

TEXAS SHORES

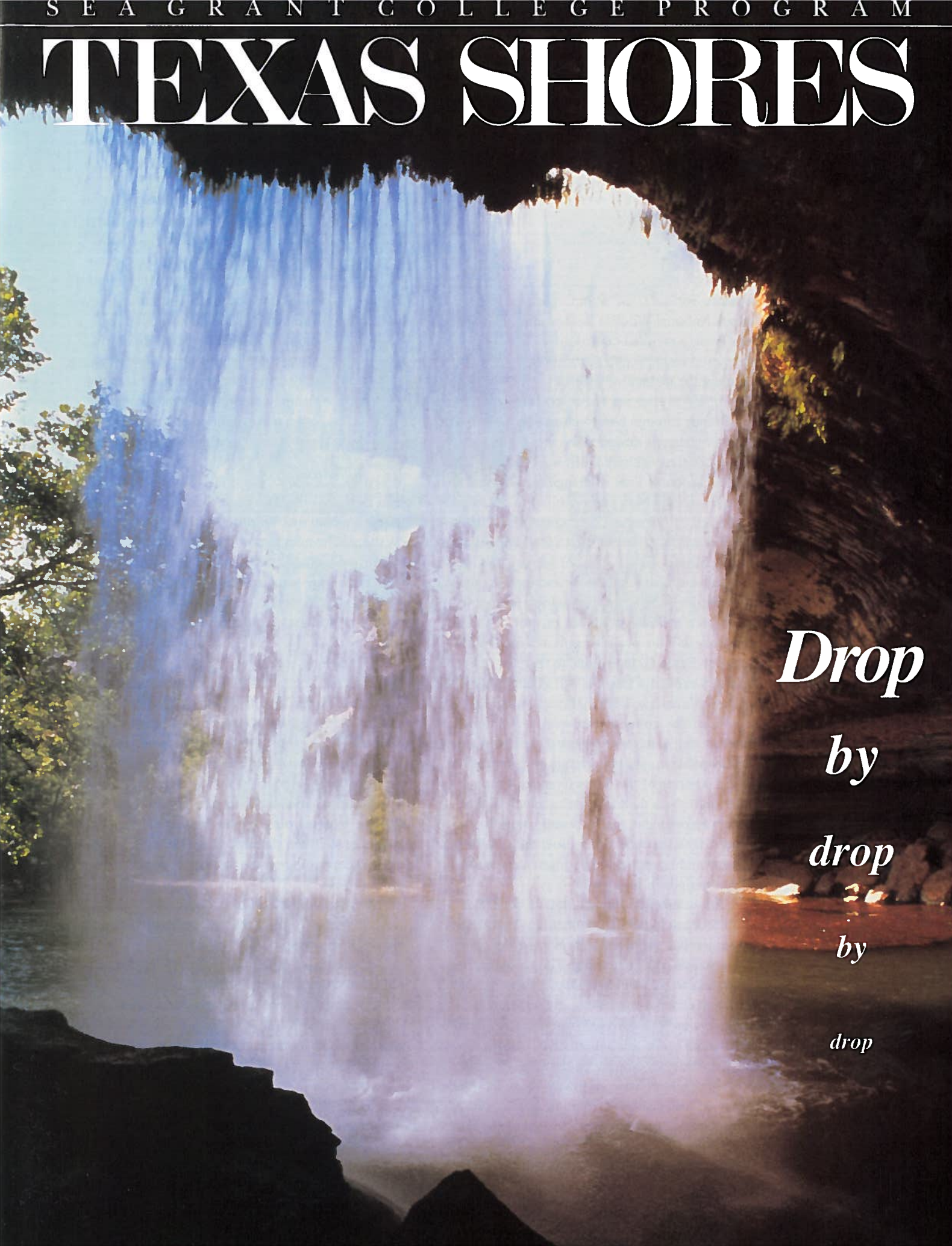
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Public-private partnership leads restoration effort for the Bahia Grande

BROWNSVILLE, TX — A major public-private partnership has been formed to restore the Bahia Grande (*Texas Shores* Summer 2002) to a functional wetland again. The U.S. Fish & Wildlife Service (USFWS), Laguna Atascosa National Wildlife Refuge and Ocean Trust, a national non-profit conservation and research foundation, are leading the restoration project.

The USFWS proposes to re-flood the Bahia Grande through construction of a channel or channels designed to take advantage of the normal tidal flow in the area. This will allow adequate tidal exchange of salt water to maximize water circulation as well as allow migration of marine organisms into and out of the basin, restore habitat for wintering waterfowl and migratory shorebirds, create additional nursery habitat for finfish and shellfish populations and restore other native wildlife and plant communities, including seagrass beds and fringing black mangrove stands.

Not only will the project result in a biodiversity level in the Bahia Grande equal to that now present at nearby San Martin Lake, it will greatly reduce the blowing sediment problem that is affecting air quality in nearby communities.

Engineering and hydrological studies indicate that under favorable conditions, water may inundate about 6,500 acres of the Bahia Grande. A topographic survey has determined that much of the basin lies below mean sea level and would be inundated with seawater during low tides. Additional acreage would be inundated by high tides, storm surges or periods of high rainfall.

The Environmental Impact Statement (EIS), which was open to public comment in August and early September, proposed four alternatives. The first alternative was do nothing. The second called for diverting water from San Martin Lake through a constructed channel to inundate Bahia Grande. Water also would be diverted from the Brownsville Ship Channel in the third alternative, passing through a relatively straight constructed channel under a bridge over State Highway 48. In the final alternative, both channels would be constructed to achieve the level of circulation desired in the Bahia Grande.

According to the EIS, the proposed flooding of



Bahia Grande — and two smaller, adjacent water bodies, Laguna Larga and Little Laguna Madre — would have a positive, beneficial socioeconomic impact on surrounding communities. Proponents of the project anticipate that land developers will build houses on the northern bluffs, along State Highway 100, overlooking the basins. The report concludes that fishing activity, bird watching and other compatible public uses will have significant beneficial effects on the

local area.

Public comments essentially supported the EIS and the Bahia Grande project, according to Laguna Atascosa National Wildlife Refuge Manager John Wallace. The next step will be a shoreline survey requested by the State Historic Preservation Office.

This survey is on hold since the Bahia Grande currently is flooded as a result of the Pacific storm Marco and an early cold front that stalled over the area.

“Everything is delayed,” said USFWS biologist Ken Merritt, “but at least the water has relieved the dust problem for the surrounding communities. We are in the process of working up a Bahia Grande update for all the agencies now. We can’t apply for the Corps of Engineers permit until the survey is completed.

“I would estimate it will take two to three months to construct even the longest channel once we receive all the clearances and permits. It could be less depending on the number of operators we have on site.”

Merritt said the Port of Brownsville is also working on a Corps permit to construct a channel across its property.

The purchase of the Bahia Grande by the USFWS and the Natural Resources Conservation Service (NRCS) and its incorporation into the Laguna Atascosa National Wildlife Refuge was the starting point for the restoration of Bahia Grande, which was cut off from tidal water in the 1930s with the construction of the Brownsville Ship Channel. The restoration project has the support of the Brownsville-Port Isabel community and national organizations.

In addition to the USFWS and Ocean Trust, *(Continued on inside back cover)*

2 COASTAL LEGEND HENRY HILDEBRAND DIES

The founder of the marine science program at Texas A&M-Corpus Christi and one of



the pioneers of marine environmental research dies just days short of his 81st birthday.

4 LIQUID PARADOX

Walk into your kitchen and turn on a tap. What do you get? Well, duh — water, of



course. But will that always be the case? Today, Texans use about 16.5 million acre feet of water each year for all purposes, from irrigating crops to quenching their thirst.



By and large, we take it

for granted — but there are increasing signals that the well may be shrinking if not running dry.



26 AT THE WATER'S EDGE: CAMERON COUNTY — CATCHING THE BIG ONE

Fishing is big business in Cameron County — both for the commercial shrimp



and for the recreational industries. A 65-year-old fishing tournament is an economic boon to the county as well as area students since the tourney funds scholarships for high school students each year.

SEA NOTES

A public-private partnership is through the EIS phase of a restoration plan for the Bahia Grande. An historical survey is next on the agenda before a



COE permit can be issued. Also in Sea Notes, Rubaba Ismayilova is the third recipient of a Texas Sea Grant State Fellowship. She will spend the next year working with the Texas Water Development Board on analyzing data on water availability and wetland valuation.

FRONT AND BACK COVER — TEXAS DEPARTMENT OF TRANSPORTATION

TEXAS SHORES is published quarterly by the Texas Sea Grant College Program in an effort to promote a better understanding of the Texas marine environment. Sea Grant is a partnership of university, government and industry focusing on marine research, education and outreach. Nationally, Sea Grant began in 1966 with the passage of the Sea Grant Program and College Act. Patterned after the Land Grant Act of the 1860s, the Sea Grant concept is a broad-based scientific effort to better the world for all those living in and out of the sea.

In 1968, Texas A&M University received the distinction of being named among the nation's first six institutional award recipients. Three years later the school was designated a Sea Grant College. The university has a rich heritage of oceanography research dating back to 1949 when the program began. In addition, there is an ongoing program to get marine information to the public.



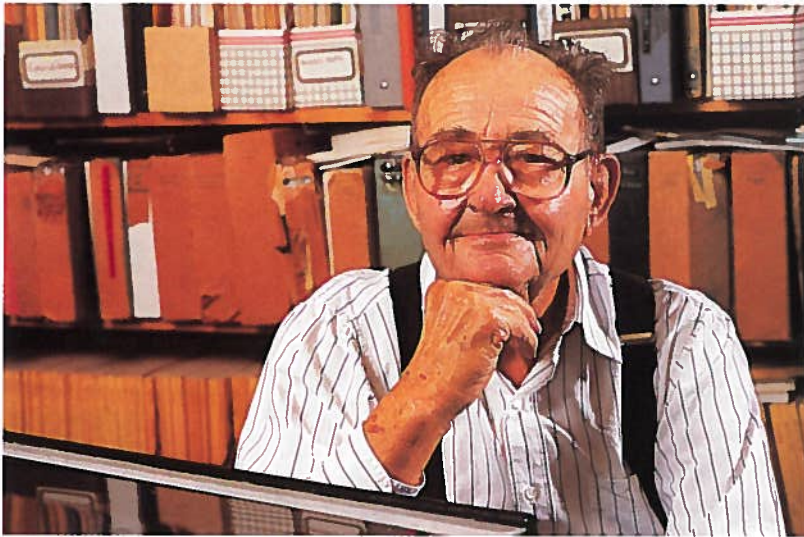
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Coastal legend Henry Hildebrand dies

CORPUS CHRISTI — The quiet, constantly disheveled scientist who valued fieldwork more than books, discovered the fabled breeding grounds of the world's most endangered sea turtle and who conducted pioneering research on many facets of



Texas' unique marine environment is gone.

Dr. Henry H. Hildebrand III died here on August 14, five days short of his 81st birthday. Hildebrand was living in a nursing home at the time and had suffered a series of strokes. He also suffered from kidney ailments.

Close to 100 friends, family colleagues and former students gathered to celebrate Hildebrand and his life during a memorial service Sept. 12 at the Natural Resources Center on the Texas A&M-Corpus Christi campus.

Dr. Wes Tunnell, a friend and colleague of Hildebrand for more than 30 years, said the venue was the most fitting location to remember a man who founded the university's marine science program and whose research is still cited in scientific literature a half century after it was completed.

"I felt very obligated to do something for

him," Tunnell said of the decision to hold a memorial service. "Interestingly, the family asked us if we would do something for him because the university was such a part of their life. They actually lived on campus when Henry began teaching here. There were two or three small wood frame houses back in the 1950s, 1960s and early 1970s that were left over from Navy days. They lived in one of those houses on the front of the island. His daughter and his son remembered very well their days in early life here on the island, so it meant a lot to them that we would put on a memorial service here."

Hildebrand's dress — often compared to that of a janitor — was a source of light humor for the legions of students he inspired. His ill-fitting slacks, misbuttoned shirts and tousled hair belied a razor sharp mind and vast intellect that allowed Hildebrand to speak at length about any number of topics.

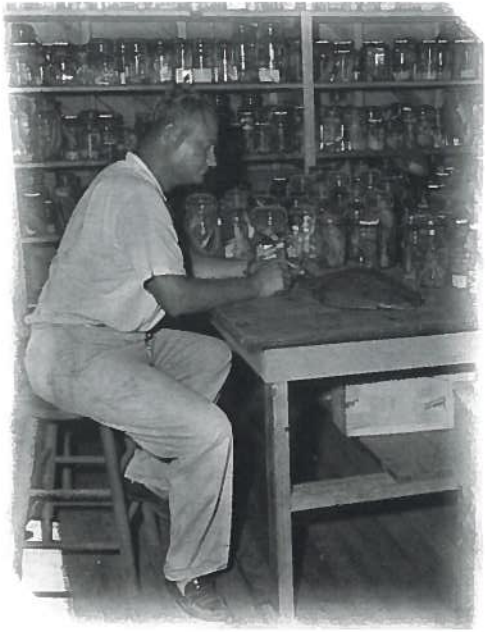
"Henry is a classic example of the certifiable genius who does not care what people think of him or the way he dresses," Tunnell said in a profile of Hildebrand published in the Spring 2002 issue of *Texas Shores*."

Tunnell, director of the Center for Coastal Studies and associate director of the Harte Research Institute for Gulf of Mexico Studies, referred to Hildebrand as "the Neptune of the sea. He was like a walking encyclopedia of the ocean. He could talk about anything in the ocean."

Hildebrand conducted groundbreaking research on the Laguna Madre in Texas and Mexico — work that became the basis for most of the research that has been conducted by other scientists since then.

He also studied the shrimp grounds in the western Gulf of Mexico, harmful algal blooms, oil and tar on beaches, oyster shell dredging and saltwater dumping by oil companies into Texas streams.

Hildebrand's research was not limited to



Henry Hildebrand in a lab at The University of Texas Marine Science Institute in 1955.

Texas or even the United States. He studied the king crab fishery in the Bering Sea and the cod fishery at Ungava Bay in Québec, and his trips to Mexico and Central America were legendary.

One of his greatest accomplishments was finding the nesting beach of the Kemp's ridley sea turtle at Rancho Nuevo, in the Mexican state of Tamaulipas. For decades the nesting habits of the smallest and most endangered sea turtle had been a scientific mystery.

"I spent considerable time searching for that beach in Veracruz and Tamaulipas," Hildebrand told *Texas Shores* in 2002.

Henry Hildebrand was born in Fowler, Kan., to a high school teacher and a teacher-turned-housewife. From the time he entered high school, Hildebrand was interested in zoology and fisheries because of the influence of his uncle, Samuel Hildebrand, who is considered one of the greatest ichthyologists ever produced by this country.

Hildebrand received a bachelor's degree in zoology from the University of Kansas and a master's degree in fisheries from McGill University in Montreal. He moved to the coastal bend of Texas to work on his Ph.D. at The University of Texas Marine Science Institute. He received his doctorate in 1954 and called

the area his home until his death.

Hildebrand's passion for hands-on teaching in the field remains the model used for the curriculum at Texas A&M-Corpus Christi, which was the University of Corpus Christi when he began teaching there in the mid-1950s. Through his approach to biology, Hildebrand heeded the call of 19th Century Swiss scientist Louis Agassi: "Study nature, not books."

"I credit him with being the one who started the marine science program on this island in 1957," says Tunnell. "We owe our legacy to him. He developed a hands-on, field marine biology program. We continued to pattern that when I came in here in 1974 and still today our fame is this hands-on, get-out-in-the-field approach to marine science. Henry started that.

"For our university, his passing is a real milestone," Tunnell said. "He donated his entire library to the university. It filled about four rooms and five closets in his house."

Hildebrand's writings, notebooks and collections will be housed in the university's archives, while most of his books and journals will go to the Center for Coastal Studies and the Harte Research Institute.

His remaining books will be given to Mexico and most likely shared between coastal universities in the states of Tamaulipas, Veracruz and Campeche.

"One of his passions was trying to help out people in Mexico," said Tunnell.

A scholarship fund honoring Hildebrand that was established a couple of years before his death recently achieved "endowed" status. Anyone wishing to contribute to the fund can do so by making checks payable to Texas A&M-Corpus Christi and mailing them to the Dr. Henry H. Hildebrand III Scholarship Fund, c/o Dr. Wes Tunnell, Texas A&M-Corpus Christi, 6300 Ocean Dr., Corpus Christi, TX 78412.

For more information, contact Gloria at (361) 825-2736.

*'We owe
our
legacy
to him'*





Liquid Paradox



BY JIM HINEY

With a flash and a bang — or the wave of an almighty hand, whichever you prefer — the heavens and Earth came into being, along with all of the water that would ever be here.



Barring a technological advancement that allows humans to inexpensively combine two hydrogen atoms with one oxygen atom, what we have is what we've got.



That's no big deal, right? Look at a globe or world map sometime. A little more than 70 percent of the planet's surface is colored the cool blue of water. We live on a water planet.

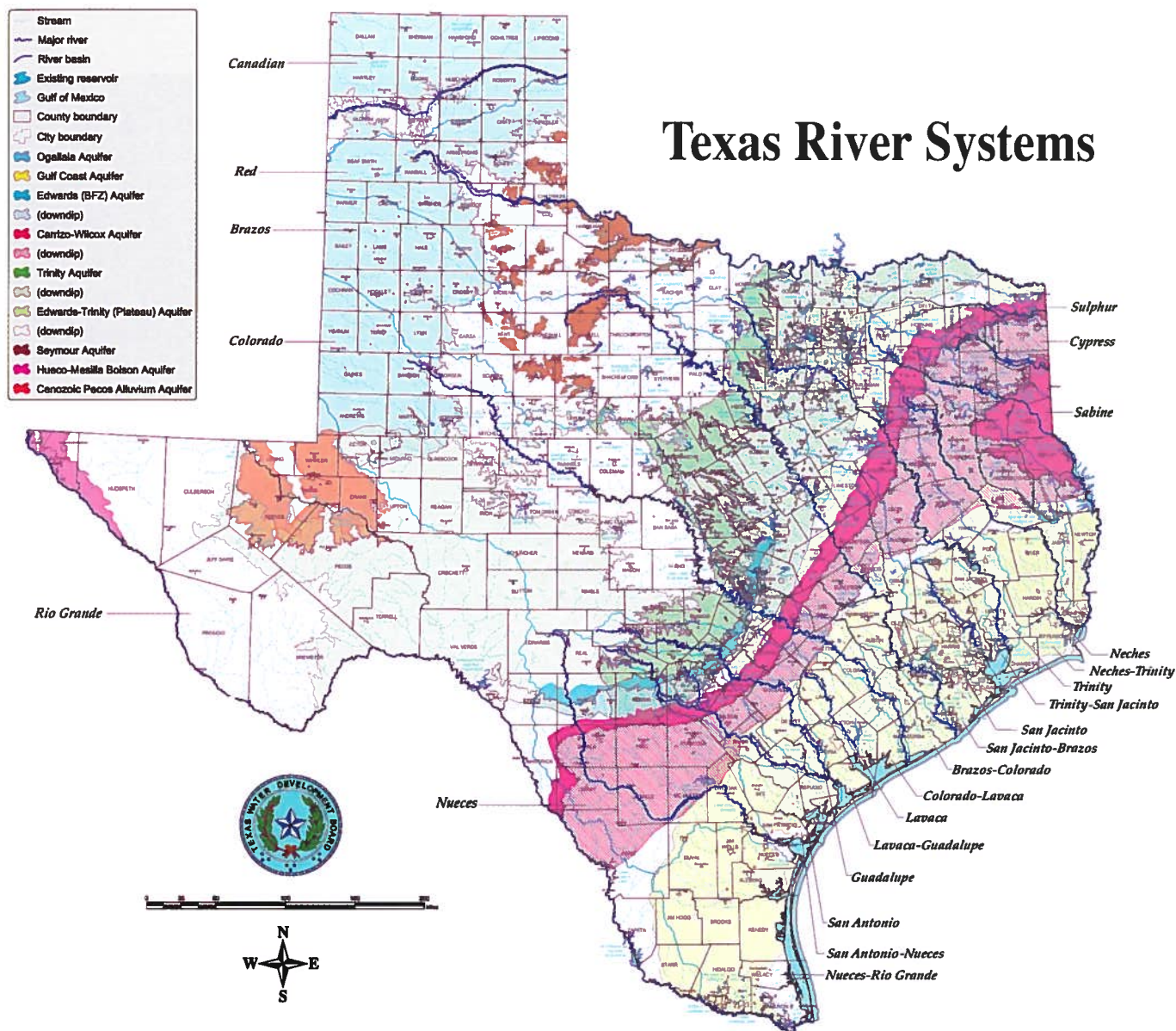
“That's one of the ironies about water,” says Dr. George Ward, one of the state's leading hydrologists and water researchers. “It's true, we've got a lot of water on the surface of the Earth. But the issue is how much of that water is useable by man?”



“Unfortunately, most of that water is contaminated from the standpoint of consumption by terrestrial organisms because it has too many dissolved



Texas River Systems



solids (saltwater),” says Ward, associate director of the Center for Research in Water Resources at The University of Texas. “Instead, you have to focus on the freshwater resources. If you remove the freshwater that is locked up in the polar ice caps and permanent glaciers, and you remove the freshwater that is locked up in the deep formations of the Earth that are inaccessible by man, what you are left with is a minuscule amount. Now you further reduce that minuscule amount by the freshwater that is located in the major lakes of the world—the Great Lakes in this country, Lake Victoria in Africa and so forth — what you are left with is a teeny fraction. Then you have to recognize that most of

that water is to be found in the major river systems—the Amazon, the Congo, the Niger, the Mississippi, the Columbia—and we’re not even talking about Texas yet. Texas doesn’t have any of that water. We’re dealing with a very, very minuscule portion that turns out can be greatly influenced on a year to year basis just by what happens in the atmosphere. That’s no surprise. That’s why we deal with droughts and floods in this state. We are extremely sensitive to it. So the fact is, when you start focusing in upon water that is useable and accessible by mankind, we no longer have a water planet: This is a desert planet.”

In Texas, freshwater courses through

almost 200,000 miles of streams and rivers, and bides its time in 212 major reservoirs before flowing without fanfare into seven major estuaries. Other supplies wait to be tapped in giant underground pools or aquifers.

Early settlers appreciated the importance of freshwater. Native Americans and European settlers chose camp and settlement sites near reliable sources of water. The best farm and ranch land was that which had a lake, stream or river nearby.

“Perhaps no other natural resource in Texas has evoked more emotional debate, nor has been more coveted or fought over throughout Texas history,” says Dr. Larry McKinney, the Texas

Parks and Wildlife Department's (TPWD) senior director for water policy. "Water. Oil pales beside it, and the value of the land itself is measured by it. Texas differs little from many western lakes in this regard. Water not only has been the definer of our natural setting but the great limiter of growth and development.

"Until you see a map on which vegetation, cities and roads have been stripped away, leaving only the remaining natural topography, you cannot fully appreciate how much water dominates the state. It is the great integrator, linking and melding our 11 distinctive ecological regions. Such a map is even more impressive when you include the vast quantities of water hidden beneath the ground in a system of intermeshed aquifers. The influence of the state's nine major and 16 minor aquifers has been subtle and often unrecognized, except for the unique and spectacular expression of the Edwards Aquifer as seen at Comal and San Marcos Springs.

"Ever since the first settler forded a river and stepped onto Texas soil, water has been the magic fluid shaping the state's development. Rivers and bays were the first Texas highways; every great city in the state grew where it did because of water. Water nurtured wildlife and the land."

But humans civilized the state and technology brought running water into homes, easy access to clean water soon led people to take freshwater supplies for granted — to the point where wasting it became the norm.

As Flying Hawk (1852-1931), an Oglala Sioux chief, noted near the end of his life, "Indians and animals know better how to live than white man: nobody can be in good health if he does not have all the time fresh air, sunshine and good water.

By and large, humans do not have to work to get water anymore. We take it



Decreased freshwater inflows combined with drought can have devastating effects on wetlands, like the one above near Sabine Pass. At right, the majority of groundwater pumped in Texas goes to irrigating crops.



for granted, like old friends who are always there when we need them. Turn a tap and it comes rushing forth, without much thought.

It has been said before in these pages but it bears repeating: There is no life without water, just ask the Martians.

Water is so painfully valuable that nothing on Earth can survive long without it, yet it can be had for pennies, even fractions of pennies, per gallon. It's like going to Fort Knox, plopping down \$2 and asking for five pounds of gold.

Couching his comparison in terms of another highly valuable commodity,

Ron Kaiser believes "water is like diamonds and its value comes down to scarcity.

"If diamonds were as plentiful as water, we'd wonder who needs diamonds?," says Kaiser, professor of water policy and law with the Texas Water Resources Institute at Texas A&M University. "When water is plentiful, we don't worry much about it. It doesn't pop up on the policy radar screen, it doesn't pop up in terms of research emphasis.

"But you can't live without water," he continues. "We can live without oil and gas — our lifestyles may be different — but we can live without

them. We can live without love, but we can't live without water. It is truly the kingpin resource."

This liquid paradox prompted founding father Ben Franklin to observe, "When the well's dry, we know the worth of water."

Today, Texans use about 16.5 million acre feet of water annually for all purposes, from irrigating crops to quenching their thirst on a hot August day. An acre foot is the standard unit of measure when it comes to large quantities of water. As the term suggests, an acre foot is the amount of water needed to cover an acre of land to a depth of one foot, or about 326,000 gallons.

Already the resource is in peril. The Nile River in Egypt, the Yellow River in China and the Colorado River that meanders through Colorado and Arizona are so overused or diverted that little, if any, freshwater makes it to the sea. Increasing demands for Texas' surface water has river authorities vying with other users for whatever available water remains in the state's waterways.

In one case, the Guadalupe-Blanco River Authority (GBRA) is opposing an application for rights to 1.15 million acre feet of water in the Guadalupe River filed by an environmental group — the San Marcos River Foundation (SMRF). SMRF wants to leave the water in the river so it can provide freshwater inflows that will keep San Antonio Bay's estuary healthy. The GBRA wants the water so it can sell it to the city of San Antonio.

Probably the best known poster child for ongoing water wars in Texas is the dispute between the United States and Mexico over Mexico's 1.5 million acre-foot water debt, which has accrued since the mid-1990s. That debt is at least partly responsible for the Rio Grande's waters failing to reach the Gulf of Mexico at times during the past three years and has caused an uproar among American farmers whose crops are dying because there is not enough water in the Rio Grande to go around.

Under a 1944 treaty, the two countries share equally storm water runoff



The Rio Grande has stopped flowing into the Gulf of Mexico (left) several times since 2001. The photo at right shows its normal flow. Increased human diversions,

into the Rio Grande. The treaty also specifies that water deliveries from six Mexican tributaries to the Rio Grande will be split between the two countries, with Mexico receiving two-thirds of the water and the United States receiving the other one-third. That one-third share is supposed to average 350,000 acre feet per year over a five year cycle.

"Since the end of 1992, those volumes have not met the 350,000 acre foot average, so a deficit has been accrued," says Sally Spener, public affairs specialist with the International Boundary and Water Commission (IBWC). The IBWC is the bi-national agency responsible for applying the boundary and water treaties between the United States and Mexico, and settling differences that arise in their application.

Between the end of 1992 and Aug. 30, 2003, the Mexican water debt grew to 1.47 million acre feet, or about 480 billion gallons. The Mexican govern-

ment claims an ongoing drought has prevented the country from meeting its treaty obligations.

American officials are, to say the least, skeptical.

"While there have certainly been dry years during that period, it is clear to the United States from our analysis of the situation that Mexico could have done much more to release water from its dams to the Rio Grande, so it is a question of how Mexico managed its water system as well as suffering through some dry years," Spener says.

Mexico has already delivered more than 300,000 acre feet of water thus far in 2003 and there is every expectation that it will meet its 350,000 acre-foot target by the end of the year. But even if the country continues to deliver its quota of water, the 1.5 million acre foot deficit remains.

Mexico hopes to increase its water deliveries by implementing several



Mexico's unpaid water debt and exotic plants that clogged the river channel are blamed for decreasing the river's flow.

conservation measures along the Rio Conchos basin. The Rio Conchos, which comes out of the state of Chihuahua and enters the Rio Grande in the Big Bend area, is the largest of the six Mexican tributaries named in the 1944 treaty. There are a number of reservoirs located in the river's basin and much of the water is used for crop irrigation.

"There is a lot of waste and inefficiency in the way they are irrigating in the Rio Conchos basin," says Spener. "By improving the water delivery system for irrigation, there is going to be water that will be conserved. The expectation is that the conserved water will increase the amount of water in the Rio Conchos, allowing more water to enter the Rio Grande."

The conservation measures include lining open irrigation canals to prevent water seeping into the ground, transporting water through pipes when possible to decrease the effects of evaporation and utilizing drip irrigation.

Heavy storms upstream of the two international reservoirs on the Rio Grande — Falcon and Amistad — could help Mexico get out of its water dog house. The treaty provides that all water debts are cancelled when both reservoirs are full.

The United States must rely on Mexico's good intentions in paying off the debt because the treaty lacks any teeth to require payment. Each country operates under the honor system.

"Treaty law is based on the idea that the treaty is binding on all parties and there will be a good faith effort on the part of all parties to comply with the treaty provisions," explains Spener. "That is the basis under which this treaty has been operating"

There are a few high-level political approaches — what Spener characterizes as "diplomatic carrots and sticks" — that might prompt Mexico to pay its water debt. She declined to discuss the specifics of those approaches citing the

confidentiality of diplomatic communications.

Kaiser is less convinced that the debt will be repaid soon.

"The honor system works well when you have plenty of resources. Unless you have some punitive measures beyond the treaty, when you get into scarcity it becomes every person for themselves," he says. "What the parties will do is undertake action to protect themselves. In Mexico, when you look on the Rio Conchos, the states in Mexico have built reservoirs there because they know they are going to get drought so they try to capture storm water flow to protect themselves when they get into drought. That has had a profound impact on the water that is supposed to flow into the Amistad and Falcon reservoirs.

"When you're dealing at that political level, the issues of Texas farmers are really below the radar screen. The bigger issues are how you ensure democracy in Mexico, so the stakes are higher than whether you get some water to grow a few melons."

Buying and selling water rights is big business, particularly in the Lower Rio Grande Basin. The price varies depending on the age of the water right. Older rights command a greater price than new rights, but despite the increasing scarcity of freshwater the average water permit in Texas sells for a paltry \$800 to \$1,000 per acre foot.

By 2050, the state's population is expected to double and the infrastructure needed to support that many people will grow proportionally — putting additional pressure on the state's freshwater supplies.

Those who study the state's water resources predict that by 2050, in the absence of any major changes or technological advancements — adoption of widespread conservation measures or development of low-cost desalinization, for instance — annual demand for freshwater in Texas will be about 5 million acre feet more than the state can supply.

"You can imagine the stress that is going to be put on water resources," says Kaiser.



A fisherman enjoys a quiet outing on Caddo Lake — Texas' only natural lake. The state's new water plan suggests building up to eight new major reservoirs, although state officials believe that there are suitable sites available for just three more.

The status flow

McKinney does not relish the nickname foisted upon him by one of Texas' foremost outdoors writers, but he understands why he's often introduced as "Dr. Doom."

About 10 years ago members of the Texas Outdoor Writers' Association invited him to their annual meeting to talk about the state of water, and it became a yearly ritual, as did the tenor of his comments.

"It seems like every year I went and gave this doom and gloom report about all of the problems I was trying to deal with," he half chuckles. "A writer from south Texas, Jim Foster, started introducing me as Dr. Doom and I've been trying to get away from that nickname ever since, but it seems like every time I talk about water, it begins to go that way."

McKinney's assessment of the state's current freshwater status begins optimistically enough. "Right now we are in pretty good shape," he says before his Dr. Doom alter ego emerges. "But we're riding right on the margin. The best way to describe it is that, if we were doing a risk analysis, we would never let the water supplies of our cities,

industries and municipalities reach this level of risk."

By "level of risk" he means the potential for ecological damage and economic harm.

"We are at risk because we are beginning to eat into the margin of safety that we have as far as the amounts of water necessary to sustain the health of our coastal estuaries — our rivers and bays, he says.

The single biggest natural resource issue we face in this agency (TPWD) is water — it doesn't matter if it's related to fish or wildlife. Ninety-seven percent of Texas may be privately owned, and that is an important factor in conserving wildlife, but surface water — which is not privately owned — is another form of habitat and it is equally important.

"It doesn't matter how good a job we do managing fish and wildlife resources, or how we set bag limits or seasons, if we don't have water both as habitat for the fisheries and as support for wildlife, all we are doing is cutting up a diminishing pie," McKinney gloomily forecasts. "Making sure that fish and wildlife are at the table when we are making water decisions is critical to this agency and critical for the fish and wildlife of Texas."

The problem is that in the fight for freshwater, the environment is fourth in the pecking order. Not surprisingly, humans have first right to ensure their health and safety. Next in line is industry, followed by agriculture and then the environment.

Complicating the situation are the differences between the two major supplies of water and the state's fairly antiquated water laws.

Texans generally receive freshwater from either surface water sources or underground aquifers, which supply what is known as groundwater.

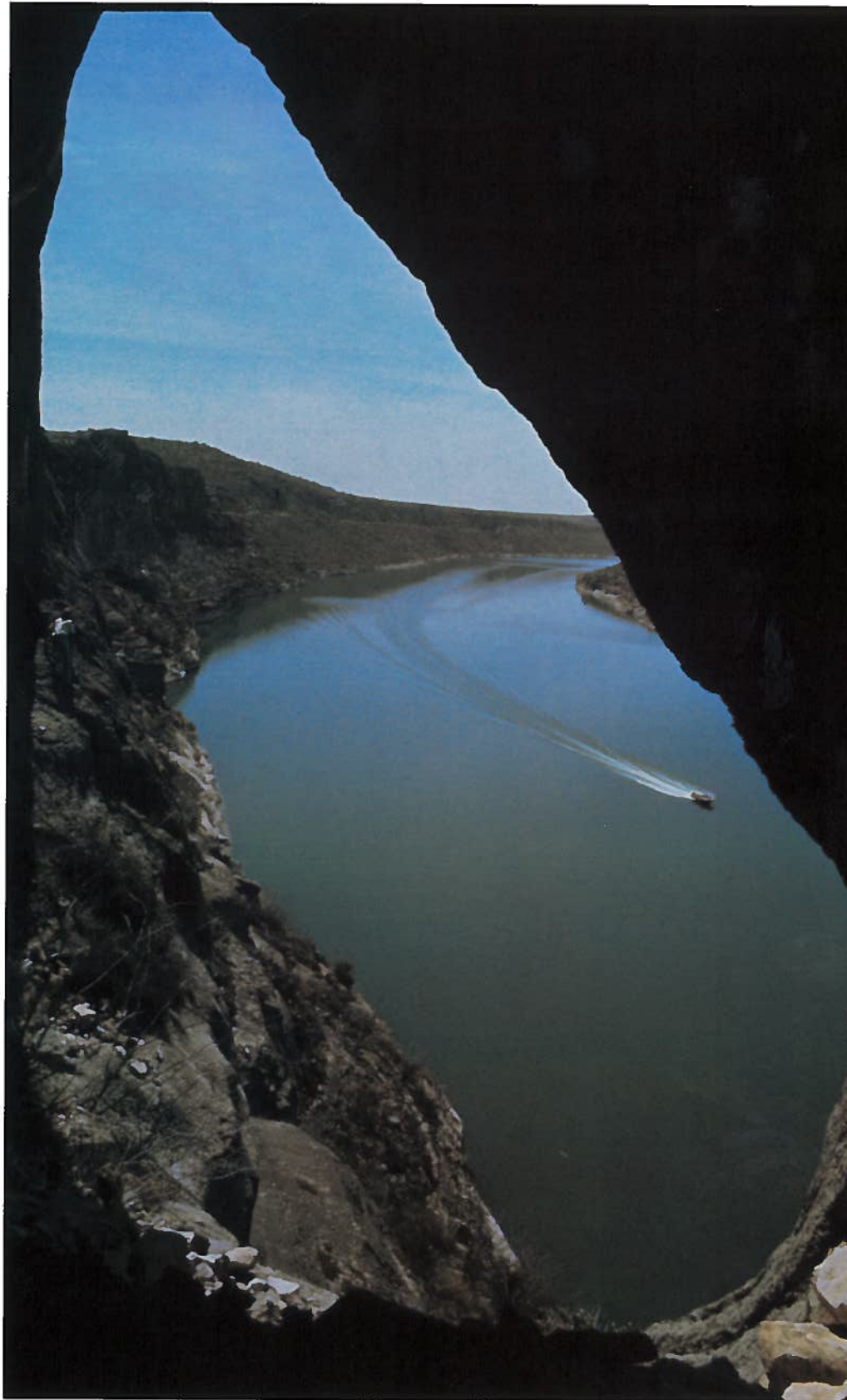
Surface water is defined as "the ordinary flow, underflow and tides of every flowing river, natural stream and lake, and every bay or arm of the Gulf of Mexico, and the storm water, floodwater and rainwater of every river, natural stream, canyon, ravine, depression and watershed in the state."

All of that legalese basically says that surface water is the water in any watercourse that has a defined bed and banks and has a source of supply, which can be rain or even groundwater.

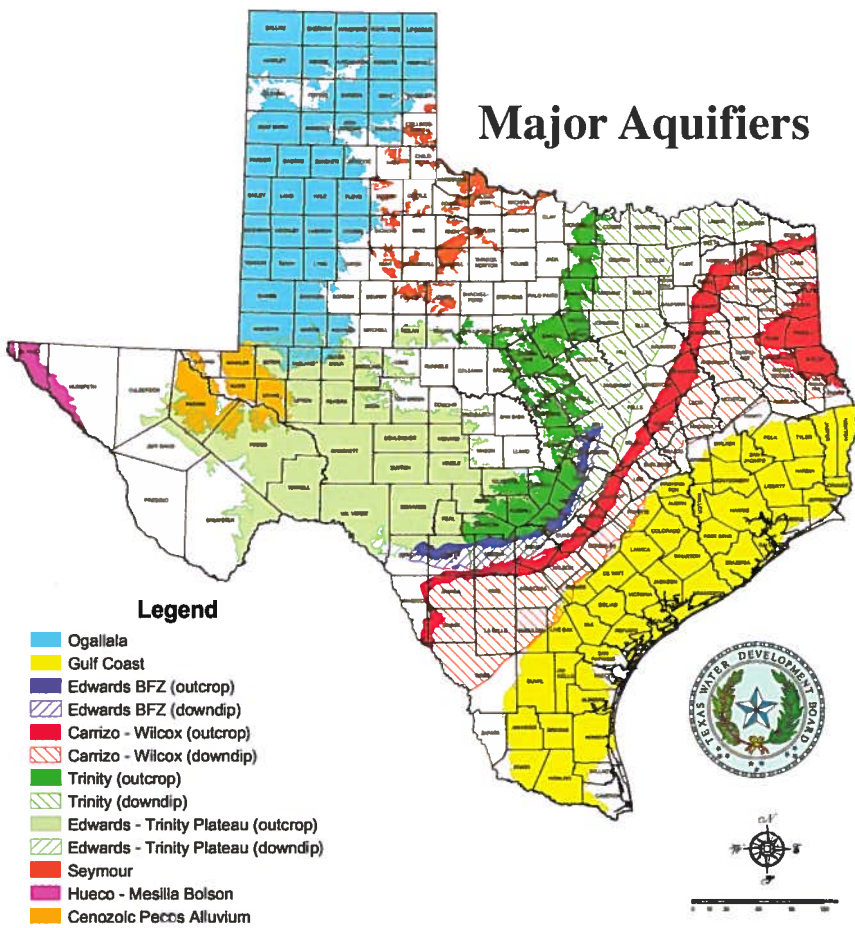
Under the state's water law, surface water belongs to the people of Texas. It is held in trust and its use administered by the Texas Commission on Environmental Quality (TCEQ), formerly known as the Texas Natural Resource Conservation Commission. In most cases, anyone wanting to divert surface water from a stream or river must get permission from the state in the form of a water permit.

Groundwater, on the other hand, is deemed to belong to the landowner. They have the right to pump and capture whatever groundwater they can from beneath their property. Save for a few exceptions established by the courts, landowners are free to pump and use groundwater however they wish.

Not surprisingly, Texas law pertaining to surface water is extensive while groundwater law is relatively meager. It is difficult for the average Texan to understand the tug-of-war for water without a better understanding of the two major sources and the laws governing the resource.



A powerboat glides up the Devil's River arm of Lake Amistad. Most surface water in Texas, including that held in reservoirs, belongs to the people of Texas and is held in trust by the state. However, water in the Rio Grande and that held in the Amistad and Falcon international reservoirs is split between the United States and Mexico by treaty.



the best-known example of an unconfined aquifer in Texas.

A confined aquifer, like the Ogallala, comprises a layer of water sandwiched between two layers of clay. The dense clay hinders most rainwater from seeping into the aquifer — greatly slowing the recharge process if not preventing it altogether.

Water filled the Ogallala during the Pleistocene Era of the last ice age, between 10,000 and 1.6 million years ago, and it has been recharged little since then.

Each type of aquifer comes with its special problems.

As long as storms pass periodically through the recharge zone of an uncontained aquifer, it will recharge quickly and will tolerate most levels of pumping. As Kaiser puts it, “When we’re into normalcy, we generally have enough water to go around.”

But Texans know well the vagaries of nature. Rain falls in clumps, not uniform sheets, across the state’s vast landscape. “Rain doesn’t fall in a very civilized fashion in Texas,” laughs Kaiser.

“College Station gets the same amount of rainfall as Seattle,” he points out. “We get about 38 inches to 39 inches per year. Seattle takes about 225 days of rain to get its moisture. We get ours in 70 to 75 days.”

Drought is an inescapable part of Texas’ hydrological cycle and takes its toll on unconfined aquifers, as can attest San Antonio residents who monitored the Edwards Aquifer level through the news media while enduring stringent water restrictions during most of the 1990s.

Unconfined aquifers also impede development to a certain extent. As Kaiser explains, “You don’t want to do a lot of building in the recharge zone because if you do, you put down impermeable layers on the ground, like parking lots, and water cannot flow into the aquifer.”

Confined aquifers are for the most part oblivious to surface weather and remain in a constant state of drought. Kaiser likens them to a bank account that does not accrue interest payments. “You only put so much money in to start,” he says. “Every time you make a withdrawal, it leaves less money in your account for the future.”

Eating away at the principle of this water account — pumping out water faster than it can be recharged — is called “mining.” Mining has already depleted so much water

What lies beneath



The majority of the state’s freshwater supply — about 60 percent — comes from underground formations known as aquifers. Depending on the surrounding geology, an aquifer can yield water from a thunderstorm last week or from the last ice age.

Nine major aquifers provide almost 97 percent of the groundwater used in Texas, and none is more heavily pumped than the Ogallala in the Texas panhandle. It provides two-thirds of the groundwater pumped annually, more than the other eight aquifers combined.

The other 3 percent of groundwater comes from 20 minor aquifers.

Aquifers fall into two categories: confined and unconfined. An unconfined aquifer has a fairly impenetrable layer of clay beneath it and permeable soil above. The loose soil allows the aquifer to recharge, or be refilled, by rainwater soaking into the ground.

The Edwards Aquifer, which supplies San Antonio with most of its water, is probably

in the Ogallalla that in places there is not enough to economically pump out, particularly in areas supporting irrigated crops. In addition to exhausting the water supply, mining an aquifer can lead to subsidence (as it has in Houston) or allow underground saltwater deposits to migrate into the aquifer (as happened near El Paso).

Groundwater in Texas is governed by a nearly century-old legal doctrine known as the "Rule of Capture." It resulted from a lawsuit filed by a rancher living south of Dallas who claimed his water well went dry because of a neighboring well owned by a railroad company. At the time, locomotives ran on steam power and could travel limited distances before they had to refill their water tanks.

The railroad company set up a pumping station near the rancher's property. The railroad's larger, deeper well caused groundwater to migrate away from the rancher's property and to the pumping station.

In 1904 a court sided with the railroad and ruled that landowners can pump as much groundwater as they want, even if doing so deprives neighboring landowners of water, thus leading the rule of capture to be dubbed, "the law of the biggest pump."

Courts have continually upheld the rule of capture during the past 100 years, imposing few restrictions. Landowners are prohibited from pumping groundwater if:

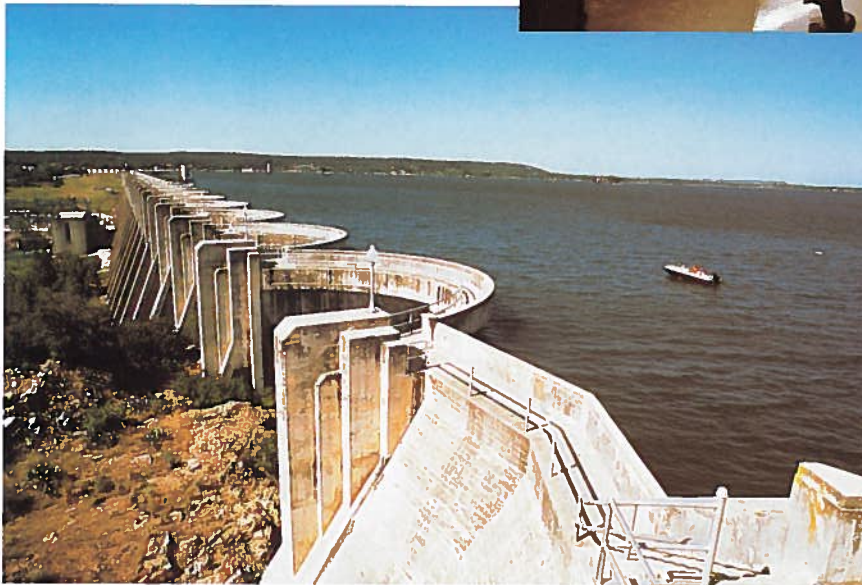
- They are doing so to intentionally harm a neighbor;
- The water is being wasted;
- Pumping causes subsidence;
- They drilled a slant well that crosses adjoining property.

The fundamental flaw in the rule of capture is that it encourages landowners to pump as much water as quickly as they can, before their neighbors get it.

"If conservation is important, this is a perverse and inverse rule," says Kaiser. "It discourages people from conserving."

Aside from handing down a few

pumping restrictions, the courts have been hesitant to change the law of capture. Judges feel that if groundwater pumping is doing harm, then it is the Legislature's job to pass laws



The Lake Buchanan dam (left) impounds freshwater that the Lower Colorado River Authority uses in part to generate electricity, which is monitored in the dam's control room above.

addressing the situation, Kaiser says.

But the Legislature has been loathe to get too involved in the groundwater fight. Legislators believe they have already addressed groundwater concerns through laws dating back to 1949 providing for creation of groundwater conservation districts.

Groundwater conservation districts can be formed in several different ways, but their missions are similar: protect the rights of landowners to pump groundwater while at the same time protecting and conserving the resource.

The districts have become more common in the past decade as thirsty cities look for water sources to augment their surface water supplies. Kaiser looks no further than his own backyard, where Brazos County taps into the plentiful Carrizo-Wilcox aquifer, for an example.

"Living in Bryan-College Station, we have lots of water and we are drought proof," he says. "The bad news is that Houston has discovered it. There are projects in Burlson and Robertson counties

where people have put together plans, leased a lot of land and formed cooperatives so they can sell the groundwater — most likely to Houston or the growth areas north of Austin.”

In the Panhandle, noted corporate raider T. Boone Pickens has formed a cooperative of landowners called Mesa Water, with the intent of supplying groundwater to the city of Dallas or any other buyer he can find.

Groundwater conservation districts cannot prohibit the transfer of groundwater from a rural area to a city, but it can place reasonable restrictions on how much water a landowner pumps.

“The operative word is ‘can.’ They don’t have to,” says Kaiser, noting that only three of 12 groundwater conservation districts in the Panhandle have gone against constituents’ wishes and imposed pumping restrictions. “While the districts have the authority to restrict

groundwater pumping, they often times lack the political will.”

Surface water laws are rooted in what the head of Texas’ water rights permitting system terms an “amalgam of different legal ways of dealing with water rights.”

“We got some of the law from the Spanish colonial times, we had some water rights based on the English system of riparian rights and then the state started issuing permits based on the prior appropriations doctrine,” explains Todd Chenoweth, manager of the Texas Commission on Environmental Quality’s Water Rights Permitting and Availability Section. “This led to a lot of confusion about who had rights and the relative duties and responsibilities of rights between the different systems. That led the Legislature to pass the Water Adjudication Act, which created a mechanism for the state of

Texas to go through and sort out all of these competing claims and decide who had what water rights and move them all into a prior appropriation scheme, with the exception of the Rio Grande Valley.”

The prior appropriations doctrine is a legal system for handling water that arose in the western United States because of water shortages. Under the doctrine, people seeking water rights must apply to the state for a permit, and each permit carries a priority date that establishes the holder’s right to a given amount of water relative to all other permit holders.

People who hold older water rights, which are referred to as senior water rights, get their water before the more recently issued permits, known as junior water rights.

The operating catch phrase is, ‘First in time, first in right.’”



Aerial view of a marina on Lake Travis. The lake was one of five created by the Lower Colorado River Authority to provide water, electricity and recreational facilities to Texans.

What flows above

When it comes to surface water, Texas is one of several so-called “dual doctrine” states that recognize both prior appropriation permits and the rights accorded without permits to landowners living adjacent to rivers, known as the riparian doctrine.

The first water law came to Texas during the Spanish occupation of San Antonio more than 200 years ago. The oldest water permit on record with a priority date is from 1731 and belongs to the San Juan Ditch Water Supply Corp. in San Antonio.

The Mexican government, which won ownership of Texas in 1821 at the end of the War of Mexican Independence, adopted the Spanish legal system. After gaining independence from Mexico, the Republic of Texas recognized property rights, including water rights, granted by the Spanish crown.

That doctrine remained unchanged until 1840, when the Texas Congress adopted the English riparian doctrine, which was somewhat different than the Spanish legal system.

The English doctrine established what Chenoweth characterizes as a “reasonable use test” for water diverted out of a river.

“I have to put that flow to a reasonable use, so I can’t waste the water,” he explains. “To the extent that I can utilize it in a non-consumptive manner or return the part that I don’t use to the river, I’ve got a duty to do that. With riparians, no one has priority over the others. They all share that water.”

A classic example of English riparian law is that of an old English mill by a river. The mill would utilize the flow of the river to turn the mill wheel and the landowner might even be able to divert some water out of the river to run other parts of the mill’s operation, but in both cases much of the water was returned to the stream flow.

“As a farmer I could not divert the water and let it drain someplace so my downstream neighbor lost use of the water,” says Chenoweth.

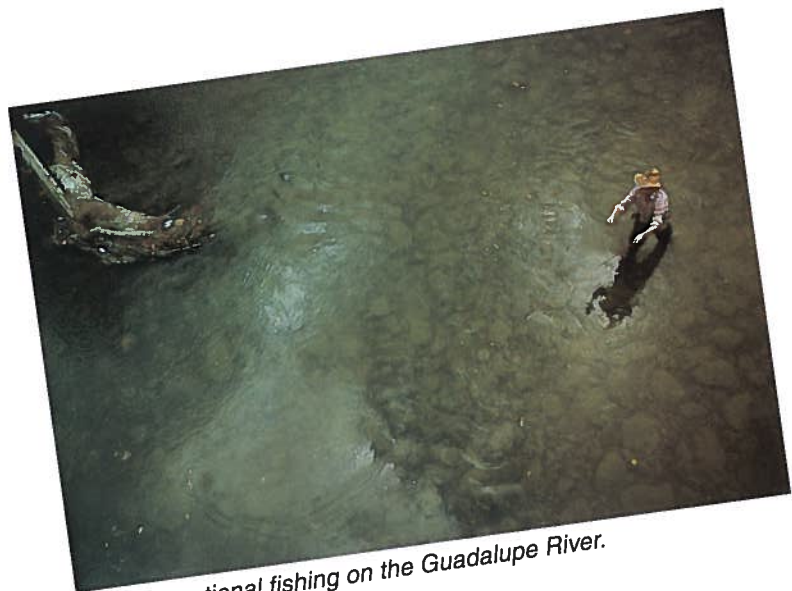
Under the English doctrine, farmers could also divert water to irrigate their crops



Among the many competing uses for freshwater in Texas are livestock production, like that at the LBJ Ranch (above),



crop irrigation near Lake Medina



and recreational fishing on the Guadalupe River.



as long as any water left over was returned to the river for use by downstream neighbors.

In the early 1870s, the Texas Supreme Court noted that the riparian doctrine was not the best means of assigning water rights for irrigation in the more arid portions of the state. Instead, the court suggested that the state Legislature pass into law the prior appropriation system.

Legislators heeded the court's advice and adopted a prior appropriation system around the turn of the 20th Century.

Water rights granted under all three systems survived well into the 20th Century. In fact, the Texas Supreme Court upheld a right to irrigate land under a Spanish grant late as the 1950s. The existence of claims under each system caused regulators and rights holders no end of trouble since the three doctrines were often in effect on the same streams.

The state sorely needed a way to determine who held rights to what water.

Legislators responded with the Water Rights Adjudication Act of 1967, which established an administrative and judicial process for sorting through sometimes competing claims for the same water.

As a result of the adjudication act, more than 11,600 claims involving more than 7 million acre feet of water were filed by 1969. Rights holders had to prove up their claims, including how much water they had historically used. They emerged from the adjudication process with a certificate noting the amount of water they could divert, its intended purpose and a priority date that determined the holder's place in the water line, as it were.

By the late 1980s, the state had finished adjudicating most of the claims, which seems relatively recent for an issue that has existed for a couple of centuries.

"Believe it or not, Texas is ahead of every other Western state," Chenoweth says. "In New Mexico, they don't think they will ever finish their adjudication. Rights to a single river segment will take decades to decide."

The only semblance of truly riparian rights left in Texas belong to landowners who use water from rivers and/or streams to provide for the needs of their households or to water farm animals. Under the

so-called domestic and livestock use, or D&L, landowners can also impound water in stock tanks as long as the tanks hold less than 200 acre feet of water.

In order to get any other water right now, an application has to satisfy several conditions. First and foremost, there must be unappropriated water available in the given stream or river at the particular location where the applicant is going to divert it.

"You have to take what water is available and subtract out all of the existing permits," says Chenoweth. "Then the applicant has to show that they can beneficially use that water — they are not going to waste it — and because we have the authority the commission puts stream flow restrictions on the permits to ensure that water is here for environmental needs, including not only aquatic life but also to ensure that enough water is there to maintain a minimum level for water quality purposes. Within 200 miles of the coast they put in flow restrictions to ensure freshwater inflows to the bays and estuaries."

At one point in time the state could have granted permits for every drop of water in a water course, but no more, says Chenoweth

"I think it would be difficult to permit the last drop in the stream because they would have trouble satisfying one of those conditions," he explains. "Plus, we're not permitting the last drop in the stream if we are leaving water in there for the environment, which we would do under our permitting scheme."

TCEQ places environmental stream flow restrictions on permits granted on locations more than 200 miles from the coast, but those restrictions are not meant to ensure freshwater to bays and estuaries, says Chenoweth. Instead, water is left in the stream to ensure water quality and healthy habitat for aquatic life — both animals and plants.

San Marcos resident Dianne Wassenich takes issue with the current state of TCEQ's "permitting scheme." If the agency's governing commission is committed to making sure that the state's rivers have enough water in them to meet both coastal and inland environmental needs, why did it deny a water permit that would ensure that very thing?



Kayakers navigate the turbulent Guadalupe River. The San Marcos River Foundation is seeking rights to 1.15 million acre feet of water in the Guadalupe to preserve the health of the river and the San Antonio Bay system estuary.

Courting a river



The San Marcos River is an inseparable part of its namesake city.

“It springs out of the ground from the Edwards Aquifer right in the middle of our town,” Wassenich says in a strong, reverent tone that says as much about her feelings for the river as her words do. “It is an exceptionally clear and beautiful spring-fed river. The community has a strong love for the river here. It is the centerpiece of the community. It is a tourism attraction but it is also heavily used by the locals.”

Near Gonzales the San Marcos River joins the Guadalupe River, which flows to the coast and feeds freshwater to San Antonio Bay. The Guadalupe River also receives freshwater from Comal Springs in northwestern New Braunfels via the Comal River.

During dry periods, flows from the San Marcos and Comal rivers account for 90 percent of the freshwater inflow to the bay and one of its most important habitats — the Aransas National Wildlife Refuge. The refuge is internationally famous as the wintering grounds of the largest remaining wild flock of endangered whooping cranes in the world. The cranes rely on crab and other estuarine-dependent species for food to ensure their survival.

“The cranes are a big canary in the coal mine,” asserts Wassenich. “There is a lot of fishing, tourism and birding and a lot of creatures besides the whooping cranes, including humans, that depend on that freshwater. It has great economic impact not only at the coast, but all the way along the river.”

That’s why a small group of people banded together about 17 years ago with the mission of protecting the river through clean-up projects, educational programs and frequent monitoring.

The San Marcos River Foundation (SMRF), frequently referred to as “smurf” for its acronym, has come a long way since then, says Wassenich, now the group’s executive director.

SMRF gradually moved from river clean-ups to taking an advocacy role when increasing pollution became a problem in

the upper part of the San Marcos. That experience served as great education for SMRF because it taught the group which state agencies have jurisdiction over water issues, the limits of the agencies’ powers and where gaps in regulations exist.



“Finally, about 10 years ago, the river foundation got involved in a water rights case that is extremely complex,” Wassenich says. “It dealt with a bed and banks permit, where an entity uses the bed and the banks of the river to transport water downstream.”

When first created, bed and banks permits were intended to allow landowners to pump groundwater from one location and move it to another using the bed and banks of a river, thus saving the cost of building a pipeline.



“There was an attempt to use the San Marcos River as the conduit for some effluent discharged by the city of San Marcos from a wastewater plant,” Wassenich explains.

Under the permit, the city wanted to claim a volume of river water downstream equal to the amount of effluent that was discharged.

“We protested because we saw that as an end run around the water rights system for the state and a very bad precedent to set,” she says. SMRF won an appellate decision in September 2003. The city has appealed the decision to the Texas Supreme Court.

Wassenich characterizes the case as “a real turning point for SMRF. When we went through the original hearing in about 1996 or 1997 it was like going to graduate school in water rights.” After that, SMRF clearly understood the state’s system for water rights allocation and realized that all of our assumptions that the government would somehow make sure that there were minimum adequate flows in rivers were wrong.

“We also learned it might be too late for many Texas rivers, but we had hope that there might be some water available in the Guadalupe River and there was a chance that the San

Antonio Bay estuary might survive if SMRF dealt with it decisively and quickly.”

An amazing couple of coincidences and a radically unique strategy have placed SMRF on the cutting edge of environmental issues in Texas. If successful, SMRF will effectively beat the state over the head with the very water laws that have historically ignored the environment.

In 2000, while still enmeshed in the bed and banks permit case, SMRF members learned that the Guadalupe had dumped less freshwater than normal into San Antonio Bay and neighboring Aransas Bay. Without enough freshwater, the bays were saltier than normal, reducing production of shrimp, crabs and other estuarine-dependent species. The crabs were of particular concern because they comprise almost 90 percent of the whooping cranes’ diet.

SMRF members came to the startling realization that to protect the San Marcos River and ultimately the San Antonio Bay estuary system, they had to attack the status quo across the entire watershed. They concluded that the best way to ensure adequate freshwater inflow to the estuary was to comply with existing state law and apply for a water rights permit in the Guadalupe River. But instead of taking water out of the river, SMRF intended to leave it in.

Their plan had the novel advantage of never having been tried before.

TPWD’s Dr. Larry McKinney remembers the day SMRF members walked into his office and dropped their bombshell.

“At that time, I had given several talks that included the statement that if all permitted water was taken from the Guadalupe, the river would run dry,” recalls McKinney. “I told them they could apply for the permit but there was no water left. They decided to go for the permit to bring attention to the situation.”



The Island Queen motors along Buffalo Bayou in Houston at twilight.

As SMRF was submitting its application, McKinney visited with Bill West, general manager of the Guadalupe-Blanco River Authority (GBRA), about submitting an application for a three-way water rights permit to be shared between TPWD, GBRA and SMRF in an effort to set aside some water for the environment.

By a quirk of fate, the state had just set a benchmark for the minimum freshwater inflow needed to keep San Antonio Bay healthy. In a joint effort, the Texas Water Development Board (TWDB) and TPWD completed extensive surveys of the state’s seven major estuary systems. Part of the surveys determined the estuaries’ freshwater needs. The Texas Estuarine Mathematical Programming model, or TxEMP, lets regulators know the least amount of inflow necessary for an estuary, the greatest amount necessary and the amount that will maximize the fishery harvest.

TxEMP had determined that San Antonio Bay needs about 1.15 million acre feet of freshwater annually to remain productive. SMRF now had a non-arbitrary volume of water to request based on the state’s own research.

Three years earlier, the Legislature had passed Senate Bill 1 (SB1), a landmark in Texas water law. Among its provisions, SB1 changed the way statewide water planning is done. Before SB1, the TWDB came up with a statewide plan and then allocated water flows to municipalities. Under SB1, the municipalities developed their own water plans, using TWDB data. Municipal plans were combined into regional plans, and the regional plans were combined into a state plan that was released in January 2002.

SB1 also gave the environment a seat at the water planning table by requiring resource managers to consider the environmental impact freshwater diversions have on the basin the water came from and the basin receiving the water; and by establishing the Texas Water Trust. The Texas Water Trust is a mechanism whereby water rights holders can, on a permanent or temporary basis, put that water into trust, and it protects that water right from being modified for other uses, for example canceled, and allows those parties who want to do so to dedicate their water rights to environmental protection.

If granted the water rights permit it sought, SMRF intended to place the 1.15 million acre feet into the water trust.

Before any entity could develop a water plan, the state had to determine how much water was available. SB1 mandated that the TCEQ's predecessor agency, the TNRCC, update its water availability models. One of the first rivers studied was the Guadalupe. Low and behold, the model found that the river was not completely subscribed, as McKinney had thought.

There were almost 2 million acre feet of water available for permitting.

Even more startling, the group that was first in line for rights to the water was SMRF.

"You talk about the proverbial you know what hitting the fan," McKinney chuckles. "That's 2 million acre feet of water that might be available to the city of San Antonio when the city was getting ready to pay billions to the Lower Colorado River Authority for a freshwater supply to supplement the Edwards Aquifer. They were looking for water anywhere, yet here was a little conservation group that, following all the rules, was first in line for the permit. All of a sudden GBRA fell off the table with the joint permit and the Legislature got involved."

West could not be reached for comment.



Fishing among the lily pads on Caddo Lake. Ensuring freshwater supplies helps support a recreational fishing industry worth more than \$2 billion annually.

Earlier this year, the TCEQ's commissioners voted to deny SMRF's application, saying that the Legislature had not empowered them to grant water permits for the type of conservation use that SMRF intended.

The commissioners reached their decision despite a finding by the TCEQ's executive director that the agency does have the authority to issue such a permit.

"It wasn't necessarily that the commissioners didn't think SMRF's application was for a beneficial use," says Chenoweth. "They were really troubled by the fact that the use didn't appear in that itemized list of uses set out in the statutes and they thought it was such a unique permit that they felt more comfortable if the Legislature said, 'We've thought about this and you can issue these types of permits.'"

SMRF has appealed the commission's decision, but as of publication time the appeals court has not taken any action.

As for the commission's reasoning behind its decision, Wassenich is politely dumbfounded, although not surprised.

"They've been granting permits to leave water in rivers for close to 100 years, or at least 50 years," says Wassenich. "They have water right permits of all kinds for wildlife, fish and recreation, which amount to water that is left in the rivers."

Following the denial of SMRF's application, the Legislature passed Senate Bill 1639 (SB 1639), which supported the commission's decision by stating that "the Legislature has not expressly authorized granting water rights exclusively for instream flows dedicated to environmental needs or inflows to the state's bay and estuary systems; or other similar beneficial uses.

SB 1639 went on to place a two-year moratorium on new applications seeking instream flows dedicated to environmen-

tal needs, although the bill expressly allows existing water rights holders to amend their permits by adding instream environmental flows.

SB 1639 also mandated creation of the Study Commission on Water for Environmental Flows. The 15-member committee is charged with finding ways to balance the increasing water needs of the state's population with the environmental needs of the rivers, bays and estuaries.

"One of the solutions could be that the Legislature tells the TCEQ that it has the authority to grant these types of permits, or they come up with another solution," says Chenoweth.

SB 1639 put a halt to granting purely environmental permits, but not permits seeking traditional uses of the state's surface waters. Several applications have been submitted for rights to the same Guadalupe River water that SMRF wants, although Chenoweth said he does not immediately know who made the requests.

It is possible that the TCEQ could

grant one or all of the new permits, but that does not mean that SMRF will be left out in the cold. Should the court eventually rule in favor of the group, its permit has the earliest priority date and thus would be senior to any permit that followed.

All SMRF wants is for the court to order an administrative hearing on its application, "which is how things like this should be handled," says Wassenich. "You should go where you can hear scientific evidence, you should hammer out the differences between the two sides and find out the amount of water that is a reasonable amount to set aside for this use.

"We want to make sure that these rivers are not destroyed behind closed doors with nobody understanding what's going on," she continues. "If we neglect the bays and estuaries, the damage is going to travel upstream, all

the way to central Texas along every creek and river way.

"We're just trying to make sure that rivers and bays survive," says Wassenich. "Developers will have to figure out where their water is coming from if they want to develop and it will have to be priced at a level that they are willing to pay, but the cost of that development should not be destroying our Texas rivers and bays without the public understanding what the choice has been."

McKinney sees the flap over the SMRF permit as an opportunity lost.

"The point is that right now in the Guadalupe River there is 2 million acre feet of water that is unappropriated. If the city of San Antonio and the GBRA said they were going to take care of San Antonio Bay and set aside 1.5 million acre feet of water and reserve it for the estuary, they

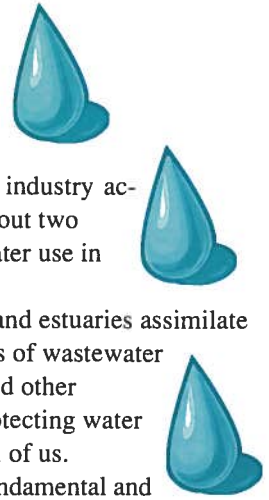
would still have almost 500,000 acre feet of water to allocate to the city of San Antonio and anything else they wanted," McKinney says a bit exasperated. "If you look at the regional water plan for the city of San Antonio, they think they only need 50,000 acre feet a year for the next 20 years in addition to what they are already doing.

"They could all pat themselves on the back and say they had done a wonderful thing, but water is so valuable now that everyone is stepping forward and wants control of that resource. While we talk a lot about taking care of the environment, you have to walk the walk and we are getting to the point where we are going to have to stop talking and start walking. It is going to be a test to see if people will really take care of the environment."



An aerial view of the Rio Grande emptying into the Gulf of Mexico at Boca Chico. Like the Colorado, Nile and Yellow rivers, the Rio Grande may one day stop flowing into the Gulf for good.

Returning the flow



Historically, the needs of the environment have all too often been ignored in the fight for freshwater. It is an oversight that is coming back to vex society in very expensive ways.

- In July 2003, the Chesapeake Bay Commission announced the results of a study that found the states of Virginia, Maryland and Pennsylvania will need to spend more than \$19 billion over the next seven to 10 years to restore the bay's health.
- President George W. Bush and his brother, Florida Governor Jeb Bush, last year called for spending \$7.8 billion over the next 30 years to restore the 2.4 million-acre Everglades.
- Also in 2002, Louisiana's congressional delegation asked Congress to back a \$14 billion plan over next 15-25 years to stop coastal land loss caused by diverting the Mississippi River water and its sediments away from its historical course.

"You don't have to be a tree-hugger, you don't have to be a fisherman or an environmentalist to see the danger. We are talking about real dollars here," says McKinney. "If we make the wrong decision, if we do not make sure that we have sufficient water for the environment, we are talking real money. The cost to just restore the ecological harmony in Louisiana is more than our initial estimate to fund the entire Texas water plan.

"There are real economic conse-

quences of failing to take these things into account. We just can't seem to get that message across. It's just too long term, I guess."

Just as ignored aquatic ecosystems cost enormous amounts of money to restore, properly hydrated systems generate enormous amounts of money. According to McKinney's research:

- About 30,000 commercial fishers catch 100 million pounds of coastal fish and shellfish worth \$200 million each year.
- Texans spend more than \$3 billion annually on trips to fish, swim, boat and water ski.
- Texas is the number-two sport-fishing state in the nation. Freshwater anglers alone spend \$1.9 billion annually in the state.
- Agriculture contributes \$45 billion annually to the Texas economy. Irrigated crops include cotton, wheat, corn, sorghum grain, fruit, hay and rice.
- Texas is the largest livestock producer in the nation. Water use by

the livestock industry accounts for about two percent of water use in the state.

- Texas rivers and estuaries assimilate huge volumes of wastewater discharges and other pollution, protecting water quality for all of us.

"The most fundamental and common element of these important ecological and economic contributors to Texas is water," says McKinney. "That is why one of the Texas Parks and Wildlife Department's most important goals is to assure freshwater inflows to estuaries and instream flows for rivers and streams, and into reservoirs that conserve the health and productivity of those aquatic ecosystems."

In the face of growing demand for freshwater, the only way to ensure that aquatic ecosystems receive their fair share is to somehow increase the available supply. The two best ways to increase the available supply are through conservation or creating more freshwater.

Easy access and low prices have made American complacent about their water supply. While gathering information for the Legislature a few years ago, McKinney found a study that showed the average Texan's monthly home water bill was between \$12 and \$20. The cost has not increased much, if any, in the ensuing years.

"That's all people have to spend for basically all of the



A crowded marina on Lake Meredith, north of Amarillo.

water they want,” he says. “Now you understand why people don’t worry about conservation. If you look at places like Germany, Australia and other places where the cost of water is higher, you find that the degree of successful conservation is directly proportional to the cost of the water. The more water costs, the more people conserve. When we reach a point where we no longer subsidize all of the water that everyone wants, we will start to see conservation.”

Embracing conservation also means changing the way groundwater supplies are exploited, says TWRI’s Dr. Ron Kaiser. He favors managing them for sustainability and in his model the state’s aquifers are treated like trust funds.

“You can deplete your trust fund and when it is gone, it is gone,” Kaiser says. “Or you can use the interest off that trust fund. That means when you have really wet years and you’re building the aquifer back up, you are drawing off the interest. The average amount of water pumped out per year over five years ought to be approximately the amount of water coming in.”

As far as managing surface water is concerned, McKinney says he hopes the study commission on environmental flows created by the Legislature will explore the possibility of a reservation system. Under a reservation system, resource managers would establish an amount of water that must be left in the major river and bay systems to maintain their health. No new permits would be granted after all but the reserve flow had been appropriated.

“It gives tremendous certainty to everybody,” says McKinney trying to sell the idea. “If we had a reservation system, we would not have to condition water permits. People could do what-



A child takes advantage of the refreshing water in Lake Balmorhea, located in the otherwise arid expanse of far west Texas.

ever they wanted as long as that reservation was in place.”

Since science has yet to find a way of inexpensively joining hydrogen and oxygen atoms on a massive scale, desalinization appears to be the best method for creating more freshwater. Technology has advanced to the point where desalinization is not as prohibitively expensive as it was at one time.

Desalinizing seawater, which contains an average of 35 parts per thousand of salt, is still a bit pricey due to the high energy costs involved, but it has become economically feasible for arid countries like Saudi Arabia and coastal cities like Tampa, Florida, to build seawater desalinization facilities.

The real technological breakthrough has come in the area of desalinizing brackish water that contains 5-10 parts per thousand of salt. The cost to desalinize brackish water, pumped from huge aquifers in central and west Texas, rivals that to treat surface water or groundwater. Cities like Wichita Falls and Throckmorton have already installed brackish water desalinization plants and the cities of El Paso and Brownsville are involved in constructing similar facilities.

The growing use of desalinization raises the question of what to do with all of the salt that is pulled from the water?

The new Texas water plan, re-

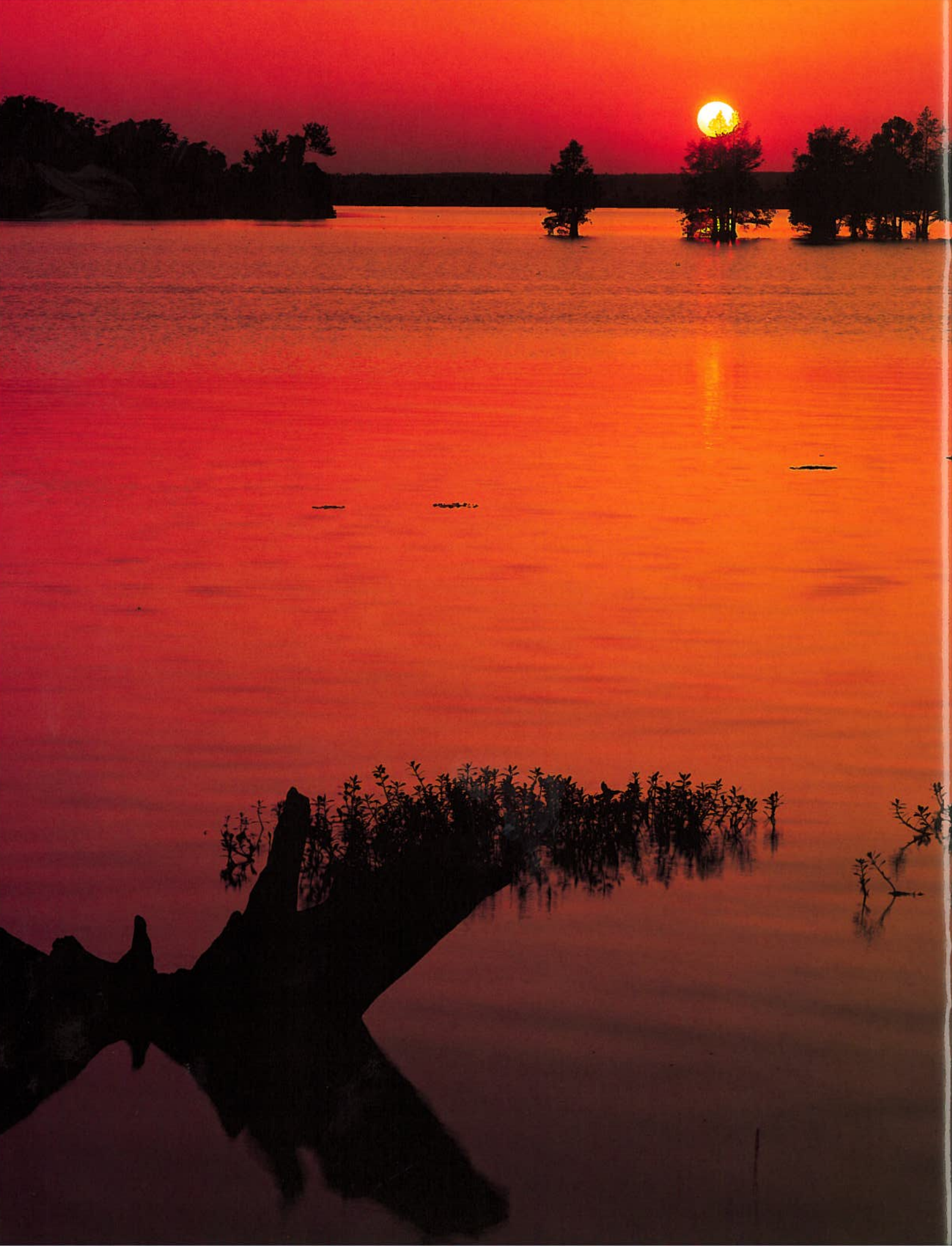
leased in January 2002, mentions the possibility of increasing freshwater stores by building 10 minor and eight major new reservoirs, but that many will most likely never be built. Texas already has more acres of lakes than Minnesota — the land of 10,000 lakes — and the truth of the matter is that there are not 18 suitable places left in Texas to construct reservoirs. McKinney says he believes the state will build at most two or three of the proposed lakes, and those will probably be located in East Texas.

Despite conservation measures and technological advancements, the possibility remains that eventually freshwater supplies will not be able to meet societal and environmental demands. If that becomes the case, who gets the resource?

“When you start running short of water, who is at the top of the pile and who is at the bottom?” asks McKinney. “The top of the pile is, understandably, you and me because we want to have water to drink so we are going to take care of the municipalities — fire, safety and health. The next level down is industry, primarily because of clout and the ability to lobby for the water. Then comes agriculture and then comes the environment after that. Even though the environment is at the bottom of that heap, agriculture is not that far away.

“Quite frankly, right now to some extent agriculture interests are selling water as fast as they can because that is where the money is.”

McKinney believes there should be a natural alliance between the agriculture industry and the environment because the two are so inextricably linked. The success of an



agricultural operation depends on the quality of the surrounding environment.

"But this is such a divisive issue that you have some people in agriculture who, like on a sinking boat, will claw their way up above anybody to get that last breath, but they won't reach down and try to pull anybody up and help each other float," he says.

McKinney has been fighting for the environment's right to freshwater since he joined TPWD in the 1980s. At the time it was not uncommon for him to attend a meeting and hear someone say every drop of water that makes it past a dam and to the ocean is wasted. Environmental consciousness has grown since then, but McKinney admits he still hears the sentiment expressed from time to time.

If fighting for the environment's right to freshwater was McKinney's first battle, his second battle is one of science. "The second battle is getting some agreement on what quantities of water are necessary for maintaining the health of our streams, bays and estuaries," he says. "We have finished estuarine studies and are doing in-stream studies. But even now there are some groups, like river authorities, who are getting ready to spend millions of dollars to challenge those studies and to try to get at that scientific base. They are trying to get into the battle of who gets the water.

"We often talk about this business of water for fish, wildlife and the environment, and that is what the fight is over. That is certainly one part of it and certainly we are very interested in that, but what people don't realize is that all of these rivers, as long as we keep them healthy with water in them and in the bays, are huge wastewater treatment facilities,"

McKinney points out. "We discharge our municipal waste into them at a secondary level and expect our rivers and our bays to finish that treatment so the water can be used again. All of our industries discharge pollution into these rivers at certain levels and TCEQ permits it because they assume the rivers and the bays will assimilate that waste. That assumption is based on the fact that you have enough water in those systems to keep them healthy. If that health is adversely affected, even diminished to some degree, the carrying capacity quickly goes away.

"More than one-third of our bays are now closed to shellfish harvest because they are assimilating all of those wastes," he continues. "We could easily go to half or more. We could close all of our bays to shellfish harvest if we don't make sure that they remain healthy and have enough water coming into them. Do you want to live on the edge of the Galveston bay sewage treatment facility?

"We don't have to go there in Texas," McKinney half pleads. "I've watched Louisiana go there and I've watched Florida go there to some extent in the Everglades, and in Chesapeake Bay. We are sitting here in Texas now with a margin of safety in place — it is small but it is there. We have the science that no one else has, *no one else has*," he repeats for emphasis, "that tells us what it takes to keep these systems healthy. What we have to do now is to actually take that policy step and put it into place and make it happen. It's not that difficult to do."

Recreational and commercial fishing alone generate \$3 billion to \$4 billion annually. Tourism and other businesses dependent on healthy ecosystems pump

even more money into the state's economy. "All we have to do is keep water flowing to the coast to generate that economic benefit," McKinney offers.

"We could get into the situation where our bays are basically wastewater treatment facilities and all we try to maintain is water quality, but is that really what we want to do?" he asks. "The answer is no, we don't want to do that and we don't have to do that. There are too many options open right now that we don't have to go that far."

But human nature often dictates that people need to be slapped across the face with a crisis before they act.

"We wait until the Rio Grande quits running to the sea. We wait until New Orleans subsides below sea level and the Everglades dries up. Then we'll start doing something about it and the price tag goes up," says McKinney with a bit of frustration in his voice. "We have some options right now. Our margin of error is small but it still is a margin. We have the latitude to make some decisions now that will hold that margin or increase it over time.

"Overall, the fish and wildlife of Texas, our rivers, lakes and estuaries, remain healthy and productive, but the warning signs, such as the Rio Grande, are flashing," he believes. "Now is the time to plan how to conserve, safeguard and wisely manage our water resources in ways that will protect human health, allow for economic growth and enhance quality of life. The current choices we face about water planning provide an opportunity to look around and see what our heritage means to us - and what it will mean to our children." ■

Cameron County: Catching the Big One



Boca Chica Beach is a paradise for surf fishermen.

At the water's edge



BY

JEAN O'DETTE

It's early on a late July scorcher of a morning. An old blue Cameron County truck can be seen kicking up dust on coastal Route 4 headed for the beach. Behind the wheel, Cameron County marine agent Tony Reisinger is beginning just another day at work.

Bright eyes shine out from under a faded baseball cap and a pirate's smile widens from within a salty beard of brown and white. His face is tanned and the lines are deepest around the edges of his grin and the corners of his laughing eyes.

As he motors down the desolate road in the early morning light, he makes note of the lush vegetation due to heavy showers that have blessed the Valley lately. "I live in Paradise," says Reisinger. "Coming to work doesn't even feel like a job."

Situated at the southern-most tip of Texas, Cameron County is an oasis for fishermen, tourists, naturalists and more than 260,000 locals who come to bask here every summer. Reisinger who has lived and worked in the Valley for more than 20 years, knows the landscape like the back of his hand.

On the left side of the road, he notices fresh water barrels outside the small settlement of houses that line the otherwise desolate landscape. "Despite the recent rainfall, some residents still have to rely on the county to bring in their fresh water," says Reisinger. "If they had to depend on natural water sources, living out here wouldn't be possible."

Still, the hardships of surviving here have

never kept people from living in the Valley. In fact, Boca Chica (the mouth of the Rio Grande River) has a long history of human activity and settlements – both permanent and temporary.

Like in most other Texas coastal areas, Karankawas were here and survived by gathering berries, hunting and fishing in the Rio Grande. Spanish explorers arrived in the early part of the 17th century and in 1774 granted land rights to settlers in the area.

It was not until the Texas Revolution in 1836 that territorial disputes began to escalate. Ten years later, under the command of General Zachary Taylor, U.S. troops marched into the disputed areas between the Rio Grande and the Nueces Rivers. A temporary fort, called Fort Brown, was built across from Matamoros.

Stopping just before Route 4 turns into the beach access, Reisinger eases his truck onto the side of the road to read a historical marker commemorating the Battle of Palmito Hill, the last battle of the Civil War in Texas. There are other markers in Cameron County recounting battles during the Mexican American War, particularly those for the battle of Palo Alto and the battle of Resaca de la Palma. These battles are also noteworthy because generals such as Lee and Grant who later faced each other in the Civil War fought side by side at Palo Alto and Resaca de la Palma.

"People just don't realize the amount of American history this area contains," says an animated Reisinger. "A lot of the tourists just

drive right through on their way to the beach and never stop to understand the history of this place.”

As the road ends and the beach begins, the waves hitting the sand under a hot sun come into view. As the county truck turns south down the packed sand, all signs of civilization are left behind with the paved road.

There are no sunbathers, beach towels or toddlers building sandcastles here. Instead, Reisinger sees a colleague collecting water samples, a crab basking in the sun and an old couple testing their luck at surf fishing. The only other sign of recent activity are the SUV tracks in the sand.

Reisinger drives about 2.5 miles, scanning the beach debris for anything of interest and then parks the truck at the mouth of the river. Across the water is Mexico. Border Patrol is heavy here. Mexican families on the other side enjoy the beach — a grill’s charcoal fire can be smelled cooking up a fresh catch.

Reisinger says there are a lot of issues out here. “Until a few months ago the mouth of the river was completely dried up.” He says the major problem with the Rio Grande is that people upstream have been building dams on the river and skimming off large amounts of water for irrigation and drinking purposes, thus leaving the water levels that make it to the Gulf of Mexico less and less each year.

Don Hockaday, acting director of The University of Texas-Pan American Coastal Studies Lab and a local resident, says that it’s such a complicated issue because the water shortage can’t be solely blamed on one organization or individual. “Unfortunately, I don’t see any solution for significantly increasing the (water) supply,” says Hockaday who is spending his morning volunteering with children’s activities at the Texas International Fishing Tournament (TIFT). He says conservation holds promise because there is so much waste in many outdated water systems. “This area keeps growing and the fresh water supply just can’t keep up. It’s hard to come to a solution that will be agreed on by the majority because there are so many people involved in both the U.S. and Mexico.

“When we have heavy rains like we have this past year, it hurts our cause in the long run because people forget about the past when there was no water and they lie to themselves and pretend it will never dry up,” continues Hockaday. “When you see the river flowing, it’s hard to imagine that it could ever dry up again.”

Reisinger agrees that nothing will get done about the water supply here until people are

faced with serious problems and a need to do something long term. “It’s nature’s cycle — some years are good and others are bad for rainfall,” he adds. “A desalinization plant being built on the north side of Brownsville should be on-line by the end of year to alleviate some of the water demand.”

Leaving the mouth of the Rio Grande, Reisinger heads north on the beach past the turn for Route 4. The dunes to the left show signs of 4-wheel drive activity, and he points out where a 4-H redbird camp he helped with was conducted.

Fishermen can be seen on the rock jetties all the way north on the access road. “This is my favorite area,” says Reisinger. “It’s so calm out here and you can see South Padre Island in the distance.”

South Padre Island is much different from the part of Cameron County Reisinger has been exploring this morning. Protecting the mainland and stretching across the Lower Laguna Madre, it is the number one tourist destination in Texas and now surpasses agriculture as the major source of economic income in Cameron County. Despite its population of just more than 2,000 permanent residents, the Island may host 50,000 people on a given spring or summer day.

Visitors to the Island usually fly into Harlingen, located about 45 miles north of South Padre. There is no major highway to the Island; the main road is Route 100 through Port Isabel. The Queen Isabella Causeway is the only bridge to the island. “It’s insane here at spring break,” says Hockaday. “All you can see are bumper-to-bumper cars going over to the island.”

Plans for a second causeway have been discussed for several years now but there has been no development due to disagreements about location, funding, environmental impact and other issues. The Port Isabel community believes that putting in a major causeway at the north end of the island and connecting it to Highway 77 in Harlingen will devastate its economy.

On the other side of the spectrum, officials in South Padre see the north end of the Island as the only logical place to start building. “It’s our feeling that the Causeway will bring



Refuge manager John Wallace and operations specialist Sonny Perez observe the changes in the ecosystem at the Laguna Atascosa National Refuge.



Those pushing for a second bridge to Padre Island became more vocal after an accident in 2001 cut off all vehicular travel between the island resort and the mainland.

in so many more people to the Island that business will increase everywhere,” says Dan Quandt, Executive Director for the South Padre Island Convention and Visitors Bureau.

Pat Marchan, the mayor of Port Isabel and owner of several businesses there, is not convinced. “We have fought about this for so long, and the way I view it now is as an opportunity for growth,” says



Daniel Bryant's Dolphin Watch cruises entertain and educate thousands of visitors to the Island each year.

cationers will take the shortest, most direct route to get to South Padre Island, but he thinks Port Isabel can draw enough interest on its own to keep the economy going. “They’ve got great restaurants, museums, the lighthouse and a community that’s completely set apart from South Padre.”

Bryant, born and raised in Cameron County, realized early on that a changing economy meant he couldn’t make a living commercial



Tony Reisinger helps weigh fish during the 65-year-old Texas International Fishing Tournament. The figures are recorded on the giant toteboard where bystanders can keep track of entries.

scholarships to college-aged kids that have a history of participating and helping with TIFT.” She says, to her, the magic of the event is seeing a five year old as excited to catch a first catfish as the professional sports fisherman is to catch his 400-pound blue marlin. “It’s about instilling the love of fishing in our youth and teaching them conservation and environmental principles for the rest of their lives,” says Wells.

Reisinger can be found right in the middle of all the TIFT action. This year,



Anthony Reisinger helps as an official weighmaster at TIFT.

Marchan. “But regardless of how it is done, we fear there will be a significant economic decline for Port Isabel – at least in the short term — and we don’t know if we can weather that storm.”

Don Hockaday says that regardless of the location, a second and possibly third causeway or ferry system is greatly needed. “I’ve lived in this area all my life,” he says. “For me it’s like asking which parent I like better – my mom or my dad – I value South Padre and Port Isabel equally. It’s not like I want either to suffer because of this – I think everyone wants the best solution for all parties involved.”

Daniel Bryant, a local businessman who owns a dolphin watch company, parasailing operations and other water-sport tourist attractions, says he knows that regardless of location disputes, another causeway will eventually be built. “I’ve been all over the world to different tourist beaches like South Padre, and we are the only major tourist place in the world that has such limited access.” Bryant says it is common sense that va-

ishing like his father. So he got into the growing tourism business. Once established in South Padre, he traveled all over the world trying to open similar businesses. “I always had to come back here,” he says. “There isn’t any place like it — it’s unique and it will always be home to me.”

Besides running several businesses on the Island, Bryant also finds time to participate in the Texas International Fishing Tournament (TIFT) each year. Continuously running for 65 years, the event, held at the South Point Marina in Port Isabel, brings in an estimated \$2 million in revenue to the area in the five days it takes place each year.

Anglers and fishermen from all over participate to see who can catch the biggest and most unique fish. Seventy percent of those registered are local to Cameron County, according to Betty Wells, tournament director for the past 15 years. She says that the tournament is important to the area for several reasons. “The youth are a huge part of this tournament,” says Wells. “We give seven \$1,500

he helped with the children’s activity day at the Convention Center on Thursday morning and acted as an official weigh master for the rest of the weekend at the Marina. Reisinger helps with many aspects of TIFT and is regularly interviewed by the local television station as an expert. This year his son Anthony, a 21-year-old college student, received a scholarship and participated as he does every year as a weigh master along with his father.

During the tournament, Daniel Bryant pulls up to the Marina in his boat, *Poco Mas*, with several notable catches. Flags on the tops of the boats indicate what the crew has caught and also which fish have been tagged and released, meaning the fish were caught, tagged, photographed and then released back into the water.

“We feel strongly about conservation,” says Bryant. “Especially with these big fish out here — it’s our duty as fishermen to make sure we’re not

killing off some of our most valuable resources.” Bryant carries that philosophy onto his dolphin watching cruises too. “We don’t believe in doing anything to disrupt the natural flow of the environment,” says Bryant. “We don’t feed the dolphins so they’ll come by the boat – but they’ve always been good to us. We’ve never gone out when we haven’t seen any,” he smiles.

His two-hour cruises also include a trawling demonstration where tourists learn how a shrimp trawl works. The exercise allows them to see marine life common to the area and educates them on helping to preserve the ecosystem while vacationing.

John Wallace, the Refuge Manager for

the Laguna Atascosa National Wildlife Refuge, is also investigating marine life in the area. He is spearheading a project to get the Laguna Atascosa wetlands to once again be a productive marine habitat. Much like the Rio Grande, man-made dams have created unnatural water flows in the Laguna Atascosa wetlands. Wallace has enlisted the help of Ocean Trust, Harlingen Shrimp Farm, Reisinger and others to help him devise a plan to restore water conditions so the natural marine life like the blue crab and many fish species will have a chance to regain their populations.

“This area is known for being part of the endangered ocelot population recovery area, and this is just another project

we feel is very important to the ecosystem,” says Wallace.

Reisinger couldn’t agree more. He is dedicated to helping the people of Cameron County maintain their natural resources and continues to instill his love of the land in everyone he meets.

Today at TIFT, however, Reisinger is still waiting at the Marina to see the last fishing boats come in. It has been rumored that one of the boats has quite a catch on board. As the day ends, Reisinger’s son, Anthony, helps weigh a 479-pound blue marlin.

Reisinger’s eyes twinkle and he smiles his pirate smile. Someone has caught the big one – and Reisinger is in paradise. ■

Sea Grant fellow to analyze wetland valuation during year at TWDB in Austin

The Texas Sea Grant College Program and Texas Water Development Board (TWDB) have joined to sponsor a graduate fellow who will use her background as an economist to develop a protocol to determine the value of wetlands.



Ismayilova

Rubaba Ismayilova is the third recipient of the Texas Sea Grant Fellowship. As such, she will spend a year either in Austin working alongside TWDB staffers or in studying selected sites along the Texas coast.

Ms. Ismayilova, a native of Baku, Azerbaijan, is a doctoral candidate in the Urban and Regional Science Program at Texas A&M University, having received a master’s in economics in 1999.

She has a background in international banking, with extensive experience in monetary policy and banking in transition economies from her work at the Central Bank in Azerbaijan. Ms. Ismayilova worked closely with the International Monetary Fund and the World Bank staff, both in Azerbaijan and later as an intern in New York City.

“I will be analyzing data related to water availability in different regions of Texas,” explained Ms. Ismayilova, “and also wetland valuation. I also will evaluate environmental damages from various developments and find offsets for them.”

She continued by saying she hopes her experience and interest in coastal management can be applied to such problems as environmental policymaking, resource management and economic sustainable development.

The Texas Sea Grant Fellowship is patterned after the Dean John A. Knauss Marine Policy Fellowship program, which is sponsored by the National Sea Grant Program. The statewide program provides a \$25,000 annual stipend and places graduate students either in TWDB, the Texas Parks and Wildlife Department or the Texas General Land Office.

Bahia Grande

(Continued from inside front cover)
project partners include USFWS Texas Coastal Program and the North American Wetland Conservation Act, NRCS, U.S. Army Corps of Engineers, Environmental Protection Agency, National Oceanic and Atmospheric Administration, NOAA Fisheries, Texas Parks and Wildlife Department, Texas Council for Environmental Quality, Texas Department of Transportation, The Conservation Fund, The Nature Conservancy—Texas, National Fisheries Institute, Ducks Unlimited, Brownsville Shrimpers Assn., Marcos Sales, Brownsville Navigation District (Port of Brownsville), Texas Sea Grant College Program, Cameron County Parks System, Coastal Conservation Assn.-Texas Chapter, Texas A&M University Department of Civil Engineering, Texas Center for Policy Studies, Cameron County Office of the County Judge and Congressman Solomon P. Ortiz.

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