

Texas Shores



Spring/Summer 2012

Texas Sea Grant College Program

Vol. 40 No. 2



*One menhaden among the thousands killed by the 2011 red tide in South Texas was washed up on the bank by ship wakes in the Brownsville Ship Channel. Menhaden, which are filter feeders, are among the first species to die from the naturally occurring neurotoxins in the red tide algae *Karenia brevis*. High salinities in the state's bays from the 2011 drought provided a hospitable environment for *K. brevis* to spread. Photo by Tony Reisinger*

ON THE COVER: The combination of an extremely high tide and the wake from passing ships washed thousands of fish killed by the red tide, mainly striped mullet, onto the bank of the Brownsville Ship Channel near the Carl "Joe" Gayman Channel, which provides inflow to the Bahia Grande. Photo by Tony Reisinger



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contents

2 sea notes

Lionfish and tiger shrimp ✪ *Texas Sea Grant survey* ✪ *\$100K grant for community planning* ✪ *Jacob honored with Hershey Award* ✪ *Floating Classroom on the move* ✪ *Texas Knauss Fellows in D.C.* ✪ *National Ocean Sciences Bowl* ✪ *New quarters for Texas Sea Grant*



11 feature story

Water, water everywhere...

Between the effects of the devastating drought and a massive red tide, 2011 was a year to remember on the Texas coast — though some might wish they could forget it.



31 coastal icon

The late Roberta Ripke left big shoes to fill in the coastal community she loved so dearly.



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Science At Work For Texans

<http://TexasSeaGrant.org>



sea notes

More lions, fewer tigers reported in Texas

Sightings in the past year of lionfish at the Flower Garden Banks National Marine Sanctuary have more than doubled — and the fish are getting bigger — while fewer black tiger shrimp are making it back to Texas ports despite the skyrocketing number being reported in other areas of the Gulf of Mexico.

Lionfish and black tiger shrimp are only two of more than 40 species of non-indigenous sea life known to be spreading through the Gulf of Mexico from their native waters, but they are seen by many resource experts as the most threatening. Both species are native to the Indian and western Pacific Oceans and are noted for their aggressive feeding behaviors and hardiness — they can live in a wide



PHOTO BY TONY REISINGER

Black tiger shrimp caught south of Morgan City, La., by the F/V Jake M.

as an accidental or intentional release from an aquarium.

According to Michelle Johnston, research ecologist for the Flower Garden Banks, divers reported 20 lionfish last year, with an average size of 10 to 12 centimeters. This year, there have been 29 sightings, and the average size of the fish has been 18 to 23 centimeters. Of the 49 total lionfish spotted, 28 were within the sanctuary boundaries, and Johnston says 17 of those 28 fish were captured and removed from the sanctuary.

The Asian black tiger shrimp also has established a foothold in the Gulf. Officials at the U.S. Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) have seen a nearly ten-fold rise in the number of these shrimp reportedly caught in the Gulf of Mexico. They do not yet know if the increased reports reflect a growing population or represent a growing awareness of the invasive species by shrimp fishermen.

USGS and NOAA researchers are working with state agencies from North Carolina to Texas to determine how this species reached the United States and what the increase in sightings may mean for native species. The largest species of shrimp in the world, black tiger shrimp are grown in aquaculture facilities in several places around the world, although not in the United States, and one popular theory holds that some of the shrimp escaped into the sea from an aquaculture pond in the Caribbean that was breached by a hurricane in 2005. Others speculate that the shrimp hitched a ride from Asian to U.S. waters in the ballast tanks of ships.

Only five of the shrimp, which can grow to more than a foot long and approach one pound in weight, have been documented in Texas waters thus far, and all were caught



PHOTO COURTESY U.S. GEOLOGICAL SURVEY

Lionfish.

range of water temperatures and salinities. These traits make them perfect, and dangerous, invaders.

The first lionfish reported at the Flower Garden Banks was seen last summer. Since then, both sanctuary staff and recreational divers have reported seeing 49 in and around the sanctuary, located about 100 miles off the Texas-Louisiana border.

Lionfish are strikingly colored, brightly striped venomous fish that can quickly populate an area and decrease native populations through either eating them or chasing them away. They were most likely introduced to the Gulf of Mexico through the aquarium trade — either

last year. Most of the captures have occurred off the Louisiana, Mississippi and Alabama coasts.

Texas shrimpers caught several black tiger shrimp while fishing off of Louisiana and, at the request of Texas Sea Grant and Texas Parks and Wildlife (TPWD) personnel, brought the specimens back to shore for genetic testing by USGS in hopes of determining their origin. Cameron County Coastal and Marine Resources Agent Tony Reisinger, who often collected the specimens when the boats returned to port, says he is now seeing fewer tiger shrimp making it back to Texas for several reasons. High fuel prices kept many boats from traveling to Louisiana until the Texas shrimp fishery closure began on May 15. “Texas crews also found out that tiger shrimp are good eating, and there is no reward for turning the shrimp over to the government,” Reisinger says.



Tiger shrimp shown for comparison with a native brown shrimp.

He is currently working with Texas shrimping industry officials to develop an incentive program to increase the number of tiger shrimp given to state officials for testing. Despite the rise in captures in other parts of the Gulf of Mexico, experts believe the number of tiger shrimp found is still greatly under-reported.

Black tiger shrimp eat the same types of food as native shrimp species, but as they grow they also eat their smaller cousins. They also are susceptible to about 16 diseases — not all of them fatal — that can be transmitted to native shrimp and crabs, says Leslie Hartman, TPWD’s Matagorda Bay Ecosystem Leader.

“The potential impact is roughly similar to the Europeans bringing smallpox to the new world,” she says. “They can put a hurt on the domestic shrimping and crabbing industries.

“Our native shrimp are active scavengers. Tiger shrimp are active predators that are twice the size of their compatriots, so between the diseases they carry and being an active predator, the black tiger shrimp can be a big issue.”

On the other hand, black tiger shrimp, which are also susceptible to diseases carried by native shrimp, are a highly valuable commodity. The shrimp fetch a market price similar to native white and brown shrimp.

— Jim Hiney

Penny for your thoughts? How about \$100?

The Texas Sea Grant College Program is asking Texans to help it chart its course in the areas of coastal and marine research, outreach and education by participating in an online survey. As a “thank you,” five people who complete the survey will be chosen at random to win \$100 gift cards.

The program that bills itself as “Science at Work for Texans” is currently developing its strategic plan for 2014-2017. Texas Sea Grant’s mission is to improve the understanding, wise use and stewardship of Texas coastal and marine resources. To achieve this mission, Texas Sea Grant develops and supports research, education and outreach programs and partnerships, and relies on the public for knowledge, advice and guidance.

The survey takes just a few minutes to complete and gauges participants’ interest in issues concerning coastal community growth and development, jobs and the

economy, coastal and marine

education, and coastal health, safety and beauty.

Individuals interested in voicing their opinions can find a link to the survey on Texas Sea Grant’s homepage, <http://TexasSeaGrant.org>. All responses are anonymous.

— Jim Hiney



Community planning effort gets \$100K grant

Community leaders, elected officials and citizens in the Rockport area will work side-by-side using ordinary tables and light pens in new ways to crunch complex data and make far-reaching decisions about the area's growth over the next quarter-century, thanks to a \$100,000 federal grant.

The National Oceanic and Atmospheric Administration (NOAA) awarded the grant to Dr. John Jacob, Texas Sea Grant's Coastal Communities Development Specialist, to use the Community Health and Resources Management (CHARM) model in conjunction with the innovative weTable during an 18-month series of development planning workshops beginning this summer.

The CHARM model uses a variety of data — demographics, average water consumption per dwelling type, and topographic and bathymetric measurements — to calculate the end result of development based on parameters fed to it by workshop participants. These parameters can include locations for growth, anticipated numbers of new residents and predicted hurricane storm surges.

The weTable combines a laptop computer, a projector,



The weTable transforms a tabletop into an interactive computer interface.



PHOTOS COURTESY JOHN JACOB

a light pen and a Nintendo Wii remote to transform an ordinary tabletop into an interactive computer interface. Participants use the light pen like a computer mouse on the projected image of the computer's desktop, which is shown on the tabletop. The Wii remote detects the pen's position on the table and sends the location to the laptop via Bluetooth connection so people can turn complex data into a color palette that allows them to paint different versions of future development, and the resulting picture reveals the consequences of their decisions in terms of potential runoff pollution, flooding and flood damage, water consumption and even walkability.

Read more: <http://TexasSeaGrant.org/NewsAndEvents/MediaReleases/press12/weTable-JohnJacob.html>.

— Jim Hiney

Jacob receives Hershey Award for Excellence

Dr. John Jacob's impressive body of work integrating conservation and sustainable community development has earned him the prestigious Terry Hershey Award for Excellence from the Department of Recreation, Park and Tourism Sciences (RPTS) at Texas A&M University.

Named in honor of Houston's grande dame of conservation, the Hershey Award recognizes excellence in park, recreation or natural resources contributions to Texas, the region and/or the nation, as well as support for education and innovations as a leader in natural resource protection.

Jacob, Professor and Coastal Community Development Specialist with Texas Sea Grant, was chosen for his work and achievements that "have helped to make people aware of bayou conservation, community development patterns and the value of open spaces," says Dr. Scott Shafer, RPTS Associate Department Head. "These are the kinds of issues Terry Hershey believes in and supports."

Read more: <http://TexasSeaGrant.org/NewsAndEvents/MediaReleases/press12/HersheyAward-Jacob.html>

— Jim Hiney



PHOTO BY JIM HINEY

Dr. John Jacob receiving the Hershey award from Dr. Scott Shafer of the TAMU Department of Recreation, Park and Tourism Sciences.

Floating Classroom to visit Matagorda, Willacy counties

Texas Sea Grant's Floating Classroom, the *Karma*, will continue its wandering ways this fall when it returns to Matagorda County to help students there learn about local aquatic ecosystems. The boat will also revisit Port Mansfield, most likely in February 2013, and may also make a port call in Rockport.

For the past few years, the *Karma* has traveled from its homeport in Corpus Christi to Matagorda County — the boat's former homeport — to take the county's fifth grade students on cruises aimed at enhancing their marine science knowledge. These cruises were made possible by a grant from the federal government, and sufficient funds remain to provide for two more visits, including the one this fall, says Dr. Russ Miget, Floating Classroom Program Coordinator.

The *Karma* visited Port Mansfield and South Padre Island in February 2012 to provide fourth through eighth grade students from the Lasara, San Perlita and Lyford school districts, as well as ichthyology students from The University of Texas at Brownsville (UTB), with a unique opportunity to learn about the Laguna Madre first hand. In addition to cruising on the *Karma*, the Willacy County students spent two hours on land at the UTB Department of Biological Sciences field station in Port Mansfield, where Dr. Richard Kline, Assistant Professor of Biological Sciences, and his graduate students taught lessons on several topics, including fisheries, coral biology and beach restoration. Kline also led students into nearby marine ecosystems, where they threw cast nets and examined the animals they caught.



Dr. Russ Miget, Floating Classroom Program Coordinator, supervises Willacy County students as they handle sea life brought aboard the R/V *Karma* in a trawl net.

A month later, the Floating Classroom traveled to Port Lavaca for 10 days of cruises for Calhoun County middle school students.



UTB graduate student Andres Garcia prepares to throw a cast net as Willacy County students watch. The activity was part of shoreside lessons done in conjunction with the *Karma*.

During the *Karma*'s hands-on educational cruises, students participate in a number of activities, including helping to deploy and retrieve a small trawl net. Sea life caught in the net is transferred to touch tanks on the back deck of the 57-foot former bay shrimp boat, where students are allowed to handle the catch while naturalists describe the animals' biology and role in the ecosystem. Students also collect and view plankton samples, test water clarity and learn about aquatic food webs.

The *Karma* offers public cruises in addition to those booked by school groups, and several passengers from Rockport were impressed with what they saw. "We've had many requests from people from Rockport who have taken the public cruise, asking that we visit their community, so we are seriously considering taking the boat to Rockport for a week, probably this fall," Miget says.

The Floating Classroom Program is operated by the Texas Sea Grant Program in partnership with Texas AgriLife Extension. The *Karma* is a U.S. Coast Guard-inspected passenger-for-hire vessel, which means it meets the strictest safety requirements. It is operated by a licensed captain and experienced crew trained to respond to all emergencies.

More information on the Floating Classroom Program is available at <http://floatingclassroom.tamu.edu>.

— Jim Hiney



Texas Knauss Fellows thriving in Washington, D.C.

Texas Sea Grant's four Knauss Fellows have been making the most of their year-long assignments to federal agencies in Washington, D.C. Halfway through their fellowships, Kathleen Welder, April Bagwill, Alyson Azzara and Liam Carr report they are tackling a number of important issues that shape the way their agencies operate and affect management of the nation's aquatic resources.

The Dean John A. Knauss Marine Policy Fellowships, established in 1979, provide a unique educational experience to students who have an interest in ocean, coastal and Great Lakes resources and in the national policy decisions affecting these resources. The program is named in honor of one of Sea Grant's founders, former National Oceanic and Atmospheric Administration (NOAA) Administrator John A. Knauss.

Welder received her master's degree in Environmental Science from Texas A&M University-Corpus Christi in August 2011 and is spending her fellowship working for the U.S. Coast Guard (USCG) Office of Navigation Systems, which is charged with ensuring navigation safety in U.S. waterways. Within the Office of Navigation Systems, Welder is part of the Navigation Standards Division.

She is currently a member of the division's Offshore



Kathleen Welder

Renewable Energy Team and is helping refine a Navigation and Vessel Inspection Circular (NVIC) that provides internal and external guidance to the USCG, other agencies and future developers about factors the USCG will consider when reviewing applications to build and operate offshore renewable energy installations (OREI), like wind farms, in U.S. navigable waters. The USCG has no regulatory authority over OREIs, but since these developments will most likely alter historic navigation routes, the USCG will review development applications and provide comments to lead permitting agencies.

In March, Welder attended a Ports and Waterways Safety Assessment (PAWSA) two-day work session in Chicago, where the USCG brought together different waterway user groups to assess the safety and user impacts of Mayor Rahm Emanuel's proposal to build four new kayak boat houses on the Chicago River.

Welder is also participating in the recently assembled eNavigation subcommittee of the federal interagency Committee on the Marine Transportation System (CMTS). She is currently working with representatives from NOAA and the U.S. Army Corps of Engineers to develop and monitor the progress of the eNavigation effort, which is aimed at streamlining the exchange of electronic information flowing from ship-to-ship and ship-to-shore.

Azzara, who received her doctorate in Marine Biology

through the Interdisciplinary Degree Program at Texas A&M University at Galveston in May, is working for the CMTS and chairs its

Environmental Stewardship Discussion Group. The group recently met to discuss regulation and mitigation options for vessel emissions of black carbon, a substance formed through the incomplete combustion of fossil fuels, biofuels or biomass. Black carbon is cited as a contributing factor to climate change.



Alyson Azzara



Texas Knauss Fellows Liam Carr (background), Kathleen Welder and April Bagwill watch as TXSG Fisheries specialist Gary Graham explains the workings of a shrimp trawl net.

PHOTO BY JIM HINEY

One of Azzara's first assignments was to update the CMTS Maritime Data Portal, which is a database of federal publications and information including reports, statistics and public documents. The database now links 200 websites containing information.

She is also working with two of CMTS's Integrated Action Teams on policy recommendations for the Arctic Marine Transportation System as well as an assessment of infrastructure investment criteria for the nation's Marine Transportation System (MTS).

In May, Azzara began a project looking into "greening the MTS" that will examine green port initiatives for U.S. ports, including incentive programs for vessels calling as well as port shoreside support such as trucks and rail systems.

Bagwill, who received her doctorate in Zoology from Oklahoma State University in May, has spent a lot of time traveling as a communications specialist with the NOAA Fisheries Office of Aquaculture. She has learned a great deal about current aquaculture research by attending the Aquaculture America Conference in Las Vegas, the Milford Aquaculture Seminar on Shellfish Biology in Westbrook, Conn., and the National Shellfish Association Conference in Seattle. She also met with researchers and aquaculture industry representatives from around the world during a workshop on the sustainability of marine cage culture that examined new and currently used models for siting aquaculture operations and estimating their environmental impacts.

When she was not traveling, Bagwill augmented content for the office's website as well as the NOAA FishWatch website. She is also scheduling a webinar series, putting together a paper comparing production costs of terrestrial and aquatic protein sources, working with the NOAA Fisheries Aquaculture Regulatory Working Group to provide advice on regulatory and



Azzara (from left) Welder and Bagwill wade in the Gulf of Mexico at Freeport.

PHOTO BY JIM HINEY

permitting issues, and addressing various communications and outreach issues as they arise.

Carr, who received his doctorate in Geography from Texas A&M University in May, has been busy tweaking NOAA policies and procedures as Senior Advisor to NOAA's Director of External Affairs, Andy Winer.

He is working on NOAA's Fleet Plan for 2013-2027 that identifies current and future needs for NOAA's fleet of research vessels as they carry out ocean observing missions in support of NOAA programs dealing with

fisheries, emerging research and hydrographic mapping. He is also strengthening NOAA's Scientific Integrity Policy, which was created to protect scientific findings from being suppressed, distorted or altered by political pressure, to strengthen science and to encourage a culture of transparency. The Scientific Integrity Policy applies to all NOAA employees — career, political and contractor — who conduct, supervise, assess or interpret scientific information on behalf of NOAA.

Tapping into experiences he gained while studying fishermen and their communities in the Caribbean, Carr has been tasked with formulating NOAA's Caribbean strategy as the agency seeks to strengthen its presence in the region, especially with its foreign partners. He is also the agency's representative to the U.S. Coral Reef Task Force, which addresses pressing issues related to coral reefs in American jurisdictions.

Shortly before he graduated, Carr spent time in Mexico educating local fishermen on fish spawning aggregations, bathymetric mapping skills and opportunities to take part in the dive tourism industry with the goal of decreasing fishing pressure on the fish populations when they gather to spawn.



April Bagwill



Liam Carr

Knauss Fellows blog about their experiences in Washington, D.C.: <http://TexasSeaGrant.org>; click the link for the Knauss blog.

— Jim Hiney



Annapolis Christian, Langham Creek win Texas NOSB Regionals

Annapolis Christian Academy and Langham Creek High School's "A" Team represented Texas well at the National Ocean Sciences Bowl (NOSB) National Finals Competition in Baltimore, says the state's NOSB regional coordinator.

"I'm extremely proud of these kids," says Terrie Looney, Texas Sea Grant Coastal and Marine Resources Agent for Jefferson and Chambers Counties, who as regional coordinator accompanied the teams to Baltimore for the finals in April. "They worked incredibly hard and performed well in the regional competitions, so they earned their spots in the National Finals alongside the other 23 regional champions."

Despite stellar efforts, the two teams did not advance from the competition's round-robin matches to the double elimination round.

"Although they did not do as well as they wanted in Baltimore, the competition and associated events, like tours and a career fair, gave the kids a unique opportunity to learn about aspects of ocean science that they would not have been exposed to at home. I think this experience has changed the career paths of some of these students," Looney says.

a 10-team field. Second place went to Corpus Christi Homeschool Co-op, Chaparral Star Academy (Austin) "A" Team placed third and Gregory-Portland High School's "B" Team received the Dr. Wes Tunnell Sportsmanship Award.



Langham Creek, from left: Syed Ali, Andrew Hu, Madison Selldin, coach Timothy Kraemer, Sydney Denmen and Christina Tremel.

Langham Creek's team of Andrew Hu, Syed Ali, Madison Selldin, Christina Tremel and Sydney Denmen earned their trip to Baltimore by winning the Dolphin Challenge Regional NOSB Competition on March 3. The Houston school emerged at the top of a 10-team field after a day of head-to-head matches held on the campus of Texas A&M University at Galveston. Sanger High School's "A" Team finished second, Lubbock High School placed third and for the second straight year, Pearland's Glenda Dawson High School won the Ralph Rayburn Sportsmanship Award.

NOSB is intended to increase knowledge of the oceans on the part of high school students, their teachers and parents, and to raise the visibility and public understanding of the national investment in ocean-related research.

During NOSB competitions, the students demonstrate their knowledge of marine and coastal science by answering questions from biology, physics, chemistry, geology, geography, mathematics and the social sciences.

The sportsmanship awards go to the teams judged by competition officials to best embody the spirit of earnest competition while demonstrating exemplary decorum.

NOSB is managed nationally by the Consortium for Ocean Leadership, a nonprofit organization representing 94 of the leading public and private ocean research and education institutions, aquaria and industry with the mission to advance research, education and sound ocean policy.



Annapolis Christian Academy, from left: Emily Borchardt, Austin Jones, coach Sarah Borchardt, Andrew Hanks, assistant coach Jackie Hanks, Rylee Williams and Colton Garrett.

Hometown team Annapolis Christian Academy won the Loggerhead Challenge Regional NOSB Competition on Feb. 4 at Texas A&M University-Corpus Christi. The team of Emily Borchardt, Andrew Hanks, Austin Jones, Colton Garrett and Rylee Williams finished atop

—Jim Hiney

Sea Grant moves back to campus

Texas Sea Grant's headquarters returned to the Texas A&M University campus in late April after two decades of operating out of private office buildings in Bryan and College Station.

"Texas Sea Grant is delighted to be back on the Texas A&M University campus," says Dr. Pamela Plotkin, Texas Sea Grant Director. "We are looking forward to reinvigorating our relationship with Texas A&M, maximizing opportunities to interact and partner with the university community and contributing to the mission of this great institution in novel and meaningful ways."

All of the program's telephone and fax numbers and staff emails remain unchanged, but the mailing address is now Texas A&M University, MS 4115, College Station, TX 77843. The physical address for delivery services is 730 Lamar Street.

Texas Sea Grant is a partnership of university, government and industry focusing on marine research,



Texas Sea Grant located in the TAES Building at 730 Lamar St.

PHOTO BY JIM HINEY

education and outreach. It is administered through the National Oceanic and Atmospheric Administration and is one of 32 university-based Sea Grant Programs around the country. Texas Sea Grant is based at Texas A&M University, where it is classified as a non-academic research center within the College of Geosciences.

— Jim Hiney

Changing tides



Seafood Specialist **Mike Haby** will retire on Aug. 31 after 30 years with Texas Sea Grant, but he will not be gone for good. The Corpus Christi-based Haby will return to work on a half-time basis to conduct a number of special projects focusing on seafood safety and economics. He graduated from Texas A&M University in 1974 with a bachelor's degree in marketing. He began his Sea Grant career with the New York program in 1978 on a one-year appointment dealing with seafood business issues and moved to Virginia Sea Grant in 1979 as an area agent. Haby came to Texas Sea Grant in 1982, the same year he received his master's degree in Marine Resources Management from Texas A&M University.



Mike Haby



Miranda Rubach joined Texas Sea Grant as its Reporting Coordinator in February. She is responsible for compiling information for mandated state and federal reports. Rubach graduated from Sam Houston State University in 2009 with a degree in accounting. Before joining Texas Sea Grant, she worked for Texas A&M's Division of Finance in the Financial Management Operations and Budget and Planning Departments.



Miranda Rubach



John O'Connell, who has been Matagorda County Coastal and Marine Resources Agent for the past nine years, moved his office 40 miles northeast on SH 35 in early April to become the new Brazoria County Coastal and Marine Resources Agent. O'Connell replaced Rich Tillman, who retired in 2010 after 14 years on the job. The position is funded jointly by the Texas Sea Grant College Program, Texas AgriLife Extension Service and Brazoria County.



John O'Connell

— Jim Hiney



The view from Plover Point Deck at the Laguna Atascosa National Wildlife Refuge includes the Lower Laguna Madre and the City of South Padre Island on the horizon.

PHOTO BY TONY REISINGER

Water, water everywhere...

It might be difficult to think of something as wet as a bay or estuary as being “in a drought,” but the devastation across Texas in 2011 also struck these coastal ecosystems.

By Cindie Powell

The Texas drought of 2011 was the worst single-year drought in the state since recordkeeping began and may turn out to be one of the costliest natural events in state history — direct agricultural losses alone reached \$7.62 billion.

Its effects on the terrestrial environment were obvious to see — dry lakes and empty stock ponds, emaciated livestock and desiccated crops in the fields, and massive wildfires, including the worst in Texas’ history, sweeping through the state.

But what about on the coast? Unlike on land, many of the coastal effects of a drought occur beneath the surface of the water, hidden from view.

Texas’ coastal zone supports a series of estuaries, partially enclosed areas where rivers’ freshwater mingles with tidal-driven seawater, that are home to vibrant ecosystems and abundant life. Though a couple of the state’s estuaries face directly into the Gulf of Mexico, most are in shallow, enclosed bays, protected from the open Gulf by narrow barrier islands or peninsulas.

Estuaries have been called the “nurseries of the sea,” and are among the most productive habitats in the world. The lifeblood of these coastal gems is the freshwater drainage from rivers, some of which extend across the entire state. When there is little water to drain because the rivers run through areas stricken by drought, freshwater inflows are greatly reduced, affecting the salinities in the estuaries and the amount of nutrients being brought into each system.

“All the bay habitat conditions change in a very dramatic way,” says Dr. Paul Montagna, who holds the Endowed Chair for Ecosystem Studies and Modeling at the Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi (TAMUCC). “With higher salinities and lower nutrients, the net result is a nutrient-starved bay. That sets up the biological effects, and the food chain gets starved as well.”

The nutrients in freshwater inflows stimulate the growth of primary producers, the algae, phytoplankton and seagrasses that turn sunlight into food energy and serve as the base for the food web in the estuaries. Montagna, who studies the benthos, the bottom of water bodies and the life there, says the most immediate effect of decreased freshwater inflow is a loss of biodiversity. Much like on land, where the least drought-tolerant plants are the first to die without adequate water, when bay habitats are altered so much that they are outside the range of what the organisms living there can tolerate, the ones that are the most sensitive disappear.

“You start losing organisms from species that cannot deal with the change in conditions, either physiologically or food-wise,” he says. “A direct effect is the organism cannot adapt physiologically to the high salinity. The indirect effect is its food disappears. They can’t develop in those conditions.”

Nearly all estuarine species that live on the bottom, including species important to humans like shrimp, crabs and oysters, have a similar alternation of lifestyle as they go through their life cycle — eggs are released in the water, and the organisms live in planktonic or floating form for a time before settling to the bottom to change into their adult form.

“If the water conditions aren’t good when they’re in that baby phase in the water column, then the babies don’t make it to the next generation, they die or don’t settle out,” Montagna says.

“Freshwater is important to the estuaries and coasts, but it’s not a direct effect — it’s not as if pouring fresh water on the backs of things helps them — it’s that the freshwater affects the habitat quality, and the habitat quality effects the organisms themselves, so there’s a domino effect.”

The built-in lag from this domino effect is one of the reasons it has been so difficult for researchers to tie specific responses to particular floods and droughts.

Water, water everywhere...

“Once we started focusing our research on understanding how the inflow affects estuary habitat condition, particularly as it relates to salinity zones, then it became easy to relate the quality of the habitats to the quality of the biological response.”

Salinity is measured in parts per thousand (ppt); the Gulf of Mexico and open ocean are around 35 ppt, and freshwater has a salinity of 0 ppt. Brackish water, somewhere between freshwater and ocean-level salinities, is the rule for nearly all estuaries, and the organisms that live there are adapted to tolerate a wide range of salinities, from totally fresh to totally marine.

“They have to deal with a variable environment,” Montagna says. “But almost nothing’s adapted to live in hypersaline conditions, when salinity goes above 35. That’s when things go bad. Droughts really don’t start exhibiting problems until we are up against that hypersaline barrier. Then all of a sudden things go really bad, really quickly.”

Texas’ bays have a range of salinities from north to south, from freshest to saltiest, which is a product of their geography and climate: north to south is also from highest river inflows to lowest, and from most rain to least. The Texas Parks and Wildlife Department (TPWD) measures salinities in the bays, and during the 2011 drought, many of them set records and all but one reached levels that were saltier than the open ocean.

Sabine Lake is by far the freshest bay in the state. It was the only Texas bay not to reach hypersaline conditions during the drought. Normal salinities there range from the single digits to the low 10s, and salinities peaked in

August at 30 to 32 ppt.

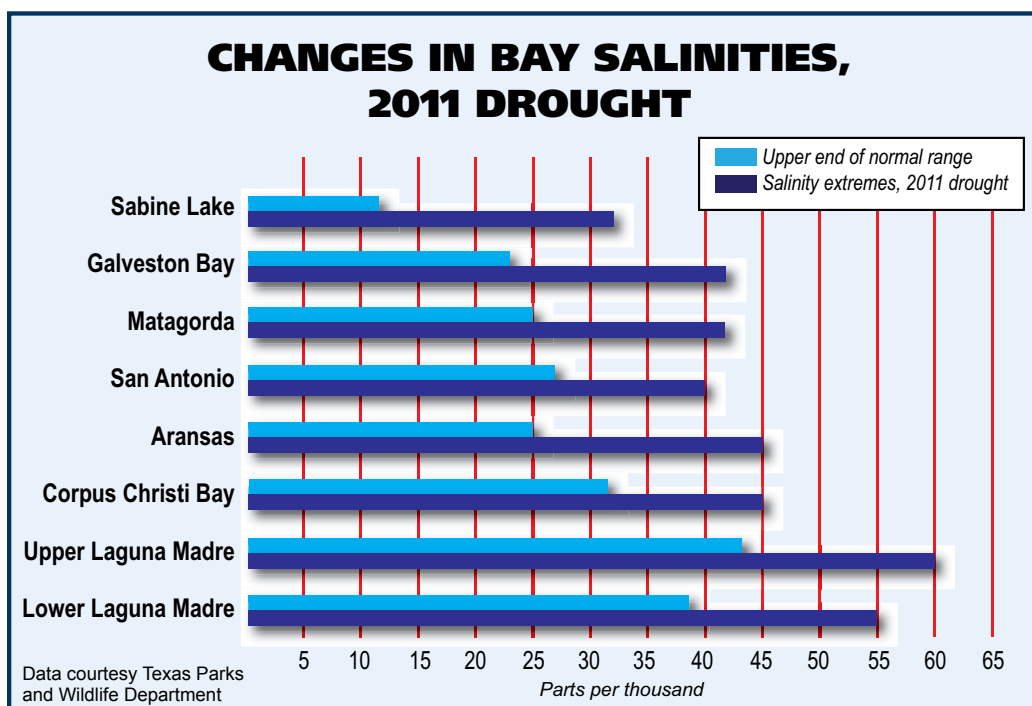
At the opposite end of the scale, the wide, shallow Laguna Madre in South Texas is in a class by itself. With strong evaporation from its large surface area, a dry climate and little to no inflows, it is frequently hypersaline but is still one of the most productive ecosystems in the state. Organisms there are adapted to regular periods of high salinity. Heavy freshwater inflows from flooding can be more stressful to Laguna Madre ecosystems than a drought — the normal low inflows allow for clearer waters lacking sediments, nutrients or turbidity, and combined with its shallow depth, this means sunlight reaches the bottom nearly everywhere in the bay system. Large seagrass meadows, including highly salinity-tolerant shoal grass, support abundant life, including finfish, crabs and shrimp, and wintering waterfowl.

Dr. Ken Dunton, Professor of Marine Science at The University of Texas Marine Science Institute (UTMSI) in Port Aransas, says seagrass ecosystems overall are fairly tolerant of salinity increases.

“We often see salinity values well over 40 during drought periods, and sometimes greater than 50 in the Laguna Madre, which has limited water exchange with the Gulf. In the short term, that’s not detrimental to seagrasses,” he says. “Over the long term, salinities greater than 50 are likely detrimental to some species — particularly *Thalassia testudinum* (turtle grass). Turtle grass, which is a robust perennial species, will likely die back, and other more weedy species, like shoal grass (*Halodule wrightii*) will replace it. Shoal grass is quite salt-tolerant

and has historically dominated hypersaline lagoon areas in Texas.”

Dunton says extremely high salinities over a period of years could result in a short-term loss of seagrass cover in some areas until species like shoal grass invade areas that become unvegetated. The biggest threat he sees is the loss of seagrass species diversity. “South Texas is blessed with a mosaic of seagrass habitats characterized by five seagrass species. I would hate to see these communities dominated by one or two species of seagrasses. This could have



effects on the fauna and, of course, the ecological resiliency of the system.”

The Upper Laguna Madre is typically the saltiest bay in Texas. According to reports from TPWD, it went into the drought far fresher than usual from Hurricane Dolly in 2008 and other storms. As a result, its salinity peaked in November at “only” 60 ppt. The Upper Laguna is connected by the Gulf Intracoastal Waterway to the Lower Laguna Madre, which receives inflows from the Arroyo Colorado, Brownsville Ship Channel and the Rio Grande. The Lower Laguna peaked in salinity in the mid-50s ppt. At press time, both parts of the Laguna Madre were still hypersaline.

Four other Texas bays, Galveston, Matagorda, San Antonio and Aransas, have similar salinities for a normal range, from the teens to the mid- to upper 20s ppt. All broke salinity records during the drought — to the upper 30s to 40 ppt for San Antonio Bay, up to the low 40s for Galveston and Matagorda, and up to the mid-40s for Aransas. Corpus Christi Bay, where the normal range is from the 20s to the low 30s, is just a little saltier than the four bays to its north. It peaked in November at the mid-40s. Galveston and Matagorda bays were hypersaline from June to September, and San Antonio, Aransas and Corpus Christi bays stayed saltier than the open ocean from July or August to November.

As there is a gradient of salinities from one end of the coast to the other, there are also salinity gradients within each bay — fresher water near the river inflows, saltier water near the ocean passes. Montagna says these salinity zones are extremely important to benthic organisms, providing a cue for the juvenile stages of many species to find nursery habitat, which are usually closer to the river mouth.

“They just have to follow the lower salinity up the bay, so to speak. And those lower salinity zones always provide nursery habitats, which are necessary for the babies to grow up. During dry conditions, the size of that nursery habitat can shrink down to virtually nothing,” he adds. “Those gradients need to exist or the organisms cannot complete their life cycle, at least not successfully.”



Alligator gar, which can survive in back-marsh waters with very low oxygen levels, were among the species displaced by higher salinities in Texas' bays during the 2011 drought.

PHOTO COURTESY TEXAS PARKS AND WILDLIFE DEPARTMENT

Montagna says the salinity “sweet spot” for greatest productivity in the state’s estuaries is around 18 ppt, but even up to the 20s and low 30s is not bad, and ironically can bring some benefits. “Fish love those marine conditions, and marine organisms from the ocean will migrate into the bay, so you actually get increased diversity and increased productivity in terms of biomass.”

The species composition in each bay reflects the typical range of conditions there, with more freshwater-loving species in the north and more of those that are adapted to higher salinities in the south. TPWD’s regular samplings of fish in the bays found record numbers of probable migrants in fall 2011 during the height of the drought. According to Jerry Mambretti, TPWD’s Sabine Lake Ecosystem Leader, hundreds of alligator gar were found in the Salt Bayou marsh complex near the Keith Lake Fish Pass, probably seeking lower salinities. They are usually found in less dense populations in areas of the marsh complex west and south of Keith Lake. The Sabine Lake samples also nabbed record numbers of marine fish like Atlantic croaker and other finfish, including lookdowns and pinfish, and near-record catches of sand seatrout, sheepshead, southern flounder, Spanish mackerel and spot croaker, and in the total numbers of fish caught.

Bill Balboa, TPWD’s Galveston Bay Ecosystem Leader, says several species took the salinity changes as an opportunity to expand their ranges into new parts of Galveston Bay, too. “All throughout the bay, there were barnacles on almost everything a barnacle could set on, even up in Trinity Bay where you don’t normally see a lot of barnacles, because they’re a saltier animal.”

Water, water everywhere...

Oysters colonized the upper areas of Trinity Bay after the drought and higher than normal salinities in the bay during the preceding two years. “We had some really good oyster production near Oak Island.

“The oystermen were actually up there fishing in areas where they traditionally don’t fish, because the oysters had two or three years of higher salinity,” he says. “The transition point that keeps the predators low and disease low shifted up the bay gradually through time. With the increasing salinity, it went from the middle of Galveston Bay to halfway up Trinity Bay.”

Trinity Bay also saw unusually high populations of Florida pompano, cownose rays and ladyfish, all higher-salinity species. TPWD’s fall surveys showed the Florida pompano in locations where smallmouth buffalo and blue catfish would ordinarily be found. The freshwater species were gone. “They were probably way up in the river somewhere, because the normally single-digit

salinity at the top of Trinity Bay was in the mid-20s,” Balboa says. Later surveys in the spring, after the rains had brought salinities back to normal ranges, showed the smallmouth

buffalo and blue catfish were back where they belonged, and the Florida pompano had disappeared.

“The resilience of all these systems is incredible. Animals come, animals go, they adapt, they change locations, they shift around based on what salinity they prefer and where the food is,” he says. “If they weren’t able to adapt to droughts and then floods, they wouldn’t be here. I’d have to say the bay’s not the easiest place to live, either. You have to be pretty hardy.”

Fish more commonly found in the nearshore Gulf of Mexico were not the only temporary residents in the bay systems. One very unwelcome visitor was *Karenia brevis*, the algae responsible for red tide.

Bad tidings

It started with TPWD reports of stressed fish in the Brownsville Ship Channel on September 9. Tony Reisinger, Texas Sea Grant’s Cameron County Coastal and Marine Resources Agent, took a water sample and confirmed it was *K. brevis* on September 15. By then, fish kills had begun occurring on the Lower Laguna Madre, South Bay and Boca Chica Beach.

The red tide of 2011 was one of the largest on record for Texas. It extended from the Lower Laguna Madre to the southern end of Galveston Bay and killed 4.4 million fish, including striped mullet, scaled sardine, Gulf kingfish, Atlantic bumper, pinfish, spotted seatrout, red drum, black drum and southern flounder. “This was the biggest one in over a decade,” says Meridith Byrd, TPWD’s Harmful Algal Bloom (HAB) Coordinator.

It was also one of the longest-lasting blooms in recent memory. “From my experience, which has been since 2004, by the time Thanksgiving rolls around, the worst of the bloom has been over, but that was not the case this year. We were still seeing lots of discolored water, lots of fish kills even through the end of the year,” she says.

K. brevis is a single-celled phytoplankton dinoflagellate that can move around using two hair-like appendages. It is found in the open ocean and Gulf of Mexico year-round in low concentrations, but when it reaches concentrations of only five cells in a milliliter of water, it triggers advisories and fishery closures by state agencies. No one can say definitively what prompts the algae to rapidly multiply, or bloom. When the red tide is visible as patches or streamers of discolored water, it can have cell counts in the millions of cells per milliliter. Blooms typically form offshore and come into the bays through the inlets and passes.

“The drought means less freshwater inflow coming into our bays, and so raising the salinity of the bays and our nearshore waters can leave us more susceptible to a bloom — we think. Not everyone agrees,” Byrd says.

The first documented red tide in Texas was in 1935, although ship’s logs from Spanish explorers describe what may have been red tides occurring in the Gulf of Mexico as far back as the 1600s. Similar blooms occur occasionally throughout the world. Several different species can cause the tell-tale red discoloration of the water, and most species are not toxic, although the rapid proliferation can starve water and thus marine life of oxygen. In the Gulf of Mexico, red tides are usually caused by *K. brevis*, and Florida is plagued by them even more frequently than Texas.

The 2011 red tide was unusual in that it followed a different pattern of expansion. Usually a bloom forms at one part of the coast and spreads outward, but last year seemed to have two blooms occurring simultaneously at opposite ends of the coast.

A red tide in August formed off the northern Yucatan Peninsula, and Byrd says she was not surprised that *K. brevis* in Texas was first reported in the Brownsville Ship

I’d have to say the bay’s not the easiest place to live ... You have to be pretty hardy.

— Bill Balboa

Channel. However, by September 22, a bloom was also reported between San Luis Pass and Surfside on the upper coast.

“For us to simultaneously have a bloom at South Padre and then one up near Surfside — but none in between — that was kind of interesting,” she says. “That bloom from the north, I think, pushed downward, especially along the Intracoastal Waterway, and then the bloom south in the South Padre area got pulled north along the Gulf beaches, and they kind of met in the middle.”

TPWD had reports of red tide in Port O’Connor, Indianola and Port Mansfield by October 6, at Mustang Island State Park by October 10, at the Padre Island National Seashore by October 12, and in San Antonio and Matagorda bays by October 16.

On October 28, TPWD surveyed the upper coast from the air and detected a visible bloom in the Gulf of Mexico from Galveston Island to Freeport and at Pass Cavallo further south. They found visible red tide in San Antonio, Lavaca, Matagorda, East Matagorda, Chocolate and Lower Galveston bays, Swan Lake and at the Texas City Dike.

By November, the bloom was still flourishing, with some concentrations of cells too numerous to count. Rockport-Corpus Christi joined the list of areas affected, and fish kills continued along Gulf beaches and inside the bays.

In December, cell counts began to drop on the lower and upper coast, although the mid-coast bloom was still going strong. Finally, in January, the rains began and the bloom was nearly gone by the end of the month.

“Once we started getting rain after the first of the year, that’s really what killed off the bloom,” Byrd says. “The cold temperatures weren’t really doing it. We’d get cold fronts, but temperatures would be back up in to the 70s during the day, so they really weren’t making a whole lot of difference.”

One reason *K. brevis* blooms are of such concern is because the cells produce a neurotoxin called brevetoxin that affects the central nervous systems of fish, birds, mammals and invertebrates. When the *K. brevis* cells in a coastal bloom are ruptured, such as by waves in the surf zone along the coast, the brevetoxin is aerosolized. It can irritate the eyes and respiratory systems of people on the



Texas Parks and Wildlife Department’s aerial survey of red tide found a large patch of it on the doorstep of the agency’s Perry R. Bass Marine Fisheries Research Station in Palacios.

PHOTO BY WINSTON DENTON, TEXAS PARKS AND WILDLIFE DEPARTMENT

Water, water everywhere...

beach, potentially creating a serious health hazard for asthmatics and others with respiratory conditions.

The toxin accumulates in the visceral organs of aquatic animals, and people or animals that consume them may experience neurotoxic shellfish poisoning (NSP), a short-term illness that can have symptoms that are neurological, such as tingling in the extremities, or gastrointestinal in nature. Most human cases of NSP are caused by eating oysters, which as filter feeders can accumulate higher concentrations of toxin in their organs, and unlike most fish are consumed whole, including the organs. As soon as a red tide is detected, the Texas Department of State Health Services (TDSHS) shuts down shellfish harvesting.

Dr. Paul Zimba, Director of the Center for Coastal Studies at TAMUCC, began analyzing the concentrations of brevetoxin during the red tide of 2009 and continued his work during the 2011 bloom with graduate student Alexandra Rafalski.

“When you have a fish kill event, it can be due to three things,” Zimba says. “It can be due to the algae cells being so dense that they remove all the oxygen from the water, and the animals die because of anoxia. The second incidence is when you have the concentration of toxin, which actually kills the fish from the toxin dose. The third is when fish eat other dead fish and bioaccumulate the toxin. We largely had fish dying from toxin exposure.”

His laboratory collected or received dead and dying animals — shorebirds, including redhead ducks from South Padre Island and cormorants from Corpus Christi to South Padre, invertebrates such as crabs, shrimp, marine worms and large jellyfish, possums, dolphins, coyotes and many species of fish — and all were found to be casualties of the brevetoxin. Zimba says Padre Island National Seashore bore the brunt of dead animals being washed ashore, and the highest cell counts in the water were from Port Mansfield north. The birds and mammals are believed to have ingested the toxin by eating fish or shellfish, or possibly shoal grass in the case of the redhead ducks.

Their research has also found that half of the toxin in fish killed and washed up on the beach breaks down in from four and a half to nine days. He says the information should be of help to the managers who are responsible for deciding when they can discontinue health advisories for beach areas without risking high-level exposure for people who come to the beach, especially those who bring dogs that may eat beached fish.

Are healthy-looking fish from red tide areas safe to eat? Zimba is noncommittal.

“There are known human health risks associated with exposure to the aerosol and in consumption of large doses, as are found in oysters, but other health impacts are largely unknown,” he says.

The human health risk from brevetoxin is one reason

that early detection of a bloom is critical. The current method in use to monitor a bloom is to collect water samples and study them under a microscope to count the number of *K. brevis* cells, which requires trained personnel who can recognize the cells and differentiate them from other organisms in the sample. It is a time-consuming, labor-intensive process.

In the 1980s, Texas Sea Grant’s Reisinger and Don Hockaday, then acting director of The University of Texas-Pan American’s (UTPA) Coastal Studies Laboratory on South Padre Island, decided to help TPWD by collecting and analyzing water samples. They asked Florida’s Dr. Karen Steidinger, a leading expert in red tide and other HABs — the “Karen” in *Karenia brevis* — to train them to identify and count the cells.



Karenia brevis cell.

PHOTO COURTESY FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

After trying to keep up with a bloom in 1986 that killed 22 million fish and a couple of subsequent red tides in the early 1990s, Reisinger and Hockaday recognized that there was more work than they could do themselves to monitor a bloom as well as they would like, so they enlisted volunteers to collect water samples for them. When they then found themselves overwhelmed with samples to analyze, they took the next step and trained the volunteers to do the cell counts as well.

Today, a cadre of a dozen experienced “Red Tide Rangers,” trained by Reisinger, Hockaday and others, respond to red tides by collecting water samples, doing the cell counts at the UTPA laboratory, noting the numbers of dead fish that may have washed ashore and gauging the severity of any aerosolized brevetoxin from the cells breaking apart in the surf. Additional Rangers monitor just the fish kills and aerosols, and still others have been trained but have not yet been tested by a red tide bloom.

“We’re like the Minutemen — we’re ready in a minute to respond to a red tide,” Reisinger says. “It’s important because red tide can be problematic for people with asthma, and for pets on the beach too. If we monitor the bloom we can warn people to avoid red tide areas.”

He is working with other Texas Sea Grant Coastal and Marine Resources Agents to replicate the Red Tide Rangers in other counties along the Texas coast. So far they have conducted trainings in Matagorda and Galveston counties.

The South Padre Island group, which received a Gulf Guardian Award from the U.S. Environmental Protection Agency in 2006, is now primarily coordinated by Brigette Goza, a research assistant at the Coastal Studies Lab. The volunteers’ cell count information is communicated to TPWD’s Byrd, who issues statewide advisories about the



Seasoned Red Tide Ranger Leslie Sweeten with The University of Texas–Pan American Coastal Studies Laboratory collects a red tide sample from the surf near the lab on South Padre Island during the 2011 bloom. Sweeten is a veteran of nine blooms on the island and is considered an essential contributor to the sampling and training program.

PHOTO BY SETH PATTERSON

presence of red tide and other harmful algae.

“We have a limited number of biologists and staff who can do routine monitoring during a red tide,” Byrd says. “To have a coordinated, trained network of volunteers down at South Padre Island has been so helpful to us, and so important.

“They go out and collect every weekday. Without them, we wouldn’t have nearly the amount of data coming in from that area, because we just physically wouldn’t be able to collect it.”

While a red tide is ongoing, Byrd submits the cell count data she has available — from TPWD, TDSHS and the Red Tide Rangers — to the National Oceanic and Atmospheric Administration (NOAA), where it is incorporated in its Harmful Algal Bloom Operational Forecast System for the Gulf of Mexico. The forecast system uses satellite imagery, field observations, models, public health reports and buoy data, and sends out information about the location, extent and potential for development or movement of *K. brevis* blooms to natural resource managers and other bloom monitors, including the Rangers, in the form of a regular Harmful Algal Bloom Bulletin, which is also available on the web.

Because a red tide bloom forms offshore before

Water, water everywhere...

moving into the bays, the satellite imagery of chlorophyll concentrations offshore combined with the wind speed and direction information also in the bulletin can provide an early warning that a red tide may be on the way.

Advance notice lets monitoring groups like the Red Tide Rangers mobilize their

samplers and plan

their efforts. In return,

when the NOAA

satellites show the

presence of a bloom in

nearshore waters, the

monitoring done by

the Rangers and others

provides important groundtruthing for the imagery.

Byrd says another vital source of information about the presence of HAB species is the Imaging FlowCytobot (IFCB) deployed on the research pier at UTMSI in Port Aransas by Dr. Lisa Campbell, Professor of Oceanography and Biology at Texas A&M University (TAMU). The pier provides access to the waters in the Aransas Pass tidal inlet connecting the open Gulf with the bay systems there — an ideal location to first identify any incoming *K. brevis* or other HAB cells.

Flow cytometry was originally developed for medical applications for studying cells in bodily fluids. Robert Olson and Heidi Sosik, scientists at the Woods Hole Oceanographic Institution (WHOI), adapted the technology and combined it with video capture to monitor microscopic plant and animal life in the ocean for basic research. Campbell, interested in the applications for HAB monitoring, collaborated with the WHOI investigators to deploy the IFCB in the Gulf of Mexico beginning in September 2007. In February 2008, just few months after the instrument was set up, Campbell noticed increasing levels of *Dinophysis ovum*, a single-celled organism that can cause diarrhetic shellfish poisoning in people who eat tainted oysters, clams or mussels and that had never before been detected at bloom concentrations on the Texas coast. She was able to alert state health officials just before the Rockport Oysterfest — in time to prevent anyone from falling ill from eating tainted oysters.

With research funding from Texas Sea Grant beginning in early 2010, Campbell studied changes in population concentrations of the microzooplankton that eat algal cells and is evaluating the use of their abundance as a predictor of a bloom — fewer grazers, the theory goes, means the algae can accumulate faster than it is eaten and thus provides an opportunity for a bloom.

*We're like Minutemen —
we're ready in a minute
to respond to red tide.*

— Tony Reisinger

The IFCB works by pumping water past a laser and video camera. The laser hits each cell and causes any with chlorophyll, such as *K. brevis*, to fluoresce. This signals the camera to record an image, and the images are sent via internet to Campbell's laboratory in College Station for analysis. Campbell's graduate student, Laura Harred, is using programs to “teach” computers to detect *K. brevis* and other cells based on their size, shape and structure to further automate the process.

During the 2011 red tide, the IFCB detected very low concentrations of *K. brevis* in the Port Aransas ship channel in July — months before it reached that part of the coast at bloom levels. Byrd calls the IFCB “invaluable” to TPWD's efforts.

“Lisa contacts me and Kirk Wiles with TDSHS any time she sees even one to two cells per milliliter of *Karenia* or *Dinophysis*, or anything that might at some point cause a problem down the road. At one to two cells per milliliter, it might take four to eight weeks for that to develop into a full-blown bloom.”

Unfortunately, the IFCB, valued at more than \$100,000, was vandalized over Spring Break 2012 and is currently out of commission. The equipment must be replaced, and there are additional expenses associated with the calibration and deployment of a new instrument.

Also receiving support from Texas Sea Grant, Dr. Daniel Thornton, Associate Professor of Oceanography at TAMU, has been exploring the potential of less expensive technology for HAB monitoring. Laser *in situ* scattering and transmissometry (LISST) uses laser light scattering and is a common technique for measuring detailed size distributions and concentrations of small suspended particles in water. A laser beam passes through the water, and the particles in the water scatter the light. The combined scattering pattern from all the particles in the beam is collected on an array of photodiodes.

In the laboratory, Thornton and graduate student Lauren Railey have been able to determine the “scattering signatures” of HAB-forming dinoflagellate species at bloom-level concentrations. In later tests that added HAB cells to natural waters that included background noise from sediments and other particles normally found there, they were again able to detect the HABs at bloom concentrations.

“We can certainly detect bloom concentrations of dinoflagellates, the problem is that dinoflagellates are very similar in shape, and I don't think we can distinguish very well between species,” Thornton says. “The advantage of our technique is it's relatively low cost and relatively

simple, but you would still need somebody at some stage to do microscopic confirmations, and you would have to use our instrument in conjunction with other instruments, like a chlorophyll fluorometer.”

He says the real potential for LISST in HAB monitoring would be for mapping the extent of a known bloom. “The LISST is commercially available, it’s relatively cheap and simple to operate, and you can just throw it in the water. If you did have a red tide that you knew was there, our instrument is very good for synoptically mapping that, because you can drag it behind a boat.”

Even as researchers are searching for ways to make it easier to detect and monitor *K. brevis*, there are still many unanswered questions about the organism itself. Its toxicity seems to vary from year to year — a similar bloom in 1986 killed 22 million fish, compared to 4.5 million this year. Similar species in other parts of the world form resting cysts and sink to the bottom to become the seeds for the next year’s population. Does *K. brevis* do the same?

No one can say for sure.

“No one has ever identified the full life history of *Karenia brevis*,” TAMU’s Campbell says. “No one has ever documented that (cyst stage) or documented anything from the sediments.”

Just as much mystery surrounds what causes a bloom to form. Influences that have been cited include iron-rich dust from the Sahara causing a cyanobacteria, or blue-green algae, bloom that puts nitrogen in the water column to drive *K. brevis* production, which is then perpetuated as nutrients are released from the decomposition of fish killed by the bloom; wind-driven upwelling of nutrients from the sea floor on the Florida coast; and recently, by a TAMU researcher, wind-driven downwelling at the Texas coast that amasses populations of *K. brevis* cells by piling them up near the shore.

In the latter hypothesis, proposed by Dr. Robert Hetland, Associate Professor of Oceanography, seasonal winds in the Gulf of Mexico combine with the Earth’s rotation (the Coriolis effect, which also causes hurricanes to spin) and the geography of the shoreline to cause a downwelling of water near the Texas coast in the fall — water near the surface moves toward the coast, is shoved down deeper, then creates a deep return flow back out to sea. As the water moves toward shore and then down, it compresses the surface layer of water. At the same time, *K. brevis* cells in the surface layer swim upward so they can continue to gather energy from the sun. Eventually the cell concentrations reach levels high enough to see with the naked eye as a large “bloom,” but the convergence of cells might be better characterized as a “traffic jam.”

Hetland’s theory can account for an up to 1,000-times increase in cell count, which might better explain the rapid explosion of cell counts during a bloom, since the cells can double only every two to three days through reproduction alone. He and Campbell used information from the 2005 and 2009 Texas red tides, including records of physical conditions such as wind direction and intensity leading up to the bloom, to confirm his model.

Not knowing for certain what causes a red tide to form makes it doubly difficult to prevent one or reduce its size or duration.



PHOTO BY JIM HINEY

Graduate student Laura Harred and Dr. Lisa Campbell with their lab version of an Imaging Flowcytobot.

Water, water everywhere...

Economic impacts from *K. brevis* blooms have included losses in tourism dollars, including recreational fishing businesses, and to commercial fisheries from consumer fears of purchasing any kind of seafood from red tide areas. Other costs include beach cleanups, HAB monitoring and medical expenses. An economic survey of Galveston County after the 2000 red tide there estimated a direct economic impact of between \$9.9 and \$11.5 million. A study from an earlier bloom on South Padre Island estimated that it was responsible for a 10 percent decline in hotel/motel taxes there.

Economic losses across all sectors of the economy from the 2011 red tide have not yet been calculated, but one segment about which there is information is the oyster harvesting industry, which was hit hard from a season cut in half.

Red tides, oysterman blues

For the oyster industry, the 2011 red tide was “the worst red tide event in Texas since we’ve been recording the information,” according to Lance Robinson, TPWD’s Upper Coast Regional Director and their oyster specialist.

“We’ve had closures periodically up and down the coast, but there usually has been a bay system or something open (to oyster harvesting). This one covered every bay system on the Texas coast,” he says.

The presence of red tide prompted the state’s health department to

close all oyster bays in Texas three weeks before opening day of the public reef harvest season, and the lingering presence of *K. brevis* in the water and later the brevetoxin that had accumulated in the oysters kept the reefs closed for three months in some areas and even longer in others.

For a fishery with a season that lasts six months, from November 1 to April 30, the three-month closure was devastating. TPWD estimates oyster landings dropped by \$9.9 million from last year due to the red tide and other factors.

“That’s just the price paid to the fishermen, it doesn’t factor in the losses to the shucking plants and all the other industries and companies along the pipeline as that product moves to the consumer,” Robinson says.

San Antonio Bay was the first to open, on January 27, but parts of Matagorda Bay weren’t open to harvest until April 8. Some sections of Galveston Bay were able to open in early March, but then were closed again later that month because runoff from heavy rains resulted in high bacteria levels entering the water, posing human health risks. In those parts of the bay, the “season” lasted only three weeks.



Oyster boats in Calhoun County head out at dawn for a day of harvesting.

PHOTO BY MIKE MITCHELL, TEXAS PARKS AND WILDLIFE DEPARTMENT

Unlike finfish, which are killed from exposure to the *K. brevis* toxin, oysters are not susceptible to the toxins in the red tide and may appear normal. Even after the red tide algae has disappeared and water tests show it is no longer present, there is an additional delay as the oysters clear the brevetoxin from their organs.

TDSHS monitors the oyster beds and determines when each is clear and its oysters safe for consumption, and thus open for harvest. The amount of time can vary depending on a number of environmental factors that affect how quickly the oysters can flush the toxins from their systems and the concentration of brevetoxin in the oyster. Because of the warm waters during the winter of 2011-12, the oysters cleared the brevetoxin relatively quickly — in just 15-20 days in many cases — possibly because they were more active during the unusually warm winter temperatures. In comparison, the 1996 red tide bloom required 30 days between the end of the red tide and the time when oysters were safe to harvest.

According to TPWD data, total oyster landings by weight for October 2011 through April 2012 decreased by 44.2 percent compared to the average of the five years before the red tide. The ex-vessel value, the dollars paid to oystermen for the catch, saw a 30 percent drop.

“Value, though still down, did a bit better primarily because the price per sack was higher, perhaps as a result of increased demand within the market,” Robinson says.

The five-year averages for the first two months of the public season, November and December, were \$3.3 million and \$2.2 million, which was income lost to the fishermen during those months in 2011 because the reefs were closed to harvest.

In the last few days of January 2012, when the only area open was part of San Antonio Bay, oyster fishermen were paid \$200,706, compared to \$2.2 million in an average year. Soon after, however, as more bay systems opened for harvest, oystermen were able to partially make up for the lost time — the oysters were still on the reefs and had an additional three months or more to grow. The fishermen brought in \$3.0 million in February, \$3.6 million in March and \$2.7 million in April, compared to average ex-vessel values of \$1.9 million in February and March and \$1.4 million in April. Even so, it was impossible for them to make up completely for the lost harvest time.

“There’s no way they would have been able to double production for the three months that they lost — physically they couldn’t do it,” Robinson says. “Sack limits also were reduced this year and the legal times they were fishing were reduced. Those were confounding issues that contributed to reductions in landings.”

Each sack weighs about 110 pounds and yields on average a bit more than six pounds of meat. TPWD instituted new regulations during the 2011-12 oyster season, lowering the maximum number of sacks fishermen could harvest per day from 90 to 50 and changing the end of the harvesting day from sunset to 3:30 p.m. Robinson says the changes were made in response to requests from the industry, both fishermen and dealers, to reduce the harvest pressure on the oyster reefs, especially in the early parts of the season immediately after spawning, when oysters are not at their best. Delaying the harvest is designed to ensure that more are available for harvest later in the season — as temperatures decrease, oysters build up their stores of glycogen and plump up, with their flavor peaking in the coldest month, February.

Buddy Treybig, owner of Arnold’s Seafood and Buddy’s Seafood in Matagorda, which serve about 90 restaurants across Texas, says the drought, a late start to the season and a warm winter were a bad combination.

“Oysters on the uphill from November get fatter until the end of March, when they start deteriorating. With the water temperatures being so warm, the oysters really didn’t have a chance. With the hot winter and the drought in the summer, it was bad all the way around for the oysters,” he says.

“We need freshwater and we need it at the right times, when oysters are spawning and spats are trying to set. We need the right conditions.”

He usually deals only in Texas oysters, but says that this year he needed to supplement the local crop with about 30 percent oysters from Louisiana. Treybig, who is also a shrimp fisherman, buys oysters from his own boats and from other fishermen, and he says his profits were lower this year because of increases in the cost per sack of oyster from the fishermen.

“Nobody made money this year,” he says. “I was lucky to get my product put up so I would have something to give to my clientele.”

Treybig says there is a careful balancing act for pricing a luxury item like oysters.

“I’m selling the end product. If you go too high on that meat price, restaurants will take it off the menu. We’re not a product that people have to have — if bread and eggs go up, people will still buy it. If oysters and crabs and shrimp go up, people don’t buy it. We can put ourselves out of business economically and physically.”

Lisa Halili, vice president of Prestige Oysters in San Leon, said her company also was impacted by conditions elsewhere in the country. Some of their customers have

Water, water everywhere...

stopped shucking themselves and have been purchasing pre-shucked frozen oysters. High freight costs of shipping from the Gulf of Mexico is also a consideration. The market in Virginia, usually one of their biggest buyers, was able to get oysters from Chesapeake Bay. The recent floods in the eastern United States have driven back oyster parasites and contributed to a rebound in the reefs there.

“They were able to get oysters from their own bay, of course they’re not going to buy from down here. With Virginia and the Carolinas, all the states that flooded, starting to get oysters back, I don’t know what the season will be like next year,” she says.

“We have a lot of things against us for next season. We need a big break.”

The eastern oyster, *Crassostrea virginica*, is the species found in the Gulf of Mexico and all along the eastern Atlantic. In Texas, oysters spawn from spring to fall, with a peak in the spring, triggered by rising temperatures, and another spike in the fall. During its first few weeks of life, a young oyster will drift in the water column, transforming through different life stages. Eventually it will “set” — cement itself to hard substrate, usually other oyster shells, and metamorphose at last into a tiny oyster called a spat. From the time it sets, it will grow to three inches in size — market size, the point at which it can be legally harvested — in 18 to 24 months.

Statewide, TPWD estimates there are currently slightly more than 43,000 acres of oyster habitat. Of that, approximately 26,000 acres are in Galveston Bay. The Matagorda Bay complex, including East Matagorda and Matagorda Bay, makes up about 7,500 acres, San Antonio Bay has about 5,500 acres, and Aransas Bay is about 3,200 acres in size. Small oyster reef acreage in the Sabine Lake complex is not commercially harvested.

Texas oysters on your plate are harvested from either public reefs or private leases. About three quarters of Texas oysters come from the public reefs, with its six-month-long harvest season. The remainder are harvested year-round from one of 43 private leases that range in size from 11 to 100 acres in Galveston Bay. The acreage is leased from the Texas General Land Office, and the leaseholders

receive a certificate of location that privatizes the oysters on their lease. The oysters are moved there from reefs that are closed to harvesting because of human health risk, such as locations on the shoreline near municipalities or agriculture where there is a risk of fecal coliform bacteria washing off the land into the water.

Under a special permit issued by TPWD, the leaseholders are allowed, typically in May and September, to go into the restricted waters, pick the oysters up, put them on their boats, and then transport them to their lease and dump them over the side. The oysters can purge themselves of bacteria and even heavy metals if given sufficient time.

“The purpose behind the lease program is to keep the oysters in these restricted areas thinned down a bit,” Robinson says. “That way, when we move into the public season in November, there’s less incentive for someone to go into a closed area and harvest these illegal oysters containing high bacteria, and those getting commingled into the food pipeline and potentially somebody getting sick. It’s a management strategy for making the resource available for industry that would otherwise not be available, but probably more importantly, for managing the risk to human health.”

The old adage about only eating oysters in a month with an “R” in it stems from the need to keep the shellfish cool to discourage bacterial growth. Oysters are harvested following a time-temperature matrix that, based on water temperature, limits the time between an oyster first hitting the deck and it being placed under refrigeration. During the public reef season, the number of hours until the oysters must be refrigerated is as long as or longer than the length of the harvest day.

Throughout the rest of the year, when only the private leases are being harvested, the time drops considerably — down to just one hour in July and August. However, the boats that work the private leases are equipped with refrigeration equipment that makes it possible to meet the deadlines, making the old adage no longer applicable, Robinson says.

Fishing is a competitive business, with a goal of catching more than the other fishermen, oyster fishermen included. But prompted in large part by the 2011 red tide, oystermen formed the Union of Commercial Oystermen of Texas, which at last count had 305 members, mainly boat owners, captains and deck hands. The group’s president, Mauricio Blanco, is an independent shrimp and oyster fisherman in Port Lavaca. He says when he approached public officials about a disaster declaration for

(Oysters) are nature’s vacuum cleaner — they will clean the bays all by themselves if you leave them alone, filtering all the time.

— Lance Robinson



Oysters serve an important function in the bays beyond being the catch of the day. Montagna at the Harte Research Institute says that while they are a valuable commercial crop, they are invaluable for the benefits they provide to the ecosystem.

“They are nature’s vacuum cleaner — they will clean the bays all by themselves if you leave them alone, filtering all the time,” he says. “They also provide shoreline stabilization. A lot of them live along the edges, and they cement together the shoreline so you don’t get erosion. They’re great

the oyster fishery because of the red tide, they asked who he represented.

“As fishermen we don’t share information. On a daily basis, that’s our livelihood, and the more knowledge you have, you catch the most and create a bigger payday,” Blanco says. “We formed the union because we saw a need to get organized.

“It was a common need, a common problem,” he says. “That was the reason why we created the union — we want to manage our resources and we’re tired of being ignored.”

Blanco says the fisherman also want to have more input in issues like the reduced sack limit, which limited their ability to catch up from the three months of the season that were lost.

TPWD’s Robinson has been encouraging the fishermen to organize for years.

“They’ve reached out to local and federal legislators over issues and concerns that they have experienced,” he says. “Hopefully they will stay organized and active.”

Robinson says the Texas Governor’s Office has asked the U.S. Department of Commerce to review the circumstances surrounding last year’s oyster season for a possible disaster declaration for the impact of the red tide on the fishery. Commerce’s National Marine Fisheries Service is the department that would make the decision. “There is no pot of money out there waiting for a declaration to occur,” he says. If NOAA determines that there is enough evidence to show the fishery suffered a disaster, Congress would have to appropriate or redistribute funds to provide assistance.



Oyster fishermen unload their catch at Misho’s dock in Seadrift Harbor on April 30, 2012, the last day of the public reef oyster season.

PHOTOS BY RHONDA CUMMINS

bioengineers, creating habitat for other organisms as well. Oysters are pretty darn important for bay ecology.”

Dr. Sammy Ray, Professor Emeritus of Marine Biology at Texas A&M University at Galveston, has been studying oysters for more than 60 years. He says they are an excellent biological indicator of the health of Texas’ bays.

“If the oysters are doing well, many other estuarine-dependent species are also,” he says. “If we keep the oysters healthy, the bays are in good shape for other things. The oyster is equivalent to the canary in the coalmine to tell you of danger.

“The oyster plays a great role. If we never ate another oyster, it’s still important for us to have oyster production in our bays.”

Continued on page 25

Aw, Shucks!

They sink seashells by the seashore

Dozens of volunteers lined up on the fishing pier, down a set of steps and into the water of St. Charles Bay near Goose Island State Park on a Saturday in May. Instead of a bucket brigade, they passed net bags of oyster shells out to the oyster reef at the end of the line. The “Sink Your Shucks” project at Texas A&M University-Corpus Christi’s Harte Research Institute for Gulf of Mexico Studies (HRI) was holding a reef restoration day with empty oyster shells, called shucks.

Maintaining oyster populations are important both for the fishery and because of the ecosystem services that oysters provide. Young oysters need a hard surface to settle on, but hard substrate is in short supply in Texas — Dr. Jennifer Pollack, Assistant Professor of Life Sciences and the founder and coordinator of the Sink Your Shucks oyster recycling initiative, calls the state’s bays “big, muddy bathtubs” — so there’s not much for a young oyster to attach to except previous generations of oysters on an established oyster reef.

When oysters are harvested with an oyster dredge, they are scraped off the bottom. If the oysters are harvested faster than they can grow back — or if the oysters are affected by poor water quality — the oyster reefs degrade or shrink, leaving a potential housing shortage for young oysters.

While large shucking operations may sell the empty shells to the construction or poultry industries, restaurants usually send their shells to landfills. “They’re stinky, they’re heavy and they take up a lot space. (Restaurant owners) really don’t have a way to do anything else with them,” Pollack says. “We think of it as a resource out of place if an oyster shell goes to a landfill. We’re just stepping in to reclaim those shells and put them back where they need to be, which is in the bay to create or maintain oyster habitat.”

Sink Your Shucks partners with seafood wholesalers and restaurants in the Corpus Christi area to collect the empty shells. The shucks are left out in the sun to cure for at least six months to kill bacteria or other disease-causing organisms. Volunteers then bag up the shucks and deposit them on the reef.

The program hosted three events on Saturdays in March, April and May, with about 150 volunteers each day who submerged a total of 1,816 bags of shucks weighing almost 40,000 pounds.



PHOTOS BY ALLISON KNIGHT

On a chilly March day, Sink Your Shucks volunteers loaded sacks with empty oyster shells and moved them out to the reefs in a supply line that started on the pier.

Other entities are also conducting or partnering in reef restoration projects in Texas, including The Nature Conservancy, the National Oceanic and Atmospheric Administration’s Community Restoration Program, the Mission-Aransas National Estuarine Research Reserve, Texas A&M University, the Coastal Conservation Association, the Galveston Bay Foundation and the U.S. Fish and Wildlife Service. Commercial fisherman and seafood dealer Buddy Treybig, owner of Arnold’s Seafood and Buddy’s Seafood in Matagorda, this year began taking empty shells out to East Matagorda Bay with a special permit from the Texas Parks and Wildlife Department (TPWD).

TPWD has undertaken a massive project in the Galveston Bay system. Using disaster funding from the National Marine Fisheries Service for impacts from hurricanes Ike and Rita, they have already restored 1,303 acres of oyster habitat. About 60 percent of the oyster reefs there were buried under silt brought in by the storm surge from Hurricane Ike, and East Galveston Bay alone lost 80 percent of its oyster habitat.

HRI also restored four acres in Copano Bay last summer and will restore two acres in Aransas Bay this summer, both using reclaimed shells from the Sink Your Shucks project. Neither is located in a place as easy for volunteers to access as the St. Charles Bay site.

“We chose that location because it’s surrounded by natural oysters, so it’s a good source for new oysters, but it’s also really close to a fishing pier and accessible to Corpus Christi ISD students to take field trips out a couple of times a year to use as an outdoor classroom,” Pollack says. Students who bagged the shucks and put them in the water will be able to come back on field trips with their classmates to measure how the reef changes with time.

“We were trying to figure out how to get people to get their hands dirty and actively participate, which builds more consensus amongst the community that this is something that’s important. And because it’s such a simple process, it’s really easy for them to understand what they’re doing and the kind of difference they’re making.”

In addition to the red tide, the 2011 drought hit oysters with a one-two punch of two salinity-loving species: oyster drills and dermo, neither of which harm humans but do kill the oysters.

Oyster drills are predatory snails that, as the name suggests, drill holes into oyster shells to feed on them. TPWD had reports of drills on several oyster reefs where they had not been observed in the past.

“We get inflow input from the rivers and it keeps the salinities moderated, so it keeps the drills pushed back. We saw the opposite this past summer, with drills pretty pervasive throughout the Galveston Bay system, and coastwide as well — they were everywhere,” Robinson says.

The other threat, dermo, is an oyster disease caused by the single-celled parasite *Perkinsus marinus* (originally called *Dermocystidium marinum*, hence the name). While dermo is harmless to humans, it causes high mortality in oysters, slowing growth rates, impairing function of their adductor muscles and inhibiting reproduction. Once an oyster picks up a dermo infection, it usually has it until it dies, although occasionally, with low enough temperatures and salinities, the parasites don't multiply inside the oyster and the host's immune system can get rid of them.

Initially thought to be a fungus, dermo was discovered in the late 1940s, and the first paper was published on it by J.G. Mackin, H. Malcolm Owen and Albert Collier in 1950. Ray, who was working with Collier at the time, developed a method for detecting dermo in the early 1950s that is still used today with little change.

He regularly tests oyster samples from throughout Texas' bays for the parasite and found in 2011 that, like the oyster drills, dermo infection had spread to unprecedented levels, including to areas he didn't think had high enough salinities to even support oysters.

“During this period, it is my belief that dermo advanced further up the bays than any time since we've known about it,” he says. “I got samples showing oysters infected with dermo in upper Texas bays, in such areas as the San Jacinto River and in the upper Trinity Bay, at high levels.”

People look at floods as disasters, but in my opinion, if I could control things, I'd have a good flood every eight to 10 years to clean out the parasites.

— Dr. Sammy Ray

Ray says a little drought can be a good thing for oysters, depending on the timing, but definitely not at the levels experienced during 2011. When there are high salinities in late winter and early spring, the oysters have sufficient salinity to develop their reproductive organs and they have a good set of spat in spring and summer. However, with prolonged drought, which in last year's case began in October 2010 and lasted for 18 months, young oysters develop significant levels of dermo even in their first year — a very unusual occurrence.

“I have no records of young oysters becoming infected to the extent that the 2011 oyster recruits picked up dermo, and it's much faster than I had ever recorded before in the 60-some years I've been working on oysters,” he says. “A lot of oysters of that bumper crop will be lost because of the warm season that we had.”

“Most of the drought now is broken in Texas, but we've had a very warm winter. Normally, with regard to dermo, when we have a normal winter, the oyster gets rid of a lot of the parasites, but I'm predicting the oysters didn't get rid of much in the way of parasites, and late spring and early summer I am expecting a die-off.”

Ray isn't hoping for just enough rain to end the drought, he's hoping for a deluge.



Dr. Sammy Ray, Professor Emeritus of Marine Biology at Texas A&M University.

PHOTO BY STEPHAN MYERS

Water, water everywhere...

“We need a good flood,” he says. “The flood will kill off a lot of the oysters that are harboring dermo, and kill off a lot of drills. If the salinities recover to at least 10 to 12 ppt, in most of our bays, we’ll have a good set, and if we get a good set, the oysters will recover and we’ll have market-size oysters in the next 18 to 24 months.

“People look at floods as disasters, but in my opinion, if I could control things, I’d have a good flood every eight to 10 years to clean out the parasites. Steady state gets a building up of predators and parasites. We made a mistake by letting people build homes in flood plains, and now we have to prevent floods, which keeps freshwater from getting to our bays and estuaries.”

With Texas’ climate of cyclical drought and flood, it’s not a question of whether Ray will get his wished-for flood, but how long he’ll have to wait. Dr. John Nielsen-Gammon, the Texas State Climatologist and Regents Professor in the Department of Atmospheric Sciences at TAMU, puts it this way: “Texas has a tendency to end droughts with floods.”

Enough Freshwater for the Future?

At the height of the 2011 drought, the National Integrated Drought Information System’s National Drought Monitor showed that none of the state was free from drought and almost 88 percent of Texas was in exceptional drought, the worst level. Thanks to the winter

and spring rains, by mid-April 2012, the percentage of Texas that was back in the normal range had climbed to 18 percent, and less than 10 percent of the state was in exceptional drought.

Through May, however, even as the parts of the state experiencing the highest levels of drought continued to shrink, other sections of Texas that had been drought-free appeared to be slipping back into abnormally dry conditions. By early June, less than three percent of the state, most of it on the upper Gulf coast around Galveston Bay, was normal — while more than 65 percent was in at least moderate drought, and another 32 percent was listed as abnormally dry. Is another summer of drought on the way?

In early May, NOAA’s National Weather Service Climate Prediction Center announced the end of the two-year La Niña that was the main cause of the Texas drought. La Niña is part of the El Niño/Southern Oscillation (ENSO), a recurring interaction of the oceans and atmosphere that can produce extreme weather globally. El Niño and La Niña refer to the warm/cold cycle of surface temperatures in the eastern Pacific Ocean, and the Southern Oscillation is the concurrent changes in atmospheric pressure in the Southern Hemisphere. In Texas, the push and pull of these conditions contribute to the cycle of drought and flood, the latter of which is often associated with El Niño conditions.

The May 3 announcement also predicted ENSO-neutral conditions through the summer, with the

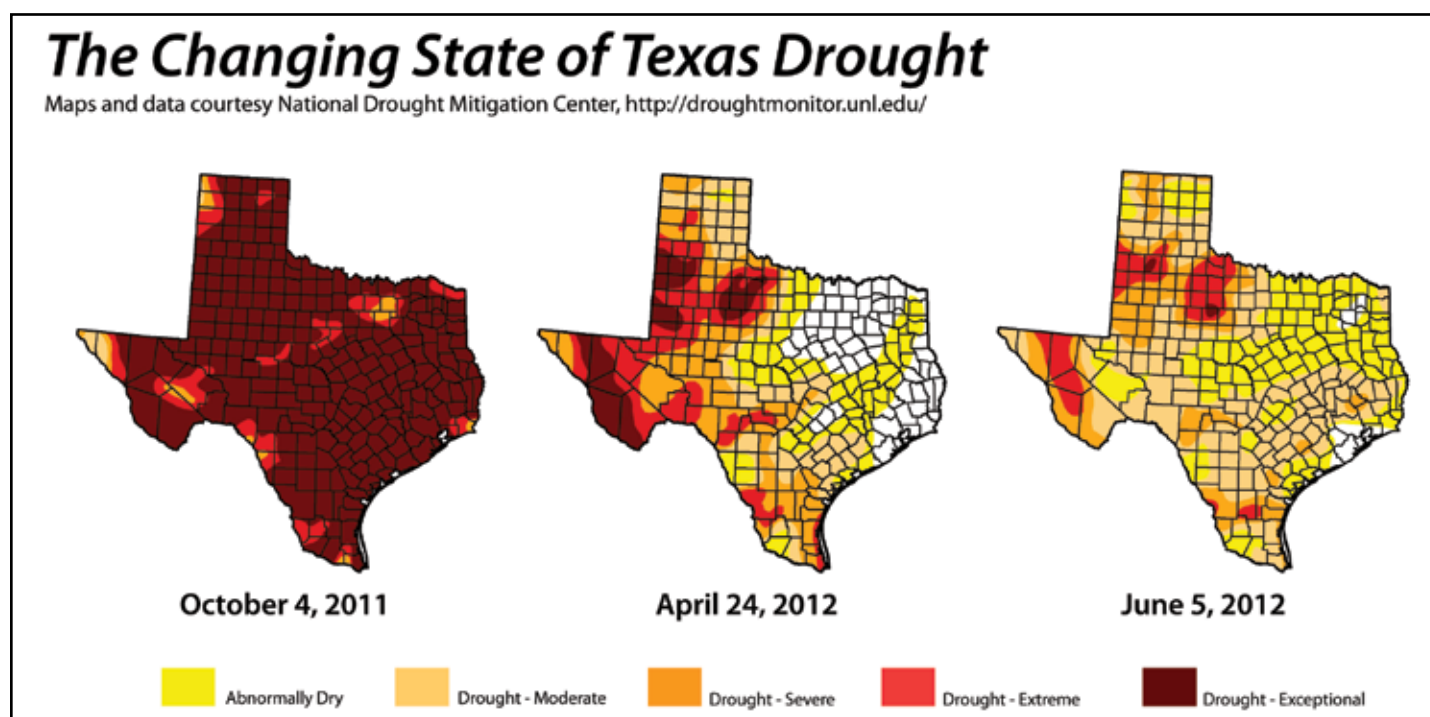




PHOTO BY DEWAYNE HOLLIN

Chandler's Landing at Lake Ray Hubbard, Rockwall, Texas, during the 2011 drought.

projection models split on whether they will continue beyond then or if El Niño conditions will develop instead. The models do agree, however, that it is less likely that La Niña will re-develop later this year.

The latter forecast has many heaving a tentative sigh of relief. The 2011 drought was frequently compared to the Texas drought of record in the 1950s. One of the reasons that earlier drought was so severe was because of long-lasting, recurring La Niña conditions.

“There were several La Niñas and one marginal El Niño (in the 1950s), so Texas really didn’t get the full cycle of drought and flood that we normally do, we missed half a cycle,” Nielsen-Gammon says. “Plus the Atlantic Ocean was relatively warm back then, which tends to lead to dry conditions in the south central U.S. — which we have had again since the mid-1990s.”

In the tropics, the drought and flood cycles map fairly directly to ENSO, but in temperate climates like Texas, the relationships are not as clear. “You can get above normal rain during a La Niña one year out of five during the wintertime, for example. And in the summer, it doesn’t have as big an effect anyway, so there’s a lot more randomness to the weather,” he says.

In Texas, the wettest months are May-June and September-October, when ENSO has less influence. “El Niño and La Niña are not controlling the most important months of rainfall, that’s the good news (during La Niña

conditions). The bad news is, that means we have less ability to predict what’s going to happen during those months.”

If El Niño conditions do develop later this summer, the wind shear that results likely will make it harder for tropical storms and hurricanes to develop in the Atlantic-Caribbean basin — good news for those living on the coast, perhaps, but less good for those who are hoping for a good soaking from a tropical storm or two to finish off the drought.

Even so, Nielsen-Gammon sees cause for optimism. “The other main factor affecting hurricane season is Atlantic Ocean temperature,” he says. “This year, the Atlantic is cooler than it has been for a while, which will tend to suppress hurricanes, but at the same time lead to more rain in the central and eastern United States. Cooler water temperatures mean fewer thunderstorms over water and more thunderstorms over land.

“The extremely high temperatures we had last year were mainly related to the lack of rainfall, so as long as we get occasional rain during the summer, we shouldn’t see the ridiculous heat that we did last time.”

On the other hand, he says, “Summers tend to be hot and relatively dry, so the expectation is that we won’t be able to recover from drought at least until the temperature turns cool again this winter.”

Water, water everywhere...

The 1980s and 1990s were the wettest two decades of the 20th century in Texas, he says, part of a century-long trend that saw observed precipitation in Texas increase by five to 15 percent.

“Effectively we got used to some nice, wet years,” he says. “We’ve been in a dry period since the late 90s, and it hasn’t been dry on average so much as it’s been a lot of relatively high frequency of drought, because we also have wet years like ’04 and ’07, so on average it looks normal, but that’s Texas for you.

“The longer you get from a major drought, the more abstract it becomes — you don’t realize it is physically possible to run out of water,” he says. “We’ve had drought response plans in effect since the mid-’90s across Texas, but they’ve never really been tested severely in most places until this drought. So the different stages of the water restrictions are new to a lot of people, and we don’t really know in some cases whether the restrictions are too restrictive or not restrictive enough.

“There is a slide that I borrowed from the Brazos River Authority that shows the summertime flow at Hempstead during 2011 and has it broken down into estimated flow from reservoir releases and everything else. And there were a few times during the summer when there was no ‘everything else.’”

With or without a drought, demand for freshwater is only expected to increase. Texas’ population is projected to grow from 25 million to 46 million by 2060, and those 21 million new Texans mean more water will be required

for municipal, agricultural and industrial needs — an estimated 27 percent more. The competition between those needs and water for adequate environmental flows to sustain the health of river and estuarine ecosystems will also rise.

That is one of the concerns of Treybig of Arnold’s Seafood. “This is going to become a common problem, maybe not as bad as in a drought, but it’s going to be bad for the seafood industry in the future if we don’t see freshwater inflows. We’re going to see it get worse even without a drought.

“As commercial fishermen, we see the decline,” he says. “A lot of commercial fishermen in this state are gone or they’re leaving the industry, and it doesn’t look good for the future.”

Treybig serves on the Bay/Basin Stakeholders Committee for Matagorda/Lavaca Bay. It is part of a statewide effort to answer the question, “How much freshwater does a river or estuary need to function?” and to set policy that maintains that function.

Consideration of environmental flows is a relatively recent development. In Texas, surface water rights have been granted for hundreds of years in relation to specific purposes, such as for agricultural irrigation or a municipal water supply. The state operates under a “first in time, first in right” doctrine, through which senior rights-holders, those whose permits were granted first, have priority over those whose permits were granted later. Under current water law, senior rights-holders can petition the Texas

Commission on Environmental Quality (TCEQ) for more water, trumping junior rights-holders’ access to water on the same river. During the 2011 drought, TCEQ had an unprecedented 15 of these “senior calls” that curtailed or suspended 1,200 junior water rights, far more than any previous drought.

In 1997, Senate Bill 1 established regional water planning groups, with the intent to have regional stakeholders work together to develop acceptable local strategies. This was followed up in 2001 by Senate Bill 2, which mandated that the



PHOTO COURTESY BRAZOS RIVER AUTHORITY

At the height of the drought, the Brazos River near Seymour was little more than a dry riverbed.

state's water resource agencies — the TCEQ, Texas Water Development Board (TWDB) and TPWD — work together to conduct environmental flows research through a Texas Instream Flow Program.

“People realized we don't understand enough about ecology,” says Dr. Kirk Winemiller, Regents Professor in the Department of Wildlife and Fisheries Sciences at TAMU, who assisted with the instream flow program. “The question of how much water a river or stream actually needs — what's the minimum amount that we can provide for the environment? — that turns out to be a really difficult question.”

In 2007, the Texas Legislature passed Senate Bill 3, which set up a process to address that question and use the answers as a basis for future water permitting policies in all the river basins in the state. The legislation established an Environmental Flows Advisory Group (EFAG) made up of legislators and representatives from TCEQ, TWDB and TPWD, and divided the state into 11 regions, including the seven river basins that drain into the estuaries and bays of the northwestern Gulf of Mexico. The EFAG appointed members to a Bay/Basin Stakeholders Committee (BBASC) for each region, and those committees in turn appointed a Bay/Basin Expert Science Team (BBEST) for their regions. The EFAG also appointed members to a statewide Science Advisory Committee that works with the BBESTs to promote consistency across the state.

The BBESTs develop science-based recommendations for flow regimes within each river basin, and forward their recommendations to the respective stakeholder committees. The stakeholders then develop strategies to meet the flow recommendations based on their BBEST report, perceived economic needs for water, and policy considerations. The TCEQ considers reports from each basin's BBEST and BBASC, as well as public comments, and one year later establishes flow rules. The flow rules will be used to evaluate new water rights permit applications, and may in some cases be used as a basis for environmental contingencies on new permits.

The deadlines for each region are staggered, with the earliest rules, for the Sabine and Neches Rivers/Sabine Lake Bay Area and the Trinity and San Antonio Rivers/Galveston Bay, released in June 2011. Two other bay and basin systems in the central coast have submitted their reports and are waiting for decisions from TCEQ, due by September 2012. Two other systems — the Brazos and Nueces — are in process at the stakeholder committee level, and their reports are due to TCEQ by September of

this year for a decision by September 2013. Another area, the Rio Grande, has received an extension and its two BBESTs are working on their reports.

“It sounded like a good idea when the politicians and various stakeholders helped draft the legislation — yes, let's get all the available evidence, let's get the best minds we have available in the state to work on this, and let's get some recommendations that are better than what we have now,” says Winemiller, who is a member of the Sabine and Neches Rivers/Sabine Lake Bay Area BBEST. “It sounded great, but it's not so easy.”

Texas Sea Grant's Reisinger is the chairman of the Rio Grande/Lower Laguna Madre Area BBASC. He regularly attends the meetings of one of their two BBESTs. “I've learned a lot about the complex hydrology of water usage and drainage in the Valley,” he says. “I'm impressed with what the scientists have been able to do with the little they have to work with, including some ungauged flows. The cooperation from the Texas Water Development Board and TCEQ has been outstanding.”

Prior to SB 3, TCEQ relied primarily on charts and models that used a single target flow, a “floor for the flow,” to determine adequate river flows in granting water rights permits. Winemiller says those types of models aren't sufficient.

“We know a lot more about river ecology now, and we know that you have to have variability in flow to maintain the biodiversity and the ecosystem functions of fluvial ecosystems, and that includes estuaries,” he says.

The challenge of SB3 is to preserve this flow variability — including high flow pulses during wet times, subsistence flows during extreme drought, and everything in between, along with their timing, duration and magnitudes — that is found in naturally occurring flow regimes.

The Harte Research Institute's Montagna agrees that the variation between drought and flood are exactly what the bays and estuaries need.

“There's no such thing as average flows. We talk about average flows all the time, but the environment doesn't care about the average, they have to deal with the extremes,” he says. “What we actually have is really dry years and really wet years.”

Mother nature is amazingly resilient, when given a chance.

— Dr. Kirk Winemiller

Water, water everywhere...

“One of the things our research has shown is that those big floods act like a forest fire acts on land, it cleans out the debris, and when the salinity starts to come back up to midrange values, the bays become more productive than before,” Montagna says.

Winemiller, whose research focuses on river ecosystems, recently surveyed the lower Neches River and found freshwater levels back to normal in the river and species distributions returning to their normal range. “It is very rapidly bouncing back with the restoration of flow,” he says. “Mother Nature is amazingly resilient, when given a chance.”

He says SB 3 is not a perfect solution, but it is a good first step.

“I think most people that were involved, even those that were a little bit disillusioned with how Senate Bill 3 ultimately played out, at least in the basins that have been completed, will still tell you that it’s better than what we had before,” he says. “You only have to go back 20 years or so in Texas and there was no consideration of the environment in water rights permitting, nobody even thought about it, it wasn’t even an afterthought, it was just, ‘What are the human needs? Period.’ It’s a relatively recent phenomenon that we’re even thinking about this.

“We’re going to need more freshwater, there’s no way around it,” Winemiller adds. “This challenge is going to be with us forever.” ♡



PHOTO BY DEAN JOHNSTONE

Sufficient freshwater inflows will ensure healthy habitats for coastal species, including this great blue heron on an oyster reef near Indianola.

coastal icon

Roberta Ripke

'Driven to do good works'

By Jim Hiney

Roberta Ripke refused to be sedated for her final trip home. She did not want drugs to dull her senses and keep her from appreciating the sights and sounds of her journey.

Five days earlier, lying in a New Braunfels hospital, her body ravaged by cancer, she told her children she wanted to go back to Palacios, the “City by the Sea” where she had lived since early childhood.

“I’m tired,” Ripke said to her son, Richard Ripke, and Felicia Ripke Jackson, one of her two daughters. “I’m ready to go home and die.”

About three hours after leaving New Braunfels, attendants gently lifted Ripke’s gurney from the back of an ambulance and onto her driveway. As she looked at her house for the first time in five weeks, her other daughter, Kimberly Ripke Garcia, asked if she recognized the place.

A tracheotomy tube in her throat prevented her from saying anything, but Ripke “smiled real big,” Jackson remembers of the moment on January 25 of this year. “She knew where she was, and she was happy to be home.”

The woman known to most as simply “Bert” passed away an hour later.

Through sheer strength of character and will, Ripke made it back to her most special place, where for much of her 66 years she had been a tireless community activist, volunteer, advocate, cheerleader and force of nature when it came to getting the job done — any job.

She left an indelible mark on Palacios, Matagorda County and, more importantly, the people she touched through her myriad projects. Her record of activities was almost as boundless as her energy — Ripke organized regattas, was a Girl Scout leader, conducted hurricane preparedness and relief efforts in the wake of Hurricanes Claudette and Rita, organized volunteers to help the Texas Historical Commission excavate French explorer La

Salle’s ship *La Belle* from the bottom of Matagorda Bay, taught sailing courses, volunteered to work with kids at the annual Summer Ocean Awareness Retreat (SOAR) camp on Matagorda Island, spearheaded efforts to replace Palacios’ historic bay front pavilion, worked to get a sailing-capable, half-scale model of *La Belle* built as a local tourist attraction, helped create and organize the annual BayFest, and almost single-handedly provided Christmas gifts and groceries to 250 families each year through Operation Santa Claus.

“Bert was instrumental in the nurturing of Palacios,” says longtime friend Cathy Wakefield. “Perhaps nurturing is not the right word, but she was instrumental in expanding the things that were here. I can’t think of anything that I’ve been involved with in town that her name wasn’t attached to.”

Nick West, another long-time friend and publisher of the *Palacios Beacon* newspaper, says Ripke proved that “one individual, particularly in a small community, can make a big difference and improve the quality of life for everybody.

“Many of the things that she accomplished helped everyone in the community — tourists and residents alike. A lot of people who come down here enjoy things that she had a hand in creating, like BayFest, the recreation center and improvements along the bay front. Many people from around the state came to Palacios because Bert helped set up regattas. Many people learned a lot about nature



PHOTO COURTESY PALACIOS BEACON

*She liked helping people
and had a passion for it.
She made an impact on a
lot of people’s lives.*

— Felicia Ripke Jackson

coastal icon

because she convinced them to take part in activities like the retreats on Matagorda Island.

“She was a caring person. She was very comfortable to be with — and she was always working,” continues West.

Roberta Kaye Anthis was born in Temple, Texas, on Aug. 3, 1945, to Joseph Horton Anthis Jr. and Mabel “Bobbie” Hansen Anthis. Ripke was young when the family moved to Palacios after her father found work at the Alcoa plant in nearby Point Comfort. She attended Palacios public schools and graduated from Palacios High School. Bert married a local boy, Clarence George Ripke Jr., who taught fifth grade math in Palacios and, after he retired from the classroom, became a Job Training Partnership Act (JTPA) counselor working with the school district to provide job training for economically disadvantaged kids and adults, dislocated workers and others facing significant employment barriers. Together, Bert and Clarence settled down to raise three children in the small town on the banks of Tres Palacios Bay.

Family and friends do not know what prompted Ripke’s community activism, but it reaches back as far as Felicia Jackson can remember.



PHOTO COURTESY PALACIOS BEACON

Ripke holds a book on the history of Palacios produced by the Palacios Beacon. Ripke helped choose photographs for the book.

“My earliest memories of my mother are of me being in the Brownies and she was our troop leader,” Jackson says. “I knew she was involved in many activities. It was common to pick up the *Palacios Beacon* and see her name and photo, but I didn’t think it was unusual because I didn’t have anyone to compare her to.”

Jackson’s epiphany about her mother’s community involvement came while she was a student at Southwest Texas State University, now known as Texas State University, in San Marcos. “It became a game for my friends and me to see how far we could read through the *Beacon* before we saw my mother’s name or photo. That’s when I realized how much she truly did for her community. I think she did it because it was her way of giving back to her community. She liked helping people and had a passion for it. She made an impact on a lot of people’s lives.”

Palacios resident Colleen Claybourn and Ripke were childhood acquaintances who lived around the corner from each other when they were young. Claybourn laughed when she recalled how Ripke dyed her hair white when she was in high school. “She was the kind of person who wanted to make sure that everybody knew who she was, but not in a bad way,” Claybourn says.

The pair developed a deeper friendship in the late 1970s, when their concern for local children compelled them to raise funds for a community swimming pool.

“It seemed there was at least one child who drowned every year because they went out in Palacios Bay and didn’t know how to swim,” says Claybourn, now chairman of the philanthropic Trull Foundation. “We decided that we wanted to raise funds for a city swimming pool so people had a place with low fees to swim and take swimming lessons.”

They raised the \$270,000 they thought was needed for construction by holding monthly dances and a series of fish fries, bake sales and “just about anything you can think of to raise money,” Claybourn says. “It was a lot of fun, but also a lot of work.”

When the project went out for bids, the pair discovered that the area’s high water table complicated construction and raised the project cost to more than \$500,000. Undeterred, they secured a grant for the remaining funds from the Texas Parks and Wildlife Department. The Palacios Swimming Pool is still in use today, and local children take swimming lessons there through the Palacios Independent School District.

Bert became director of the Palacios Area Fund (PAF)

in the mid-1980s. The PAF, a division of Dallas-based Communities Foundation of Texas, is a donor-supported philanthropic organization dedicated to building a permanent endowment to fund a variety of local non-profit organizations and activities through grants and special projects. Its mission is to promote philanthropy throughout the Palacios area as an effective way to improve the quality of life there. The job was tailor-made for a woman most often described by friends and family as selfless, compassionate and caring. “She would do for others before she did for herself,” Jackson says. “She loved her job so much that she once said she would do it for free if she had to.”

West donated office space in his newspaper building to the PAF. “I’d come in at 7:30 a.m. and she’d already be over in her office. She was a tireless worker and very dedicated to her community.”

Willie Younger, who was then Texas Sea Grant’s Matagorda County Agent, first met Ripke when she took the PAF directorship, and the two worked together for a quarter century. Younger, who went on to become Texas Sea Grant’s Marine Education Specialist and has since retired, calls her a “renaissance woman.”

“She wasn’t fearful of treading into unknown waters. Her lack of knowledge on a topic did not stop her from bringing herself up to speed and jumping in feet first to get things done. You’d go to her knowing she had no time to spare, but she would always find time to help you if she could.”

Ripke was one of the key adult leaders in helping plan and execute Sea Grant programs like the 4-H Sea Masters and the SOAR camp on Matagorda Island.

SOAR camp was born in the early 1980s out of a desire by three of Texas Sea Grant’s county marine agents to develop a joint youth program. Matagorda County’s Younger developed a plan with Joe Surovik in Calhoun County and Rich Tillman, who worked in Aransas and San Patricio Counties, to take kids camping on the eastern end of Matagorda Island, home to a state park at the time. Over the course of the next few years, the camp moved to land on the western side of the island owned by the U.S. Fish and Wildlife Service, and participants were limited to kids who were members of Matagorda County’s 4-H Sea Masters program.

Younger had formed the Sea Masters to serve young people who wanted to be involved in 4-H but were more interested in the marine sciences than the group’s traditional areas of agriculture and home economics.



PHOTO COURTESY PALACIOS BEACON

Ripke kneels beside some of the toys and other gifts she collected during Operation Santa Claus.

During their three-night, four-day stay, SOAR campers participated in a variety of lessons developed by Younger, his volunteers and naturalists living on the island.

Lee Edward Bacca, another active volunteer in many of Younger’s Matagorda County programs, met Ripke at SOAR camp. He remembers her as “an impressive person. She was very level-headed and always seemed to keep things under control. She had a real concern and good rapport with the kids and the people she worked with. I admired her for her concern for youth.”

Over the ensuing years, Bacca and Ripke worked on a variety of volunteer projects. “She was a fine lady, always willing to do her part and help you with your part if you needed it,” he says. “She was very easy to work with, and I enjoyed working with her. Ours was a relationship where you didn’t have to sit down and think about it. It just worked.”

Logan Respass, now the Extension Program Leader of Texas Sea Grant, continued the camp as the new Matagorda County Agent in 1998 after Younger left to become

Bert was driven to do good works, whether it was youth education or trying to support the community and its residents. — Logan Respass

coastal icon

the Marine Education Specialist.

“SOAR was unique in that it was so much more than just a camp,” Respass says. “For many of those kids, it was their first time away from home. Many

of the kids had never washed a dish or served themselves because it was easier for their parents to do these things for them. SOAR camp was a leadership program. Parents were amazed when the kids returned from camp at how much more empowered the kids were. The kids wanted to help cook and do more things on their own.”

Respass says Ripke was the first person up every morning and the last person to go to bed. She cooked food, taught art and tended to the campers’ first aid needs.

“Bert always had a big sun hat on. She could have been just another tourist at the beach, but she had a way with kids. She could get them involved in arts and crafts with materials they picked up off the beach. It was amazing watching her keep those kids engaged and entertained, and to see how much they learned under her leadership.

“Bert was driven to do good works, whether it was youth education or trying to support the community and its residents,” Respass continues. “She was always trying to cheerlead the virtues and beauty of the area, to get the word out about what a neat place Matagorda County, and especially Palacios, is.”

History and the water are the two biggest tourism draws for Palacios, which made Ripke a natural and ardent advocate of programs that preserved both. “She loved the bay and anything that had to do with the bay — that meant *La Belle*, sailing and the pavilion, and she would fight for them,” Claybourn says.

La Belle, a 54-foot barque-longue, was the flagship of famed French explorer René-Robert Cavelier, Sieur de La Salle’s four-ship expedition that sailed in 1684 from France to the Gulf of Mexico to find the mouth of the Mississippi. La Salle planned to establish a French settlement there as a means to ultimately invade Spanish territory in the region.

He lost one ship to Spanish privateers in the



One of Logan Respass’ prized possessions is a SOAR sign Ripke painted for him.

PHOTO BY JIM HINEY

Dominican Republic. Through navigation errors and the crew’s unfamiliarity with the Gulf of Mexico, the remaining ships sailed past the Mississippi River and entered Matagorda Bay in early 1685. *La*

Belle had a relatively shallow eight-foot draft and easily maneuvered through Pass Cavallo and into the bay. The much larger storeship *L’Aimable* ran aground on a sandbar in the pass and ultimately sank. The remaining ship — the 36-gun man-of-war *Le Joly* — returned to France after having, in the captain’s mind, completed its mission of escorting La Salle’s party to the Gulf coast.

La Belle ran aground and sank a year later. It remained mostly buried in Matagorda Bay sediment for more than 300 years before Texas Historical Commission (THC) divers discovered the wreck in 1995. THC excavated the site from July 1996 through May 1997 and made Palacios its shoreside headquarters. Ripke immediately began mustering local residents as volunteers at the excavation site, where they helped archaeologists with jobs like sifting tons of sediment looking for artifacts.

In typical Ripke style, Bert saw an opportunity to use the sifted sediments, or “shell hash,” to benefit kids. She worked with the Texas State Marine Education Center in Palacios to set up a hands-on activity at the center that allowed students to sift through shell hash from the excavation site to find artifacts. She also arranged for some of the artifacts to be part of a temporary display in Palacios and trained volunteer docents to lead people through the exhibit.

“I remember Bert helped entertain the French contingent that came to Palacios to see *La Belle*,” says friend Martha Riccio, whose family worked with Ripke on a number of projects. “She could go from

She thought it was very important to teach kids how to sail properly and safely because of our proximity to water.

— Ted Riccio

talking to the poorest person in town all the way to the French Ambassador. She could do it all and she did it well.”

Seizing on the enormity of *La Belle's* discovery and excavation, Ripke pushed for construction of La Petit Belle — a half-scale working model of *La Belle* that would become a permanent tourist attraction in Palacios. Still under construction, the ship will be fitted with both sails and a motor, according to Ted Riccio, Martha's husband.

Ted also worked with Ripke at the South Texas Sailing Academy, which Ripke formed to offer sailing training to youth. “She thought it was very important to teach kids how to sail properly and safely because of our proximity to water,” he says. The Riccio family worked with Ripke both at the sailing academy and to host sailing regattas. The annual Cannonball Run Regatta, still hosted by the sailing academy, pumps about \$80,000 a year into the Palacios economy through booked hotel rooms and sales by local merchants, Ted Riccio says.

Another of the city's landmarks attracted Ripke's attention. The pavilion, which stood over the water of Tres Palacios Bay near the equally famous Luther Hotel, was the third iteration of a structure that has been a tourist attraction since 1904, when the double-decked “Pleasure Pavilion” opened to the public for dancing, skating and basketball games. A walkway encircled the dance floor, allowing guests to look out over the bay and watch swimmers in the water below.

Hurricanes in 1915 and 1919 caused damage to the pavilion and pier that was quickly repaired, but by the time a 1934 hurricane took its toll on the structures, the community decided it was time to renovate the 30-year-old pavilion. The Pleasure Pavilion was demolished in 1935 and “The Roundhouse” took its place.

Palacios' population swelled when World War II began, owing mostly to the influx of soldiers to nearby Camp Hulen for anti-aircraft training, and their families, who needed housing in and around the city.

“The pavilion was a very prominent part of Palacios during World War II,” Younger says. “Many of the nationally renowned big bands, including Harry James and Artie Shaw, played there and stayed at the Luther Hotel. They entertained the military contingent stationed in Palacios.”

Hurricane Carla hit Palacios hard in September 1961 and “left the great dome (of the Roundhouse) looking like a punctured umbrella and the concrete pier in chunks,” Mary Griffith wrote in a history of the pavilions. “A Palacios Landmark was gone. Though there were many

‘ups and downs’ throughout its history, the Roundhouse and the Pleasure Pavilions were always a source of pride to the citizens of Palacios and surrounding areas.”

Ripke understood that the pavilion was more than a wooden structure with historical significance; it was also part of the city's identity. The pavilion had been synonymous with Palacios for more than a century, and she was determined that it remain so for many years to come. She was a prominent member of a committee exploring options for rebuilding the pavilion, including the possibility of building a new structure a short distance to the west. The committee formed in 2004 and was well into its work when Ripke learned an old nemesis had returned.

A long-time smoker, she was first diagnosed with lung cancer in 1993. Doctors removed part of her left lung and then scheduled her for radiation treatments. She drove about an hour each way between Palacios and Wharton every morning, Monday through Friday, for about six weeks to receive radiation therapy. Every afternoon, she was back in her PAF office tending to the needs of the community. “She was determined to do it herself,” Jackson says.

The cancer returned in mid-2010. This time, Ripke had to make a more daunting four-hour round trip to Houston's famed M.D. Anderson Cancer Center five days a week for chemotherapy and radiation treatments — a



Ripke (seated) is embraced by Lucja White during a gathering of friends in Palacios.

PHOTO COURTESY COLLEEN CLAYBOURNE

task she could not handle alone. The community that she served so well for years returned the favor during her time of need. They formed a carpool program of sorts, with people taking turns driving Ripke to and from treatment.

“Everybody in the community signed up to help her out because everybody knows her and loves her,” West says.

By May 2011, the cancer and complications from the treatments had taken a toll on Ripke, and her health steadily declined to the point where she could no longer maintain her hectic pace. One of her final acts was to resign as PAF Director effective Dec. 31, 2011, a task she did “with a heavy heart, but she knew she was no longer capable of carrying the workload by herself,” Jackson says. “She always spoke of wanting to have a part in finding her replacement, and I thought to myself, ‘What big shoes someone will have to fill.’”

Friends pitched in where they could to continue Ripke’s projects. West’s wife, Mary, headed up Operation Santa Claus in 2010, and Amy Tapia of the Precinct 3 Justice of the Peace’s Office led the program in 2011. Ted

Bert proved it is possible for one person to get a lot of things done for the good of their community, if they will just get up off their you-know-whats and get at it.

— Colleen Claybourn

Riccio, who had been chairman of the PAF’s Distribution Committee, lead the PAF until Palacios resident Sally Kurtz was chosen recently to run the organization.

Without its most outspoken promoter, the pavilion committee initially foundered, but it has now been revived and is pushing forward the way Ripke would have wanted. “We already have a \$1 million grant to proceed with the

pavilion project,” says Ted Riccio.

Those who knew Ripke best say she left a void in Palacios and Matagorda County that no one person will ever be able to fill, but her giving spirit lives on in the many people who are stepping forward to make sure her good works continue.

“Bert proved it is possible for one person to get a lot of things done for the good of their community, if they will just get up off their you-know-whats and get at it,” Claybourn says. “Someplace in their community there is a place for them that is important for them to be. That’s what Roberta did.” ♡

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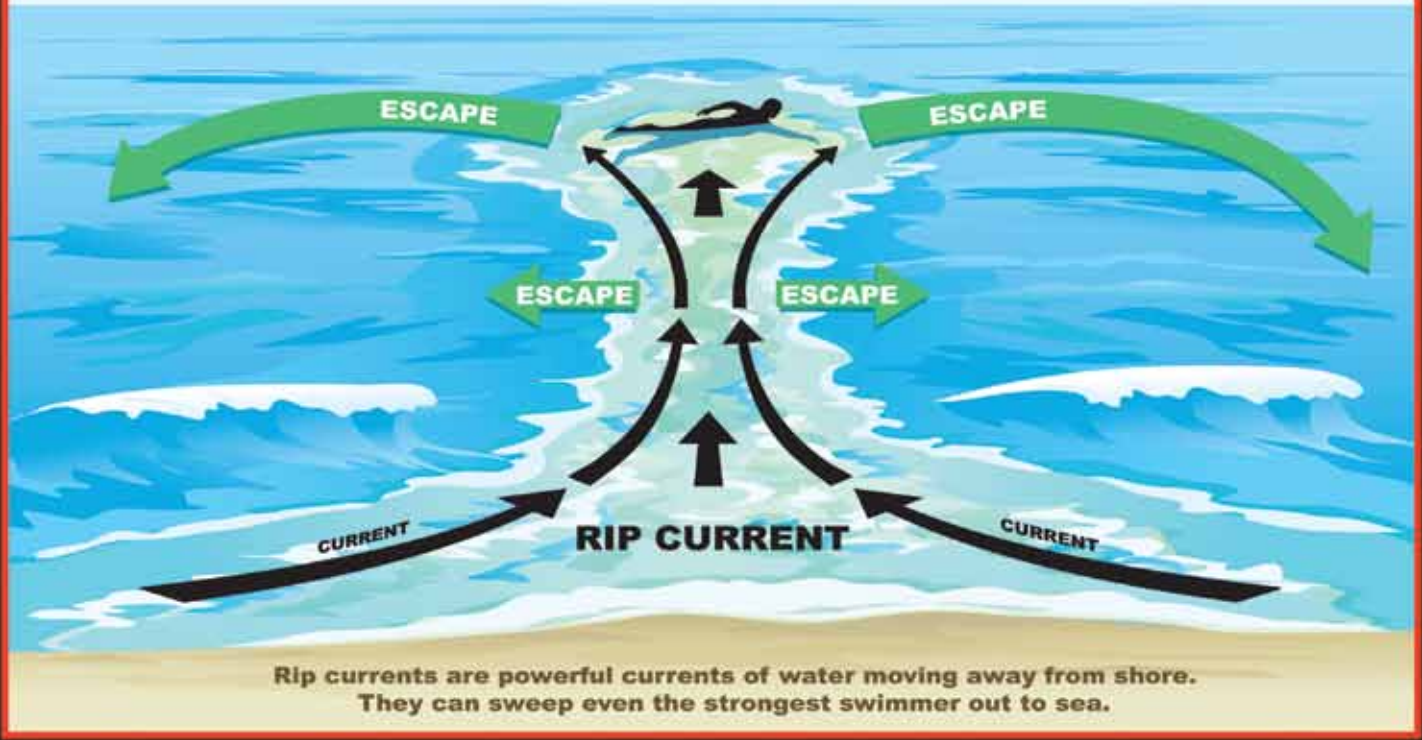
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