, about everything—the water, the flora and fauna, and it’s amazing how much is going on. It’s all connected,” he says.

As the rain begins to fall, we exchange goodbyes, and Norris and I climb into the green Suburban and drive toward the boundary between the Edwards Plateau and the South Texas Plains, where, as Norris describes it, “everything pokes or scratches you.” The live oaks grow squattier as we drive westward, and the grasslands are interspersed with yucca and prickly pear. “You get 35 inches of rain on the eastern edge of the Edwards plateau and 12 inches of rainfall on the western edge,” says Norris. Springs become increasingly more important to wildlife as one moves toward the western edge of the ecoregion.

Though spring-fed creeks nourish the immediate ecosystem, spring water also provides a critical lifeline to creatures in many Texas estuaries. “I’ve actually had people telling me a drop of water that reaches the bay is a drop of water wasted,” laments Norris. Interest groups are intensely planning for future water demands, but many don’t realize that freshwater inflows—water that reaches the estuaries at the mouths of rivers—feed multimillion-dollar fisheries industries. “Without the water coming from springs, it significantly reduces the quality of the estuary,” says Norris.

We arrive at the ranch owned by John Rogers, another landowner who has welcomed Norris. Joining us is Sky Lewey, an activist, mother and rancher who oversees education and outreach for the Nueces River Authority. We’re here to measure water flow and to look for invertebrates, fish and salamanders in a spring on Rogers’ Uvalde County ranch. We park and haul out some nets and gear. Donning rubber boots, we wade across a wide but shallow creek, its spring water so clear you can see furrows made by wagon wheels from an age long gone, and the fish darting about oblivious to them.

The spring water flows down the limestone bedrock into the creek. Little caverns line the side, created by the springs' cool, dripping water constantly wearing away at the limestone. We scour the crevices and look under debris for spined and spineless wonders. Norris explains the system aquatic biologists use to rate the tolerance invertebrates have to pollution or disturbance, ranging from 1 to 10, with 1 being the most intolerant. At the top of the creek bed, Norris calls us over, "Do you want to see something with a level-two tolerance?" He reveals a tiny caddisfly larva, a *helicoptychid*, that makes a coiling case out of sand grains. He also catches other intolerant critters: mayfly larvae, a brilliantly colored greenthroat darter and a caddisfly that makes cases out of sycamore leaves. This is a good sign, that this spring remains pristine.

We also spot a cave salamander of the genus *Eurycea*, which has reduced eyes and lives only at the source of springs. Since springs occur in isolated pockets, biologists sometimes liken them to aquatic islands in a sea of land. Spring-adapted animals can't just saunter over to the next spring if one dries up, because they can only live near the spring opening. Because of the aquatic island phenomenon, these species often become highly specialized and genetically distinct from species in nearby springs. Many cave salamanders and other spring fauna are endemic, meaning that in all of the world, that species lives only at a single spring, or group of springs. Norris explains that the Edwards Plateau has the highest concentration of endemic flora and fauna species of any ecoregion in Texas.

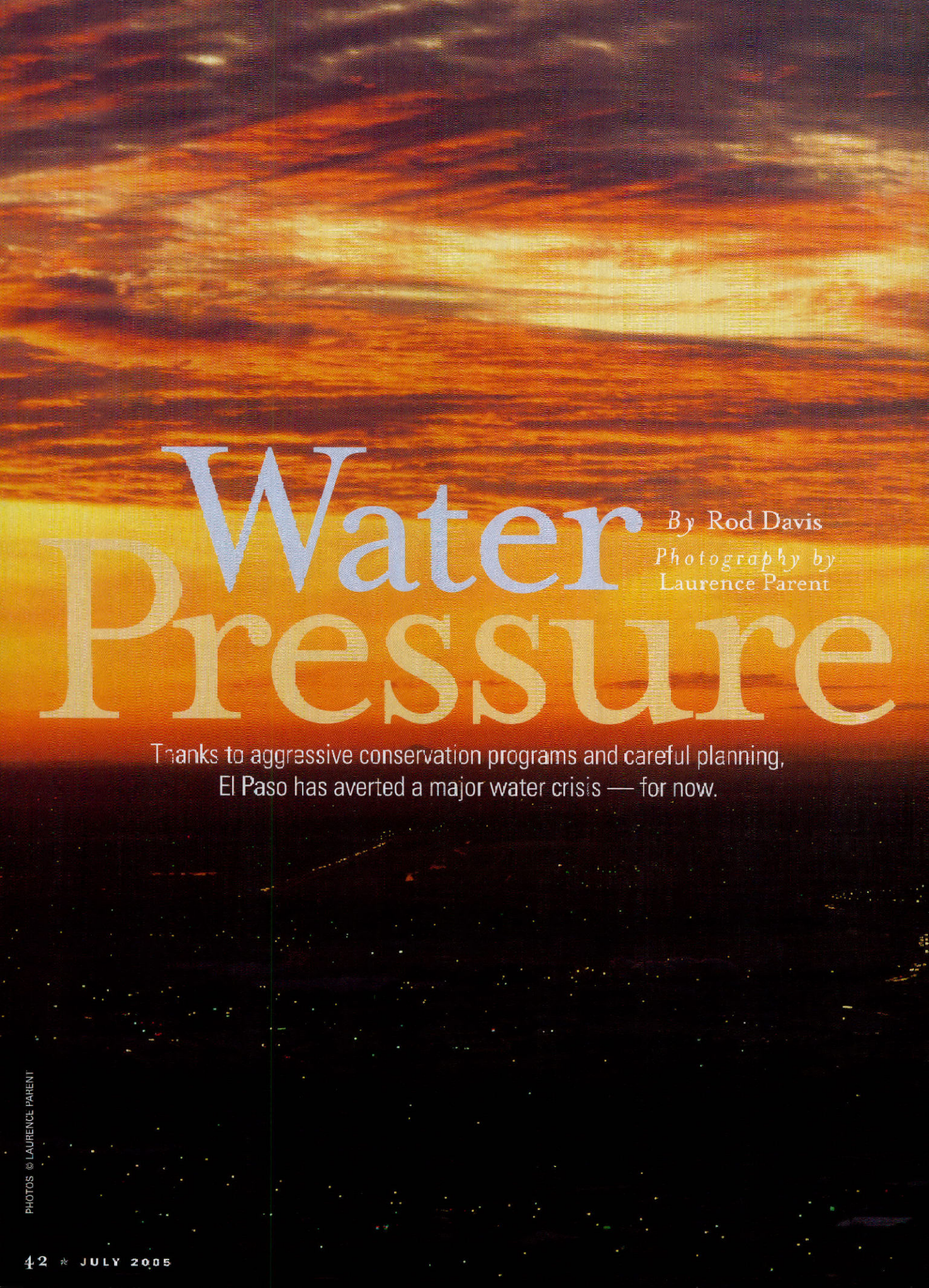
Like the Storms, Lewey and Rogers have nothing but praise for Norris' efforts. "It's a way to link resource stewards with the information they need to manage their resources," says Lewey, who has spread the word about Norris' work to several landowners. "Plus I am pretty darn sick of hearing of only two springs in Texas." The bulk of research and media attention goes to the largest springs in Texas, Comal and San Marcos. Many citizens don't even realize the extent and importance of freshwater springs throughout the state. "The trick is educating the public about a resource without exposing the resource to the public. This spring can't handle a lot of feet. It can barely handle a few."

We spend a couple of hours exploring the creek, measuring flow with the state-of-the-art flowmeter, and looking for critters before wading back across the wide creek to the vehicle. We drive around hilly roads and Rogers points out Blue Hole, a deep spring-fed pool where many generations of children have played.

The importance of springs historically, prehistorically and ecologically cannot be overstated. Springs often provided the only reliable source of clean water for settlers, Native Americans as well as European and Mexican explorers. Trails, and later roads, connected springs like a dot-to-dot map. The earliest archeological artifacts in Texas date to more than 30,000 years ago, and were located near springs and spring-fed creeks. Middens and archeological artifacts can be found near many springs, including on the Storm Ranch and Lewey's property. These geological features existed millennia before humankind settled the landscape, and in less than half a decade, one by one, we have witnessed Texas springs drying up due to water table declines in the aquifers that feed them. Brune documented the decline of many Texas springs in his work in the 1970s, and the situation has only worsened. Springs must maintain a delicate balance between the water table below and an adequate area for recharge above. Brune wrote, "The story of Texas springs is largely a story of the past. Many are already gone. It is urgent that data on past and present springs be recorded." It remains up to scientists such as Norris and gracious landowners to capture a snapshot of springs in time, and hope that his work can do more than mark the end of an age, but ultimately lead to efforts that may reawaken the increasingly silent springs. ★



Many cave salamanders and other spring fauna are endemic, meaning that in all of the world, that species lives only at a single spring, or group of springs. Norris explains that the Edwards Plateau has the highest concentration of endemic flora and fauna species of any ecoregion in Texas. Top: Texas blind salamander. Above: Fountain darter.

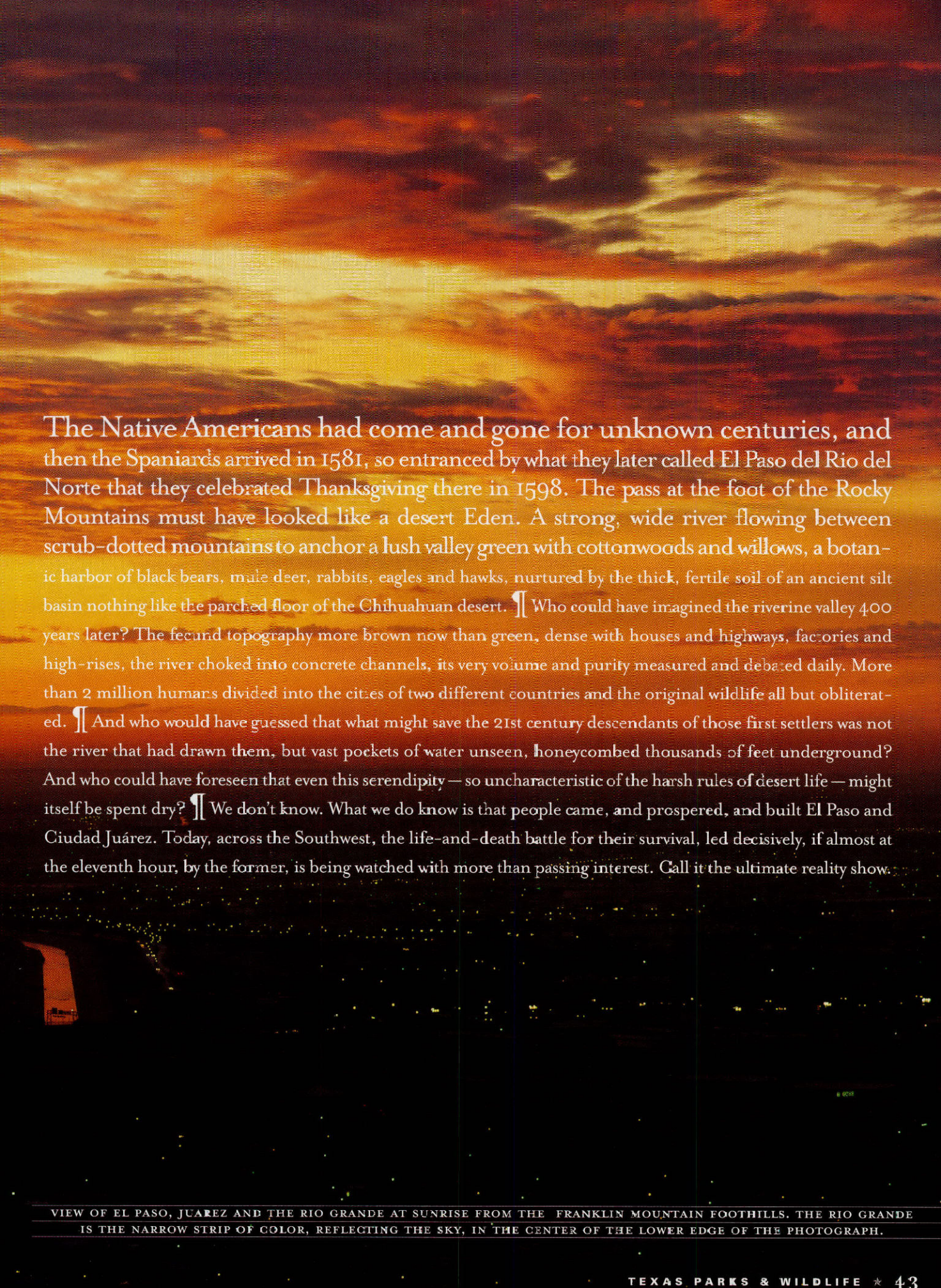


Water Pressure

By Rod Davis

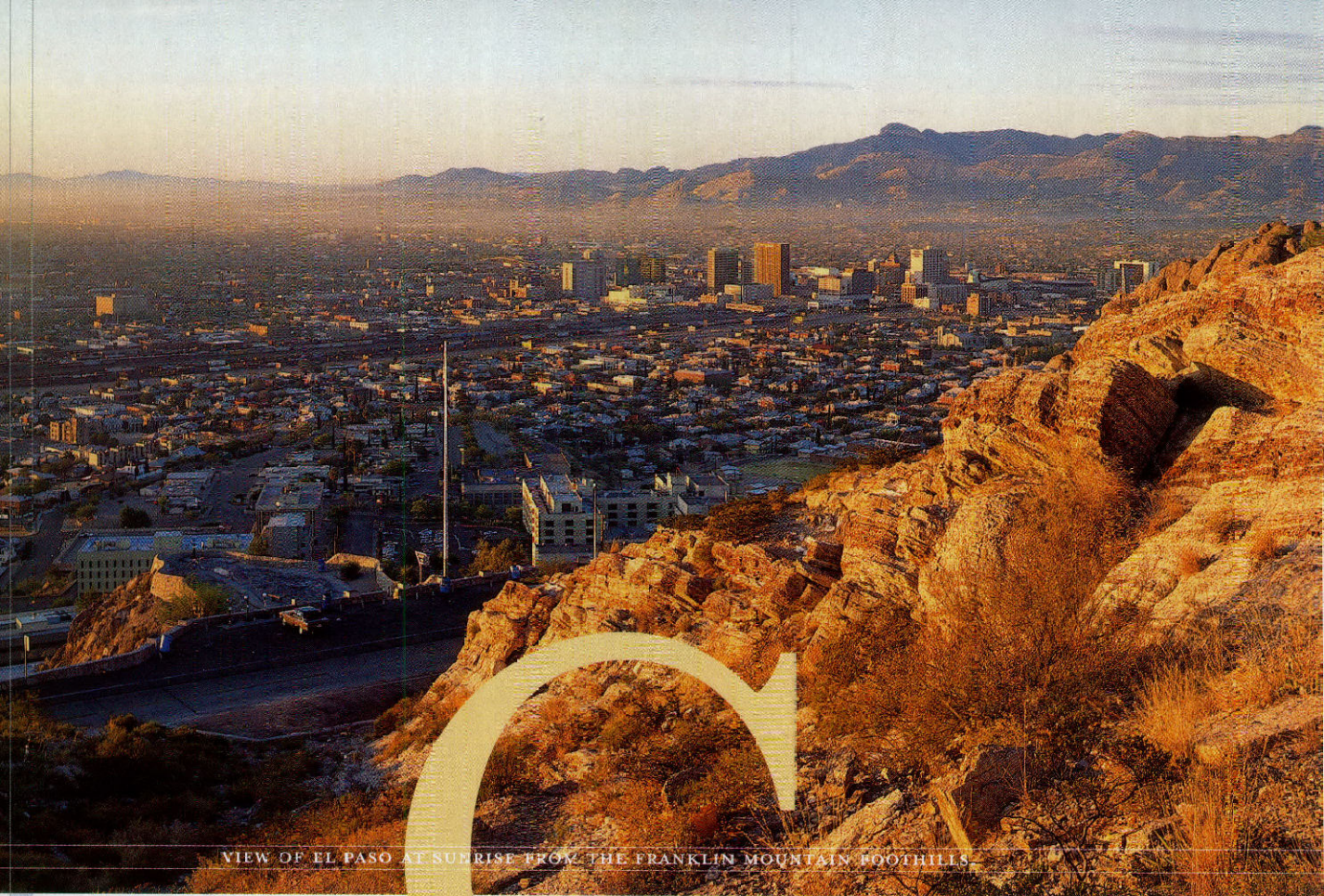
Photography by
Laurence Parent

Thanks to aggressive conservation programs and careful planning,
El Paso has averted a major water crisis — for now.



The Native Americans had come and gone for unknown centuries, and then the Spaniards arrived in 1581, so entranced by what they later called El Paso del Rio del Norte that they celebrated Thanksgiving there in 1598. The pass at the foot of the Rocky Mountains must have looked like a desert Eden. A strong, wide river flowing between scrub-dotted mountains to anchor a lush valley green with cottonwoods and willows, a botanic harbor of black bears, mule deer, rabbits, eagles and hawks, nurtured by the thick, fertile soil of an ancient silt basin nothing like the parched floor of the Chihuahuan desert. ¶ Who could have imagined the riverine valley 400 years later? The fecund topography more brown now than green, dense with houses and highways, factories and high-rises, the river choked into concrete channels, its very volume and purity measured and debated daily. More than 2 million humans divided into the cities of two different countries and the original wildlife all but obliterated. ¶ And who would have guessed that what might save the 21st century descendants of those first settlers was not the river that had drawn them, but vast pockets of water unseen, honeycombed thousands of feet underground? And who could have foreseen that even this serendipity — so uncharacteristic of the harsh rules of desert life — might itself be spent dry? ¶ We don't know. What we do know is that people came, and prospered, and built El Paso and Ciudad Juárez. Today, across the Southwest, the life-and-death battle for their survival, led decisively, if almost at the eleventh hour, by the former, is being watched with more than passing interest. Call it the ultimate reality show.

VIEW OF EL PASO, JUAREZ AND THE RIO GRANDE AT SUNRISE FROM THE FRANKLIN MOUNTAIN FOOTHILLS. THE RIO GRANDE IS THE NARROW STRIP OF COLOR, REFLECTING THE SKY, IN THE CENTER OF THE LOWER EDGE OF THE PHOTOGRAPH.



VIEW OF EL PASO AT SUNRISE FROM THE FRANKLIN MOUNTAIN FOOTHILLS

GROWTH

El Paso and Juárez, whose ecological destinies cannot be separated, share the mixed honor of being among the most rapidly expanding cities in their respective countries. Growth in El Paso and Juárez is up more than 50 percent in the last two decades, so El Paso Water Utilities now serves about 700,000. Juárez has virtually exploded, to at least 1.3 million. The combined population is predicted to double by 2020, to about 3.4 million, and that's probably conservative.

The numbers are important, because water is ultimately a numbers game. How many drops quench how much thirst? For whom?

For most of El Paso's history, the numbers have turned on the bounty of the river. But it is famously stressed by the dozens of communities and hundreds of agricultural and industrial needs along its 1,900 miles, beginning in the San Juan Mountains of Colorado, then running down through the middle of New Mexico and finally defining the 1,250-mile Texas-Mexico border until it hits the Gulf at Boca Chica. More than once in the last decade, the river cried up en route.

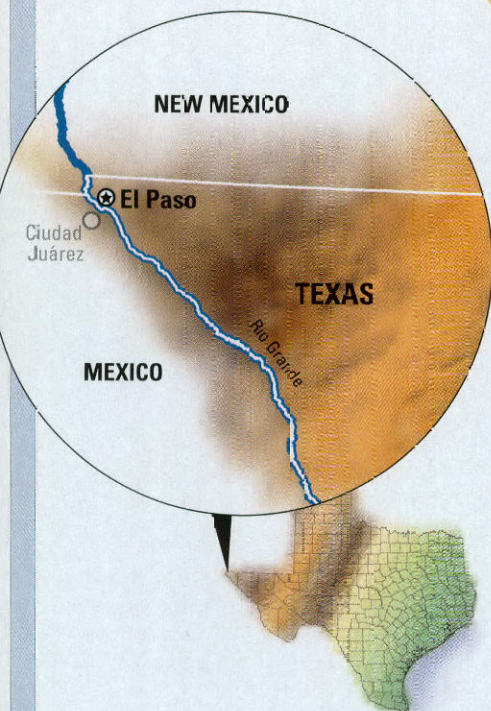
In good years, such as this one, the river is high from unusually heavy rains (12.20 inches compared to an average of 8–11 inch-

es) and deep snowpack. El Paso can draw from it about half of its total demand. In bad years the draw is less. It's a sliding scale.

The upper limit of water that can be taken from the river is about 100 million gallons per day, the capacity that can be handled by the city's two river water treatment plants. Allotments are delivered by El Paso County Water Improvement District No. 1 and indirectly by a variety of federal and international treaties. It rarely gets to that. Although the river averages a flow rate of 573,000 acre-feet a year, the volume is usually much weaker. In 2004, the flow was only about 40 percent of its average. It could rise up to 70 percent this year.

The other end of the sliding scale leads to the aquifers, or bolsons (also *bolsónes* in Spanish — the unique Southwestern term for the broad pockets of underground water reserves is listed in dictionaries in both Spanish and English forms). The biggest bolson is the Hueco, about 9,000 feet of porous silt, sand and granite at its thickest. The smaller Mesilla is about 2,000 feet thick.

The Hueco Bolson stretches along the east side of the Franklin Mountains, which cut through the middle of El Paso, and runs down the length of the county, more or less along the line of the river, but also stretching into Mexico, Hudspeth County to the



east and New Mexico to the north. The Mesilla is basically west of the mountains but also crosses the same boundaries.

The actual volume of the bolsons is still being measured, or, in geologist terminology, "modeled," but the basic game plan for the city is to draw 40,000 acre-feet from the bolsons in "normal" years and up to 75,000 in dry years.

In Juárez, the Hueco Bolson has no self-imposed gauge. It is the only source of drinking water. The city takes as much as it wants. The 60,000 acre-feet of the Rio Grande it gets under international treaty go to agricultural or industrial uses.

In the years to come, especially during periodic droughts or because of other problems along the troubled Rio Grande, the water from down under could be tapped even more. Consider recent numbers: Of the 101,495 acre-feet demand from the city of El Paso in 2004, a total of 71,701 acre-feet came from the bolsons (49,480 acre-feet from the Hueco and 22,221 acre-feet from the Mesilla) and only 29,794 acre-feet came from the low-flowing river.

The 2004 demand was down considerably from 120,485 acre-feet in 2002, but in that year the river input was much higher, at 58,743 acre-feet, prompting a lesser proportion from the bolsons, which combined for 61,742 acre-feet.

Both amounts are within the city's projected range of use, but clearly, the bolsons are taking strong hits in their backup role, and it's been noticed. Five years ago, newspaper articles and early interpretations of groundwater studies were predicting that the Hueco already would have been sucked dry by now — or would be in another 20 years.

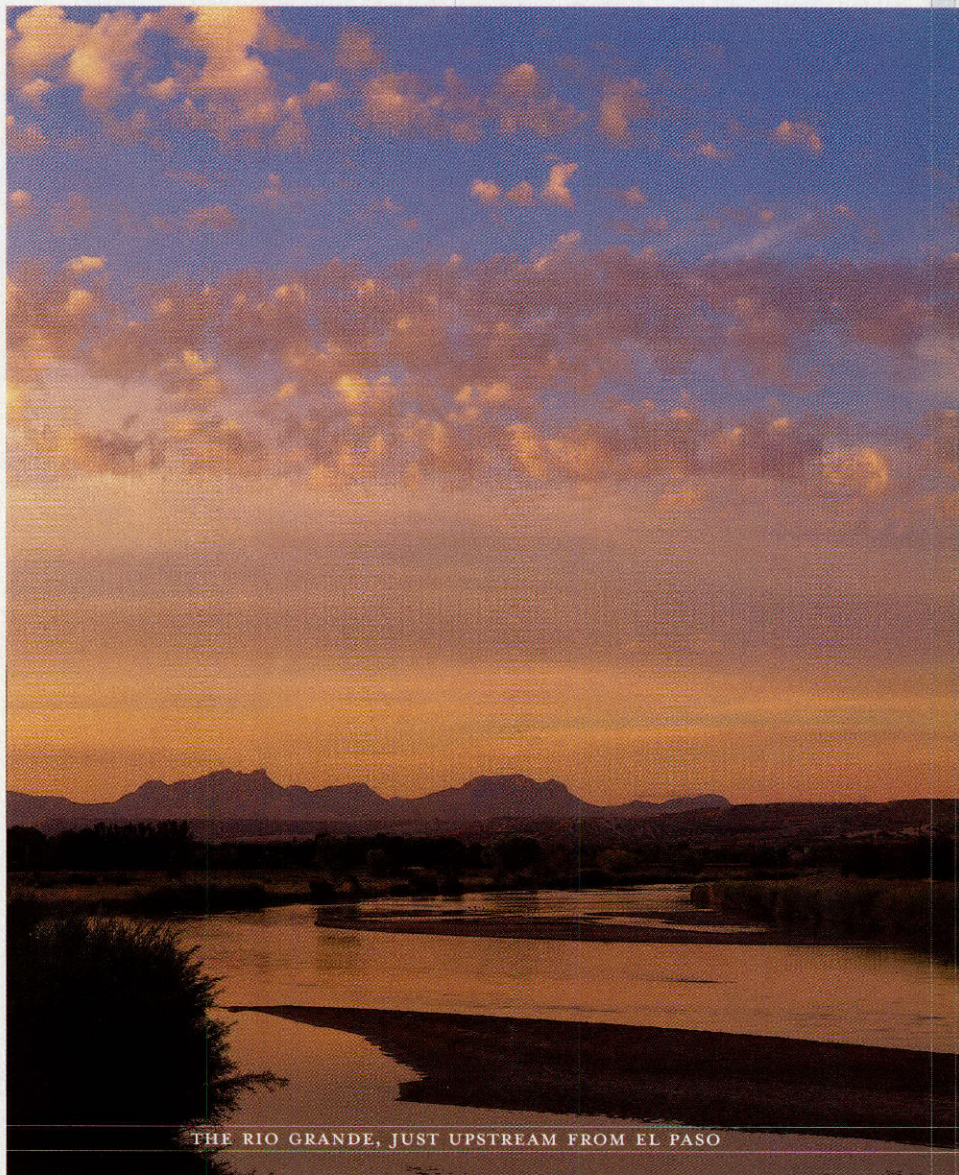
El Paso Water Utilities had been having similar thoughts, or nightmares, but for longer. Fifteen years ago, the city's big utility began buying "water ranches" near Valentine and Van Horn, augmented since then by more land over the Bone Springs and Capitan Reef aquifers, preserving holdings in four different counties (Hudspeth, Culberson, Jeff Davis and Presidio). EPWU reasoned that the way to assuage the thirst of its citizens might be to "mine" water from distant wells and pump it in through long pipelines not coincidentally similar to the oil patch models, since a number of oil firms also started looking at water the way they had once looked at petroleum.

Today, speculation in other water ranches and the groundwater drilling rights necessary to profit from them is roiling old farming and ranching communities like Dell City, 90 miles east of El Paso, on the theory that one day the aquifers in the playa-filled region may also be exploitable not only for El

Paso's needs, but possibly also for Juárez. Lawsuits and hard political infighting there involve big developers like Woody Hunt of El Paso and Philip Anschutz of Denver and longtime local ranchers like the Lynch family. It also brings into play the evolving role of local groundwater districts in modifying Texas' much-criticized Rule of Capture regulations that effectively put limits on how much water can be pumped and sold by which landowners.

regulation in leasing them out, if it has to be done at all.

The Texas Parks and Wildlife Department has entered its own objections, chiefly over the potential effects of aquifer pumping on wildlife habitats and in numerous pristine conservation areas including Big Bend Ranch State Park, Balmorhea State Park and Big Bend National Park. "Careful and deliberate actions regarding privatization of water seem especially prudent to minimize further con-



THE RIO GRANDE, JUST UPSTREAM FROM EL PASO

The water rush is even being pursued on state-owned lands, such as in the six Trans-Pecos counties: Presidio, Jeff Davis, Brewster, Culberson, Hudspeth — and El Paso. There, water rights are being sought by Midland-based Rio Nuevo, Ltd. for export to various thirsty cities, potentially including El Paso. In that brawl, state agencies such as the General Land Office, which owns the public lands, are pitted against the Department of Agriculture, which essentially wants greater

flict, and frankly, to provide the best opportunity to conserve this important element of Texas' natural heritage," TPWD Chair Joseph Fitzsimons wrote in a lengthy memo to Land Commissioner Jerry Patterson last March.

Wherever the battles — and the state is teeming with them — the basic premise is poised nowhere more dramatically than in El Paso. The premise is that the city will not be able to hydrate itself much longer.

But is that true?

GETTING GROUNDED

In 1989, the year EPWU's new general manager, Ed Archuleta, came in from Albuquerque, the city drew a record-shattering 80,000 acre-feet of supplemental water from its bolsons. Total demand spiked to 131,700 acre-feet, way more than the city could sustain. Visions of bleached bones among the ocotillo and hot winds whistling through vacant, forlorn streets weren't difficult to conjure.

"We didn't have a long-term plan for water," Archuleta recalls of that critical year. "And we were in major litigation with New Mexico over water rights." The city was spending \$8 million in legal and technical fees, and getting nowhere. Doing nothing was not an option,

toilets. Newsletters and brochures tout conservation, as does a monthly program on public television.

Results are impressive. Not only are total citywide demand and peak use down, so is the all-important per capita use. From a high of 200 gallons per day (gpd), El Pasoans have reduced their draw to 139 gpd, which already beats the target of 140 gpd by 2010.

Across the river in Juárez, the per capita use is said to be about half that, but there are twice as many residents.

WHAT ELSE HAVE YOU GOT?

The water El Paso can't save by not using, it can partly reclaim. Infrastructure invest-

landscaping, and thus saves an equivalent amount of water for drinking, lowering the demands on the river and bolsons.

The city is also building four new arsenic treatment plants, mandated by changes in EPA rules. In the Hueco and Mesilla bolsons, arsenic is a naturally occurring mineral, averaging about 12 parts per billion (ppb), well below the previous federal standard of 50 ppb. The new plants will take the level to below the new level of 10 ppb.

The city also has just awarded contracts for a new \$7.6 million International Water Quality Laboratory to consolidate testing of more than 40,000 samples each year.

Investors like what they see. Fitch Ratings gave EPWU an AA rating (the highest is AAA+) on a recent bond issue, citing "solid debt service coverage, strong legal provisions, competitive rate structure, extensive financial capital and water resource planning."

For Kevin Ward, executive administrator of the Texas Water Development Board, a state agency that helps funnel funds to some of the city's water projects, El Paso has demonstrated "an enterprising ... and healthy balance in growth and supply of water."

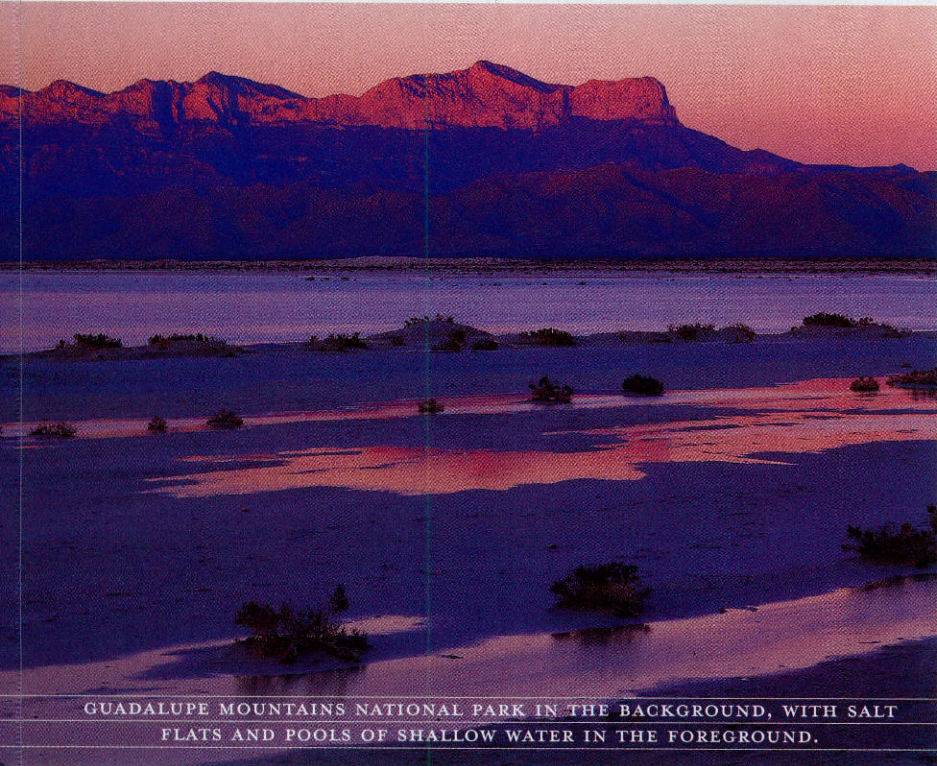
The bottom line for residents may come from the Texas Commission on Environmental Quality, which rates the city's water as "superior."

GET THE SALT OUT

But what has gained most publicity as El Paso tries to get control of its use-it-but-don't-lose-it future, is desalination. Water in the aquifers is brackish, or salty, in varying degrees, and has to be treated to achieve drinkability standards of less than 1,000 parts per million (ppm) of salinity or other solids.

Construction was scheduled to begin in June on an \$83.6 million desalination plant—the largest such inland facility in the world. It will be able to deliver 27.5 million gallons per day (mgd) of blended drinking water, all from the Hueco Bolson, when it begins operation, which is scheduled for 2006. The site is located on easements on Fort Bliss, which will share a small portion of the water for its own needs, scheduled to increase as the base takes in more troops in the next few years.

Also to be located on Fort Bliss is the logical consequence of desalination—the brackish residue. As the plant pumps out 15.5 mgd of pure water, it will also produce, from reverse osmosis filters, 3 mgd of saline concentrate. The pure water will be blended with 12 mgd of other aquifer water in accordance with drinking water standards.



GUADALUPE MOUNTAINS NATIONAL PARK IN THE BACKGROUND, WITH SALT FLATS AND POOLS OF SHALLOW WATER IN THE FOREGROUND.

so Archuleta and his staff began drawing up a 50-year plan, which he says was "the genesis of all we've done." The result is an information and technology-driven approach called "Total Water Management." Its basic prongs are conservation, reclamation, more efficient use of the river and bolsons, and, as necessary, importation.

Conservation is easily the cheapest and probably the most effective way to manage water. To date, EPWU programs have given away more than 200,000 low-flow showerheads and hundreds of free clamps for swamp cooler hoses (which reduce the amount of water used by evaporative coolers). It offers substantial rebates for water-conserving horizontal (front loading) washing machines, xeriscaped lawns and low-flow

ments have given the city some of the country's most comprehensive and innovative water-recycling programs. Over the next 10 years, EPWU plans to spend another \$1.1 billion in capital improvements. The state and federal governments offer relatively minor funding, so the burden is borne by the taxpayer-users. This year, the city authorized a 35 percent rate increase, to minimal ratepayer objections.

The money goes to facilities such as three secondary-level wastewater treatment facilities and a tertiary-level reclamation plant. These currently reclaim about 11 percent of the city's indoor (nonevaporative) water and wastewater, and might climb up to 17 percent. Reclaimed water goes to nonpotable uses such as electric power plant cooling or

Getting rid of the concentrate is the problem. EPWU's decision, selected from several alternatives, is to inject it underground. Pending approval from the TCEQ, the EPWU will sink three Class-V, gravity-fed injection wells to pump the brine to a zone 2,350 to 3,770 feet deep, near the New Mexico border.

The saline extract, which is clear and looks just like water, will contain 6,000 parts per billion of dissolved solids. That's not only considerably less than the 35,000 ppb found in sea water, but also less than the 7,000 to 8,000 already in the porous rock injection zone of fractured dolomite and limestone. (Anything under 10,000 ppb is considered a potential source of drinking water if treated.)

The major environmental concern is possible seepage. The injection zone holds a "plume" of the pumped-in material, and although shale layers are supposed to prevent spreading, the EPWU will monitor the injections. If leaks occur, the EPWU will make adjustments, according to Bill Hutchison, EPWU's manager of hydrogeology. But he says any seepage from the Fort Bliss site, if occurring, would not be catastrophic, since the salinity of the concentrate would actually be lower than that of the brackish aquifer into which it is injected. Effects of the drilling on already compromised habitat on the Fort Bliss property is not considered to be significant.

CAN IT WORK?

The El Paso chapter of the regional Sierra Club has long been watching the problem, especially how watering a city affects the ecology around it, from natural habitat to the homes of its neighbors. Club President Laurence Gibson says that while the city and EPWU have "made a lot of progress," especially in conservation, for the most part all the technical achievements ignore the more important questions of the city's ethical soul.

"We think it's dishonest," Gibson says of a plan that not only tolerates but encourages continued growth and continued draining of the aquifers and the river. "The city needs to acknowledge the fact that we're living in a desert. Our position is that we should be living sustainably. The real problem is that we're not. Look, we're switching from fresh-water to desal, and the city's fathers are looking to a future of importation. ... We need a huge change of morality to understand that it's not right to take other people's water."

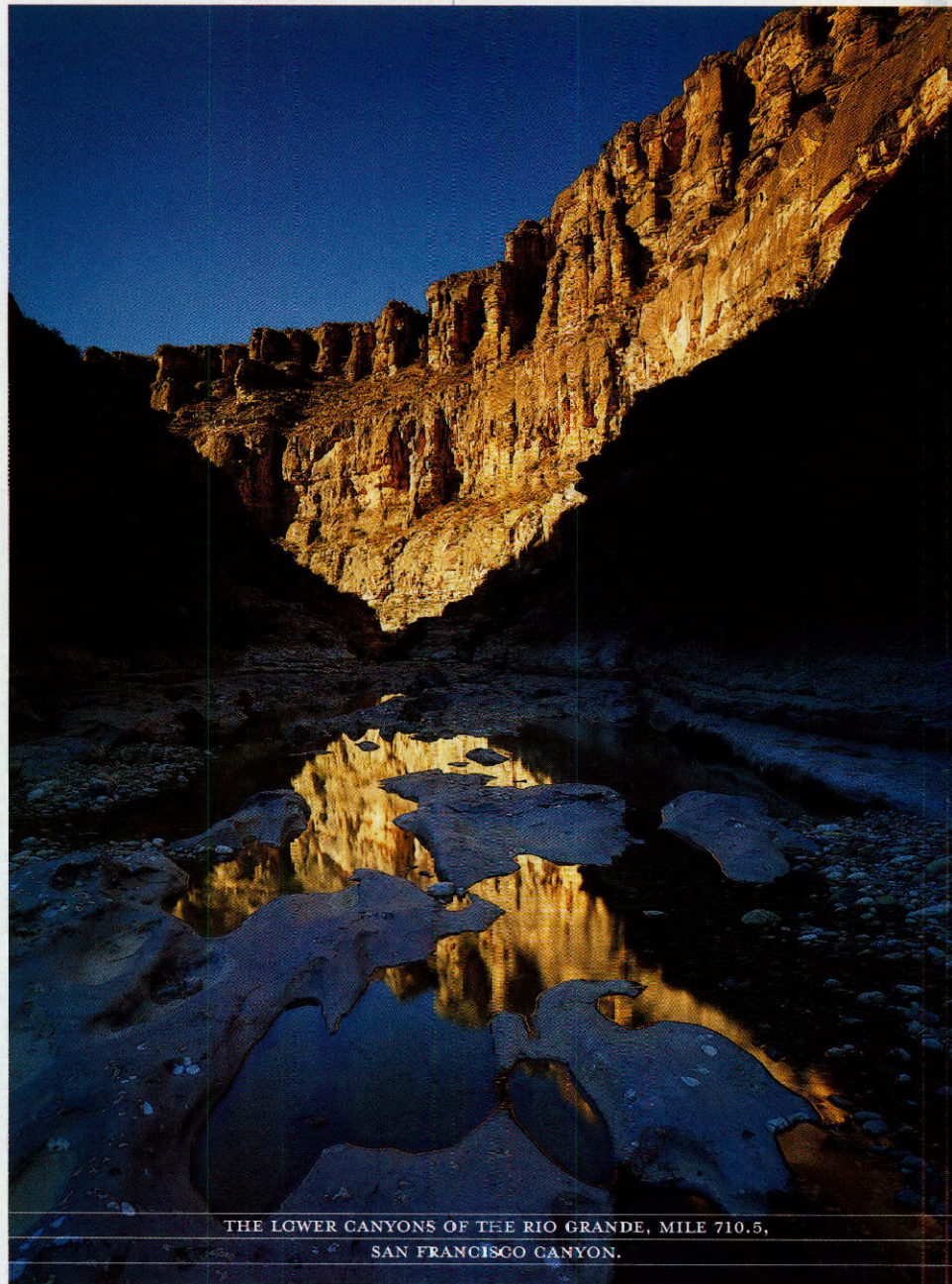
Desalination, he says, at least is "a more honest approach than importation," but it only begs the morality question again: Why the growth, and why the territorial impera-

tive to take whatever is needed. The problem, to him is political, not technical. "The people are not calling the shots," he says. "The good-old-boy network is still alive here."

Even with these and other criticisms, the Cassandra outlook of only a few years ago has been dialed down significantly. EPWU says

importation — the likely source of the biggest battles to come — might begin would be 2015, and then only on the water ranches the city owns and, much later, in Del City or other areas. "We told them, when the dust settles, come and see us," he says.

Juárez remains the unknown factor. Its engineers are sharing data with El Paso's,



THE LOWER CANYONS OF THE RIO GRANDE, MILE 710.5,
SAN FRANCISCO CANYON.

its data show that El Paso has sufficient groundwater resources, at current growth projections, to last 75 to 100 years. "We're not declining like we were," says Archuleta. "We've seen dramatic changes in groundwater projections ... There's a lot more recharge from the river than we thought. If we keep doing what we're doing ... we're going to be fine for a long time."

Archuleta says the earliest time frame that

and the two cities have agreed to use the same modeling projections, but the Mexican city is hampered by inadequate treatment facilities, limited budget and rampant growth. Ecological issues are not exactly on the front burner. Juárez is even said to be considering tapping into the Mesilla Bolson, where, like El Paso, it can draw as much as it wants, for as long as it has to, but only for as long as it lasts. ★

IMPROVING THE LANDSCAPE OF TEXAS

"TEXAS: THE STATE OF WATER"
COMMUNICATIONS INITIATIVE.

M.D. ANDERSON CANCER CENTER.

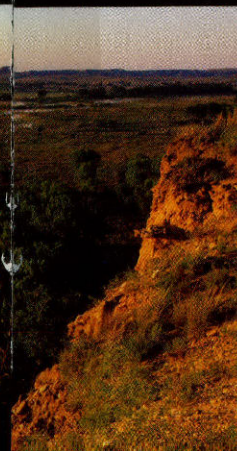
SCOTTISH RITE HOSPITAL FOR CHILDREN.

UT SOUTHWESTERN MEDICAL CENTER.

COLLEGE SCHOLARSHIPS THAT ENSURE EDUCATIONAL
OPPORTUNITIES FOR FUTURE GENERATIONS.

Boone Pickens' Mesa Vista Ranch in Roberts County, Texas,
where wildlife management initiatives have improved natural habitat for native species.

Photo by Wyman Meinzer



The
**BOONE
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Foundation of
Texas Fund

These are just a few of the many causes supported by Boone Pickens and The Boone Pickens Foundation, committed to improving the natural and human landscape of Texas for decades to come.




Mean

By John H. Ostdick

Al. Green
Aliens

PHOTO © BRADY ALLEN

SALT CEDAR IN BLOOM. THIS GANGLY INVASIVE, IMPORTED IN THE 19TH CENTURY TO CONTROL EROSION, STEALS WATER FROM STREAMS AND RIVERS IN TEXAS AND THE WEST.



In the battle against invasive plants, scientists try everything from airborne herbicides to ravenous bugs to sterile fish.

PHOTO © KATHY ADAMS CLARK/KAC PRODUCTIONS

EVEN THOUGH ITS BLOOMS ARE INVITING, THE WATER HYACINTH, AN INVADER FROM SOUTH AMERICA, IS AN UGLY CURSE FOR TEXAS LAKES — POSING A THREAT TO CADDO LAKE, TOLEDO BEND AND OTHERS.

When a federal government program in 1823 began introducing the pink-flowered, gangly saltcedar (*Tamarix spp.*) into the western United States to stem the rate of soil and bank erosion in arid riparian systems, administrators overlooked how the trees might react when removed from their natural predators.

James Tracy, below right, a biological science technician with Grassland Soil and Water Research Laboratory in Temple, monitors the activity of the saltcedar leaf beetle in a controlled environment. His research led him to a leaf beetle (family *Diorhabda*), below, a natural enemy of the saltcedar, that offers the best option for effective biological control. It lays eggs on the stem, lower right, and its larvae feed on the saltcedar leaves.



The long-term results had far-reaching consequences: The saltcedar spread and multiplied at voluminous rates, choking off native grasses, cottonwoods and willows. Today, saltcedars occupy more than 800,000 hectares (1.977 million acres) of highly valuable land along streams and lakeshores from the central Great Plains to the Pacific, and from Montana into northern Mexico. In 1999, the NASA-sponsored Texas Synergy Project identified 12,500 acres of likely saltcedar stands in the state, data that the Texas Department of Agriculture is using to prioritize control efforts.

Saltcedars and other invasive species are wreaking havoc on a number of the state's lakes and rivers, crowding out more beneficial vegetation while putting down water-sucking roots along shorelines, in some instances clogging rivers and power plants, damaging wildlife habitats and, in the most severe instances, killing out other aquatic life in lakes.

The economic impact of terrestrial and

aquatic invasives is staggering — yet difficult to estimate with any precision. According to the Washington-based Union of Concerned Scientists, an independent nonprofit alliance of more than 100,000 scientists and concerned citizens, the nationwide economic impact of invasive plants is \$13 billion a year. Certainly, water-related invasives pose a significant threat to the state's water quality and supply, wildlife habitats, its tourism and the more-than-\$6-billion sportfishing industry.

In February 2003, UCS published the results of a three-state study (Texas, Alaska and West Virginia) that provided the first comprehensive tally of invasive species. In Texas, it identified 122 non-native species — from the saltcedar to beaver-like rodents called nutria — that are “wreaking havoc on Texas's crop lands, native plants and animals,

and the state's resource-based economy,” reports Phyllis Windle, a UCS senior scientist and invasive species project manager.

Invasive species are legally defined as alien species whose introduction does, or is likely to, cause economic or environmental injury or harm to human health. Any species not native to an ecosystem is considered an alien species; the introduction can come in many forms, both intentional, as in the case of the saltcedar, and accidental.

“Basically, saltcedar is in every river west of Interstate 35, with the possible exceptions of maybe the Nueces and the Frio,” says Danny Allen, an Austin-based analyst with the Wildlife Habitat Assessment Program at the Texas Parks and Wildlife Department.

Hydrilla (*Hydrilla verticillata*), first introduced into North America in the mid- to late-1950s by the aquarium trade, is one of the state's worst aquatic invaders. Today it covers about 100,000 surface acres and is growing in nearly all of Texas' 100 reservoirs, according to Earl Chilton, Aquatic Habitat Enhancement Program Director for Aquatic Vegetation Programs at TPWD in Austin.

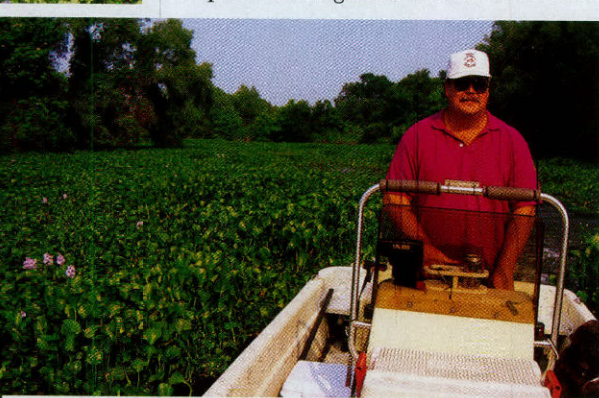
Dense mats of hydrilla alter water quality by raising pH, decreasing oxygen levels under the mats and increasing water temperature. Stagnant water created by hydrilla mats also provides good breeding grounds for mosquitoes. Hydrilla growing from the bottom of the water body increases the roughness of the bottom, slowing the conveyance of water.

Giant salvinia (*Salvinia molesta*) is a floating, rootless water fern native to South Africa. Predators control its population within its natural habitat, but outside their reach it spreads astronomically, doubling its population every two to eight days. It can grow to 2 feet thick, and kill off an entire body of water, says TPWD's Chilton. In Texas, the fern was first noted in a small pond in 1998; it now has been documented in 10 public waterways and many more private bodies. The floating invasive is particularly insidious: A single leaf transported into a new water source on boat trailers or propellers can launch a new population.

Water hyacinth (*Eichhornia crassipes*), a free-floating plant native to South America, can vary in size from a few inches tall to more than 3 feet and produces a showy purple or lavender flower, which makes it a popular ornamental. However, massive weed



SALT CEDAR'S INFESTATION IS PARTICULARLY PROBLEMATIC ON THE RIO GRANDE, WHERE IT CROWDS THE RIVER BANK, CHOKING OUT THE NATIVE COTTONWOODS AND WILLOWS.



colonies can grow when introduced into areas that are conducive to their proliferation — posing a significant challenge in East Texas in Caddo Lake, Toledo Bend, Lake Houston, Lake Livingston and Lake Texana. Texana is a Molotov cocktail of invasives, with hydrilla, giant salvinia and water hyacinth all present.

In most cases, eradication of these invasives is extremely problematic because of both cost and logistical factors, especially in larger bodies of water and in rivers that pass through large tracts of privately held property. Biologists and agency officials are searching for the best methods to restrict new introduction and a combination of chemical and biological agents to control their existing populations and limit the damage they can cause in Texas waters.

Sitting in his Temple office amid boxes of research and correspondence that have put down almost as many roots as the nearest stand of saltcedars some 300 miles away, Jack DeLoach believes he has a viable biological control for the invasive species.

“Many people have never heard of biological countermeasures, although the practice began in 1863,” says DeLoach, an entomologist with the Grassland Soil and Water Research Laboratory at the U.S. Agriculture Department’s Agriculture Research Service.

“There have been 1,100 cases of insects being released in more than 25 countries since.”

DeLoach, who started working on the saltcedar problem in March 1986, is a member of the Saltcedar Biological Control Consortium, a coalition of about 35 federal and state agencies, universities, and private and environmental groups organized in 1997 to research biological control alternatives to saltcedar infestations (about one-third of the participating organizations are in Texas).

“When saltcedar first invaded the Colorado River, it spread at the rate of 50 to 60 miles a year,” says DeLoach, whose longish, slightly askew gray hair, large glass-

es, dark blue work shirt with pocket protector, and blue jeans embody how a *New Yorker* cartoonist might sketch an entomologist. “They have tiny seeds that ride on the wind or are carried on the water. Talk of saltcedar eradication is nonsense. What you try to do is keep the population controlled, below the threshold of damage.”

In five overseas trips from 1992 to 1998, DeLoach and consortium colleagues helped identify more than 20 types of insects that were tested against all related plants in the saltcedar-affected areas. After research indicated it would not harm other organisms in the regions involved, DeLoach gained approval to use a leaf beetle from Fukang, China, and Chilik, Kazakhstan, for sample testing release.

DeLoach was ready to do the first release in 1995 when federal concerns about a possible threat to the willow flycatcher, an endangered species that had started nesting in some isolated saltcedars in New Mexico, delayed the project while DeLoach conducted follow-up impact studies. In May 1999, his group received approvals for open field tests at eight of 10 approved sites, including West Texas. Under an agreement with the U.S. Fish and Wildlife Service, researchers will not release the beetles within 200 miles of a flycatcher nesting in saltcedar.

Although DeLoach could have done some cage tests at that point, Texas open field tests were delayed another two years because the original beetles proved ineffectual in the state due to climate differences from their native land. “We had to find more beetles in the Mediterranean area (*Diorhabda* from Crete) and test them,” he notes.

The worst concentration of saltcedar in the country is along the Rio Grande, from Presidio to almost El Paso. “It’s called the ‘Forgotten River,’ because water from the El Paso area is absorbed by the saltcedar and doesn’t make it to Presidio,” DeLoach explains.

Although early estimates of the water saltcedars actually draw per day were highly overestimated, where the saltcedars grow and how they impact habitats make them formidable threats to water resources and wildlife habitats. The saltcedar not only chokes water supplies, it also degrades existing water and soil quality by secreting salt from its leaves.

Cottonwood and willows are far more valuable from a wildlife habitat perspective, DeLoach notes. “Further, cottonwood and willows can only live in areas where there are shallow water tables,” he says. “Saltcedar can live in both shallow and deeper water tables, so it can grow much farther back from the river, using water over the whole river valley. That’s why they use a lot more water overall.”

The battle with invasive species escalates on Texas lakes and rivers. Plants like the giant salvinia, bottom right, and water hyacinth, center right, can completely cover a body of water. Infected shallow areas, too, are nearly impossible to treat. Invasives clog propellers, center left. In some cases, a single leaf can start a new colony. The beaver-like nutria, bottom left, is wreaking havoc on Texas waters.

The Texas Parks and Wildlife Department, the Texas Department of Agriculture and the Texas A&M Extension Service are involved in various ways with other entities on the saltcedar project, wildlife habitat analyst Allen says.

"For example, the Texas A&M Extension Service has been doing a project on the Pecos River, in cooperation with the Pecos River Water Authority, spraying the river with a herbicide carrying the trade label Arsenal, from Red Bluff Dam all the way to the confluence with the Rio Grande," he says. "The river authority considered it an important water-yield project, calculating that for every dollar it spends on the treatment of saltcedar it can get so much value in water return. In many places, for saltcedar control the money is the problem — it costs about \$180 an acre to spray."

Because spraying with herbicides like Arsenal results in about a 90 percent kill immediately, many local entities see it as the best option. "But Arsenal will kill all the vegetation there [it's not toxic to wildlife because it specifically works on a photosynthesis pathway]," Allen says. "When we've still got a mix of some cottonwoods in there, some willows or some native herbaceous vegetation mixed in, and you've got a sprinkling of saltcedar, it becomes more of an issue."

Control efforts are adopting "almost a two-pronged approach," Allen says. "There are immediate needs that we're spraying, and hopefully we can use biological control to get into the spots that we can't reach and to use as a long-term to control regrowth."

The phone rattles loudly in DeLoach's Temple office.

Consortium partner Ray Caruthers, of the Exotic Invasive & Weeds Research Group of the USDA-ARS in California, is touching base before traveling to a laboratory just outside of Buenos Aires to do further saltcedar research.

"I owe my life in the program to Ray Caruthers," DeLoach says. "He got a \$3 million grant that all of us involved in this project shared for four years. We're out of money, and we're just getting started on our work. We need about \$800,000 over a three- to four-year period, shared between members of the research project, and then we can get this well on the way."

The project has had its greatest success with 1,400 beetles released in Lovelock, Nevada, in May 2001. In September, local researchers reported that 65,000 acres of saltcedar have been defoliated, 100 miles up and down a river system. In areas where there is other vegetation, the saltcedars are defoliated but the other plants are untouched, DeLoach says.

In the rosiest of scenarios, DeLoach thinks the Crete beetle can do the same in Texas — they are actually only established at Big Spring and Artesia in the open field — and other southwestern states. "Three years from now, these beetles could control all of the saltcedar along these release areas and no additional controls will ever be needed," he says.

DeLoach and technician Tom Robbins, who has been working on the project for more than 20 years himself, walk toward a cluster of meshed beetle testing tents at the research center.

"This is as close to natural conditions as we can get and still keep them confined," DeLoach says. The researchers bag branches with larvae on them so they can study them and how much they grow, including an overwintering program to see how the beetles survive the Texas winter and how soon they emerge in the spring.

On a blustery early-spring day, inside the tents the saltcedars' pinkish flowers, which emerge before their wiry green foliage, are just popping out. A smattering of tiny green beetles works up and down the gangly trees. "It doesn't matter how small the beetles are if there are enough of them," DeLoach says. "Eventually, we'll have field days here, and

Agencies are battling aquatic invasives in the state with a combination of harvesting, chemical and biological measures

landowners will be able to come pick up beetles from the lab and release them on their own property. The only cost will be gasoline that they use in coming to get them. We're about ready for that in several places."

Finding further research funds is the greatest obstacle DeLoach faces. He has modest expectations for a March meeting, which drew "representation from all aspects of society, federal and state agencies from both Texas and New Mexico," seeking to build a broader consortium for the project.

Federal and state agencies are battling aquatic invasives in the state with a combination of harvesting, chemical and biological measures as well.

In giant salvinia's native habitat, a hyperactive small weevil — *Cyrtobagous salviniae* — controls the spread of salvinia. They were used as a highly effective countermeasure in Australia and New Guinea, and are being tested in the United States.

"About the best we can hope for is to keep it (salvinia) under control," says Chilton of TPWD's Aquatic Habitat Enhancement Program. "While herbicides can prove effective at eliminating salvinia from small bod-

ies of water, cost and impact considerations make large-scale eradication efforts impossible on large reservoirs or river systems."

From 1998 to 2003, a three-part cocktail of mechanical harvesting, herbicides and the introduction of sterile carp (a controlled introduction of sterile fish shouldn't have a long-term impact on the native fish populations) helped water managers get the upper hand on the hydrilla problems along the Rio Grande south of McAllen, Allen notes. Significant problems remain upstream between McAllen and the International Falcon Reservoir.

UCS senior scientist Windle, cites the importance of the National Aquatic Invasive Species Act, which would reauthorize 1996 legislation that expired in 2002. Windle worries that the legislation's complicated reach will continue to stall it in Congressional subcommittees.

"It was first introduced in 2002, when the '96 act expired," Windle says. "There is increasing pressure to break the legislation apart and just pass its first section, which deals with ballast water issues. I'm increasingly worried that would take us back to the piecemeal approach to the whole invasive species issue that has failed us in the past."

On April 13, 2005, nine senators co-sponsored a reintroduction of a bipartisan National Aquatic Invasive Species Act to "reauthorize and strengthen the National Invasive Species Act of 1996." As introduced, it would "regulate ballast discharge from commercial vessels; prevent invasive species introductions from other pathways; support state management plans; screen live aquatic organisms entering the United States for the first time commercially; authorize rapid response funds; create education and outreach programs; conduct research on invasion pathways, and prevention and control technologies; authorize funds for state and regional grants; and strengthen specific prevention efforts in the Great Lakes." Five representatives also introduced complementary legislation consisting of two bills, one research-oriented and the other geared toward preventive measures for the future.

"The lack of funds is certainly an issue for Texas," Windle says. "This legislation also addresses for the first time what we call screening of intentionally introduced organisms for invasiveness before they could be introduced. That is a pioneering step we really need."

In the last year, Congress passed four separate laws on invasive species, but all were very narrow and often addressed a single species or particular issue. Windle concludes, "This problem cannot be addressed on a species-by-species basis." ★



Water

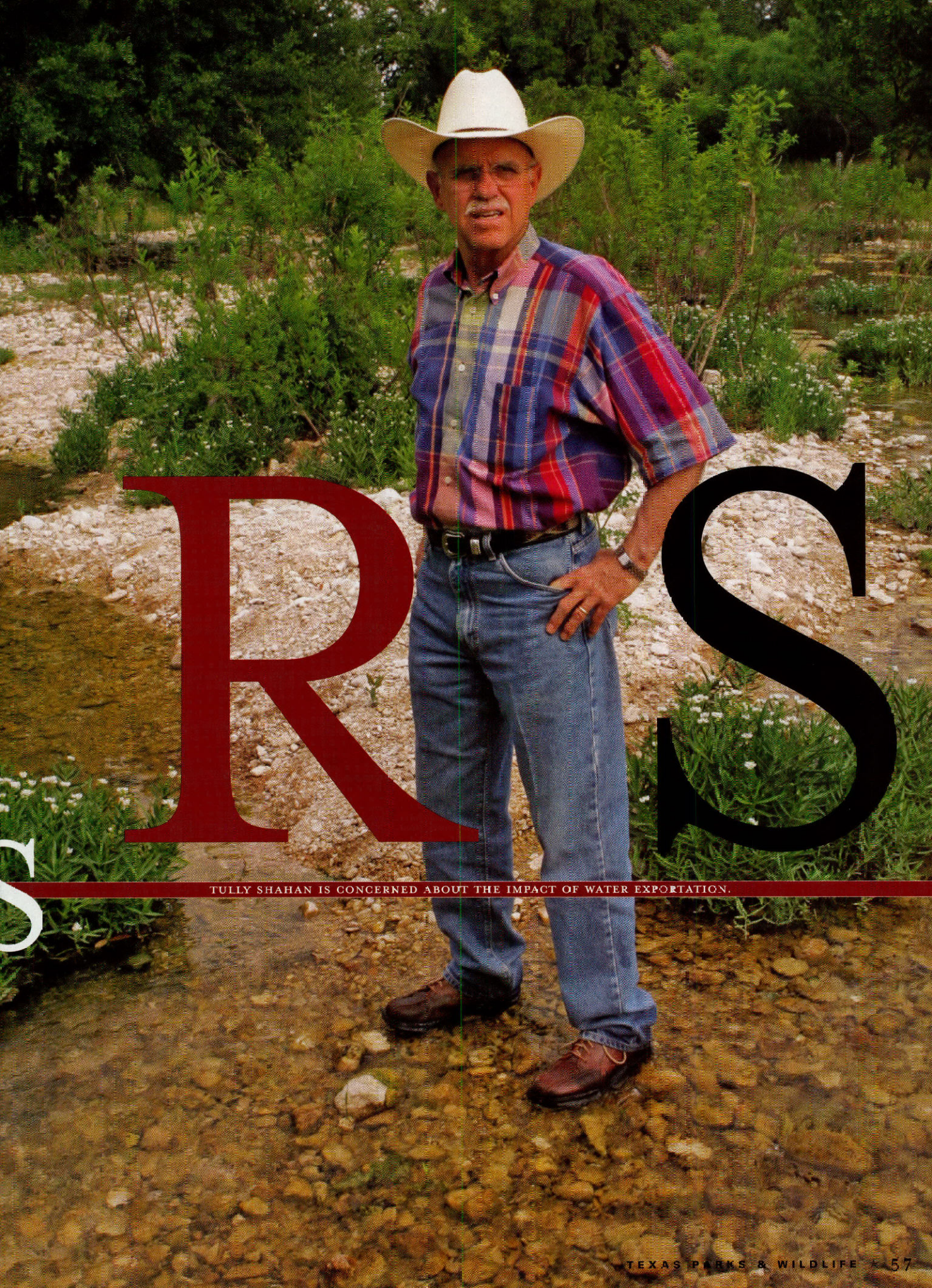
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ZACK DAVIS BELIEVES THERE'S ENOUGH WATER TO SELL.

How growing demand, fuzzy legal rulings and plain old stubbornness have turned **Kinney County** into a hotbed of **water politics**.

By Joe Nick Patoski

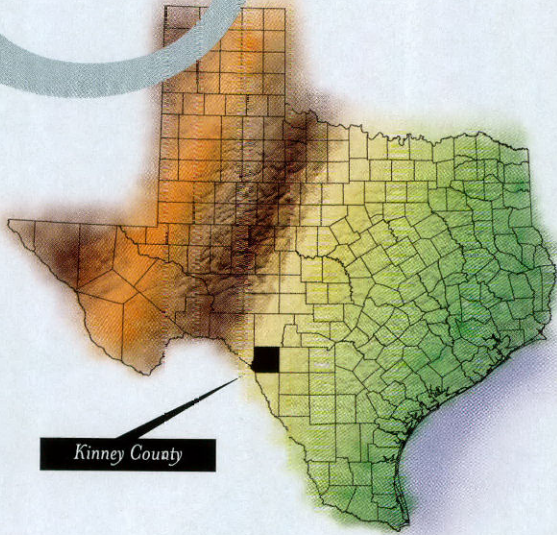
Photography by Earl Nottingham



IRS

TULLY SHAHAN IS CONCERNED ABOUT THE IMPACT OF WATER EXPORTATION.

Unless you frequently travel U.S. Highway 90 between San Antonio and Del Rio, you probably don't know where Kinney County is. Depending who you talk with, the Kinney County Groundwater Conservation District is either the poster child for how not to manage groundwater, or the last best defense for rural areas fighting big cities that covet their water.

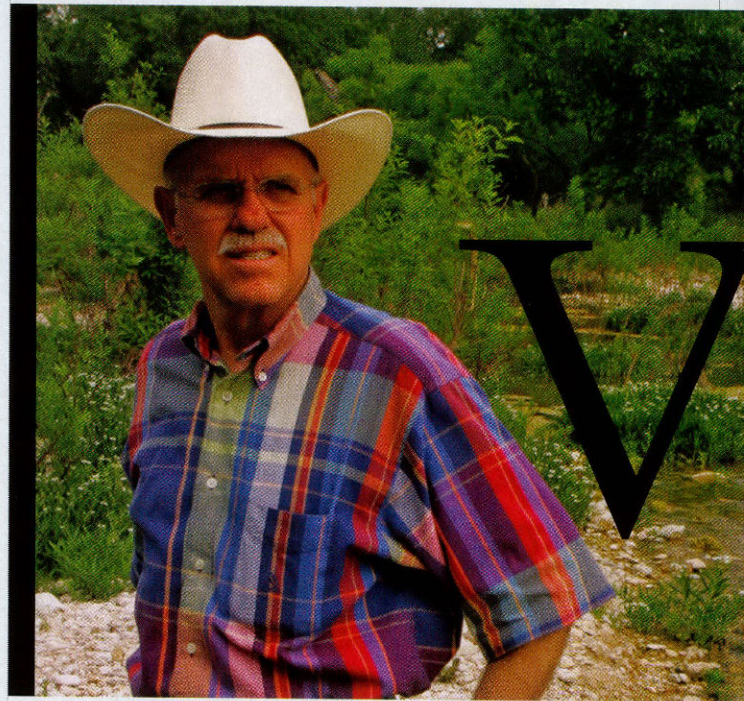


“Eight tenths of one percent of county property is irrigated, and the irrigators are trying to tell us what to do with 100 percent of the water.”

— Tully Shahan

The sparsely populated county is located in that transition zone between the Edwards Plateau and the South Texas Brush Country on the edge of the Chihuahuan desert. Brackettville, the county seat and largest town, with a population just shy of 2,000, is directly across the highway from one of Kinney County's natural treasures, Las Moras Springs, the ninth-largest group of springs in Texas, which discharge about 160 gallons of water a second. Fort Clark, which was built around the springs by the U.S. Army in 1852, thrives today as a gated residential community.

In 1959, Brackettville became famous as the location where the major motion picture, *The Alamo* starring John Wayne, was filmed. The movie set was preserved by landowner Happy Shahan and promoted as a tourist attraction called Alamo Village. But a couple of years before the movie was filmed, something more significant happened in Kinney County. While drilling an exploratory well north-



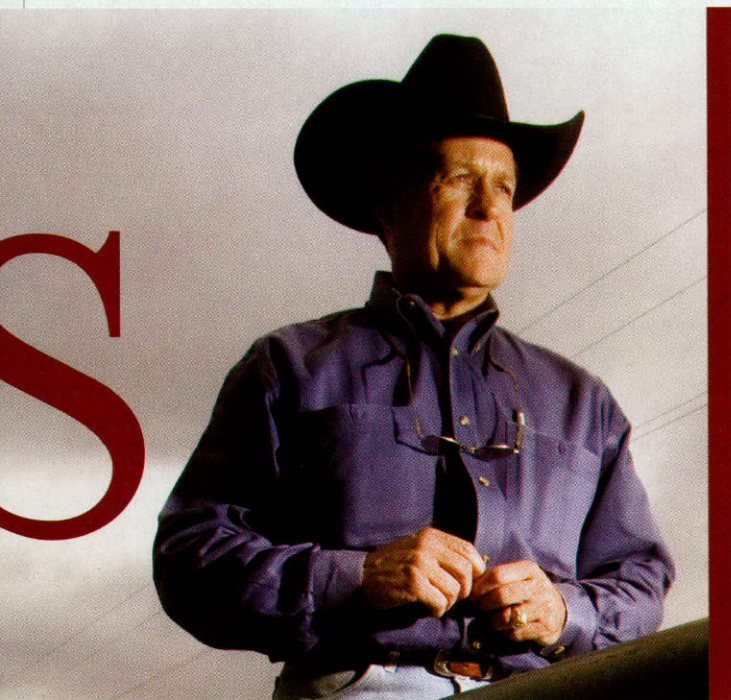
west of town in search of oil, drillers hit water. So much water that when Senate Bill 1 — the landmark water legislation mandating that all regions of Texas secure water supplies for the next 50 years — was passed in 1997, Kinney County came into play.

The abundance of groundwater, the county's small population, the growing demands of thirsty cities and Texas water law have made Kinney County ground zero in Texas' water wars, as water marketers, legislators, attorneys and lobbyists grapple with the new local groundwater district over how much, if any, water can be pumped and sold outside the county without impacting water supplies, springs, creeks and streams inside the county.

FROM ALL OUTWARD APPEARANCES, the February 22, 2005, meeting of the board of directors of the

Kinney County Groundwater Conservation District at the Kinney County Courthouse in Brackettville is perfunctorily bureaucratic — board members and the general manager gather around a table to discuss audits, groundwater availability models, recharge numbers, well violations, management zones and a newsletter. The language bandied about is as complex as the aquifers the board is charged with overseeing — the Kinney County portion of the Edwards Aquifer, the Edwards-Trinity zone and the Austin Chalk zone — all of which lack definite boundaries separating one aquifer from the other.

But that only partially explains the tension in the room, which emanates from 11 people sitting in the gallery separated from the board by a railing. They represent the interests of those in Kinney County who want to sell their water. One holds an audio recorder, another a video camera to record the proceedings. From the comments overheard in the hallway during a break, they are a frustrated bunch. They felt that the board was ignoring allocations recommended by Steve Walthour, the hydrologist hired by the board to advise them on pumping permits. Board member Christopher Ring's family corporation got more water than Walthour recommended; almost everyone else got far less than what they asked for. Allocations were based on land acreage, not on hydrology. They said board members had spread fear among voters that the county's water was going to be stolen, in order to assure election of five of six



board members opposed to moving water out of the county. The board refused the offer by WaterTexas, which most of the folks in the gallery were aligned with, to pay for a study of available groundwater. They even alleged that General Manager Darlene Shahan was working with her husband, Tully Shahan, the county attorney, to thwart their interests.

After the meeting, I head east to Hugh and Dennette Coates' place in the Anacacho Mountains, where Hugh Coates loads me up with legal briefs and talks about the Pinto Valley farmland he bought in 1988. "We have big water there, shoots straight to the ground. Never has been a pump that's sucked air in that valley," he says. And yet, the groundwater district just allotted him less than one third of what the board's consultant recommended. "It's like coming to your house and saying, 'You can have one bath a month,'" Coates complains.

Some of the other folks attending the groundwater district board meeting show up at the Coates', too: Jewel Robinson, the publisher of *The Brackett News* and a Pinto Valley landowner who has applied for a pumping permit not to sell water, she says, but to assure flow in the creek that "means so much to me"; her son Wesley; Beth Ann Smith, the groundwater district board member who typically casts the lone dissenting vote in board matters; her husband, Richard Smith; Tony Frerich, the co-owner of Kinney County Wool & Mohair; Jennifer McDaniel, who works at the wool house, and her husband, Jim McDaniel, the last cotton farmer in the county.

Over a sumptuous spread of real South Texas Mexican food, they detail the unpleasantness that's been visited upon them since the city of Eagle Pass first approached several of them eight years ago to see if they'd be interested in selling their water. Their willingness to sell has run headfirst into a board that they say is unwilling to compromise but keeps changing the rules anyway. The pumping caps set by the board are arbitrary, they say. Allocation of such measly percentages amounts to a property rights "taking" (in a legal context, "taking" refers to a government action assuming ownership of real property by eminent domain). They believe that anyone on Pinto Creek downstream from the Shahans and the Rings is getting shorted. Jim McDaniel, the farmer, got 41 percent of what he asked for and will have to go back to the board in July for more water in order to finish his crop. Still, he admits, if he ever gets the permitted amount he seeks, he's inclined to sell his water and get out of farming altogether. Things have gotten so ugly, Dennette Coates relates, "They're telling us not to eat in a particular restaurant; they'll spit in your food."

I'd heard a whole other story earlier in the day in Tully Shahan's law office across the street from the county courthouse. Tully Shahan is the county attorney. His wife, Darlene Shahan, is the general manager of the groundwater district. Both have been instrumental

"This water getting valuable isn't my idea. It's something that happened. It still has to be a managed, regulated resource."

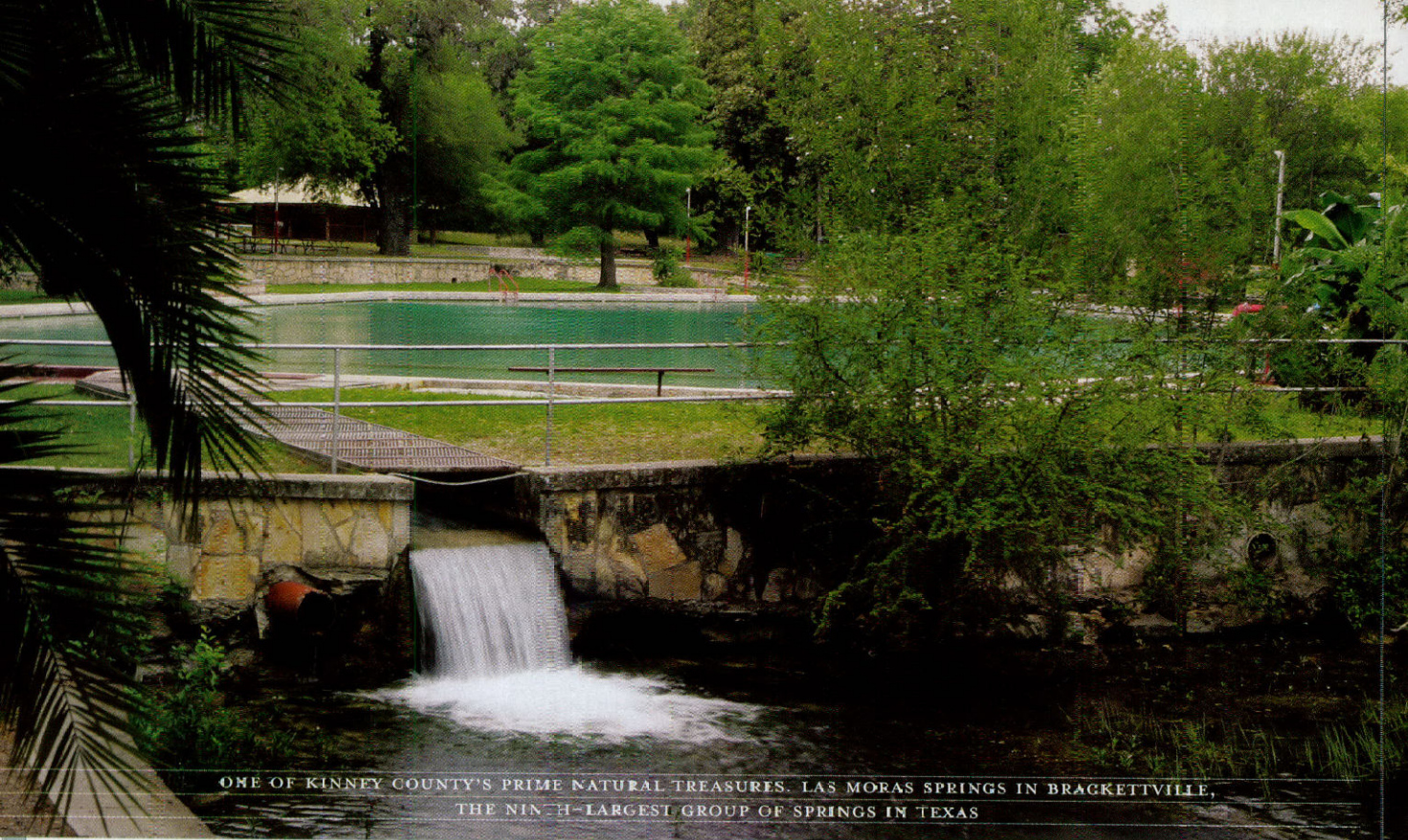
— Zack Davis

in forming the groundwater district and leading the fight against exporting water from the county. The way the Shahans tell it, approximately two-thirds of permit applicants were trying to thwart the will of the county's voters who elected the groundwater district members. Every sitting board member was reelected despite opposition, they point out. By going to state legislators and lobbyists, filing lawsuits and seeking to have the district dissolved, a tyranny of the few was destroying the board's good work, or at least bankrupting it through costly legal fees.

"Eight tenths of one percent of county property is irrigated," Tully Shahan says, "and the irrigators are trying to tell us what to do with 100 percent of the water."

The water purveyors have lobbyists, they say. The district can't afford one. "We have the highest tax rate and lowest budget of anyone out there," says Darlene Shahan. "We are very limited in what we can do as a district. More than two-thirds of the current budget is being absorbed by legal and consulting fees."

Tully Shahan produces an interim report by Senator Ken Armbrister, the chair of the Senate Select Committee on Water Policy, issued before the Legislature convened last January. It proposes dissolving the Kinney County Groundwater District and bringing the county under the jurisdiction of the Edwards Aquifer



ONE OF KINNEY COUNTY'S PRIME NATURAL TREASURES. LAS MORAS SPRINGS IN BRACKETTVILLE, THE NINTH-LARGEST GROUP OF SPRINGS IN TEXAS

Authority. the legislation introduced to accomplish this goal is HB 3571 (sponsored by Rep. Robert Puente) and SB 1857 (sponsored by Sen. Frank Madla). The move would leave the county without representation and cost the town of Brackettville at least \$24,000 a year for water it is now getting for free. Tully Shahan contends. He pulls out another newspaper clipping that quotes Armbrister as saying the 1904 State Supreme Court decision on Rule of Capture is not in the Texas Constitution.

Darlene Shahan insists the district is doing what the Legislature intended — protecting existing water supplies and users before allocating pumping permits. “Why did we enter into hearings in August, spend money on technical studies, give people an open forum and due process?” she asks. “One hearing was 13 hours. [Water sellers are] saying that we were going to rubber stamp the hydrologist’s findings. If that was the case, the board wouldn’t have sat through those hearings. The water sellers just don’t like how the board is interpreting the rules. The board is doing their best to protect the water according to Chapter 36 of the Texas Water Code and the local rules. We’re being as conservative as we can.”

To illustrate why the board is taking the cautious approach, Tully Shahan drives me out of town to the family ranch, a 16,000-acre spread just north of Brackettville, where the headwaters of Pinto Creek are located. He takes a modified golf cart through a pasture down to the rough creek bottom where the creek emerges out of a rocky outcropping and runs pure and shallow through the oak scrub. The cart scoots up over and around limestone gravel shoals to a perch overlooking a small tributary of the creek. A few stone skips away, bubbles float to the surface marking the main spring. The creek bottom, fully visible, shimmers with a pale blue tinge of purity.

Shahan then drives to another spot near a fence line. On the other side are wells that were drilled in the early 1960s that immediately dried up six wells on his family’s land, forcing him to drill new wells at considerable expense. The direct cause-and-effect have given him pause ever since, he says.

A little after eight the next morning, I meet Zack Davis at the

Davis Hardware Store and Ranch Supply in downtown Brackettville. Davis, a tall, jut-jawed Kinney County native like Tully Shahan, is taking me to his farm in the Pinto Valley, about 5 miles northwest of town and about 20 creek miles upstream of the Rio Grande. Like most folks in the county, Davis wears many hats — veterinarian, farmer-rancher, former small businessman (after 26 years, he sold his store), husband of a pharmacist, father to six kids.

Pinto Valley is a small 4-mile-by-1-mile basin along Pinto Creek that is locally known as the “honey hole,” Davis explains, an exceptionally abundant source of recharged groundwater where most of the county’s irrigated farming occurs, marked by an almost straight line of artesian wells that run down the valley. Land within a mile yields no water at all. “I had a hydrologist out here once who’d studied this area,” he says. “He told me this solved a mystery — now he knew where all the runoff in Edwards and Real counties up on the Edwards Plateau went.”

After the bounty of water below was discovered in 1957, the Pinto Valley was intensively farmed for vegetables over the next 25 years. Buildings that once housed packing sheds and loading docks speak of that brief period when one-third of the nation’s cabbage and a good chunk of America’s onions were raised in Pinto Valley. But by the 1980s, economics prompted farmers to switch to livestock feed crops such as sorghum, oats, millet, Bermuda grass and alfalfa.

Even with more than enough water, farming and ranching are dicey propositions, acknowledges Davis. “There’s five to 10 percent of the livestock that there was in 1978. If we didn’t have hunting in this county you could turn the lights out.” In fact, the hunting economy in Kinney County generates more dollars today than farming and ranching combined.

He drives his truck over a fresh field of oats, scanning the sheep and cattle grazing on the bright green cover to spot any legs sticking out of the furrows. Some sheep fall asleep while grazing and fall into a furrow and can’t get up, Davis explains. He finds several and puts them upright.

He stops to demonstrate just how much water there is in the honey

hole. Using a large wrench to open a valve in a tangle of pipes, he unleashes a torrent of cool, clear water that shoots out of the pipe with enough force to knock a person down. That sort of abundance, along with queries from Eagle Pass, then Laredo, prompted Davis to organize farmers interested in selling water rather than using it to farm. His search eventually led to WaterTexas, an Austin-based company hired to represent the sellers' interests. Ironically, one of the first things WaterTexas' Dan Pearson told Davis was that Kinney County needed a groundwater district before exportation could begin.

Selling water is a higher, better use of the resource, Davis says. "If City X comes in and says they'll pay me more than what I'm making on this, what am I going to do?" Davis asks. "Over in Uvalde, they built a Wal-Mart on prime farmland. This water is no different. It's taking a different value than if we farm it. This water getting valuable isn't my idea. It's something that happened. It still has to be a managed, regulated resource."

He still believes in the concept of groundwater districts, just as he believes in the Rule of Capture. "The Edwards Aquifer Authority scares me like it did 12 years ago [when the county successfully petitioned to be left out of the EAA's jurisdiction]. At the same time, it can't be any worse than what we have now."

Davis sat on the groundwater district board until he resigned out of frustration and still sits on the board of the Plateau Region J regional water planning group along with Tully Shahan; the group oversees water planning in a zone that runs roughly between Del Rio and Kerrville. He views the Shahans and the Rings as co-conspirators bent on pressuring smaller landowners downstream like himself. "We feel like they're trying to choke us out financially. They want to make it so we'll have to go to them for their allotment if we want to sell water. But we're fortunate. We don't have to depend on the farm as our sole source of income. They're not going to get my farm."

Davis pulls his vehicle over by the banks of Pinto Creek. "I've seen it go bone-dry while the artesian wells are flowing," he says, gazing over the spread of low oaks and mesquite and blindingly green, lush fields of oats and alfalfa that are fed by the artesian wells. He drives back to Brackettville, heads north to the other side of the Shahan and Ring properties all the way to Nueces Canyon, a stunning sliver of lost Hill Country scenery on the west fork of the Nueces River. Davis grew up on this land and has maintained the family homestead here. He gazes proudly over the rugged hills and fertile bottomland and says, "There's not enough money in this world to dry up springs. You've lost touch with reality if money means more to you than something like this."

Despite the effect of artesian well pumping on Pinto Creek, Zack Davis believes there's plenty of water to give and relates the story about when Las Moras Springs went dry in 1964 (due to drought and heavy pumping for irrigated farming, according to many accounts), Brown & Root, which had bought Fort Clark after it was decommissioned, sent tanker trucks to fill up on water from an artesian well in the valley and drove the water to Brackettville.

The prospect of the groundwater district being dissolved and water speculators taking over groundwater in the next county prompted Jay J. Johnson, the owner of a bed & breakfast in Del Rio, to organize the West Texas Springs Alliance in March 2005, joining other groups throughout central Texas in the Greater Edwards Aquifer Alliance who are fighting water marketers. "Kinney County is a test case. If a fast one can be pulled on the naive citizens here, the same fast one can be pulled on any other board in any other county that is rich with water," says Johnson. "I maintain that the true farmer or rancher should be allotted and receive the water that they need to conduct the agricultural business on their land. On the other hand, I'm totally opposed to anyone who would exploit and siphon from our aquifers so that water can be exported to the metro areas," he says.

Kinney County Judge Herb Senne points out that the commissioners court, as well as the city councils of Brackettville and Spofford, passed resolutions supporting the Kinney County Groundwater Conservation District and opposing its dissolution by the Texas Legislature.

"The voters of their county were given a choice whether to put a district in place. Seventy-eight percent of the people who voted in the elections said yes. That same ballot had the option of how to fund the district and 65 percent of those who voted chose to fund it with an ad valorem tax. If that doesn't show the district is clearly the choice of the voters in Kinney County, I'll eat my hat."

Anecdotal evidence on both sides of the issue fails to address other lingering questions: Exactly what constitutes a private property taking? What constitutes degradation of a natural resource like a spring? Who pays for the degradation? Is there a right of guaranteed stream flow? How connected are the headwaters of Pinto Creek to the artesian wells in Pinto Valley? If the Legislature dissolves the Kinney County Groundwater Conservation District, what does that say about groundwater districts being the state's preferred means of locally controlling groundwater use, and what does it say about preserving the Rule of Capture?

No matter what legislators, lawyers, lobbyists, judges, entrepreneurs or bureaucrats say or do, springs are vital to the environmental and economic health of Kinney County, just as they are everywhere else in Texas.

Though the feuding has spilled over into churches, schools, businesses and all over the county, each and every one of the folks I visited with has more in common with each other than they'd care to admit: They are passionate about protecting their land, guided by a deep and abiding love for its beauty, which in the respective cases of the Shahans, Coates and Davises is directly tied to the water.

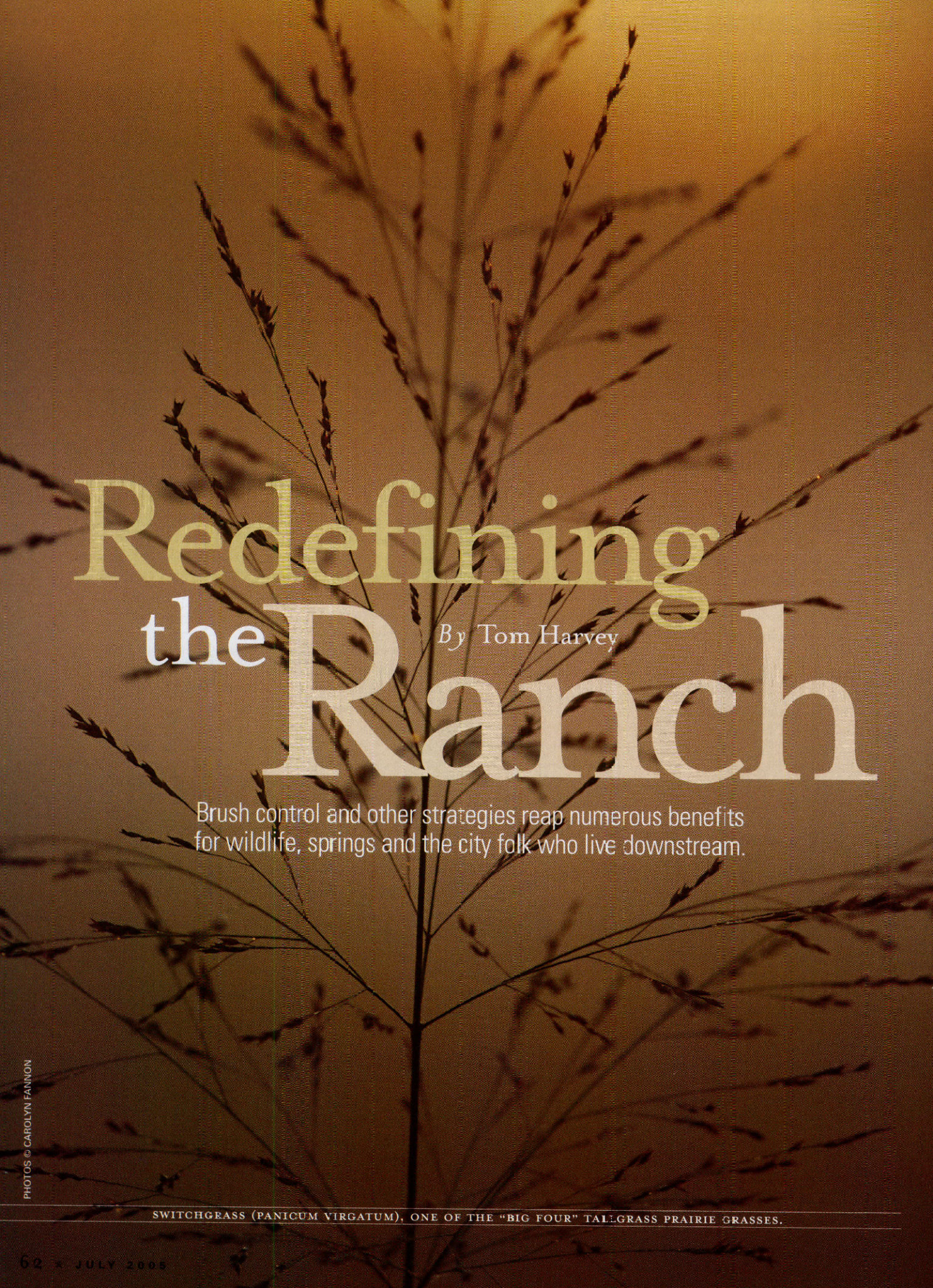
Politics aside, Kinney County has some of the best water anywhere in Texas. The riparian corridor along Las Moras Creek below the headwaters was as alive with wildlife as anywhere in the Rio Grande Valley river brush just after sunrise one morning. The sight of artesian water gushing out of well pipes, pure, clean, cool, pushed as high as 20 feet in the air by underground pressure, is downright miraculous.

Some of the hows and whys of that miracle are answered by Gary Garrett at the Heart of the Hills Fisheries Science Center near Ingram. Garrett is a TPWD biologist who has studied the springs and creeks of Kinney County extensively. He wastes no time explaining their delicate condition.

"The headwaters of Pinto Creek are biologically unique. It's one of only four places on earth where the Devils River minnow exists. It's a natural lab scientists hardly ever see. Pinto is really two creeks. North of Highway 90, it's quite a healthy system. That's where the Devils River minnow thrives. South of the highway, the level of sulphur in the water is higher [writer's note: and emits quite an odor], salinity goes up, ammonia goes up, turbidity goes up. The Devils River minnow is no longer found. Instead it's the red shiner, which does well in a polluted environment.

"The value of rare, unique species is that they are biological indicators," Garrett explains. "If there's no value other than that, it is extremely important. I don't mind water leaving the county if it doesn't affect the flow of the springs and streams. The question is, how much? When they irrigate, some of the springs stop flowing. Those springs need to flow, that creek needs to flow. The death of an aquatic system ultimately affects humans. Keeping them healthy is healthy for all of us."


A century after the Texas Supreme Court decision upheld the Rule of Capture by declaring groundwater too "mysterious and occult" to regulate, the mystery remains, in Kinney County at least. ★



Redefining the Ranch

By Tom Harvey

Brush control and other strategies reap numerous benefits for wildlife, springs and the city folk who live downstream.



As Texas leaders and planners try to figure out how to provide enough clean water for cities, industry, agriculture and the environment, they might do well to look down. In the earth itself, they may find part of the key. ¶ When Texas soil is rich and dense with the fibrous roots of native grasses, it's like a giant sponge. The rain that falls on it soaks in and percolates slowly down, replenishing underground aquifers that bubble forth as springs. This is water conservation at the earliest possible point, using the land as a great catchment system to hold and filter water. In some soils, this can help sustain aquifers and springs during droughts, when water is needed most. In every case, it sends cleaner, higher-quality water into streams, rivers and coastal estuaries. ¶ The reverse is also true. When the land is abused, when it's overgrazed, when unmanaged native or invasive exotic plants suck the life out of it, when it's bare and rocky, the water runs off quickly, carrying precious topsoil with it, silt up rivers and lakes, quickly flushing everything away, leaving little behind for the dry times. ¶ This is a story about people who are doing things right. It's a story that shows why people in cities should care what happens in the country.

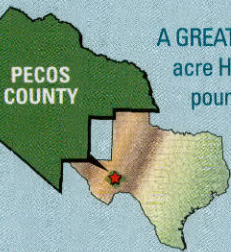
KNOTROOT BRISTLEGRASS (*SETARIA GENICULATA*) ON THE TALLGRASS COASTAL PRAIRIE.



SHERMAN HAMMOND SURVEYS HIS HAMMOND RANCH



GHOSTS OF SHIPS IN THE DESERT



A GREAT LENGTH OF ANCHOR CHAIN lies across the arid soil of the 33,000-acre Hammond Ranch southwest of Fort Stockton. A single link weighs 50 pounds and measures 18 inches. In years past, it hoisted anchors for ocean-going vessels. Similar chains stretch across the earth on other ranches nearby.

Although long divorced from the sea, these chains retain a connection with water. Ranchers pull them between bulldozers to scrape away water-sucking creosotebush, tarbush and mesquite.

Sherman Hammond has cleared brush on some 12,000 acres this way. For Hammond, in a region that averages 12 inches of rainfall per year, it's all about water.

"The problem you have in this part of Texas is when it rains all your water runs off," Hammond says. "It's been so abused by overgrazing for the past 100 years."

Hammond's wife's great-grandfather homesteaded the ranch close to a century ago. His wife inherited one-eighth of the property in 1963. Sherman proceeded to buy out the other heirs, and they had the ranch back together by 1980.

"When I got control of this ranch, it had all these ranch roads over it, and they turned into canals when it rained," Hammond says. "What I've been trying to do is get the water out of the road and spread it back out over the rangeland."

Hammond began digging "potholes" the size of pickups all over the ranch, producing aerial photos that one observer said "look like a bombing range." The earth from these shallow pits is piled next to them to stop and hold rainwater. He also built long berms or levees off the ranch roads to catch water.

The result is a patchwork of green across the land. Water stays in the soil longer here, and native grasses are coming back.

"We're seeing bluestem, buffalo grass and sideoats grama," says Hammond. "Those are the ones we call the 'ice cream grasses,' the ones your cattle, deer and wildlife will eat first. We also have more tobosa grass, a native that's great nesting habitat for quail."

Research has verified the benefits. Dale Rollins of Texas A&M University in San Angelo conducted a two-year quail study on the ranch.

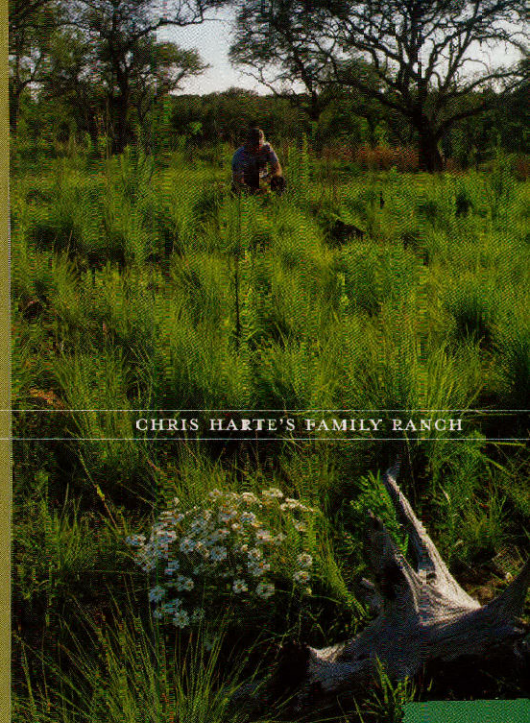
"Those moist soil sites produced 25 times more vegetation and six times more arthropods [insects]," Rollins says. "By putting those little green spots across the landscape, we're providing more insects, which are a key factor for quail and other birds."

Hammond believes there was "live water" on the ranch long ago, because "We've got Indian camp grounds indicating that." But the springs or creeks are gone now.

Still, he has noticed that the underground water table "is as high now as it's ever been."

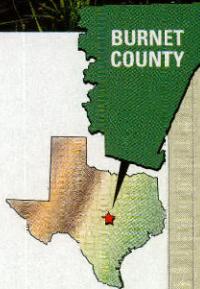
Every time they service a well pump, they measure the water level.

"On one well, the static level has risen 75 feet. I don't know how much of this you can contribute to this chaining we're doing, but every time you take out one of these bushes, you're saving water, and it filters down into the aquifer." ★



CHRIS HARTE'S FAMILY RANCH

A LEGACY WELLS UP ON SPICEWOOD RANCH



FOR 10 YEARS, Kay Harte urged her husband, Chris, to restore the family ranch west of Austin. Through her landscape architecture training at UT and work with David Mahler, an environmental consultant who has guided restoration on the ranch, Kay developed a love for the Hill Country.

Tragically, Kay died of cancer eight years ago. But her vision left a showcase of innovative ranching in a part of Texas that is being consumed by suburban sprawl.

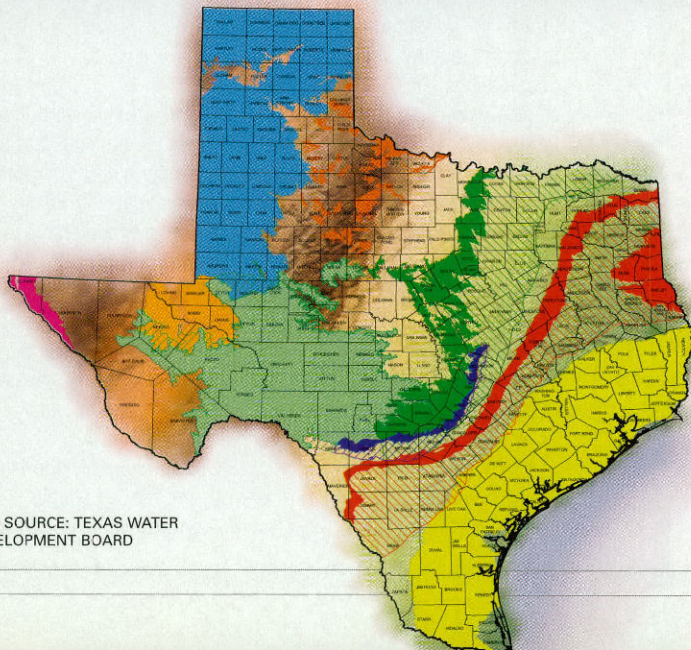
This is the country of the five-acre ranchettes, the front line of landscape fragmentation, where the old ranching families are gradually selling out to developers.

But, for decades, the Spicewood Ranch has gone against the grain, getting bigger, not smaller.

When Chris Harte was at The University of Texas at Austin, getting a Master of Business Administration degree, and his brother Will was at Texas A&M University getting a range science degree, they convinced their father and uncle, Ed and Houston Harte, to buy the ranch.

Over the years, Chris bought out the other family members, and he began to buy adjacent property as it became available, especially environmentally sensitive areas along creeks, costly as this was near Austin. Today, the ranch is about 1,100 acres.

They began to clear cedar that had invaded and shaded out the grasses after people sup-



MAP SOURCE: TEXAS WATER DEVELOPMENT BOARD

pressed the natural wildfires that used to keep invasive plants under control.

"We have a Bobcat skid loader with tree shears on the front of it," says Allen Spelce, who lives on and manages the ranch day to day. "We've found that is least damaging to the land because you only disturb the top two inches of soil. It's a little slower than a bulldozer but the returns are greater in terms of promoting grasses. If you want to plant row crops, you're probably better off bulldozing, but if you want to restore a native landscape, the Bobcat is better. With the Bobcat, you can leave a stand of persimmon trees, which offers habitat for quail and other birds."

Prescribed fire has also been used extensively.

"We've burned almost every year for about 14 years, mostly in winter," Spelce says. "That has promoted cool season grasses, forbs in the summer and a diversity of native plants."

After the burning and clearing, they reseed native grasses like Indiangrass, big bluestem, little bluestem, switchgrass and big muhly. They also plant forbs, broadleafed plants with flowers, like golden eye and Maximilian sunflower.

The goal, Mahler stresses, is "not to get rid of all the cedar. Our end product will have some prairie, some savannah, live oak woodlands, cedar-elm woodlands, riparian areas, cedar breaks and post oak savannah on some of the sandy soils, so we're going for the full diversity of plants and wildlife that could be on a property like that."

A dozen years of careful restoration have paid off in upwelling water.

"We've definitely had seeps develop that weren't there before," Harte says. "We have more water and more small springs. In cleared areas that might have been thick cedar years ago, you can now see water pooling and seeping up through the soil."

The quality of Alligator Creek, which flows most of the year, has improved noticeably.

"What I've discovered is that restoration takes a long time," Harte says. "We could go in and bulldoze everything out there, spend hundreds of thousands of dollars, but to work with fire and nature is a better way. And in the end, it's not only more satisfying, but also I think we'll get better results." ★



BUDDY BALDRIDGE ON MESQUITE GROVE RANCH

AMID THE BROWN, A SPREAD OF GREEN

IN THE YEAR 2000, wildlife biologist Jim Lionberger was out collecting deer age and antler data in Kent County southeast of Lubbock, when he noticed something interesting.

All around him, the landscape was brown, scorched by a decade of drought. But one ranch looked different.

"I saw quite a bit of little bluestem out there," Lionberger recalls. "There are

a lot of folks out here who manage their places well, but his place was greener. You could tell by the vegetation and the diversity that they were doing something right."

The man behind the green turned out to be Buddy Baldrige, owner of the 35,000-acre Mesquite Grove Ranch. Baldrige's son B.J. makes the fifth generation of ranch owners. His great-great-grandfather, Nicholas Bilby, started the ranch in 1901.

The reason Buddy's place stays greener in the dry times starts with cattle grazing.

"We have employed what they call Holistic Management," Baldrige says.



"Basically, that involves time-controlled, rotational grazing. We have two herds in rotation through about 50 to 60 pastures, so they don't have to stay any one place too long."

Like many ranches today, the Mesquite Grove balances the needs of livestock with those of wildlife, since hunting-ease income pays an increasing percentage of the bills.

"Cattle are really good to go with our deer and quail," Baldrige says. "But we have

to be careful to not overgraze, because that can take out all the quail habitat. We've got about two-thirds of the place in shinnery oak stands. That's where we find a lot of the little bluestem and sand sage and ragweed, and that's good quail habitat."

Baldrige has controlled brush with federal Environmental Quality Incentives Program dollars, which he says has "opened up a lot of quail country."

"I think we're keeping more water and more

soil on the pastures because it's not running off," Baldrige says. "We're seeing erosion not only stop, but turn around and actually start filling in with eastern gammagrass — that's a grass that hasn't been seen here in a long time."

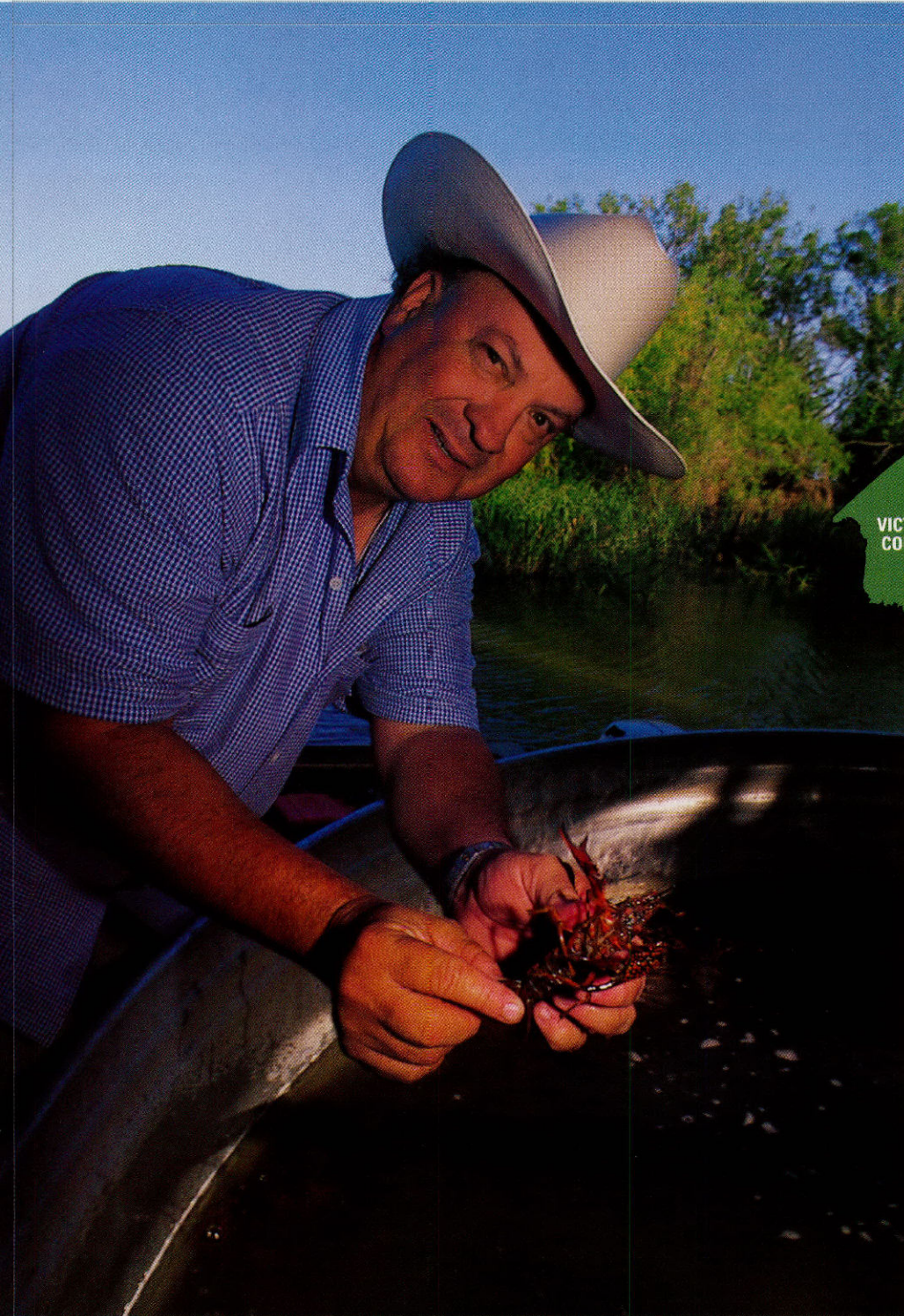
Restoring the native landscape has helped creeks and springs flow again here, too. And this is a region where groundwater levels are being watched nervously.

"We have a spring that had been dry for I don't know how long, and that came back during

the drought."

Baldrige says what matters most to him is having a diverse mix of plants and wildlife coexisting with livestock.

"If you continue to do what you've always done, you'll always have what you've always had. If you don't make some changes, you're going to keep getting the same result. I feel like we're going to be able to leave the place in better shape than we found it." ★



THE LATE JESS WOMACK

THE WETLAND RANCHERS

CENTURIES AGO, down along the Guadalupe River just a few miles from where it flows into San Antonio Bay, early settlers couldn't make money off the trees in the river bottom. So they cleared the trees, built levees to hold back the river and planted crops.

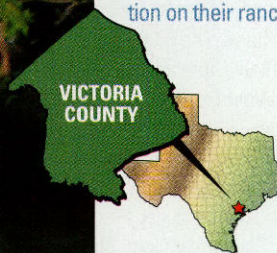
Jess Womack and his son Jesse have worked a magical transformation on their ranch of close to 9,000 acres. When Jess took over this part of the historic McFaddin Ranch in 1988, a decision was made to stop farming.

"That decision was partly made by me and partly by Mother Nature," Jess said, explaining that floods in 1987 broke levees along the Guadalupe in 17 places.

The Womacks sold a conservation easement on their property to the federal Wetland Reserve Program, keeping ownership and control of the land but giving up the rights to develop it in ways that might harm wetlands.

They became "wetland ranchers," emphasizing light, rotational grazing, controlled burning and restoration of native grasses and forbs. They gave up planting cotton and corn and the fertilizers and pesticides used to grow them.

"We took a very ecologically sensitive ranch that had been somewhat degraded over the years, and have made it into a showplace, and been very successful at both ranching and wildlife," the elder Womack said with



pride. But the Womacks were always in the ranching business to make a profit.

Today, about 60 percent of ranch income comes from cattle, the rest from hunting.

Jess Womack passed away shortly after he was interviewed for this article, but he left his love and passion for Texas woods and waters to his son, Jesse.

Jesse attended Texas Christian University's ranch management school in Fort Worth, which was "by far the best year of school I've ever spent," he says.

"You abide the law of take half, leave half," says Jesse. "That way, the good, native grasses can have a competitive advantage over the bad grasses and will eventually multiply, benefiting

water, wildlife, soil, everything."

The Womacks also conduct controlled burns "as much as we possibly can." And they manage their wildlife populations just as they manage cattle, so they don't overpopulate and overtax the vegetation.

"The more I'm down here, and the more I'm around wetlands, I've become more and more of a conservationist," Jesse says.

"My biggest pride is to see these wetlands, which were mostly ag fields until 20 years ago, to watch them grow and to see the bird populations."

Despite his optimism, he's realistic about the obstacles ahead. At the moment, one of his big concerns is abandoned oil wells. Jesse

believes that the neglected wells, on his property and across the state, pose a serious threat to water quality. "I do battle with small-time oil and gas companies around here, because there are way too many loopholes in oil and gas law."

"What scares me is I feel like it's a prevalent opinion in the U.S. that if something needs to be protected, like these wetlands out there, they see government ownership as the answer. But I maintain that private stewards continue to be the best stewards. It's micro management vs. macro management. On the whole, private stewards take pride in managing their land well, and that really gets down to water quality." ★

Rocky Creek Flows Again

I PARK IN FRONT OF PRODUCER'S LIVESTOCK IN SAN ANGELO, note the unmistakable smell of a cattle stockyard, and walk upstairs to the office of John Cargile (rhymes with Argyle), who owns the livestock auction company and Rocky Creek Ranch outside of town.

Cargile briskly dons a tan felt hat, looks me in the eye and sticks out his hand. The 80-year-old rancher seems remarkably spry and sharp after decades of toil in the West Texas heat.

"Tell me again what you're doing?" he asks. Cargile seems a little suspicious of me, maybe because I seem to represent the government and the media, a double whammy of distrusted institutions.

We hop in Cargile's SUV and pick up Steve Nelle of the Natural Resource Conservation Service on the way to the ranch, which today comprises 24,000 acres.

A few miles before the main gate, we ride over a low-water crossing and I get my first look at Rocky Creek. Stories about how this creek began to flow again after brush clearing have become a minor legend in the insular ranching community — landowners I interviewed for this article 500 miles away had heard of it.

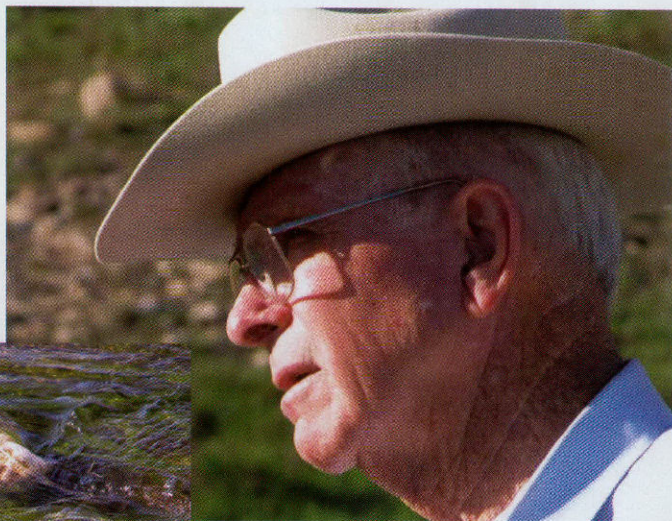
On this topic and others, Cargile is characteristically terse and understated.

"I can't say that getting rid of the brush made the creek run," he says. "The creek runs more when it rains more."

Cargile is a conservation-minded rancher, what wildlife biologists like to call a private land steward. Over the years, he's participated in government programs that have funded conservation projects, including one, starting in 1962, to clear brush off about 2,000 acres. This helped stimulate grasses to improve cattle forage and quail cover, and it got rid of invasive plants like mesquite, which can suck up to 30 gallons of water per day in summer. More recently, with Nelle's guidance, he got a grant to build an enclosure fence that will keep cattle out of the riparian zone along Rocky Creek for several years to let grasses come back and prevent erosion.

He is also intensely practical.

"What are you trying to do with your ranch?" I ask, hoping for some juicy quotes about conservation ideals.



"I need to make a living," Cargile replies.

Some readers may mistakenly think this means it's all about profit. If ranching families want to pay their taxes and expenses, keep their spreads from

getting sold off and chopped into ranchettes, and do some good for the land, they must be able to make a living.

For example, the riparian buffer will prevent erosion and benefit creek water, but it's not entirely a charity project. It will also improve habitat for many kinds of wildlife, including deer, turkey and quail. And these days, hunting-lease income has grown to rival the cattle business.

We stop at a gate and clamber down to the banks of Rocky Creek.

Nelle suddenly gets excited. The long green shoots around him turn out to be Texas bluegrass, highly desirable but somewhat rare, early proof that the enclosure fence is working.

At the ranch house, the talk turns back to water.

"Proper grazing management where you have good grass cover is important, because I think that helps underground water, and I know it helps stop erosion," Cargile says. "Obviously, the better care you take of the land, the more it's going to help your water supply. There's a relationship there."

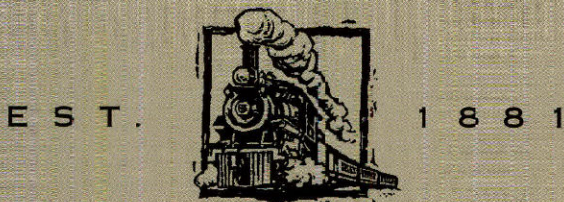
This prompts Nelle to observe, "If they ever subdivided that area west of San Angelo, that creek would be gone so fast, they'd suck it dry."

"I don't think it'll happen in my lifetime, but it'll happen," Cargile muses. "In 100 years, it'll all be cut up. When the money gets big enough." The winds of change are at the door. But on places like Rocky Creek Ranch, tradition and determination still provide a windbreak. ★



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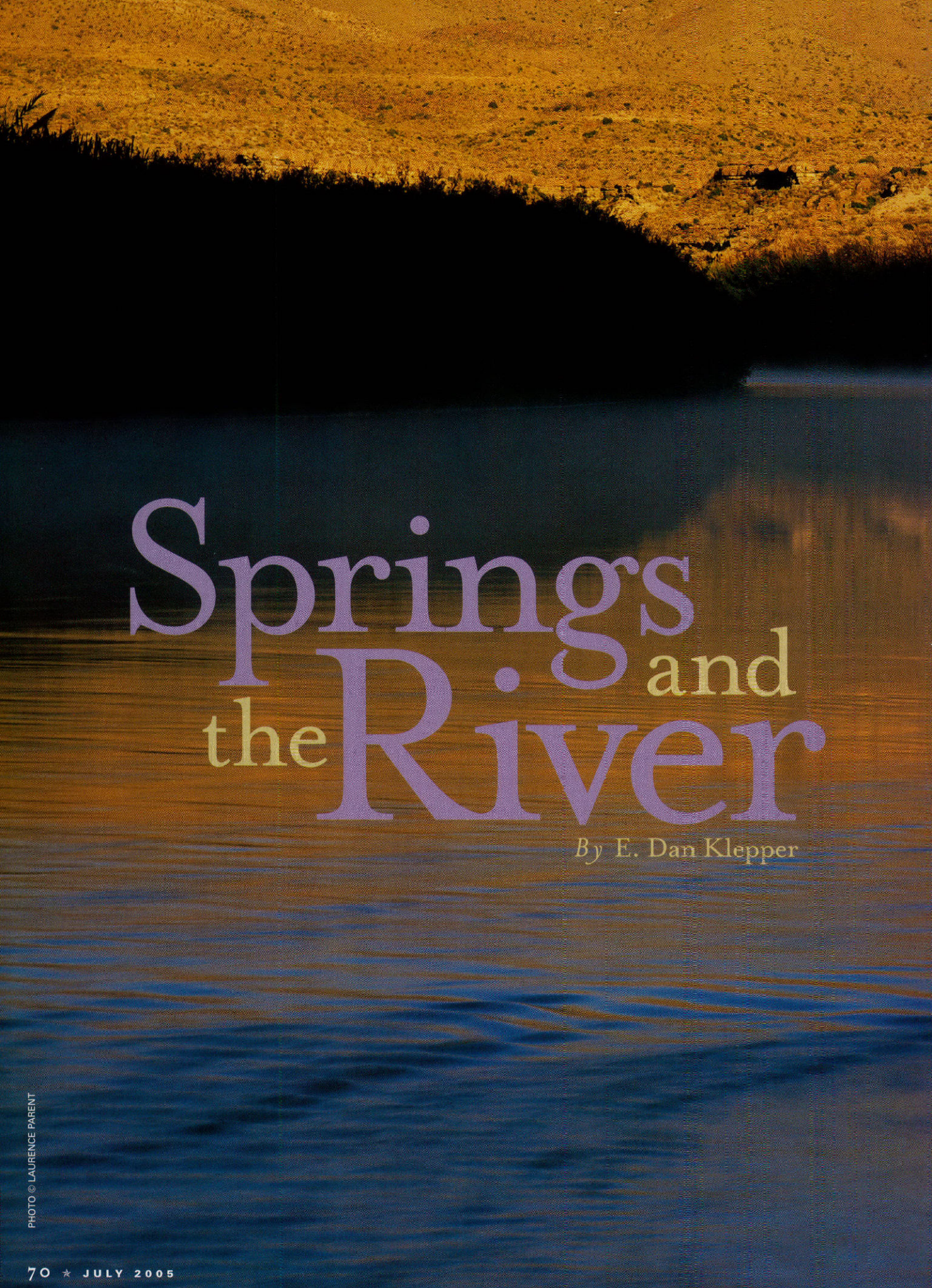
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Springs and the River

By E. Dan Klepper



Canoeing the spring-fed waters of the Rio Grande's Lower Canyons

CANOES ON THE BANK OF THE RIO GRANDE AT FIRST LIGHT, MILE 761

“Hardly had we begun to enjoy the pleasing sensation of drifting down the stream when a roaring noise was heard ahead,” reported geologist Robert T. Hill during his 1899 survey of the state’s Rio Grande canyons. “This came from seething and dangerous torrents of water foaming over huge rounded boulders of volcanic rock which everywhere form the bottom of the river.”

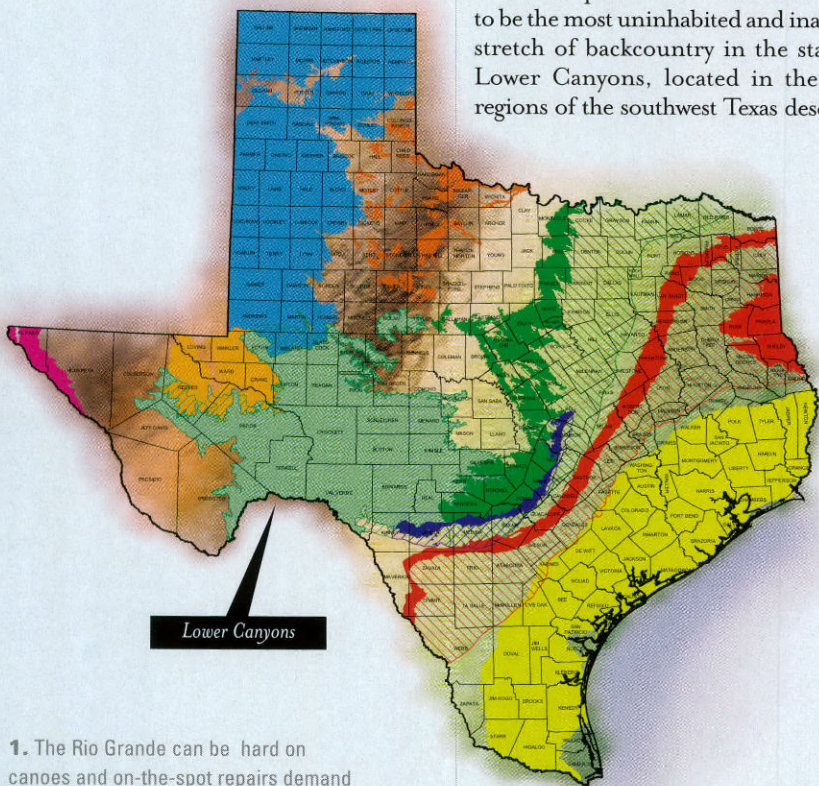
Hill, the first scientist to successfully navigate the deep gorges of the Texas river wilderness, included in his survey the notorious segment known today as the Lower Canyons, and published a record of his expedition. More than 100 years after Hill’s run, this riparian no-man’s land continues to be the most uninhabited and inaccessible stretch of backcountry in the state. The Lower Canyons, located in the remote regions of the southwest Texas desert, were

stones, or holding them back by the stern-lines. This process had to be repeated many times a day for the entire distance, and, as a consequence, all hands were constantly wet. The swift current and uncertain footing of the hidden rocks make them very dangerous. A loss of balance or a fall meant almost certain death.”

The geologist Hill may have been exaggerating a bit for the benefit of his readership in this account of the survey, published in a 1901 issue of *Century Magazine*. Death is a guarantee at some point in life, but in terms of an expedition down the Rio Grande’s Lower Canyons, it remains only a possibility, not a certainty. However, the rest of Hill’s description rings true. After seven days of canoeing this remote stretch, the four members of a more recent survey team — James Mueller, professor of biology at Sul Ross State University, Mueller’s students Aaron Sides and Anne Marie Hilscher, and this writer — had waded, lined, swamped and strong-armed two canoes loaded with an assortment of scientific equipment and gear through 12 rapids over 60-plus miles in which all hands were indeed constantly wet.

The Lower Canyons, a segment of river from the abandoned border town of La Linda downriver to the takeout at Dryden Crossing, is part of the federally designated Rio Grande Wild and Scenic River corridor. Negotiating this particular stretch requires the same kind of preparedness and fortitude necessary to run the upper canyons of the river’s Texas section but with a stronger commitment. Once entering the canyons, the trip demands a minimum of a week’s time regardless of the weather, boat damage, loss of gear, lack of food or medical emergencies. But perhaps what elevates the Lower Canyons above all else as the greatest of the river’s challenges is simply its abundance of water.

Unlike the upriver canyons where drought and excessive pumping can cause dramatic declines in flow, the Lower Canyons are constantly refreshed by a plentitude of underground springs. Water percolates through the vast rock layers, known as formations, beneath desert scrub, vegas and mesas that extend for miles on either side of the river’s course. This subterranean draw gravitates downwards, as does the geogra-

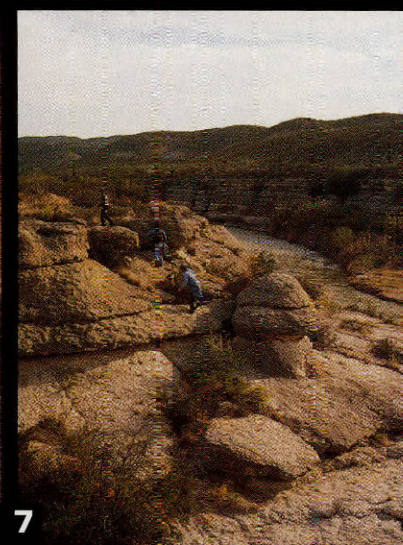


Lower Canyons

1. The Rio Grande can be hard on canoes and on-the-spot repairs demand ingenuity.
 2. Dryden Crossing, where the Lower Canyons canoe trip ends.
 3. A spring fills a serpentine channel.
 4. Spring-fed tinajas like this one are important for wildlife.
 5. Bailing the canoes.
 6. One of the Rio Grande’s rugged side canyons.
 7. The stark beauty of the bluffs.
 8. Another of the many tinajas along the way.
 9. Even though it is next to the river, the camp is in the desert.
 10. A well-worn tinaja creates a deeper pool.
 11. Rock squirrels populate the unforgiving country.
- Photographs 1 - 10 © E. Dan Klepper. Photograph 11 (rock squirrel) © Rolf Nussbaumer/ KAC Productions.

just part of the 350-mile Rio Grande corridor that Hill ultimately surveyed. His journey began at the mouth of the Rio Concho and ended at the limestone bluffs below the courthouse of Langtry’s Judge Roy Bean. He made his run with five companions including his 19-year-old nephew Prentice, a local trapper named James MacMahon, a cook and two extra boatmen “of great strength, inured to hardships, skilled with oar and gun, and capable of unlimited endurance.” Together, they rowed three wooden boats loaded with surveying equipment, guns, ammunition, food stores and bedrolls down the orneriest waterway in West Texas.

“Reaching these rapids,” Hill continued, “we had to get out of the boats and wade beside them, pushing them off or over





THE DAY'S LAST LIGHT FLICKERS AMBER TONES ACROSS THE RIO GRANDE
BELOW THE REAGAN CANYON CONFLUENCE (MILE 747.51)

phy, towards the massive land drainage that is the Rio Grande. Springs appear along the river's edge, often in the shadow of thick stands of chattering cane, running flush as if poured from a bucket. Other springs chew through muddy yellow sands, leaving a chum line of crusting calcium, algae and fern spore. Some springs appear to gizzle forth from solid rock, carving serpentine channels into the limestone before joining the river's course. By far the oddest and sometimes most disconcerting indications of excessive water flow are the fresh springs that belch up from the belly of the river. These erupt in bubbly spans the size of pancakes and skillets. Others boil up with a kettle drum ruckus and in certain light their disturbing characteristics make navigation a challenge. The

canoeist must distinguish between these mid-river springs, which a boat can pass lightly over without incident, and the gentle whiffles made by the multitude of submerged boulders lurking like killer hippos just under the surface. It is a navigation decision that, when poorly made, often results in extremely undesirable consequences.

Stretching away from this watery bounty lie other deep-rutted canyons, aligned in intersecting degrees to the river, with names like Panther, Washboard, Bear and Palmes, and some with no names at all. These arteries to the Rio Grande are scarred by draining stormwaters and spring flows of their own. Many begin in giant pouroffs dropping into deep natural wells called *tinajas* that have been scoured into the rock by a continuous

drilling of water power. These remarkable water features maintain life in the desert, their bluff faces shielding their water stores from the evaporative effects of the sun with constant shadow, providing year-round drinking for wildlife unwilling or unable to find their way to the river proper.

Whenever water is available on the surface of a vast, inhospitable desert, a remarkable catalogue of wildlife takes advantage of it. Mueller, like Hill, had been contracted by a department of the federal government to survey aspects of this rugged corridor. But while Hill's responsibilities were strictly geological, Mueller was charged with determining just what exactly that catalogue of wildlife included. Fortunately, Mueller and company had one overriding advantage that Hill

did not — a topographic map of the river course. The Mueller expedition's purpose was to perform an in-depth survey of the mammal population of the Lower Canyons, one of several taking place during the project, and its members came well-equipped to accommodate the task.

The canoes were loaded with 100 Sherman traps (aluminum boxes with spring-trap doors designed to live-capture small critters), mist nets (tennis court-sized spans of black netting for snagging bats), three sets of metal poles and rebar to accommodate the nets, an Anabat bat detector (a device that can detect and record the echolocations of bats), a laptop computer and its outboard-motor-sized battery, two motion-sensing cameras and t-bar mounts, a port-a-can, plenty of food, a kitchen, tents, bedrolls and personal gear. The boats floated, in the best of circumstances, just a few inches above the waterline. Confronting the Lower Canyon's class II, III, and IV rapids in these load conditions required caution and good judgment. Typically, an overabundance of caution prevailed whenever judgment faltered. At least most of the time.

Hill first reported that "a striking feature" of canyon life was, at times, the absence of animals. "There was little sign of bird, rabbit, wolf, squirrel or other animal, so common upon the uplands above. The only indigenous creature we saw was a small specimen of bat, new and unknown to me, which fluttered about at night." But with the aid of the Anabat bat detector, the Mueller expedition recorded thousands of "hits" whenever the instrument was activated, indicating a night sky full of mammals despite the January chill.

As Hill's company flowed deeper into the Lower Canyons, however, "evidence of animal life, hitherto so rare, now began to appear. A lizard was noted, and two

Unlike the upriver canyons where drought and excessive pumping can cause dramatic declines in flow, the Lower Canyons are constantly refreshed by a plenitude of underground springs.

immense ravens, half hopping, half flying, defied us to shoot them. Everywhere along the muddy banks, beaver slides were found, and the willows had been cut — or chewed — by them. Three deer were also seen, while now and then, a covey of blue quail scrambled up the stony banks and scattered in the

cactus-scrub. Only one who is accustomed to the animal life of the desert can imagine the joy with which we greeted these lowly friends."

For the Mueller expedition, the occasional javelina could always be counted on to appear, as could rock squirrels, bats, mule deer, ringtails, turtles, 16 species of birds and traces of a few descendants of Hill's beavers. But hopes of recording the presence of charismatic megafauna like mountain lions or the rare jaguarundi along the Lower Canyon corridor were left to the motion-detecting cameras posted along the route.

Perhaps the true citizens of the Lower Canyons are the humble, seed-eating tribes of rodents, including pocket mice, kangaroo rats, cactus mice and cotton rats, that cumulatively make up the enormous order *Rodentia*. As the bulk of the Mueller trapping illustrated, these denizens of the desert waterworld occupy every nook and cranny available in a stratum of landscape that begins at river's edge and continues up the canyon grade and out. Without them, the canyons would be the barren rocks that Hill first imagined them to be rather than a courseway of teeming life. They are the sowers and tillers of the desert canyon landscape, caching and spreading seeds, consuming life's kernels and, perhaps more importantly, being consumed by larger and more dynamic species. Their contributions, not to mention their quick-footedness and painful bite, are to be appreciated and admired, and a closer scrutiny of their character often revealed the true nature of a canyon's wildness and its ability to delight.

Unlike the members of Mueller's crew, Hill had little time to contemplate the canyons' offerings. But one particular aspect proved too compelling for Hill to decline an indulgence — the warmth of the canyons' hot springs. "Shortly after making the turn to the east," Hill explained, "and in the depths of a beautifully terraced canyon, we came upon another copious hot spring running out of the bluff upon a low bench, where it made a large, clear pool of water. We reached this place one Sunday noon. The sight of this natural bath of warm water was tempting to tired and dirty men, and here we made our first and only stop for recreation. After lunch, most of the party proceeded to the warm pool, and, stripping, we literally soaked for hours in its delightful waters, stopping occasionally to soap and scrub our linens."

This tranquil restorative for Hill, as well as for a few members of the Mueller expedition, belied the chaotic machinations of the hot springs' geothermal origins. Far

beneath the earth's crust lies molten rock churning as if caught in a hellish blender. This intense furnace transmits energy up through layers of solid rock to meet and greet and then heat, deeply penetrating water stores below the riverbed. Due to convection, this superheated water is driven upwards, heating more rocks and water as it moves through a Homeric labyrinth of underground cracks and fissures. The many hot springs of the Lower Canyons occur whenever this water ultimately breaks the surface.

It is perhaps mythology, after all, that best defines the Lower Canyons, with its odyssey of subterranean mysteries and its Promethean challenges. Even Hill saw it in the landscape and was awed by the overwhelming force of water and its ability to shape all things. "Still lower down the river this region becomes more weird," exclaimed Hill, referring to the "great bluffs" and "many fantastic" curving forms he witnessed from his boat. "One of these, 200 feet high, stands out conspicuously from its surroundings, an almost perfect reproduction of the Egyptian Sphinx." As Hill floated farther down into the Lower Canyons, he noted that the rocks of the canyon walls "are broken into beautiful pointed salients and vertical columns. Wonderful indeed are the remarkable forms of rock sculpture. Among these was a vast cylindrical tower like the imaginary pictures of Babel, standing outward of the cliff-line and rising, through perspective, far above."

For centuries, the Lower Canyons have suffered the relentless pulverizing, wearing down and carving by water as it pours from the skies and runs aground from within the rock itself. It is a slow and methodical process, one that is imperceptible on the human time scale. But it can also be as sudden as the blink of an eye. Catastrophic floods routinely scour the canyons' corridor, obliterating everything in the water's rushing pathway.

The Mueller expedition began its last night in the canyons by tossing camp along a comfortable, relatively flat spot. The place, called Bone Watering in the irony of the desert's own mythology, was a thick sandbar bluff 12 feet or so above the river's edge. The power of the canyons' water held sway over the quiet evening, culminating in an acute realization that with one swift deluge the expedition's accomplishments, indeed a century of human effort all along this river corridor, and most remarkable of all the very ground beneath them, could be swept up and lost at a moment's notice, then catapulted downriver all the way to the sea. ★

Top

A
spring
fanatic
picks his
10 favorites
(plus a few
honorable
mentions)

By Joe Nick Patoski

Hot Swimming



Of all the features that define natural Texas, nothing speaks to the soul quite like springs do. As the source of water in its purest, most pristine form, springs are the basic building block of life. They present themselves in a manner as miraculous as birth itself, gestating in the womblike darkness of an aquifer deep underground until pressure percolates, pushes, and forces the water up through cracks, fissures, and faults in the limestone cap until it bubbles, seeps or sometimes even gushes, to the surface, magically turning everything around it lush and green. Springs feed creeks, streams and rivers, and nourish plant and animal life. Springs are why Texas has been inhabited for tens of thousands of years.

As far as I'm concerned, though, the greatest thing about springs is that they create swimming holes, which are the very best place to be in Texas in the summer. The greatest concentration are clustered in the Hill Country, where human activity around San Marcos Springs, the second largest springs in Texas, has been traced back more than 12,000 years. Like me, the ancients must have figured out that immersing in cool artesian spring water was a pretty smart way to survive a hot day in August.

I endure the heat gladly when I'm close to a spring-fed swimming hole. The endless string of broiling days and sweltering nights that wear down the spirit and sap the want-to and can-do in even the hardest of souls—that's my favorite time of the year. Springs are why.

The great spring-fed swimming holes of Texas run the gamut from wild and unsullied to tamed and civilized. All

PHOTO BY EARL KOTTINGHAM



BALMORHEA STATE PARK, Toyahvale

Back in the 1930s the Civilian Conservation Corps lined the banks of San Solomon Springs, the biggest springs in West Texas, with native stone and built a classic bathhouse to provide easier access to 78 degree water that is Caribbean-clear and brimming with pupfish, tetras, catfish and turtles. Those features and its picturesque location in the Chihuahuan Desert with the Davis Mountains on the horizon conspire to create the finest natural swimming experience on earth. [See also "The Park That Time Forgot," in the April 2005 issue.] (432) 375-2370 . <www.tpwd.state.tx.us/park/balmorhe/>

of them promise a shady place to cool off, cool down and cultivate the lazy streak that resides within us all. The swimming hole is my church, a holy place to splash in water clean and clear enough not to have to worry, with at least one big rock to lie out on and jump off of, and ideally a rope swing hanging from a tree limb. Settings like that are compelling evidence there is a higher power.

I have written about swimming holes on numerous occasions for several publications. I live where I live for the swimming hole, which all of my family enjoys in the summer. I plan road trips around swimming holes. I'm always on the prowl to find new ones.

There are literally hundreds of these liquid jewels scattered across Texas, many of them known, some secret, all defying the logic of geography, geology, climate and progress. Without springs, I would not be here. Without springs, I don't think Texas would be here, either.

Having to select my 10 favorite swimming holes is not unlike having to choose among your children, knowing I'm leaving out sweet spots like Mankin's Crossing on the San

Gabriel, Shumacher's Crossing on the Guadalupe, Tonkawa Falls in Crawford, the state parks at Colorado Bend, McKinney Falls, and on the Guadalupe River near Boerne, the entire Medina River, Burger's Lake in Fort Worth, the Paluxy River in Glen Rose, Possum Kingdom Lake west of Mineral Wells, Tule Canyon Lake near Silverton, Chain-O-Lakes near Cleveland, Hancock

Springs in Lampasas, Las Moras Springs at Fort Clark in Brackettville, the Slab in Llano and the 7A Crossing in Wimberley, just to name a few. The following 10 are chosen at my own personal peril and risk, because they're just my opinion. You likely have your own top 10. Either way, we should all quit arguing and jump in, feet first, eyes closed. Biggest cannonball splash wins.



BARTON SPRINGS, Austin

As development has sprawled beyond the pool and the creek upstream all the way to its headwaters some 30 miles away in Hays County, Barton Springs is more remarkable than ever. There are times when the water is so clear it's as if nothing has changed in the last 100 years. I derive a great deal of pleasure watching friends get hooked the same way I did at Barton's more than 30 years ago. Two recent converts I know begin their day at 5 a.m. in the springs, with downtown skyscrapers and the moon providing all the illumination they need to navigate the dark waters. That's a little too extreme for me, but they know like I know there is no better urban swimming hole on Earth. Period.

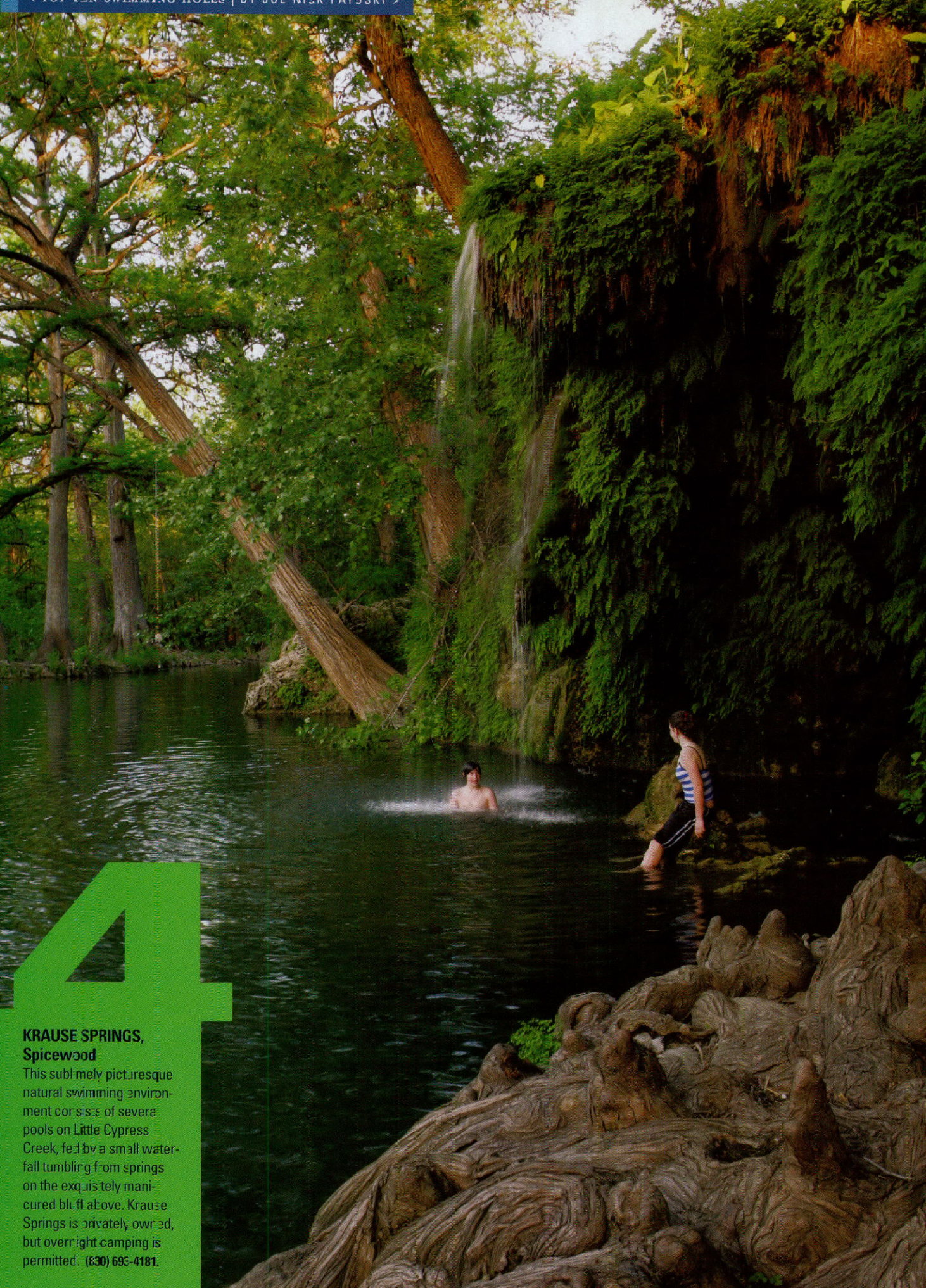
(512) 476-9044 <www.ci.austin.tx.us/parks/bartonsprings.htm>



LANDA PARK, New Braunfels

The 1.5 million-gallon, spring-fed pool at the Landa Park Aquatic Complex on the Comal River in New Braunfels is a compact version of Barton Springs without the crowds, fed by the biggest springs in Texas. A few hundred yards downstream on the Comal River is the Prince Solms Tube Chute, a cheap thrill ride that inspired the nearby Schlitterbahn, consistently rated as the best waterpark in America. Thanks to the constant 73-degree water temperature, snorkelers and divers can do the entire mile-long stretch of the river year-round.

(830) 608-2160; <www.ci-newbraunfels.tx.us/parks/Landa%20Park.htm>



4

KRAUSE SPRINGS, Spicewood

This sublimely picturesque natural swimming environment consists of several pools on Little Cypress Creek, fed by a small waterfall tumbling from springs on the exquisitely manicured bluff above. Krause Springs is privately owned, but overnight camping is permitted. (830) 693-4181.



SEWELL PARK, CITY PARK, RIO VISTA PARK, SAN MARCOS RIVER, San Marcos

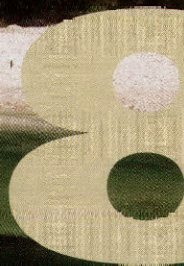
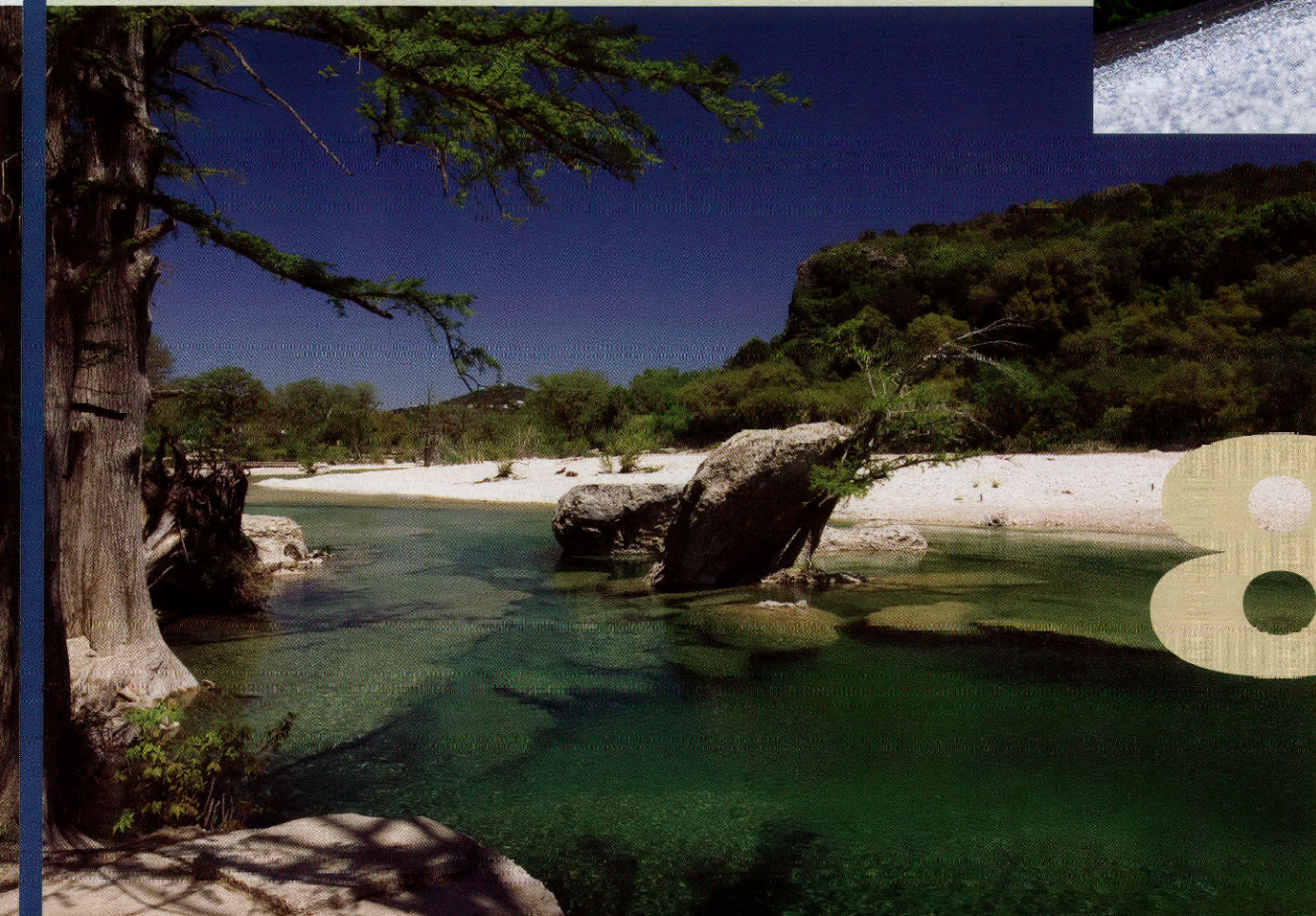
The San Marcos River begins at the bottom of Spring Lake, an impoundment where the second biggest complex of springs in Texas pumps out thousands of gallons of pure water, spilling over two small dams before winding swift, crystal-clear and cool (70 degrees year-round) on a short, two-mile run as a semi-tropical waterway ideal for tubing, snorkeling or wading. The flow in some spots is so strong, you can point upstream and swim in place, getting a good workout among the turtles and fishes in the wild rice without going anywhere. There's even a small dam to slide down to keep things interesting.

SEWELL PARK (on Texas State University Campus); (512) 245-2004 . <www.campusrecreation.txstate.edu/Outdoor/ot_sewell.htm>
CITY PARK, RIO VISTA PARK; (512) 393-8400. <www.ci.san-marcos.tx.us/departments/parks/ParksFacilities.html>



SCHUMACHER'S CROSSING, GUADALUPE RIVER, Hunt

This storied hole on Highway 39 was popular long before Hunt became a favorite Hill Country destination for wealthy families from Houston and San Antonio in the early 20th century. Deep holes and the acquired sport of dam sliding are two reasons Schumacher remains popular today. Contact West Kerr County Chamber of Commerce (830) 367 4322 <www.wkcc.com>



NEAL'S LODGES, CONCAN/GARNER STATE PARK, RIO FRIO, Leakey

The whole stretch of the Rio Frio between Leakey and Concan is made for tubing and splashing. But these two historic spots dating back to the 1920s on the banks of turquoise-tinted Frio, one of the most gin-clear bodies of water in the Southwest, are a cut above the rest when it comes to swimming and floating among the cypresses. (830) 232-6118



**HAMILTON POOL,
HAMILTON POOL NATURE PRESERVE,
Travis County**

Thirty miles southwest of downtown Austin, Hamilton Creek transforms into a 50-foot waterfall that tumbles into a steep canyon shaded by a near-perfect cave overhang with a nice sandy beach at the opposite end of the natural pool. Access to this idyllic grotto is limited.

(512) 264-2740

www.co.travis.tx.us/tnr/parks/hamilton_pool.asp



BLANCO RIVER STATE PARK, Blanco (tie)

A sentimental pick, mainly for the sweet pleasure of pulling off the highway just after sunset at the end of Labor Day weekend last year for a swim in the gathering darkness, the park's hole is created by a low dam spanning the river with a small pool area below the dam for that cement-pond swimming experience. (830) 833-4333; <www.tpwd.state.tx.us/park/blanco/>

DEVIL'S WATER HOLE, INKS LAKE STATE PARK, Burnet (tie)

The red granite cliff, a Highland Lakes landmark, is rife with small falls fed by Spring Creek following heavy rains and offers a 25-foot promontory from which to jump (feet first, of course) into this dammed portion of the Colorado River. (512) 793-2223; <www.tpwd.state.tx.us/park/blanco/>



PHOTOS BY EARL NOTTINGHAM



10

SAN FELIPE SPRINGS, Del Rio

This swimming hole on San Felipe Creek in the small city-owned Horseshoe Park is a welcome oasis on the edge of the desert, even though busy Highway 90 crosses nearby. Flanked by improved banks of native stone, shaded by stately pecan, elm, maple and mulberry trees, lined with a hard limestone bottom, and fed by the fourth largest springs in Texas, the pool is shallow enough near the banks for kids to stand in and long enough to swim short laps. **HORSESHOE PARK: (830) 774-8454.**



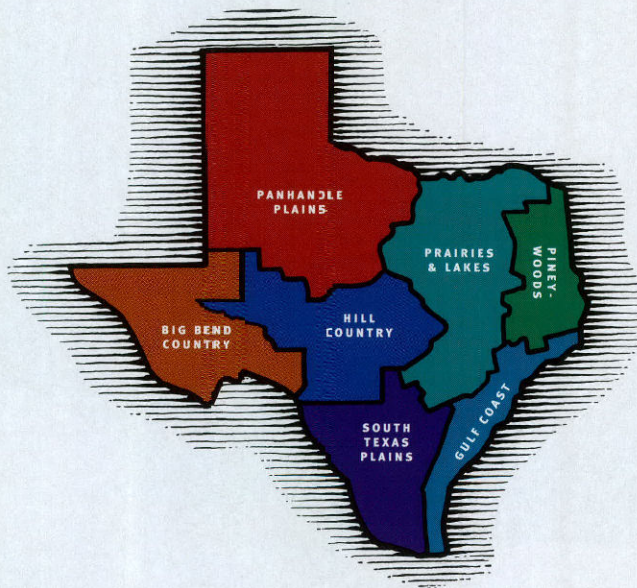
BLUE HOLE, Wimberley

This storied hole should bust back into the Top Ten next year when it reopens as a city park. The hole is in the process of being purchased by the Village of Wimberley, aided in no small part by a \$1.9-million grant from the Texas Parks and Wildlife Department after being saved from development by local resident Peter Way. ✧

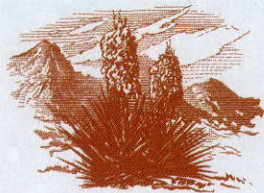
LOWER PHOTO © LAURENCE PARENT; TOP PHOTO BY EARL NOTTINGHAM

GETAWAYS

FROM BIG BEND TO THE BIG THICKET AND THE RED TO THE RIO GRANDE



For more detailed information on outdoor events across the state, visit www.tpwd.state.tx.us and click on "TPWD Events" in the blue area labeled "In the Parks."



BIG BEND COUNTRY

JULY: Desert Garden Tours, Barton Warnock Environmental Education Center, Terlingua, available by reservation only to groups of six or more, (432) 424-3327

JULY: Summer Amphitheater Programs, Davis Mountains SP, Fort Davis, every Wednesday through Saturday night, (432) 426-3337

JULY: Hiking Tours, Hueco Tanks SHS, El Paso, every Wednesday through Sunday, reservations required, (915) 849-6684

JULY: Pictograph Tours, Hueco Tanks SHS, El Paso, every Wednesday through Sunday, reservations required, (915) 849-6684

JULY: Texas Camel Treks, Monahans Sandhills SP,

Monahans, e-mail for dates, required reservations or more information at info@texas-camelcorps.com or call toll-free, (866) 6CAMELS

JULY: Fate Bell Cave Dwelling, Seminole Canyon SP&HS, Comstock, every Wednesday through Sunday, tours are subject to cancellation, (432) 292-4464

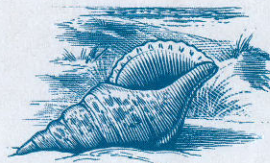
JULY: White Shaman Tour, Seminole Canyon SP&HS, Comstock, every Saturday, tours are subject to cancellation, (888) 525-3307

JULY 2: Solitario Tour, Big Bend Ranch SP, Presidio, reservations required, (432) 229-3416

JULY 8: Stories of Spirits, Magoffin Home SHS, El Paso, reservations required, (915) 533-5147

JULY 9: Gualte Mesa Tour, Big Bend Ranch SP, Presidio, reservations required, (432) 229-3416

JULY 17: Birding Tours, Hueco Tanks SHS, El Paso, reservations required, (915) 849-6684



GULF COAST

JULY: Weekend Nature Programs, Brazos Bend SP, Needville, every Saturday and Sunday, for details, visit www.bbspvo.org or call (979) 553-5101

JULY: Hatchery Tours, Coastal Conservation Association/American Electric Power Marine Development Center SFH, Corpus Christi, every Monday through Saturday except holidays, reservations required, (361) 939-7784

JULY: Bay Seining, Galveston Island SP, Galveston, every Saturday, (409) 737-1222

JULY: Exploring Sea Life, Galveston Island SP, Galveston, every Saturday, (409) 737-1222

JULY: Plant Identification Hike, Galveston Island SP, Galveston every Sunday, (409) 737-1222

JULY: Aquarium and Hatchery Tours, Sea Center Texas, Lake Jackson, every Tuesday through Sunday, hatchery tours by reservation only, (979) 292-0100

JULY: Marsh Airboat Tours, Sea Rim SP, Sabine Pass, every Wednesday through Sunday, reservations recommended, (409) 971-2559

JULY 2, 9, 15, 16, 23, 30: Story Time, Sea Center Texas, Lake Jackson, program also available on request by reservation, (979) 292-0100

JULY 9: Miss Ima's Birthday, Varner-Hogg Plantation SHS, West Columbia, (979) 345-4656

JULY 23: Nighttime Alligator Count and Marsh Tour, J.D. Murphree WMA, Port Arthur, Annual Public Hunting Permit or Limited Public Use Permit and reservations required, (409) 736-2551 ext. 23 or ext. 25



HILL COUNTRY

JULY: Gorman Falls Tour, Colorado Bend SP, Bend, every Saturday and Sunday weather permitting, (325) 628-3240

JULY: Walking Wild Cave Tour, Colorado Bend SP, Bend, every Saturday and Sunday weather permitting, reservations recommended, (325) 628-3240

JULY: Evening Bat Flights, Devil's Sinkhole SNA, Rock Springs, every Wednesday through Sunday, reservations required, (830) 683-BATS

JULY: Cowboy Sunset Serenade and Historic Hayride, Garner SP, Concan, every Monday through Friday, reservations required, (830) 232-6132

JULY: Interpretive Trail Hikes, Garner SP, Concan, every Tuesday through Friday, (830) 232-6132

JULY: Evening Interpretive Programs, Guadalupe River SP, Spring Branch, every Saturday, (830) 438-2656

JULY: Saturday Morning Interpretive Walk, Honey Creek SNA, Spring Branch, every Saturday, (830) 438-2656

JULY: Wild Cave Tour, Longhorn Cavern SP, Burnet, every Saturday, reservations required, (877) 441-2283

JULY 1: Range and Wildlife Seminar, Kerr WMA, Hunt, reservations available but not required, (830) 238-4483

JULY 1: Folk Music in the Park, Inks Lake SP, Burnet, (512) 793-2223

JULY 1, 16, 30: Stumpy Hollow Nature Hike, Inks Lake SP, Burnet, (512) 793-2223

JULY 2: Happy Birthday USA, Bicycle Parade, Inks Lake SP, Burnet, (512) 793-2223



Kerr Wildlife Management Area, Hunt

JULY 2: Crawling Wild Cave Exploration, Colorado Bend SP, Berd, minimum of three, reservations required, (325) 623-3240

JULY 2, 9, 16, 23, 30: Go Fishing with a Ranger, Inks Lake SP, Burnet, (512) 793-2223

JULY 2, 30: Wild Cave Tour, Kickapoo Cavern SP, Brackettville, reservations required, (830) 663-2342

JULY 3, 7, 14, 17, 21, 28, 31: Basic Canoe Skills Clinic, Inks Lake SP, Burnet, reservations required, (512) 793-2223

JULY 3, 7, 14, 17, 21, 28, 31: Devil's Waterhole Canoe Trip, Inks Lake SP, Burnet, reservations required, (512) 793-2223

JULY 4: Fourth of July Parade and Program, Admiral Nimitz SHS-National Museum of the Pacific War, Fredericksburg, (830) 997-4379

JULY 9: Bluegrass in the Park, Inks Lake SP, Burnet, (512) 793-2223

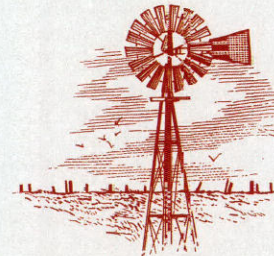
JULY 9, 23: Simple Sounds Concert in the Cave, Longhorn Cavern SP, Burnet, reservations required, (377) 441-2233

JULY 15-17: Blue Moon Benefit Trail Ride, Hill Country SNA, Bardera, visit www.fcsnap.org or call (330) 393-7037

JULY 16: Trail Project.

Enchanted Rock SNA, Fredericksburg, (325) 247-3903

JULY 16: 3rd Annual Catfish Kid Fish, Landmark Inn SHS, Castroville, reservations recommended, (830) 931-2133



PANHANDLE PLAINS

JULY 1, 22: Canyon Critters, Palo Duro Canyon SP, Canyon, (806) 488-2227

JULY 2: Sun Fun and Star Walk, Copper Breaks SP, Quanah, (940) 839-4331

JULY 2: Petroglyph Tour, San Angelo SP, San Angelo, (325) 949-4757

JULY 8: Stargazing, Palo Duro Canyon SP, Canyon, (806) 488-2227

JULY 9: Stargazing Party, San Angelo SP, San Angelo, (325) 949-4757

JULY 9, 23: Guided History and Nature Hike, Palo Duro Canyon SP, Canyon, (806) 488-2227

JULY 16, 30: Night Noises, Palo Duro Canyon SP, Canyon, (806) 488-2227

JULY 16-31: Annual Summer Art Show, Copper Breaks SP, Quanah, (940) 839-4331

JULY 23: Search and Rescue Dog Program, Fort Richardson SP&HS & Lost Creek Reservoir State Trailway, Jacksboro, (940) 567-3506



PINEYWOODS

JULY: Guided Nature Hikes, Lake Livingston SP, Livingston, reservations required, (936) 365-2201

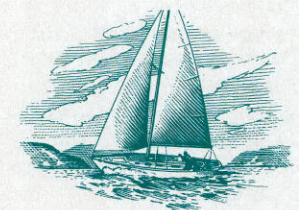
JULY: Walk on the Wild Side, Martin Dies, Jr. SP, Jasper, every Sunday, (409) 384-5231

JULY: Kids Ride Free, Texas State Railroad SP, Rusk, Every Thursday through Sunday, reservations required, (800) 442-8951

JULY 4: Annual 4th of July Concert, Martin Dies, Jr. SP, Jasper, (409) 384-5231

JULY 9, 16, 23, 30: Saturday Evening Programs, Martin Dies, Jr. SP, Jasper, (409) 384-5231

JULY 16: Floating the Forks, Martin Dies, Jr. SP, Jasper, reservations required (409) 384-5231



PRAIRIES & LAKES

JULY 1: Reptiles: Our Scaly Skinned Friends, Cedar Hill SP, Cedar Hill, call to confirm program, (972) 291-3900

JULY: Group History Tours, Monument Hill & Kreische Brewery SHS, LaGrange, call to reserve a tour for your group, (979) 968-5653

(continued on page 90)

CORPUS CHRISTI: KEDT-FM 90.3 / 5:33 p.m.; KFTX-FM 97.5 / between 5 – 6 a.m.; KVRT-FM 90.7 / 5:33 p.m.; KLUX-FM 89.5 / throughout the day

CROCKETT: KIVY-AM 1290 / 8:20 a.m., KIVY-FM 92.7 / 8:15 a.m.

DIMMITT: KDHN-AM 1470 / 10:30 a.m.

EAGLE PASS: KINL-FM 92.7 / 3:30 p.m.

EASTLAND: KEAS-AM 1590 / 5:50 a.m., 5:50 p.m. KATX-FM 97.7 / 5:50 a.m., 5:50 p.m.

EDNA: KGUL-FM 96.1 / 7:10 a.m.

EL CAMPO: KULP-AM 1390 / 2:36 p.m.

EL PASO: KTEP-FM 88.5 / 12:15 p.m. Thurs.

FAIRFIELD: KNES-FM 99.1 / Sat. mornings

FLORESVILLE: KWCB-FM 89.7 / 1:30 p.m.

FORT STOCKTON: KFST-AM 860 / 7:10 a.m., KFST-FM 94.3 / 7:10 a.m.

GAINESVILLE: KGAF-AM 1580 / 10 a.m.

GRANBURY: KPIR-AM 1420 / 4:20 p.m.

GREENVILLE: KGVL-AM 1400 / 8:10 a.m.

HARLINGEN: KMBH-FM 88.9 / 4:58 p.m.; KHID-FM 88.1 / 4:58 p.m.

HENDERSON: KZQX-FM 104.7 / 10:20 a.m., 4:20 p.m.

HEREFORD: KPAN-AM 860 / 2:50 p.m.; KPAN-FM 106.3 / 2:50 p.m.

HILLSBORO: KHBR-AM 1560 / 9:30 a.m.

HOUSTON: KILT-AM 610 / between 4 a.m. and 7 a.m. Thur.-Sun.

HUNTSVILLE: KSHU-FM 90.5 / throughout the day

JACKSONVILLE: KEBE-AM 1400 / 7:15 a.m.

JUNCTION: KMBL-AM 1450 / 6:40 a.m., 3:30 p.m., KOOK-FM 93.5 / 10:20 a.m., 3:30 p.m.

KERRVILLE: KRNH-FM 92.3 / 5:31 a.m., 12:57 p.m., 7:35 p.m.; KERV-AM 1230 / 7:54 a.m., 11:42 p.m., 6:42 p.m.; KRVL-FM 94.3 / 5:54 a.m., 11:42 p.m., 6:42 p.m.

KILGORE: KZQX-FM 105.3 / 10:20 a.m. and 4:20 p.m.

LA GRANGE: KBUK-FM 104.9 / 12:30 p.m.; KVLG-AM 1300 / 12:30 p.m.

LAKE CHEROKEE: KZQX-FM 104.7 / 10:20 a.m. and 4:20 p.m.

LAMPASAS: KACQ-FM 101.9 / 8:25 a.m.; KCYL-AM 1450 / 8:25 a.m.

LAREDO: KHOY-FM 88.1 / throughout the day

LEVELLAND: KIVT-AM 1230 / 12:30 p.m.

LLANO: KITY-FM 102.9 / 5:15 a.m.; 1:15 p.m.; 3:15 p.m.; 9:15 p.m.

LONGVIEW: KZQZ-FM 101.9 / 10:20 a.m.; 4:20 p.m.

LUBBOCK: KJTV-AM 950 / overnights

LUFKIN: KUEZ-FM 100.1 / 12:15 p.m.; KYBI-FM 101.9 / 12:15 p.m.

MADISONVILLE: KMVL-AM 1220 / 7:45 a.m.; KMVL-FM 100.5 / 7:45 a.m.

MARSHALL: KCUL-FM 92.3 / 6:12 a.m.; KMHT-FM 103.9 / 6:25 a.m.; KMHT-AM

1450 / 6:25 a.m.

MASON: KOTY-FM 95.7 / throughout the day

MESQUITE: KEOM-FM 88.5 / 8:15 a.m., 2:30 p.m., 8:30 p.m. Mon.-Thu.; 8:15 a.m., 2:30 p.m. Fri.

MEXIA: KROX-AM 1590 / 3:15 p.m.; KYCX-FM 104.9 / 3:15 p.m.

MINEOLA: KMOO-FM 99.9 / 5:15 p.m.

MONAHANS: KLBO-AM 1330 / between 8–9 a.m. and 1–3 p.m.

NACOGDOCHES: KSAU-FM 90.1 / 2:45 p.m.

NEW BRAUNFELS: KGNB-AM 1420 / 5:55 a.m.

ODESSA: KCRS-AM 550 / 6:15 a.m., 5:50 p.m., KOCV-FM 91.3 / 6:49 a.m.

PECOS: KIUN-AM 1400 / 10:30 a.m.

PLAINVIEW: KVOP-AM 1090 / 9:50 a.m.

ROCKDALE: KRXT-FM 98.5 / 5:04 a.m., 8:45 p.m.

SAN ANGELO: KGKL-AM 960 / 6:32 a.m. and 6:58 p.m.

SAN ANTONIO: KSTX-FM 89.1 / 9:04 p.m.

SEGUIN: KWED-AM 1580 / 7:55 a.m.

SONORA: KHOS-FM 92.1 / 10:15 a.m.; KYXX-FM 94.3 / 10:15 a.m.

SULPHUR SPRINGS: KSST-AM 1230 / 2:50 a.m., 11:50 a.m.

SWEETWATER: KXOX-FM 96.7 / 8:30 a.m.; KXOX-AM 1240 / 8:30 a.m.

TEMPLE: KTEM-AM 1400 / 10:20 a.m.

TEXARKANA: KTXK-FM 91.5 / 2:04 p.m.

VICTORIA: KTXN-FM 98.7 / 6:50 a.m.; KZAM-FM 104.7 / 7:10 a.m.; KGUL-FM 96.1 / 7:10 a.m.

WACO: KBBW-AM 1010 / throughout the day

WICHITA FALLS: KWFS-AM 1290 / 6:15 a.m., 7:45 a.m.

WOODVILLE: KWUD-AM 1490 / throughout the day

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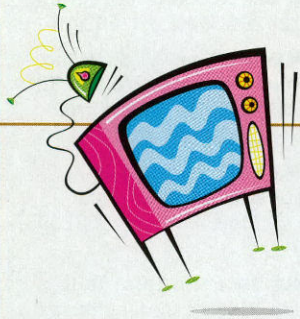
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June 26 - July 3:

Understanding animal defenses; trout fishing in Texas; hand cycling across the country; cactus flowers; Caddoan Mounds State Historic Site.

July 3 - 10:

Basic compass skills; Lake Somerville State Park; striped bass; mythology of snakes; Colorado Bend State Park.

July 10 - 17:

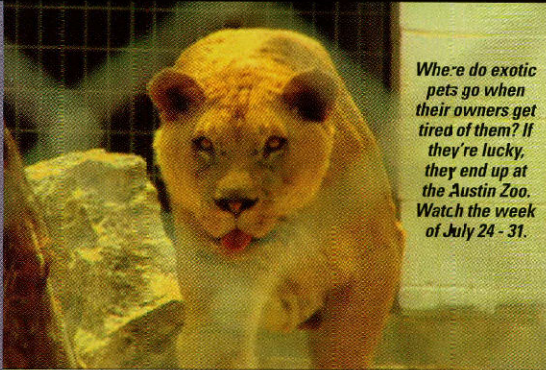
The dangers of exotic plants & animals; state parks as teaching tools; mystery at Caddo Lake; a misty morning; the elusive kingfisher.

July 17 - 24:

Alligators rule at Brazos Bend State Park; archeology of the San Jacinto Battleground; underwater in the Pedernales; shooting sports; prepare game in the field.

July 24 - 31:

Exotic animal sanctuary at the Austin Zoo; Barton Warnock Environmental Education Center; waterfalls at Lake Possum Kingdom State Park; animal communication; fish on the line.



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CARTHAGE: KGAS-AM 1590 / throughout the day; KGAS-FM 104.3 / throughout the day

CENTER: KDET-AM 930 / 5:20 p.m.; KQSI-FM 92.5 / 5:20 p.m.

CISCO: KCER-FM 105.9 / 12 p.m.

COMMERCE: KETR-FM 88.9 / 10:15 a.m.

(continued on page 88)



July 9 – September 4: Texas Movies, a tribute to the wide array of films produced in the Lone Star State (below), Bob Bullock Texas State History Museum (above), Austir, (512) 936-8746.



JULY: Kreische Brewery Tours, Monument Hill & Kreische Brewery SHS, LaGrange, every Saturday and Sunday weather permitting, available to groups of 10 or more by reservation, (979) 968-5658

JULY: Ranger Tales, Pur-tis Creek SP, Eustace, every Saturday (903) 425-2332

JULY: Exhibit: Lov's

Messenger: Courtship in the Victorian Age, Sebastopol House SHS, Seguin, every Friday through Sunday, (830) 379-4833

JULY 2: Kids Wilderness Survival, Cedar Hill SP, Cedar Hill, reservations required, (972) 291-3900 Ext. 232.

JULY 2: Sanc Castle Building Contest, Cooper Lake SP/South Sulphur Unit,

(continued from page 87)

Sulphur Springs, (903) 395-3100

JULY 2, 30: Mammals – Our Fuzzy and Furry Friends, Cedar Hill SP, Cedar Hill, call to confirm, (972) 291-3900 ext. 232.

JULY 2-3, 10, 16-17, 23-24, 30-31: Tours, Fanthorp Inn SHS, Anderson, (936) 873-2633

JULY 3: Cowboy Campfire, Music and Poetry, Lake Mineral Wells SP & Trailway, Mineral Wells, (940) 328-1171

JULY 3, 10: Kreische House Tour, Monument Hill & Kreische Brewery SHS, LaGrange, also available to groups of 10 or more by reservation on other dates, (979) 968-5658

JULY 5-8: Camp Fish, Texas Freshwater Fisheries Center, Athens, reservations required, (903) 676-BASS

JULY 8: Wildlife Slide Show, Eisenhower SP, Denison, (903) 465-1956

JULY 9: Orienteering, Cooper Lake SP/Doctors Creek Unit, Cooper, (903) 395-3100

JULY 9: Stagecoach Days, Fanthorp Inn SHS, (936) 873-2633

JULY 9: Kid's Wilderness Survival, Lake Mineral Wells SP & Trailway, Mineral Wells, reservations required, (940) 328-1171

JULY 9: Star Party, Lake Whitney SP, Whitney, (254) 694-3793

JULY 9: Stargazing Party, Ray Roberts Lake SP/Isle du Bois Unit, Pilot Point, (940) 686-2148

JULY 9, 23: Canoe Tours, Pur-tis Creek SP, Eustace, reservations required, (903) 425-2332

JULY 15: Fish of Lake Texoma Slide Show, Eisenhower SP, Denison, (903) 465-1956

JULY 16: Guided Nature Hike, Cooper Lake SP/South Sulphur Unit, Sulphur Springs, (903) 395-3100

JULY 16: Mineral Wells Adventure Race, Lake Mineral Wells SP & Trailway, Mineral Wells, reservations required, visit <www.SteelSports.net> or call (903) 871-8466

JULY 16: Stargazing,

Palmetto SP, Gonzales, (830) 672-3266

JULY 23: Get to Know the Trees, Cedar Hill SP, Cedar Hill, call to confirm program, (972) 291-3900, ext. 232

JULY 23: Silent Birds of the Night – Owls, Cedar Hill SP, Cedar Hill, call to confirm, (972) 291-3900, ext. 232

JULY 23: Birdwatching Walk, Cooper Lake SP/Doctors Creek Unit, Cooper, (903) 395-3100

JULY 30: Penn Farm Tour, Cedar Hill SP, Cedar Hill, call to confirm program, (972) 291-3900

JULY 30: Creatures of the Night, Cooper Lake SP/South Sulphur Unit, Sulphur Springs, (903) 395-3100



SOUTH TEXAS PLAINS

JULY: Men with a Mission, the Civilian Conservation Corps in Goliad, Goliad SP, Goliad, daily, (361) 645-3405

JULY: Nature Programs, Goliad SP, Goliad, call for dates, (361) 645-3405

JULY: Nature Trail Walk, Goliad SP, Goliad, every Sunday, (361) 645-3405

JULY 13-15: Summer Youth Program, Goliad SP, Goliad, reservations required, (361) 645-3405

JULY 16: The Better To Eat You With: Plant & Animal Adaptations For Survival, Government Canyon SNA, San Antonio, for reservations, e-mail educmte@hotmail.com, or call (210) 688-2208

SP	State Park
SHS	State Historical Site
SNA	State Natural Area
WMA	Wildlife Management Area
SFH	State Fish Hatchery

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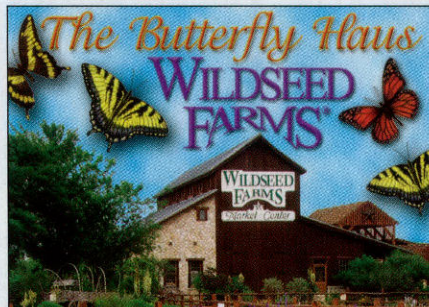
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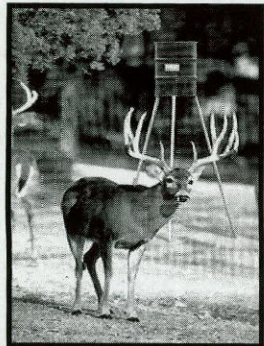
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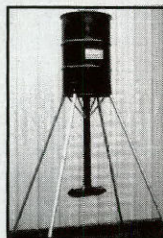
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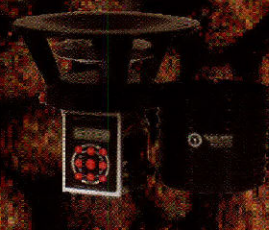
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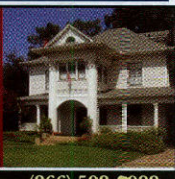
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PARTINGSHOT

Photographer Glenn Hayes says this dragonfly buzzed around the turtle repeatedly, trying to land on its nose. Each time, the aggravated yellow mud turtle would pull its head back inside its shell. After about 30 minutes, the turtle just gave up, allowing the eastern amberwing dragonfly to strike a pose. Photo taken at El Tecamate Ranch in South Texas.

IMAGE SPECS:

Canon EOS-3 with a 600 mm f/4 lens and a 1/250 second shutter speed at f/11 on Fuji Sensia 100 film.

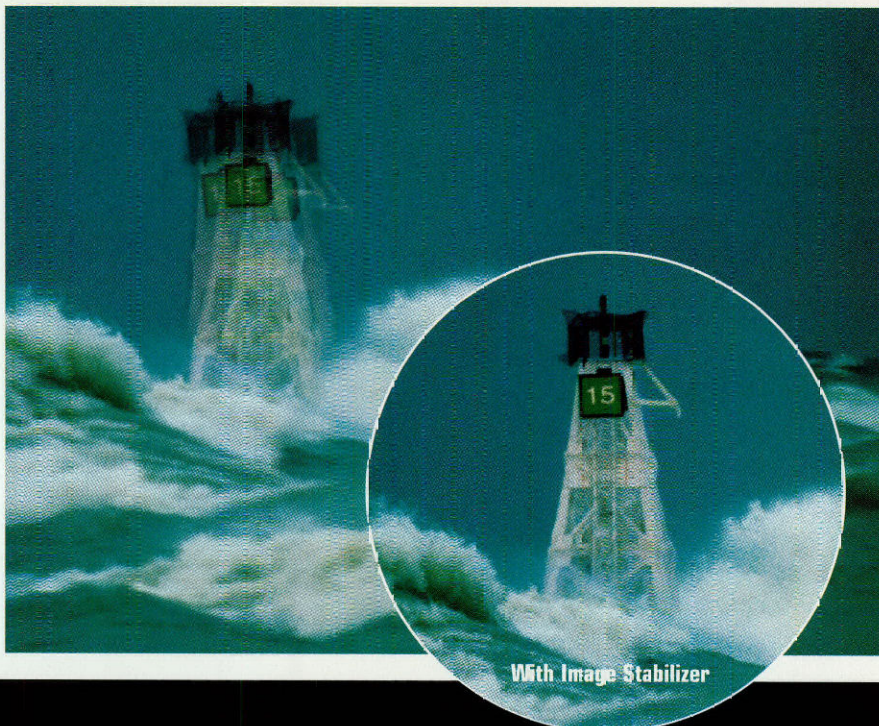


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