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SPECIAL  
KEEPSAKE  
ISSUE

# TEXAS

PARKS & WILDLIFE

*The* OUTDOOR MAGAZINE *of* TEXAS

## *Why* BAYS MATTER

*by* LARRY MCKINNEY

## *The* SLIGHTED BEAUTY

*by* GARY CARTWRIGHT

## *The* WHOOPER'S TABLE

*by* MICHAEL BERRYHILL

# *The* State *of* Bays

## *The* SALTY LAGOON

*by* CLAUDIA KOLKER

## *The* BROKEN MARSH

*by* PHIL H. SHOOK

## *The* HIDDEN BAY

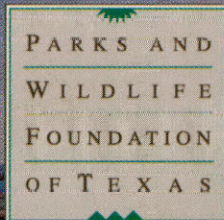
*by* JOE NICK PATOSKI

## *The* SHINING MARSH

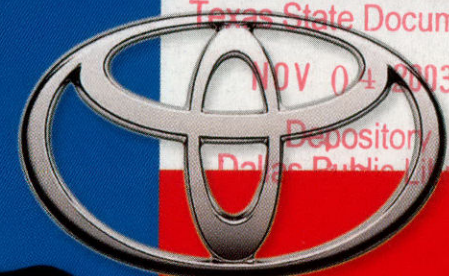
*by* RICK BASS



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# Features

## 23 Why Bays Matter

by *Larry McKinney*

Texas bays and estuaries generate billions of dollars in seafood and tourism each year. The challenge is to ensure that they receive enough fresh water to keep them healthy and productive.

## 26 The Slighted Beauty

by *Gary Cartwright*

Blighted by industry, Galveston Bay remains productive, beautiful and endangered.

## 38 The Whooper's Table

by *Michael Berryhill*

Fresh water from the Guadalupe River nourishes San Antonio Bay and the fabled whooping crane.

## 50 The Salty Lagoon

by *Claudia Kolker*

Stretching more than 200 miles, from Corpus Christi into Mexico, the fragile Laguna Madre has been spared from development.

## 60 The Broken Marsh

by *Phil H. Shook*

The freshest bay of the Texas Coast, Sabine Lake may be losing its identity to dredging and saltwater intrusion.

## 68 The Hidden Bay

by *Joe Nick Patoski*

Tucked behind the larger and better-known Corpus Christi Bay, Nueces Bay could be a model for how to restore an estuary.

## 79 The View Ahead

Interviews by *Tom Harvey*

Commissioners from the three state agencies in charge of water discuss the future of this most important resource.

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# CONTENTS

JULY 2003



AN ESSAY:

82

## The Shining Marsh

by Rick Bass

As ibises probe the bottom of the marsh,  
a writer puzzles the mysteries of creation.

PHOTO BY EARL NOTTINGHAM



# Departments

## 8 At Issue

Executive Director Robert L. Cook writes about the need for water planning.

## 10 Mail Call

Our readers respond.

## 15 Scout

### 15 REDEFINING WETLANDS *by Kevin Cermody*

A new interpretation of federal rules could make Texas coastal wetlands vulnerable to development.

### 17 COLORADO QUANDARY *by Cindy Loeffler and Bill Balboa*

Should Parker's Cut from the Colorado River into Matagorda Bay be reopened?

### 18 HEALING A BAY *by Bill Dawson*

Californians are discovering the high cost of trying to restore San Francisco Bay.

### 20 CLEARING UP THE WATERS *by Larry D. Hodge*

Dredge spoil is being used to create habitat.

## 89 Sights & Sounds

Check out Texas Parks and Wildlife's television and radio schedule.

## 90 Getaways

Find things to do and places to go across the state.

## 96 Parting Shot

## Covers

**FRONT:** Located on the east side of Galveston Bay, Anahuac National Wildlife Refuge protects more than 34,000 acres of marshes and other wildlife habitat. Photo © Lance Varnell

**BACK:** An angler casts for bait on the Texas Coast. Photo © Grady Allen

This page: Port O'Connor © Lance Varnell



# TEXAS

The OUTDOOR MAGAZINE of TEXAS

JULY 2003, VOL. 61, NO. 7

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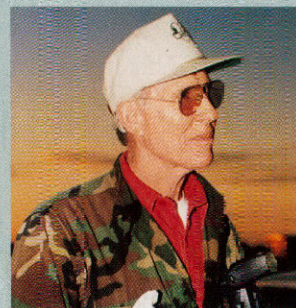
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# In the Field

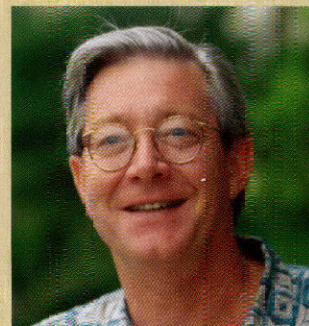
**GRADY ALLEN** has been a professional photographer for more than 25 years. Before he took up photography, Allen was a rancher and professional calf roper, the first left-handed roper ever to make it to the National Finals. Once an avid hunter, Allen says he became disenchanted with the high fences and high prices of hunting, and traded in his gun for a camera. This self-taught photographer has been published in *Field & Stream*, *Sports Afield*, *National Geographic* and many other publications. He has also been a regular contributor to *Texas Parks & Wildlife* throughout his career.



**RICK BASS** was born in Fort Worth and grew up in Houston, then studied wildlife science and geology at Utah State University. He's the author of 18 books of fiction and nonfiction, including a novel, *Where the Sea Used to Be*, and a story collection, *The Hermit's Story*. He lives with his wife and daughters in northwest Montana's Yaak Valley, where he is active with numerous local conservation organizations, including the Yaak Valley Forest Council, which is working to protect the last few roadless areas in Kootenai National Forest and supporting forest reform practices that return to more sustainable harvest methods.

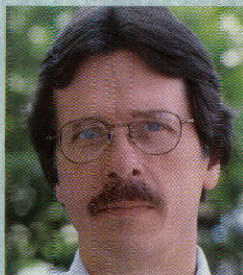


**MICHAEL BERRYHILL** became the editorial director of *Texas Parks & Wildlife* magazine in December 2002. His first magazine article, published in 1980 in *Houston City Magazine*, was about quail hunting in South Texas. Since then he has worked as an editor and writer for many Texas publications, including the *Fort Worth Star-Telegram*, *D Magazine*, the *Houston Chronicle*, *Houstonian* magazine, and the *Houston Press*. His freelance work has appeared in *The New Republic*, *Harper's*, *Sports Illustrated* and the *New York Times Sunday Magazine*. He wrote extensively about the environment for the *Houston Press*; in 1996, the Press Club of Houston named him Print Journalist of the Year.



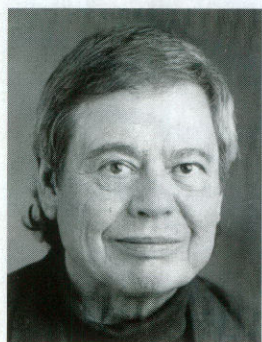


**KEVIN CARMODY** is the environment writer for the *Austin American-Statesman*. A founding board member and past president of the National Society of Environmental Journalists, he has won more than two dozen national and regional reporting honors, including the George Polk, National Headliners and Thomas Stokes awards. Carmody received a BA in journalism in 1980 from Marquette University, which honored him as a Distinguished Alumni Scholar in 1992. Among his science fellowships, Carmody has studied cellular and molecular biology at the Marine Biological Laboratory at Woods Hole, Mass., and accompanied a NASA-funded science team to the headwaters of the Brazilian Amazon for atmospheric research.



worked for many years as a refuge manager in the National Wildlife Refuge System, retiring in 1990 to become a full-time photographer. Ditto often appears at nature festivals and outdoor events to lead nature photography seminars. Much of his spare time is devoted to wildlife habitat conservation in South Texas, assisting the Valley Land Fund and Friends of the Wildlife Corridor.

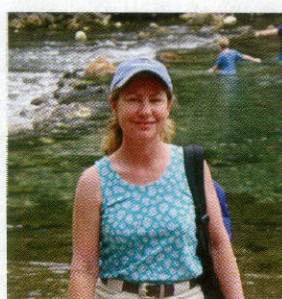
**CLAUDIA KOLKER** is a Houston-based writer who settled in Texas seven years ago. She has worked as a reporter in Latin America and in her home city of Washington, D.C., and in Texas has been a staff writer at the *Houston Press* and *Houston Chronicle*. Most recently, she was the Houston bureau chief for the *Los Angeles Times*. She recently returned from three months in India and Pakistan, where she was working on a series for the *Houston Chronicle*. Her work also appears in the *Los Angeles Times Magazine*, *The Boston Globe*, the *St. Petersburg Times*, *The Christian Science Monitor* and *Salon*.



**GARY CARTWRIGHT** is an author, screenwriter, journalist and senior editor at *Texas Monthly*. He has written for the magazine since its inception in 1973, and joined the *Monthly* staff in 1981. His work has also appeared in numerous other magazines including *Harper's Esquire*, *Rolling Stone*, *Sports Illustrated* and the *New York Times*. He has written three screenplays and published eight books, including

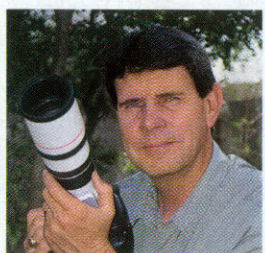
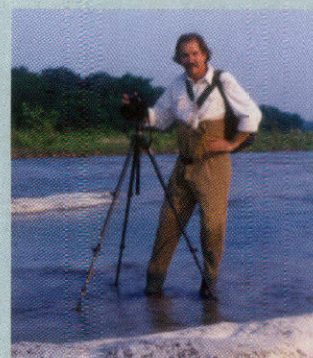
*Galveston: A History of the Island*, originally published in 1991. Cartwright lives in Austin with his wife Phyllis and their two Airedale terriers, Nicholas and Alexandra.

**BILL DAWSON** is a Houston writer. He formerly was the environmental reporter for the *Houston Chronicle*, where his investigative projects examined Houston's air-quality problems, wetlands, threats to Galveston Bay and tropical deforestation. Dawson covered environmental issues at three other newspapers and an investigative reporting organization. He traces his love of the outdoors to childhood treks in the woods of Tennessee and Georgia (where he discovered the joys of lying in the grass to look at bees and clouds). He earned degrees at Rice University and the University of Texas. He and his wife Glenna have two children, Sarah and Will.



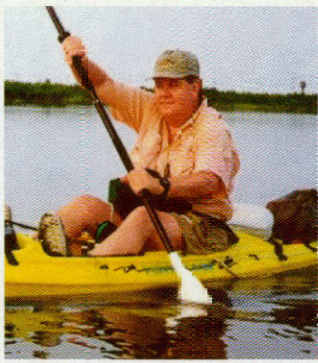
**CINDY LOEFFLER** received her bachelor's degree in engineering from Colorado State University and is a registered professional engineer in the State of Texas. She began working at the Texas Parks and Wildlife Department in 1987 as part of the interagency team that developed and applied the methodology for determining freshwater inflow needs for Texas bays and estuaries. In 2001 Loeffler was named the water resources branch chief at TPWD. Her duties now include the coordination of TPWD responses to water resource issues. She enjoys camping and kayaking at Texas state parks with her husband and two sons.

**WYMAN MEINZER** developed an interest in photography while doing research for his bachelor's degree in wildlife management at Texas Tech University. He sold his first image five years after his graduation in 1974 and since then his work has appeared on more than 250 magazine covers. His photography has been featured in more than a dozen books, including *Texas Rivers* and *Wyman Meinzer: Eyes on Texas*. Meinzer's photography has garnered many awards and accolades, and in 1997 Gov. George W. Bush named him Official State Photographer of Texas. Meinzer lives in the small ranching town of Benjamin with his wife, Syllinda.



**LARRY DITTO** has been engaged in nature photography for more than 25 years. His work has appeared in books, calendars and magazines such as *Texas Parks & Wildlife*, *Texas Highways* and *Field & Stream*. He



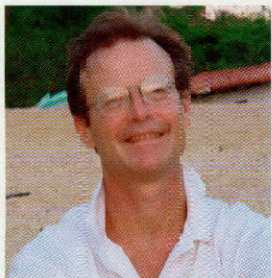
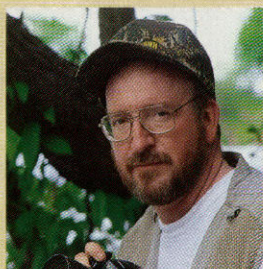


**LARRY MCKINNEY** grew up near the small West Texas farming community of Coahoma during the 1950s "drought of record," which was a defining point for water development in the state. He completed his Ph.D. at Texas A&M University in 1976 and was a Smithsonian Fellow that same year. His research in

benthic ecology and estuarine dynamics has included projects in all of Texas' major estuaries and nearshore waters. Currently, McKinney is senior director for aquatic resources at TPWD. His major concerns include the protection of inflows to estuaries and instream flows for rivers and reservoirs, wetland preservation and endangered species conservation.

## EARL NOTTINGHAM

TPWD staff photographer since 1995, has received national photography awards from the Outdoor Writers Association of America, Western Publications Association and Association for Conservation Information. A native Texan, he is a graduate of East Texas State University and attended the Art Institute of Atlanta. His photographs have appeared in *Texas Highways*, *Smithsonian*, *National Geographic Traveller*, *Texas Monthly*, *Southern Living* and other magazines. Nottingham is a licensed pilot, and he enjoys taking aerial photos of the Texas landscape. He speaks to civic groups about photography and conducts photo classes. Nottingham lives in Temple with his wife Paula and son Adam.

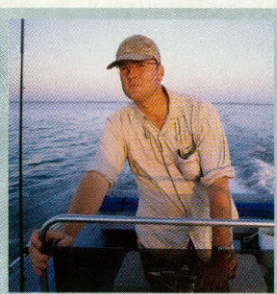


**JOE NICK PATOSKI** has been writing about Texas for Texans for more than 30 years. His love for water began at Burger's Lake and South Padre Island as a child, and turned to a passion at Barton Springs in Austin. Since then, he's written about the top 10 swimming holes in Texas, rafting the Rio

Grande, stalking redfish in Aransas Bay, drilling on the Padre Island National Seashore, T. Boone Pickens and the new generation of water hustlers, and the fight to save Caddo Lake. An avid swimmer and paddler, and wannabe surfer and fisherman, he wrote about the Devils River for last year's water issue.

**DAVID J. SAMS** is a Dallas-based photographer who shoots for a number of corporate clients, but specializes in outdoor photography because of his love for hunting and fishing. He has been published in numerous magazines, and was a finalist for the Pulitzer Prize in 1988. A prolific

contributor to major outdoor magazines, Sams was recently named contributing photographer for *Field & Stream*. In addition to his magazine work, Sams has released his own book, *Engulfed*, which highlights his passion for the Texas Coast.

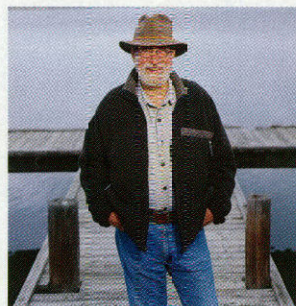
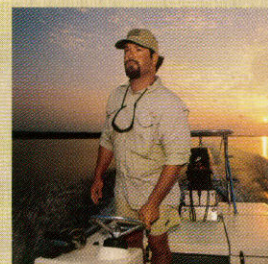


**PHIL H. SHOOK** has been a writer with the *Abilene Reporter-News*, *Laredo Times* and *Dallas Times-Herald*, and has contributed features to *Texas Parks & Wildlife* on angling and fisheries conservation for more than a decade. He is a native of San Antonio and a journalism graduate of the University of Texas at Austin.

His articles and photographs have also appeared in *Field & Stream*, *Outdoor Life*, *Texas Sporting Journal*, and others. He is the author of two fly fishing books, both of which were judged best outdoor books of their respective years by the Texas Outdoor Writers Association. He now lives with his wife and daughter on Long Island Sound, Larchmont, N.Y.

**SCOTT SOMMERLATTE**, born and raised on the Texas Coast, has made a living as a fly fishing and waterfowl guide for more than a decade. He served in the U.S. Coast Guard from 1991 to 1999, and got the bug for writing and photography soon afterward. He is a self-taught writer and photo-

grapher, and in recent years his images and writing have appeared in numerous national and regional publications, including *Tide*, *Saltwater Sportsman* and *Sport Fishing*. He is also recognized as a contributing writer for *Fly Fishing in Salt Waters* magazine.



**JACK UNRUH** has been a published artist for more than 20 years. He was born in Pretty Prairie, Kansas, the son of an Air Force veteran. As a youngster, he lived in a variety of places before attending Washington University in St. Louis. After graduating, he moved to Texas, and decided to

settle in Dallas. He has received gold and silver medals from the Society of Illustrators and was awarded the Hamilton King Award by the New York Society of Illustrators. Much of his work parallels an interest in the outdoors, or was inspired by his time in the outdoors. His illustrations have been published in many magazines, including *Time* and *National Geographic*.



# AT ISSUE

FROM THE PEN OF ROBERT L. COOK

**Although many Texans take it for granted** that we'll always have plenty of fresh water, water rationing is a real possibility in our future. If we want to avoid that unpleasant task, we must do a better job of water planning and water conservation. We can provide an adequate supply of fresh water for future Texans if, and only if, we act now. We need to take action promptly and make these decisions while our options are still open. We should not wait until the crisis is upon us and all the choices are bad. Ask California, Florida and a double handful of nations around the world about dealing with these issues during a water crisis.

Texas has the water-planning framework to take us into the future. In 1985, the 69th Texas Legislature provided that environmental needs be considered in issuing new water permits, and directed TPWD and the Texas Water Development Board to come up with the science to do so. In 1997, the 75th legislature adopted a regional approach to water planning and management under the requirements of Senate Bill 1.

We now have the science that tells us how much water we need in our rivers and lakes, and how much water needs to flow into our bays and estuaries so that they will remain healthy and productive. We have the tools to balance the water equation and meet our human, economic and ecological needs. We must decide how to use those tools and, in true Texas style, we have to get it done.

Urban and rural Texans can help balance our water equation through water conservation and good land management. Rural landowners can make significant contributions through good range management and brush control to increase absorption of rainfall, reduce erosion, restore spring flow and improve water quality, thereby assuring clear-running streams and rivers. Urban Texans must take action by installing low-flow shower heads and toilets, by doing larger loads of laundry, by using less water to wash the car and by reducing or eliminating the need to water the lawn by planting native grasses adapted to our state's normal rainfall rates.

The key issue is what we do with the water we save from these efforts as well as with the water now in our rivers that is not appropriated for other uses. Following the lead of other western states, Texas should carefully consider implementing a water reservation system for instream flows and freshwater inflows. Under a reservation system, the state could reserve from permit appropriation enough instream flow of fresh water to maintain the health and productivity of our rivers, lakes, bays and estuaries. In order to accomplish this goal, a public process, incorporating all essential stakeholders and relying on the best available technical information, can be developed to determine the reservation levels needed for each of our state's legendary river systems.

*Urban and rural  
Texans can help  
balance our water  
equation through  
water conservation  
and good land  
management.*

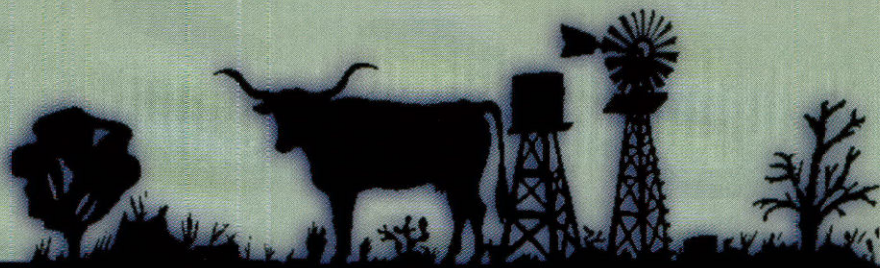


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# MAIL CALL

PICKS, PANS AND PROBES FROM PREVIOUS ISSUES

## FOREWORD

**Water commands center stage in this second installment** of our annual water series, entitled "Texas: The State of Bays."

In these pages, some of Texas' foremost environmental and outdoor writers and photographers join forces to share with you the intricate and spellbinding tales of five of Texas' most threatened bays: Galveston Bay, Sabine Lake, San Antonio Bay, Nueces Bay and Laguna Madre. Many of these contributors are listed on pages five through seven. I only wish we had room to thank each and every one of the many contributors to this ambitious undertaking.

Texas bays support billions of dollars of petro-chemical and commercial seafood industries, recreational fisheries and tourism. Let us not forget that these bays, these stews of fecund, primeval ooze where the rivers meet the sea, feed something just as vital: our souls.

Could it be that these estuaries are so much like our own bodies — which are more than 60 percent water with the remainder made up of the minerals of the earth — that we are drawn to them for spiritual restoration? Whatever the reason, I am somehow drawn inexplicably to these lifegiving waters, and I am never disappointed.

On a spanking-clean June morning, swirling through cypress-rimmed, syrupy black waters near the mouth of the Trinity River, my heart leaps at the neon flash of a prothonotary warbler. On a crisp October day, I sight-cast to redbfish as a friend and I drift across Fence Lake on San Jose Island, standing astride our kayaks to turn our bodies into sails. Darting in the foot-deep water beneath us are shrimp, crabs and rays in astounding numbers. At a wintry dawn on Matagorda Bay, a flight of blue teal appears seemingly from nowhere to cup their wings and settle among our decoys; the vision so achingly beautiful I note sheepishly that I have forgotten to mount my gun. That same morning, I observe two whooping cranes with their lanky offspring, a first-time migrator. On a blustery early spring day, while exploring the Sabine Lake region, I delight in pulling a fat, fragrant marsh bass from the brackish waters near Taylor Bayou.

To be sure, the ocean calls to me as well — for who cannot love the open beach and the pounding surf? — and I probably spend more time on rivers than on any other bodies of water. Still, it's the magical commingling of river and sea that speaks to me so richly of life, of rebirth, of renewal, of restoration. These are the places that feed my soul.

Texas is blessed with more miles of coastline than any of the contiguous United States, with the exception of Florida, California and Louisiana. As stewards of this incredibly rich and forgiving resource, we earn both high marks and low ones.

We can do better.

I like to think the more we know about a place, the more easily we fall in love with it. Begin with this issue of *Texas Parks & Wildlife*, then get out there and stick your hands in the resource. Paddle a canoe, catch a fish, watch a bird, sketch, take a photograph. Simply look around you; there's no telling what you'll see and learn about the natural world if you simply open yourself up to it.

And if you're as lucky as I've been, you're apt to learn a little about yourself as well.

## LETTERS

### TREASURED BOOKS

Thanks for creating the "Texas Treasure Hunt!" Boy, I'm glad I read my May issue cover to cover. Being one of the first 50 to answer all the questions about Texas state parks and Texas wildlife management areas correctly

entitled me to win two outstanding publications. These books are truly outstanding in their format, clarity and expert description by the writers.

My favorite parks are Cooper Lake for bassing, Meridian, Garner, Falcon Lake and Bentsen-Rio Grande. Spring of '99 saw me add 21 lifers to my birding list at Garner, Falcon and Bentsen. I also like Matador WMA for quail hunting.

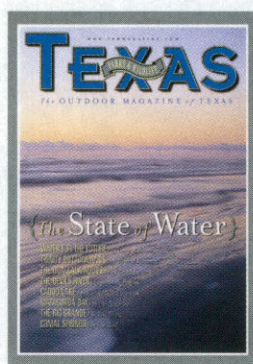
Thanks again for the two books. I'll treasure them the rest of my days.

JIMMY G. HOOVER  
Wichita Falls

### REMEMBERING ALLOWAY

I was saddened to note (May 2003, page 68)

the loss of David Alloway, a veritable genius of the outdoors. Approximately 10 years ago, a group of us were passengers on the park bus, departing Fort Leaton for an all-day tour of Big Bend Ranch State Park. Alloway stood in the aisle as he spoke over a mike, explaining what we were seeing. He stopped the bus at various spots reflecting Native American history — wisps of small running creeks, 12-inch deep holes in solid rock where grain was ground, various high rock cliffs — and explained significant desert plants



You may order a copy of the July 2002 issue by sending a check or money order for \$5 to:  
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# MAIL CALL

and their purposes. On one stop, he invited the passengers off the bus to show us how Native Americans used the sotol plant to make sewing thread. He was so informative and interesting that I will never forget his delightful commentary.

Your photograph of Alloway and his son and the Deuteronomy quotation was a fitting tribute to an unforgettable man. Thank you for your sensitivity in sharing this with your readers.

RICHARD ARNESON  
San Antonio

## MAN HOOKED BY BASS

**U**nable to sleep early this morning, I went to the kitchen for a cup of hot tea. Then to the living room, to my favorite rocker, thinking to enjoy Rick Bass' essay "A Texas Childhood" in the March 2003 issue.

Enjoy it I did, identifying with Lowry as she tracked that deer and then as she attempted to hide behind the bare alder, in order to catch even a fleeting glimpse of the pileated woodpecker.

It brought back memories from my own childhood, of treks in the back draws of Palo Duro Canyon, or even visits to my grandparents' places when they still lived or farmed in the country.

Ah, the cover article by Robert Bryce on "The Trouble with Bees." That cover photo had caught my attention, since one of our sons-in-law has a couple of hives on their place north of Bangs.

The tea having relaxed me, and still thinking about Lowry in her dad's essay, I went back to bed then, back to the Montana wilderness, back to my own childhood memories. Thanks, Rick Bass, for helping me recall them.

MILTON ALLRED  
Tlaxiaco, Oaxaca, Mexico

## A TALE OF TWO TURKEYS

**Y**our "Parting Shot" (June 2003) is an interesting picture, but I have perhaps an explanation to the color aberration. I live just east of Boerne and my family has had a ranch on the Guadalupe just north of me since the mid-1930s. We raised turkeys at the place but starting with the Korean War we got many more because the government was paying good money for them. (Ask a veteran of that conflict if they



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# MAIL CALL

look forward to turkey at Thanksgiving: it was about the only meat they got during the war and most got sick of it.)

To get bigger birds we replaced the standard birds with the pure white kind. As our birds were free range after several years, we began to see a strange phenomenon in the wild birds on the place. Seems that several every year looked a lot like your picture and the best we could guess was that some hanky-panky went on out in the cedar thickets between the two bloodlines.

Well, the war ended, the market went to almost zero, and my family ate turkey at least every other week for about two years. I don't look forward today to those "special dinners" either, even though I was only about 12 at the time. With the white birds gone, the color variation disappeared from our place in the mid-'60s, but perhaps this bird has an errant gene from our unintended experiment!

JOHN GRIFFITH

Boerne

**ERRATA:** The information regarding Devils River State Natural Area (May 2003, page 22) should state that Dolan Falls is not part of the park, but is a separate entity. There is no access by land to Dolan Falls from the Devils River SNA. The Nature Conservancy controls access to Dolan Falls as part of the Centex Homes Dolan Falls Preserve. The preserve is open to the public only for scheduled field trips and volunteer workdays. For more information, contact the Centex Homes Dolan Falls Preserve, P.O. Box 1630, Uvalde, Texas 78802, phone: (830) 278-3945, or email Jim Harrison at <jharrison@tnc.org>.

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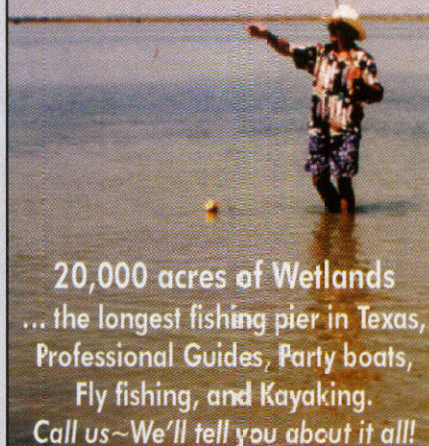


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# SCOUT

NEWS AND VIEWS IN THE TEXAS OUTDOORS

## Redefining Wetlands

*The coastal marshes of Texas may have lost one of their most valuable protections with a recent change in the interpretation of federal rules.*

**For a quarter of a century,** coastal wetlands have been protected by federal law because, as Congress acknowledged in the 1970s, these marshes are far more valuable than previously assumed. Take a 15-acre plot in Galveston County, most of it covered with mermaid weed, arrowhead and cat-tails, and year-round pools of water teeming with mosquito fish. These 15 acres might not seem like much but, along with many thousands of similar marshes dotting the Texas Coast, they do a lot: providing food for water birds and spawning grounds for fish, and filtering pollutants before they flow into Galveston Bay.

When it rains torrents, this wetland slows the flow of water moving toward the nearby bay. Its plants and bacteria filter and digest pollutants such as toxic metals and oil that run off Texas Highway 146 and surrounding commercial properties. The marsh water doesn't move in streams but in sheets, and through subtle depressions called swales, before entering a roadside ditch and emptying into the bay. That's a good thing, considering that urban run-off is a major problem for Galveston Bay — responsible for closed oyster beds and Texas Health Department advisories to avoid eating fish caught in certain parts of the bay and its tributaries.

But a recent interpretation of a 2001 U.S. Supreme Court decision by the Galveston District Office of the U.S. Army Corps of Engineers threatens to unravel the protections such Texas coastal wetlands have long enjoyed. Federal officials confirm that what's at

stake, potentially, is the unlimited development of 40 percent of Texas' 3 million acres of coastal wetlands. In the near run, the marshes dotting the big ranches along the South Texas coast shouldn't be threatened. But, state and federal resource agencies acknowledge, wetlands along the upper Texas Coast, especially those in reach of Houston's sprawl, are already being filled at an accelerated pace without any mitigation.

Federal protection for wetlands accelerated in the late 1980s when then-President George H.W. Bush declared a national policy of "no net loss of wetlands." Under that policy, building on wetlands required scrutiny for ecological impacts, permits and, in cases where wetlands were filled in mitigation. Mitigation typically has meant the creation of new wetlands in exchange for what is lost. And so for a

**Wetlands not connected to major waterways by streams with beds and banks may no longer be protected under federal law.**



PHOTO © LANCE VARNELL



decade, according to the government's 2000 national water quality report, the rate of wetland loss slowed considerably.

Several years ago the Galveston District Office of the U.S. Army Corps of Engineers protected this little wetland on the edge of Galveston Bay, denying a developer the right to fill it without an adequate mitigation plan. Today, a new owner is filling the wetland with no permit and no mitigation. Unless the corps backtracks, it's legal. The change hinges on the interpretation of a 2001 Supreme Court ruling by the Galveston office that affects the whole Texas Coast. Ironically, other Corps of Engineers district offices interpret the ruling differently. If those same 15 acres now being filled were taken out of the Galveston District and put in the state of Washington, for example, they almost certainly would be protected by federal law.

What changed? It all depends, it seems, on how wetlands are defined. The Galveston District's interpretation of the 2001 U.S. Supreme Court case, *SWANCC vs. U.S. Army Corps of Engineers*, stripped protection from the precise type of wetlands that dominate the Texas Coast: wetlands connected by swales and overland "sheet flow" — not streams with beds and banks — to major waterways and bays.

At the crux of the issue lies a pivotal legal question: which wetlands are "isolated" from major waterways and bays and can be filled without consequence, and which wetlands are "adjacent" public waters that merit federal protection under the wetlands provision of the Clean Water Act?

The Supreme Court decision focused not on the type of wetlands found along the Texas Coast, but on the abandoned gravel pits at the site of a landfill proposed by the Solid Waste Authority of Northern Cook County (SWANCC). The Chicago pits were truly isolated — filled by rain and having no surface connection or influence on other water bodies and no biological use except the potential for waterfowl to land and rest there. The corps had blocked filling of those based solely on the decade-old "migratory bird rule" that protected even isolated wetlands used by endangered or migrating birds. The court concluded the use of the migratory bird rule alone overstepped the intent of the Clean Water Act, which, it said, was primarily intended to protect water quality in major water bodies, not birds. If such isolated waters as unregulated quarries were valuable for bird habitat, and some clearly are, they should be protected by other federal or state laws, the court said.

After the decision, the Galveston District reverted to its former rules from the 1980s that defined "isolated wetlands" as those that, with limited exceptions, aren't connected to a navigable waterway by a bed-and-bank stream.

The wetlands that filter much of the polluted urban runoff along Texas' flat coastal plain are not connected by such streams, but through swales and other slight depressions that don't fit the bed-and-bank rule. During rains, sheets of water can run in torrents across the land, flowing from these supposedly isolated wetlands directly to waterways and bays. In most of Texas, such connections don't count any longer.

Texas environmental and wildlife managers have protested in public comments that the Galveston Corps' definition is an overly broad interpretation of the Supreme Court decision. Most of the Texas coastal marshes that have been defined out of protection aren't isolated like the Chicago gravel pits, they say, because water flows in and out of them.

"If the Galveston District's interpretation was in place in Florida, most of the Everglades would be considered isolated and subject to filling," said Andrew Sipocz, a TPWD habitat biologist from Seabrook. "People think it's just the wetland grasses that filter out particles of pollution like toxic metals, but it's far more involved, with bacteria actually altering the pollutants and digesting them. The loss of that function, on this scale, will have serious consequences for the fisheries and other wildlife along the coast."

The corps staff in Galveston say they are sympathetic, but argue their hands are tied. "We're right there with the people saying that these wetlands are valuable, worth protecting," said Fred Anthamatten, chief of the policy analysis section for the Galveston District. "But we're bound by the requirements of the law and have to follow the Supreme Court's directive to us."

In response to the uncertainty over the SWANCC case, the U.S. Environmental Protection Agency and the corps headquarters in Washington have proposed new rules generally in line with the Galveston office's current interpretation that narrows the definition of wetlands to exclude much of the Texas coastal marshes. During the public comment period on the rules that ended in late April, real estate and developer groups praised the proposal for easing what they long have seen as the overly zealous protection of marginal wetlands. Several agencies, including TPWD, took issue with the Supreme Court's observation in SWANCC that if states want to protect isolated wetlands they can adapt laws to do so. Texas law, the TPWD pointed out, prohibits state regulations from being stricter than federal rules.

A decision on the national rules for isolated wetlands may take years, says John Millett, spokesman for the EPA, which oversees the corps enforcement on wetlands cases. In the interim, the policies of individual corps districts hold sway.

Meanwhile, on the 15 acres near Galveston Bay, the filling process and other site work is nearing completion. On a sunny Saturday morning in late April, the site looked as if had been subjected to a Paul Bunyan-sized tiller, erasing most evidence of wetland plants and animals that once flourished there. Still, three snowy egrets stalked through the puddles that remained of the marsh, searching for the crayfish and mosquito fish that instinct told them should have been there. — KEVIN CARMODY



Wading birds such as this snowy egret feed on fish they capture in wetlands all along the Texas Coast.



# Colorado Quandary

*Whether to open Parker's Cut near the mouth of the Colorado River or leave it closed is no open-and-shut case.*

In 1935, Matagorda Bay was split in two, the culmination of a series of actions to remove a major logjam from the Colorado River. The logjam was first surveyed by William Selkirk, one of Stephen F. Austin's surveyors, back in the early 1800s. By 1924 the jam extended 46 miles upstream and was blamed for catastrophic flooding in the towns of Wharton, Bay City and Matagorda.

The removal of the logjam through dynamite, dredging and a massive flood in the 1920s led to the rapid formation of a delta covering Dog Island reef, reported to be the largest oyster reef on the Texas Coast. Within 20 years the delta became a land bridge that extended across the bay to Matagorda Peninsula. The Colorado River was channeled across Matagorda Peninsula and allowed to flow unfettered into the Gulf of Mexico, and the bay was bisected into what we

know today as East Matagorda Bay and West Matagorda Bay.

Desiring to exploit the plentiful oyster shell in West Matagorda Bay, the Parker Brothers' dredge company created a pass through the west side of the land bridge that was known locally as Parker's Cut. Never much more than three or four feet deep, the cut was a boon to boaters because it offered easy access from the river channel into West Matagorda Bay and the great fishing on the back bays and sloughs of Matagorda Peninsula. But then the law of unintended consequences caught up to Parker's Cut.

Probably no place on the Texas Coast better illustrates this principle than the various attempts to fix the mouth of the Colorado River. In 1935, diverting the flow of the Colorado River into the gulf must have seemed obvious. Rivers were regarded chiefly as flood hazards, and their flows had not yet been slowed by upstream reservoirs. The flooding problem



In this view, looking up the Colorado River from the Gulf of Mexico, Parker's Cut is in the background on the left.

diminished, but a new problem replaced it: the slow decline of the health of Matagorda Bay. By the late 1970s, the bay's fisheries, both commercial and recreational, were suffering.

The solution to that problem seems as obvious now as the solution to flooding was in 1935: put the water back into the bay. But a lot had been learned since 1935, and the process was slower. In 1992, 11 years after the U.S. Army Corps of Engineers completed its studies, the Colorado River again flowed into the bay through a newly dredged diversion channel. Many of the good effects that had been predicted for this action have come true. Hundreds of acres of productive marshes have been created along the mouth of the diversion channel from the sediments and nutrients that now flow into the bay instead of the gulf. Newly created oyster reefs are flourishing.

But changes to natural systems create complications. Having determined to spend a good deal of money to divert fresh water into the bay, the corps did not want the water to escape back out through Parker's Cut and into the sea. There



was also concern that Parker's Cut could allow salt water back into the bay. So the pass was closed.

This measure was not lightly taken. In its 1981 Environmental Impact Statement, the corps considered creating either a small lock or a boat sling that would enable small boats to get through Parker's Cut, but decided against those options. The result is that, in order to get into West Matagorda Bay, small boats must go upstream in the old river channel, turn left at the Gulf Intracoastal Waterway, and pass through a lock shared with massive barges pushed by towboats. The currents in the lock are treacherous, and seem to have been aggravated by passage of river water entering into the new diversion channel nearby. The lock near the Colorado is one of the most difficult passages for a towboat captain to negotiate.

So for 10 years the corps has been considering its options, listening to the opinions of recreational fishers, towboat operators, the Texas Parks and Wildlife Department and other agencies concerned with the health of the bay. Hoping to better understand the dynamics of the water flowing through this complex system, the corps even built a scale model of the locks in its Vicksburg office. Reopening Parker's Cut might help reduce hazardous currents in the GIWW. Dredging a pass into the southwest corner of East Matagorda Bay, known as Southwest Cut, might also reduce the currents. Another possibility is to dredge a bypass channel around the locks for recreational boaters.

Would significant amounts of fresh water be lost if Parker's Cut were reopened? Or would opening the cut help the productivity of the bay by letting juvenile fish and shrimp larvae back into the bay from the Gulf, where they might find shelter in the newly developing marsh nurseries? But how much salt water might come flowing back with them? Those questions have to be balanced with human safety, as well. If a small boat loses power in the lock and is crushed against the lock's wall by a barge pushed by a towboat fighting the difficult currents, there will be a lot of second guessing.

The corps faces a difficult decision. Models can predict only what *might* happen. In reality, only the passage of many years will enable us to see what effects might be incurred by reopening Parker's Cut or opening the Southwest Cut into East Matagorda Bay. Like all coastal systems, Matagorda Bay's productivity is the result of extremely complex hydrological, meteorological and biological interactions, which are not yet fully understood. Every time we interfere with natural processes, there are repercussions from our actions.

Predicting the future is risky. Suppose Parker's Cut is reopened and a drought of record hits, or the outflow of the Colorado River is drastically reduced by appropriations for urban needs? A cut could be helpful or harmful, depending on flows. Finally, how do you weigh human safety and the health of the bay? Carefully and deliberately can be the only answer. And then watch and be prepared for unintended consequences.

— CINDY LOEFFLER AND EILL BALBOA



## Healing a Bay

*California is spending hundreds of millions of dollars to restore what Texas still has: living estuaries.*

**Stroll along the Golden Gate Promenade** on a summer afternoon, and Crissy Field is a harmony of blue and green, city and nature. Behind the bird-studded tidal marsh, San Francisco's skyline towers. Across white-capped San Francisco Bay stretches the Golden Gate Bridge.

Crissy Field is a showcase, not of environmental preservation, but of environmental restoration. Once a historic aviation facility, Crissy Field became a national park in 2001 after a \$34 million project recycled 70 acres of asphalt and removed 87,000 tons of hazardous materials. Thousands of volunteers planted native vegetation. The restoration was an ambitious undertaking by any measure. And around the San Francisco estuary — the bay plus the delta of the Sacramento and San Joaquin rivers — many more projects are being planned and carried out to undo some of the ecological degradation that happened over decades.

For Texans concerned about their coastal waters, this rehabilitation serves as a cautionary tale. Let the damage mount up for too long and in too many ways, and restoring a bay system can be complex and expensive.

Consider the mammoth diversion of fresh water to farms and cities from the San Francisco estuary, which historically received 40 percent of California's flow. An elaborate system of dams, canals and pumping stations irrigates 4.5 million acres and provides drinking water for 22 million people. The diversion, which has radically damaged the estuary, has generated legal and political battles spanning decades. In

PHOTO © LAURENCE PARENT



recent years the drama has included a series of fish kills at the huge pumps. However, "some real progress has been made in reducing diversions from the estuary at critical times," says Barry Nelson, former executive director of the prominent Save the Bay group and now with the Natural Resources Defense Council.

The water wars finally have led to a major truce. In 1994, a negotiated agreement set new standards that leave more water in the estuary. A well-funded, state-federal partnership, the CALFED Bay-Delta Program, was established. It is now three years into a 30-year plan to restore the estuary's ecological health and improve water quality and water-supply reliability. Nearly \$400 million has been awarded already for more than 379 projects.

Progress toward resolving the water-diversion debate is not uniformly steady, however. In April, four years of negotiations toward ending a 15-year legal battle over the San Joaquin River collapsed. A coalition of 15 conservation and fishing groups wants the federally owned Friant Dam to release water for the environment, as other major dams nearby do, so salmon can return and water quality can improve. Water districts supplying growers would not accept a federal mediator's last proposal, however, and the dispute headed back to court. Some observers, meanwhile, fear that water battles could resume with new proposals to build or enlarge dams.

Additional challenges confront environmental planners. Since the mid-19th century, an estimated 95 percent of estuary wetlands were converted to other uses, with 600,000 acres of delta wetlands diked for agriculture.

Now, net gains of wetlands are reported, although the turnaround is neither simple nor cheap. Along 20 miles of shoreline near San Jose, for instance, 16,500 acres of salt-producing ponds were transferred from private to public ownership in March, creating the largest wetlands restoration project in California history. Estimates for the cost of restoration range widely — from \$300 million to \$1 billion during the next 30 years — for the ponds present a daunting physical problem.

"Many of the ponds have subsided,"

state project manager Amy Hutzel says, "and there's not enough sediment in the system to restore them. There's not even enough dredge material in San Francisco Bay to restore them."

Then there's another looming problem, which hasn't yet prompted much action. "San Francisco Bay is the poster child for marine invasive species," says Andy Cohen, a scientist at the San Francisco Estuary Institute and leading expert on the subject. Such invaders can cause economic and ecological havoc. "In many habitats, we'll never be able to restore to anything like natural conditions," Cohen says, but he believes preventive action can limit the entry of nonnative species that arrive in ships' ballast water and by other routes.

Even well-established efforts to restore damaged estuaries in other parts of the country have run into trouble. The hard-fought plan to restore the Everglades — an \$8.4 billion effort by state and federal agencies — was clouded this spring by a sugar-industry-backed bill to ease pollution restrictions in Florida's Everglades Forever Act.

Despite years of model conservation efforts, Chesapeake Bay, the nation's biggest and historically most productive estuary, faces "an uncertain future," warns a new scientific report from the Chesapeake Bay Program: "If sediment and nutrient loads continue at levels witnessed at the end of the 20th century, multiplied by a growing population and new development, water quality will worsen."

Don Boesch, an author of the report who has done scientific work in damaged estuaries around the country, cautions that even successful restoration has its limits: "A pristine state is not an option."

Hutzel agrees. "You're never going to recreate the historical conditions in these dramatically changed environments," she says. "You're never going to get back to pre-Gold Rush in San Francisco Bay."

"It would have been far preferable," Nelson says, "if we hadn't abused the estuary as much as we have before we turned the corner."

— BILL DAWSON

## FIELD NOTES

### Speckled Trout Regulation Changes

If you landed a 25-inch speckled trout last year, consider yourself among the fortunate few. Texas Parks and Wildlife Department creel surveys show that anglers take one of these bruisers during less than 3 percent of all guided outings. That's not to say trout are in peril. Arguably, the fishing is better than ever along the Texas Coast, as the same data points out, but marine biologists say a decline in catches of big trout is a trend that needs addressing.

"Seatrout are the most sought-after species on the coast, with more than one million harvested annually," explains Hal Osburn, TPWD coastal fisheries division director. "We recognize that our management decisions do have social, economic and biologic impacts, and we will take all those factors into consideration."



That's why the Texas Parks and Wildlife Department Commission adopted new regulations this year that will protect larger seatrout, improve the overall fishery and ultimately will enhance your chances of hooking one of these prizes. As of September 1, anglers will be allowed to retain only one trout per day longer than 25 inches.

The maximum length limit was set at 25 inches following numerous public hearings and meetings of a Spotted Seatrout Work Group the agency brought together for the sole purpose of addressing trout management. At 25 inches long, a female trout is five years of age and can live another four years if released, giving other anglers a better chance for a major thrill.

The last change to spotted seatrout regulations occurred in 1990 when the minimum size limit was increased from 14 to 15 inches. Since then, the number of saltwater angling hours has increased from 3.9 million to 5.3 million. Since the early 1980s, the number of fishing guides has grown from approximately 200 to around 800, an important factor in fishing pressure, since guided trips account for 40 percent of the seatrout caught.

The commission also adopted a rule change establishing a daily "boat limit" for all guided trips. The new regulation affects "for hire" guided fishing trips only and establishes the daily bag limit for all species based on the number of customers on board. A guide can still catch fish and retain his catch, but the overall bag limit for his vessel cannot exceed the combined bag limits of his customers. As the number of fishing guides has almost quadrupled during the past two decades, this measure will reduce fishing pressure.

— Steve Lightfoot



# Clearing up the Waters

*Once the bane of Galveston Bay, dredge spoil is being used to recreate marshes instead of destroying them.*

**Of all the deliberate changes** to Texas bays, dredging ranks high on the list for hurting the environment. Ship channels allow salt water to intrude high into bays, changing the salinity gradient, which is critical to the health of estuaries. They also bring the powerful wakes of ocean-going vessels into the shallow bays, eroding the protective marshes along the shore. The dredging of ship channels has created one other problem: what to do with the dredge spoil, the mud that is sucked up from the channel bottom by pump dredges. For many years, the conventional answer was to put it next to the channel, sometimes creating a spoil island. This technique, called "open bay disposal," has been the cheapest way of handling dredge spoil, but because of the considerable damage it does to valuable wetlands, the cost-savings may, in the long run, be too expensive.

Galveston Bay alone is thought to have lost 7,000 acres of marsh because of poor dredge spoil disposal. But the bay is going to get more than 4,000 acres of that loss restored through a nationally recognized plan that uses dredge spoil to restore wildlife habitat. During the next 50 years, an estimated \$700 million will be spent on dredging projects that will use spoil to benefit wildlife. A few of the benefits are in already.

A six-acre bird island has been created to replace those lost to subsidence off Smith Point. Named by a fourth-grader in a contest, tiny Evia Island held 300 fledged sandwich tern chicks, 250 royal tern chicks, 175 black skimmer chicks and more than 1,600 brown pelicans during its first nesting season in 2001. Atkinson Island, near the mouth of the Houston Ship Channel off Morgan's Point, has developed into a successful bird-breeding island, and is going to more than double in size as 1,500 acres of marsh are created.

The problem with traditional spoil islands is that they tend



**Dredge spoil — the mud that is sucked up to create or deepen a ship channel — is now being used to create new marshes and habitat for wildlife such as these brown pelicans.**

to wash away, muddying nearby waters, and sometimes smothering living oyster reefs. Dredge spoil for marsh restoration must be confined with geo-tubes and other rigid forms.

"The material is put into enclosed cells where it can't wash away," explains Andrew Sipocz a TPWD biologist from Seabrook. "It takes about three years for the mud to compact to the point where it is inundated by water

daily. At that point we will plant marsh grasses. It takes about 10 years to get to the point where it actually looks like a marsh."

The momentum for changing the way dredge spoil is handled began building in 1987, when the U.S. Army Corps of Engineers submitted a plan for deepening and widening the Houston Ship Channel that was based on open bay disposal. The corps proposed dumping 180 million cubic yards of dredge spoil in the middle of Galveston Bay, covering 11 square miles of bottom with four feet of mud and cutting the water depth in half. Wind and wave action would have eaten away at the mud, clouding the water with silt almost continually and adversely affecting fish and oysters.

Local environmental groups and state agencies felt there had to be a better way to deal with the spoil. They raised so many objections that in 1989 the corps set up a team with members from 11 different state and federal agencies to



resolve the issues. One of the subcommittees of that team became the Beneficial Uses Group, or BUG, which took on the task of finding environmentally responsible ways to use the dredged material. TPWD is a member of the BUG, along with the Texas General Land Office, the Port of Houston Authority, the United States Environmental Protection Agency, the United States Department of Agriculture, the National Marine Fisheries Service and the United States Fish and Wildlife Service.

Members of the BUG worked with the Corps of Engineers to develop a plan that uses dredged material to create 4,500 acres of new salt marshes. Other features of the project include construction of 118 acres of oyster reefs, restoration of Goat Island in Buffalo Bayou and provision of access channels and boat anchorages in mid- and lower Galveston Bay and the recreation of Redfish Island, a favorite spot for boaters, fishers and oystermen.

When the BUG sought public input on the project, the one thing everyone agreed on was the need to bring back Redfish Island. Located only 500 feet from the Houston Ship Channel at its closest point, the island was eaten away by subsidence, waves and ships' wakes.

The island was first created early in the 20th century when spoil material generated by the deepening of the Houston Ship Channel was dumped on Redfish Bar. The bar rose so near the surface that at low tide, cattle from the east side of the bay could be driven from Smith Point along the bar to the railroad at San Leon. At one time Redfish Island had a light-house, and a herd of sheep grazed it until the lack of fresh water forced the rancher to abandon the effort. Several bait camps operated for a time, and local lore holds that gambling

houses once flourished there. As the entire bay area subsided, the island shrank until it disappeared in 1992.

The reconstruction of Redfish Island is the most visible example of how public input into project planning turned a negative into a positive. "The original plan was to use dredged material to rebuild the island," Sipocz says. "However, that part of the bay is the single most important oyster-producing area in Texas — about a third of all Texas oysters come out of there. We did not want to discharge earth in that area, because the wakes from passing ships would have kept the water muddy." At a cost of \$7 million, the corps agreed to rebuild Redfish Island using 140 barge loads of Missouri limestone and oyster shell rather than dredge spoil to protect the nearby oyster reefs.

The reconstructed Redfish Island is a four-acre crescent about 120 feet wide and 2,500 feet long. "Thousands of birds use it for resting, and eventually many will nest on the north end, which connects to the rest of the island with a narrow stone walkway," Sipocz says. Boaters again are anchoring in the protected inside curve of the crescent, out of wind and waves. The corps justified the \$7 million cost of restoring the island as environmental restoration with incidental recreational benefits.

Other entities in the area that do dredging are already using the BUG model to guide their projects. "It's something everyone is doing to make their dredging projects more environmentally friendly," Sipocz says. BUG's plan appears to be on its way to becoming a national model for how to handle dredge spoil.

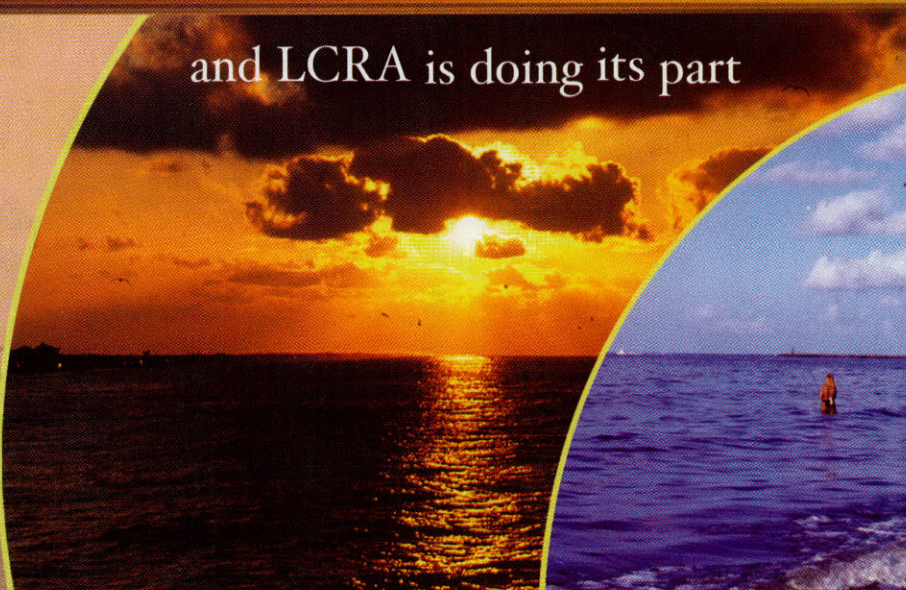
For photos, maps and complete information, visit the U.S. Army Corps of Engineers Web site at <[www.swg.usace.army.mil/items/hgnc/default.asp#RR](http://www.swg.usace.army.mil/items/hgnc/default.asp#RR)> or <[www.betterbay.org](http://www.betterbay.org)>.

— LARRY D. HODGE

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# WHY BAYS MATTER

*Texas needs bays, and Texas bays need fresh water.*

BY LARRY MCKINNEY





THE WIND ON REDFISH BAY WAS COLD AND GUSTY AS WE PREPARED TO LAUNCH OUR kayaks on an early morning last October. We had to cross a shrimp-boat channel where the north wind was pitching a steady train of high swells across our path, but that was a minor impediment. Once across, we turned into one of the myriad of tidal channels connecting the mangrove maze, seagrass flats and lakes that border the southwestern margin of the bay.

The winds diminished rapidly and when the sun rose fully above the horizon, we were treated to a scene that Audubon should have painted. Hundreds of birds, from stubby pelicans to elegant blue herons, had sought refuge from the wind in the stunted mangroves. Only a few feet from the bows of our kayaks, the common birds of the Texas Coast flapped and waded and hopped in a riot of colors, ranging from the hot pink of roseate spoonbills to the dun of plovers.

We glided past one another along the winding channels in the silent truce of the windblown. The occasional boom of distant duck hunters chased thousands of redhead ducks low overhead, seeking safer waters. In the middle of one such darkening passage of ducks, I spotted the first redfish of the day, industriously working the shallow bottom, its fanlike, iridescent tail waving in the air. Several more tails popped up behind that one. What a choice — birds or fish.

THE FISH WON AND I CAST MY VOODOO-CHILD fly just to its left. Even with the wind, the water in the protected lake was fairly clear, so I could see the fish briefly hesitate. I never finished my first strip. The redfish hit, I set the hook and the shallow lake exploded into action as the fly line ripped upward in a curtain of water. The fish and most of his buddies headed for the far side of the bay.

What is remarkable about this experience is that it is not an uncommon one on the Texas Coast. Yet few Texans would recognize it as something within their grasp. It is possible because of our state's most valuable and under-appreciated natural resources: our estuaries. Flowing into some 2.6 million acres of coastal waters, Texas estuaries create diverse wetlands that support the production of 100 million pounds of seafood annually and sustain an internationally recognized birding Mecca.

From space, Texas estuaries appear as evenly spaced pearls strung along 360 miles of coastline. Each of the seven major estuaries, or bays, as we more commonly refer to them, is different from the next. Their names ring with Texas history. LaSalle's ship foundered in Matagorda Bay. We won our independence from Mexico at San Jacinto, on the margins of Galveston Bay. The pirate Jean Lafitte cruised the waters of San Antonio Bay, slipping out to sea through Cedar Bayou.

Few Texans recognize our bays and estuaries for much more than this, if they note them at all. Less than half of the population of the City of Houston and Harris County, which occupies much of the northern margins of Galveston Bay, has swum in, fished in or boated on the bay.

Perhaps that helps explain why bays and estuaries have failed to win a place in Texas mythology, which is full of cowboys, oil rigs and wide-open land. It's difficult to appreciate the natural wonder of our bays as you whiz by them on the highway. At 70 miles an hour, they appear as dull expanses of water broken by intermittent stretches of marsh and mudflat. To really see their remarkable nature, you have to get out into them, and few people seem willing to do so nowadays.

Another reason our bays go unrecognized is their resilient nature. We tend to take them for granted, even though they deserve as much protection as other noteworthy ecosystems. We fret about and

raise money to save Central American rainforests, old-growth timber in the West and coral reefs everywhere, and all the while we ignore the plight of the treasure at our back door. We fill in the wetlands (about half of Texas coastal wetlands are gone) to provide housing for the fastest-growing areas in the state. We crisscross bay bottoms with channels, drastically altering hydrology to speed commerce and promote petroleum development. We depend upon these waters to treat our waste and assimilate our pollution, which results in the closure of more than 30 percent of their waters to shellfish harvest. Through all of this abuse, our bays and estuaries persevere, absorbing blow after blow, rebounding only to suffer new abuse and serve yet again.

The resiliency of our estuaries is their greatest strength and ultimately may be their greatest weakness. Despite all of the abuses, each year these coastal ecosystems generate \$2 billion in economic benefits from recreational fishing alone. Commercial fisheries average another \$266 million. Coastal destinations account for about 30 percent of travel in Texas, and that translates into \$10 billion in economic benefits each year. All these benefits are based on healthy and productive estuaries.

The good news for Texans is that our estuaries are absorbing all that we throw at them and they seem to come back for more. That means we still have the time to take those actions necessary to preserve them for our children. The bad news swirling below the surface and out of sight is that no matter how resilient our estuarine systems are, they do have breaking points. The world abounds with examples of broken systems: the Aral Sea, the Colorado River (the western one emptying into the Gulf of California), the Mississippi River, the Everglades, the Nile and on and on. The reasons for their destruction, in hindsight, are obvious: poor planning, greed, ignorance and just plain bad luck.

We can see the breaking point for Texas bays rushing toward us in the form of people. Texas' population is predicted to nearly double in the next 50 years. We already have used half of our natural resources, such as wetlands and hardwood bottomlands, to get where we are now. We cannot continue on that course. Unless we take steps to protect our bays and estuaries now, we may lose them in a crisis in the next 10 or 15 years.

We do not have to await that crisis. We can act now and do so responsibly and reasonably, in a way that balances all needs — municipal, industrial, agricultural and environmental. For Texas estuaries, the key to the future is water — freshwater inflows to maintain their integrity.

FRESHWATER INFLOWS ARE IMPORTANT to these ecosystems for the most fundamental of reasons. An estuary is that place on the coast where fresh water from rivers meets and mixes with seawater. Sabine Lake, Galveston Bay, Matagorda Bay, San Antonio Bay and Corpus Christi Bay are vast caldrons where freshwater inflows create salinity gradients that expand and contract with drought and flood. Along with fresh water, the rivers that empty into them bring nutrients and sediments that feed both fish and wildlife and the wetlands in which they live and grow. Shrimp, crabs, oysters, redfish and spotted seatrout, to name only a few, have evolved to take advantage of



these dynamic ecosystems. Their life cycles are inexorably linked to the ebb and flow of water into these systems. Adapted to flood and drought, they require both to prosper. Freshwater inflows mean fish to catch and shrimp to eat. If estuaries are like factories, the resource that fuels them is fresh water.

**W**E HAVE NOT ALWAYS RECOGNIZED that fact in Texas. Often has been heard the cry: "A drop of water past my dam is a drop of water wasted." Our earliest water plans, in the 1950s, proposed a canal to run the length of the coast that would capture flow from 11 major rivers and divert it to South Texas to irrigate a million acres of agricultural lands. To its credit, the plan did recognize the need for freshwater inflows to estuaries, and allocated 2.5 million acre-feet to supplement them. The average annual inflow to Texas estuaries is approximately 24.5 million acre-feet.

Thus began the first battles in a protracted war that often has pitted one Texan against another. The arguments took on new intensity following the drought of the 1950s, when we realized that water was, or could be, a scarce commodity that we should use wisely. We began to build reservoirs to hold enough water to get us through the next drought. When Texans start a project, we do it big, and today we have 4,790 square miles of surface water, almost as much as Minnesota, the land of 10,000 lakes. The water now captured behind dams serves a real need, for sure, but it is water that no longer nurtures the estuaries.

The Texas Legislature has continued to struggle with water issues, including the needs of bays and estuaries, through many sessions. In 1985, the 69th legislature directed the Texas Water Development Board and the Texas Parks and Wildlife Department to undertake the studies necessary to develop freshwater inflow recommendations for all Texas estuaries. This has been a long and difficult process that created a groundbreaking application of science to resource management that has not happened anywhere else. The study of environmental inflows required thousands upon thousands of hours by dedicated scientists and technicians, millions of dollars and 15 years of effort to complete. Today that work represents the best science available, and we have it just in time.

Senate Bill 1 (SB-1), championed by the late lieutenant governor Bob Bullock, was a historic piece of water legislation adopted by the 75th legislature in 1997. Addressing nearly all aspects of water management in Texas, it put the state in position to address its growing water needs. SB-1 provided the tools with which to address our state's future water needs. Now all that is needed are the means to use those tools to assure that enough environmental water will be provided to our rivers, lakes and estuaries to keep them healthy and productive. The 78th legislature is contemplating the next logical step—the framework within which we apply the science and make use of the tools we have to balance the water needs of Texas.

This is both a complex and a simple problem. The complexity is that no two Texas estuaries are similar. Sabine Lake has an abundance of fresh water and Corpus Christi Bay has too little. More and more thirsty people hem in Galveston Bay, and they live downstream from even more thirsty people in Dallas and Fort Worth. Many people want to move water destined for Matagorda Bay and San Antonio Bay to just about everywhere else. The simplicity is that all it takes to keep our estuaries healthy is water, and not even all of the water they normally receive, but water nonetheless.

We know the problem. We know the solution. We have the science and the means to apply that science. In this we are better prepared by far than anyone who has faced this challenge before us. Mark Twain once said, "Just do the right thing; it will gratify some of the people and it will astound the rest." If we have the will to do so, Texans can astound the rest. ★

## HOW DO WE KNOW HOW MUCH FRESH WATER BAYS NEED?

Rivers and streams are the arteries for our estuaries, constantly carrying the nutrients and sediments that estuaries need in order to thrive. The river delivers the sediment into the quiet waters of the delta marsh, where it settles to the bottom, providing footing for marsh plants and shelter for myriad worms, clams and other animals. Within the sediments are nutrients such as nitrogen and phosphorous that feed marsh plants as well as millions of microscopic floating plants called plankton. The marsh plants shelter juvenile fish, shrimp and crabs from predators. The microscopic plankton are eaten by oysters that build reefs, which provide more shelter for fish and crabs. Without enough fresh water, sediment and nutrients, the estuaries we know and the benefits they provide us would cease to exist.

Understanding the importance of ensuring that estuaries stay healthy, in 1985 the Texas Legislature directed Texas Parks and Wildlife Department (TPWD) and the Texas Water Development Board (TWDB) to calculate how much fresh water, sediment and nutrients our estuaries need to remain healthy. These freshwater inflow studies, guided by Section 11.147 of the Texas Water Code, define beneficial inflows as a "salinity, nutrient, and sediment loading regime adequate to maintain an ecologically sound environment in the receiving bay and estuary system that is necessary for the maintenance of productivity of economically important and ecologically characteristic sport or commercial fish and shellfish species and estuarine life upon which such fish and shellfish are dependent."

TPWD and TWDB developed a method, now nationally recognized, for determining beneficial freshwater inflow needs for estuaries. During the last 15 years, scientists have collected information about the river flows, water circulation patterns, tides, weather, concentrations of salts, nutrients and sediment, and the fish and shellfish populations for seven major Texas estuaries. This information was analyzed in computer models to estimate how much fresh water each estuary needs and what seasons are important for freshwater inflow. Two computer models were created. A computer optimization model produced a freshwater inflow schedule that met state management objectives while producing optimal levels of finfish and shellfish. A second model predicted circulation patterns and salinity gradients that will result from the freshwater inflow patterns. To make sure the predictions of the computer models were reasonable, they were compared to TPWD data on fisheries and salinity for the past 25 years.

The computer model predictions are complete for all seven major Texas estuaries: Sabine Lake, Galveston Bay, Matagorda Bay, San Antonio Bay, Aransas Bay, Nueces Bay and Laguna Madre. Results show that all estuaries need high freshwater inflows during the late spring and early summer. Some estuaries benefit from having elevated freshwater inflows during September and October as well. Freshwater inflow requirements tend to duplicate rainfall patterns. Estuaries in East Texas are adapted to much higher amounts of freshwater inflow than estuaries in South Texas. Since East Texas experiences more rainfall than South Texas, on average, estuaries in the eastern part of the state receive more inflow in the form of runoff as well as freshwater inflows from rivers and streams. Rainfall patterns, which influence river flows, also dictate how much water is available for human uses.

Anyone who takes water from rivers or streams must obtain permission from the Texas Commission on Environmental Quality (TCEQ). The TCEQ must consider the effect on freshwater inflow to estuaries when it issues a permit to take surface water. TCEQ is required to include permit conditions "to the extent practicable when considering all public interests" necessary to maintain beneficial inflows. The freshwater inflow studies conducted by the TPWD and TWDB provide a scientific basis for the TCEQ as it evaluates water rights permits and establishes permit conditions.

—Cindy Loeffler



# The Slighted

*Despite a tough, urban exterior, Galveston Bay is an extraordinary natural beauty that keeps giving and giving.*

By Gary  
Cartwright





# Beauty

Following a rainfall, Houston's trash washes downstream through Buffalo Bayou and into Galveston Bay.





GALVESTON BAY

**At 600 square miles, Galveston Bay is the largest and most productive bay in the state. Petro-chemical plants line its northern edge.**

Approached from the north, Galveston Bay looks like hell's own trollop: petro-chemical plants, drilling rigs, dikes, junkyards, stacked hully-gully against a turbid body of water the color of heavily creamed coffee. This ain't the girl you take home to Mama. She has none of the pizzazz of Chesapeake or Biscayne or America's other elite bays. Then you take a closer, more personal look. Remember the unattractive librarian in all those 1950s movies, plain as a kitchen mop — until she unexpectedly removes her eyeglasses and shakes loose her hair? That's when it hits you. Why, why, she's... beautiful!

The Galveston Bay system is 600 square miles of contradictions and enigmas, so big, shallow and alive that it defies man's determination to spoil it. It's the largest and most productive of our state's bays. More than half of our annual harvest of bay shrimp comes from these waters. Galveston Bay produces more oysters than any single body of water in America, and rivals the output from the entire states of Louisiana and Washington. It supplies the country with more than a million pounds of blue crabs. If you order oysters or crab at a restaurant in Baltimore, chances are they came from Galveston Bay.

The bay is so vast that you have to understand it one piece at a time. The segment known as Trinity Bay, where the Trinity River empties into the bay system, is as different from West Bay as Beaumont is from Odessa. Fresh water is the life force of any bay system and the Trinity supplies more than half the inflow to the bay. The remainder of the fresh water is delivered by various bayous and by the San Jacinto River, which empties into Upper Galveston Bay and the Houston Ship Channel. Though there are 200 miles of manmade channel in the bay — and industry is constantly clamoring for more

— the bay is essentially healthy and stable. That's because its wind-driven tides work like a giant mixer, stirring nutrients, sediment and bacteria and periodically washing the wastes through the natural cut at Bolivar Roads and into the Gulf of Mexico. A strong norther can flush half of the water out of the bay; on such occasions you can almost walk across. Strong southerly winds reverse the process, forcing up the bay's salinity. The squeeze play between fresh and salt water is unending. So is the war of attrition between environmentalists and developers.

My love affair with Galveston Bay start-



The squeeze play  
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and developers.



## GALVESTON BAY

We stop to view  
one of the last  
cypress swamps in  
Texas, a place so  
exotic and magical  
that we seem to  
have slipped into  
a parallel  
universe.

PHOTO © WYMAN-MENZIE; INSET PHOTO BY EARL NOTTINGHAM





ed in late February when I spent a week exploring the great bay with my friend Shannon Tompkins, a biologist and outdoor writer who grew up here. Hauling his small boat, we drove from Houston, east on I-10 into Chambers County, to the north and east sides of the bay system. The interstate, I was amazed to learn, was built with corpses of tons of live oyster reefs, dredged out of the bay in the '50s. Oyster reefs are the lungs of the bay, natural filters that clean and purify water; dredging, if the spoil is disposed of improperly, can pollute and destroy habitat, making an area unlivable. At the same time, dredging opened the bay by deepening its shallowest part between Smith Point and Eagle Point, a key area for oystermen.

"Environmentalists don't like to hear me say this," Sammy Ray, a marine biologist at Texas A&M Galveston and expert on oyster diseases, told me, "but some good can come from dredging." Compromise is a way of life on the bay, not always pretty but usually enduring.



inal plan for the Wallisville Dam — proposed by the City of Houston, various port, industrial and commercial interests and the U.S. Army Corps of Engineers — had been completed. Wallisville was to have been the initial step in a humongous project that would have turned the Trinity into a 370-mile-long ship channel, connecting Dallas-Fort Worth to the bay and hence the Gulf. Stopping the Wallisville Dam was a major victory for environmentalists and common sense: the scaled-down Wallisville saltwater barrier that was built instead spared 19,000 acres of marsh, cypress swamp and marine nursery.

The east side of the bay has an understated elegance and beauty redolent of the Old South: still, quiet and fragrant. Chambers County is said to have more alligators than humans. Hard to believe that just across the bay beats a metropolis of 4 million people. John James Audubon visited the bay in 1837, a year after the Texas Revolution. Legend has it that after the Battle of San Jacinto, Santa



**Left: Cypress swamps festooned with Spanish moss along the Trinity; left inset, waterlilies. Above: Alligators, snow geese and Canada geese are among the many inhabitants of Anahuac National Wildlife Refuge.**

Just past the bridge where I-10 crosses the Trinity River, we stop to view one of the last cypress swamps in Texas, a place so exotic and magical that we seem to have slipped into a parallel universe. Ignoring the rumble of 18-wheelers, we cross a footbridge to a shimmering spread of electric-green water plants, Spanish moss, alligators and a hallelujah chorus of birds. There are so many birds in this rookery that the far shoreline appears to pulsate with massive clusters of snowy egrets with bright yellow feet, great blue herons, neon-pink roseate spoonbills, terns and ducks of all kinds.

This entire section of the lower Trinity would have been under water if the orig-

Anna spent a night tied to an oak tree on the old Middleton estate at what used to be the town of Wallisville. At the ruins of Fort Anahuac, overlooking the mouth of the Trinity, a historical marker reminds us that we are near the place where Texican colonists drafted the Turtle Bayou Resolutions, protesting the Mexican customs collector's arrest of their lawyer, William B. Travis.

Across a stretch of East Bay, snow geese so thick they blot out a spoil bank serenaded with their high-pitched barks. Snow geese are so prolific that bag limits are removed during an extended hunting season. Two brown pelicans, mother and child, scout the water from a perch atop



Shell dredging,  
channelization and  
subsidence have  
increased the bay's  
volume 30 percent  
in the last  
hundred years.







some pilings. DDT ravaged the bay's population of brown pelicans in the late '50s, but they are back now by the thousands. A swarm of ibis darkens a swath of sky above a rice field. A hundred years ago this side of the bay was vibrant wetland or coastal prairie all the way to Mobile. Now the land is mostly rice fields or pastures for cattle. Huge herds of wild cattle once grazed here. During the blizzard of 1895, hundreds of cows retreated to the edge of East Bay, where they stopped and froze to death. That's why the spit of ground on the edge of Anahuac National Wildlife Refuge is called Frozen Point.

Anahuac NWR is a wonderful example of how unintended consequences conspire to save the bay. Years ago, a big chunk of this 34,000-acre tract was a marsh owned by a family that dreamed of riches from rice farming. They drained their tract, only to discover the land was too saline for farming. To cut their losses, the would-be rice farmers donated the land to the government as a tax write-off. The U.S. Fish & Wildlife Service is slowly returning the marsh to its natural condition.

Driving the 12 miles of gravel roads, I experience surges of euphoria and exhilaration. Everywhere I look there's something new, at least to me. Five alligators in a clump nap amid the deep green frogbit and roseau cane of Shoveler Pond, a manmade freshwater impoundment where long-legged water birds mingle with roseate spoonbills, great egrets and white ibis. Mallards, teal and 25 additional species of ducks bob among the floating vegetation. Nearly 300 species of birds are regular or occasional visitors to the refuge. We didn't see them, but there are muskrats, nutria, bobcats and other mammals in residence. People come here from all over the world: on the day I was at Anahuac NWR birders from London, Glasgow and Munich signed the registry. We take a leisurely boat ride down Oyster Bayou, which meanders through ancient floodplains to East Bay. At least it meandered until World War II, when someone got the bright idea to use German POWs to straighten the damn thing.

People can't resist tinkering with nature. Old-timers say that East Bay was once clear as gin and floored with eelgrass. In 1955 the Texas Game and Fish Commission dredged a channel across Rollover Pass to improve fishing, inadvertently spiking East Bay with salt water and killing off vegetation. In the 1950s the bay supported 2,500 acres of seagrasses; now it has fewer than 700. The Texas City Dike, built in 1915, trapped

nutrients and sediment and increased the salinity of West Bay. Private development and public works projects have consumed 30,000 acres of marsh and tidal estuary. Shell dredging, channelization and subsidence have increased the bay's volume 30 percent in the last hundred years. The Houston Ship Channel was so toxic in the late 1960s that it sometimes caught fire. A Ralph Nader task force called it "the nation's most poisoned and potentially most explosive body of water."

Many bay watchers, including environmentalists, scientists and commercial and recreational fishermen, believe that the bay's No. 1 enemy is salinity. Salt in moderation is essential to the estuaries, where most marine life has its genesis, but in high concentrations it kills. Bay salinity varies greatly, from five parts per thousand (ppt) in Trinity Bay to 15 in East Bay, 20 in West Bay and 25 at Bolivar Roads, the bay's opening to the Gulf. Floods and hurricanes can change the dynamics overnight. Shrimp and crabs tolerate high salinity, spending part of their lives in the Gulf, which is 35 ppt, or 3 percent salt.

The stationary oyster can live in a great range of saltiness, but so can its predators. "Oysters need at least five parts per thousand," marine biologist Sammy Ray told me. "But when it gets above 15 parts per thousand — and when water temperatures go above 20 degrees Celsius [70 degrees Fahrenheit] — predators like the oyster drill and parasites like Dermo thrive." Ray was one of the first marine biologists to understand the deadly effects of Dermo on oysters (the parasite isn't a threat to humans). He is working on a model that would calculate the effect of the interaction of salinity and temperature on the well-being of oysters. His Web site, DermoWatch, gives oystermen temperature and salinity readings in various parts of the bay and warns when critical periods are near. Because of its higher salinity, West Bay appears regularly on the warning list for outbreaks of Dermo.

On the way to Smith Point one morning, Ray explains how drought and disease have nearly wiped out oystering in Chesapeake Bay. Back in the '60s, Chesapeake produced 3 million to 6 million bushels of oysters a year. This year's projection is a measly 100,000. That figure seems meaningless until I'm intro-

**Shorebirds feed on invertebrates and fish at Bolivar Flats, a sanctuary between Galveston Bay and the Gulf of Mexico on Bolivar Peninsula.**

PHOTO © KATHY ADAMS CLARK/KAC PRODUCTIONS



Galveston Bay  
produces more  
oysters than any  
single body of  
water in  
America.





duced to Ben Nelson, patron of a family of Smith Point oyster harvesters. Each of Nelson's 13 luggers (as oyster boats are called) hauls up 50 or 60 bushels a day. At that rate, this one operation will produce more oysters in six months than Chesapeake Bay can offer in a year. A century of reef dredging, and the subsequent impacts of siltation and runoff, have rendered Chesapeake oysters helpless against disease. Could that happen here?

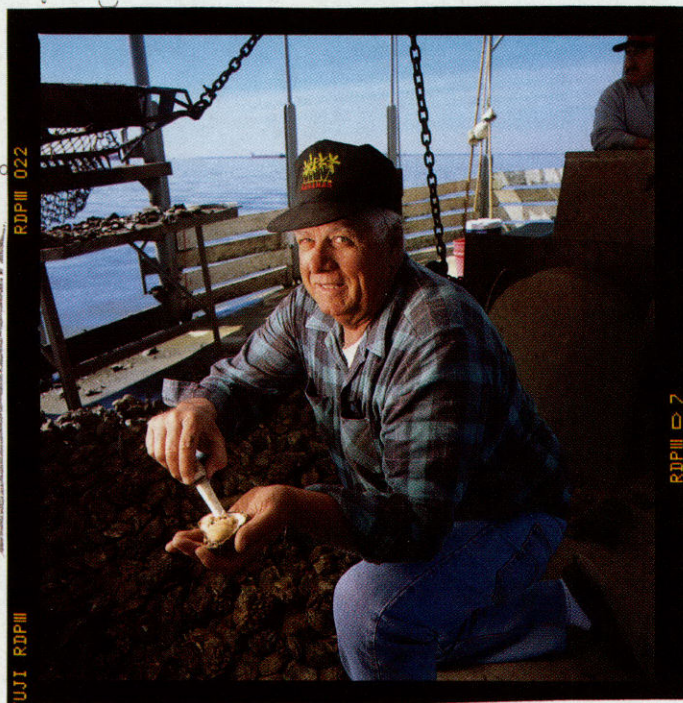
Ray explains that Chesapeake Bay is different from Galveston Bay: it's much deeper and is dependent on a number of rivers from a number of different states, as well as conflicting sets of regulations. But yes, it could happen if the bay's supply of fresh water diminishes. Under the state's transplant program, crews such as Ben Nelson's are permitted to take 100 bushels of oysters a day from unapproved areas where bacteria levels often are high

ature hovers in the mid-30s, Ben's son Runt is barefoot, walking without apparent difficulty over broken shells, glass and debris. I ask Ray if Runt ever surrenders to footwear and he thinks a moment before replying: "The only time I remember was at his daughter's wedding." Someone has brought along red sauce and crackers and we slurp down these wonderfully fresh oysters almost as fast as they dredge them up. Someone aboard asks the marine biologist if oysters are safe to eat raw and Ray inquires of the questioner: "How's your liver?" Only people with liver problems, immune deficiency, diabetes or other chronic diseases need fear the raw oyster, Ray says.

The Nelsons remember when the bay was so polluted that buyers insisted on frying and tasting seafood before writing checks. And they worry that it could happen again. Joe Nelson, Ben's younger

classified as "point source" pollutants. Scientists are also worried about pollutants from non-point sources, such as runoffs from parking lots and highways. Periodic warnings against eating seafood from certain parts of the bay almost always follow heavy rains.

Unlike the serene and mostly uninhabited east side of the bay, the opposite bank is a jumble of bait shops, seafood eateries, petrochemical plants and smelly water. Galveston Island, which has a tidal range of only a foot and a half, has subsided half a foot during the last 50 years. Seabrook lies so close to sea level that the Texas Parks and Wildlife Department lab flooded during high tides and now has been put up for sale. Between Seabrook and the village of Shoreacres is the future home of Bayport, a colossal \$1.2 billion container port that the Port of Houston Authority proposes to build in the area.



and replant them in approved leases. The lowly oyster has an amazing filter system that cleans itself and the bay at the same time: it feeds prodigiously on algae and binds up nitrogen and phosphorus that otherwise would foul the water. An oyster can purify itself in three days, though the state requires a wait of two weeks before marketing.

That afternoon I join Nelson and his crew as they harvest from a reef in Lower Trinity Bay. Smith Point is one of the most remote and isolated spots on the bay and one of the most productive. People here are weathered and permanently stained by the sun, and wary of city folks and their habits. Though today's temper-

brother, remembers a weird day in 1999 near Shoreacres when he watched a tern snatch a fish, fly a few feet and drop it like a hot rock. Water from a submerged pipe was bubbling to the surface and Joe dipped a finger into the water and tasted it, thinking it was a saltwater discharge pipe. "It was like an electric shock going through my lips," he told me. "Then they turned numb and the next day started to peel off." The submerged pipe, he learned later, belonged to a plant in Pasadena that had a permit to dump 52 different chemicals into the bay—but not the 186 that a test sample detected. Such examples are an aberration, I'm told. Discharge pipes from chemical plants are

**Ben Nelson, left, operates 13 oyster boats in the bay. Biologist Sammy Ray, right, is an oyster specialist.**

The port authority and labor unions have squared off against residents, civic leaders and environmentalists. Five thousand 18-wheelers are expected to rumble in and out of Bayport every day, in addition to eight 8,000-foot trains. The depth of the water at the Bayport wharves is planned at 50 feet, but the ship channel is only 45 feet deep, sparking concern that the Port of Houston Authority soon will be asking for a deeper channel, which would increase salinity in the upper part of the bay. For its part, the Port of



Houston  
doesn't think  
of itself as a  
coastal town,  
even though  
the tides of  
Buffalo Bayou  
sweep past  
downtown  
every day.







**A snowy egret feeds at a sewer runoff near Houston.**

Houston Authority states that Bayport can be successful for years to come without deepening the existing channel.

Bayport opponents propose that the port build in Galveston or Texas City. "Alternative sites are available," says environmental lawyer Jim Blackburn, founder of Galveston Bay Conservation and Preservation Association and an outspoken opponent of the Bayport project. "They're cheaper for taxpayers and would place the port closer to areas of high salinity rather than bringing salinity all the way up." The Port of Houston Authority contends that the Texas City site would be more expensive to develop and operate, and take much longer to build. Houston needs the project — and the jobs that come with it — now, the authority says.

The TPWD has designated Galveston Bay as the bay that faces the greatest conservation challenges of any bay system in the state. Communities along the bay are forming partnerships with scientists, industries, environmentalists and TPWD biologists to protect the bay with whatever tools they can manage. Dredge material is now being used to create bird islands. The Galveston Bay Estuary Program plans to restore 10,000 acres of marsh; it has coaxed small beds of seagrass to grow again in West Bay, and protected shallow, open-water areas in Galveston Island State Park. In various spots around the bay, groups are planting clumps of cordgrass to protect against shoreline erosion. A group called Scenic Galveston is working to reestablish marsh corridors along the I-45 highway approach to the island. Bird-nesting areas are being protected by Audubon chapters from Galveston and Houston. Another group is working to clean up Clear Creek. Christmas Bay, a shallow extension of West Bay that harbors the system's remaining seagrasses, has been given special status as a coastal preserve.

It's been a tough fight that could get tougher. Except for water developers, farmers and urban planners, most people in Texas spend little time worrying about water. We're conditioned to believe that water is wasted if it gets to the bay. Houston doesn't think of itself as a coastal town, even though the tides of Buffalo Bayou sweep past downtown every day. And that's a shame, because if people could only see how beautiful Galveston Bay is, they would never begrudge her what she needs. ★

PHOTO © PETER GOTTSCHEG/KAC PRODUCTIONS



SAN ANTONIO BAY

# *The* Whooper's Table



PHOTO © TOM AND PAT IFFSON



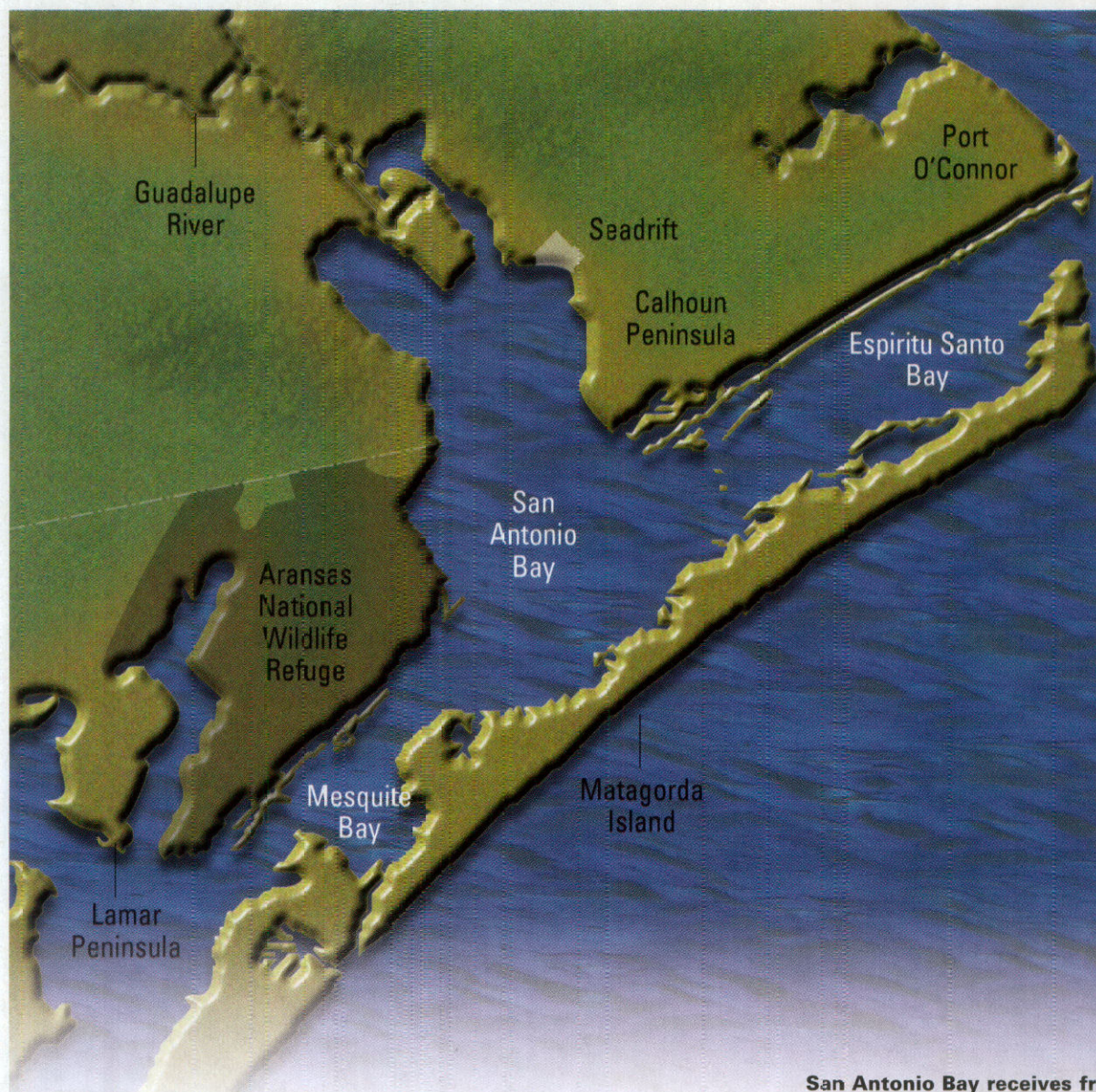
*Nourished by the  
Guadalupe River,  
San Antonio Bay  
feeds the central  
coast, including  
the endangered  
whooping crane.*

By Michael  
Berryhill



Whooping cranes stalk blue crabs in  
the shallow waters off Aransas  
National Wildlife Refuge.





SAN ANTONIO BAY

San Antonio Bay receives fresh water from the Guadalupe River, creating a nursery for crabs and other marine life.

When we wade in San Antonio Bay, my daughter and I play a game with mud. I scrunch down in the water and grab a handful of bay bottom and pour it into her cupped palms. "Here's some ice cream, Elizabeth," I say, "it's chocolate." Then I grub in the bottom for another handful, and give her another scoop and another, while she stands laughing, the mud oozing through her fingers.

On the fourth or fifth grab into the bay bottom, I almost always find the top-ping for her sundae: a common rangia clam. We stop and admire this animal that lives in the water only 50 yards from our front porch near the harbor at Seadrift.

Shaped like a bulging triangle, the rangia clam is about an inch thick at the caramel-colored hinge, and tapers to a perfectly

sealed lip subtly designed for burrowing. It is not a gaudy shell, but quite beautiful; its growth can be seen in the concentric succession of ridges in the top of the shell, which is acorn-brown growing gradually paler toward the lip. The rangia has a nice heft to it. Its shell is thick; it feels good in the hand. It's also good to eat. The nearby middens of the Karankawa Indians contain

many thousands of rangia shells mixed in with oyster shells. A friend of mine cooked the clams in a big dish of pasta and vegetables, and they were quite good.

Like oysters, clams are filter feeders, and in our corner of the bay, they have a lot to filter. The water of San Antonio Bay is almost always murky, or what the scientists call turbid. Its color varies from dark green



Without the bay,  
the tiny juvenile  
crabs that live in  
the shelter of the  
salt-tolerant  
spartina grass  
would dwindle  
and possibly  
disappear.





It would not be an exaggeration to say that the Guadalupe River has kept the whooping crane from going extinct.







to whitened coffee to deep chocolate, and is hardly ever clear, for San Antonio Bay is an estuary, one of the most important, and possibly one of the most endangered, on the Texas Coast. Clear water can be great for fishing; it's wonderful to swim in, beautiful to see. But I have learned to appreciate the turbid water of San Antonio Bay, for it speaks not of filth but of life, and the rangia clam is the very symptom of the bay's vitality.

The clams receive the nutrients and fresh water that pour out of the mouth of the Guadalupe River, only a few miles to the west of Seadrift in the upper reaches of the bay. The river and the bay live a yin-yang relationship. Without the outflow of the Guadalupe River, San Antonio Bay would be a completely different place, not necessarily dead, but radically altered, shorn of many species. Without the bay to capture the river's outflow and deliver salt water to it, the tiny juvenile crabs and shrimp and fish that live in the shelter of the salt-tolerant spartina grass would dwindle and possibly disappear.

Everything in the bay answers to the exchange of salt and fresh water. Fresh water helps the roots of the marsh grasses descend more deeply, anchoring the soil and providing sturdier shelter for the larval animals. The larval animals eat zooplankton, tiny floating animals such as copepods, which in turn gobble up the phytoplankton, the tiny floating plants that bloom from the nitrogen and phosphorus pushed into the estuary by the river. Farther out in the bay where the water is moderately saline, the oyster reefs are arranged in wide Vs to catch the plankton, living and dead, and the other nutrients the river pushes south.

With oysters come oystercatchers, the birds with the red-orange, chisel-like beaks that make you believe someone studied them in order to make the oyster knife. Clams, snails, crabs, shrimp, trout, red and black drum, sheepshead, flounder and spotted seatrout flourish in this bay, and with them come commercial and recreational fishermen and women. Ducks winter here, and with them come duck hunters. Shorebirds, stilts, sandpipers, peeps, terns, gulls, pelicans, herons, roseate spoonbills, egrets, wood storks and the most famous birds of all, the whooping cranes, are drawn to the bay, attracting birdwatchers from around the world.

It would not be an exaggeration to say that the Guadalupe River has kept the whooping crane from going extinct, and that the crane's future depends on whether the river continues to deliver fresh water to San Antonio Bay. The river reaches beyond the bay's boundaries. Its water pushes south

along the edge of Blackjack Peninsula, turns right, washes through a chain of islands, and enters Mesquite Bay. It then moves down the coast, bringing nutrients and freshening Aransas and Copano bays, nourishing them, too. To the northeast, the fresh water purls into Espiritu Santo Bay, which is also blocked with oyster reefs that act as bird islands and is a favorite spot for recreational fishing.

So it is foolish to think solely in terms of San Antonio Bay, as though that body of

In an average year,  
2.4 million acre-feet  
of fresh water are  
pushed into the bay.  
The water and  
nutrients from the  
Guadalupe estuary  
create the nursery  
of the bay.

water alone is what matters. It's San Antonio Bay and Mesquite Bay and Espiritu Santo Bay and the Guadalupe estuary, and this place, this living place, this super-organism, depends on decisions made hundreds of miles from the mouth of the river. It's dependent on how San Antonio manages the water it withdraws from the Edwards Aquifer, which in times of severe drought supplies 70 percent of the flow of the river. It's dependent on how much water we take from the river to feed the developing cities of Central Texas.

The river has given a lot to this bay, even the name of its only town, a fishing village of about 1,300 souls named Seadrift. Seadrift sits about eight feet above sea level, and is tucked into the neck of the western side of Calhoun Peninsula. It was named by some German settlers about a hundred years ago for the driftwood that washed up on shore. But that debris didn't drift in from the sea, which is 16 miles away on the other side of the barrier island of Matagorda. The debris was washed out of the Guadalupe River.

Other things wash out of the Guadalupe when the fall and spring floods come. Last August, rafts of invasive water hyacinth

**Blue crabs make up as much as 80 percent of the whooping crane's diet.**



In the winter,  
ducks migrate to  
San Antonio Bay.  
They swim in the  
open waters by the  
thousands, and  
retreat into the  
marshes of the  
Guadalupe Delta  
to feed on  
widgeon grass.



floated out of the flooded river and dappled the bay before being blown against the sea wall and up into the tidal creek that drains the western side of the town. It took a few months for the bay to digest it, but it's gone. An alligator came with the hyacinth, and it was strange to see this 10-foot-long specimen drifting out in the chop a hundred yards from shore, its jaws open. In the winter ducks migrate to San Antonio Bay. They swim in the open waters by the thousands, and retreat into the marshes of the Guadalupe Delta to feed on widgeon grass.

Fresh water makes this possible. Very little life can survive without fresh water, and fresh water from the Guadalupe is sizeable. In an average year, 2.4 million acre-feet of fresh water are pushed into the bay. The water and nutrients from the Guadalupe estuary create the nursery of the bay. Hatched in the gulf, larvae produced in the trillions by shrimp, crabs and fish drift back through Pass Cavallo and into the marshes of the Guadalupe delta. The larvae find shelter among the grasses and feed on the microscopic particles washed there by the river, and on each other. These young thrive according to how salty or fresh the water is: too salty and the larvae can't develop properly; too fresh and their growth is slowed. For this reason, eggs and larvae are plentiful. A redfish lays from 1 million to 2 million eggs at a spawn, eggs so small they look like yellow dust when collected in a bottle. Only a few creatures from this extravagant spawn reach adulthood. The rest serve as food for all the creatures in the nursery: the shrimp, crabs and the finfish; red drum, spotted seatrout, black drum, sheepshead and flounder.

All this seafood has attracted the commercial fishers, and that's what Seadrift has been most of its life, a commercial fishing town. The grandest building is a 2½-story, high-ceilinged wooden hotel (now a private residence) built for train crews early in the 20th century, when a rail line ran straight to the harbor to haul out oysters, crabs and shrimp from the bay. Although shrimping in the bay has been erratic for the past dozen years, San Antonio Bay is still productive, producing as much as 8 million pounds of seafood in a good year.

Commercial fishing has taken a lot of hits in the last 50 years. Some people would like to see it disappear from the bays altogether. Let all the shrimping be done in the Gulf, they argue, except shrimping for bait. This is largely an economic argument: recreational fishing delivers so much money that it seems rational just to set aside all the fish and shrimp for hook-and-line fishing.

I would hate to see commercial fishing disappear. (For one thing, nothing is more

delicious and subtly flavored than a shrimp caught in the bay before it's gone to the Gulf and become flavored with iodine.) There is something immensely important about being able to go to a fish house and buy fresh oysters or shrimp or flounder that have come out of the bay that day or the day before. I think of the commercial fishers as indicator species. As long as their boats are docked in the harbor, and they are surviving, sometimes even prospering, then the bay is still producing, still living.

The years of records kept of the commercial fishing harvest have played a role in the study of Texas bays. In 1987 the Texas Parks and Wildlife Department and the Texas Water Development Board began collaborating on studies of the major Texas estuaries to determine how freshwater inflows shape their productivity. Their purpose was to plan for the future of water development in Texas, and make sure that our bays receive an adequate share of the

the lower salinity waters. The females move there to mate, then return to higher salinity waters to spawn. A female will lay 2 million eggs at a time, but none of those eggs will hatch in fresh water. They require relatively high salinities of 23 to 30 parts per thousand; seawater averages 32 parts per thousand. Like many creatures, crabs move according to the salinity gradient of the water at different times of their lives, and we barely understand the subtle chemistry involved.

One thing is certain, however: fresh water is essential to crabs and there are more crabs in the bay when fresh water is plentiful. The highest commercial blue crab catch in San Antonio Bay, according to one study, came during three years when the Guadalupe River was pouring 3 million acre-feet of water annually into the bay.

How much fresh water is the right amount? The answer is hard to come by. Nature doesn't work like an engineer. It



**At left: Winter brings ducks and duck hunters to the bay. Vegetation lines the river where it joins the bay, above.**

water. San Antonio Bay was the first estuary to be studied.

The truism of ecological science is that everything is connected. A corollary is the connections may be more complex than we are capable of thinking. Still, we've got to start somewhere, and the foundation of bay studies is as simple as what a commercial fisherman once told me: that seafood is like a crop, and if you want to have a crop you've got to have fresh water. How much and where and when and how it all works is more complicated.

Take blue crabs, for example. Judging by the placement of crab traps in the bay, I'd have to say they're everywhere, from far out in the most saline parts of the bay to right up in the sloughs of the Guadalupe delta. The biologists say that the male crab prefers

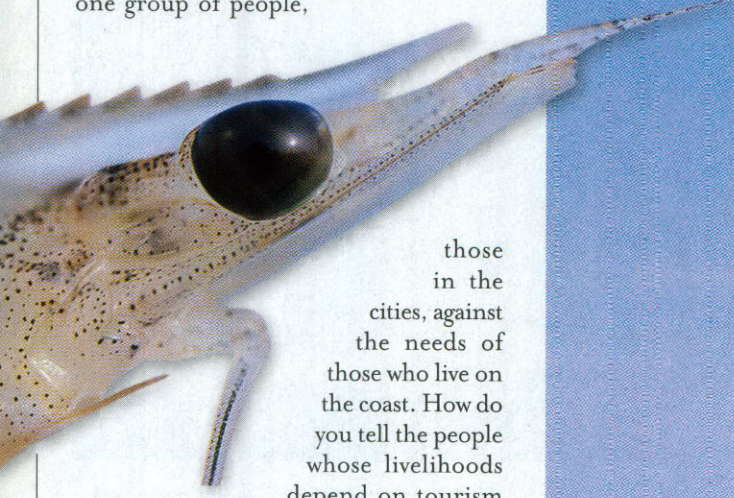
doesn't know grids and averages. The human heart may beat regularly, but the heart of the estuary works in pulses of water; dramatic events are part of its way. Floods may come and wipe out the oyster reefs for a couple of years. Droughts may do the same thing. No one seems to worry about too much fresh water in the bays, but drought is a concern. The last great drought began in 1948 and ended in 1957. During its peak in 1956, the bays received 14 percent of their average freshwater inflows. San Antonio bay received only 196,000 acre-feet of water, or 8.4 percent of its average. Up and down the coast,



the oyster crop disappeared, white shrimp declined drastically and the high salinity in Upper Laguna Madre blinded black drum and scored them with lesions.

The drought of record is the baseline for scientific study of the freshwater inflows. Such factors as historical inflows, nutrient and sediment loads, circulation and salinity patterns were studied and compared to a fisheries analysis to determine how much water is needed to sustain the productivity of San Antonio Bay. Similar studies have been performed for other estuaries of the Texas Coast and numbers have been produced stating the amount of water needed to keep the bays relatively productive, provided the water is distributed in a seasonal pattern. The number for San Antonio bay is 1.1 million acre-feet, about a third of what is considered a great year.

And so in San Antonio Bay we face what seems to be the archetypal environmental dilemma: balancing the needs of people with the needs of the natural world. If only it were that simple, as though people don't live in the natural world, but in a world of their own making. The problem is further complicated because it sets the needs of one group of people,

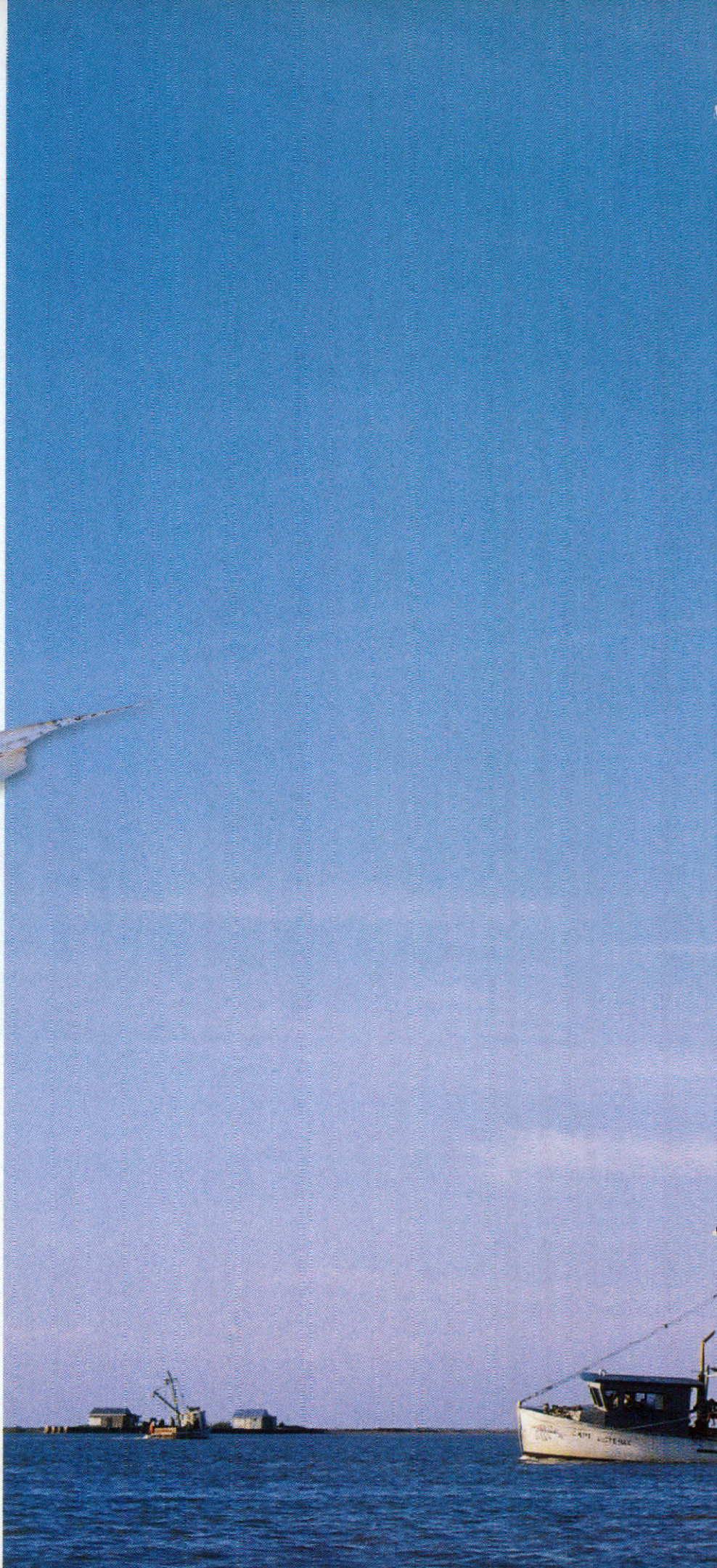


those  
in the  
cities, against  
the needs of  
those who live on  
the coast. How do  
you tell the people  
whose livelihoods  
depend on tourism

and fishing and birdwatching that their lives are not as important as those of the people in San Antonio?

A nonprofit group called the San Marcos River Foundation has moved the issue of environmental water to the top of the state's water planning agenda by applying for 1.3 million acre-feet of water rights in the Guadalupe River. Their plan was not to take the water out of the river as cities, industries and farmers do. Their plan was to leave the water in the river and let it flow into the estuary. A water rights application

**San Antonio Bay produces as much as 8 million pounds of seafood in a good year.**





And so in San Antonio Bay we face what seems to be the archetypal environmental dilemma: balancing the needs of people with the needs of the natural world.



PHOTOS © SCOTT SOMMERLATE



of such scope is unprecedented, and the Texas Commission for Environmental Quality, which regulates such permits, denied the permit last March, stating it lacked specific authority to grant such a request.

As I write this, the Texas Legislature is considering a bill that would create a statewide commission to study environmental inflows for the bays and estuaries and create a management plan to assure they are not left out of the water planning process.

As that course proceeds, there may be other complications. Just as everything in the environment is interconnected in ways that are not immediately evident, so environmental law can be interconnected. I must come back to the blue crab, that wonderful food of the sea.

Whooping cranes love blue crabs, and when they're plentiful, biologists estimate they make up 80 percent of the whooping crane's diet. This magnificent and endangered bird has never been numerous. Like the endangered white cranes of Asia, it has made a serious mistake in its way of living. It winters in pristine marsh, and pristine marsh is in short supply.

The whooping crane must be the most famous endangered species in the country. It is what environmentalists call a charismatic animal, like the panda and the koala. It's not hard to see why in 1937 the whooping cranes became the object of the nation's first major effort to save a species from extinction. They stand nearly five feet tall, are pure white with black wing tips, a red scalp patch and a black band across the eyes. When their wings are folded back, they give the impression that the crane is wearing an enormous bustle. Cranes have been revered in Asian mythology for millennia, perhaps because human qualities can be projected on them. They live for 25 to 30 years in the wild, they mate for life, are devoted to their spouses and protective of their offspring. In Chinese fairy tales and myths people are always turning into cranes, the way Merlin turns into an owl, and shamans in the Amazon turn into jaguars.

The whooping crane has been in decline for a long time, perhaps as long as 10,000 years, scientists say, because it prefers wintering in pristine marsh. Unlike its cousin,

the smaller, plentiful sandhill crane, which feeds in fields and flies in flocks, whooping cranes are family feeders. A pair will stake out a territory of 200 to 500 acres of marsh and defend it against intrusion by other whoopers. Some of the birds have been returning to the same areas for years. Here they feed on mollusks, crustaceans and, most importantly, blue crabs.

As an endangered species, the whooper is protected by federal laws that can supercede state law. Tom Stehn, U.S. whooping crane coordinator for the Aransas National Wildlife Refuge, has written emphatically that freshwater inflows from the Guadalupe River are essential to maintain healthy blue crab populations and, in turn, the health of the crane population, which stood at 185

an estimated \$6 million in tourist revenues to the coast each year. The Edwards Aquifer also sustains the flow of the Guadalupe River, as much as 30 percent in years of normal rainfall, as much as 70 percent during drought years.

Water planners have a lot to consider when they look at San Antonio Bay. We have saved the bay for the whooping crane, and now the whooping crane, through its legal status, may save the bay. Yin and yang.

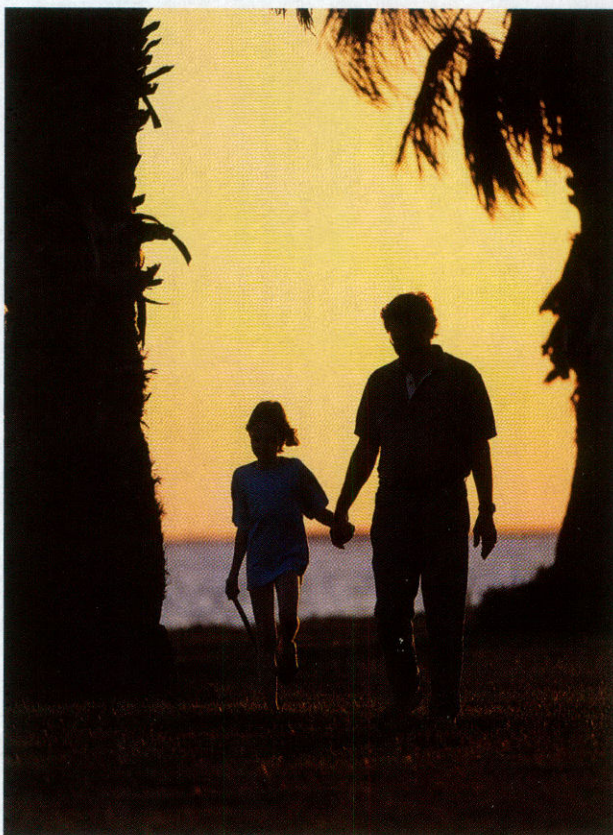
The cranes are special, but when I look at San Antonio Bay, I have to think of much more than cranes. I think of the river. I often take visitors up the mouth of the Guadalupe in my skiff, and marvel at the steady flow of water in the narrow channel. Huge elephant ears, spider lilies, reeds and grasses, and palmetto palms line the banks.

Masses of blossoming vines climb the trees, and here and there a magnificent cypress towers over the river. There's a shell midden six feet high, and farther upstream lie burial grounds of the Karankawa, who feasted on seafood here in the fall and winter, then moved inland in the summer to hunt deer and bison. Some anthropologists have theorized that the Karankawa were so tall because they ate so much seafood.

Because I live there when I can, I am tempted to call San Antonio Bay my bay, which is, of course, silly, since loving something is only a start. Romance is easy; intimacy is hard. Intimacy comes from knowledge, from seeing the connections. I sit on my porch with Elizabeth sometimes and we just watch the sun shine on the water. The white pelicans paddle by majestically. In the morning we might see a crabber heading out, his little boat stacked eight feet

high with traps. In the afternoon, the shrimp boats come in, trailing clouds of birds. A black skimmer swoops down to the surface of the water, scooping up a fish or a shrimp with its long lower bill. When you grow intimate with a bay, you want to learn everything about it, and every new thing raises another question and another.

This place is a nursery. Some day my little girl will bring her children here and, I hope, her children's children. They'll start out in that dark water, groping in the mud, reaching for clams. They will grow up knowing the bay better than I ever will, and because they know it and love it, they will protect it and care for it long after I and the rest of us are gone. ★



this winter. (One of the 16 chicks that made it from Canada, however, was lost to a predator.) Stehn fears that without a protein-rich winter diet, birds will die in the marsh, and others will fail to make the 2,600-mile-long migration back to Canada.

There are too many variables in the law, as in the environment, to predict what could happen, but the legal aura of an endangered species can affect water planning. Because of the threat to endangered species, San Antonio has already had to restrict how much water it withdraws from the Edwards Aquifer. That aquifer sustains endangered animals much less charismatic than the whooping crane, which attracts

**The author and his daughter, above, enjoy a sunset walk on the bay.**



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PARKS &  
WILDLIFE

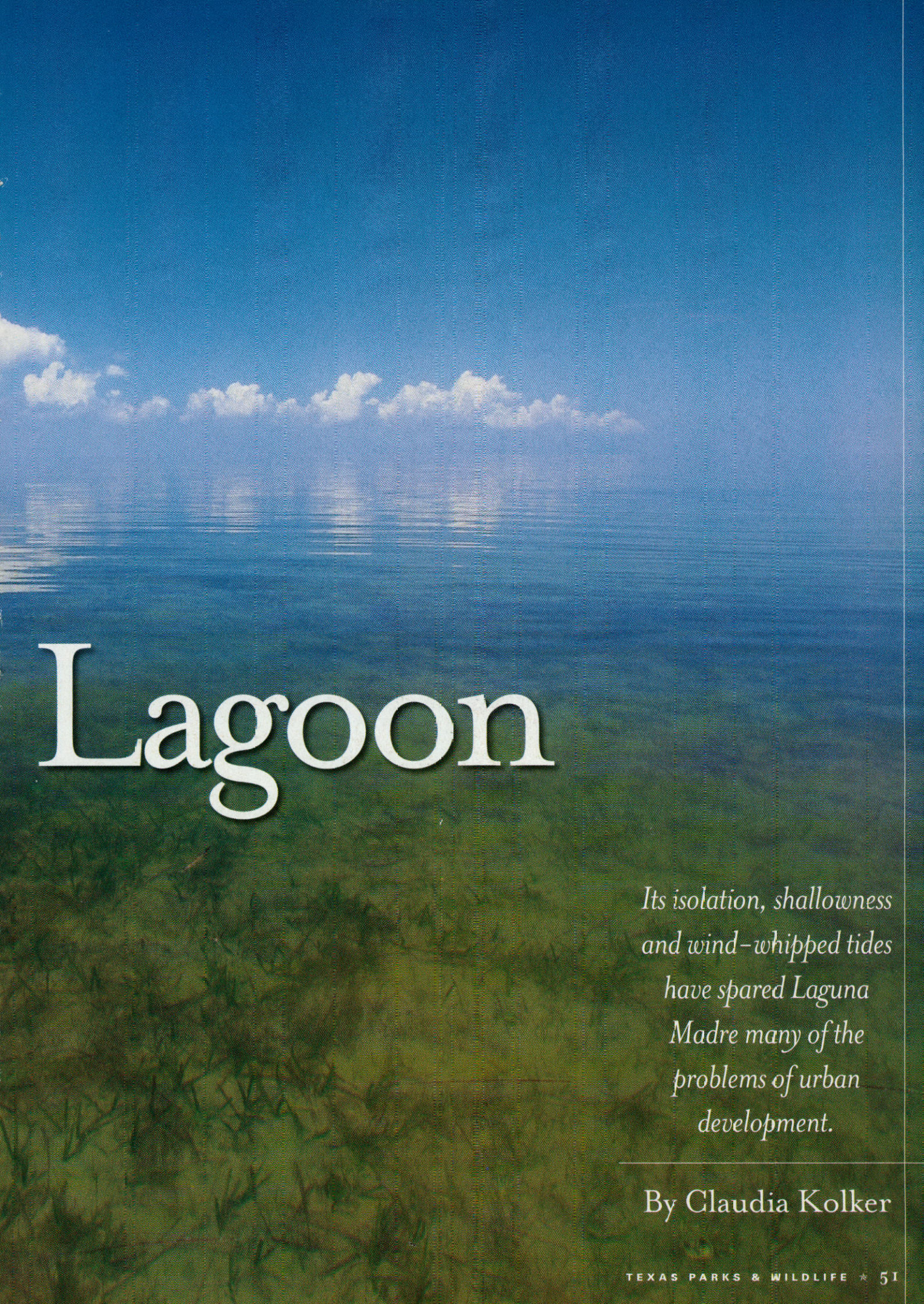


# *The Salty*

PHOTO © DAVIDJSAMS.COM

The shallow Laguna Madre is one of only half a dozen lagoons in the world whose water is hypersaline — saltier than seawater.





# Lagoon

*Its isolation, shallowness  
and wind-whipped tides  
have spared Laguna  
Madre many of the  
problems of urban  
development.*

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By Claudia Kolker



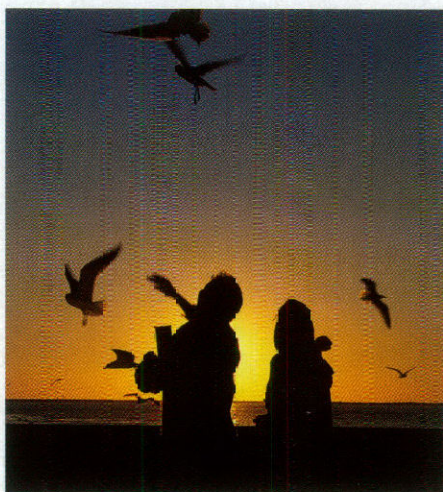


## LAGUNA MADRE

Wedged between the mainland and a rim of barrier islands, Laguna Madre starts near Corpus Christi and extends 227 miles south into Mexico.

*The gulls sound like they're laughing at me.*

It's a hushed, drizzly morning on Upper Laguna Madre. The fishermen have stayed at home, and even windsurfers are scarce. So out here by the water, it's just me, biologist Kyle Spiller and the flock of gulls. In my neon yellow waders, I'm an obvious outsider in this landscape of pale grass and flint-colored clouds. The laughing gulls, meanwhile, are in their element. Flapping wings in the damp wind, they peck each other, groom and bark with that unnerving laugh. There's no question why a gull might like Laguna Madre. What I want to know is why so many humans — duck

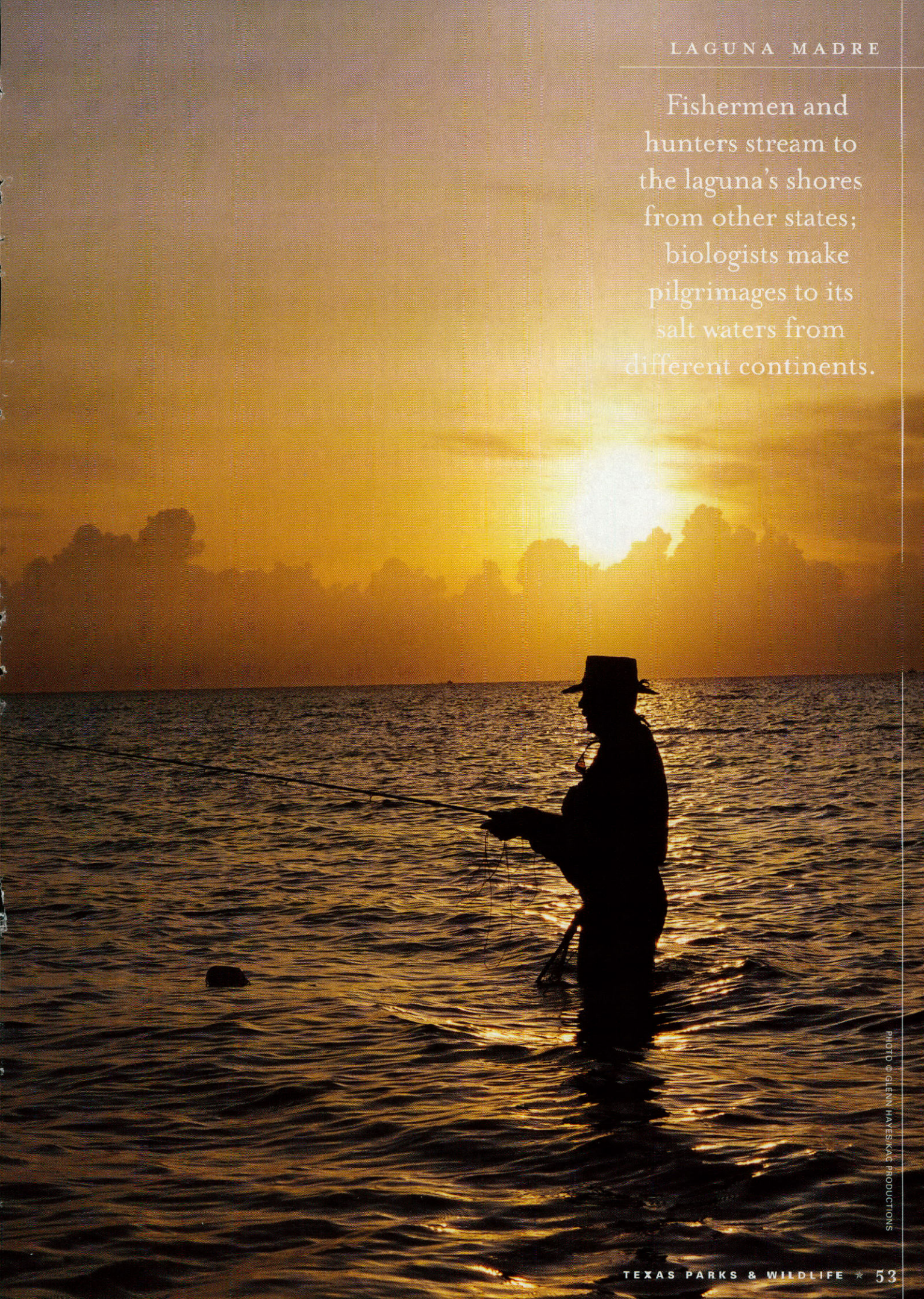


hunters, fishermen, conservationists and scientists — love this slim saltwater bay as well.

Five years ago, the Nature Conservancy of Texas named Laguna Madre one of its half-dozen top priorities for conservation. Fishermen and hunters stream to the lagoon's shores from other states; biologists make pilgrimages to its salt waters from different continents. But when I first stand on these austere flats of grass and scrub, with few creatures visible except the gulls, I wonder what it is so many people see.



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Fill a vast,  
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water undisturbed  
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rivers or the sea,  
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Laguna Madre —  
a bay whose sandy,  
grass-swept  
bottom is visible as  
far as you can see.







I do have some guidance from John “Wes” Tunnell, director of the Center for Coastal Studies at the Corpus Christi branch of Texas A&M University. Laguna Madre, he has told me, is one of only half a dozen lagoons in the world whose water is hypersaline — saltier than seawater. Like a desert, this landscape might appear incompatible with life. In fact, Tunnell tells me, it nourishes some of the most vigorous species anywhere.

Christopher Onuf, a seagrass expert with the U.S. Geological Survey, has given me another hint. Get into the water, he advises. If you want to see why Laguna Madre is unique, Onuf tells me, you need to look at it up close.

When the U.S. Army Corps of Engineers toiled on the laguna during World War II, up close was not a top priority. Instead, they looked straight down. Peering from helicopters, they saw two elongated bays stretched along the Texas Coast. Both lacked major inflows from rivers or the Gulf.

Budding near the JFK Causeway in Corpus Christi and reaching 227 miles south into La Pesca, Mexico, Laguna Madre of Texas and Laguna Madre of Tamaulipas are mirror images, wedged between the mainland and a rim of barrier islands. In its Texas incarnation, the system is divided into Upper and Lower Laguna Madre. Below, in Mexico, the system splits into the Northern Laguna and Southern Laguna. The whole eel-shaped complex belongs to one water system that for centuries routinely has been saltier than the ocean.

It is also extremely shallow, 4 feet deep or less in most spots. Midway between Corpus Christi and Brownsville, the water simply fades into tidal flats that often are dry enough to tramp across on foot. This geography, to the chagrin of Corpus Christi oil refiners, made commercial shipping through Laguna Madre out of the question.

So in the 1940s, at the urging of the refiners wanting to transport gasoline to Brownsville, the corps started an extension of the Gulf Intracoastal Waterway (GIWW), which had stopped at the laguna’s northern end. By 1949 the corps had dredged a canal 12 feet deep and 125 feet wide straight down the lagoon. The channel carved through the land bridge that divides the Upper and Lower Laguna; today this channel is known as the Land Cut. In 1954 the corps dredged another channel across Lower Laguna and through the barrier island at Mansfield Pass.

While the digging improved commercial transport in the region, it also refash-

ioned the laguna’s ecosystem. Before the dredging, salinity levels routinely hit two or three times those found in the oceans. Vast fish kills would cyclically signal that salt had reached a concentration that was unlivable for many organisms. Then, also cyclically, hurricanes would storm in from the Gulf and flush the system with fresher water.

The GIWW and other channel-building projects stabilized that boom-and-bust fish population and freshened the laguna’s water overall. Nevertheless, it’s still a hypersaline environment, so challenging that only a handful of fish and plant species can live there.

And therein lies Laguna Madre’s paradox — the one that makes it so compelling to biologists. Rather than compete with other plants and animals, the creatures here compete only with their habitat. Those that are successful — whether they are shoalgrasses, red-headed ducks or spotted seatrout — thrive in an unlikely, almost Edenic abundance.

But Christopher Onuf, the seagrass specialist, was right. It’s only when I start looking closely that I really begin to understand the life here.

The Upper Laguna’s most famous feature makes its appearance in spring. When the air grows calm and bright, the waters sparkle with sublime transparency. Shallowness is the secret for gin-clear water. Fill a vast, shallow basin with water undisturbed by inflows from rivers or the sea, and you get Laguna Madre — a bay whose sandy, grass-swept bottom is visible as far as you can see. For sight fishermen, it rates among the classic fishing destinations in North America.

“It’s not like shallow-water redfish drives [elsewhere] when anglers in tunnel hulls churn up mud and sea grass while rounding up fish against a shoreline,” writes David Sikes, outdoors columnist for the *Corpus Christi Caller-Times*. “In the clear green water, schooling reds appear as an orange or pinkish haze.” On a recent trip, Sikes writes, “I scurried to the bow and cast... into about 200 reds, mostly bulls over 30 inches... I could see fleeing redfish, shoulder to shoulder, under and around the boat.”

But when it’s windy, or when it rains, the Upper Laguna’s waters grow obscure. Its paradoxes, though, grow more apparent. That’s how it is this morning, as Kyle Spiller and I set out in a Texas Parks and Wildlife Department boat. Lined by a

**Redfish feed in the clear, shallow water, making the laguna an excellent sight-fishing destination.**



grassy shore, the water is a flat, slow-breathing field of gray. There is almost no moon-driven tide here, Spiller tells me. Instead, it's wind that sweeps the water to and from the shorelines. "It's not uncommon," he says, pointing to a cozy-looking curve of beach, "for a duck hunter to anchor his boat in a little tertiary bay and have the water blown out from under him. If you're not careful which way the wind is blowing, it can leave you high and dry."

I mull this as our flat-bottomed boat proceeds, once bogging down in waters only a few inches deep. I've always thought of tides — the kind pulled by gravity — as the life force of a bay. In Laguna Madre, though, it's wind-driven tides that catalyze astounding bursts of life.

Laguna Madre houses North America's biggest expanse of wind-tidal flats — parched, barren-looking sand patches that are engulfed periodically by wind-pushed water. When this flooding occurs, these apparent scraps of desert leap to life so fiercely you see it happen. Within hours of being inundated, the bleached-bone flat begins to bubble like a stew. Microalgae — invisible during months of dryness — synthesize wildly, transforming the packed sand into a lush, blue-green vegetative mat. Sometimes, bubbles lift the whole top off a flat, setting it adrift as if it were a fuzzy ice floe.

The new habitat lures hordes of birds, hungry not for algae, but for the bugs and baby fish now coursing through it. Depending on the water's depth, the tidal flat pulses with piping plovers, dunlin, sandpipers, roseate spoonbills and egrets.

Today, since it's been raining on and off for weeks, the tidal flats sit underwater. As we whoosh over the dark surface, we see water birds resting in more permanent haunts: humps of sand in the middle of the lagoon, often marked with signs warning boaters to leave the birds alone.

At first a big grass-colored blur, the shoreline slowly separates into individual plants. Their variety now stuns me: millions of brushstrokes in cinnamon, taupe, tan, wheat, flax and ash. And though there are few trees onshore, there are no people, either. The only creatures in the grass are white pelicans, huddled against the chill.

It would be difficult indeed to see so little on another stretch of U.S. bay. As a

whole, Laguna Madre is the least-developed bay in the country. In addition to its physical remoteness from urban centers, about 70 percent of Laguna Madre in Texas is protected by the federal government in the form of nature preserves; by private groups such as the Nature Conservancy; and by a handful of historic ranches, including the Armstrong Ranch, Kenedy Ranch, King Ranch and Yturria Ranch.

Harsh-looking at first, Laguna Madre's empty shoreline ends up entrancing visitors, says local fishing guide Walt Kittelberger.

"To a lot of people the appeal of the laguna is its remoteness," Kittelberger says. "There is a certain value in just not seeing the reflective glass of a condominium as the background of your fishing experience."

The great ranches that border Laguna Madre have acted as barriers to such development. At the same time, outfits such as the King Ranch have also kept their shorelines pristine and wild. As we approach the shore, it gains definition, with mesquite trees crenellating its top edge. Even closer, one section of the horizon seems to shatter. It's a flock of redheads, rising like a cinder cloud over the beach.

Of all creatures in the laguna, the red-head reflects the amazing vitality that a hypersaline habitat can breed. About 80 percent of all redheads in North America spend their winters on these shores. In the winter of 1997-1998, federal surveys counted 2.4 million of them in the region. Despite the lack of fresh water, the ducks flourish because they eat the rhizomes of a single plant: shoalgrass. And shoalgrass coats three-fourths of the floor of Upper Laguna Madre.

These meadows are an underwater reflection of the abundance overhead. More than 80 percent of all the seagrass meadows in Texas wave underneath the laguna's surface. On a clear day, you can see the thick, jade-colored fronds stretching like a great lawn across the lagoon. The grass looks scratchy, indestructible. In fact, it's fragile — vulnerable to at least two threats distinctive to the very habitat that also makes it so abundant.

One of these is propeller scarring — wear and tear from boats just like the one we're riding in today. It's ironic, Spiller tells me. For decades, Laguna Madre was remote enough that relatively few people boated or fished on it, and so shallow that many parts of it were unnavigable. In recent years, though, more and more Americans have been drawn to live near

**Great egrets, brown pelicans and a host of other birds feed and roost in vegetation bordering the shallow waters of Laguna Madre.**





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PHOTO © KATHY ADAMS CLARK/KAC PRODUCTIONS



“It’s not really good management to ignore any species. The first rule in environmental management is to keep all the components intact until you understand their role.”





coasts; shallow-water hulls and stronger engines have enabled them to travel to once-pristine parts of the bay. When boats run aground, as inevitably happens in the shallowest parts, their propellers dig apart the seagrass beds below.

Dredging of the GIWW creates another set of problems. A half-century after its creation, the GIWW is more than a commercial structure. It shapes its very environment, freshening the Upper Laguna's water through the land cut and staving off the fish kills that occurred regularly when the salinity was more intense. But the maintenance of the canal is continuing to affect the ecosystem, Onuf says.

Mainly for economic reasons, the U.S. Army Corps of Engineers dumps the superfine sand and clay called dredge spoil onto islands or designated spots in the laguna every year. Dredge spoil isn't toxic, but it tends to hang suspended in laguna waters. When the water gets too murky, light can't get in to the underwater meadows. The grasses die, the laguna floor becomes less stable — and more and more particles churn up to make the water darker.

And if the shoalgrass meadows smother, or simply are replaced by other grasses? It's starting to happen already. For reasons that are not completely clear, some of the shoalgrass in Lower Laguna Madre has been replaced with manatee grass, a sturdier species but one that offers fewer nutrients to sea creatures. Slowly, shoalgrass in some patches of the Upper Laguna Madre is ceding way to other grasses, too.

In response to a 1994 environmental lawsuit, state and federal agencies have prepared a long-term management plan for the disposal of dredge spoil. Their draft, released this winter, recommended against the current practice of dumping in the open bay. But it also noted that the corps doesn't have the money to perform the best practice: dumping the spoil offshore in the Gulf.

Onuf, who is one of the world's authorities on seagrass, points out that dredging is not the only culprit behind murkier waters. From 1990 through 1997, Laguna Madre was invaded by brown tide, an algal bloom that darkened the water and killed whole seagrass meadows. No one is really sure what triggered the brown tide, but agricultural and oil industry runoff may have played a role.

So far, though, shoalgrass still dominates the Upper Laguna. Despite gradual arrival of new seagrass species, the shoalgrass-loving redhead population is extravagantly healthy. Red drum, black drum

and spotted seatrout also abound, to the joy of visiting sight fishermen and their paid guides. In the past 10 years, in fact, the number of fishing guides in the laguna has more than doubled, Kittelberger says.

As we veer away from the King Ranch, I see another cloud of cinders, and now recognize them as redheads. I ask Spiller to stop the boat near a point where the laguna is only a few inches deep, and I get out to look. Clumsy in my yellow waders, I peer into the pure water. In a few more weeks, the whole laguna will be this clear.

I stand there in the water, watching the grass fronds arc around my boots. Nothing, I think, could look less natural than my two neon feet in this transparent water. And yet — probably no other wild

But what about other links in this humanly influenced wilderness? What do people owe Laguna Madre? What does it owe to us? I don't know the answer, and most scientists and managers I meet don't purport to either. The one thing I'm convinced of is that, like a feral creature fed by humans, the laguna must be nurtured on its own terms, not those of something tamed and owned.

"So many people," fishing guide Kittelberger says, "look at our system through the narrow perspective of one species or another. If you're a trout fisherman, you might say dredging must be OK because we're catching a lot of trout. But it's not really good management to ignore any species. The first rule in environmental management is to keep all the



place is more thoroughly enmeshed with human handiwork than Laguna Madre. Sixty years ago, people resculpted and remixed this bay into what it is today. In the years after, commercial, private and governmental interests combined to keep it among the most pristine coastal environment in the country.

So questions of intervention, evolution and conservancy all have special shadings here. What parts of this harsh, grassy place should be preserved — and why? Take the laguna's transparent water, for example: It's good for shoalgrass, which is good for ducks and, not unimportantly, duck hunters. It's also simply good for human souls to look at.

**The South Texas ranches that border Laguna Madre have acted as barriers to development.**

components intact until you understand their role."

Spiller steers us toward the shore. As we approach, the gulls, still gathered by the water, burst out with their unnerving jeers. But it never pays to anthropomorphize, I reflect. The gulls belong to this pale landscape, yes. To keep Laguna Madre wild, though, humans now have to be a part of it as well. The gulls laugh on and I climb from the boat. We are in this together. ★

PHOTO © GLENN HAYES/KAC PRODUCTIONS

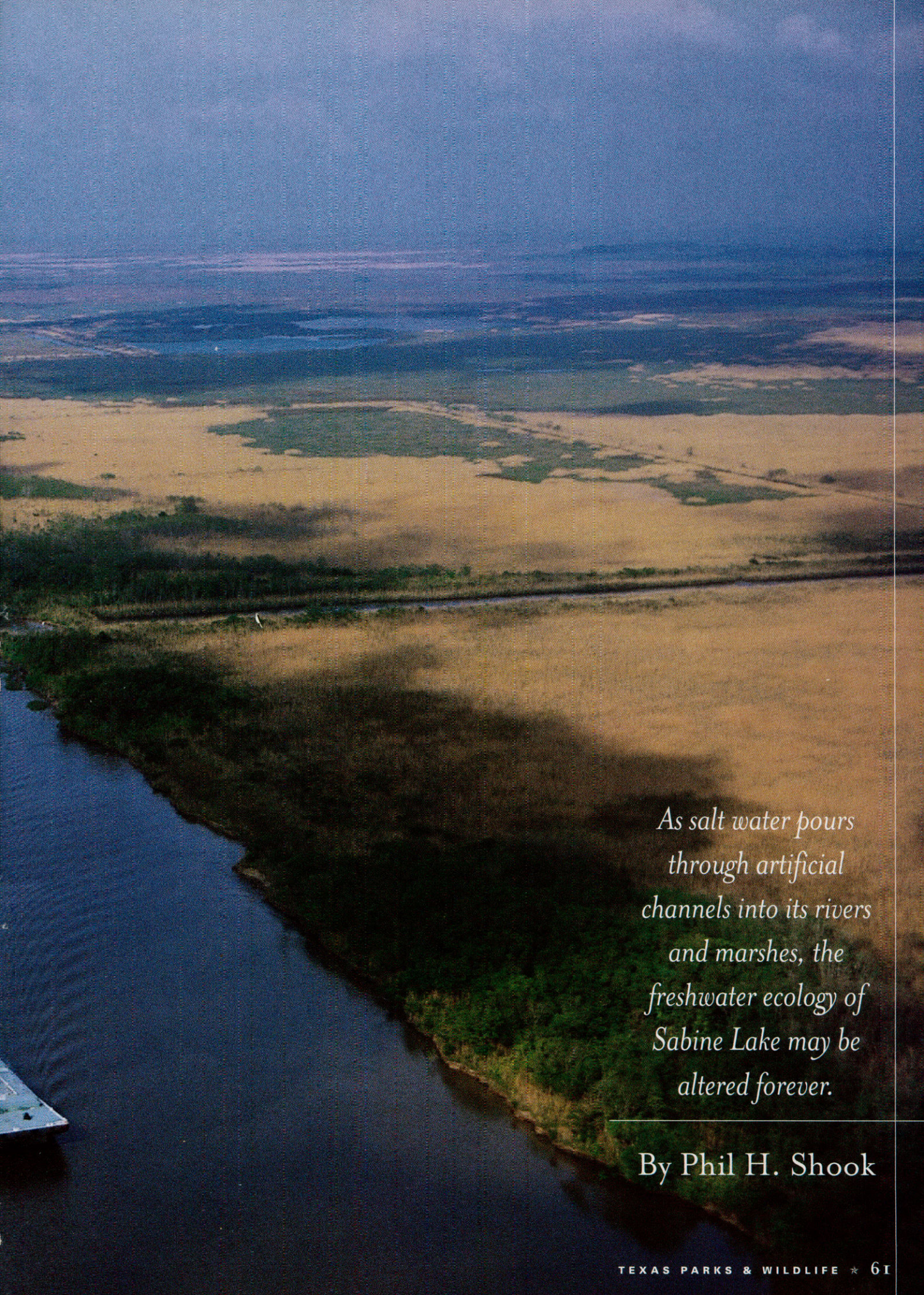


# The Broken Marsh

PHOTO BY EARL NOTTINGHAM

**Barges ply the Gulf Intracoastal Waterway near Port Arthur. Man-made alterations have allowed salt water to intrude into the Sabine Lake complex.**



An aerial photograph of a coastal landscape. In the foreground, a dark river flows from the bottom left towards the center. To the right of the river is a large, dense area of green marshland. Beyond the marsh, the land transitions into a vast, flat expanse of yellowish-brown fields or marshes, interspersed with small patches of green. In the far distance, a thin, dark line of land is visible on the horizon under a clear, deep blue sky. The overall scene suggests a coastal wetland area, likely Sabine Lake as mentioned in the text.

*As salt water pours  
through artificial  
channels into its rivers  
and marshes, the  
freshwater ecology of  
Sabine Lake may be  
altered forever.*

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By Phil H. Shook





SABINE LAKE

Located on the Texas-Louisiana border, Sabine Lake is 14 miles long and seven miles wide. Refineries and chemical plants dominate the northern end.

**B**uilt on a foundation of thick, rich alluvial soil, surrounded by thousands of acres of virgin marshes and blessed with generous rainfall and life-giving inflows from two powerful rivers, the Sabine Lake estuary was born with special privileges. When its rainfall, river flows and marine waters are allowed to co-exist in a natural balance, the bond between the estuary's sweetwater marshes and the salt flows of the Gulf sustains a masterpiece of plant and animal life, making Sabine Lake a wilderness like no other on the Texas Coast.

Playful river otters, nutria and mink make wakes along its bayous. Snapping turtles, bullfrogs and salamanders thrive in its rivers and marshes. Mallards, wigeons and wood ducks migrate each winter to its bays and potholes. Mosquito ferns, mermaid weed, wild celery and many other aquatic and wetland plants provide food and habitat for its wildlife. Orchids such as the Navasota ladies'-tresses grow in its flooded forests.

The Sabine complex also is blessed — some would say cursed — with some of the most abundant insect life on the planet.

"There are 49 different kinds of mosquitoes here, one for every kind of weather and every kind of condition," says Jim Sutherlin, project leader for the Texas Parks and Wildlife Department's J.D. Murphree Wildlife Management Area. "The insects make this part of the coast dynamic. The food web starts here." Local institutions such as Port Arthur's Museum of the Gulf Coast accept this with humor, calling its member newsletter *Mosquito Bites*.

On trips upstream along the winding turns of the Sabine River, one gets a hint of what it must have been like in the 19th

century when cotton traders sailed up it to load cargoes and lumbermen rafted logs downstream to the bay. The buccaneer Jean Lafitte and Texas revolutionary war heroes James Fannin and Jim Bowie are said to have engaged in a profitable contraband trade on these rivers, including trafficking in slaves.

Today, first-time visitors to Sabine Lake are jarred by the cooling towers and smokestacks of its refineries and chemical plants. To some, Sabine Lake might seem more like Lake Maracaibo. But to those who have explored its wild shores, been



captivated by its wildlife and gotten lost in its winding bayous and marshes, it is more like the Everglades.

The smallest of the seven major estuaries on the Texas Coast, the 14-mile-long by seven-mile-wide Sabine Lake receives more freshwater inflows and rainfall than any other bay system. But its marshes, bayous, bays and wetlands are not the same as when the English explorer George Gauld sailed into the shallow, heavily shoaled pass in 1777 and found a freshwater lake surrounded by pristine marshes. Today that Gulf pass that was once only 50 feet wide has been cleared of its oyster bars. It is 45 feet deep and 500 feet wide and the freshwater lake that Gauld mapped is a full-fledged marine estuary.

In 1898, Arthur E. Stilwell, a New York railroad magnate driven by a passion to build a major port on the upper Texas Coast, dug a ship channel around the west side of Sabine Lake to the nearby Gulf Pass. Although he would lose his investment to barbed wire and steel tycoon John W. "Bet-A-Million" Gates, he gave his name to Port Arthur. And his practice of carving up, deepening and redirecting the waterways around Sabine Lake continues to this day.

The Gulf Intracoastal Waterway now dissects its wetlands, ship channels extend up its rivers and pipelines stretch throughout its marshes. With these changes to its coastal landscape, the Sabine Lake complex, a rich and produc-

tive collection of rivers, bays, estuaries and marshes on the Texas-Louisiana border, has been systematically altered by the relentless encroachment of Gulf-driven saltwater currents.

During certain times of the year, salt water runs for miles up the two rivers that flow into the north end of the estuary. In response, river authorities have installed saltwater barriers on the Neches River, and industrial plants on the Sabine River receive fresh water through canals well upstream from the saltwater wedge.

The Sabine and Neches rivers flow into the bay at its northern end, providing boaters a glimpse of industrial landings, chemical plants and shipbuilding facilities. Pint-sized largemouths, called

## SABINE LAKE

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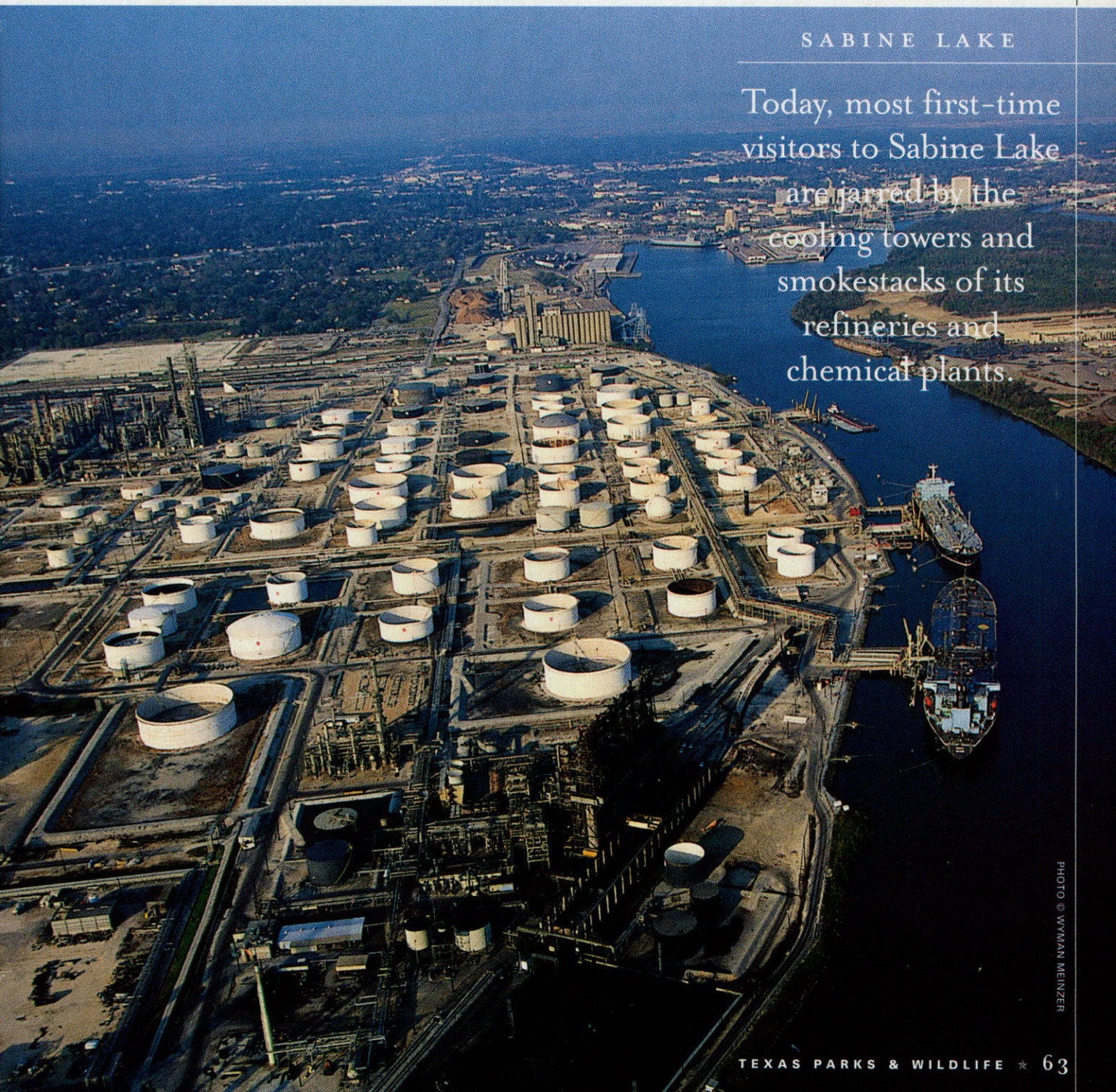
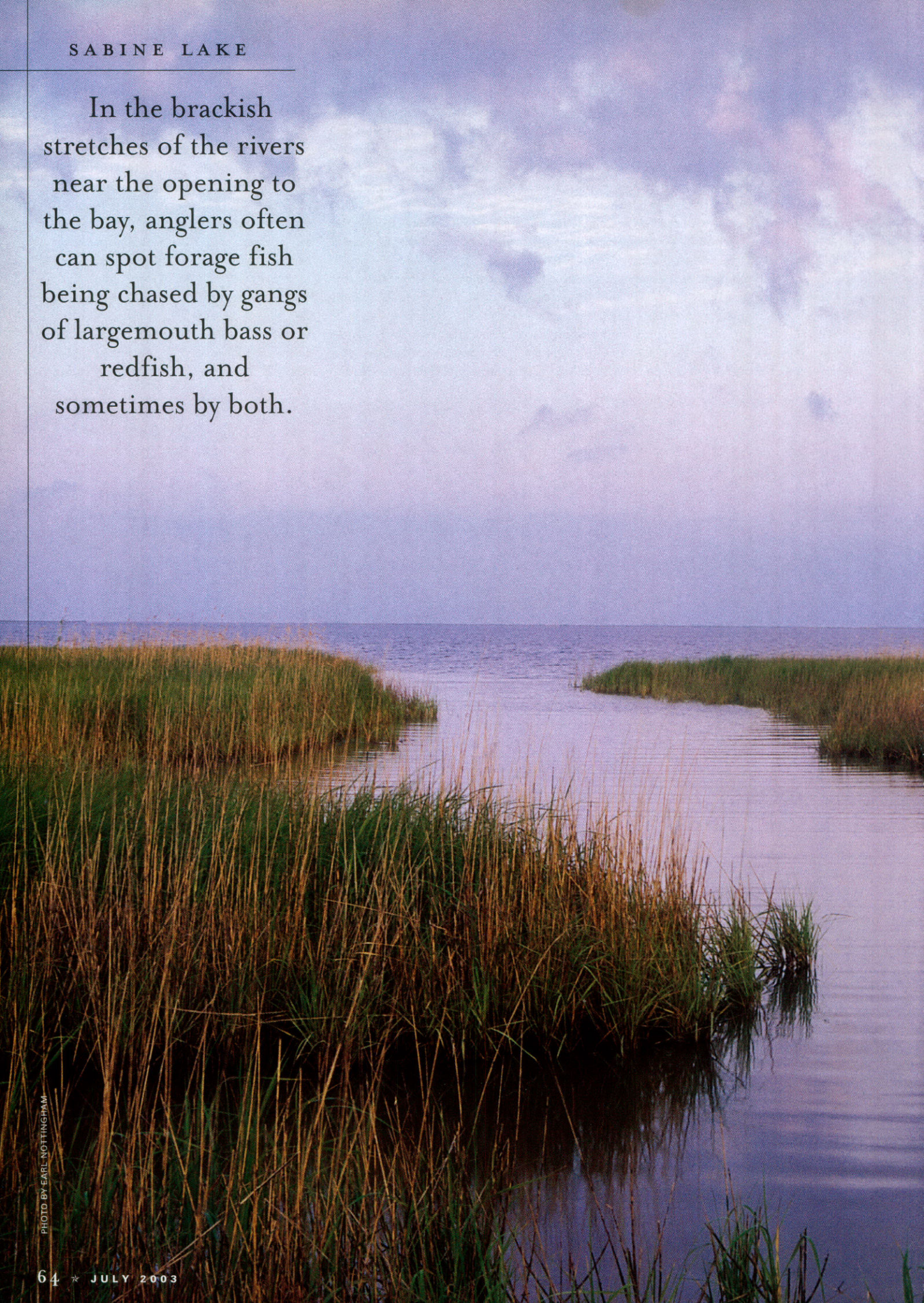


PHOTO © WYMAN MEINZER



In the brackish stretches of the rivers near the opening to the bay, anglers often can spot forage fish being chased by gangs of largemouth bass or redfish, and sometimes by both.





"marsh bass," provide lots of action for light-tackle anglers throwing flies or small lures along the banks. The Sabine and the Neches also are home to a healthy population of bowfin, one of the last survivors of a primitive family of fishes. Their long, undulating dorsal fin causes some anglers to mistake them for snakes. These rivers have so many bayous and oxbow lakes leading off the main channel that it pays to explore these waters with a guide, or risk being lost.

In the brackish stretches of the rivers near the opening to the bay, anglers often can spot forage fish being chased by gangs of largemouth bass or redfish, and sometimes by both. Here it is not unusual for an angler to land a flounder on one cast and a bass on the next. The open waters of Sabine Lake offer some of the most exciting top-water fishing for redfish and trout on the Texas Coast.

The east side of Sabine Lake is bor-

hunting and fishing in the area, recalls pulling his skiff up to a bank to retrieve a duck he had shot only to see it appear to be crawling up the bank backwards. "This big ol' boar mink had that pintail and was chugging through the marsh grass for all he was worth," Robison says.

Another marsh that lies along the Neches River is the Bessie Heights Marsh, a native marshland connected by a network of canals and bayous originally dug in the 1930s to provide access to oil-field sites. Its finger channels and backcountry shorelines provide prime habitat for redfish, spotted seatrout and flounder. Before saltwater intrusion from oilfield canals and the widening of the ship channel on the Neches River, Bessie Heights was primarily a freshwater muskrat marsh, rich in vegetation.

On the southwest corner of the bay is Keith Lake, another satellite marsh with grass flats, secluded bayous and a fish pass



**Left: Brackish stretches of river open into Sabine Lake; above, Keith Lake's marshes and secluded bayous attract birds such as this green heron.**

dered by one of the largest contiguous marshes on the continent, a big portion of which is part of the Sabine National Wildlife Refuge in Louisiana. Along Madame Johnson Bayou, anglers prospecting for flounder and reds sometimes spot river otters playing along the narrow bayous and feral hogs foraging for food along the thick roseau cane-covered banks. Roseate spoonbills, white ibis, black-necked stilts, herons and egrets add dashes of color to the waterways.

Duck hunters on Sabine Lake's marshes have had some experiences not normally found on other parts of the Texas Coast. Ronnie Robison, who has spent a lifetime

that is a favorite with local anglers. A fish pass connecting Keith Lake to the Port Arthur Ship Channel, cut in 1977 to enhance the production of finfish, crabs and shrimp from nearby marshes, has been eroded and now is three times its original size. The subsequent push of salt water in and out of the pass threatens to destroy backcountry marshes. One of the solutions being studied to stem the flow is the placement of an artificial reef near the estuary opening.

Also on the southeast side of the lake are the lush marshlands and bayous of the J.D. Murphree Wildlife Management Area, home for thousands of wintering

PHOTO © WYMAN MEINZER



## SABINE LAKE

The lush marshes  
of the J.D.  
Murphree  
Wildlife  
Management Area  
are home to  
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wintering  
waterfowl.





waterfowl as well as a resident population of Florida-strain largemouths. Part of the Texas Chenier plain and the westernmost geologic delta of the Mississippi River, its freshwater marshes hold Siren salamanders, bullfrogs and pig frogs. Unlike its bank-bound cousin, the bullfrog, the night-prowling pig frog prefers to do its hunting while floating in the middle of lily pad fields. And instead of the jug-o-rum sound of the bullfrog, these amphibians make a sound likened to the grunting of a herd of pigs.

The Murphree WMA and neighboring McFaddin National Wildlife Refuge are among the many public hunting areas in the Sabine complex. "From the hunter's perspective, day-in and day-out, our waterfowl hunting has been as good as anybody's," TPWD's Jim Sutherlin says. "There are some places you can hunt on public lands in Jefferson, Orange and Chambers counties seven days a week for little or no fee."

The region's fur-trapping and rice economies have long been supplanted by petroleum-based economy following the nearby Spindletop oil discovery in 1901 and the development of the great East Texas field near Tyler in the 1930s. These discoveries brought unparalleled wealth to the mineral owners and growth and prosperity to Port Arthur, Orange and Beaumont, the Golden Triangle communities around Sabine Lake.

"Those refineries and chemical plants represent to the people here everything that their families depended on – and for some of them that has covered three generations now," Sutherlin says. "And they still represent the future to people who worked in those plants and to those whose children may work in those plants."

Charles Stutzenbaker, a retired TPWD biologist who spent his career in the area, credits industry for improving its environmental practices from decades past, when plant workers would phone saying they had been ordered to release oil and sludge into the bay. Sometimes industry has even improved the fishing. The DuPont Sabine River Works, a chemical and plastics plant, discharges about 10 million gallons of water a day into the Sabine River. The outlet, referred to as the "bait hole," is a favorite fishing spot for local anglers because it transports algae from the plant's treatment ponds that provide food for forage fish, which in turn attract game fish.

The ship channels, Gulf Intracoastal Waterway and dams on the rivers have served the needs of industry and helped bring growth and prosperity to the

region. But now these coastal communities have to deal with changed dynamics of their valuable natural resources.

"The system was built on freshwater-driven events, the big freshwater engine that was in East Texas and Louisiana," Sutherlin says. "But today, with the chan-

**Unlike its bank-bound cousin, the bullfrog, the night-prowling pig frog prefers to do its hunting while floating in the middle of lily pad fields.**



**At left: Top, aerial view of J.D. Murphree WMA wetlands; lower left, lily pads; lower right, TPWD biologist Derrick Wolters travels Murphree's wetlands in an airboat. Pig frogs, above, live in the WMA's freshwater marshes.**

nels and the dams in place, the system is driven by the tidal engine in the Gulf, a saltwater wedge."

At the Murphree WMA, Sutherlin points to a map showing how its marshes are split by levee banks that separate freshwater marshes from wetlands inundated by saline water. "The Intracoastal came along," he says, "and cut that entire drainage off so sheet-flow water across this country was redirected. This marsh lost its fresh water because the Intracoastal Waterway became a high bank on both sides."

If channels and passes continue to be widened and deepened, Stutzenbaker

foresees a scenario in which one day the marine environment overwhelms what is left of freshwater inflows. "We will have less fresh water coming down and more salt water coming in, which means it will totally eliminate the freshwater species – the bullfrogs and dragon flies, salamanders and crawfish." For a short time the saltwater species would thrive in this deteriorating environment, Stutzenbaker says. They would feast on the dying vegetation, but once this organic matter is exhausted, he says, the marine species will hit rock bottom.

Other wildlife officials are just as distressed about the unstable state of the estuary, but they see the problems as fixable. "When we are able to mimic historical water regimes, we get real good recovery," Sutherlin says.

Protecting existing river flows, piping fresh water under levees to wetlands and getting more people to use the resource are among the solutions being suggested

to help restore the historical dynamics of the estuary.

"With the right approaches, water regimes can be restored," Sutherlin says, noting that this has been demonstrated in Louisiana. "You get control of your water and you start your recovery because the country is still freshwater-driven."

The same tools that were used to scar the coastal scene can be used to renew it, Sutherlin says. "I contend that we used dredges, draglines, concrete and steel to change the coastal complexion of the country and we can use those same things to restore it." ★

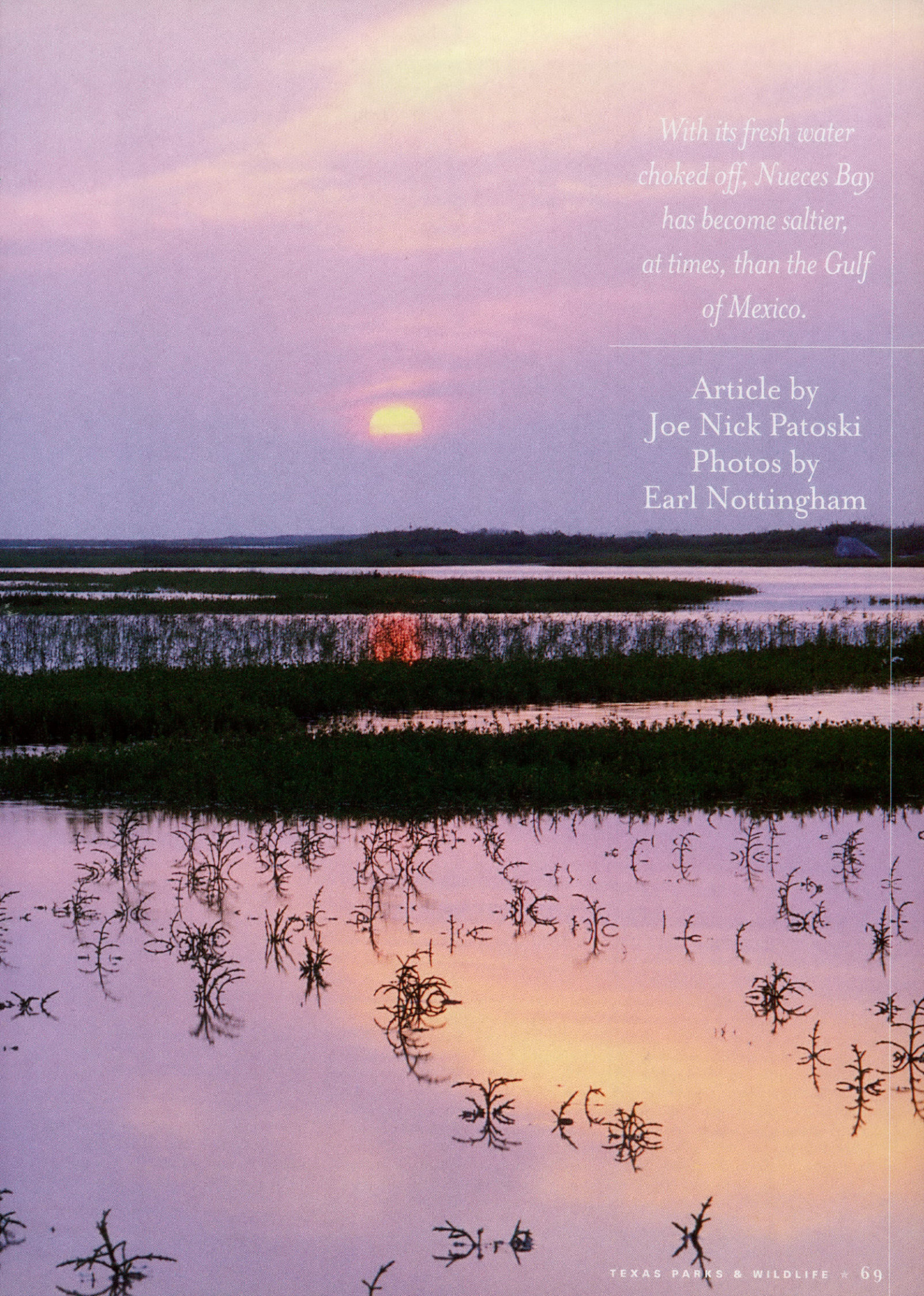


NUECES BAY

# *The Hidden Bay*

Nueces Bay has been called the most important body of water in the Coastal Bend.

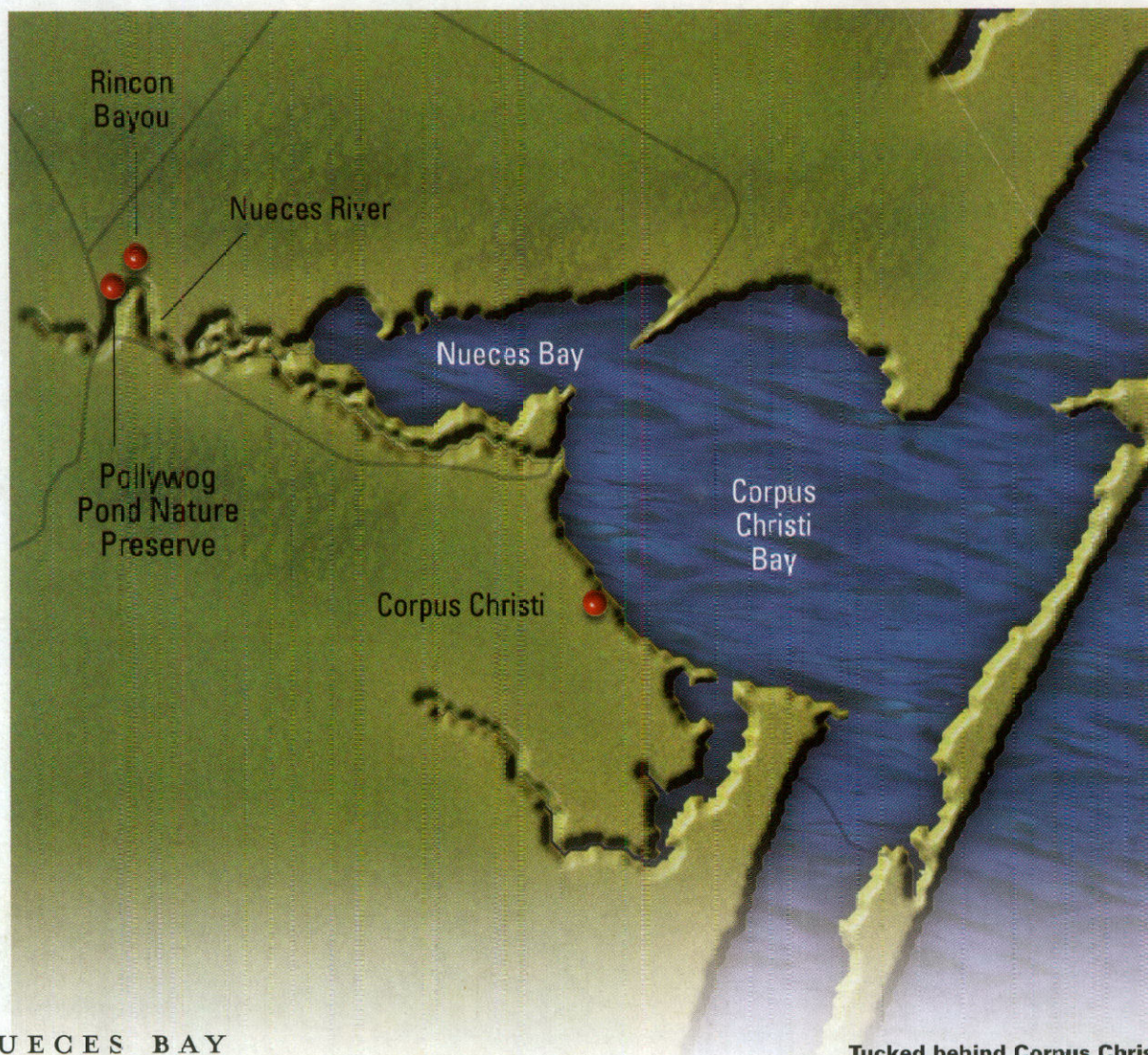




*With its fresh water  
choked off, Nueces Bay  
has become saltier,  
at times, than the Gulf  
of Mexico.*

Article by  
Joe Nick Patoski  
Photos by  
Earl Nottingham





## NUECES BAY

**Tucked behind Corpus Christi Bay, Nueces Bay is hemmed in by refineries on the south and farmland on the north. Right: Roseate spoonbills forage with refineries in the background.**

I'd zoomed past hundreds of times, doing 70 miles an hour on Interstate 37, sometimes stealing a quick glance at the low dam at Labonte Park just south of Exit 16 to see whether any water was running over it, which was hardly ever. But I'd never known I was glancing at Nueces Bay, because I'd never taken the time to look and ponder and follow its main channel meandering under the Interstate before disappearing into a mesquite thicket, forever lost behind the skyline of petrochemical refineries rising to the north as Corpus Christi drew nearer.

If I had done that, I might have understood why the Nueces, the river that feeds the bay and the first Texas river given a prominent place on European maps, was initially identified by Spanish explorers as the Río Escondido — the hidden river. And I sure never pondered that what I was glancing at was a classic estuary, the wheel that keeps the circle of life turning in the marine world. I was always in too much of a rush, always anticipating the soft, white, sandy beaches and the great

big Gulf of Mexico half an hour away. Why stop? Why pause? Why care?

"Because everything in the Gulf is connected to that bay," Ray Allen tells me with a wrinkled smile. "Because redfish and trout depend on the bay, as do shrimp. Because if you want big redfish, you need a place for little fish to grow up and the Nueces Bay delta teems with life vital to redfish, starting with phytoplankton and working your way up the food chain. Because you have to help the food

chain in order to drive the system. Because without it, the entire marine ecosystem of the Coastal Bend collapses." Oh.

Allen is the public face of the Coastal Bend Bays and Estuaries Program, or the Estuary Program, as it is commonly known (however you pronounce the acronym CBBEP, it's a tongue twister). The "it" he is talking about is Nueces Bay, the most important body of water in the Coastal Bend. Allen is the best friend



You try to relate to the public the importance of a healthy estuary from an aesthetic and economic perspective.





Nueces Bay has ever had. A beaming, burly old salt, partial to loose-fitting, floral-print beach shirts, he wins over strangers with his gregarious enthusiasm before rattling off facts that make you want to care, even if you never knew you needed to care. And if any bay in Texas needs caring about, it's Nueces Bay.

Estuaries and bays have suffered from bad PR since the dawn of humanity. They're the stepchildren of waterways, lacking the see-through clarity and the poetry of rushing Hill Country streams, and nowhere as dazzling and dramatic as those special places on the coast where land meets sea. Bays are not very people-friendly. They're gooshy, muddy, slimy and buggy. Yet neither rivers nor the sea is nearly as important to marine life as a bay.

Nueces Bay has gotten particularly bad treatment. It was a fragile watershed to begin with, situated on the edge of the Wild Horse Desert, an arid plain more susceptible to drought than storm surges and hurricanes. A century's worth of exploitation has almost destroyed it. The mining of oyster shells from the bay's bottom for roadbeds turned its once-hard bottom to mud, causing bird islands to erode away. Construction of two major reservoirs upstream shut off the flow of fresh water into the bay, threatening to suffocate the bay's delta, its most critical habitat.

"Over the years, the river channel has wandered all over," Allen explains. "Right now, it hugs the south shoreline of the delta complex and bypasses the actual delta, emerging at mid-bay rather than at the top of the delta like it used to. So we're seeing a reverse estuary. Instead of the upper bay being the freshest part of the bay, it's the saltiest — sometimes saltier than the Gulf of Mexico. Instead of seeing marshes, you're seeing hypersaline flats."

Allen has hauled me back to Labonte Park by Interstate 37 to show me the dam I've seen from the highway. "It's a barrier to keep salt water from the bay out of the intake of Corpus Christi's water treatment plant, which is just upstream from here," he explains. Without the dam, the reverse estuary not only would threaten the health of the bay but the health of the river upstream, as well.

"Since the time of reliable data, we've had a significant loss of habitat, brackish wetlands and emergent marshes to urban development, agriculture and erosion,"

Allen says. "The tremendous amount of shell-dredging in the bay has altered the ecosystem. Then there are dam controls that have introduced a highly managed regime of flood control that restricts freshwater inflow." Mix in a policy-making system that Allen equates with public school financing and you've got a recipe for disaster, he says. "We're not stepping up to do our job."

Under the freeway, Allen gazes across the muddy waterway. "This is what passes for a river," he says with a sigh. The yellow blooms of mesquite and huisache fill the air with heavy perfume. He motions to a small opening on the opposite bank. "That's the diversion channel that gets the water out to the delta where it's needed when the river's up." Diversion channel is a fancy term for a ditch carved by the U.S.

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Bureau of Reclamation to redirect some of the river flow through the river bank, which has been built up to control flooding. "They had to cut the bank a couple feet. They cut it down to where it hits a natural low spot leading to Rincon Bayou. This is not a high-tech operation. The city hired someone with a drag line."

The bay, Allen acknowledges, is a highly managed water system. "We have too many reservoirs, too much use, to think it's a natural system anymore. We have to manage it the best we can. We don't have any choice. But there's enough data so we can do a good job. We don't understand what month you have to put water into the system for roseate spoonbills yet. We don't know about dolphins. But you try to understand how sediment and nutrients work, and you work your way up the food chain."

When the 28 national estuary programs were established in 1987, each program was given five years to complete its plan. It took only four years to complete the Coastal Bend plan for the upper Laguna Madre, the Aransas estuary and Nueces Bay, all of which are linked by hydrology and biology. Farmers, ranchers, fishing and shrimping interests and industrial representatives already had been sitting at the table talking. A science advisory committee and a citizen committee were created. The City of Corpus Christi, the Port of Corpus Christi Authority, the Nueces



**"Everything in the Gulf is connected to that bay," says Ray Allen of the Coastal Bend Bays and Estuaries Program.**



Instead of the upper bay being the freshest, it's the saltiest. Instead of seeing marshes, you're seeing hypersaline flats.



A photograph of a dry, cracked landscape. The foreground and middle ground are filled with a dense pattern of brown, polygonal cracks in the soil, resembling a mosaic. A few small, green, scrubby plants are scattered across the cracked earth. In the far background, a city skyline is visible under a hazy, orange-tinted sky, suggesting a sunset or sunrise. The overall color palette is dominated by warm, earthy tones of brown and orange.

## NUECES BAY

Some years, the Coastal Bend bays function as wet and tropical bodies of water; some years they're more like the dry Peruvian coast.



Floods once moved water into the Nueces Bay delta three or four times a year. Now such floods happen every two or three years at best.



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River Authority, the Conrad Blucher Institute for Surveying and Science at Texas A&M Corpus Christi, the Center for Coastal Studies at Texas A&M Corpus Christi, and the University of Texas Marine Science Institute signed on as partners. Volunteers since have invested 40,000 hours to get the program up and running. Fifty different action plans to help the bay and other Coastal Bend waterways through inflow strategies, stewardship and land purchases have been implemented while pursuing the greater goal of raising public awareness.

Knowledge, Allen contends, is the most powerful tool of all, and a key reason why the nonprofit group stays politically neutral. "If you're a developer, we'll share everything we've got. If you're an extreme preservationist, we'll talk to you. It's all for the good of the bay. As we like to say, it doesn't go away, it goes in the bay," Allen says, laughing. A catchy slogan can be informative too, as long as converts are being won. "It takes a groundswell of public support to change the minds of elected officials."

Perhaps the most critical need is to preserve freshwater inflow. Unlike in most of Texas, standards requiring pass-through releases from dams upstream were set as part of the deal to build Choke Canyon Reservoir upstream on the Nueces River. As vital as the practice is to the bay, it is a political hot potato. Even though releases are suspended during droughts, when water levels drop at Lake Corpus Christi and Choke Canyon reservoir, homeowners blame it on the release requirements.

"Some segments of the public don't understand or appreciate the benefits of freshwater inflows," Allen admits. "We're still faced with an attitude of 'There's plenty of water out there [in that bay], isn't there?'" Overcoming that perception is one of Allen's biggest challenges. "You try to relate to the public the importance of a healthy estuary from an aesthetic and economic perspective. White shrimp, brown shrimp, pick your fish — they all depend on fresh water coming into the bay. Those freshwater releases try to mimic natural cycles. Without them, recovery times are lengthened, the system changes from what it was to something completely different, and ultimately the bay dies and so do the coastal fisheries. You can cut off all freshwater inflow and it won't turn into desert, but the rule of consequences will get you, and you won't like it."

Floods once moved water into the Nueces Bay delta three or four times a year. Now such floods happen every two to

three years at best, robbing the delta of the nutrients it needs. One solution has been to open diversion channels to get more fresh water directly into the delta. Another is the pilot project to pipe 2 million gallons of effluent — fresh water nonetheless — from the city's Allison wastewater-treatment plant to the delta.

Those projects have been financed by the City of Corpus Christi, which is bound by law to release fresh water downstream from Choke Canyon and Lake Corpus Christi, but did so only when shrimpers and environmental groups sued in 1991 to force the city to comply. Since then, Corpus Christi has become one of the bay's good guys.

"I won't lie and tell you we didn't go into this kicking and screaming," says Eduardo Garaña, the director of the city's water department. "We're not going to link arms and sing 'Kumbaya' with some parties. But by God, we're talking. We're not drawing lines in the sand."

All that talking has led to adjustments in the freshwater-release schedule, which gives the city more flexibility, and has led to the city's involvement in Nueces delta restoration projects, a high priority with Coastal Bend conservationists and environmentalists. There's plenty of incentive: every gallon of fresh water that gets into the delta through those restoration projects means one less gallon of fresh water that has to be released from the dams upstream.

Garaña uses himself as an example of what talking can do. "Look at me. I'm a water guy. I'm an engineer. I know all about drinking water. When you realize

what it takes to make drinking water drinking water, you start seeing the biology involved and the big picture. No one's saying, 'Don't use water for lawns.' You just need to be effective, efficient. I used to clean my driveway by watering it with a hose once a week. Now I do it maybe once every six months. Understand, there's still a lot of Wild West down here. No one's saying, 'Don't use water for lawns.' We're saying, 'Maybe you don't have to water every day, when once or twice a week will do.' People have to realize the old Wild West is gone and water is a precious commodity. We're going to have to reduce the demand. Fortunately our city council understands there's more than one side to this water story."

As do the scientists. Of Texas' seven estuary systems, the Coastal Bend offers more to study because of its extreme fluctuations of inflow and rainfall. Salt marshes and oyster beds common on the upper coast and seagrass beds and wind and tidal flats typical of the lower coast are both found here. This is also where evaporation and precipitation meet — south of Corpus evaporation exceeds precipitation. To the north, precipitation exceeds evaporation.

Some years, the Coastal Bend bays function as wet and tropical bodies of water; some years they're more like the dry Peruvian coast. In that respect, they're a marine version of the Hill Country, where several different climatic zones collide.

**Efforts are under way to restore degraded wetlands, left. Pelicans congregate in Rincon Bayou, below.**





The stresses placed on the estuary system by bouncing from drought to flood give researchers more variables to study.

"So much knowledge has been gained in Nueces Bay over the last 50 years," says Wes Tunnell, the Harte Research Institute scientist who also directs Texas A&M Corpus Christi's Center for Coastal Studies. "My colleague Paul Montagna at the UT Marine Science Institute, who's studied the bay longer than anyone, thinks this will be a model for the rest of the world. Problems happening here will be migrating elsewhere up the coast if they're not taken care of. The data's sound. It shows what's there and what's needed. But there's a big disconnect between the scientists and the policy makers. We're not seeing laws respond to the science."

Inside the delta, that disconnect, the piles of stats and data, the long history of degradation, all the good sentiments voiced by Ray Allen, are reduced to background chatter and trivial pursuits. Erin Albert, a resource specialist at the Center for Coastal Studies at Texas A&M, Corpus Christi, monitors several pilot restoration projects in the bay. She offered to take me on a trip to see for myself. She enlisted Jim Tolan, the Texas Parks and Wildlife Department ecologist studying juvenile fish populations in the delta. Tolan hustled up a shallow-draft boat and brought along graduate student David Newstead. Newstead has just completed a four-year-long study of ichthyoplankton — fish eggs and larvae that are basic building blocks in the marine food chain — that was funded by the Corpus Christi Bays and Estuaries Program. He is analyzing the data for his master's thesis.

After following winding, twisting channels through a maze of low marsh, we arrive in a faraway place that is most definitely Somewhere Else. The refineries, bridges, railroad tracks, electric towers and other signs of civilization have peeled away and faded into the humid haze lining the horizon. Here, the bay is distilled to its purest essence: an abstract of water, land and sky. Humans are the intruders here. The shore and sky are the domain of whistling ducks, buffleheads, caracaras, ospreys, northern harriers, bald eagles, kingfishers, white pelicans, curlews, great blue herons, black-crowned night herons, great egrets and snowy egrets. Below the surface, fish, crabs and shrimp mix and mingle with sediments, nutrients and bacteria to make everything grow and grow up.

Our trip begins at Rincon Point in the shadow of the Corpus Christi-Portland Causeway. The causeway parallels a string

of shallow oyster reef beds that were used as a historic crossing during low tide by the Pamoque Indians who lived near the mouth and, later, by early pioneers. This reef "road" separates Nueces and Corpus Christi bays. It also may function as a barrier for fish. "I'm trying to figure out if this choke point prevents them from getting back to the delta," Tolan tells me as we pull away from the shore. "No one's ever studied baby fisheries in Nueces Bay."

We've seen one of the Conrad Blucher Institute's real-time salinity monitors and a nearby roseate spoonbill rookery island brilliant with pink where the Estuary Program has been depositing dredge spoil as a breakwater to prevent further erosion. Albert has showed us the city-funded Wastewater Plant Diversion Demo Project that's rerouting 2 million gallons of effluent per day directly into the delta. We find the ill-defined mouth where the river's main channel opens into the middle of the bay, and travel up the river

The four of us gaze  
silently in every  
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channel to the saltwater barrier dam by Interstate 37.

At first, the channel banks are low, flat and almost desert-like, indicative of a salt-heavy environment, dominated by spartina. "It is a real important marsh grass," Albert says. "It can out-compete other plants when there's a little bit of salt." And there's definitely salt. "You get full-strength sea water up here, just because there's so little flow," Jim Tolan adds. What freshwater flow there is, makes a huge difference. Within a couple of miles, the scrubby landscape transforms into a lush riparian corridor as the clumps of spartina are replaced by other grasses. Mesquite, huisache and the occasional palm begin to line the shore.

After returning to the main part of the bay, Tolan finds another channel known as Rincon Bayou, then begins to negotiate a maze of twists and curves, with some stretches so tight and narrow it's impossi-

ble to turn the boat around. After doing this long enough to thoroughly confuse at least one passenger, Tolan cuts the engine. The four of us stand and gaze silently in every direction, taking in what Albert had earlier described to me as "the most beautiful place in Corpus." I wasn't sure if I believed her when she tossed out the superlative back in her office on the TAMCC campus. Now, in this splendidly isolated delta environment of low marsh and shallow bay, under a dome of big sky, her words ring loud and clear.

"I'm surprised a commercial enterprise hasn't run an airboat tour up in here," Tolan muses while savoring the solitude. I'm surprised, too, until we motor back out of the channel into the bay and a headwind from the southeast greets us with some serious chop, making for a blustery, very bumpy ride back to the launch. The delta is not an easy place to reach.

Albert's description underscores perhaps the biggest negative Nueces Bay faces — it is dang-near impossible to access. The general public has no difficulty appreciating Corpus Christi Bay from behind windshields. The bayfront is Corpus Christi's front door and showcase. Nueces Bay, insulated by Refinery Row and the Ship Channel to the south, and by sprawling farmland to the north, is hard to see and even harder to get to.

Ray Allen of the Estuary Program is working on that detail, too. He hopes the purchase of 1,470 acres of prime delta land from the John McGregor family with the assistance of the Texas Nature Conservancy will enable folks to get back into the delta without a boat. Access is being improved at Labonte Park and the nearby Pollywog Pond Nature Preserve as well, while plans are being considered for the 25-acre tract across the river from Labonte Park that the McGregors have donated as part of the Nature Conservancy land transaction.

After being in the bay, the beach looked different to me. The allure of the crashing surf and the soft, sandy beach was as strong as ever, but I recognized this wasn't the zone of convergence where water and land came together that I once thought it was. That was far back in the delta of Nueces Bay, a place most people will never experience. I understood why those few who do see the delta and the bay become converts, because I'd become one, too. When I headed home up Interstate 37, I couldn't help but follow the irresistible tug to pull off the highway and detour to Labonte Park. I had no choice. I had to have one last look at the hidden bay. ★



# THE VIEW AHEAD

## COMMISSIONERS FROM THE THREE TEXAS AGENCIES IN CHARGE OF WATER SEE MORE CONSERVATION COMING.

INTERVIEWS BY TOM HARVEY

**T**HREE STATE AGENCIES share the primary responsibility for Texas water, with each agency playing a particular role in the planning, conservation and regulation of the state's most important natural resource.

The Texas Parks and Wildlife Department plays a scientific and advisory role with regard to water. Its mission is to assure that the state provides water for fish and wildlife, and when needed, TPWD participates in the regulatory process. In 1985 TPWD, along with the Texas Water Development board (TWDB), was directed by the legislature to determine how much fresh water Texas bays need to remain healthy. The TWDB is in charge of assisting regional water planners in developing regional water plans for 16 Texas regions, preparing the State Water Plan and providing financial assistance for water-related projects.

The third agency that manages water in Texas is the Texas Commission on Environmental Quality (TCEQ), formerly the Texas Natural Resources Conservation Commission. TCEQ regulates surface water use. The agency makes its rulings in part on the science on environmental water provided by the TPWD and the TWDB.

Key commissioners and directors from each agency meet regularly to discuss their concerns about the future of water in Texas. To get their perspective, a commissioner from each agency was asked to talk about the future of environmental water in Texas. The questions and their answers have been edited for brevity. For a more complete version of the interviews, go to <www.tpwmagazine.com>.

### UNDERSTANDING THE SCIENCE OF ENVIRONMENTAL INFLOWS

**ARMSTRONG (TPWD):**

The three agencies are reaffirming their efforts to work cooperatively, and there have been new understandings. One of the most important involves the science developed over the past 10 years by the three agencies on freshwater inflow needs of bays and estuaries. We agree that this science is of the highest quality and should represent a benchmark for evaluating future scientific discoveries. We're also developing a plan for the three agencies as we embark on research on instream flows for rivers and streams. We're agreeing at the beginning of the process on mutually acceptable scientific methodology and modeling that will be reviewed by the National Academy of Science. In addition to science developed by our three agencies, we welcome credible input from all

quarters, private and public, industry and academia.

**MADDEN (TWDB):** We concur completely with Armstrong's conclusion that the science is the best. One of our most important jobs at this point is to present these important studies to the public in an understandable and meaningful manner. Since the beginning of the bays and estuaries program, a vitally important element of the state's environmental flow programs has been the effort to obtain scientific peer review. We're committed to improving this work, and I would point out that we have already updated our original model on Nueces Bay, are currently updating our model on Matagorda Bay and are currently working with stakeholders to develop a scope of work to update our original model on Galveston Bay.

**WHITE (TCEQ):** I wholeheartedly [agree]... that the

### | WHO'S MINDING OUR WATER? |



#### TEXAS PARKS AND WILDLIFE DEPARTMENT

**KATHARINE ARMSTRONG** is a fifth-generation Texan raised on her family's South Texas cattle ranch, an artist and an avid outdoorswoman. She was appointed to the Texas Parks and Wildlife Department Commission in 1999 by Gov. George W. Bush and named chairman in 2001 by Gov. Rick Perry. Armstrong attended

Southwestern University and the University of Texas, then worked in investment banking at Smith Barney & Company in New York. A founding member of the Dream Team of Memorial Sloan-Kettering Cancer Center, she has served on several boards, including the selection committee for the White House Fellows Program. She currently serves on the advisory councils for the Harte Institute for Gulf of Mexico Studies and the James Madison Book Award.

**TPWD mission:** "To manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations."

**2003 OPERATING BUDGET:** \$203.3 MILLION

**AUTHORIZED EMPLOYEES** – 3,035.5

#### Main water resource functions:

- Review and comment on wastewater discharge permits issued by TCEQ
- Conduct research on water needs for river instream flows and inflows to bays and estuaries
- Monitor fish and wildlife populations affected by quality and quantity of water resources
- Law enforcement: enforce environmental laws that protect water quality
- Fish and wildlife kills: investigate kills caused by contaminant spills, seek civil restitution from responsible party



methodology and modeling used in these studies offer a sound scientific approach for determining the freshwater inflow needs of Texas bays and estuaries. The TCEQ must consider this science in issuance of water rights permits within 200 miles of the Texas Coast. The Water Code requires the TCEQ to assess the effects of those permits on the bays and estuaries and consider the studies and other available information. By law the commission shall include in the permit environmentally beneficial inflows to the extent practicable when considering the public interest.

I believe there are valid questions about the quality and quantity of data in the seven different studies. But the bottom line is that we agree that the methodology in the studies is scientifically sound and provides a benchmark for the assessment of other studies.

## THE POTENTIAL FOR OVER-APPROPRIATION OF RIVERS

**WHITE:** The question regarding potential over-appropriation of Texas rivers is difficult to answer. We allocate water rights based on water availability in a time of drought. One can simply answer the question that in a time of drought there are a number of areas of the state that are over-appropriated.

The reverse answer is that in a wet year, there is probably available water in almost all of our rivers most of the time.

At TCEQ we use the 75-75 rule — we typically grant permits if there will be 75 percent of the water requested in a permit application available 75 percent of time. The exception is municipal use. This is determined on the basis of 100 percent of water requested being available 100 percent of the time, because of the state's responsibility to assure the populace that their basic water needs will be met. Most river basins have some unappropriated flow some of the time. There are the extremes — the Canadian, Red, Sabine and San Jacinto at points well downstream almost always have water. The Colorado at a point downstream still has some unappropriated flow, but only about 20 percent of the time. The rest is already permitted. The Nueces, just above Corpus, has unappropriated flow only about five percent of the time.

The rest of the major river basins fall somewhere between those extremes. The answer is highly dependent on where in the basin you are, so it's not accurate to speak about entire river basins. In the lower Sabine there is lots of water well downstream, but halfway up on the Louisiana border,

there is available water only about 20 percent of the time. These figures come from many years of data from stream gauges managed by the U.S. Geological Survey, although some rivers have more of those gauges than others do.

## ENVIRONMENTAL WATER AND REGIONAL PLANNING

**MADDEN:** There are several statutory requirements for financing of water projects that ensure adequate water for the environment. For example, the TWDB may not finance a water-supply project unless the needs to be addressed by it will be addressed in a manner consistent with the regional water plan. All TWDB-funded surface water supply projects have been designed based on consideration of the environment.

Senate Bill 1 in the late 1990s created a regional water planning process based on several guiding principles. One of these principles is that the regional water plans are to be developed to "protect the agricultural and natural resources of the region." To achieve this goal, the regional water planning groups were required to analyze all new surface water projects in a manner that ensured sufficient water is left in the rivers and streams to maintain a

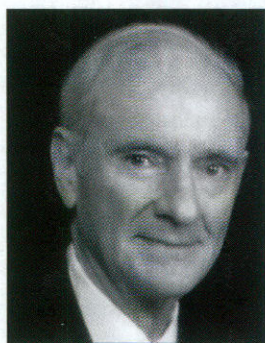
healthy environment.

Following requirements in Senate Bill 2 of the 2001 legislative session, the level of environmental evaluation was expanded. It now requires a quantitative reporting of effects on the environment for all water management strategies recommended to meet future water supply needs. This requirement will allow the regional water planning groups to make an even more informed decision regarding the environmental impacts of the strategies they select.

## THE POSSIBILITY OF WATER SHORTAGES

**WHITE:** The figure to which I always return is that if none of the proposed water-supply strategies in the current regional plans were implemented, in the year 2050 based on population projections, 38 percent of the state's population would not have sufficient water supplies to meet water supply needs during drought conditions. In a variety of communities we already see short-term shortages. In other words, we're talking about near-term water shortages within this decade, not merely something that might occur 45 years from now. The regional plans and the state plans provide us with a way to address these projected shortages by utilizing water

## WHO'S MINDING OUR WATER?



### TEXAS WATER DEVELOPMENT BOARD

**WALES MADDEN, JR.,** board member of the Texas Water Development Board, is an attorney in private practice who serves on the Community Advisory Board of Wells Fargo Bank in Amarillo. Gov. George W. Bush appointed him to the Texas Water Development Board in January 1998. He is a member of the Amarillo and American bar associations, the State Bar of Texas and the Texas Bar Foundation. He serves as a trustee for the University of Texas Law School Foundation and is a former member of the boards of trustees for the University of Texas System and Amarillo College. Madden received his bachelor's and law degrees from The University of Texas.

**TWDB MISSION:** "To provide leadership, technical services and financial assistance to support planning, conservation and responsible development of water for the State of Texas."

**2003 OPERATING BUDGET:** \$36.4 MILLION

**AUTHORIZED EMPLOYEES:** 312.5

#### Main functions:

- Collect and disseminate groundwater and surface water data
- Coordinate regional water planning process and develop state water plan.
- Manage water development financial assistance programs that provide about \$600 million per year in loans and grants, mostly for municipal water-wastewater projects



conservation strategies and the development of new resources.

### WATER CONSERVATION NEEDS

**WHITE:** I am a great believer in water conservation or efficiency as a goal for individual behavior as well as municipal, industrial and agricultural use. We need to take bold steps to reuse water and use less water. It's a primary way to increase inflows to our bays and estuaries. Through the regional planning process, I think more people are aware of how potentially scarce and therefore how valuable water is.

The cities of San Antonio and El Paso have dramatically reduced per capita use in all kinds of creative ways. Water conservation is no longer a prudent thing to do; it's an imperative in this state. In Texas, the future of our quality of life as humans and the quality of our environment depends on our efforts in water conservation.

**ARMSTRONG:** There are good options available and all of them should be entertained. First and foremost, the marketplace must be allowed to work to the fullest extent possible. If Texans demand abundant and clean water supply, then they must be willing to pay for it. By that I mean pricing that reflects the actual cost of water, for developing, transporting and delivering

water to consumers. Right now, consumers do not pay that full cost. Higher prices that reflect the actual cost of water will encourage conservation. Conservation standards have a role to play as well. We might look at a reservation system as part of the solution.

Environmental permitting for instream flows is certainly one tool. Providing sufficient incentives so that the Texas Water Trust can work as it was envisioned is an option. Many states have used, to varying degrees, these and other tools.

But it's important that we in Texas avail ourselves of all options to fashion a policy that works for Texas. Finally, we must not overlook the vital role of the private landowner, which has always been the cornerstone of conservation in Texas.

### COORDINATING DEVELOPMENT AND CONSERVATION

**MADDEN:** Conservation and water planning cannot and should not be severed. This is a statewide problem that should not be limited by delineation of rural and metropolitan needs, industrial or agricultural needs or environmental flows. Plentiful supplies for human consumption and use are the alpha and omega of all of our efforts. The 2002 state water plan contains an unprece-

dent list of water conservation strategies. The governing board of the TWDB authorized its staff at the December 2002 meeting to work with legislative leaders to address statutory language that creates a water conservation task force.

This task force will be charged with evaluating and making legislative recommendations to the 79th Texas Legislature on a number of Texas water conservation issues.

**WHITE:** I believe local people should chart their own futures. The El Paso and San Antonio examples show how people can do it themselves. Having said that, we are very near a point where, because of water scarcity and environmental needs, it might be appropriate for the state to encourage new water conservation methods if local municipalities don't do so.

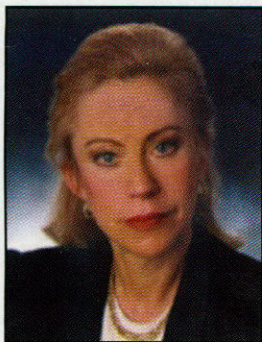
I don't think we need uniform standards — Lufkin has a lot more water than San Angelo. To require costly auditing appropriate for one city might be inappropriate for another. I don't think one size fits all. There are a variety of ways to meet consistent goals. A water audit might be one way. San Antonio used rate structures — that might now work elsewhere. El Paso has used water ordinances.

These are some of the options to consider.

**ARMSTRONG:** The marketplace should play the leading role. Let pricing that more accurately reflects the actual cost of water drive conservation efforts. I do not believe in top down control. I believe in the voluntary exercising of choices and incentives to motivate people to do the right thing. But having said that, there will be a role to play by the cities and regions in setting conservation standards and goals. For example, San Antonio has a water shortage, so they've had to pay higher prices and institute water rationing. If water utilities included the actual cost of water development in monthly water bills, people and businesses would conserve more.

I really do believe that we have a golden opportunity right now to lead the way in the United States in formulating water policy before it's too late, while we have a chance to chart our own course. If we do it now, we'll all have to make sacrifices and adjustments, but if we wait, it's going to hurt worse and we will have many fewer options. Do it now and get it right. Wait 20 years and you're going to face choices much more painful than those before us now. ★

## WHO'S MINDING OUR WATER?



### TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

**KATHLEEN HARTNETT WHITE**, commissioner for the Texas Commission on Environmental Quality, runs a 115-year-old ranching operation with her husband in Jeff Davis and Presidio counties. She was appointed to the Texas Water Development Board in 1999 and left that position when Gov. Rick Perry appointed her to the Texas Commission

on Environmental Quality in 2001. A writer and consultant on environmental laws, natural resource policy and ranching history, White received her bachelor's and master's degrees from Stanford University. She studied comparative religion at Princeton University and law at Texas Tech University. She has served as director of the Ranching Heritage Association and as a member of several water and cattle associations.

**TCEQ MISSION:** "To protect our state's human and natural resources consistent with sustainable economic development. Our goal is clean air, clean water, and the safe management of waste."

**2003 OPERATING BUDGET:** \$395.5 MILLION

**AUTHORIZED EMPLOYEES:** 3,046.5

#### Main water resource functions:

- **Water rights permitting:** decide who may use Texas surface water.
- **Wastewater discharge permitting:** regulate industrial plants, municipal treatment plants and similar facilities
- **Water quality monitoring:** surface and groundwater data collection and dissemination
- **Water quality protection:** set Total Maximum Daily Loads (TMDLs) of allowed contaminants for lakes, rivers, bays. Can result in stricter wastewater permitting to improve water quality.
- **Law enforcement:** enforce environmental laws that protect water quality



HERE AT SEA'S

EDGE, IBISES

COME AS IF DRAWN

*The*

BY A MAGNET,

SHINING

OR DIRECTED

MARSH

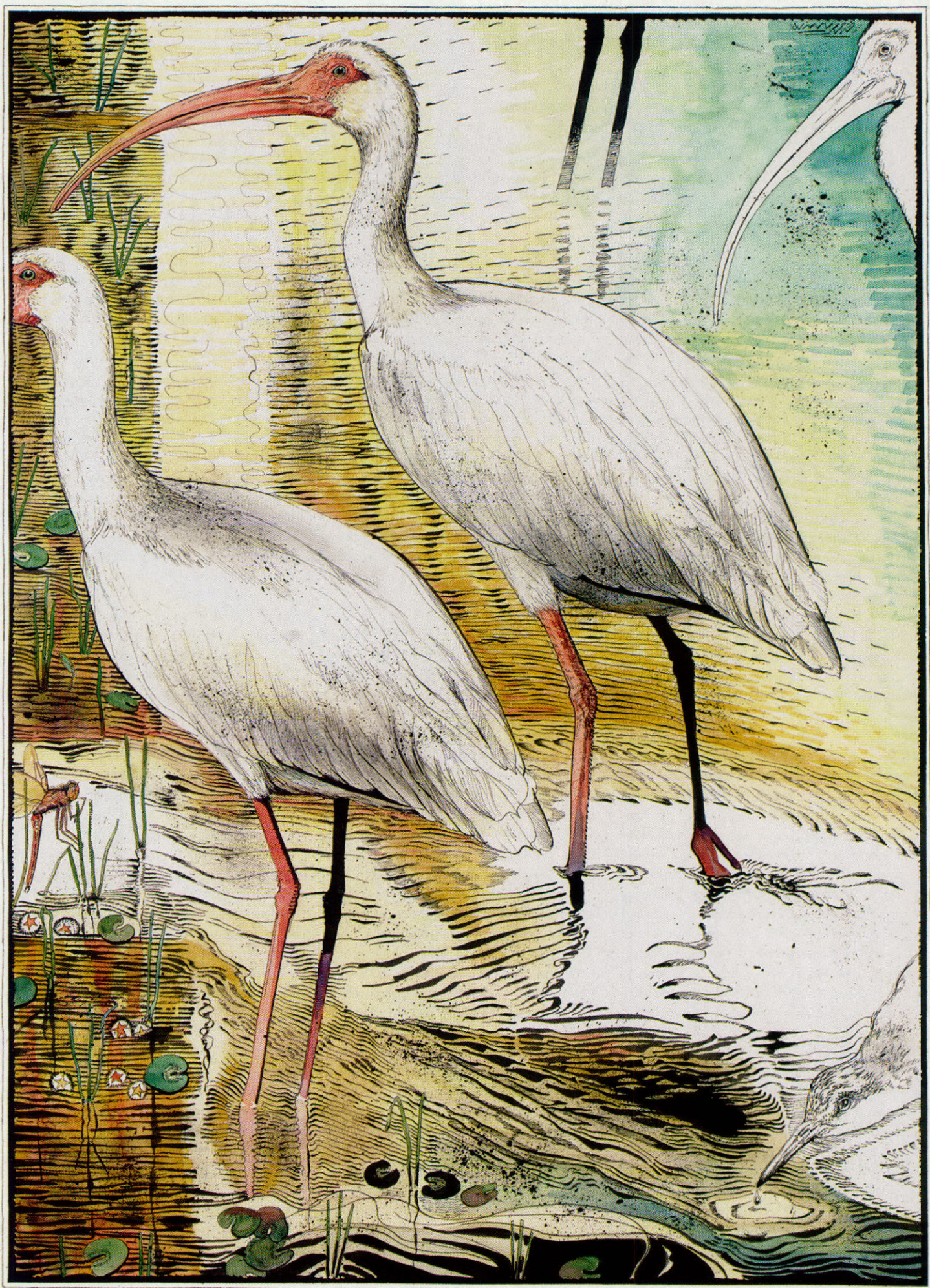
BY SOME

*by Rick Bass*

DIVINE FORCE.

*illustration by Jack Unruh*







## FIRST THERE'S THE MECHANICAL GENIUS OF THE AIRBOAT.

I knew such things existed, and I knew vaguely what their purpose was and how they functioned — to skim across the top of water so ludicrously shallow that it would appear you could just as easily navigate it in your boots, and never take on water above those boot tops — but I had no idea they could go across dry land as well.

I FEEL LIKE A COUNTRY RUBE as Todd Merendino, a Texas Parks and Wildlife Department biologist, trails us out into the middle of what looks like a cow pasture. Indeed, there are cow pies sprinkling the pasture, and the perpetrators themselves come shuffling toward us, after we have shoved the flat-bottomed boat off its trailer. The cattle edge in even closer, surrounding us, and I'm thinking, *Man, that water, that shining marsh, sure looks a long way off, it's going to be a tough slog to push this heavy thing all the way from here to there.*

But Todd gestures to me to climb up into his strange carriage, and he starts the incredibly loud motor, and suddenly the breeze is in our face and then the early April brown prairie, with its first few tiny flecks of blue-eyed grass, is hurtling beneath us in a dizzying mosaic, like the old film clips of the pages of a calendar shuttling by uncontrollably fast.

The tiny castles of crawfish stipple the landscape, and it's like some kind of Star Wars phenomenon, as if we're weaving our way through civilizations and palaces, and then suddenly we're into the clear, living water of the marsh — two inches of fresh water, maybe three or four. It's more like some kind of fairy tale as we hurtle through and between and amidst what I think of as the three elements of time — earth and sky and water — and as a cyed-in-the-wool treehugger — the fact that it is the fuel of the fourth element, fire, in the form of recently ignited fossil hydrocarbons, which is propelling us on this privileged, astonishing voyage, makes me blanch a little.

Just this once, I tell myself, just one more time. I'm back in Texas, at the Peach Point Wildlife Management Area, only an hour and a half south and east from where I grew up in Houston, back in the state where as a geologist I learned how to probe the ancient earth below, searching for the very products, oil and gas, which have allowed us to be on this merry journey. In our species' curious, endearing and maddening way, I find myself trying to rationalize this discrepancy, this problem: to

resolve the paradox, to search almost wildly for a way to make amends; to mitigate, seeking balance in an imbalanced world.

We have not yet traveled very far at all, skittering across the shining, shallow water, before there rises suddenly before us a hawl of birds, a cyclone of birds — big magnificent birds with long legs, long bills, long wings — the sky before us filling with them, ibises, so many of them that it seems we have blundered into the place where all of the world's ibises are congregating, this blue-sky, early spring day, or perhaps even into the place where ibises come from — erupting as if from some volcanic neck, an outpouring of ibises, a Spindletop of ibises.

TODD CUTS THE ENGINE and we drift, watching the sky-borne wave of them: white-faced ibises, which are not white at all but dark, blackish-appearing in profile, but then iridescent in movement, and white ibises, which are the color of snow. Together, the two species roll across the sky like the notes of visible but inaudible music. And once they're a little farther away from us, they quickly settle down and begin feeding once more, striding purposefully through that clear, shallow water with glittering splashes spraying diamond-like around their legs as the wind gusts past them in sheets. They stir and probe the mud, dowsers-like, with their incredible bills, plowing and furrowing this vast and near-final flooded prairie of rot and ultimate organicity. A long time ago — 3,000 years? — this was an inland bay, but centuries and then millennia of deposition from the great Brazos River have changed all that.

This is the place, now, where the rich, fine-grained, organic sediments finally settled out, filtered by landscape: the confluence of the San Bernard and Brazos rivers, the latter one of the most amazing transporters of sediment in this country — in the company of the Mississippi and the Amazon, in that regard — head-watering up in the Panhandle and then winding

and curving its way through Texas, until the river finally lies down to rest here on this phenomenally planar delta, bestowing its final gift.

And to that final gift, here at sea's edge, the ibises come as if drawn by a magnet, or directed by some divine force; and from the richness of all that sediment, as well as the high-tide yields of the ocean — bounty coming from the north as well as the south — the magnificent beauty of the ibises is born, each bird as fantastic and phenomenal as a lotus from the mire.

Even a non-birder such as myself knows enough, in that first instant of ibis-sighting, to gape in slack-jawed, awe-bound reverence — the word transfixed comes to mind — and it does not surprise me to discover later, in reading up on these amazing birds, that they've been revered by human cultures for centuries. In *The Birds of Texas*, John L. Tveten writes of the family *Threskiornithidae*, "The sacred ibis was deified as the god Toth by the ancient Egyptians, and the very rare Japanese ibis was declared a national treasure by that government. Ibises have been popular subjects of Japanese and Chinese artists through the ages." And then, with a familiar blush of shame, I read on: "In the United States, on the other hand, hundreds of thousands of white ibises and roseate spoonbills were slaughtered in the late nineteenth century because the feathers were prized for ladies' hats."

Well. Here they are, so many that if Todd, ballast to my ignorance, were to tell me that it is in this last 15,500-acre garden that every last ibis in the world is holed up, stirring the rich muck of delta soup, this writhing rich broth, in search of crabs, snails, crayfish, insects and all the other explosive proteins it can excavate with its long bill — each bird searching for its own desired, not-yet-fossil fuel, probing and drilling — then I would believe him, that it is behind this one last magic curtain on this one last special marsh, where all remaining ibises gather in graceful, ancient ceremony.



**W**E STOP OUT ON THE flats and stare out at them through binoculars. The bright light is distorted into shimmering vertical waves similar to the wind-whipped, horizontal water-waves through which the ibises are wading, further accentuating the impression that we have stepped behind a curtain, and into another, older world. How long has it taken to make an ibis, I wonder — ten million years? A hundred million? Rarely have I ever seen one species so wedded to its landscape, so fitted, the sculpted relationship between landscape and species so easily witnessed. It's like looking out at a field of ten thousand grizzly bears, or ten thousand buffalo. It is profound, and we sit there, lulled by the slap of shallow waves against the hull of the boat.

The Freeport Christmas Bird Count, started near here many years ago by bird-watching legend Victor Emanuel when he was a teenager, for a long time held the national record for most sightings in a day — more than 300 species, all due to the confluence of the two essential habitats — marine and riparian.

How close it all came to the void, however. This area was one of the initial Spanish land grants deeded to Stephen F. Austin's "Old Three Hundred," back in 1821. Austin knew a good thing, and deeded himself land between Jones Creek and the Brazos in 1830; a portion of Peach Point lies within those old boundaries.

It's big country, but because it's so flat, we can see to the horizon in any direction: and back toward the mainland, the shimmering white shapes of refineries and massive storage tanks blur and waver, magnified by that shimmering light, marking the management area's boundaries. Phillips Petroleum and Dow Chemical once owned thousands of acres in these parts (and still do), but due to various industrial activities elsewhere, the corporations needed to come up with some mitigation to proceed — blood-money, environmentalists sometimes call it — and so this amazing spot was protected, though not without a near-miss, like a tiny chip in the teeth of fate's gears.

For a while, during the oil boom of the early 1980s, the Seadock Corporation was planning to turn this area from an inland marsh into a port with an offshore terminal for the world's super-tankers. The boom ended, though, or else they'd probably still be digging and dredging here, hauling the marsh away, just like that fellow over in Iraq did to his country's native wetlands. The Texas Nature Conservancy bought the property and then sold it to TPWD in 1987. The refuge now exists as a

"sister refuge" with another protected area up in Alberta, in prairie pothole country, and thinking of my own fragmented, vital valley in northwest Montana, I'm envious of Alberta's good fortune. There's so little left to save, really, and our appetites are so immense.

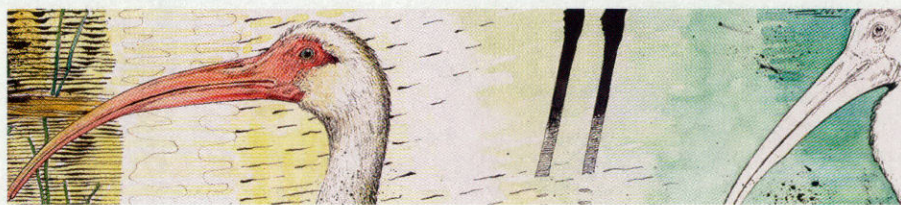
**D**O THE IBISES KNOW THIS? I hope not. Driven by their own fierce hungers, they come to this perfect place, as intent, perhaps, on the universe of crustaceans just a few inches beneath them — the milieu of the sacred past — as they are upon the world above, the world through which they stride. They come soaring in, highly social, in flocks of a hundred, two hundred, gliding on bent wings with their bills bent like dippers, identifying them to us from a great distance, and identifying their needs clearly, unambiguously — to probe and stir, to drill. They fly right over the tops of the sprawling refinery complexes, the seemingly endless phalanx of smokestack and giant storage tanks, as if flying into the heart of the beast itself; nothing can turn

bad, but brings it all south, and deposits it here, poison and bounty alike. Tveten reports that analyses of the nest failures of ibises along the Texas Coast have revealed "lethal concentrations of dieldrin and other persistent insecticides in the bodies of the nestlings."

We scoot on, pushing up more birds from behind the veil — calories, units of heat, energy expended with each flock's fluttering wave, then energy gained from a new feeding ground. It's all an equation, a swirl, and the slow sultry death of the Brazos feeds and feeds and feeds these amazing birds, as does the ocean, and its tides.

Of the white-faced ibises, Tveten reports: "At close range and in good light, they are unexpectedly beautiful birds," with "the rainbow iridescence of bronze and green and violet" that seems to shimmer across them as they pass through different angles of sunlight; and sometimes, in the flocks that leap up before us and veer away, there are other vast congregations: a battalion of night herons, from behind one curtain of reeds, and in another open stretch, a great assemblage of

**THE BRIGHT LIGHT IS DISTORTED INTO SHIMMERING VERTICAL WAVES SIMILAR TO THE WIND-WHIPPED, HORIZONTAL WATER-WAVES THROUGH WHICH THE IBISES ARE WADING, ACCENTUATING THE IMPRESSION THAT WE HAVE STEPPED BEHIND A CURTAIN, AND INTO ANOTHER, OLDER WORLD.**



back their desire, their need.

Writes Tveten: "They move in unison, as if following a choreographed routine, beaks probing the mud ahead. Stride, probe, stride, probe. Occasionally an ibis raises its head to swallow a tasty morsel, then, as if afraid of losing ground, hurries to regain its place in the advancing line. It is one of nature's great ballets."

It is like a ballet, and like a march, too: like an army. During the mating season, as their bare facial skin and legs convert springtime's hormones to turn bright scarlet and shiny — as bright as if painted with fingernail polish — they consume even more shellfish, seeking ever more protein for the rigors of the breeding cycle.

The destruction and fragmentation of wetlands is a huge continuing pressure against their survival, as is our heavy use of pesticides and herbicides, particularly in the rice fields. The democratic Brazos does not differentiate between good and

willetts is mixed in with the ubiquitous ibises, each willet less than half the size of the ibises that tower around them, and yet they are all feeding together.

We can never pick it all apart, can never know all of the why's — though even if we could, we would then surely be unable to know all of the whys of the whys — and amidst such bounty, it is clear that the mysteries of life extend all the way down, like rich layers of sediment, traveling all the way to the world's core. Such realization, while bathed in such beauty and bounty, produces in us not just awe, but a kind of wonderment, almost like shock: almost like the shock of being loved, and deeply.

**B**ACK AND FORTH we skitter, to the perimeters and then to the center, finding birds everywhere. Of course the world needs its many vital, scattered places, each to accept the dispersal of this bounty, but how fiercely it needs



also its core places, these late-winter staging grounds that can provide such a rich and continuous feast for all who gather. All are invited, none are turned away. In nature's democracy, the journey north to their various breeding grounds will begin to select them, choosing winners and losers, and sharpening or breaking each one to this strange and shifting world but here and now, at Peach Point, there is only feasting, only bounty.

We motor on, wind-buffed in our roaring chariot, across the shining, glittering marsh. We can see distant little mottes of oaks, smudges of forest-green painted in etchings between the blue sky and the winter-browned marsh. Todd refers to these groves or islands of oaks as "migrant traps," which draw the eye of the tiny little songbirds, the azure and vermilion and emerald and lemon and lazuli and crimson travelers, the flecks of eye-candy that nearly stun us with their beauty. Such tiny travelers drop down into these increasingly rare forests to take a break from their migration, to rest and feed on the insects found there, and to take refuge

is more than enough, is like some spectacle from Africa, or the Everglades or Saskatchewan.

Again, I feel a blush of shame, to be perched out here on the bow of a boat this lovely cold day, while others of my kind are out in the sands of the Middle East, lost and burning, shooting and bombing and killing and being killed.

What a wake-up call, what a moral challenge, for environmentalists: what a crucible for our bedrock faith that the natural world still matters, has always mattered, through thick and thin; that as long as there are still patches or gardens of beauty in the world, uncompromised and existing for a purpose beyond our own immediate needs or desires, then almost any kind of redemption or recovery can be dreamed and imagined, even accomplished.

*This is what it looked like before we began to make mistakes. This is what it looked like before things started to go bad.*

*This is how our hearts used to feel, as children.*

**OF COURSE THE WORLD NEEDS ITS MANY VITAL, SCATTERED PLACES, EACH TO ACCEPT THE DISPERSAL OF THIS BOUNTY, BUT HOW FIERCELY IT NEEDS ALSO ITS CORE PLACES, THESE LATE-WINTER STAGING GROUNDS THAT CAN PROVIDE SUCH A RICH AND CONTINUOUS FEAST FOR ALL WHO GATHER.**



against inclement weather. Earlier this morning I had stopped and looked around in a motte of live oaks but had seen nothing, and had presumed that the little migrants were still a bit farther south, unwilling to push on just yet into the teeth of the cold north wind that had swept and scrubbed these blue skies so clean.

Perhaps they are only a day, or even half a day, farther south, hunkered down beneath the canopies of coastal thickets, waiting and listening impatiently; the wind is supposed to die down by evening. Perhaps as soon as I leave the WMA this afternoon, they will come surging north — strategic, determined, relentless. Surely they are still out there, bright in the world. We know that their numbers, as well as their habitats, are dwindling, but surely this is not the year, yet, when they no longer come.

Nor are we disappointed by this day's or two days' delay. What we are seeing already

**W**HEN I WAS A GEOLOGIST — a fifth of a century ago — I used to explore long-buried landscapes not all that distant from this one, probing and pecking little eight- and five-eighths-inch holes into Paleozoic deltas and offshore bars. With my pencil and eraser, I used to wander across old bays and estuaries, wading through the wave-tossed detritus of dissolved mountains, looking for buried treasure — what we called "production," a euphemism little different from that of either a farmer or a biologist — and when we succeeded in discovering what we were looking for, we would turn our maps over to our engineers, who would perform all sorts of complicated equations designed to tell us how many acre-feet of oil we had discovered.

Looking out at this vast sheet of shining water, I'm reminded again of that phrase, acre-feet, for although the volume of this

marsh might not possess as much water as even a medium-sized impoundment of oil, it is the distribution and reliability that matters most of all — the fact that it is even here at all — and that it has come so far to get here, and that the open space is here to receive and hold that water, as well as all those tons, all those acre-feet, of sediment, shellfish and history.

It has been a long time since I have felt in Texas that in ecological terms we are rich with anything; but here, perched atop a civilization far more ancient than that of Babylon, in this little 15,500-acre garden — a sanctuary, a little park — I feel that way once more, feel it again even more wondrously than I did in childhood, before I became aware of the diminishment of things, and the erosion of boundaries.

And forgive my gluttony, but I want more. Like some crazed imperialist, even in the midst of such concentrated, focused bounty, I find myself wondering, *Where will they all go from here, and will the way be safe for them? And I want more.*

We move oceanward, out into more shining space, and I'm forced again to consider the hair's-breadth changes, the near-misses that lead to the Big Events that can and do change history. If the oil-boom of the early eighties had crested a few months earlier — not eons or millennia, but months — we might be motoring across sixty feet of water, instead of six inches. There might be only a few laughing gulls circling overhead, or maybe nothing at all. Perhaps we would be surrounded by looming tankers, shining in the sun, their decks towering sixty feet above us.

Instead, we come into a shallow salt-water bay where crab traps bob in gun-metal-gray waves, and where the calceus labia of oyster shells are exposed to the wind-whipped low tides of late winter. We pause near a sandbar and study a congregation of willets, gulls and black-necked stilts, each bird distinct, the gulls hopping up into the wind and catching air, then flaring, and the stilts accelerating their soldierly march somewhat, but still hunting and searching, striding as if in synchrony to the beat of some inaudible rap music and the brown little willets, with their shorter legs, seeming more furtive, even anxious.

Various flocks settle down, too, after their initial skittishness, and return to the exact place they were feeding and gathering before our approach, as if there exists, after all, a plan, a pattern, and although we tend to see the world as random, it is all woven together like one of those maddening five-



thousand-piece puzzles that sits assembled in some lakeside summer cottage, pieced together during a week of rainy weather by some unknown visitors maybe fifty years ago; and that despite the momentary disruption caused by our sudden and noisy arrival, all the puzzle pieces must, sooner or later, settle back down into their slots and niches and crevices.

This is a dangerous conceit, and yet out here in the middle of Peach Point, that is how it appears, this one day; and if on this one day, then why not also on all others, now and forever more, no matter what?

**P**ERHAPS IF THIS SPIT was here fifty and sixty years ago, red wolves might have stood on its shores, waiting for bounty to come rolling in. Perhaps, fifty and sixty years from now, whooping cranes — if they can recover sufficiently to expand back into their historical territory — will stand in this mud once again, leaving splayed tracks as large as a man's hand.

Does it seem that there are fewer and fewer nations of the living, and more and more nations of the gone-away, laid down in the layers of the past like fine-grained Brazos sediment? Does it seem sometimes that the unraveling might not just stop or cease with the unbraiding of cranes and songbirds, wetlands, marshes and red wolves, but instead might keep on going, falling apart twist by twist?

And if it does, what force — what loving force — cares or desires to reassemble those braids, and in what manner?

I ask Todd what the most challenging part of his job is. I expect him to say that it's managing water flows in an era of diminished availability of that most vital of resources. I try to imagine what a gauntlet it is for a gallon of water that begins somewhere up in North Texas, in the Brazos headwaters, or around Glen Rose, up behind the dam at Possum Kingdom Lake — how difficult it is for that gallon to make it all the way to the coast, and in so doing, carry with it the nutrients that are as critical to this ecosystem as is the dissolved oxygen in your or my red blood.

I would have thought that would be the hardest part: juggling the water, shuttling the puzzle pieces of habitat need and water levels for each individual species each season — like some biological bed-and-breakfast host trying to remember the precise and various needs of an ever-changing assemblage of rushing-through guests.

But Todd tells me that's the easy part — that as far as the water goes, "Either you have it or you don't." If it's not there in certain years, there's nothing you can do

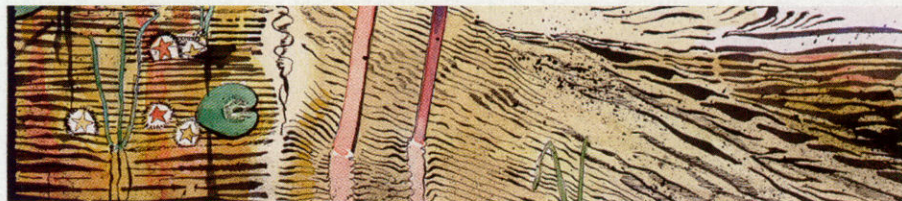
but just wait, and wait.

The prescribed burns, designed to improve prairie habitat, are hard to coordinate, he says, because they make so much smoke for "the city," by which I presume he means Houston, just to the north (which in 2000 bypassed Los Angeles as possessor of the most polluted air in the nation) — and the mosquitoes can make his job pretty rough, too. "You can't imagine," he says, "it's unbearable" — and yet, he bears it — and when I ask him what his favorite time of year is, he says it's right now, mid-February through mid-April, during the peak of bird activity, before the mosquitoes get bad, and before the heat returns.

The hardest thing, he says, is the vegetative manipulation: trying to keep out the encroachment of woody debris, trying to knock back the invasive, non-native species such as Chinese tallow, while promoting the recovery of the natives that are so wedded to this marsh: bushy bluegrass, eastern baccharis, seashore paspalum, jointed flatsedge (which the ever-expanding numbers of snow geese devastate).

It's like novel writing, I think, with draft

**DOES IT SEEM SOMETIMES THAT THE UNRAVELING MIGHT NOT JUST STOP OR CEASE WITH THE UNBRAIDING OF CRANES AND SONGBIRDS, WETLANDS, MARSHES AND RED WOLVES, BUT INSTEAD MIGHT KEEP ON GOING, FALLING APART TWIST BY TWIST?**



after draft, revision after revision: adding one scene, smoothing out another. Dreaming about it, day and night, and with the dream growing slowly, through the years.

Back at the shop, Todd shows me around his office, talks a little more about the mechanics of airboats, including some horror stories about getting stranded far, far out in the marsh. He tells me about the bacopa, a creeping vine that the airboat can skitter over when it's wet, but when it's dried out, it becomes like a gripping net of splayed fingers that snares the boat and will not allow its passage. And then it's time to leave, and for Todd to get back to the little remnant of his weekend. We say our good-byes — and because I still have a few hours left to kill, I take some old back roads, or what I remember from thirty years ago as being back roads.

And for a little while — in the first faint buffer beyond the refuge — things are

somewhat as I remember them. I stop outside one large cotton field and park beneath a giant oak and lean my seat back and nap for a while, sleeping the deep sleep of one whose senses have been overstimulated, and for whom catatonia is now almost an antidote, a recompense for the rigors of having been so charged earlier, so wired. For a little while I dream that the ibises are still soaring above me in waves, but then I sink even deeper, and just sleep.

When I awaken, about an hour later, the north wind has stilled somewhat, and the ibises are still dancing in my head.

Sometimes I think that scientists like Todd might come as close to fulfilling the role of distant observer as anyone here among the living is able. They can look at a delta landscape and rather than fretting about why the wing tips of snow geese are black, can instead evaluate this entire buried, once-upon-a-time bay in terms of tons-of-protein-per-acre as if all of life in this one landscape is but an evolving recipe, a great cauldron slowly simmering through the seasons, as if over the course of only a single day: a great stewing broth of shellfish,

sunlight, vegetation, feldspar, potassium.

**W**HOSE RECIPE, THEN? Who dreamed, and continues to dream, the things that have arisen from this broth? How many infinite ways are there to distribute, then redistribute, these rations, these elements, these nutrients? Pause in the stirring at any one point in the recipe and one story or species might leap up from the creation; toss in another pinch, and something else. No one will ever know or understand or even dream it all; in the end, we can only witness.

What does it take to support an ibis — or ten thousand ibises — when those same tons-per-acre could support instead another story, an equal biomass of sparrows and starlings?

All life is spectacular, and in its brief flash, sacred. But all things being equal, I will choose ibises. ★



Continued from page 89

**DIMMITT:** KDHN-AM 1470 / 12:30 p.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 p.m.  
**FAIRFIELD:** KNES-FM 99.1 / 6:47 a.m.  
**FLORESVILLE:** KULB-FM 89.7 / 1:30 p.m.  
**FORT STOCKTON:** KFST-AM 860 / 12:55 p.m., KFST-FM 94.3 / 12:55 p.m.  
**GAINESVILLE:** KGAF-AM 1580 / 10 a.m.  
**GRANBURY:** KPIR-AM 1420 / 4:05 p.m.  
**GREENVILLE:** KGVN-AM 1400 / 8:10 a.m.  
**HARLINGEN:** KNBH-FM 88.9 / 4:58 p.m.; KHID-FM 88.1 / 4:58 p.m.  
**HASKELL:** KVRP-FM 97.1 / 9:30 a.m.; KVRP-AM 1400 / 9:30 a.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 / 9:35 a.m.  
**HOUSTON:** KILT-AM 610 / between 4 a.m. and 7 a.m. Thur.-Sun.  
**HUNTSVILLE:** KSHU-FM 90.5 / 12:05 p.m., 5:05 p.m.  
**JACKSONVILLE:** KEBE-AM 1400 / 7:15 a.m.  
**JUNCTION:** KMBL-AM 1450 / 7:36 a.m., 12:46 p.m., 5:56 p.m., KOOK-FM 93.5 / 7:36 a.m., 12:46 p.m., 5:56 p.m.  
**KERRVILLE:** KRNH-FM 92.3 / 5:31 a.m., 12:57 p.m., 7:35 p.m.; KMBL-AM 1450 / 5:49 a.m., 12:49 p.m., 5:49 p.m.; KERV-AM 1230 / 5:49 a.m., 12:49 p.m., 5:49 p.m.; KRVL-FM 94.3 / 5:49 a.m., 12:49 p.m., 5:49 p.m.  
**LAMPASAS:** KCYL-AM 1450 / 7:10 a.m., KACQ-FM 101.9 / 7:10 a.m.  
**LAREDO:** KHOY-FM 88.1 / 2 p.m.  
**LEVELLAND:** KLVN-AM 1230 / 12:05 p.m.  
**LUBBOCK:** KJTV-AM 950 / 6:45 a.m.  
**MADISONVILLE:** KMVL-AM 1220 / 7:45 a.m.; KMVL-FM 100.5 / 7:45 a.m.  
**MARBLE FALLS:** KHLB-AM 1340 / 12:20 p.m., 5:20 p.m.; KHLB-FM 106.9 / 12:20 p.m., 5:20 p.m.  
**MARSHALL:** KCUL-FM 92.3 / 6:15 a.m.  
**MCALLEN:** KHID-FM 88.1 / 4:58 p.m.  
**MESQUITE:** KEOM-FM 88.5 / 5:30 a.m., 2:30 p.m., 8:30 p.m. M-Th., 5:30 a.m., 4:45 p.m. F.  
**MEXIA:** KYCX-AM 1580 / 3:15 p.m.; KYCX-FM 104.9 / 3:15 p.m.  
**MINEOLA:** KMOO-FM 99.9 / 5:10 p.m.  
**MONAHANS:** KLBO-AM 1330 / 6 a.m., noon, 3 p.m.  
**NACOGDOCHES:** KSAU-FM 90.1 / 2:45 p.m.

**NEW BRAUNFELS:** KGNB-AM 1420 / 6:52 a.m., 5:24 p.m.  
**ODESSA:** KCRS-AM 550 / 6:05 a.m., 5:15 p.m., KOCV-FM 91.3 / 7:37 a.m.  
**PECOS:** KIUN-AM 1400 / 10:30 a.m.  
**PLAINVIEW:** KVOP-AM 1090 / 7:49 a.m.  
**PLEASANTON:** KBUC-FM 95.7 / noon Sat.  
**ROCKDALE:** KRXT-FM 98.5 / 5:05 a.m.  
**SAN ANTONIO:** KENS-AM 1160 / 6:25 p.m.; KSTX-FM 89.1 / 9:04 p.m.  
**SEGUIN:** KWED-AM 1580 / 7:55 a.m.  
**SONORA:** KHOS-FM 92.1 / 10:13 a.m.; KYXX-FM 94.3 / 2:23 p.m.  
**STEPHENVILLE:** KSTV-FM 93.1 / between 5 a.m. and 7 a.m.  
**SULPHUR SPRINGS:** KSST-AM 1230 / 3:50 a.m., 11:20 a.m.  
**TEMPLE:** KTEM-AM 1400 / 10:20 a.m.  
**TEXARKANA:** KTXK-FM 91.5 / 8 p.m.  
**UVALDE:** KVOU-FM 104.9 / 8:30 a.m.  
**VICTORIA:** KTXN-FM 98.7 / 6:50 a.m.; KZAM-FM 104.7 / 7:10 a.m.  
**WACO:** KWTX-AM 1230 / 7 a.m., 7 p.m. Sat. and Sun.  
**WICHITA FALLS:** KWFS-AM 1290 / 6:15 a.m., 7:45 a.m.

**AUSTIN AMERICAN-STATESMAN'S INSIDE LINE:** (512) 416-5700 category 6287 (NATR)  
**BEDFORD:** K-Meadow, Meadow Creek Elementary / noon  
**VIRTUAL RADIO eTUNZ:** <www.etunz.net> / 10:10 a.m. & 2:10, 4:10 p.m.

"Passport to Texas" is available at no cost to stations across the state. For information fax (512) 389-4450 or write to 4200 Smith School Road, Austin, Texas 78744, e-mail <info@passporttotexas.org>.

This series is made possible in part by grants from



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# TEXAS

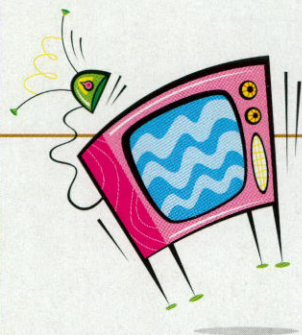
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# SIGHTS AND SOUNDS



THE FRONT LINE OF NEWS AND VIEWS



## T E L E V I S I O N

LOOK FOR THESE STORIES  
IN THE COMING WEEKS:

### June 29 – July 6:

A traditional quail hunt; Matagorda Island geology and ecology; choosing a sleeping bag; tagging and tracking the horned lizard.

### July 6 – 13:

A second life for ships; mallards; a real cliffhanger; coastal paddling trails; the birthplace of President Dwight D. Eisenhower.

### July 13 – 20:

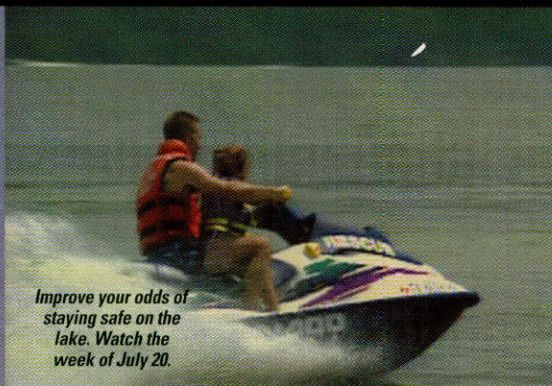
Preserving ancient rock art at Hueco Tanks; sunny CDs; buck fever; seagrasses; history and culture of Caddo Lake.

### July 20 – 27:

Safe boating; titmouse calls; the web of life; wildlife at Brazos Bend; Caprock Canyons State Park.

### July 27 – Aug. 3:

Saving the Attwater's greater prairie chicken; living history in state parks; bigger bass; coyotes; GPS.



Improve your odds of staying safe on the lake. Watch the week of July 20.

### "TEXAS PARKS & WILDLIFE"

Winner of 12 Emmy Awards, our television series is broadcast throughout Texas on local PBS affiliates. In stereo where available.

**AMARILLO:** KACV, Ch. 2 / Sat. 6 p.m.

**AUSTIN:** KLRU, Ch. 18 / Sun. 10 a.m. / Mon. 12:30 p.m. KLRU-TOO, Cable Ch. 20 / Tues. 11 p.m.

**BRYAN-COLLEGE STATION:** KAMU, Ch. 15 / Thurs. 7 p.m. / Sun. 5 p.m., 10:30 p.m.

**CORPUS CHRISTI:** KEDT, Ch. 16 / Sun. 11 a.m. / Thurs. 1 p.m. / Fri. 8:30 p.m.

**DALLAS-FORT WORTH:** KERA, Ch. 13 / Sat. 8:30 a.m.

Also serving Abilene, Denton, Longview, Marshall, San Angelo, Texarkana, Tyler, Wichita Falls, Sherman

**EL PASO:** KCOS, Ch. 13 / Sat. 5:30 p.m.

(rotates with other programs; check listings)

**HARLINGEN:** KMBH, Ch. 60 / Sun. 5:30 p.m.

Also serving McAllen, Mission, Brownsville

**HOUSTON:** KUHT, Ch. 8 / Sun. 5 p.m. / Fri. 1 p.m.

Also serving Beaumont/Port Arthur, Galveston, Texas City, Victoria

**KILLEEN:** KNCT, Ch. 46 / Sun. 5 p.m.

Also serving Temple

**LUBBOCK:** KTX, Ch. 5 / Sat. noon

**ODESSA-MIDLAND:** KOCV, Ch. 36 / Sat. 5 p.m.

**PORTALES, N.M.:** KENW, Ch. 3 / Sun. 2 p.m.

Also serving West Texas/Panhandle area

**SAN ANTONIO & LAREDO:** KLRN, Ch. 9 / Friday noon, Sunday 2 p.m.

**WACO:** KWBU, Ch. 34 / Sat. 3 p.m.

Check local listings. Times and dates are subject to change, especially during PBS membership drives.

## R A D I O

### "PASSPORT TO TEXAS"

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**ABILENE:** KACU-FM 89.7 / 7:04 a.m., 1:43 p.m., 6 p.m.; KWKC-AM 1340 / 6:30 a.m.

**ALPINE:** KSRU-AM 1670 / 9 p.m.

**AMARILLO:** KACV-FM 89.9 / 11:20 a.m.

**ATLANTA:** KPYN-AM 900 / 7:45 a.m.

**AUSTIN:** KVET-AM 1300 / between 5 a.m. and 7 a.m. Sat.; K-Zilker 90.1 / 7:15 a.m., 2:45 p.m.

**BEAUMONT:** KLVI-AM 560 / 5:20 a.m.

**BIG SPRING:** KBST-AM 1490 / 10:50 a.m.

**BRADY:** KNEL-AM 1490 / 7:20 a.m.; KNEL-FM 95.3 / 7:20 a.m.

**BRIDGEPORT:** KBOC-FM 98.3 / 10:20 a.m.

**BRYAN:** KZNE-AM 1150 / 5:45 p.m.

**CANTON:** KVCJ-AM 1510 / 6:40 a.m.

**CANYON:** KWTS-FM 91.1 / noon, 4 p.m., 7 p.m.

**CARTHAGE:** KGAS-AM 1590 / 6:40 a.m.; KGAS-FM 104.3 / 6:30 a.m.

**CENTER:** KDET-AM 930 / 11:55 a.m.

**COLUMBUS:** KULM-FM 98.3 / 5:20 a.m.

**COMANCHE:** KCOM-AM 1550 / 6:30 a.m.

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

**CORPUS CHRISTI:** KEDT-FM 90.3 / 5:33 p.m.; KFTX-FM 97.5 / 5:40 a.m.; KVRT-FM 90.7 / 5:33 p.m.

**CROCKETT:** KIVY-AM 1290 / 7:45 a.m., KIVY-FM 92.7 / 7:45 a.m.

**DENISON:** KJIM-AM 1500 / 11:54 a.m.

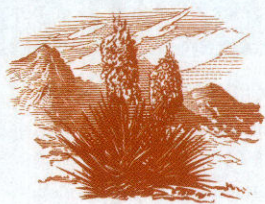
**DENTON:** KNTU-FM 88.1 / 10:58 a.m., 3:58 p.m., 11:59 p.m.

Continued on page 88



# GETAWAYS

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



## BIG BEND COUNTRY

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

**JULY:** Texas Camel Treks, Big Bend Ranch SP, Presidio, call for dates, (866) 6CAMELS.

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

**JULY:** Bouldering Tours, Hueco Tanks SHS, El Paso, Wednesday through Sunday, by prior arrangement, (915) 849-6684.

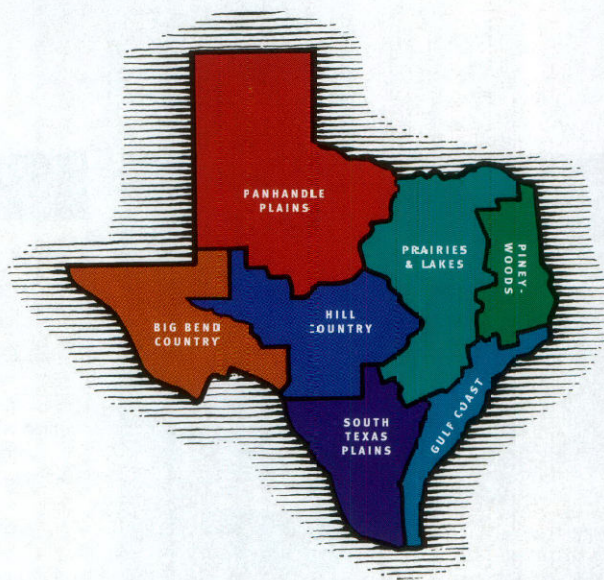
**JULY:** Hiking Tours, Hueco Tanks SHS, El Paso, Wednesday through Sunday, by prior arrangement, (915) 849-6684.

**JULY:** Pictograph Tours, Hueco Tanks SHS, El Paso, every Wednesday through Sunday, by prior arrangement, (915) 849-6684.

**JULY:** Texas Camel Treks, Monahans Sandhills SP, Monahans, call for dates, (866) 6CAMELS.

**JULY:** Fate Bell Cave Dwelling Tour, Seminole Canyon SP & HS, Comstock, every Wednesday through Sunday, (432) 292-4464.

**JULY:** White Shaman Tour, Seminole Canyon SP & HS, Comstock, every Saturday, (800) ROCKART.



For more detailed information on outdoor getaways across the state, visit [www.tpwd.state.tx.us](http://www.tpwd.state.tx.us) and click on "TPWD Events" in the center light blue area entitled "In the Parks."

**JULY 1-31:** Fishing on the Rio Grande, Black Gap WMA, Alpine, (432) 376-2216.

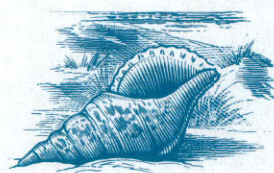
**JULY 1-31:** Maravillas Canyon-Rio Grande Equestrian Trail, Black Gap WMA, Alpine, (432) 376-2216.

**JULY 4-6:** Photo Contest, Wyler Aerial Tramway, El Paso, (915) 562-9899.

**JULY 5:** Madrid Falls Tcur, Big Bend Ranch SP, Presidio, (432) 229-3416.

**JULY 5-6, 19-20:** Guided Tours, Franklin Mountains SP, El Paso, reservations required, (915) 566-6441.

**JULY 12:** Stories of Spirits, Magoffin Home SHS, El Paso, (915) 533-5147.



## GULF COAST

**JULY:** Hatchery Tours, Coastal Conservation

Association/American Electric Power Marine Development Center SFH, Corpus Christi, every Monday through Saturday except holidays, reservations required, (351) 939-7784.

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

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

**JULY:** Plantation House, Barn and Groves Tour, Varner-Hogg Plantation SHS, Wednesdays through Sundays, (979) 345-4656.

**JULY 4:** July 4th Celebration, Lake Texana SP, Edna, (361) 782-5718.

**JULY 5:** Miss Ime's Annual Birthday Celebration, Varner-Hogg Plantation SHS, West Columbia, (979) 345-4656.

**JULY 5, 19:** Summer Night Hikes, Sea Rim SP, Sabine Pass, reservations required, (409) 971-2559.

**JULY 5, 12, 18, 19, 26:** Story Time, Sea Center Texas, Lake Jackson, (979) 292-0100.

**JULY 8-11:** Wilderness Experience Camp, Corpus Christi Botanical Gardens, Corpus Christi, (361) 852-2100.

**JULY 24-27:** Brownsville International Birding Festival, (956) 546-3721.

**JULY 25-27:** East Texas Huntarama Expo Tour & Bucks of East Texas, Beaumont, (936) 967-4629.



## HILL COUNTRY

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

**JULY:** Evening Bat Flight Tour, Devil's Sinkhole SNA, Rocksprings, every Wednesday through Sunday evening, reservations required, (830) 683-BATS.

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

**JULY:** Go Fishing with a Ranger, Inks Lake SP, Burnet, every Saturday, (512) 793-2223.

**JULY:** Stumpy Hollow Nature Hike, Inks Lake SP, Burnet, every Saturday, (512) 793-2223.



**JULY:** Nature Nights, Lady Bird Johnson Wildflower Center, Austin, Thursdays, (512) 292-4200.

**JULY 2:** Stargazing, Wild Basin Wilderness Preserve, Austin, (512) 327-7622.

**JULY 3, 4, 10, 17, 24, 31:** Basic Canoe Skills Clinic, Inks Lake SP, Burnet, reservations required, (512) 793-2223.

**JULY 3, 4, 10, 17, 24, 31:** Devil's Waterhole Canoe Tour, Inks Lake SP, Burnet, reservations required, (512) 793-2223.

**JULY 4:** Fourth of July Parade, Inks Lake SP, Burnet, (512) 793-2223.

**JULY 4:** Tour the Texas State Parks Slide Show, Inks Lake SP, Burnet, (512) 793-2223.

**JULY 4-6:** July 4th Guided Tours, Fort McKavett SHS, Fort McKavett, (325) 396-2358.

**JULY 5-6:** Island Assault 1944 Living History Program, Admiral Nimitz SHS-National Museum of the Pacific War, Fredericksburg, (830) 997-4379.

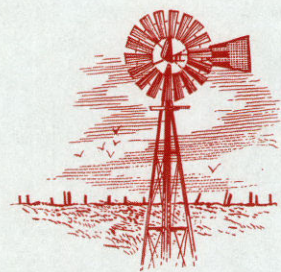
**JULY 11:** Range and Wildlife Seminar, Kerr WMA, Hunt, (830) 238-4483.

**JULY 12:** Back of the Park Store Lunchtime Concert, Inks Lake SP, Burnet, (512) 793-2223.

**JULY 12:** Full Moon Hike, Inks Lake SP, Burnet, (512) 793-2223.

**JULY 13:** Moonlighting, Wild Basin Wilderness Preserve, Austin, (512) 327-7622.

**JULY 26:** 16th Annual Texas International Apple Festival, Medina, (830) 589-7224.



## PANHANDLE PLAINS

**JULY:** History Hike, Palo Duro Canyon SP, Canyon, every Friday, (806) 488-2227.

**JULY:** River Walk, Palo Duro Canyon SP, Canyon, every Thursday, (806) 488-2227.

**JULY:** Worship Service, Palo Duro Canyon SP, Canyon, every Sunday, (806) 488-2227.

**JULY 2:** Canyon Rock, Palo Duro Canyon SP, Canyon, (806) 488-2227.

**JULY 5:** Family Camping and Hiking Skills, Caprock Canyons SP & Trailway, Quitaque, (806) 455-1492.

**JULY 5:** Night Noises, Palo Duro Canyon SP, Canyon, (806) 488-2227.

**JULY 5:** Petroglyph Tour, San Angelo SP, San Angelo, (325) 949-4757.

**JULY 5, 26:** Campfire Tails, Abilene SP, Tuscola, (325) 572-3204.

**JULY 9:** Wildflower Safari, Palo Duro Canyon SP, Canyon, (806) 488-2227.

**JULY 12:** Outdoor Photography, Palo Duro Canyon SP, Canyon, (806) 488-2227.



## PINEYWOODS

**JULY 5:** Campfire Programs, Martin Dies, Jr. SP, Jasper, (409) 384-5231.

**JULY 5:** Pioneer Woodworking Skills, Mission Tejas SP, Grapeland, (936) 687-2394.

**JULY 5, 19:** Interpretive Programs, Tyler SP, Tyler, (903) 597-5338.

**JULY 5, 19:** Guided Nature Trail Hike, Village Creek SP, Lumberton, (409) 755-7322.

**JULY 6:** Mission San Francisco de los Tejas Tour, Mission Tejas SP, Grapeland, (936) 687-2394.

**JULY 6, 13, 20, 27:** Walk on the Wild Side, Martin Dies, Jr. SP, Jasper, (409) 384-5231.

**JULY 11-13:** East Texas Hunt-arama Expo Tour & Bucks of East Texas, Tyler, (936) 967-4629.

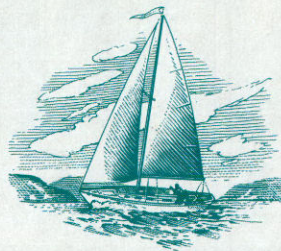
**JULY 11, 25:** Nature Slide Program, Village Creek SP, Lumberton, (409) 755-7322.

**JULY 12:** Miss Ima Hogg's Birthday Party, Governor Hogg Shrine SHS, Quitman, (903) 763-2701.

**JULY 12:** Steam Engine Shop Tours, Texas State Railroad SP, Rusk, (800) 442-8951 or (903) 683-2561 outside Texas.

**JULY 18-20:** East Texas

Hunt-arama Expo Tour & Bucks of East Texas, Lufkin, (936) 967-4629.



## PRAIRIES & LAKES

**JULY:** Historic and Scenic Tours, Monument Hill & Kreische Brewery SHS, La Grange, available by reservation to groups of 10 or more, (979) 968-5658.

**JULY:** Kreische Brewery Tours, Monument Hill & Kreische Brewery SHS, La Grange, every Saturday and Sunday, weather permitting, (979) 968-5658.

**JULY:** Monument Hill Tour, Monument Hill & Kreische Brewery SHS, La Grange, available by reservation to groups of 10 or more, (979) 968-5658.

**JULY 5:** Campfire Sing-Along, Cedar Hill SP, Cedar Hill, (972) 291-5940.

**JULY 5:** Our Scaly-Skinned Friends, Cedar Hill SP, Cedar Hill, (972) 291-5940.

**JULY 5:** Sandcastle Building Contest, Cooper Lake SP/South Sulphur Unit, Sulphur Springs, (903) 395-3100.

**JULY 5:** Cowboy Campfire, Music, and Poetry, Lake Mineral Wells SP & Trailway, Mineral Wells, (940) 327-8950.

**JULY 5:** Fish is Fine Food Cook-off, Texas Freshwater Fisheries Center, Athens, reservations required, (903) 676-BASS.

**JULY 5-6, 13, 19-20, 26-27:** Tours, Fanthorp Inn SHS, Anderson, (936) 873-2633.

**JULY 6, 13:** Kreische House Tours, Monument Hill & Kreische Brewery SHS, La Grange, (979) 968-5658.

**JULY 8-11, 15-18:** Camp Fish, Texas Freshwater Fisheries Center, Athens, reservations required, (903) 676-BASS.

**JULY 12:** Farming Like it Used to Be, Cedar Hill SP, Cedar Hill, (972) 291-5940.

**JULY 12:** Traveling the Trails, Cedar Hill SP, Cedar Hill, (972) 291-5940.

**JULY 12:** Guided Nature Hike, Cooper Lake SP/Doctors

Creek Unit, Cooper, (903) 395-3100.

**JULY 12:** Stagecoach Days, Fanthorp Inn SHS, Anderson, (936) 873-2633.

**JULY 12:** Kids' Wilderness Survival, Lake Mineral Wells SP & Trailway, Mineral Wells, reservations required, (940) 328-1171.

**JULY 12:** Dragonflies Nature Walk, Heard Natural Science Museum & Wildlife Sanctuary, McKinney, (972) 562-5566.

**JULY 12:** Bird-watching Walk, Heard Natural Science Museum & Wildlife Sanctuary, McKinney, (972) 562-5566.

**JULY 19:** Garden Walk, Texas Discovery Center, Dallas, (214) 428-7476.



## SOUTH TEXAS PLAINS

**JULY:** 3rd Annual Texas Buffalo Soldier Heritage Month Celebrations, San Antonio, every Saturday, (210) 226-0502.

<b>SP</b>	State Park
<b>SHS</b>	State Historical Site
<b>SNA</b>	State Natural Area
<b>WMA</b>	Wildlife Management Area
<b>SFH</b>	State Fish Hatchery



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Reg Price

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MK-6 Control Unit (shown)

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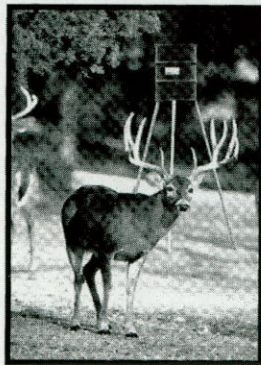
MK-6SolarControl Unit (not shown)



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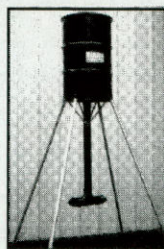


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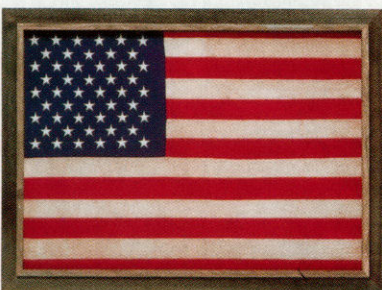
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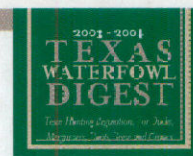
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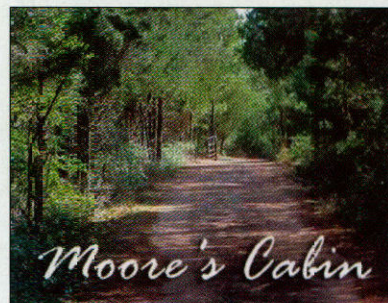


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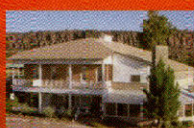
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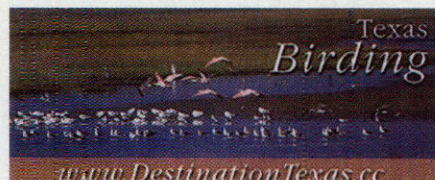
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