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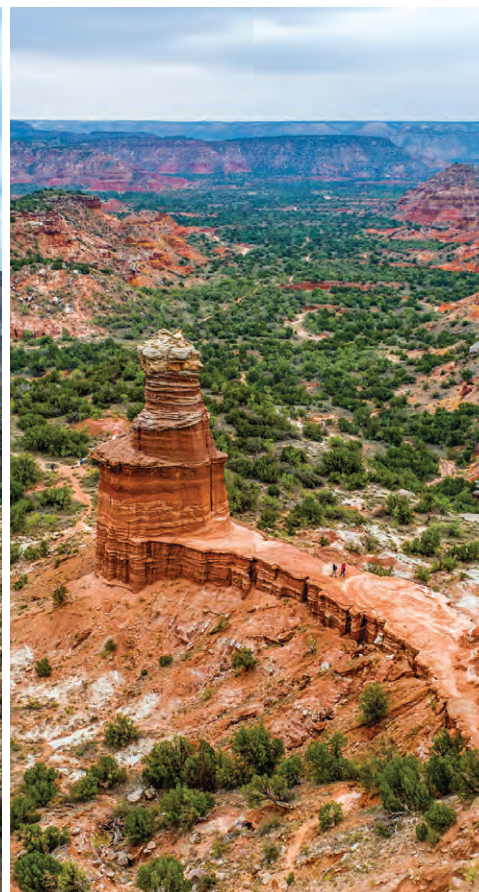
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TEXANS FOR TEXAS



Courtesy of Texas Parks and Wildlife Development

Texas has 10 natural ecoregions: Piney Woods, Gulf Prairies and marshes, Post Oak Savannah, Blackland Prairies, Cross Timbers, South Texas Plains, Edwards Plateau, Rolling Plains, High Plains and the Trans-Pecos.

From mountain scars to thirsty coastal wildlife, groups work to preserve ecoregions

By **Cody Baird, Ivoree Hernandez, Daoud Qamar and Rebecca Sloane**

Texas is vast.

With 261,820 square miles of terrain and a populace ripe with state pride, Texas boasts 10 unique, natural ecoregions.

With 89 state parks protected by the Texas Parks and Wildlife Department and two na-

tional parks within 14 areas protected by the National Parks Service, Texans are in a love-hate relationship with the natural environment. While park services work to make the outdoors a welcoming respite, they struggle with the human-caused damage produced by people unaware of the dangers in loving these delicate ecosystems to death.

From the sandy dunes of the gulf prairies to the towering oaks of the crosstimb-

each of the 10 ecoregions face similar — and unique — challenges. Conserving natural and cultural resources while providing hunting, fishing and outdoor recreation opportunities is TPWD's mission, according to their website. Scientists, conservationists and volunteer groups are partnering to educate Texans and tourists about the cause and effect of people in the state's natural paradise.

From people who flout rules designed to

preserve habitats to the universal need to manage water resources and control of invasive species, a tour through the Franklin Mountains Park in El Paso, the Panhandle and West Texas Plains, Edwards Plateau and Pineywoods, and the Gulf plains and prairies, illuminate the cause and effect of Texans loving Texas.

Coastal vistas under attack



Via NOAA's National Ocean Service

Volunteers in Hawaii collect marine litter. Debris in the water is a major factor impacting the health of ecosystems on the Texas coast.

Drought, pollution, stagnant water threaten Texas' coastal ecoregions

By Cody Baird

The gulf plains and prairies ecoregion is under attack by the triple threat of drought, stagnant water and pollution.

The only Texas region bordering the Gulf of Mexico, bays stretch from the swamps of Louisiana down to Mexico. Border islands off the Texas coastline create small passageways that make it harder to flush water out into the ocean.

Robert Hetland, a professor of oceanography at Texas A&M University, said estuaries rely on a complex balance of salinity from ocean and freshwater mixing, but droughts along the coast threaten the ecosystem due to less fresh water inputs. Estuaries are bodies of water along the coast where the ocean water is noticeably diluted by fresh water from rivers, explained Hetland. Damage to the ecosystems happens when the salinity of the mixed water is thrown off balance, he said.

"For example, oysters prefer particular salinities," Hetland said. "They don't like it too

fresh, and they don't like it too salty."

Estuary species like the oyster could suffer and new dominant species take over, he noted.

"It's kind of like temperature," Hetland explained. "If things are too hot or too cold, [some species] don't like it."

Chairman of the San Antonio Bay Partnership, Allan Berger, said the San Antonio Bay estuary is facing a drought. Garbage stagnating in the water compounds the problems facing the ecoregion about an hour north of Corpus Christi.

Solutions underway include providing fresh water sources for cranes and hauling away tons of garbage, Berger said, noting his organization works with the Coastal Bend Bays and Estuaries Program on common goals.

The bay has been starved of freshwater for a year. On Oct. 27, the U.S. Drought Monitor listed San Antonio Bay as "Abnormally Dry" continuing drought conditions from August 2019, broken only by a seven-week period from August through October 2020, according to archival maps.

"The combination of the changing climate and increasing water demand results in the bay being saltier," Berger said.

The estuary habitat — including wildlife like whooping cranes and coyotes — are being starved of freshwater during the drought. SAPD has responded by converting two old wells and ranching ponds into fresh water sources each year, Berger said.

"What we're trying to accomplish is to give the whooping crane a source of fresh water to drink," Berger said. The endangered bird migrates to the area in the winter with only 483 individuals in the wild, according to the International Union for Conservation of Nature. It notes those numbers are trending upward.

Drought is a threat multiplier since a lack of fresh and ocean water exchange causes high salinity and results in critical imbalances in the estuary and thirsty wildlife, Hetland said. No steady flow of water to flush out an estuary means pollution can build up, Hetland added. Garbage is a physical representation of damage to an estuary's environment that can stagnate in the water, he said.

"If you've got pollution or mucky water sitting there, the ecosystem is healthier usually when there is more flushing," Hetland explained.

While there is no evidence the San Anto-

nio Bay is becoming more polluted, there are signs it is getting cleaner as the SABP has taken the lead to remove consumer plastics from the bay, Berger said.

"We initiated a program this last September where we attracted 15 boats and crews to go out and pick up trash," Berger said. The cleanup hauled away 4.6 tons of garbage — including plastic bottles, aluminum cans and flip flops — from 19 miles of shoreline, according to the SABP website.

Derelict crab traps, a major problem in San Antonio Bay, are another issue SABP volunteers are successfully tackling, Berger said. Their website notes 1,249 derelict traps have been removed in 2020, up from 258 traps properly disposed of in 2016. A total of 32,705 traps have been removed from Texas coastal waters since 2002, according to the Texas Parks and Wildlife Department.

Berger said he encourages volunteers to show up to one of SABP's bay cleanup events.

"If you want to pick up crab traps or pick up trash next September or February, bring some of your buddies and do that," Berger said.

For more information about SABP, visit SABayPartnership.org.

When fire and floods help reclaim nature



Courtesy of Texas Parks & Wildlife Department

'Leave No Trace' is the message to visitors from Huntsville State Park guides to protect this natural respite located just 50 miles from College Station.

Centuries of farming, ranching have transformed Texas landscapes

By Rebecca Sloane

Before vast landscapes were settled, flash floods and wildland fires were nature's way of maintaining ecosystems. Hundreds of years later, parkland restoration is often at odds with modern agriculture.

Nestled in the Hill Country, Pedernales Falls State Park and the area surrounding used to be mainly grasslands subject to frequent flash floods and wildfires, said Stephen Garmon, the interpreter and volunteer coordinator at the park. This was actually beneficial since it naturally got rid of invasive species, Garmon said.

German settlers migrating to the hill country in the 1800s transitioned the land use to farming and ranching, which caused soil loss,

explained Garmon. It also destroyed the grasslands.

"Anytime they would harvest, most roots would die out and soil would wash away with the next flash flood," Garmon said. "We lost a lot of that soil, we lost a lot of the grassland. And the only plants and trees that were able to really flourish in the new environment were the ashe juniper."

While ashe juniper is native to Texas, Garmon said it usually grows only in areas with weedy, bad soil. The park's history of ranch and farm use had left the soil ruined for diverse, native plants by the time the state acquired it.

"When Parks and Wildlife bought this park back in 1970, we realized right off the bat that this is going to be a difficult park to manage because we can't just keep it like it is," Garmon said.

Around 200 miles east of Pedernales, the battle is to protect native species from invasive aquatic plants and zebra mussels that have

challenged the Huntsville State Park's ecosystem, said John Herron, park interpreter.

"Hydrilla, large salvinia and zebra mussels are not native to our lake," Herron said. "They come in and they tend to overpopulate and choke out the native wildlife."

Managing the invasive species in the lake is handled by the Inland Fisheries Department, explained Herron.

"Currently, they are using a targeted herbicide to deal with the Hydrilla in the lake," Herron said. "They are leaving some controlled pockets of it as it is a nice habitat for growing fish. I know they are running tests on the large salvinia that we have."

Huntsville assistant park superintendent Jessica Bright said "Leave No Trace" is the message Texas park interpreters and guides use to educate visitors of their duty to protect the ecosystem. Park boaters who properly clean their boats before and after use are vital in the ongoing battle against invasive species, she explained.

"I know that through many interpretive programs, I do swing back to always emphasizing leaving no trace," Bright said.

Visitors are recreating as intended, but there are clues that not everyone has gotten the message.

"They're leaving trash behind," Bright said. "They're not staying on the trails so they're creating new footpaths, and they are feeding the wildlife."

No matter which park it is, visitors have to stop being the problem and be the solution to reclaiming ecosystems, Garmon said.

"Staying on trails, keeping your campfires in the fire rings, picking up after yourselves and using as little water as possible while you're in the park are very impactful," Garmon said.

It comes down to stewardship and respect by park visitors, Bright said.

"It's not just cleaning up your own mess," Bright said, "but leaving the park cleaner and better than you found it."

Don't move the mountains



Courtesy of Texas Parks & Wildlife Department

As Franklin Mountains State Park increases in popularity, the large number of visitors is negatively affecting the ecosystem and scarring the landscape.

Tourist negligence harms landscape of Franklin Mountain State Park

By Ivoree Hernandez

Surrounded by a city and trampled by tourists, the rugged mountains of a rare Texas ecosystem have literal scars made by people heedless of the destruction they leave in their path.

Franklin Mountains State Park in El Paso is part of the Trans-Pecos, the only Texas region with mountainous and desert habitats. With hiking trails and campgrounds, state park workers said the park is in danger of being “loved” to death by the people drawn to its beauty and biodiversity.

Cesar Mendez, the Franklin Mountains State Park’s superintendent, said hikers routinely disobey trail signs placed to protect sensitive habitat. In creating their own paths, they are also creating a cycle of destruction, he said.

“When hikers want to make their own trails, they’re moving rocks around, which es-

entially disrupts the traffic that flows from the top of the mountain to the bottom,” Mendez said. “Emphasis on the word mountain — it’s not a flatland — so there’s major damage being done when inexperienced hikers take on unofficial trails.

“Eventually, the soil on the mountain gets exposed, creating scars on the mountain,” Mendez explained.

Park authorities are proposing new regulations including increased signage, blocking areas not meant for hikers or bikers and adding cables as barriers, he said. Planting gauge wire baskets to keep soil in place is also being considered.

The problem is growth, said Scott Cutler, president of the Franklin Mountains Wilderness Coalition. Created in the 1970s, the FMWC works to protect the mountains from the dual threats of city development and tourists who fail to recognize the fragile nature of the ecosystem, Cutler said. Just one person can have a negative impact on the landscapes.

“I think it degrades the experience of vis-

itors when they go into a natural area that is trashed, eroded or tagged compared to one that is undisturbed,” Cutler said. “Because eventually, almost everybody will have the opportunity to hike a trail at the Franklins, so we want to protect it.”

As El Paso continues to grow, visitors to the park will grow, too, Cutler said. The coalition is advocating for more parkland and protections to the surrounding area, he said.

“Certain spots like the Tom Mays campsite or the McKelligon Canyon will essentially be overworked and visitors won’t get to have that experience they went for,” Cutler said.

The park is an ideal place to reconnect with the natural world and to bring calm to a person’s life, noted Cutler. Preserving that is only possible if visitors understand the sensitivity of the ecosystem and how vulnerable it is to abuse, he added.

“Rather than addressing the problem once it arises, it’s equally important, if not more so, to identify the cause of the destruction,” Cutler said. “Which in this case, is the ignorance

about the proper way to act outdoors and treat the natural environment.”

While the Franklin Mountains aren’t going to solve the climate problem, Cutler said they are an important part of the solution.

“Having a native ground cover helps reduce the temperature build up in a community, especially where we’re located, which is in the desert,” Cutler explained.

High daytime temperatures create stored heat that radiates throughout the night, but the natural environment of the park helps to mitigate these problems.

“So you never really get things cooling off in the city,” Cutler said. “But once you’re in the open space of the state park, the moisture that comes from the plants helps cool the air, and also reflects some of the heat so that the ground doesn’t store so much heat.”

Protecting open spaces like the Franklin Mountains State Park is both an argument — and a solution — to helping mitigate climate change, noted Cutler.

Private landowners at odds with climate concerns



Courtesy of Texas Parks & Wildlife Department

Palo Duro State Park's Lighthouse trail is an example of one of Texas' unique and beautiful ecosystems.

With 95% of Texas' land privately owned, conservation is an uphill battle

By Daoud Qamar

Vast in geography but sparse in population, West Texas and the Panhandle Plains face climate concerns catalyzed by a shifting cultural landscape.

Texas land is about 95 percent privately owned, according to the nonprofit Texas Land Conservancy. Among Western states, the average is 47 percent, which means Texas land conservation and stewardship efforts are largely in the hands of private citizens. As populations increase, greater demand for resources follows.

It begs the question: Who will manage water resources, invasive species and emissions by cattle operations, all of which pose threats to environmental conservation?

Access to limited water and water resource management are the top threats facing the West Texas region and much of the Western United States, said Jim Miculka, Texas A&M professor and National Park Service coordinator. In Texas, water ownership is largely dictated by a judge-made law establishing "absolute ownership" over a property's groundwater reserves. Often referred to as the "law of the biggest pump," the rule pits individual owners against downstream needs.

"That is — to discuss whatever water is there — who actually owns that, who claims that and who has the right to say that if it runs across my land, I should be able to own it and distribute it and use up all I want?" Miculka explained. "Versus knowing further downstream, animals need to drink that water or somebody else is going to use it instead."

Scientists and conservation experts have said further research is needed before more development takes place.

"I think water availability is really critical," said Victoria Todd, executive director of Wildcat Bluff Nature Center. "You can't have human habitation if you don't have enough water."

Todd lives in Amarillo where a majority of the water is sourced from the Ogallala Aquifer. Some estimates show the aquifer will run dry by 2050 if current usage continues unchanged. Todd's husband, retired USDA soil scientist Rick Todd, Ph.D., said reliance on the Ogallala makes the region even more at the mercy of the water management practices of others.

"Some of Amarillo's domestic water comes from the Canadian River," Rick said. "And that could be impacted by the snowpack in northern New Mexico and in southern Colorado."

That makes snowfall in other states a risk factor for part of Amarillo's water source.

Cattle ranchers and mining and fracking operations compete for water in addition to

what is needed to sustain a population. These industries also pose other challenges to the land and environment.

"There are no regulations right now on greenhouse gas emissions directly from cattle in the form of methane, or indirectly, say in the form of nitrous oxide," Rick said. "But that doesn't mean that in the future there won't be, you know, as the implication of global warming becomes more apparent."

The Amarillo couple agreed that any government regulation is more likely to be federal than state, and said the argument for regulation requires both more research and more local public education about the issues at hand.

"These are people, you have to understand, that have farmed the land and lived on the land and cared deeply about the land and have for generations," Victoria said. "And so thinking about it changing, and thinking about having to do something else, is potentially really scary."

"So, it's not people that don't care about the land," Victoria explained. "They really, really do. But it is also their livelihood, and they care a lot about their animals, and they don't want to see things happen."

Ranchers also are at odds with public land management practices that encourage re-emergence of native plants and animals.

"So there's the clash of the management of national parks versus the next person across the fence that raises cows or sheep," Miculka explained. "And these mountain lions come

across the earth and kill them.

"These areas like Big Bend or Guadalupe Mountains are not islands unto themselves, you know," Miculka added. "They are just like the weather, you know, the rain isn't gonna stop up a fence line."

Recent movements of black bears and mountain lions in the region may pose threats to ranchers, but they also present advantages to the ecosystem, Miculka said. The key, he said, is educating these ranchers about the benefits.

"I think the rancher truly believes that they're good caretakers of the land," Miculka said, even if some of their environmental philosophy isn't good. "They don't want to ruin their place because they can't make a living," he added.

The current argument includes whether real economic incentive is to keep things the same or to make changes. Both Victoria and Rick Todd point out that even with more research demonstrating economic and environmental benefits of change, only lawmakers can regulate practices that pose environmental threats.

"It also boils down to if the research being done is listened to — and considered — in policy suggestions," Victoria said. "So if the powers that be can make those recommendations and don't do it, then all the research in the world isn't good enough."

Harvey brings flood of realization



Courtesy of Christopher Telschow (2017)

(Left) Christopher Telschow, a Hurricane Harvey flood victim, documents his flooded neighborhood street on August 27, 2017. (Right) The Telschow family throws away their evacuation sign amidst a pile of destroyed belongings after returning to their flooded home on September 8, 2017.

Heavy flooding brings understanding of Houston infrastructure downfalls

By Madi Telschow

Hurricane Harvey was a watershed event that proved the greater Houston area's drainage infrastructure and flood operations were not as impervious as city planners thought. It also revealed that thousands of people were living in a man-made floodplain, at risk of repeated flooding from similarly powerful storms in the future.

In the 1960s, the U.S. Army Corps of Engineers declined to purchase the land surrounding the Addicks and Barker Reservoirs. Homeowners and businesses built around the reservoirs, unaware the location was a man-made floodplain, said president of the Wil-lowfork Drainage District Wendy Duncan.

Homeowners who asked about flood insurance were told by mortgage companies they were outside of the natural, 100-year floodplain and were not recommended for such insurance, Duncan said.

"What they didn't understand — what banks didn't understand, what real estate

agents didn't understand, what title companies didn't really understand — was that they were in what is now defined as a flood pool: private property that can be flooded if the reservoirs fill to outside of government land," Duncan explained. "This was a concept — and a term — we really didn't have or understand before."

There are 10,000 homes in the flood pool, and those may not be the only homes affected in the future, said Jeff Lindner, meteorologist and director of hydrologic operations at the Harris County Flood Control District.

"Flood plains are a dynamic product, and they change over time," Lindner said. "The floodplain map may not be the same in five years. Change is constantly ongoing with various construction projects, engineering projects and channels."

Drainage infrastructure has improved over the last 15 years, but there has been a simultaneous increase in hurricane magnitude.

"The number of flood events has not increased, but the events today are significantly higher concerning the amount of rain that has fallen," Lindner said. "It's not about the frequency of hurricanes but about the increase in their precipitation."

Hurricane Harvey, with an average 35 inches of rainfall across greater Houston and more than 50 inches in other areas, was indicative of this heavy precipitation, said Justin Stapleton, a meteorologist at KPRC-TV.

"We had the 'perfect' combination of a very large hurricane, an unlimited source of energy and moisture, a very slow-moving hurricane and high pressure," Stapleton said. "I think it gave people the opportunity to understand some of the meteorological dynamics [meteorologists] all look at."

"Going forward, the question is: now that we know that can happen, what steps do we need to take in different avenues and departments to prepare for next time?" noted Stapleton.

An ongoing U.S. Army Corps of Engineers study has considered that same question, but its preliminary recommendations for property acquisition have been seen as unfavorable to local homeowners, Duncan said.

While a forced buyout of homes might not be the preferred solution, Lindner said he sees few alternatives.

"Property acquisition targets homes that are hopelessly deep in the floodplain — where it doesn't matter what infrastructure improve-

ments are made, they still flood," Lindner said. "The challenge we have is trying to go back and retrofit those areas, but there's not always an engineering solution."

While many struggle with what to do with existing homes, future urban and suburban development also must be considered, Stapleton said.

"There's such an influx of people coming into the greater Houston area — well over 100,000 people since Hurricane Ike 12 years ago — and they've all got to live somewhere," Stapleton explained. "If you take away natural fauna that can handle some of that water and replace it with streets and concrete and sidewalks, it's good for the overall economy, but you're just creating more areas that can flood."

It's a two-sided issue, Stapleton said, with warmer temperatures increasing the destructive potential of hurricanes on one side and Houston's "flood" of new residents on the other.

"It's going to continue to be an issue that the soon-to-be third largest city in the nation continues to flood on a regular basis," Stapleton said.

“You’re going to look back on this as the good old days”



Mitchell Beddingfield

Homes in Lake Charles have been gutted after two major hurricanes strike. Due to roof damage caused by the winds from Hurricane Laura, Hurricane Delta rained in hundreds of homes, rendering them temporarily uninhabitable.

A&M experts describe today's weather crises as the calm before the storm

By Mitchell Beddingfield

The smells of hot rubber and stagnant ocean water mingle in the soupy air of Lake Charles, Louisiana. Sweaty residents drag ruined belongings out of homes. The background lull of generators interrupted by the staccato of nail guns has been going on for weeks.

Two major hurricanes hit only six weeks apart. Scientists warn this is the start of the new normal.

Category 4 Hurricane Laura hit Lake Charles in late August. Debris from six weeks of cleaning streets and repairing damage was tossed to the winds when Hurricane Delta again brought the city back to its knees.

Faced with the scale of destruction, some

people have decided to relocate permanently.

With homes unlivable after the storms, some residents have been forced to live with neighbors or family. Cheryl Ware, a Lake Charles native, said she has had to leave her longtime home downtown until the water damage can be repaired.

“I think we’re getting affected a lot more because we don’t have the coastline that we used to and that’s unsustainable,” said Ware. “We used to be where people evacuated to.”

The floor in her home is covered with white powder residue from sheetrock. The only contents are construction-related — a ladder, some paint cans and a stack of tiles. Even as she oversees home repairs, Ware said she is considering leaving for greener pastures.

“I’ve got a backup, and it’s the Hill Country,” Ware said. “I’ve got relatives there, and they don’t get hurricanes.”

Hurricanes cause more death and destruc-

tion than any other type of natural disaster, according to the National Environmental Education Foundation. As low pressure systems, hurricanes like heat. The hotter the water, the more powerful the storm. In the warmer-than-average waters of the Gulf of Mexico, hurricanes grow dramatically, according to NEEF.

As global temperatures rise storms will get bigger and more destructive, warn NEEF experts, with as much as 20 percent more precipitation near the storm’s eye and a 2-11 percent increase in intensity across the board.

In Lake Charles, the evidence is scattered over a hundred rain-soaked miles.

“To have to go through every bit of your belongings, and to figure out what to keep and what’s beyond repair ... it’s really so depressing,” Carla Chrisco said, Ware’s neighbor of more than 30 years.

Extreme weather events, including hurri-

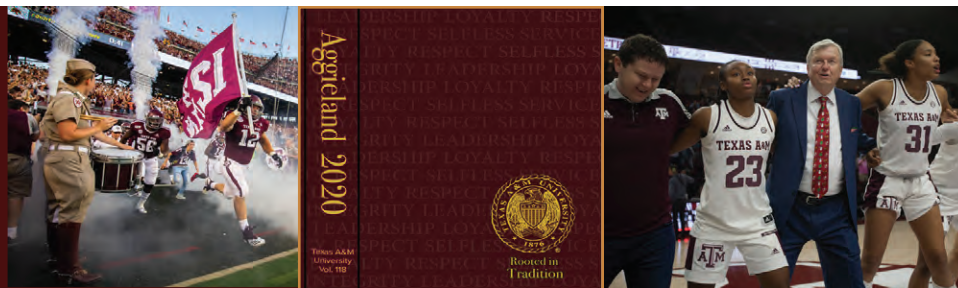
canes, will get more powerful and damaging in the future, said Andrew Dessler, Ph.D., a professor in the Texas A&M Department of Geosciences.

“We’re going to get more intense precipitation events,” Dessler said, “things like Hurricane Harvey. You know, climate change predicts we’re going to get really heavy intense rainfall events exactly like that.”

The repercussions of more powerful storms will increase over the next several decades, as well, Dessler said. People will pay the price in lost lives and property damage, he said.

“Look at 2020,” Dessler said. “Look at all the hurricanes. Look at the hurricane damage, look at the rain events, look at the fires and realize that this is the rest of your life.”

Dessler’s message is stark: “You’re going to look back on this as the good old days.”



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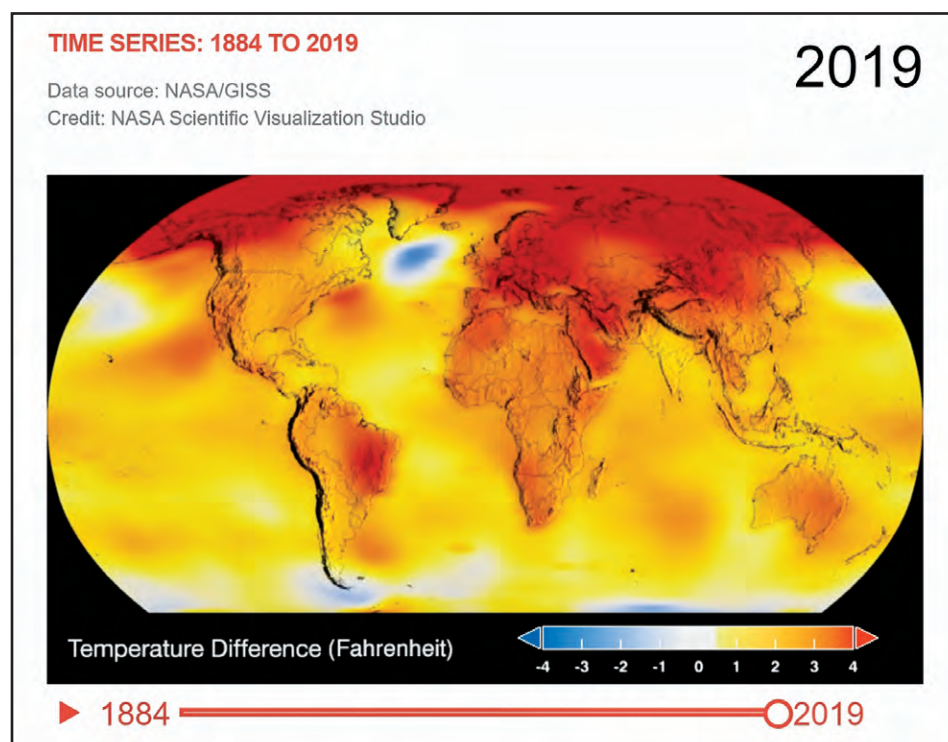
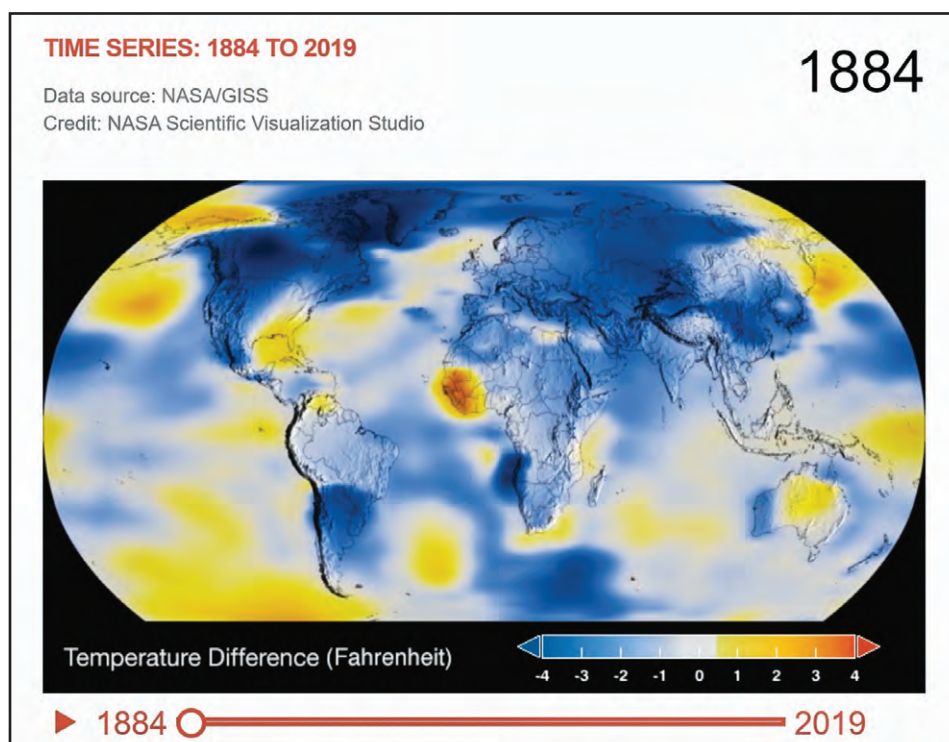


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Courtesy NASA/GISS, NASA Scientific Visualization Studio

The above maps show the average variation of global surface temperatures in 1884 compared to global surface temperatures in 2019.

The correlation between climate change, natural disasters

A&M professors say natural disasters will increase as climate changes

By Leah Hanzel & Ryne Ryskoski

Texas exceptionalism has not spared the state from an increase in extreme weather events.

From 2000 to 2019, there have been 7,348 major natural disasters around the world, according to a new United Nations report. Rising temperatures and climate changes are behind the “staggering rise” in extreme weather events, which killed 1.23 million people and resulted in \$2.97 trillion in global economic losses over the last 20 years, the report concluded.

Andrew Dessler, climate scientist and professor of atmospheric sciences at Texas A&M said scientists are examining changing weather patterns and the direct consequences of climate change on the earth to learn more about current — and future — severe natural disasters.

“We know a bunch of ways that climate is going to change the world we live in,” Dessler said. “Temperatures are going to go up, so we’re going to get more heat waves. Similarly, we’ll get less cold temperatures.”

Dessler said as the climate changes, Texas will

see increased precipitation and rainfall events as well as more intense natural disasters like Hurricane Harvey.

“It’s not the case that climate change is the reason we had all these storms,” Dessler explained. “However, climate change is making the storms that do occur more intense.”

Stronger storms with winds that blow harder produce more rain, Dessler said, and because sea levels are higher, storm surges are worse.

The chances of more powerful hurricanes are higher now, associate professor of atmospheric sciences at A&M Robert Korty said.

“There have always been Category 5 hurricanes and they’re still rare, but the probability in any year of reaching that is higher now,” Korty said.

Earth’s warming from greenhouse gases, melting ice and a flux of heat from the ocean to the atmosphere explain how climate change impacts natural disasters, Korty said.

“A large contributor is melting ice in polar regions,” Korty said. “As that ice melts into the oceans it adds mass. It adds more water to the liquid water in the oceans than there had been recently.”

As global infrastructure grows, so grows economic risks posed by natural disasters, said Texas State Climatologist John Nielson-Gammon,

Ph.D. and Regents Professor of Atmospheric Sciences at A&M.

“There’s a clear increase in damages caused by natural disasters on a global scale,” Nielson-Gammon said. “The largest factor there is the increase in the value of global infrastructure: there’s more to be damaged, and it’s worth more.”

2020 has seen a record 16 weather and climate disaster events with losses exceeding \$1 billion in costs, the most ever through nine months of any year, according to the National Oceanic and Atmospheric Administration Office. The previous U.S. average was 6.6 weather and climate disaster events costing at least \$1 billion yearly from 1980 to 2019, according to NOAA.

Korty said it’s important to recognize that current weather is based on events from previous years. Efforts to slow down climate change now won’t be observed for some time, he said.

“The climate takes a while to respond, so what we see now is, in some sense, a response to what has happened decades ago,” Korty said.

Trying to label a specific weather event as a consequence of climate change doesn’t work, Julie Loisel said. Specializing in paleoclimatology and environmental change, Loisel is an assistant professor in Texas A&M’s Department of Geography and has a Ph.D. in Earth and Environmental Sciences.

“It’s true that you cannot just say ‘Hey this one specific storm is because of climate change,’ but there are things that you can say,” Loisel said. “For example, sea surface temperatures have been increasing, and we know that in theory, when you have a warmer ocean you should be able to generate stronger hurricanes.”

“The climate is changing over decades and centuries, and so to say that a long-term trend is impacting one specific thing or event is really hard,” Loisel said.

A domino effect can be observed for the relationship between climate change components and natural disasters, Loisel said.

“The carbon that’s frozen and inactive [in permafrost] can become food for microbes and bacteria, which will eat that carbon and ‘fart’ CO₂ or methane back into the atmosphere,” Loisel said. “That’s an example of a kind of domino effect or what we call a positive feedback loop.”

Korty said he expected the current trend of melting polar ice, warmer oceans and atmosphere to continue. Evidence suggests that making changes now can solve climate change in the future, he added.

“Changing course will have benefits toward the second half of the century,” Korty explained.

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Courtesy of the Office of Sustainability

Interns run a table in fall 2019 for the Office of Sustainability.

Sustaining and balancing

Office of Sustainability meets needs of the present with a focus on the future

By Angelina Alcantar

Campus sustainability — including programs that encourage sustainable practices — takes root and grows from Director Kelly Wellman's office.

Texas A&M created the Office of Sustainability in 2008 to provide vision and leadership that encourages sustainable practices across the university. Wellman, Class of 1995, doesn't define the office's role as on or off campus, academic or non-academic. Instead, its mission is to support people who want to incorporate sustainable practices into their work and life.

Wellman has said she is particularly proud of her work developing the first Campus Sustainability Master Plan that outlines goals through 2038 and renews the university's commitment to meeting the needs of the present without compromising the future, according to the Office of Sustainability website.

"Those 16 of our goals aren't just for the office, they are for the entire college campus," Wellman said.

Texas A&M University is a charter member of the Association for the Advancement of Sustainability in Higher Education Sustainability Tracking, Assessment & Rating System. Sustainability education, outreach and support is available to students, faculty and staff, Wellman said.

"We have a sustainability internship program where students are getting educational learning opportunities but are also being educated and are responsible for educating

their peers about sustainability issues," Wellman said.

Under Wellman's tenure, students passed a referendum authorizing creation of the Aggie Green Fund, which provides grants for students, faculty and staff to make environmental improvements to the A&M campus. Around \$2.1 million has been awarded to more than 90 projects since the student-administered fund was launched in 2011, according to the Green Fund website.

Projects must directly address sustainability on the A&M campus, may not primarily address research aims, and must include publicity, education and outreach, according to the website.

The Office of Sustainability also has a YouTube channel that provides helpful tips on implementing more environmentally-conscious behaviors into daily life.

"We have a short video on how each individual Aggie can make sustainability behaviors throughout each day," Wellman said. "For instance, using refillable water bottles, using mass transportation instead of taking single-use occupancy vehicles."

Wellman said anyone who sees a need on campus should apply for the Aggie Green Fund to make real changes.

"Being a part of our internship program, being a part of environmentally and socially responsible organizations on campus is one way for students to be really involved in advancing sustainability," Wellman said.

To learn more about the Aggie Green Fund visit GreenFund.tamu.edu. For more information about more Office of Sustainability programs, visit sustainability.tamu.edu.

Focused on the future

Local activists promote climate action, implore politicians to look at benefits

By Amina Butt

More green in the cityscape and in the city coffers has to start with legislative action.

Local environmental activists want to show Aggies and elected officials how going green is good for the planet and the economy. Two local groups that want to empower everyone to take action to make change are the College Station chapter of Citizens Climate Lobby and the Texas A&M Student Sustainability and Climate Action group. Both are working to advance green legislative proposals, raise awareness of local issues and ultimately elect officials who will enact change.

The College Station chapter of CCL was started five years ago and currently has 57 members. Nationally, there are 599 active chapters of the nonprofit, nonpartisan, grassroots advocacy organization that focus on national policies to address climate change, according to the website. CCL member, Raymond Tarpley, said the organization has proposed the Carbon Fee Dividend to the U.S. House of Representatives as a way to lower greenhouse gas emissions without harming the economy.

"The measures proposed in this legislation will benefit the economy, human health, the environment and national security," Tarpley said. The proposal acts to correct market distortions and reduce non-greenhouse gas pollutants while reducing the outflow of dollars to oil-producing countries, he explained, which also improves U.S. energy security.

Tarpley said the legislation has bipartisan support.

"There's a lot of conservative economists that have said this is not only the way to move away from the catastrophic costs we're enduring now as a result of climate change, but also stimulating a job economy in clean jobs in the future," Tarpley said.

In March, CCL member Miranda Peterson founded SACA with the goal of bringing climate activism to campus.

"It's really new," Peterson said. "We wanted it to be up to the students and what they were planning."

A recent focus has been the Gibbons Creek coal plant, located 20 miles from Bryan-College Station. The Texas Municipal Power Agency has announced its intention to sell the plant to a company called Charah. Peterson said Charah claims the plan is to decommis-

sion the coal plant and redevelop the site for "renewable energy, agricultural, commercial or industrial redevelopment opportunities."

As for individual actions, Peterson said she has encouraged students to act now for their future.

"Often students don't want to speak up or take climate and environmental action because they don't feel qualified," Peterson said. "Whether or not someone has taken the time to memorize the name of the bills or the names of representatives isn't important."

"What is important is that students are speaking up and taking action on what they care about — like climate change," Peterson said.

Scientists and governments have known about climate change since the 19th century, said Dr. Gunnar Schade, Ph.D., associate professor of Atmospheric Science.

"As computers became useful really in the 1970s, the first actual primitive climate models were run and essentially by the end of the 1970s we knew all we needed to know," Schade said. Those early models have reliably predicted current warming, including its catastrophic impact on the environment.

"There are publications in the 90s that were made in the 1970s that were spot on, with respect to how much warming we would get, how it would progress and what the impacts from it would be," Schade said. "So that was all already known and passed on to the government."

Shade noted there is a simple, straightforward answer for students who ask how to bring about change.

"Voting," said Schade is the only way a Republican-controlled Texas will change.



Courtesy of Markus Spiske via Unsplash

As people search for solutions to climate change, groups in Brazos County are playing their part and encouraging others to join them.



Courtesy of Alejandro Orsi

Oceans in crisis

As ocean currents warm and hotter winds become more intense, the rate at which glaciers shed icebergs is accelerating, adding new water to the ocean and raising the sea level.

Oceanic, atmospheric warming melt ice caps, increase ocean acidification

By Allison Brock

Among all global climate threats, one major life source is already in a state of crisis.

Ocean and atmospheric warming are collapsing polar ice caps and threatening the marine ecosystems, but scientists have said it is not too late to save what ocean life is left. Research into current and historic levels of greenhouse gasses, rising atmospheric and ocean temperature, melting glaciers and rising sea levels is ongoing at Texas A&M and on research ships around the globe.

A&M is home to a “library of Earth history.” The International Ocean Discovery Program Gulf Coast Core Repository holds over 100 km of IODP’s sediment and rock cores from around the world’s oceans.

“Much of what we know about Earth’s past climates comes from deep sea sediment cores drilled by [the] International Ocean Discovery Program, which is partly based at Texas A&M,” said Trevor Williams, Ph.D., expedition project manager and staff scientist. IODP is an international research collaboration that coordinates seagoing expeditions to study the history of the Earth recorded in sediments and rocks beneath the ocean floor.

“These marine sediments contain a record of the processes, mechanisms, long-term changes and impacts of natural climate variability on

timescales from annual to hundreds of millions of years,” Williams said. Investigations include past warm climates under higher CO₂ levels than today, and the stability of Antarctic ice and resulting sea level change, Williams said.

Scientists from all over the globe use samples from the repository to investigate climate conditions from the Earth’s past. Current research is also about the Earth’s future.

As fossil fuels, oil and gas are burned to produce energy, carbon dioxide is released into the atmosphere, said Kathryn Shamberger, an assistant professor in chemical oceanography at A&M. Those emissions trigger a series of reactions within the ocean, she explained.

“We’re putting a nice warm blanket around the atmosphere,” Shamberger said. “It’s keeping heat in, and that heat warms up the atmosphere. That warms up the ocean, too.”

The result is melting polar ice caps in Antarctica and Greenland, home to well over 500 glaciers. Since the last Antarctic summer, measurements show melting of glaciers Thwaites and Pine Island — roughly the size of nine U.S. coastal states from Maine to Maryland — caused a 4-foot rise in sea levels due to underlying warm water.

As temperatures rise and warm the ocean, waters beneath the glaciers provide enough heat to crack and break off ice from the glaciers, said Alejandro Orsi, oceanography professor at A&M. Glaciers inevitably melt, generating a rise in sea levels that threatens anyone and everything along the coast, Orsi said.

“More heat is going toward the ice in the

last four or five decades,” said Orsi, who has spent much of his time in Antarctica studying the ocean currents. “If you have a glass of water, and you have an ice cube in it, and the cube melts, the level of the water doesn’t change. If you put an additional ice cube, and another, and another, the level of the water is going to go up.”

If all 483 glaciers in Greenland melt, sea levels would rise an additional 21 feet, Orsi noted. Even a single glacier melting in Antarctica would raise sea levels 27 feet, more than all of the Greenland glaciers combined. If all of Antarctica were to melt, the sea level would rise 120-150 feet.

With 80 percent of the world’s population living within 50 miles of the coast — and most oil refineries within 30 miles of the coast — Orsi said he is worried about sea levels if carbon dioxide emissions continue.

“Ice records show that when sea level rises it has occurred within 100 years,” Orsi said. “If the sea level goes up, you have to move all of those [people and refineries] uphill. Then, thinking is 100 years enough time to move and change everything?”

We have to say that we don’t have a chance,” Orsi said.

Ice cap melts are only one threat; warming ocean and atmosphere temperatures put entire ecosystems at risk, A&M atmospheric sciences professor Andrew Dessler said.

“As humans add carbon dioxide in the atmosphere, some of the carbon goes into the ocean and converts to carbonic acid, which

leads to the acidification of the ocean,” Dessler said.

Greenhouse gases like carbon dioxide and methane naturally travel back and forth between the atmosphere and ocean, explained Shamberger. As more of these gases are added to the atmosphere, more are added to the ocean, causing the acidity levels of the ocean to rise. Shamberger said there has been about a 30 percent increase in the ocean’s acidity since the start of fossil fuel burning.

“Marine organisms do not like this,” Shamberger said, citing phytoplankton, mussels, clams and fish. “Life in general is very sensitive to changes in acidification levels.”

Coral reefs are particularly sensitive to ocean acidification. Reefs maintain the ocean ecosystem by supporting thousands of marine organisms important for fisheries, pharmaceuticals and ocean diversity, Shamberger said.

“Coral reefs are having a harder and harder time building and maintaining that 3-dimensional reef structure,” Shamberger said. “There’s a lot of coastal communities where the reef actually buffers the coast from waves and storms.”

If coral reefs are unable to survive, Shamberger said coastal communities will be less protected from storms. The corresponding huge decline in tourism also would devastate economies of small island nations.

The effects on Arctic ice caps and ocean acidity levels are irreversible changes, Orsi said, but there is still more that can be done to combat further damage to the planet.

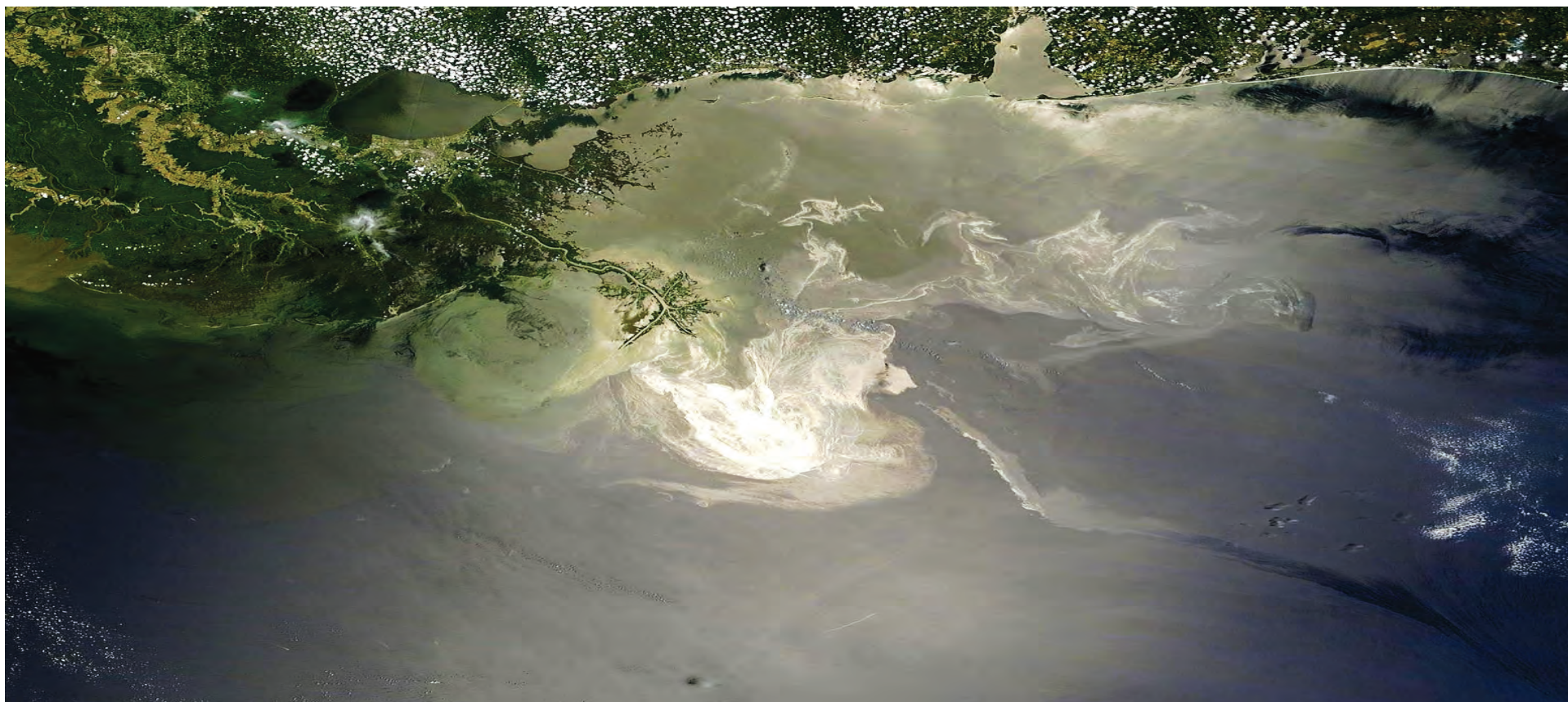
“We’re already locked in to warming and acidification,” Shamberger said. “The main thing to do is switch from fossil fuels to renewable energy.”

Some fear the switch is impossible, but Shamberger said even small changes make a drastic difference, and the A&M campus is a great place to start.

“Texas A&M is actually a really unique place in that we can make a significant difference in saving energy and reducing CO₂ emissions by doing small things,” Shamberger said. “If everyone on campus does the small things like switching light bulbs to LEDs that would actually make a big difference because our campus is so large.”

As scientists continue to research the best ways to combat climate change, understanding the full scope of the issue can be challenging.

“We are starting to better understand how the ocean, and the ice and the atmosphere interact,” Orsi said. “It’s one of the most exciting science problems that we have.”



Courtesy of Wikimedia Commons

The once leftover oil from the Deepwater Horizon spill in the Gulf of Mexico swirls in iridescent eddies as it chokes the local ecosystem.

Oil spills and their effect on the environment

Aggies weigh in on Deepwater Horizon oil spill, its long-term effects

By Jennifer Streeter

Ten years after the Deepwater Horizon oil rig exploded, scientists are only now beginning to fully understand the long-term environmental effects.

This disaster would lead to 134,000 gallons of oil spilled in the Gulf of Mexico, 11 people killed, 102,000 dead birds across 93 species, and 25,900 marine animals possibly harmed, according to data compiled by the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Services and the Center for Biological Diversity.

The explosion on April 20, 2010, caused oil to spew into the Gulf of Mexico, 41 miles off the coast of Louisiana, until Sept. 19, 2010. The rig was owned and operated by the off-shore-oil drilling company Transocean and leased by oil giant, BP. The incident is still considered the largest marine oil spill in the history of the petroleum industry.

A horrific accident resulting in environmental devastation, Deepwater Horizon made clear the risk of oil spills on the environment, said Scott Socolofsky, Ph.D., a Texas A&M professor of civil and environmental engineering. The Deepwater Horizon incident brought about more awareness for how oil spills harm oceans, said Socolofsky, who specializes in marine oil spill response, mitigation and modelling.

“Before the Deepwater Horizon, oil spill response was less aware of the dissolved [oil],” Socolofsky said, adding that “[oil] that dissolved, never came out of the ocean.”

After the disaster, it became clear that dissolved oil was trapped at a lower depth of the ocean, Socolofsky said.

“It was trapped because the ocean is stratified, that just means that dense sea water is at the bottom of the ocean and lighter sea water is at the top,” Socolofsky said. “So because of that stratification, the dissolved chemicals didn’t get out of the ocean. They stayed in the ocean at about 1,000 meters depth.”

The Deepwater Horizon oil spill harmed wildlife in the Gulf the way all oil spills do,

forcing marine animals out of their environments, said Soo Bum Bae, a Ph.D. student in the Zachary Department of Civil and Environmental Engineering.

“All these marine animals lost their habitats due to these oil spills because when the oil is as close to the water as it is, it increases toxicity,” Bae said. “When they breathe this oil, it destroys their respiratory system and affects their offspring.”

Animal experts are focusing on ocean animals due to high habitat risk, said Charlotte Wilson, an animal science major with a Pre-Vet concentration at Stephen F. Austin University.

“Our ocean is already super high risk, and so are the animals that reside in it,” Wilson said. “Oil spills don’t just affect these large animals that we can see, they also affect these small organisms that are in the ocean that you can only see under a microscope.”

When sea animals are harmed during oil spills, humans are harmed as a direct result, Bae explained.

“Imagine eating fish or shellfish who were close to the oil spill,” Bae said. “If we eat

them, do you think that is safe? It’s not.”

Detergents have been used to aid oil spill clean up, although some studies have shown an increased toxicity in the water after use.

“Humans, dolphins, birds, underwater coral — somebody is going to get oil on them — and whether or not you spray dispersant will change who,” Socolofsky said. “And that’s unfortunate; that’s why we don’t like oil spills.”

There have been at least 44 oil spills since 1969, according to the Office of Response and Restoration with the most recent spill occurring on Aug. 8 in the Golfo Triste off the coast of Venezuela. Moving forward, Wilson said oil companies must focus on oil spill prevention, not mitigation.

“I think the biggest thing in animal welfare involving oil spills is just finding better prevention and having a plan in place for if an oil spill does happen,” Wilson said. “What would be the quickest, most efficient and helpful way to clean up the environment and animals that were and are affected by the oil spills?”

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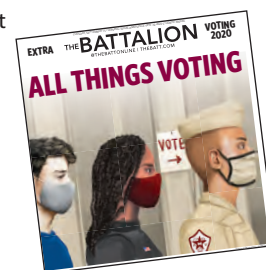
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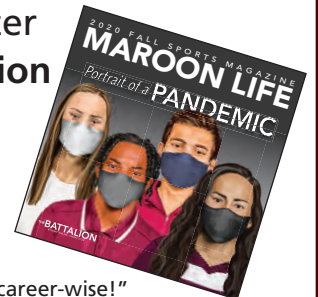
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Past wildfires help prepare for future wildfires

Experts evaluate history of wildfires, look at future of fire prevention

By Marina Garcia

Drought is the main driver behind 10 years of U.S. wildfires plaguing forests while devastating communities, upending economies and lives.

Recent wildfires in California and Texas that are larger and expand rapidly offer clues that researchers have said can lead to better practices for containing — and controlling — future fires.

Tree rings and landscape scars explain fire trends, explained Charles Lafon, professor of geography at Texas A&M. Tree rings with less scarring show how the trees were able to heal following wildfires before being cut down, he said. These scars also show that while the number of wildfires hasn't increased, the size and scale of fires has increased, Lafon said.

"The last few hundred years, I'd say, we've had fires that occurred frequently over most of the continent until about a century ago," Lafon said. "They more or less stopped. Despite what you hear on TV, there are a lot less fires than there used to be."

Drought is the main cause of wildfires, and historic drought conditions over most of the Western U.S. has created the perfect storm of dry conditions to spread flames, said A&M atmospheric sciences professor Yue Zhang, Ph.D.

As drought drives fires, current practices of not allowing natural wildfires to burn interrupts nature's cycle. It might seem responsible, but it makes wildfires more intense when one does spark, Zhang said.

"That will essentially cause more and more material for wildfires to be building up, then it'll inevitably cause a large wildfire that's going to be out of our control," Zhang said.

More intense flames and heat create more air pollution, Zhang said.

"Air quality in any region where the wildfires have happened will deteriorate for a long period of time," Zhang said, "so that could cause potential health implications for people living in the surrounding areas."

Lafon said repeat strikes cause lasting damage even when the wildfires are years apart since multiple wildfires don't give the land enough time to heal.

Considered the most devastating wildfire in

Texas history, the 2011 Bastrop County Complex lasted over a month, destroying 1,600 homes and burning tens of thousands acres, according to a report by Austin NPR Station 90.5. An estimated 1,700 trees perished.

"When you get a severe fire like that, you get a whole cell change in the vegetation," Lafon said. "The forest doesn't recover very quickly. The imprints of that fire can be on the landscape for a century or more."

It takes hundreds of years for nature to restore itself, Lafon said, but with fires continuing to burn, it can't heal. Habitat loss and extinction of some species in the area follows, Lafon said.

This fall, Colorado is experiencing its first out-of-season wildfire as spring is normally fire season. As the second largest wildfire in Colorado history, Este Park firefighters are hoping predicted upcoming snow will help extinguish the flames, as reported by The Washington Post.

Out-of-season wildfires might be a new trend due to current increases in climate change, Zhang said.

"I would even expect in the long term, as long as we still have global warming and climate change, out of season fires may still increase," Zhang said.

Research that began in October at A&M is aimed at finding solutions for safe and cost-efficient fuel treatment. The project is examining how planned vegetation removal has potential to stop wildfire spread, department head of Industrial & Systems Engineering Lewis Ntamo said.

Timing of treatment plans in a given area, why wildfires occur in the region and how vegetation changes over time are all being studied, Ntamo said.

Now more than ever, Ntamo said people should pay more attention to the true costs of wildfires and work together to prevent them. Simple, important steps include following local burn bans and reporting a fire when first spotted before it can spread, Ntamo said. Being able to prevent these wildfires in the future can save homes, land and the many lives of those that fight against these flames. Prevention can also save counties and residents money that would've been spent on repairing damages.

"There's a huge economic incentive to actually do something about [wildfires]," Ntamo said. "And that's why people should be aware of this and realize that it affects everyone."



via fs.usda.gov

The annual rings of a tree can show scars caused by wildfires of years past.

Return of the ‘red buffalo’

Fire suppression proves need for prescribed wildland burns

By Hannah Brennan

There’s more to the story of forests and wildland fire than Smokey the Bear’s admonition “only YOU” can prevent wildfires.

Wildfire, or uncontrolled fire, and wildland fire, which includes prescribed burns, are both defined by experts as important environmental “disturbance factors” for maintaining landscapes, vegetation and species diversity.

Fire has been the “great maintainer” throughout earth’s history, explained wildland fire specialist Kevin Ferguson. Fire eradicates undesirable species and causes germination for some types of vegetation, Ferguson said, who works in the Texas Parks and Wildlife State Parks Division. Prescribed burns are necessary to mimic what a wildfire would have done hundreds of years ago because of the ways fire has affected the North American landscape, not in spite of it, he added.

A wildfire that destroyed 90 percent of Bastrop State Park in 2011 started in areas with no prescribed burns, said Chris Schenck, state and fire program leader for the Wildlife Division of the Texas Parks and Wildlife Department. Contrast that

to prescribed burnings, Schenck explained, where the land is better and more palatable for vegetation and domestic and wild animals within a matter of weeks.

“In the areas that were treated with prescribed fire, there wasn’t that same understory build up,” Ferguson said. “Many areas in there we routinely treated with fire, and many we hadn’t, but the differences were drastic.”

Fire suppression over time leads to dense understories in forests, which then create volatile, lateral fuels, Ferguson said. These fuels burn to the treetops and are harder for firefighters to control, he noted.

Calmer, vertical fuels that stay low to the ground produce less-damaging effects, Ferguson said. While timber harvesting, thinning and grazing are all tactics to manage understories, Ferguson noted the most cost effective measure is prescribed burning.

“The realization that what fire does is a natural part of the ecosystem is what led to people burning the landscape trying to recreate what nature would do,” Ferguson said.

Native plains people observed vegetation and buffalo returning to areas after natural wildfires, which led to wildfires being called “red buffalo,” Schenck said.



Courtesy of Kevin Ferguson, Texas Parks & Wildlife

‘RED BUFFALO’ ON PG. 19

Prescribed burns at Cedar Hill and Dinosaur Valley State Parks help to maintain in balance the ecosystems.



Courtesy of Texas Parks & Wildlife

Wildfires can be destructive, but they also provide an opportunity for new vegetation and habitats for animals.

Habitats need fire to flourish

Prescribed fires help to preserve habitats, manage wildlife vegetation

By Anna Villalobos

For some animals and habitats, wildland fires can have surprisingly positive effects.

Since most Texas ecosystems are experiencing regular, recurring fires, most species have learned how to adapt, said Chris Schenck, state fire program leader for Texas Parks and Wildlife Department.

“Even a wildfire is generally good for animals,” Schenck said, “unless it’s under such severe conditions that it results in no growth of any vegetation.”

Dramatic climate changes pose the greatest risks to animals, he added.

“If I had to give an animal that struggles more than others or a species, I would say that ground-nesting birds have a tougher time,” Schenck said. “For instance, wild turkeys — if a fire happens during their nesting and hatching period, they could be at risk.”

Catastrophic wildfires in a watershed or drainage area can cause overlap flow that negatively affects nearby bodies of water.

“Generally, in Texas we haven’t always suffered that severe of a burn,” Schenck said. “But aquatic animals suffer more than most because it’s not like frogs and fish can actually leave their watershed very easily, and obviously fish can’t. Amphibians can only move so fast.”

HABITATS ON PG. 19



Courtesy of Kevin Furgeson, Texas Parks & Wildlife

Prescribed burns at Cedar Hill and Dinosaur Valley State Parks help to maintain the balance of the ecosystems.

'RED BUFFALO' CONTINUED

Native peoples started cultural burning to mimic wildfires and bring the desirable results, including more feed for the buffalo they heavily depended on, he added. In the 1920s, state agencies depicted controlled burning as harmful and started fighting every fire instead of lighting them, Schenck said.

"We set ourselves up for a hundred years of suppression," Schenck said. "Fire has been with us forever, but our reaction to it has been detrimental."

Over time, no fire has created

HABITATS CONTINUED

Habitat conservation is one mission of Wildland Fire Management. Conducting regular, prescribed fires under optimal conditions is part of his job, Schenck said. Prescribed fire is also important for vegetation, he said, with grazing, harvesting and eliminating invasive species all part of active management.

"If we do get an unwanted wildfire at the worst time, severity is lessened by us already having introduced or reintroduced fire back into the ecosystem," Schenck said. "We might go burn up some brush, but maybe that's now opened up an area for a species to flourish — feed a small bird or something like that."

Educating and empowering landowners to conduct controlled burns safely and effec-

tively is also part of the mission, Schenck said. Wildland Fire Management uses all the "tools in our toolbox" for the benefit of all while reminding everyone that all species are important, he added.

Schenck described movements to return to the way of "red buffalo" as good for forests and the environment.

"Let fires burn," Schenck said.

Predators such as wolves are part of nature's necessary "checks and balances," though Schenck acknowledges the emotions around this topic.

"Many species are a barometer for our own well beings for how good our environment is," Schenck said.

Canaries in coal mines was a real way to monitor environmental safety for humans, Schenck reminds people.

"We see some species suffer. We could be on that end," he cautioned

"Life and death are a huge part," Schenck said. "Even life and death of plants."

Emissions from Wildfires Contribute to Rising Global Temperatures, Accelerating Feedback Loop

Rising global temperatures lead to drier conditions in forests and longer fire seasons



Larger burned areas from fires lead to more dried out and dead vegetation that can be easily sparked by lightning, electrical lines and humans



Carbon dioxide emissions increase as fires burn over expanded areas, for longer periods and more frequently



More CO2, N2O, CH4 and other reactive compounds in the atmosphere lead to accelerated warming and increased temperatures



Over the past 10 years, an average of 6.8 million acres burned across the United States annually. There has been an annual average increase of 2.3ppm in CO2 levels between 2009-2018, which is 100 times faster than previous natural increases. The yearly temperature for North America has increased at an average rate of 0.20°C per decade since 1981.

Sources: Global Forest Watch, USDA & NOAA

Graphic by Alyssa Gafford-Gaby

MAROON IS THE *NEW GREEN*

Texas A&M University is ranked No. 1 in Texas and No. 63 nationally in the Sierra Club's listing of *Cool Schools* for its sustainability efforts. Gig 'em Ags and thanks for doing your part to contribute to a greener campus for all!

