



HIDDEN IN PLAIN SIGHT

Rediscovering Untapped Solutions

2023-2024 ANNUAL REPORT



THE MEADOWS CENTER
FOR WATER AND THE ENVIRONMENT

TEXAS STATE UNIVERSITY

MEMBER THE TEXAS STATE UNIVERSITY SYSTEM

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WHY I GIVE



The education and outreach efforts of the Meadows Center are unparalleled. The Center consistently delivers vital educational programs that teach students and Texans about water conservation, environmental stewardship, and the science of ecosystems. Supporting this cherished San Marcos institution is a privilege.

BROOKS HULL

Texas State Vice President for University Advancement



Foreword

As we look back on the past year, it is impossible to ignore the pressing realities facing Texas. Severe droughts intensified across the state, testing the limits of our water infrastructure and forcing cities to make difficult decisions about water restrictions. In 2023 alone, Texas cities reported losing over 88 billion gallons of water due to leaks in aging pipelines. Amidst these challenges, we also see glimmers of hope and innovation, such as the Texas Water Development Board's adoption of the first-ever statewide flood plan in August 2024, representing a \$54.5 billion investment in safeguarding our communities from future flood risks.

In a world where the search for innovation often drives us to look towards new frontiers, we sometimes overlook the potential hidden in plain sight. Sometimes, true innovation emerges in reimagining the connections between what is already familiar. Looking at the challenges we face through the lens of existing frameworks can uncover unexpected opportunities for navigating the uncharted territory we're encountering in Texas – and beyond.

The theme of our 2023-2024 annual report, "Hidden in Plain Sight: Rediscovering Untapped Solutions," is a reflection of the resilience and innovation that these times demand. It showcases how, in the face of these urgent challenges, innovative approaches can emerge from existing knowledge, resources, and practices.

As you explore this report, you'll discover how our research is addressing today's water crises and laying the foundation for a more resilient Texas. From innovative groundwater management techniques to community-driven river stewardship and collaborative science, we are uncovering solutions that chart a course toward a future where every drop counts.

A Message from the Executive Director



As Texas continues to experience rapid growth and the pressures of climate variability, it's becoming increasingly evident that our water resources are being stretched to their limits. However, the solutions to these challenges might be closer than we think—hidden in plain sight and waiting to be rediscovered.

Texas has a long history of pioneering innovations to manage its water resources, from the construction of reservoirs after the drought of the 1950s to the implementation of regional water planning and conservation and drought management plans after droughts of the late 1990s. But today, as we face unprecedented demands, we must look beyond conventional methods and explore untapped solutions that have been overlooked or underutilized.

One of these solutions lies in improving water efficiency in agriculture. Agriculture accounts for a significant portion of the state's water use, and while many farmers have adopted advanced irrigation systems, there is still vast potential to enhance efficiency further. Techniques like drip irrigation, rainwater harvesting, and the reuse of treated wastewater can drastically reduce water consumption without compromising crop yields. These methods are not new—they've been around for decades—but they remain underused in many regions of our state.

Urban water conservation also holds hidden opportunities. Cities like San Antonio and El Paso have already demonstrated how community-wide efforts in water conservation, paired with technology, can reduce water usage. From smart irrigation controllers to leak detection systems, integrating these tools into everyday life can make a significant difference in our urban centers. The impact is profound, yet many communities have yet to fully embrace these approaches. Rainwater harvesting, a method used by early settlers, makes more and more sense in our urban but also our rural areas.

Additionally, we must rethink our approach to stormwater management. In Texas, we often view stormwater as a problem to be controlled, but in reality, it can be part of the solution. By implementing green infrastructure—such as permeable pavements, rain gardens, and urban wetlands—we can capture and treat stormwater at the source, replenishing our groundwater supplies, mitigating flood risks, and even providing a water supply. These methods not only help with water conservation but also enhance the resilience of our cities to climate change.

Finally, Texas has vast brackish groundwater and seawater reserves, underexplored sources of water. With advancements in desalination technology, these reserves can be tapped to provide clean, drinkable water to communities across the state. As costs for desalination decrease, this solution, long considered impractical, is becoming increasingly viable—and necessary.

What is clear is that we don't need to reinvent the wheel to solve Texas' water challenges. The solutions are here—they've been here—but they require a renewed focus, investment, and a collective will to implement them.

As we continue to plan for the future of Texas, I encourage us to look closely at the resources we already have, the solutions we've long had access to, and the innovations ready to be scaled up. By rediscovering these untapped solutions, we can ensure a sustainable and water-secure future for Texas.

Your friend in water and the environment,

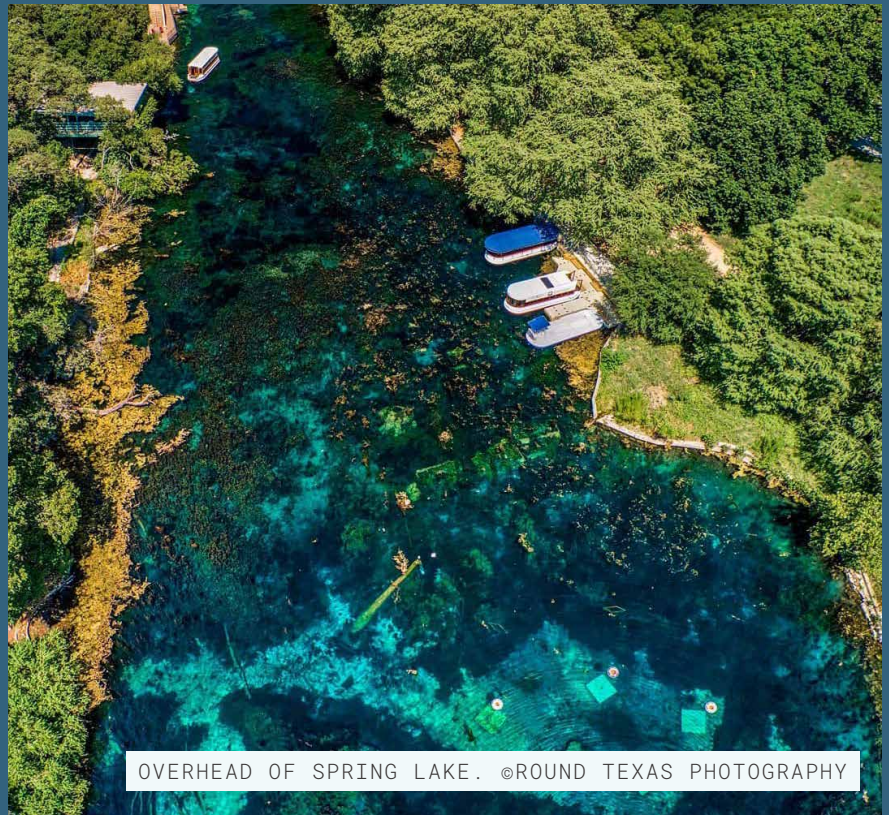
A red ink signature of Dr. Robert E. Mace, consisting of a stylized, flowing script.

Dr. Robert E. Mace

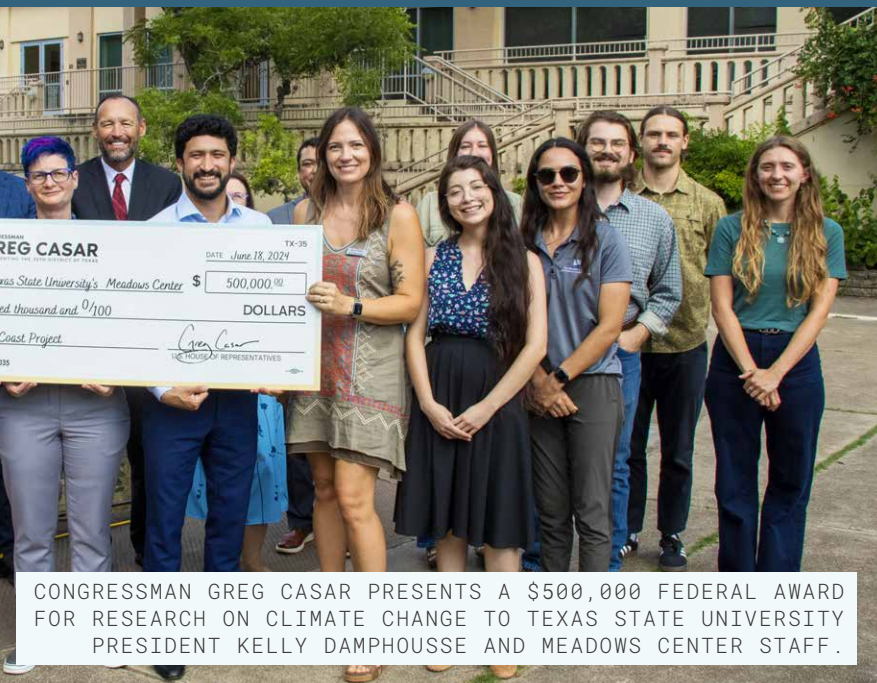




VIEW THROUGH GLASS-BOTTOM BOAT WINDOW.
 @RIANA DE LUNA



OVERHEAD OF SPRING LAKE. @ROUND TEXAS PHOTOGRAPHY



CONGRESSMAN GREG CASAR PRESENTS A \$500,000 FEDERAL AWARD FOR RESEARCH ON CLIMATE CHANGE TO TEXAS STATE UNIVERSITY PRESIDENT KELLY DAMPHOUSSE AND MEADOWS CENTER STAFF.

Our Mission

The Meadows Center for Water and the Environment is committed to inspiring research, innovation and leadership that ensures clean, abundant water for the environment and all humanity.

We envision a world where all people understand and embrace the value of water and environmental stewardship.

We fulfill our mission by integrating activities across four pillars of action: research, leadership, education, and stewardship. Our work in each of these pillars begins at Spring Lake – one of the largest artesian springs in the world – and ripples outward across Texas and beyond.



RESEARCH

Conducting Solutions-focused Research



EDUCATION

Encouraging Life-long Learning



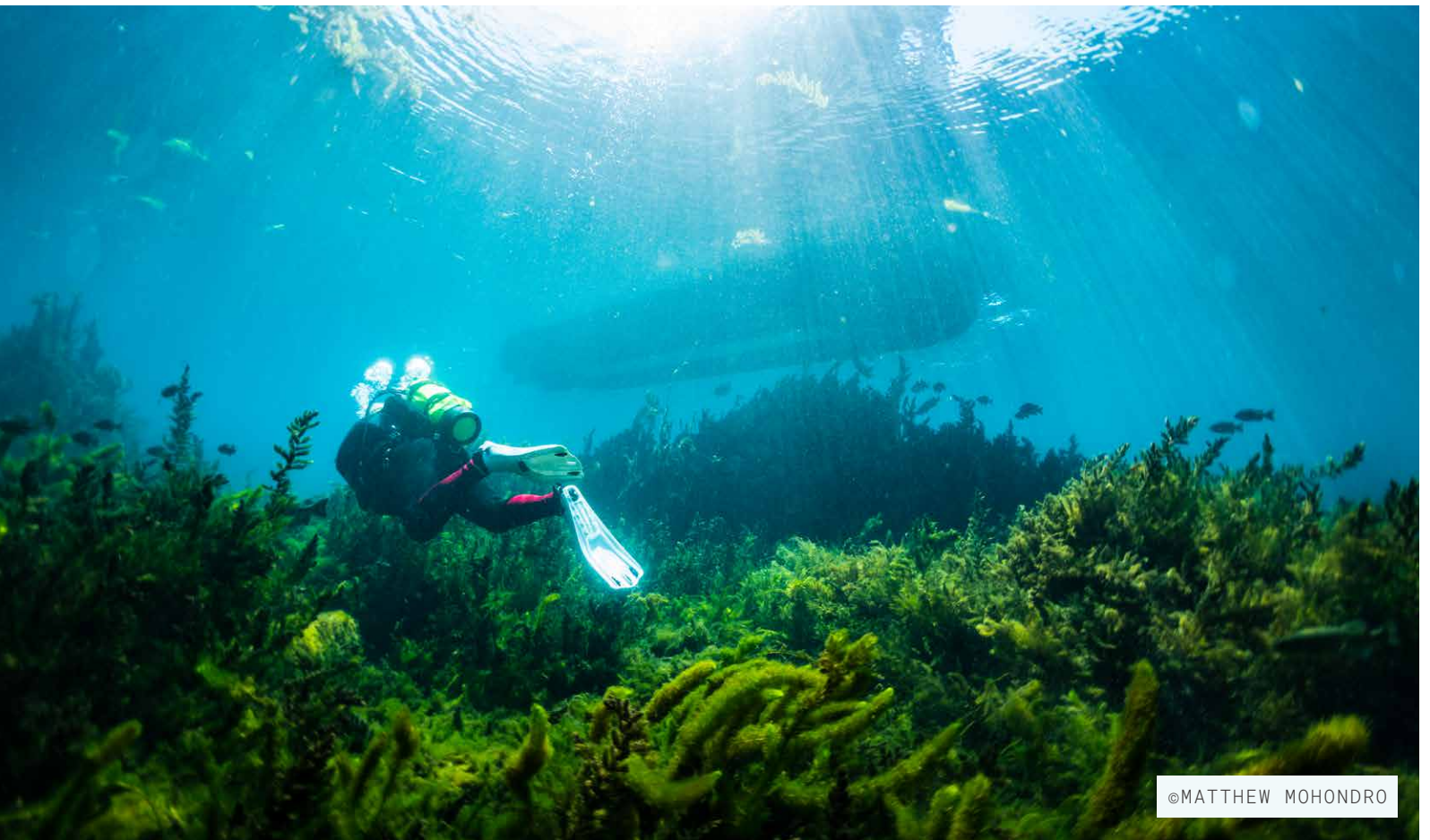
LEADERSHIP

Transforming Knowledge into Action



STEWARDSHIP

Cultivating a Stewardship Ethic



Our Year in Numbers

\$2,441,006

research dollars awarded to Meadows Center faculty and staff

26,069 m²

non-native plant species removed from Spring Lake and the San Marcos River

114,407

total visitors to Spring Lake

\$459,551

donations raised to support the Meadows Center mission

7,562

native plant species planted in Spring Lake and the San Marcos River

24,375

children and university students engaged in outdoor learning at Spring Lake

23

research grants awarded to our faculty and staff

5,982

volunteer hours dedicated to conservation

536

new community scientists trained to monitor water quality across Texas

6,904

people reached through speaking engagements in Texas and beyond

221

volunteer divers trained to help preserve the habitats of Spring Lake

123

Texas State University students supported by our research and education projects

Program Highlights

We've selected just a few of the many accomplishments achieved in the past year to give you a glimpse into the breadth and depth of our impact. On the pages that follow, you will read stories that showcase innovative approaches to water management, education, conservation, and sustainability. You'll also discover how our research and community-driven initiatives are tapping solutions for a water-secure future in Texas.

WHY I GIVE



We started the year continuing our three-year partnership! I had a wonderful time engaging with participants, exhibitors, and staff at the Earth Day San Marcos Festival (Ozarka as Stage Sponsor). Not to mention time with the amazing individuals participating in the Fahrenheit 140 podcast. I am very proud to play a small part in supporting all the great work your team does!"

TREY W. MIXON, III, P.E.

Natural Resources Manager for
BlueTriton Brands, Inc.

Revealing the Potential of Correlative Rights for Groundwater Management

Groundwater is the lifeblood of Texas, supplying over 55% of the state's water needs. Yet managing this asset has been a persistent challenge as the state seeks to find a balance between the needs of agriculture, our growing urban centers, and the environment that sustains us all. Thanks to support from the Jacob & Terese Hershey Foundation, a recent study by the Meadows Center highlights correlative allocations as a forward-thinking approach that could significantly enhance how this essential resource is managed.

Under Texas law, groundwater conservation districts are the only tool available for managing groundwater. These districts set management goals, known as desired future conditions, to protect aquifers and manage supplies, and the Texas Water Development Board determines how much groundwater can be sustainably produced without compromising these goals (modeled available groundwater).

Districts are typically established through legislative action, either by local community petitions to the Texas Legislature or by the Texas Commission on Environmental Quality in designated critical groundwater areas. Once formed, districts are confirmed through local elections, governed by a board, and work within regional water planning efforts to manage and protect groundwater resources. As of 2024, Texas has 98 districts that cover all or part of 173 of the state's 254 counties.

Despite the efforts of these districts, significant challenges persist. Many districts issue permits that exceed sustainable production limits to accommodate increased demand, often driven by the fear of

regulatory takings lawsuits—a legal conundrum in which landowners could claim that regulations have stripped them of their property's full value.

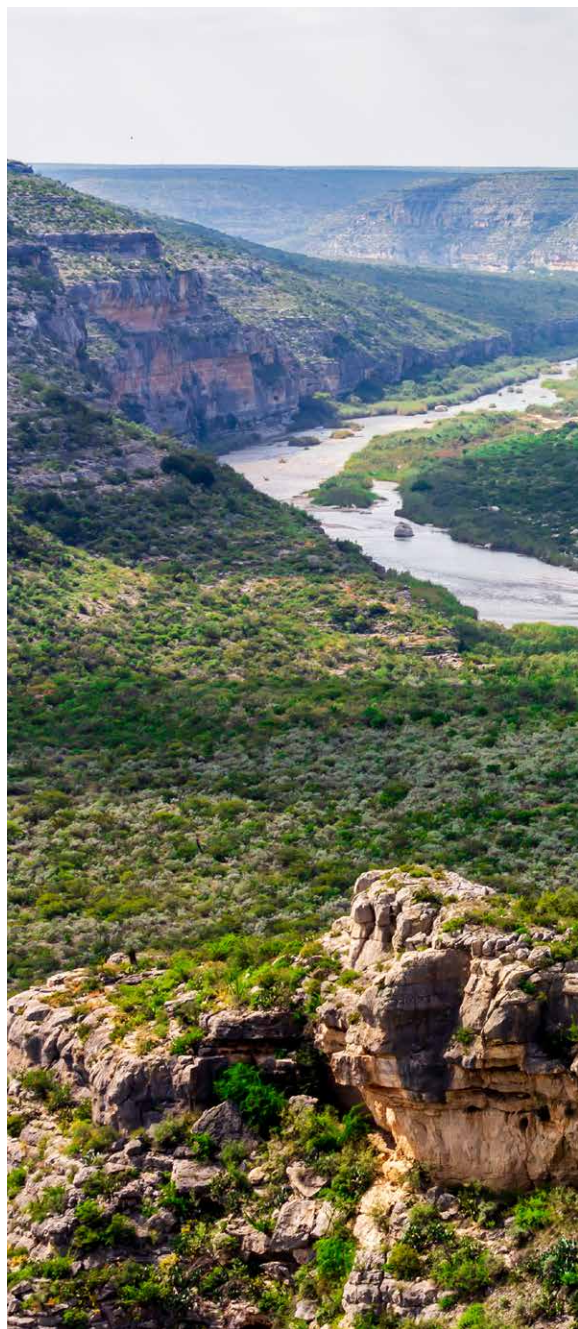
However, new research from the Meadows Center offers a path forward to addressing these perplexing management challenges by revisiting traditional approaches. The report "Coupled Correlative Allocations for Groundwater Management in Texas" examines the potential of correlative allocations for groundwater management, a legal principle that states landowners have a shared right to produce from an underlying aquifer in a manner that does not unfairly deplete the resource or deny others their equitable share.

By assigning correlative allocations based on acreage or other surface measures, districts can distribute groundwater rights in a way that respects each landowner's fair share. This method, although complex, balances individual rights with collective resource health.

The report unpacks two categories of correlative allocations – decoupled and coupled. Decoupled allocations are not tied directly to desired future conditions and often lead to overproduction, undermining long-term sustainability. In contrast, coupled allocations are designed to align with desired future conditions, ensuring that total production remains within sustainable limits. While roughly 60% of the state's districts employ some form of either approach, we found that only a handful have successfully implemented coupled correlative allocations, highlighting the potential for broader adoption.

Implementing correlative allocations is not without challenges. It may

result in smaller per-acre water allocations, particularly in less productive aquifers. However, the benefits are substantial. By defining a fair share of groundwater for each landowner, these allocations can foster water markets, enhance resource conservation, and protect districts from legal challenges. Moreover, they offer a path to equitable and sustainable groundwater use, ensuring that our water resources continue to support the state's diverse needs.



Bridging the Gap: Sneak Peek at 2024-2025 Plans

In the year ahead, we will launch a communications campaign to transform this complex concept into a practical solution for the state's groundwater conservation districts.

Misunderstandings about correlative allocations are widespread, but our campaign will clarify their power and potential to provide a clear path for adoption. Through webinars, we'll engage district members statewide to debunk common misconceptions and showcase the advantages of correlative allocations. These sessions will provide a platform for district representatives to discuss

implications specific to their local areas, share experiences, and ask questions.

We will also leverage our advocacy partners' networks to promote a correlative approach through virtual briefings, amplifying our message and empowering stakeholders to champion this approach. Additionally, we will launch a storytelling campaign to illustrate the tangible benefits through interviews, podcasts, and written stories shared on platforms like Texas+Water and the Meadows Center's networks.

This research underscores the transformative potential of correlative allocations, but realizing this potential requires sustained outreach and education. By educating the public, policymakers, and groundwater districts on the benefits and feasibility of correlative allocations, we can foster a deeper understanding and wider adoption of this approach. The Meadows Center remains committed to being a resource for change, advocating for science-based solutions that ensure the long-term sustainability of Texas's groundwater resources.

Proof-of-Concept: Converting to Coupled Correlative Allocations in Pecos County

The report outlines a hypothetical scenario exploring how the Middle Pecos Groundwater Conservation District could convert its permitting to a correlative allocation system. By defining a "Leon-Belding Productive Zone," the study proposed two potential approaches:

- 1. Uniform Allocation:** All land parcels would receive an allocation equal to the second-highest grouped parcel, while efforts would focus on reducing the highest use, which is disproportionately higher.
- 2. Individual Allocation:** Each parcel would receive its own correlative allocation based on historical use, reflecting sustainable access to the aquifer.

While only an initial exploration, this exercise shows that transitioning from existing permits to a correlative allocation system is feasible, offering a pathway to more balanced and sustainable groundwater management in the region.

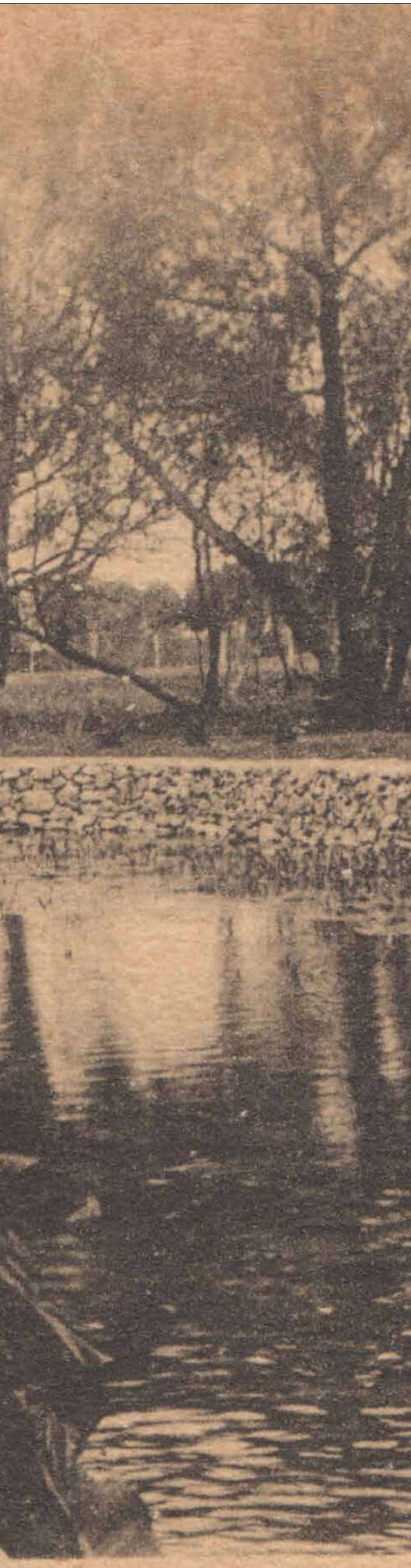
Tapping into History: Learning From the Springs of Gunnar Brune

In waterways across Texas, springs that once bubbled with life, supporting ecosystems and communities alike, are fading into memory. Thanks to support from the National Oceanic and Atmospheric Administration, the Meadows Center embarked on a study to uncover this silent decline, revisiting and building upon Gunnar Brune's seminal work, "Major and Historical Springs of Texas," to expose hidden trends in the state's spring systems.

Nearly half a century ago, Gunnar Brune's meticulous documentation of Texas' springs laid the foundation for our understanding of these vital water sources. His 1975 report and the subsequent 1981 book, "The Springs of Texas, Volume 1," captured a snapshot of a bygone era when many springs still flourished. Today, Meadows Center researchers are using advanced methods to update and expand Brune's work, revealing previously hidden trends and breathing new life into his legacy.

We employed satellite imagery, historical maps, and field visits to assess the current condition of major and historical springs across Texas. Satellite imagery allowed us to observe changes over time, providing a bird's-eye view of the springs and their surrounding landscapes. This method offered insights into the patterns of decline and helped pinpoint the locations of previously undocumented spring failures. Historical maps provided a baseline, while fieldwork confirmed the current statuses of these springs.

The research exposed alarming trends, bringing to light the growing crisis of spring failures across Texas. The findings show a significant increase in dry springs since Brune's time. In the early 1980s, **11% of the springs documented by Brune had gone dry**. Today, that figure has skyrocketed to 30%, **a staggering 173% increase** (nearly triple since Brune's time). This decline is not just a loss of water but also a loss of natural heritage, ecosystems, and the cultural significance tied to these springs.



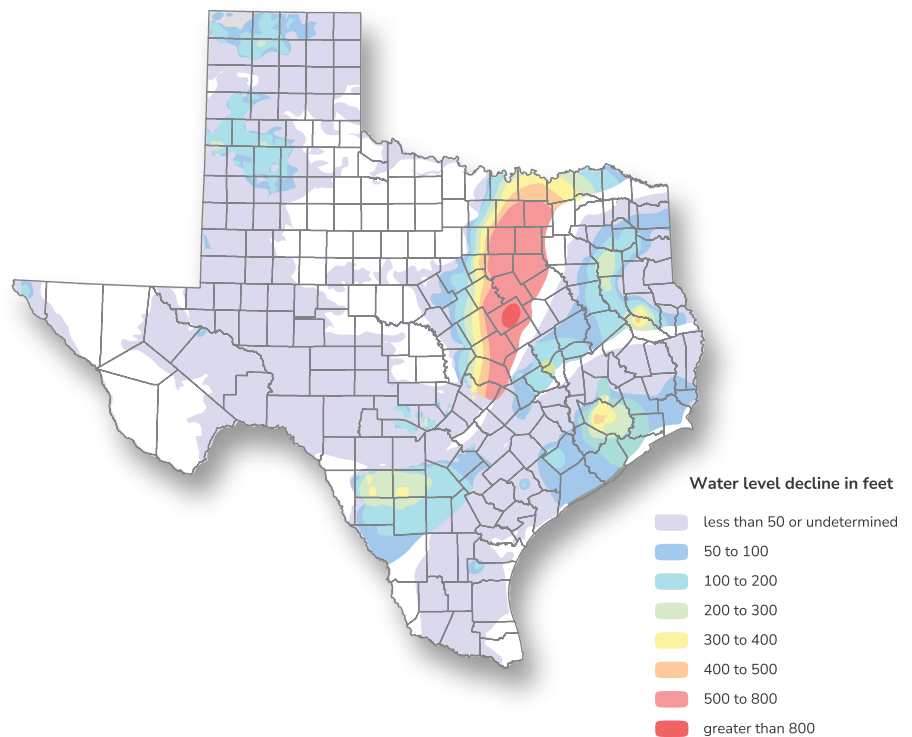
Our study went beyond simply counting dry springs. We extended Brune's original work by using a fractal analysis (a process that examines patterns within data to predict trends) to estimate the number of active springs and their combined flow. The findings indicate there are over 4,000 springs with flows of 0.01 cubic feet per second or more in Texas, contributing an estimated total springflow of 2.1 million acre-feet per year. This is a significant decrease from Brune's speculative estimate of 3 million acre-feet per year in 1975.

The data speaks volumes about the growing demands on our groundwater resources and the consequences of meeting those demands. As groundwater use continues to rise, the resulting decrease in springflow jeopardizes

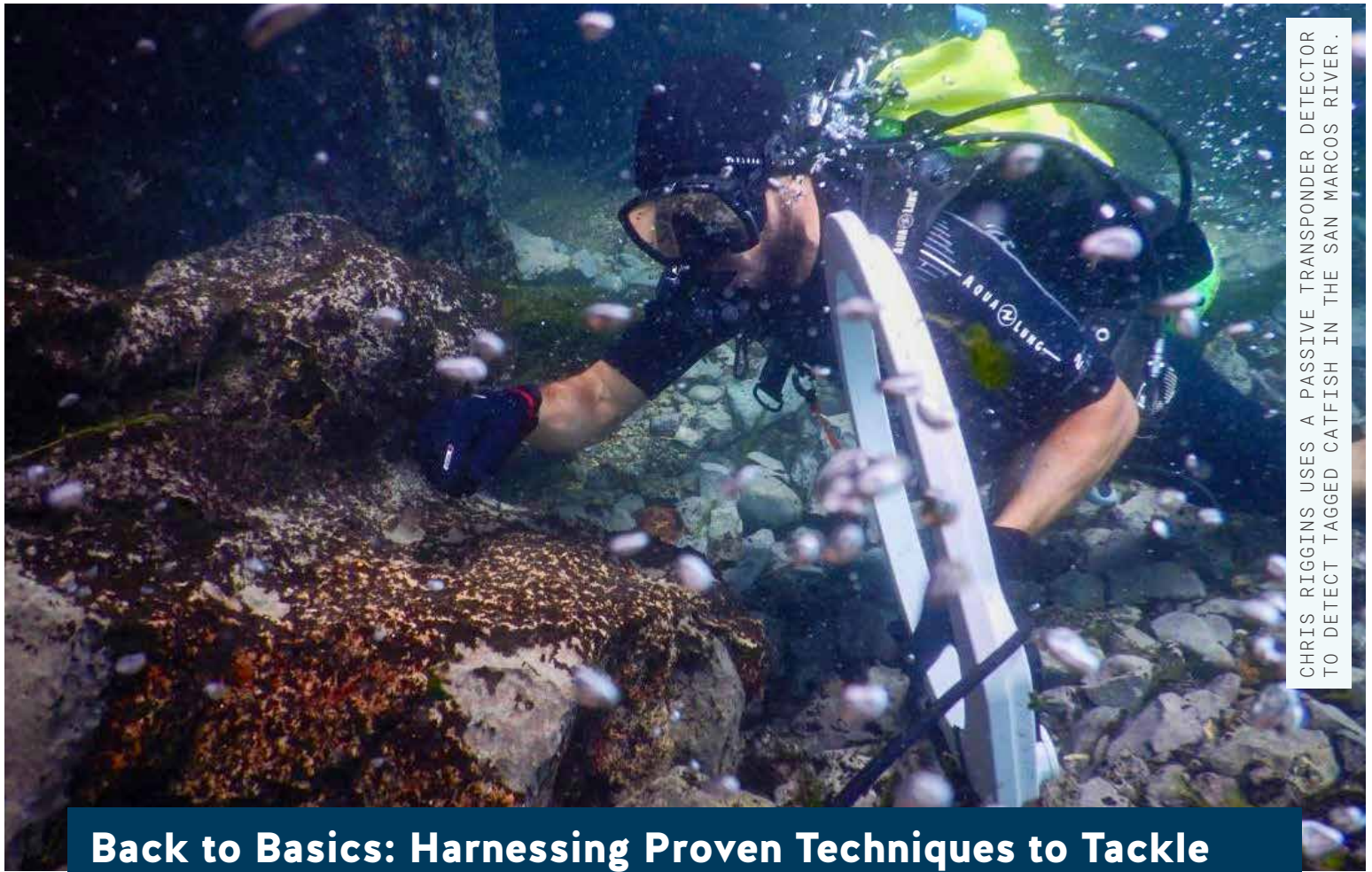
not only our water supplies but also the ecosystems and communities that depend on these springs.

As we navigate the complexities of modern water management, the story of Texas springs serves as both a warning and a guide. This project exemplifies the power of combining historical wisdom with modern innovation and underscores the need to reassess and adapt our practices to ensure sustainable water use.

The updated springs database and report, available to the public, serve as invaluable tools for researchers, policymakers, and communities. We hope this newfound knowledge will inspire action, leading to better management and preservation of Texas' springs.



The vibrant colors on this map reveal stark water level declines across Texas' major aquifers. The red zone signals regions where water levels have dropped by over 800 feet, reflecting the immense pressure on groundwater supplies.



CHRIS RIGGINS USES A PASSIVE TRANSPONDER DETECTOR TO DETECT TAGGED CATFISH IN THE SAN MARCOS RIVER.

Back to Basics: Harnessing Proven Techniques to Tackle Invasive Aquatic Species

The suckermouth armored catfish (*Hypostomus plecostomus*) is a familiar sight in home aquariums. However, when released into the wild, they transform from a pet to a formidable invasive species, creating a significant threat to local ecosystems and disrupting the balance of native aquatic life. With their voracious appetites and burrowing behavior, these catfish degrade riverbanks and outcompete native species. While the challenge posed by this invasive species is considerable, it has also sparked a wave of promising solutions drawn from time-tested ecological principles.

Researchers from the Meadows Center and Texas A&M University are employing traditional techniques to better understand how to manage and control this resilient invader. In 2019, our team embarked on a [collaborative](#)

[study](#) with Dr. Joshua Perkin from Texas A&M University's Riverscape Ecology Lab to investigate the invasive catfish's habitat preferences, site fidelity, and population densities.

Funded by the Texas Parks and Wildlife Department, the study focused on the Upper San Marcos River, where these catfish populations have reached concerning levels. Efforts to manage this species locally currently rely on traditional methods like spearfishing, which, while effective at suppressing the population, offers only temporary relief and requires constant effort.

The team conducted surveys across three seasons using a floating raft equipped with underwater cameras and lights to estimate catfish abundance and spatial distribution within the uppermost one-kilometer

section of the San Marcos River. The population estimate was 285 individuals for the one-kilometer study area and was projected as 4,509 for the full 4.5 km inhabited section of the river. Research is ongoing to refine the estimates with additional parameters and a more robust model.

These catfish were not only numerous but also highly resilient, showing strong site fidelity and minimal movement outside their preferred habitats. The catfish were particularly concentrated in areas with fast-moving water and around artificial structures where they found refuge. By tagging and tracking a subset of the population, the researchers revealed that these fish had predictable habits of settling into crevices during the day and moving out at night, making traditional removal methods more challenging.

Researchers collected 385 catfish and used dissections and observations of external features, like fin sizes, to develop a protocol to identify sex based on more easily measurable features. Based on these characteristics, they developed a model to predict whether the fish were male or female without needing to dissect the fish. The findings indicate more female catfish than male catfish in the populations tested, with females making up 60% and males 40%, hinting at a potential vulnerability that could be exploited to control the population. Male catfish generally had longer dorsal and anal fins compared to females, and the model was able to identify the sex of mature fish with an 83% accuracy.

Building on these insights, the project entered a second phase in 2023, which involved a full-scale genetic analysis of catfish populations across four Central Texas rivers. The objective was to map the genetic diversity and explore the potential for using YY super males to disrupt reproduction and induce localized extinctions. Still in its exploratory phase, this biocontrol method, rooted in classic biological management principles, repurposes a traditional strategy that could fundamentally change how this invasive species is managed in Texas.

The ability to accurately determine the sex of these fish marks a pivotal step in managing the invasive population. This knowledge facilitates targeted control measures, including the potential use of genetic techniques to curb the number of females. This approach seeks to alter the sex-ratio within the invasive population, pushing it towards all males and reducing its numbers over time without the need for continuous human intervention.

By improving our understanding of this invasive species, we are making strides toward uncovering management strategies that could lead to long-term control. As we continue to refine our understanding of the armored catfish and explore new ways to apply the YY super male method, the hope is to reduce this invasive population over time to ensure that the San Marcos River, and other ecosystems like it, remain vibrant and healthy for generations to come.



COLLECTING GENETIC MATERIAL FROM CATFISH.



COLLECTING CATFISH FROM THE UPPER SAN MARCOS RIVER.

“

I've been collecting data on suckermouth armored catfish for the past two years, and it is one of the highlights of my job! It means a lot to me to be an undergraduate student and to be considered to work on such an impactful invasive species that many people in the biology community have their eyes on.

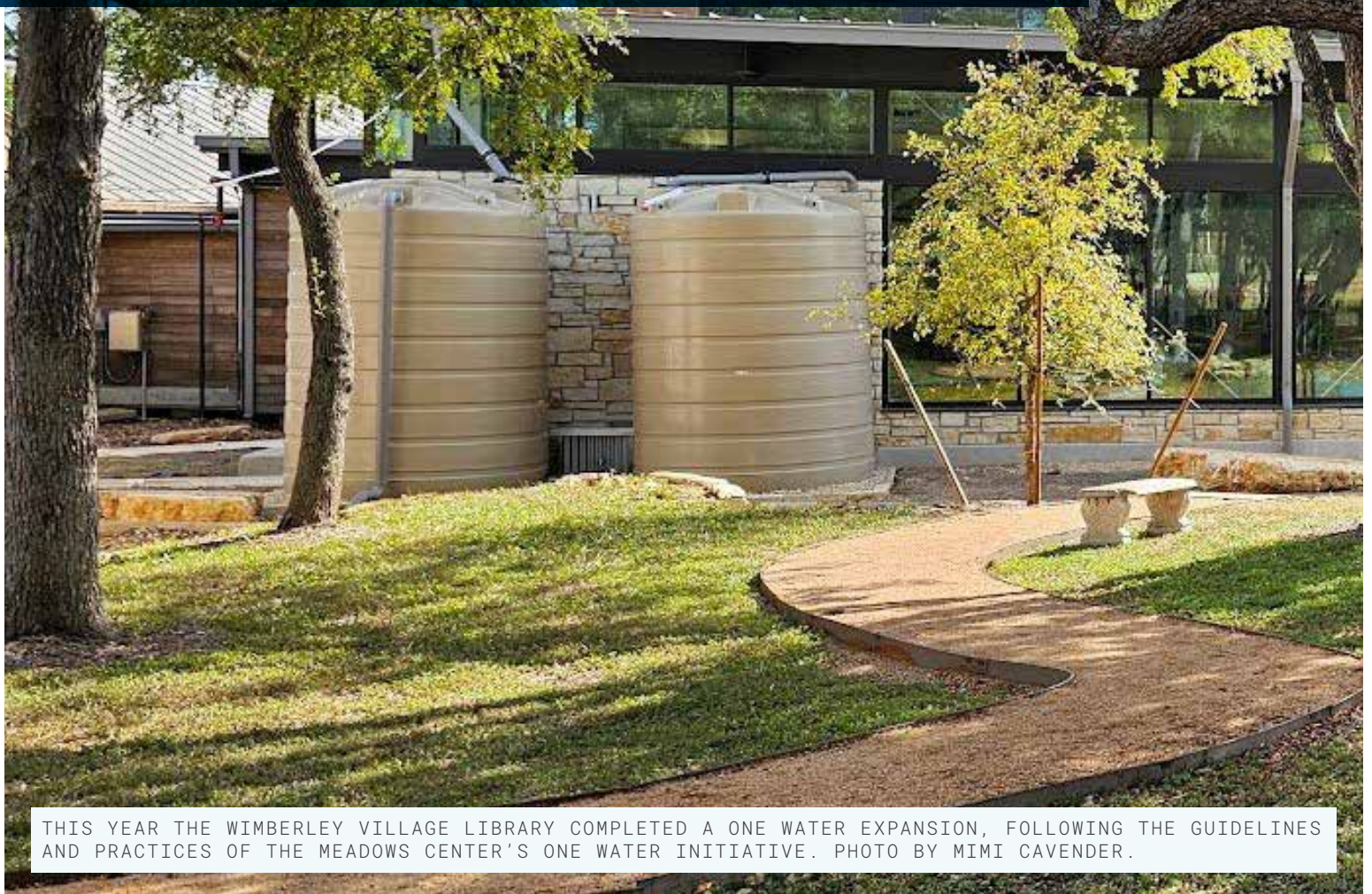
Shelby Fisher, Student Research Assistant

From Sky to Supply: The Hidden Potential of Rainwater Harvesting for Texas' Water Future

As drought and overuse plague Texas water resources, researchers have begun to search for viable alternatives to conventional sources. In pursuit of creative problem-solving and drawing from practices that have fortified ancient civilizations, early Texans, and even current rural residents, Ricardo Briones, a Texas State graduate supported by our Executive Director, Dr. Robert E. Mace, conducted a study to investigate how rainwater harvesting could help supplement Texas' water supply.

Rainwater harvesting has been a part of Texas history for centuries, but its role in formal water planning has remained limited due to questions about its reliability. Briones' study addresses this concern by evaluating the firm yield of rainwater harvesting systems statewide. Firm yield is defined as a water source that remains 100% reliable even during the most severe drought conditions, which is a critical metric for long-term water planning in Texas.

Although some of the state's regional water planning groups have begun including rainwater harvesting in their strategies, these plans often lack detailed calculations or specifications for calculating firm yields. This study fills that gap by providing comprehensive, statewide firm yield estimates, offering the data necessary for rainwater harvesting to become a viable part of regional and state water plans.



THIS YEAR THE WIMBERLEY VILLAGE LIBRARY COMPLETED A ONE WATER EXPANSION, FOLLOWING THE GUIDELINES AND PRACTICES OF THE MEADOWS CENTER'S ONE WATER INITIATIVE. PHOTO BY MIMI CAVENDER.



RICARDO BRIONES AND DR. MACE SET OUT ON A RAINWATER SAFARI, VISITING RAINWATER HARVESTING SYSTEMS ACROSS CENTRAL TEXAS.

RAINFAL – A Rainwater Planning Tool

Briones developed an Excel-based model, RAINFAL (Rainwater Assessment and Interactive eNumerator for Firm-yield Analysis Limits), to assess the performance of different rainwater harvesting setups in cities across various climate zones and determine which configurations could achieve firm yields. The model incorporated factors such as catchment area, rainfall data, runoff losses, and storage volume to calculate the daily water balance.

The results indicate that rainwater harvesting has more potential than previously recognized, especially when designed to meet specific local conditions. In wetter regions like East Texas, smaller storage systems can reliably meet water needs. For example, in Houston, a 30,000-gallon storage system and a catchment area of around 3,100 square feet can provide a steady water supply. In contrast, drier regions like West Texas require much larger catchment areas and storage systems to achieve the same level of reliability. In Midland, for instance, a catchment area of up to 70,000 square feet may be needed—a scale that is impractical for most residential properties.

These findings indicate that while rainwater harvesting alone may not meet all water needs, it can still play a significant role in augmenting local water supplies, especially during periods of drought. In regions where conventional water sources are strained, rainwater harvesting could provide a supplementary resource that lessens the burden on aquifers and reservoirs. Moreover, by carefully designing systems that take into account storage size, catchment area, and local precipitation patterns, communities across Texas could achieve a more sustainable and resilient rainwater supply.

The study also offers valuable insights into how different drought events affected firm yield across the

state. Briones found that the defining drought for firm yield varied based on water demand, highlighting the complex relationship between rainfall patterns and water use. This nuanced understanding of drought resilience is crucial for water planners seeking to incorporate rainwater harvesting into broader water management strategies.

Though challenges remain, this research underscores the untapped potential of rainwater harvesting. With strategic investment in infrastructure, incentives for homeowners and businesses, and careful planning, rainwater harvesting could become a key component of Texas' water security strategy.

As the state grapples with the realities of water scarcity, this study provides a timely reminder that innovative solutions, tailored to local conditions, can help ensure a sustainable and resilient water supply. By embracing rainwater harvesting as part of a broader water management strategy, Texas can build a more water-secure future, one drop at a time.



Through this study, I learned that rainwater harvesting is a long-term investment with positive results. I hope this research can have an impact in encouraging communities to embrace this alternative water source and enjoy better water quality.

Ricardo Briones, former Student Research Assistant

Unlocking Climate Wisdom: Driving Awareness Through Expert Insights & Engagement

As part of the Meadows Center's larger climate program, we're tapping into the potential of education as a tool to transform understanding into action. Through targeted initiatives, we equip educators, professionals, and communities with the knowledge and resources to address climate change. The following initiatives highlight how we are building a foundation of knowledge that empowers communities and individuals to confront the ever-growing threats of a warming planet.

Empowering Educators

Recognizing the critical role of education in building climate literacy, the Meadows Center hosted the "Rooted Teaching: Integrating Sense of Place into Climate Curriculum" workshop in the summer of 2024 to equip Kindergarten through 12th grade teachers with the tools and knowledge to integrate climate science into their teaching.

Funded by the National Oceanic and Atmospheric Administration,

the workshop emphasized the importance of fostering a strong "sense of place" by encouraging teachers to help students connect the global issue of climate change to their local environments. Participants engaged in hands-on activities and collaborative discussions, exploring how to make climate science relatable and actionable. The event also provided teaching resources aligned with the latest Science TEKS (Texas Essential Knowledge and Skills)

to support educators in meeting state curriculum standards while nurturing a sense of environmental stewardship among students.

By building educators' climate science prowess, the Meadows Center is cultivating a new generation of eco-literate learners capable of understanding and addressing the complex challenges posed by climate change.



This was the most useful, engaging, and unique workshop I have attended for professional development hours. I feel more confident in my abilities to teach about climate change from a local perspective. The mindfulness work we did supported my realization that our students must get connected to outdoor spaces in their community if they are to confidently navigate local issues caused by climate change.

Anonymous Teacher Comment

Expert Insights from the Climate Conference

At the Meadows Center's "Climate Science: The Good, The Bad, and The Wicked" conference, held in September 2023, more than 300 professionals in academia, government, NGOs, and the private sector from diverse fields came together to confront one of the most pressing challenges of our time: climate change.

Hosted against the backdrop of Texas' escalating climate issues, the conference focused on the concept of "wicked problems"—issues so complex they elude simple solutions. Climate change, with its intertwined scientific, social, and economic dimensions, exemplifies such a problem. The event provided a space for experts to share the latest research, discuss regional impacts, and explore interdisciplinary solutions.

Keynote speaker Michael E. Mann, a renowned climate scientist, author, and distinguished professor, set the tone with his address on



the unprecedented rate of global warming. His message was clear: while the situation is dire, there is still hope. Mann's insights into the systemic causes of climate change underscored the need for coordinated efforts across all sectors of society.

The conference also delved into Texas-specific challenges. Professionals from environmental science, public health, and urban planning shared insights into local issues like droughts, heat waves, and water scarcity. These discussions emphasized the need for localized climate action and resilient systems tailored to regional conditions. Feedback mirrored the significance of these discussions. According to the post-conference survey, 88.2% of participants were "satisfied" with their experience. One attendee expressed their appreciation for the event's unique approach: "I liked that we were talking about climate change in a way that felt real and urgent, not just theoretical."

The event also succeeded in fostering a collaborative spirit among participants. With sessions designed to encourage dialogue and partnership, the conference inspired attendees to think beyond their immediate disciplines. Discussions on policy, legislative change, and integrating climate considerations into various sectors were central to these sessions. As one attendee noted, "The most important takeaway was the need for policy and legislative change to address climate issues effectively." In addition, the diverse range of speakers presented new information that challenged preconceived notions and inspired fresh thinking.

We have always believed in the power of cross-sector collaboration, and this conference was a testament to that. It provided an invaluable platform for professionals to connect, share knowledge, and build relationships. Most attendees (83%)



stated that they would recommend future Meadows Center conferences to others, a clear indication of the impact and value it provided.

The Climate Podcast & Blog

Beyond conferences and events, the Meadows Center extends its educational reach through a climate podcast and blog. These platforms demystify complex climate issues, making them accessible to non-specialists and inspiring action across various community sectors.

The [Fahrenheit 140 podcast](#) features interviews with leading experts on a variety of topics. With Season Two's debut in April 2024, recent episodes have covered topics such as the impacts of climate change on mental health and the intricacies of the climate-fueled public health crisis. To further amplify our message, episodes are also broadcasted through the San Marcos radio station, KZSM.

The accompanying blog, [Hotter Than a Habanero](#), complements these efforts, offering in-depth articles that delve into specific issues. Recent posts have detailed nuanced topics, such as the effectiveness of international climate conferences in curbing global emissions and the importance of shifting away from "toxic optimism" to adopt behavioral changes that promote sustainable living. By providing these diverse perspectives, the blog encourages readers to find practical steps they can take in their own lives.

CONFERENCE TAKEAWAYS



I loved how well attended it was and that there were multiple points of view. I was proud of how Texas State University was seen.

I can't think of any other event or organization that convenes Texas environmental and sustainability leaders like this one.

The conference provided diverse perspectives and clearly supporting facts that did not shy away from conversations that needed to happen. This led to a very valuable outcome.

These communication strategies are moving the needle to broaden the impact of the Meadows Center's climate work. By making expert insights accessible, the podcast and blog empower individuals to take meaningful actions in their communities. They also serve as a platform for sharing success stories and innovative practices to foster a culture of sustainability and resilience.

Leveraging Local Action for Lasting Impact: The Power of Conservation Leadership & Community Science

Every citizen can play a role in safeguarding our natural heritage. The Meadows Center leverages local knowledge and volunteers to maximize the impact of our work and support the vision of those who will continue to steward these vital resources.

Here, we explore how several of our community science projects are building enduring legacies for our rivers and communities. These projects exemplify how grassroots action can ripple outwards, creating lasting impacts that extend far beyond the banks of our rivers.



CREWS REMOVE INVASIVE WATER SPRITE FROM NATIVE VEGETATION IN THE SAN MARCOS RIVER.

Texas Stream Team: Guardians of Our Rivers

Picture yourself heading out for the day. Perhaps you pass a particular creek or river that makes you tap the brakes to catch a glimpse. This moment of curiosity prompts you to slow down and wonder about its health— is it dry, flowing steadily, or teeming with life? You are, in essence, a “river rubbernecker”—someone curious about their local waterways.

For over thirty years, Texas Stream Team has tapped into this curiosity and empowered citizens to monitor and safeguard the 191,000 miles of Texas waterways. Volunteers, or community scientists, receive training to measure water quality and monitor environmental changes.

These dedicated individuals venture into local waterways monthly to collect water quality data, which, in turn, supports academic research, informs policy, and serves as an early warning system for Texas rivers. This hands-on approach turns ordinary citizens into watchful stewards of their local rivers.

Our 2023 study to investigate the impact of participating in Texas Stream Team captured the experiences and motivations of our community scientists, exploring how the program has influenced their awareness, advocacy, and personal and professional development. Here are some voices from the community:

“I found it very inspiring to see these people who were taking time out of their lives as volunteers to benefit society and to benefit the agencies and save a lot of resources on getting the data that we desperately need,” said **Mike Bira**, a long-time supporter, and former US Environmental Protection Agency employee.

• • • • •

“As a city employee, we used the data to fight fracking, to develop policies that increase natural buffer zones and preservation of native land,” an **anonymous community scientist** shared.

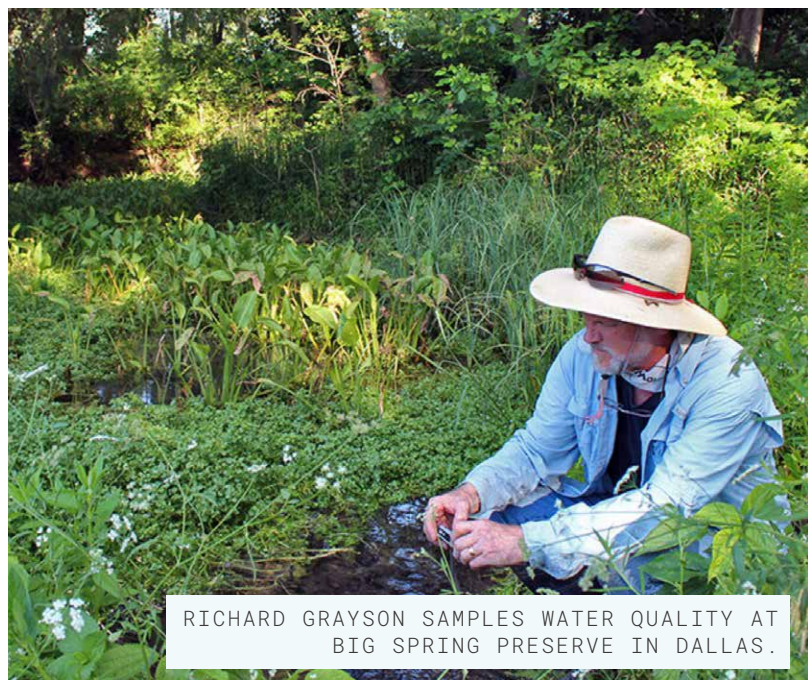
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“I became more aware of the [San Marcos] river, its history, what was going on to protect it at the time, all because I was in Texas Stream Team...,” remarked **Rachel Sanborn**, a Texas Stream Team trainer.

Volunteers like Rachel and Mike exemplify how community science can bridge the gap between professional research and public participation. Today, more than 12,000 Texans have joined this effort, forming a vigilant community network across the state. While the study is still underway, one theme is already clear: community scientists are the eyes and ears of our rivers, filling in the gaps of professional monitoring efforts. They often detect pollution events that might otherwise go unnoticed, addressing immediate threats and providing invaluable data for long-term environmental planning and policymaking.



STUDENTS FROM THE DRIPPING SPRINGS HIGH SCHOOL'S TEXAS STREAM TEAM.



RICHARD GRAYSON SAMPLES WATER QUALITY AT BIG SPRING PRESERVE IN DALLAS.

Project WAIVS: A Multiplier of Habitat Conservation in the San Marcos River

Spring Lake and the Upper San Marcos River, known for their pristine beauty and ecological significance, face a persistent threat from invasive aquatic vegetation. This is exacerbated, in part, by crystal-clear waters and consistent temperatures that allow for prolific aquatic growth. Among the most troublesome are floating plants, like water lettuce and hyacinth, and submerged species, such as hydrilla and hygrophila. These invaders choke out the native Texas wild-rice, a federally endangered species found only in the upper reaches of the San Marcos River.

As a partner of the Edwards Aquifer Habitat Conservation Plan (EAHCP), the Meadows Center is tasked with restoring the aquatic habitat within the Upper San Marcos River to preserve the river's health and the endangered species it supports. We accomplish this by continuously monitoring Spring Lake and the San Marcos River for non-native plants. Non-native species are removed by hand and sent to composting, while native aquatic plants are grown on campus to be replanted in the river.

Despite our considerable efforts over the past 11 years to eradicate invasive species through the conservation measures outlined by the EAHCP, the plan's absence of a maintenance component has led to their resurgence. Without ongoing maintenance, they will inevitably continue to re-establish throughout Spring Lake and the San Marcos River.

Backed by the generous support of the Environmental Services Committee at Texas State University, the Meadows Center launched [Project WAIVS](#) (Watershed Aquatic Invasive Vegetation Suppression) in 2023 to mitigate the impact of these aquatic invaders through targeted removal, monthly monitoring, and educational outreach. The project specifically focuses on enhancing the EAHCP in underworked areas to ensure the sustainability of restoration efforts and allow our team to refocus our efforts on removing problematic plants.

Community involvement is a cornerstone of the WAIVS project.

Volunteer invasive removal events offer students and local citizens opportunities to engage in conservation efforts, creating educational experiences that build a deeper understanding of environmental stewardship. Students gain hands-on habitat restoration experience, learning about the ecological impacts of invasive species and contributing to the health of the San Marcos River ecosystem. This involvement enriches their education and builds a lasting commitment to conservation. Signage at these events and broader outreach initiatives ensures the message of conservation reaches far and wide, embedding a culture of sustainability within the San Marcos community.

Project WAIVS is also strengthening the bond between the university and the community. Through diligent effort and a collaborative spirit, we're rediscovering the community's potential for advancing restoration and resilience, ensuring the San Marcos River remains a thriving ecosystem for all.



VOLUNTEER INVASIVE REMOVAL EVENTS AT SEWELL PARK AND SPRING LAKE.

River Education and Stewardship Alliance: Cultivating Student Leaders

At Texas State University, the newly established River Education and Stewardship Alliance (RESA) is fostering an ethic of environmental stewardship among students and staff. Formed in 2023 as a cross-campus initiative, RESA brings together the Meadows Center, the Texas State Office of Sustainability, staff and students from various departments, and the City of San Marcos. Together, we aim to increase education and outreach to the Texas State community on river-related issues of social and environmental significance.

RESA's mission aligns with the university's values of responsible natural resource management. The alliance takes a unified approach to educating the campus community about the San Marcos Springs and San Marcos River.

This initiative not only raises awareness but also promotes sustainable practices among students, staff, and faculty. Regular meetings and volunteer opportunities encourage students to engage with their environment and become proactive stewards.



Participating in RESA has been an honor. We get the opportunity to talk to community leaders about pressing issues, and it is within RESA that we get the opportunity to voice our concerns to each other and bring new ideas to light. As a student, I am happy to have RESA because it is a place where I can be heard. I am proud of the work RESA is doing, and I cannot wait to see its progress in the future.

Tyler Hartwick, Texas State Graduate Student & RESA Member

OTTER SPOTTING SIGNAL HEALTHY WATERS OF SPRING LAKE

Over the past year, North American river otters have frequently been seen at Spring Lake. These otters are considered indicator species, which means their presence is a positive sign of the lake's excellent water quality and thriving ecosystem. This underscores the exceptional work of our volunteer AquaCorps divers in preserving this unique habitat!

Trained through our Spring Lake Dive Authorization Course, these volunteers participate in bio-monitoring efforts, collect vital data on vegetation growth, and contribute to the removal of invasive species that threaten the habitat. This underwater "gardening" is vital for maintaining a balance between the native plants and the invasive species that could otherwise dominate the lake.





Through the Rain Chain: Community Collaboration for Coastal Resilience

Texas coastal communities are facing an increasingly unpredictable future. Rising sea levels, more frequent storms, and the resulting flood risks present mounting challenges that call for innovative solutions. The Clean Coast Texas Collaborative is an initiative that aims to harness the power of community collaboration to address these coastal resilience and water quality issues.

The Collaborative is led by the Texas General Land Office's Texas Coastal Nonpoint Source Pollution Program and coordinated by the Meadows Center in collaboration with Texas A&M AgriLife Extension (Texas Community Watershed Partners), Texas Sea Grant, Doucet: A Kleinfelder Company, and Anchor QEA. Through this initiative, the Collaborative provides coastal communities with technical assistance to reduce nonpoint source pollution and implement stormwater management techniques that enhance resilience. From policy development to on-the-ground projects, the Collaborative is demonstrating that community-driven solutions are key to creating a more sustainable future for the Texas coast.

Two standout projects, the rain garden at the Keach Family Library in Robstown and the stormwater ordinance updates in Port Lavaca, highlight the impact of this cooperative approach. These efforts underscore how tapping into relationships among local governments, community members, and environmental experts can lead to tangible outcomes that strengthen coastal resilience.

Planting Seeds (and Raindrops) at a Robstown Library

In August 2023, the seeds of a new partnership were planted during a public meeting in Corpus Christi about the services provided by the partnership. After listening to the presentations, the Nueces County Director of Coastal Parks saw an opportunity for the Keach Family Library in Robstown, a town just outside Corpus Christi. The Collaborative made a spontaneous visit to the library and agreed that it would be an ideal location for a green stormwater infrastructure project. After pitching the idea of a rain garden to library staff, the project began to take shape. With funding from the Coastal Bend Bays and Estuaries Program, a \$25,000 contribution from Nueces County Coastal Parks, and support from the Nueces County Commissioner's Office (Precinct 2), the project became a reality. The Texas Community Watershed Partners selected appropriate plant species, Doucet: A Kleinfelder Company provided engineering plans, and the Collaborative helped to provide coordination support.

Rain gardens like this one offer multiple benefits. They provide a habitat for wildlife and enhance public spaces

while also playing a crucial role in stormwater management. The gardens are designed to absorb and filter stormwater, preventing flooding and improving water quality. Rain gardens also help conserve water and reduce the need for maintenance by using drought-resistant plants that thrive in local conditions. In addition, they contribute to cooling the environment through evapotranspiration, making them valuable assets in the fight against rising temperatures.

The Keach Family Library rain garden project, expected to be completed in 2025, will demonstrate what green stormwater infrastructure can offer coastal communities in Texas. To solidify this goal, the library is already developing complementary educational programming around the project by hosting a Green Infrastructure for Texas workshop on rain gardens, presented by Texas Community Watershed Partners. The library has also created educational bookmarks with factoids and tips for effective rain gardens and is developing educational programming to support community awareness about the benefits of green stormwater infrastructure. These efforts to foster a community well-versed in green stormwater infrastructure will undoubtedly contribute to continued investment in coastal resiliency.

Partnerships, Policies, and Practices in Port Lavaca

As the coastal city of Port Lavaca prepares for future growth, the city manager recognized the need to update the city's criteria for stormwater detention. Their existing drainage manual, dating back to 1989, no longer met the needs of a growing community facing increasing flood risks. With stormwater from Lavaca Bay flowing into Matagorda Bay—home to a thriving oyster farming



industry—there was an urgent need to protect water quality and ensure the sustainability of the local economy.

Recognizing the Collaborative's [list of services](#) and [other helpful resources](#) as a perfect complement to Port Lavaca's needs, the Calhoun County AgriLife Extension Office and the City of Port Lavaca established a partnership with Clean Coast Texas. This resulted in the development of Port Lavaca's new stormwater ordinance and updated drainage criteria for the first time in over 35 years. By incorporating Green Stormwater Infrastructure criteria from [the Clean Coast Texas Sustainable Stormwater Manual](#), Port Lavaca is setting a new standard for coastal stormwater management.

The impact of this collaboration extends beyond policy updates. Doucet: A Kleinfelder Company worked alongside the Langford Community Management Services to submit a grant proposal to the Texas General Land Office's Resilient Communities Program on behalf of Port Lavaca. The secured funding will support revised zoning and land use planning, ensuring that future development aligns with the city's resilience goals.

As Port Lavaca prepares to implement its new stormwater ordinance, Clean Coast Texas will

continue connecting the city with other Texas communities that have adopted similar regulations. By fostering these relationships, the Collaborative is helping to build a network of resilient communities across the state.

“It Takes a Village”

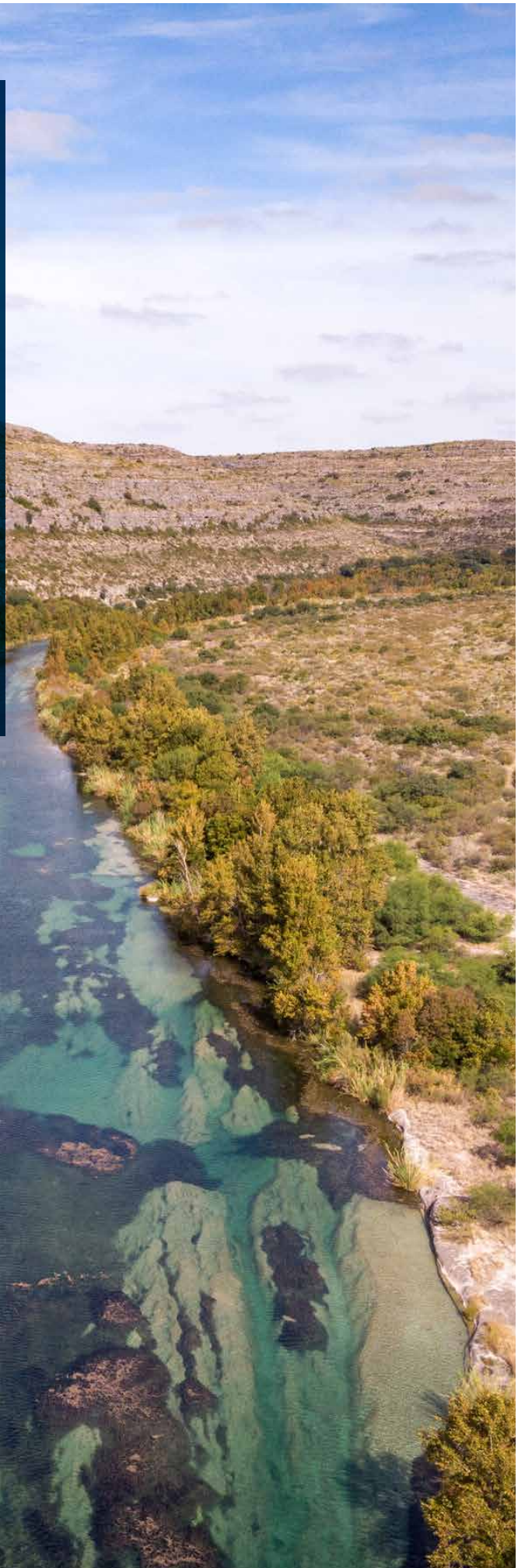
By leveraging the strength of community networks, the initiative has shown that building relationships and shared purpose can drive progress in advancing coastal resilience. Whether securing funding, implementing projects, or educating the public, these efforts empower communities to take proactive steps in safeguarding their futures, demonstrating that resilience is not just about infrastructure but about people coming together to protect what they value most.

Through the partnerships and proactive planning catalyzed by Clean Coast Texas, communities across the region are becoming stronger, more informed, and better prepared to face the environmental challenges of tomorrow. As the Collaborative continues to build on these connections, we are reminded that tapping into the strength of our collective effort is the key to creating a resilient and thriving Texas Coast for generations to come.

Bridging Gaps: The Role of Collaborative Science in Texas

Collaboration is key to the pursuit of scientific progress, but its success often hinges on an underestimated factor: effective process design and facilitation. At the Meadows Center, we've elevated facilitation from a supporting role to a driving force for progress.

Our work on the Texas Integrated Flooding Framework and the Devils River Watershed Projects demonstrate how we're moving beyond traditional methods to design engagement processes that transform complex, multidisciplinary collaborations into impactful, actionable outcomes. In both projects, our role as facilitators has focused on bridging gaps—between disciplines, between experts and the public, and between science and action. Below, we explore the successes achieved through our facilitation-driven approach to collaborative science.



Texas Integrated Flooding Framework Project

In the aftermath of Hurricane Harvey, the Texas coast faced a daunting challenge: how to prevent such catastrophic flooding in the future. The [Texas Integrated Flooding Framework \(TIFF\) project](#) emerged to address this challenge, representing a collaborative effort between the Texas Water Development Board, the U.S. Army Corps of Engineers, and the U.S. Geological Survey to reduce coastal flood risks and enhance resilience. The Meadows Center is at the heart of this endeavor, designing and facilitating the collaboration necessary to achieve the project's ambitious goals.

TIFF's strength lies in its expert Technical Advisory Teams, comprising over 100 experts from various sectors. These teams focus on four key areas: analyzing data gaps, best practices for managing data, integrating flood models, and planning outreach. Their collective expertise drives the framework forward, ensuring that the project remains grounded in high-quality, cross-disciplinary insights.

As facilitators, we design processes to elicit expert opinions, create actionable plans, and communicate the project's progress effectively. We handle tasks such as developing meeting materials, organizing logistics, and creating feedback tools to optimize every interaction with the technical teams. The outcome of each meeting is meticulously documented, capturing key decisions and valuable feedback.

In addition to meeting facilitation, we play a coaching role. Through regular meetings with the Steering Committee, which includes representatives from each project partner, we help the project's leaders stay accountable to the planned structure and make adaptations as necessary to meet the original project objectives. We use our technical expertise to help balance the project's intricacies with the broader vision, keeping the project on track.

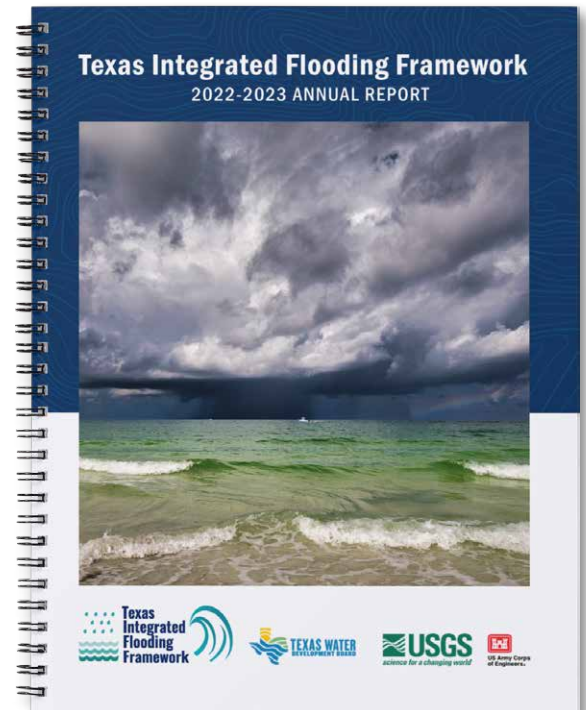
Outreach and communication are also integral to our role. We develop presentations, executive summaries, fact sheets, website content, and more to make the project's findings visible and accessible. A highlight of this work includes detailed annual reports documenting the progress generated by TIFF each year. This involves synthesizing vast amounts of technical data and expert insights to articulate the current state of knowledge and provide a roadmap for future efforts. Each report emphasizes the Technical Advisory Team's input and demonstrates how their expertise has influenced the project's direction and outcomes.

Perhaps the most critical part of the reports is their focus on actionable recommendations. We work to ensure the report goes beyond theoretical analysis by translating findings into recommendations and strategies that can be vetted or implemented in the year ahead. Developing these annual reports is as collaborative as the project itself, involving coordination with the Steering Committee, Technical Advisory Teams, and various consultants. This iterative process ensures the final product is robust, comprehensive, and reflective of the collective expertise of all involved parties.

We are proud to be a driving force behind this important endeavor. By harnessing the project's collective expertise and leading the process with a commitment to inclusivity and collaboration, we are driving meaningful progress. Each meeting, report, and interaction is a step toward a safer, more resilient future for our coastal communities.



MEADOWS CENTER TEAM SETS UP TIFF INFORMATIONAL BOOTH AT THE TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION.



COVER OF THE TIFF PROJECT YEAR TWO ANNUAL REPORT.



Devils River Watershed

The Meadows Center’s work on the [Devils River Watershed Project](#) has become a proving ground for new strategies to engage stakeholders in scientific discourse and to create settings where future collaboration is possible. Recognizing the importance of trust, structure, and accurate information in successful collaborations, we structured a process to 1) center local voices and lived experience in a comprehensive literature review of the Devils River; 2) invite all parties to the table; 3) host opportunities for people to get to know one another; and 4) create an accountable stakeholder review process, which incorporates a “stakeholder jury” to vet and certify the final product while also independently identifying any opportunities for future collaboration.

The project began in 2021 following a WaterSMART planning grant secured by the Devils River Conservancy, in partnership with the Texas Parks and Wildlife Department and The Nature

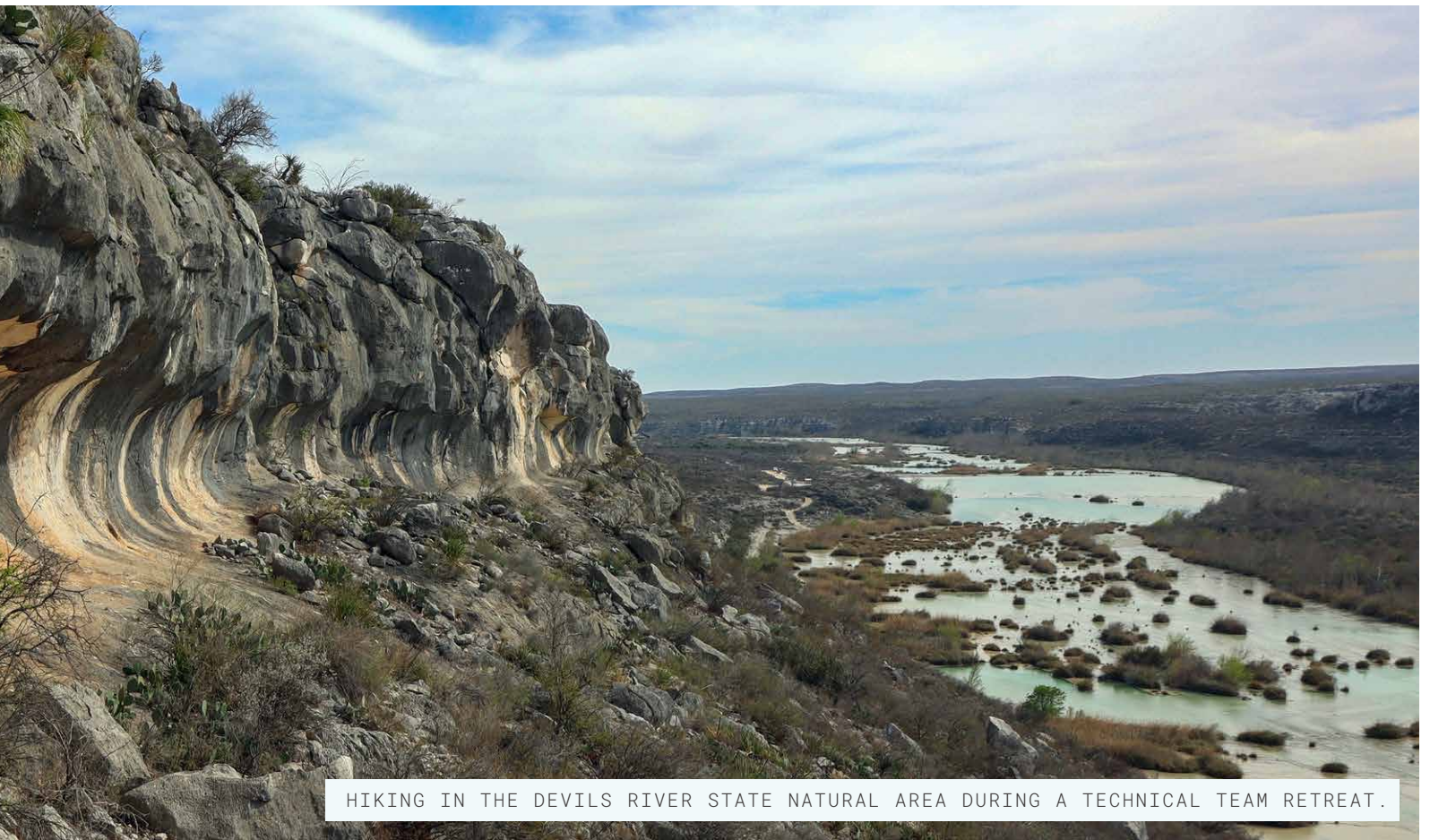
Conservancy, to support a collective planning process for stakeholders in the Lower Devils River watershed. In 2022, the Meadows Center was selected to serve as a facilitator to guide the process, providing impartial leadership to bring all voices to the table. Initial meetings with stakeholders revealed overwhelming concerns surrounding the project’s aim to create a watershed plan. The feedback was clear: the community needed a transparent, inclusive, and responsive process. They were not in a place to identify, let alone commit to, a collaborative plan. Rather than pressing forward with a one-size-fits-all strategy, we recalibrated our approach to place the stakeholders at the heart of the process.

To nurture this vision, we introduced a series of stakeholder socials—informal gatherings designed to build trust, open lines of communication, and foster a sense of community and shared purpose among participants. These events

provided a space where peers could voice their concerns, ask hard questions of the project team, share their insights, and get to know one another outside the formalities of structured meetings.

To create a common understanding of the complexities of the region, we pivoted from the original goal of a traditional watershed management plan to instead focus on basics and document the “State of the Devils River” in a collaboratively created report. The report would serve as a comprehensive literature review and reference document so that all parties could work from the same foundation should they decide to seek consensus-driven goals for the watershed in the future.

We established four technical teams of volunteer experts and stakeholders to prepare the report and gather all available information on the watershed related to groundwater resources, species and their flow requirements, sustainable recreation, and water quality.



HIKING IN THE DEVILS RIVER STATE NATURAL AREA DURING A TECHNICAL TEAM RETREAT .

And while the teams enlisted the top academic experts working in the region, local knowledge and lived experience of the river is playing a vital role throughout the report’s development. Stakeholders with generations of experience managing land, water, and the natural environment in the region are shaping the report’s content and validating (or refuting) the conclusions reached by the more traditional experts. By giving equal weight to scientific and local insights, we aim to ensure that the report honors the community’s deep connection with the river and bridges the gap between research and on-the-ground experience. The preliminary draft, released in June 2024, serves as a foundation for building a shared vision for the watershed that reflects the community’s diverse perspectives.

Another new strategy we’ve employed is the stakeholder jury. The jury comprises individuals randomly selected from a pool of willing participants representative of the broader community. It includes seats for land managers, government officials, and stakeholders to ensure the jury mirrors the complexity of the community, with each member bringing unique insights to the table. The goal is not to replace broader stakeholder engagement but to guarantee that diverse perspectives are thoroughly considered. Jurors will review the draft report and provide feedback on its content to refine and certify the technical team’s findings and final report.

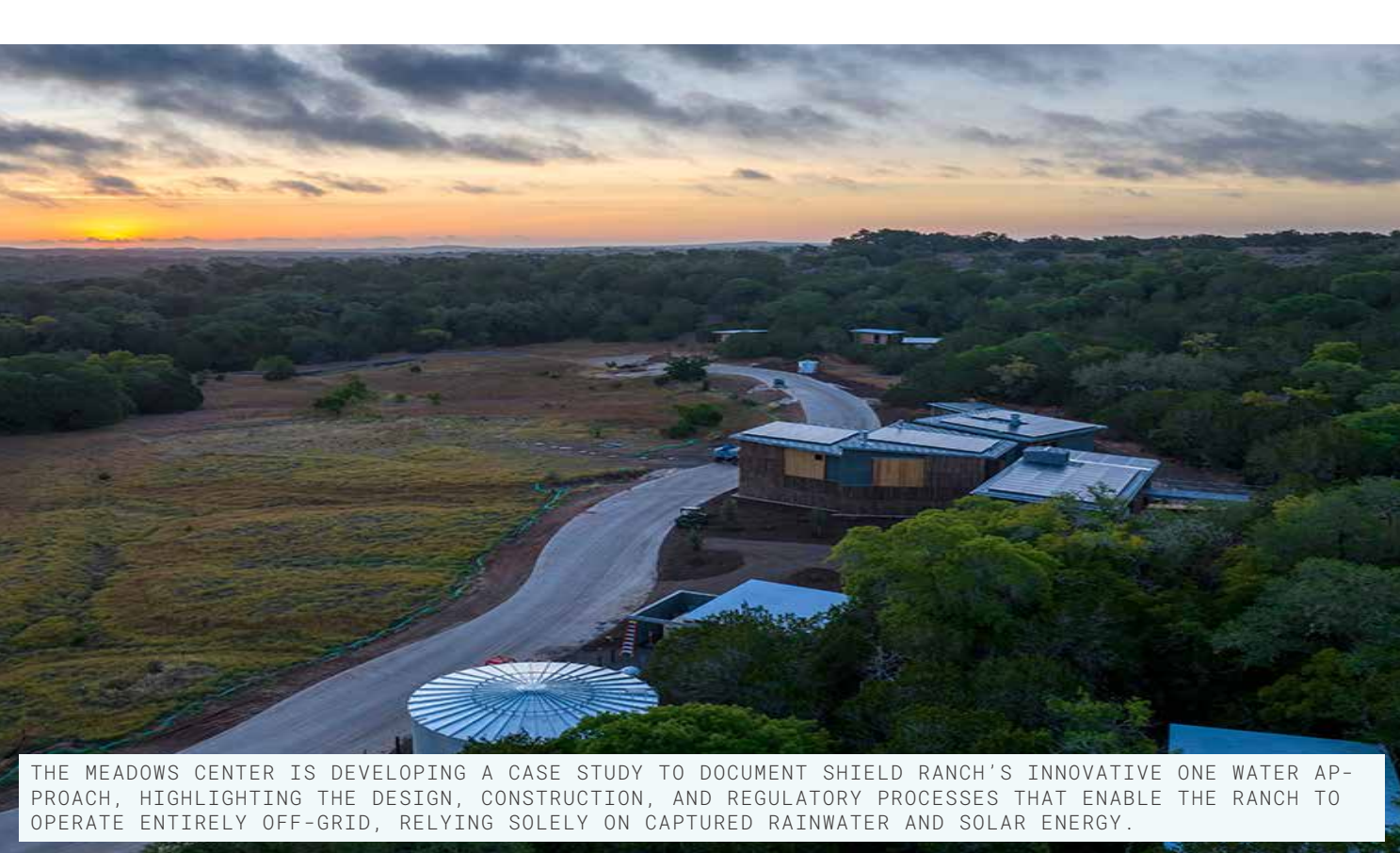
Putting stakeholders at the center of the process is key to the report’s credibility and we hope, a first step in creating partnerships that will protect the Devils River, and the communities that steward it, for generations to come.



MEADOWS CENTER PRESENTS PROJECT FACILITATION METHODS AT UNIVERSITY NETWORK FOR COLLABORATIVE GOVERNANCE CONFERENCE .



STAKEHOLDER SOCIAL IN DEL RIO, TEXAS .



THE MEADOWS CENTER IS DEVELOPING A CASE STUDY TO DOCUMENT SHIELD RANCH'S INNOVATIVE ONE WATER APPROACH, HIGHLIGHTING THE DESIGN, CONSTRUCTION, AND REGULATORY PROCESSES THAT ENABLE THE RANCH TO OPERATE ENTIRELY OFF-GRID, RELYING SOLELY ON CAPTURED RAINWATER AND SOLAR ENERGY.

Where We're Investing Next: Funding Priorities in Fiscal Year 2025 and Beyond

The Meadows Center is an integral part of Texas State's Run to R1, an ambitious campaign to become a research-focused university. Our staff works hard to raise research dollars and contribute countless research projects every year towards the R1 designation. In addition to our water research and watershed services, we steward Spring Lake, the San Marcos River, and the historic glass-bottom boats. We are seeking investments in the following areas to advance our research, stewardship, education, and leadership in Fiscal Year 2025 and beyond.

One Water

The Meadows Center is a statewide leader in promoting One Water principles. One Water is a solutions-focused, integrated approach to water that promotes the management of all water—drinking water, wastewater, stormwater, greywater—as a single resource. A One Water approach rethinks how water moves through and is used in a community and brings stakeholders together to utilize water as efficiently as possible.

In collaboration with dozens of partners, the Meadows Center has established the Texas One Water Initiative to expand One Water projects in the state, ensure communities have the resources to implement these projects, and provide statewide leadership, education, resources, and collaborative opportunities for One Water projects.

Over the next three years, the Meadows Center will fundraise to establish a new One Water staff position dedicated to this initiative. With the added capacity, we can increase research initiatives and provide

technical assistance to the many organizations and communities that turn to the Meadows Center for help with One Water solutions. We will build a One Water project database and resource hub as a data-driven tool to guide water-related research, policy, resource management, commercial and residential development, and planning for water conservation and integrated One Water projects.

In addition, we can offer more robust state and national leadership, workshops, community gatherings, and research tools to encourage ongoing dialogue, continuing education, collaboration, and data that will support One Water projects throughout Texas. Our Texas One Water initiative requires a minimum investment of \$100,000 annually over the next three years.

Operational Resilience

The Meadows Center must secure over 90% of its operating revenue every year. This revenue, which includes grants, donations, ticket sales, and professional



NEWLY RESTORED BOAT 1978 RETURNS TO SPRING LAKE.

service contracts, supports our staff, facilities, and research efforts to protect and preserve the state’s vulnerable water resources. Key strategies toward building and sustaining our financial resources include growing our Headwaters Fund and establishing a Stewardship Council in Fiscal Year 2025.

Our Headwaters Fund is the general fund that sustains us, providing essential day-to-day support and ensuring organizational resilience during an emergency like the COVID-19 pandemic. Gifts to this fund support all programs and projects. Donations to our Headwaters Fund are crucial to the continued success of the Meadows Center. Not only do these donations give us the flexibility to tend to our highest needs, but they also enlist the committed involvement of our trusted supporters and partners. An additional \$300,000 in our Headwaters Fund would meet our goal to set aside emergency funds that could sustain our operations for a full year, allowing us to focus all future donations directly on the programs and research that we do best.

Spring Lake: Access for ALL

In 1949, Paul Rogers bought the land surrounding Spring Lake, rigged a paddle boat with a glass bottom, and began taking family and friends out to see the bubbling springs, plants, and animals that thrived in the clear waters. Nearly 75 years later, the historic glass-bottom boats are still the main attraction at Spring Lake, offering a window into these sacred waters and encouraging visitors to respect and protect our precious water resources.

At the Meadows Center, we strive to keep our glass-bottom boat ticket prices affordable and accessible to everyone. Our ticket sales cover a portion of our expenses, but significant additional investment is needed each year to repair aging infrastructure, manage protected species, and provide educational experiences to over 100,000 visitors annually. And, with the lens of striving to provide access for all, an even greater investment will be needed to ensure that people of all abilities (including those who use a wheelchair) can access this beloved activity.

Over the past few years, the Meadows Center raised over \$350,000 and worked collaboratively with funding partners and talented artisans to restore our historic glass-bottom boat fleet. \$330,000 more is needed to build an ADA-accessible glass-bottom boat and boat dock (\$250,000 for the boat and \$80,000 for an accessible dock). This accessible boat will round out our fleet and allow our mobility-challenged students and guests to access the wonders of Spring Lake.



The Meadows Center collaborates with the Indigenous Cultures Institute to share the vibrant cultural legacy of the Coahuiltecan people at Spring Lake with our visitors. As plans for a new Indigenous Cultures Center take shape at the headwaters, we’re eager to expand our role in deepening the connection between visitors and the ancient traditions of this sacred site.

“We are honored to work towards establishing an Indigenous Cultures Center on the university’s campus that will become a model of community inclusion, authentic representation of native people, and exemplary environmental stewardship.”

MARIO GARZA, PH.D.

Principal Founder and Board of Elder’s Chair for the Indigenous Cultures Institute

For more information about these campaigns or to contribute, contact Amy Crowell at acrowell@txstate.edu or visit our [online donate page](#).

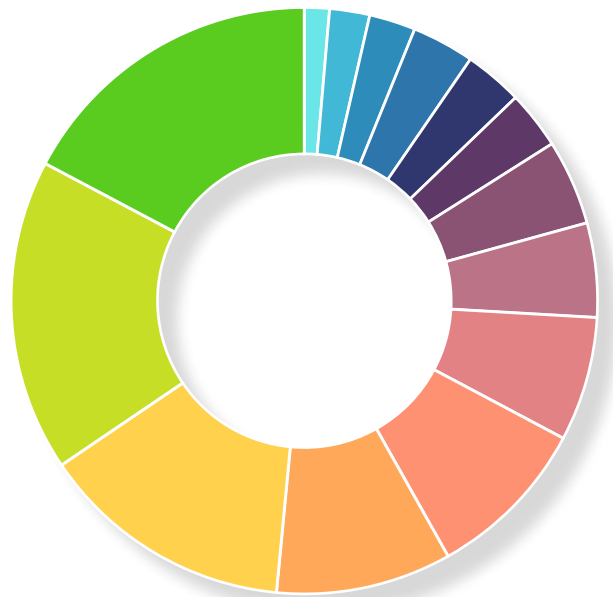


Fiscal Year 2024 Financial Overview

Revenue

Indirect Cost Recovery – 1.4%	\$68,828
Meadows Generated Income* – 2.2%	\$110,458
Private Organizations & Individual Gifts – 2.6%	\$127,634
Foundation Gifts – 3.4%	\$172,167
Dive Operations Revenue – 3.2%	\$160,876
Corporation Gifts – 3.2%	\$159,750
Professional Services Provided – 4.7%	\$235,358
Texas Research Incentive Program Match – 5.2%	\$259,541
University – 6.9%	\$342,591
Endowments – 9.1%	\$453,114
Local – 9.7%	\$483,357
Spring Lake Education (tickets & tours) – 14%	\$700,000
Federal – 17.2%	\$860,388
State – 17.3%	\$861,902

Total Revenue: \$4,995,964



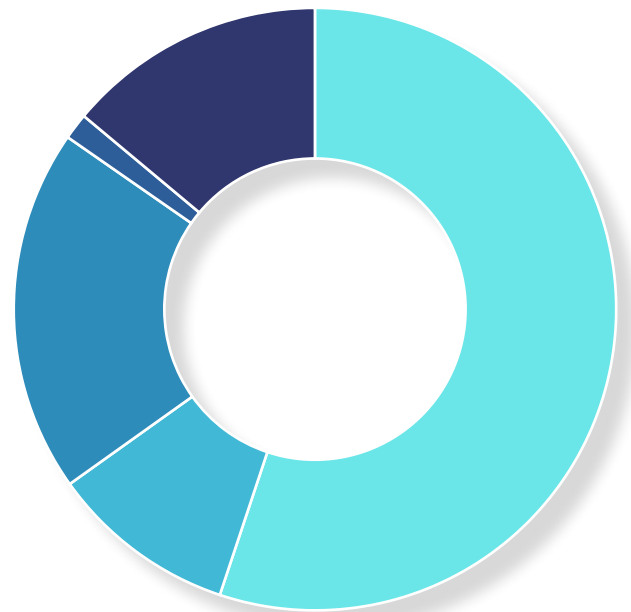
*Sources of income include book sales, hats, t-shirts, book royalties, and services rendered.



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Expenses

Professional Staff Salary and Benefits – 55.1%	\$2,266,543
Hourly Wages (Student Workers & NSNR) – 10%	\$412,210
Supplies and Facility Maintenance – 19.5%	\$803,118
Travel & Meetings – 1.4%	\$57,958
External Contracts – 13.9%	\$572,481
Total Expenses: \$4,112,309	



Fiscal Year 2025 Projections**

FY 2025 Professional and Hourly Staff Cost Estimate	\$2,759,116
Balance Carried Forward for Project Commitments	\$883,655
FY 2025 Fundraising Need Estimate: \$1,875,461	

**Balance reflects ongoing obligations to grant and Foundation funders on multi-year projects and contracts rather than funding available for discretionary activities, including operations.

Our Team



Robert Mace, Ph.D.
Executive Director & Professor of Practice, Dept. of Geography



Andrew Sansom, Ph.D.
Founder & Professor of Practice, Dept. of Geography



Carrie Thompson, M.P.A.
Director of Operations



Rob Dussler, Ph.D.
Chief Education Officer, Director of Spring Lake Education



Miranda Wait, M.S.
Deputy Director of Spring Lake Education



Jenna Walker, M.A. Geo.
Director of Watershed Services



Timothy Bonner, Ph.D.
Chief Science Officer & Meadows Endowed Professor in Aquatic Resources, Dept. of Biology



Tom Heard, M.S.
Deputy Director, Ecological Research Group



Soe Myint, Ph.D.
Chief Conservation Officer & Meadows Endowed Chair in Water Conservation, Dept. of Geography



Regina Allen, M.S.
Administrative Assistant



Claudia Campos, B.S.
Administrative and Outreach Specialist, Watershed Services



Amy Crowell, B.A.
Stewardship Manager



Jamie Donaldson
Business Manager



Michael Flores, B.S.
Dive Coordinator



Collin Garoutte, M.S.
Research Associate, Habitat Field Crew



Van Gill
Administrative Assistant



Priscilla Hernandez, CTCD
Procurement Specialist



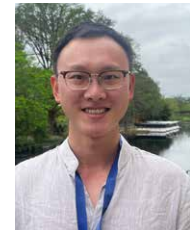
Anna Huff, B.S.
Science Communications Manager



Desiree Jackson, M.S.
Science & Stakeholder Engagement Specialist



Christina Lopez, Ph.D.
Coastal Coordinator, Watershed Services



Boling Li, Ph.D.
Run to R1 Post-Doctoral Research Scholar



Emily Lorkovic, M.S.
Wildlife & Fisheries Biologist, Habitat Field Crew



Sam Massey
Glass-Bottom Boats Manager, Spring Lake Education



Erica Jane Meier, M.S.
Administrative Assistant II, Spring Lake Education



Aspen Navarro, M.S.
Community Science Manager, Watershed Services



Laura Parchman, B.A.
GIS & Data Specialist, Watershed Services



Patti Pulis, B.B.A.
Office Administrator



Bess Price, M.S.
Education Manager, Spring Lake Education



Christopher Riggins, B.S.
Wildlife & Fisheries Biologist, Ecological Research Group



Susana Thomas, CTCD
Assistant Business Manager



Nicky Vermeersch, M.S.
Water Quality Specialist, Watershed Services



Aaron Wallendorf, B.S.
Lake Manager



Sarah Wingfield, B.A.
Digital Media Specialist

Students, Interns, and Part-Time Staff

Andrew Adams, M.S.	Katie Denson	Logan Horak	Haley Pousson
Belle Alejandria	Garrett DiPalma	Gabriel Irvine	Noah Powell
Lauren Alexander	Katie Dusek	Sara Julian	Ava Prince
Cera Anderson	Theo Ebosele	Rachel Keese	Adriana Puzon
Annabelle Bamberger	Faith Fabian	Nate LaRose	Val Rangel
Hannah Bates	Lisa Fields	Ashley Lewis	Sophia Reyes
Braydon Batts	Shelby Fisher	Maggie Maine	Tatian Roa
Adam Berglund	Megan Flannery	Claudia Martinez	Teale Robison
Alexis Betancourt	Alexandra Fleming-Patrick	Miriam Martinez	Jatziri Rodriguez
Shelby Bork	Homero Freixa	Abi Mendoza	Carrie Sheffield
Priyanjali Bose	Skylar Gibbs	Madison Metevier	Sarah Schultz
Alana Brown	Sam Gladden	Madison Mitchell	Amalia Sica
Harley Burke	Delaney Hankins	Luis Acosta Munoz	Cassandra Tamez
Kannon Byckovski	Madi Harris	Hope Myers	Neelam Thapa
Kaylei Chappel	Taylor Harshbarger	Joshua Neves	Magar
Landon Courtney	Connor Havens	Abygail Panther	Hunter Tedford
Sally Chavira	Connor Havens	Riley Patrick	Aidan Tiemann
Chevy De la Serna	Kate Hill	Charlize Paulette	Kylie Waddell
Riana De Luna	Madison Hill	Kyla Perry	Sarah-Grace Williams
	Alex Holmes	Faith Poe	Tiffany Willrich

Meadows Center Fellows

Kelly Albus, Ph.D.

Adjunct Professor, Biology For Educators, University of North Texas

Mike Abbott, Ph.D.

James Dodson, M.P.A

Principal/Consultant, GroundswellTX, Water & Coastal Resources Management

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Principal Founder, Indigenous Cultures Institute

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Watershed Systems Group, INC.

Sharlene Leurig

Chief Executive Officer, Texas Water Trade

Vanessa Puig-Williams

Director, Texas Water Program, Environmental Defense Fund

Warren Pulich, Jr., Ph.D.

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Bill Reaves, Ph.D.

Independent Art Curator & Co-Editor, Joe & Betty Moore Series on Texas Art, Texas A&M University Press

Linda Reaves, Ph.D.

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Carlos Rubinstein

Principal, RSAH2O, LLC

Todd Votteler, Ph.D.

President, Collaborative Water Resolution, LLC

Louis (Trey) W. Mixon, III, P.E.

Natural Resources Manager, Ozarka® Brand 100% Natural Spring Water - BlueTriton Brands, Inc.

Douglas A. Wierman, P.G.

President, Blue Creek Consulting, LLC

Water Wizards

Christopher Brown, Ph.D.

Associate Professor, Department of Political Science

Joni Charles, Ph.D.

Associate Professor, Department of Finance and Economics

Richard Earl, Ph.D.

Professor, Department of Geography

Sangchul S. Hwang, Ph.D., P.E.

Associate Professor of Environmental Engineering, Ingram School of Engineering

Keisuke Ikehata, Ph.D.

Assistant Professor, Ingram School of Engineering

Jason Julian, Ph.D.

Professor & Associate Chair, Department of Geography

Kimberly Meitzen, Ph.D.

Associate Professor, Department of Geography

Ken Mix, Ph.D.

Associate Professor, Department of Agricultural Sciences

Benjamin Schwartz, Ph.D.

Associate Professor, Department of Biology & Director, Edwards Aquifer Research and Data Center



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SAN MARCOS SPRINGS CLOSE-UP @ERICH SCHLEGEL

Grants Awarded in Fiscal Year 2024

- WAIVS: Watershed Aquatic Invasive Vegetation Suppression**
Funder: Texas State University Environmental Service Committee
Principal Investigator: Collin Garoutte, Emily Lorkovic
- Texas Stream Team Program: Field Audit Sessions**
Funder: Texas Commission on Environmental Quality
Principal Investigator: Aspen Navarro
- Cypress Creek Occurrence of Flowing Water: Phase 2**
Funder: Colorado River Land Trust
Principal Investigator: Jenna Walker
- Clean Coast Texas Collaborative Years 5 & 6**
Funder: Texas General Land Office
Principal Investigator: Christina Lopez
- Blanco Cypress Watershed Protection Plan**
Funder: Hays County
Principal Investigator: Jenna Walker
- A Stakeholder Driven Plan for Long-Term Coastal Hydrologic Monitoring Program**
Funder: Texas General Land Office
Principal Investigator: Jenna Walker
- Shield Ranch Campsite: Trailblazing Sustainability With Help From the Sky**
Funder: Shield-Ayers Foundation
Principal Investigator: Jenna Walker

- Earth Day, Family Fun Days, One Water**
Funder: H-E-B
Principal Investigator: Carrie Thompson
- Shoal Creek Watershed Action Plan Implementation**
Funder: Shoal Creek Conservancy
Principal Investigator: Jenna Walker
- Developing Spawning Protocols and Identifying the Sex Determining Regions in Suckermouth Armored Catfish**
Funder: Texas Parks and Wildlife Department / Texas A&M University
Principal Investigator: Tom Heard
- Stewardship and Sustainability Partnership**
Funder: BlueTriton Brands, LLC
Principal Investigator: Carrie Thompson
- Habitat Field Crew San Marcos River Litter Collection**
Funder: San Marcos Lions Club
Principal Investigator: Tom Heard
- Discretionary Grant for General Operations**
Funder: Powell Foundation
Principal Investigator: Carrie Thompson
- Habitat Conservation Plan**
Funder: City of San Marcos
Principal Investigator: Tom Heard

Slingshot Challenge Supply Funding

Funder: National Geographic via UC Bakersfield
Principal Investigator: Bess Price

Upper San Marcos River Aquatic Invasive Species Removal and Native Vegetation Repatriation

Funder: Texas Parks and Wildlife Department
Principal Investigator: Tom Heard

Green Stormwater Infrastructure Demonstration Project at Nueces County Public Library in Robstown, Texas

Funder: Coastal Bend Bays and Estuaries Program
Principal Investigator: Christina Lopez

Communicating Correlative Rights Strategies to Encourage Sustainable Groundwater Management

Funder: Jacob and Terese Hershey Foundation
Principal Investigator: Robert Mace

General Operations Funding

Funder: Burdine Johnson Foundation
Principal Investigator: Carrie Thompson

Habitat Enhancement Through Litter Removal in the Headwaters of the San Marcos River

Funder: Environmental Fund of Texas
Principal Investigator: Emily Lorkovic, Chris Riggins

Development of Innovative Monitoring Analysis Strategies for Rural Enhanced Aquifer Recharge Structures

Funder: US Environmental Protection Agency
Principal Investigator: Robert Mace

Texas Coast Pilot Project: Environmental Forensics to Assess Climate Change Effects on Fecal Contamination Towards Management for Vulnerable Communities

Funder: National Oceanic and Atmospheric Administration
Principal Investigator: Jenna Walker

Maintaining The Texas GLO's Living Shorelines Program Website (Year 3)

Funder: Texas General Land Office
Principal Investigator: Anna Huff



External Research and Creative Projects at Spring Lake in Fiscal Year 2024

Spring Lake is an environmentally, culturally, and archaeologically significant resource that serves as a living laboratory for researchers. As the entrusted stewards, the Meadows Center is committed to providing external researchers with access to this world-class platform for research—including access to programs, infrastructure, and resources. The following list details external research activities we supported at Spring Lake in Fiscal Year 2024.



Classroom Instruction

ANTH 3361: Archaeological Field Methods

Heather Smith, Texas State Anthropology Department

BIO 4435: Techniques in Wildlife Management

Danielle Gay, Texas State Biology Department

General Science 2310: Course-based Undergraduate Research Experience (CURE)

Carrie Bucklin, Texas State Biology Department

HDPE Water Collection

Felipe Gutierrez, Texas State Ingram School of Engineering

MC 4345: Drone Storytelling

Dale Blasingame, Mass Communications Department

US Compost Council Certification

Steve Shannon, Texas State Geography Department

Research & Creative Projects

Bathymetric Lidar Survey of Spring Lake

Jennifer Jensen, Texas State Biology Department

Dynamics in Comal Springs, Texas: Exploring Phenotypic Plasticity and Dietary Patterns

Ethan Owen, York University

Effects of aquatic nitrite on maternal immune transfer and offspring development in a live-bearing species

Ashley Hendrix, Texas State Biology Department

Effects of Temperature on Damselfly Species Coexistence

Michael O'Connor, University of Arkansas

PHOTO SHOOT AT SPRING LAKE FOR THE POSTER OF THE AUSTIN OPERA'S PERFORMANCE OF THE PEARL FISHERS.
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TEXAS STATE UNIVERSITY GEOGRAPHY STUDENTS ENGAGE IN OUTDOOR ACTIVITY AT SPRING LAKE .

Environmental DNA Sampling and Sequencing at Spring Lake: A Survey

Haskell V. Hart

Environmental Impact on Cognitive Function and Stress in Adult Learners: A Comparison of Natural and Artificial Learning Environments

Texas State Counseling, Leadership, Adult Education & School Psychology Department

Headwater Heterelmis Genetics and Morphology

U.S. Fish and Wildlife Service

Impacts of Place-Based Pedagogy and Environmental Mindfulness at an Informal Science Institution

Ryan Spencer, Texas State Biology Department

Status of freshwater turtles in the San Marcos River and its headwaters

Mike Forstner, Texas State Biology Department

Surviving Without Sex: Use of Phenotypic Variation in an Asexual Fish

Alison Davis, University of Texas at Austin-Department of Biology

Testing dissolved oxygen levels in Spring Lake

Jordan Whited, Texas State Biology Department

Origins and Evolution of *Poecilia latipinna* in Central Texas

Callen Inman, University of Texas, University of Oklahoma

Using metagenomics to determine the impact of environmental change and host selection on the function of the gut microbiome in an herbivorous, clonal teleost, the Amazon molly

Jessica MacPherson, University of Texas at Tyler

61st Annual Texas Water Safari

Texas Water Safari

ADCP Demonstration and Data Collection

SonTek - a Xylem Brand

Cyanobacterial Species Sampling

David Nobles, Department of Molecular Biosciences-University of Texas at Austin

Deep in the Heart Documentary (sequel)

Fin and Fur Films

Hotel Springs Collection for New Species of Annelid Worms

US Fish and Wildlife Service

Hotel Springs Sampling

Edwards Aquifer Authority

Monitoring of the San Marcos fountain darter

US Fish and Wildlife Service

NSF-funded National Research Traineeship Program

Audrey Douglas, Center for Water Supply Studies-Texas A&M University-Corpus Christi

Texas Blind Salamanders and San Marcos Salamanders Collection for the Edwards Aquifer Refugia Program

US Fish and Wildlife Service, San Marcos Aquatic Resources Center

Water Monitoring Instrument Demonstration

In-Situ

Water Quality Collection – Edwards Aquifer Habitat Conservation Plan

Edwards Aquifer Authority

Staff Published Works

The Meadows Center supports responsible water and natural resource policy in Texas and convenes stakeholders to address the grand challenges we will face in the decades to come. The following list provides a snapshot of the presentations and publications from our staff, faculty, and students in Fiscal Year 2024.

Published Papers, Reports, Books, and Abstracts

Evans, B. [Replenishing Our Hills: Protecting Lands in the Heart of the Hill Country](#). Photographs by John Freud, introduction by David K. Langford, foreword by Andrew Sansom, Texas A&M University Press, 2024. 400 pgs.

Morey, R. [The Other Side of Nowhere: Exploring Big Bend Ranch State Park and Its Flora](#). Foreword by Andrew Sansom and David H. Riskind, Texas A&M University Press, 2024. 480 pgs.

Navarro, A. 2024, Building Consistency: Lessons in Enhancing Resource Availability for Community Science: Conference for Advancing Participatory Sciences, June 4.

Bose, P., and Mace, R.E., 2024, A new water budget for Texas: 2024 AAG Annual Meeting, Honolulu, Hawaii, American Association of Geographers.

Adams, A., and Mace, R., 2024, Attitudes and actions on climate change by water resource decision-makers in Texas: 2024 AAG Annual Meeting, Honolulu, Hawaii, American Association of Geographers.

Jackson, D., Mitchell, M., and A. Navarro. (2023). Texas Stream Team Final Report: Contract #582-21-10084. The Meadows Center for Water and the Environment – Texas State University, San Marcos, Texas.

Navarro. 2024. Texas Stream Team. Guadalupe-Blanco River Authority, Clean Rivers Program Basin Highlights Report, Seguin, Texas.

Arismendez, S., Jackson, D., Mitchell, M., and A. Navarro. 2024, Texas Stream Team Final Report: Contract #20-10156. San Marcos, Texas: The Meadows Center for Water and the Environment – Texas State University, June 5.

Arismendez, S., Miranda, A., Navarro, A., Parchman, L., and K. Perry (2024). Clear Creek Watershed Data Report. Texas Stream Team – The Meadows Center for Water and the Environment, San Marcos, Texas.

Jackson, D., Mitchell, M., and A. Navarro. 2023. Texas Stream Team Final Report: Contract #582-21-10084. The Meadows Center for Water and the Environment, Texas State University, San Marcos, Texas. 26 pgs.

Arismendez, S., D. Jackson, M. Mitchell, A. Navarro, and L. Parchman. 2023. Comal River Watershed Data Report. The Meadows Center for Water and the Environment, Texas State University, San Marcos, Texas. 29 pgs.

Arismendez, S., Jackson, D., Mitchell, M., Navarro, A., and L. Parchman.

(2023). Comal River Watershed Data Report. Texas Stream Team – The Meadows Center for Water and the Environment, San Marcos, Texas.

Arismendez, S., Jackson, D., Miranda, M., Navarro, A., and L. Parchman, 2023, Plum Creek Watershed Data Report. Texas Stream Team – The Meadows Center for Water and the Environment, San Marcos, Texas.

Mace, R.E. and Galaviz, N., 2024, Revisiting Gunnar Brune's "Major and Historical Springs of Texas" with an Analysis on the Fractal Character of Springflow. San Marcos, Texas: The Meadows Center for Water and the Environment – Texas State University.

2024, Partnership Report: A Vision for Water Stewardship. The Meadows Center for Water and the Environment, San Marcos, Texas.

Arismendez, S.A., A. Miranda, A. Navarro, L. Parchman, and K. Perry. 2024. Wichita River Watershed Data Report, The Meadows Center for Water and the Environment, Texas State University, San Marcos, Texas. 30 pages.

Mace, R.E., and Zhang, Y., 2024, Coupled correlative allocations for groundwater management in Texas—Overview, examples, and a hypothetical conversion: research report funded by The Jacob & Terese Hershey Foundation, 41 p.

Schwartz, B.F., Mace, R.E., and Sprouse, P., 2023, in Stevens, L.E. (editor), *Springs of the World—Distribution, Ecology, and Conservation Status: Springs Stewardship Institute Monograph 1*, p. 173-174, ISBN: 978-0-578-96333-4. <https://springstewardshipinstitute.org/globalspringsbook>

Arend, W. A., Mangold, R. D., Riggins, C. L., Garoutte, C., Rodriguez, Y., Heard, T. C., Menchaca, N., Williamson, J., McDonald, D., Daugherty, D., McGarrity, M., Conway, K. W., & Perkin, J. S. Sexual dimorphism in an invasive population of suckermouth armored catfish: Implications for management. *North American Journal of Fisheries Management*. <https://doi.org/10.1002/nafm.10951>

Lopez, C.W.; Spears, E.; Hartwick, T.C.; Killough, J.C.; Schuett, M.A. Redefining Absentee: Towards Understanding Place Attachment and Stewardship in Non-Residential Landowners in Texas, USA. *Geographies* 2024, 4, 95-114. <https://doi.org/10.3390/geographies4010007>

Schoeck, C.N., K.T. Sullivan, J. Guajardo, B.M. Littrell, B. Kirby, A.W. Groeger, and T.H. Bonner. 2024, Mussel community and changes in water quality within a southcentral river basin of North America with emphasis on two federally proposed species: American

Malacological Bulletin 40:1-22. <https://doi.org/10.4003/006.040.0103>

Kiser, Alexander H., Cody A. Craig, Timothy H. Bonner, Brad Littrell, Chase H. Smith, Clinton R. Robertson, Hsiao-Hsuan Wang, et al. 2024. Creating a Systematic Prioritization of Stream Reaches for Conservation of Aquatic Species: *Ecosphere* 15(2): e4772. <https://doi.org/10.1002/ecs2.4772>

Deringer, S. A., Martinez, G. P., Dussler, M. R., & Morreale, A., 2024, A pedagogy of place in a contested border region: A qualitative examination of student experiences. *Journal of Experiential Education*, 46(4), 390-411. <https://doi.org/10.1177/10538259231165741>

Irwin, K. A. S. Aspbury, T. H. Bonner, and C. R. Gabor. 2024. Habitat structural complexity predicts cognitive performance and behavior in western mosquitofish. *Biology Letters* 20:20230394. <https://doi.org/10.1098/rsbl.2023.0394>

Chappell, L. E., E. Leal, J. Tivin, and T.H. Bonner. 2024. New Distributional Records for *Etheostoma fonticola* (Fountain Darter) in the San Marcos River, Texas. *Southeastern Naturalist* 23:N6-N12. <https://doi.org/10.1656/058.023.0206>

Presentations

Bixler, P., Guthrie, C., Leurig, S., Mace, R., and Walker, J., 2023, "Key Issues on Texas Water Planning and Conservation": presented at an event hosted by Planet Texas 2050, The University of Texas at Austin; virtual; September 6.

Mace, R.E., 2023, "Time to Grab the Bull by the Horns: Challenges and Opportunities for a Sustainable Lone Star State": presented at Climate Science—The Good, the Bad, and the Ugly hosted by The Meadows Center for Water and the Environment; San Marcos, Texas; September 7. [326]

Dussler, R., 2023, "The Mindful Lens": presented at *The Good, The Bad, The Wicked, Climate Conference* hosted by The Meadows Center for Water and the Environment; San Marcos, Texas; September 7. [326]

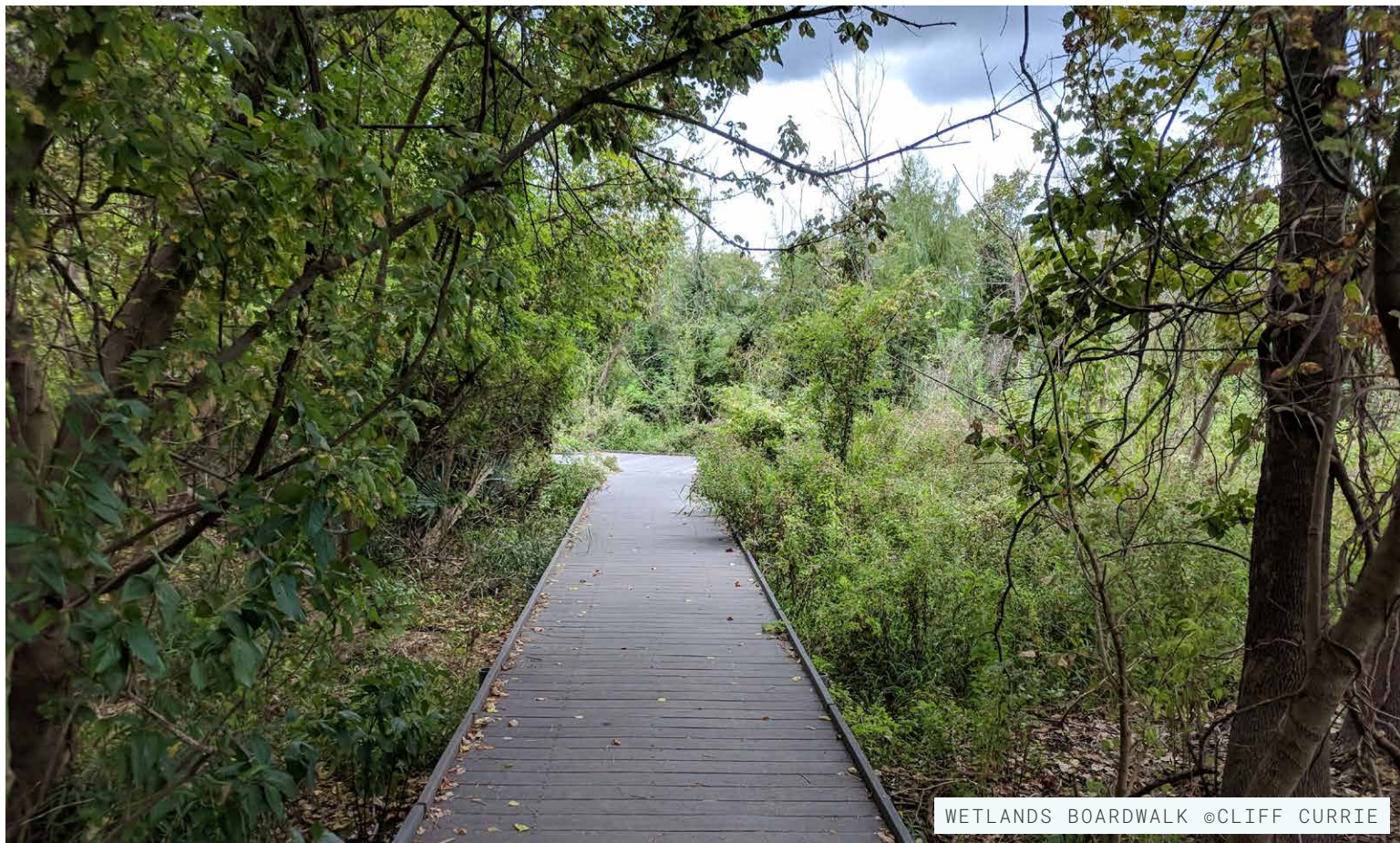
Mace, R.E., 2023, "Water Issues in Hays County": presented at the Dripping Springs Republicans; Dripping Springs, Texas; September 10.

Lopez, C., 2023, "Environmental Values of Blue Spaces": presented at *Parks and Protected Places* (Geography Course); San Marcos, Texas; September 19. [35]

Walker, J., 2023, "Every Drop Counts: One Water Solutions in Texas": presented at *Symposium on Balancing Growth, Preservation, and Conservation in Coastal*

- Watersheds hosted by the Bayou Preservation Association; Houston, Texas; September 21. [200, virtual]
- Mace, R.E., 2023, "(re)Used and (hopefully not) Abused": presented at WaterReuse Association Texas; Irving, Texas; September 21.
- Jackson, D., and Navarro, A., 2023, "Texas Stream Team *E. coli* Bacteria Water Quality Citizen Scientist Training": presented at *E. coli* Bacteria Texas Stream Team training hosted by Texas Stream Team; New Braunfels, Texas; September 23. [8]
- Mace, R.E., and Briones, R., 2023, "The Firm Yield of (and Impacts of Climate Change on) Rainwater Harvesting in Texas": presented at 2023 ARCSA Annual Conference hosted by the American Rainwater Catchment Systems Association; San Antonio, Texas; September 26.
- Arismendez, S., 2023, "Lower Cypress Creek Pilot Project: Assessment of *E. coli* and Optical Brighteners": presented at the 37th Annual SWQM Workshop hosted by the Texas Commission on Environmental Quality; Kerrville, Texas; September 26-28. [100]
- Mace, R.E., 2023, "(re)Used and (hopefully not) Abused" [invited keynote]: presented at the Digital 360 Summit hosted by Texas State University; San Marcos, Texas; September 27.
- Mace, R.E., and Briones, R., 2023, "The Firm Yield of (and Impacts of Climate Change on) Rainwater Harvesting in Texas": presented at the 2023 ARCSA Annual Conference hosted by the American Rainwater Catchment Systems Association; San Antonio, Texas; September 26.
- Arismendez, S., Navarro, A., Parchman, L., and Walker, J., 2023, "Texas Stream Team BlueTriton Updates": presented at a special meeting hosted by The Meadows Center for Water and the Environment; San Marcos, Texas; October 13. [10]
- Walker, J., 2023, "State of Texas Hill Country Water and the One Water Opportunity": presented at the Hill Country One Water Symposium hosted by the Hill Country Alliance; Boerne, Texas; October 26. [100]
- Walker, J., 2023, "State of Texas Hill Country Water and the One Water Opportunity": presented at the Hill Country One Water Symposium hosted by the Hill Country Alliance; Boerne, Texas; October 26. [100]
- Navarro, A., 2023, "Texas Stream Team": presented at the Water Resources Panel hosted by Bobcat Stream Team Texas State University Student Chapter; San Marcos, Texas; November 8. [12]
- Reisberg, B., 2023, "What's the Deal with Texas Water?": presented at the Conference for the Advancement of Science Teaching (CAST); Houston, Texas; November 9. [25]
- Garoutte, C., Mitchell, M., and Navarro, A., 2023, "Invasive Removal and Bobcat Stream Team Project Updates": presented at the monthly meeting hosted by Texas State University's Environmental Service Committee; online presentation; November 9. [8]
- Arismendez, S., and Jackson, D., 2023, "Development of a Gulf Coast Community Scientist Bacteria (*Enterococcus faecalis*) and Optical Brightener Water Quality Monitoring Program": poster presentation at the 37th Biennial Coastal and Estuarine Research Federation (CERF) Conference; Portland, Oregon; November 12-16. [1,800]
- Parchman, L.M., 2023, "Careers in GIS: A Panel": participated at TXST GIS Day hosted by the Society for GIS at Texas State University; San Marcos, Texas; November 16. [25]
- Arismendez, S., and Walker, J., 2023, "Blanco River Clean Rivers Program Water Quality Monitoring Data Summary": remote meeting and presentation with City of Blanco officials; San Marcos, Texas; December 2023. [5]
- Walker, J., 2023, "Hays County Water: Challenges and Solutions": presented at the Hays County Growth Talk hosted by Save Barton Creek Association, San Marcos River Foundation, and Clean Water Action Texas; Driftwood, Texas; December 3. [50]
- Mace, R.E., 2023, "Water in Central Texas": presented at the Central Texas Catalyst Summit; Austin, Texas; December 4. [50]
- Mace, R.E., 2023, "How Bad Has the Current Drought Been? Reports from the Field on Water Resources": presented to the Texas Water Research Network; Austin, Texas; December 8. [50]
- Lopez, C., 2024, "The Clean Coast Texas Program – A Partnership Helping Communities Protect Water Quality": presented at the 6th Annual Texas Regional Stormwater Conference; San Marcos, Texas; January 11. [50]
- Urbanczyk, K., Bennett, J., and Mace, R.E., 2024, "Examining Data Gaps—Setting Research Objectives with Experts": presented at Water in the Desert—A Conference About Water in the Chihuahuan Desert of West Texas hosted by Borderlands Research Institute; Alpine, Texas; January 17. [140]
- Urbanczyk, K., and Mace, R.E., 2024, "A Conversation About Hydrology and Water Systems in the Chihuahuan Desert Region": presented at Water in the Desert—A Conference About Water in the Chihuahuan Desert of West Texas hosted by the Borderlands Research Institute; Alpine, Texas; January 18. [260]
- Lopez, C., 2024, "Uneven Equity and Sustainability in Intentional Communities in the USA: A National-Level Exploratory Analysis": presented at the International Communal Studies Association; virtual; January 19. [50]
- Mace, R.E., and Briones, R.O., 2024, "Reliable Rainwater Is Just a Roof Away": presented at the Meadows Blue Bag hosted by The Meadows Center for Water and the Environment; via Zoom; January 30. [8 + recorded for later viewing]
- Rosser, W. (moderator), Mace, R.E., Puig-Williams, V., and Rubinstein, C., 2024, "Interaction of Water—Ground, Surface, and Environment: Water—A Deep Dive on Texas' Most Precious Natural Resource": hosted by the Texas Lyceum; Texarkana, Texas; February 2.
- Mace, R.E., 2024, "Interlude of a Hydrologist, DJ, and Theremin": presented at Water—A Deep Dive on Texas' Most Precious Natural Resource hosted by the Texas Lyceum; Texarkana, Texas; February 2.
- Arismendez, S., Campos, C., Navarro, A., Parchman, L., and Walker, J., 2024, "2024 Annual Texas Stream Team Trainer Meeting": presented at the Texas Stream Team Annual Statewide Trainer Meeting hosted by Texas Stream Team; San Marcos, Texas; February 8. [30]
- Mace, R.E., 2024, "We Need Real Intelligence as Well as Artificial Intelligence to Solve Our Water Problems": presented at the Society of American Military Engineers Infrastructure Forum; Arlington, Texas; February 9.
- Blake, A.D., Chappell, L.E., and Bonner, T.H., 2024, "Life History of the Harlequin Darter in the Lower Neches River Basin": presented at the Texas State Aquatic Biology Society Seminar (invited oral presentation).
- Zalmit, A., Bonner, T.H., and Martin, N., 2024, "Population Genetic Structure in a Rare Freshwater Mussel, *Pleurobema riddellii*": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (oral presentation). Best PhD Student Speaker Award.
- Chappell, L.E., and Bonner, T.H., 2024, "Hydrology and Geology as Structuring Mechanisms of Semi-Arid Fish Communities": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (oral presentation).
- Leal, E., Tivin, J., and Bonner, T.H., 2024, "Assessing Peripheral Populations of Two Imperiled Aquatic Fauna in the Colorado River Basin of Texas": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (oral presentation).
- Garner, C., Zalmit, A., Adams, C., and Bonner, T.H., 2024, "Reproductive Life History of *Pleurobema riddellii*": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (poster presentation).
- Blake, A.D., Chappell, L.E., and Bonner, T.H., 2024, "Life History of the Harlequin

- Darter in the Lower Neches River Basin": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (oral presentation).
- Schoeck, C., Sullivan, K.T., Littrell, B.M., Guajardo, J., Kirby, B., and Bonner, T.H., 2024, "Mussel Community and Water Quality Within a Southcentral River Basin of North America with Emphasis on Two Federally Proposed Species": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (poster presentation).
- Tivin, J.D., and Bonner, T.H., 2024, "Effects of Extreme Flow Events on Community Composition and Habitat Complexity of Groundwater-Dominated Systems": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (poster presentation).
- Chappell, L.E., Leal, E., Tivin, J.D., and Bonner, T.H., 2024, "Range Extension of Endangered Fountain Darter *Etheostoma fonticola*": presented at the Southern Division of American Fisheries Society; Chattanooga, Tennessee (poster presentation).
- Mace, R.E., 2024, "Water Sustainability in Central Texas": presented to the Buda Sustainability Commission; March 7. [8]
- Mitchell, M., and Navarro, A., 2024, "Bobcat Stream Team Project Updates": presented at the monthly meeting hosted by Texas State University's Environmental Service Committee; online presentation; March 7. [9]
- Thompson, Carrie L., and Walker, Jenna J., 2024, "The Meadows Center and the Texas Hill Country": presented at the Hill Country Leadership Institute hosted by The Hill Country Alliance; San Marcos, Texas; March 21. [25]
- Mace, R.E., 2024, "Revisiting Gunnar Brune's 'Major and Historical Springs of Texas' Implications for Groundwater Resources": presented to The Hill Country Conservation Network; March 28. [50]
- Mace, R.E., 2024, "Revisiting Gunnar Brune's 'Major and Historical Springs of Texas' Implications for Groundwater Resources": presented to the Austin Geological Society; Austin, Texas; April 1. [70]
- Price, B., 2024, "Development of an Integrated Service-Learning Experience and Community Partnership for Elementary Teacher Candidates at Texas State University": presented for the Graduate College; Texas State University; San Marcos, Texas; April 1.
- Mace, R.E., 2024, "Hydrogeology Overview—From the Highest Mountains to the Lowest Flows": presented at Groundwater Symposium: A Deep Dive into Local Aquifers hosted by Texas State Office of Sustainability, Texas State Department of Geography and Environmental Studies, and the Barton Springs Edwards Aquifer Conservation District; San Marcos, Texas; April 2. [150]
- Huff, A., and Wingfield, S., 2024, "An Overview of the NOAA National Water Model & Related Coastal Modeling Activities": facilitated virtually at the TIFF Integrated Flood Modeling Brown Bag Seminar Series for the Texas Integrated Flooding Framework; April 3. [131]
- Mace, R.E., 2024, "In the Future, There Will Only Be OneWater": presented to the Houston OneWater Cohort; City of Houston; Houston, Texas (presented remotely); April 15. [20]
- Jackson, D., and Huff, A., 2024, "TIFF Compound Flood Planning Decision Support Workshop": facilitated virtually for the Texas Integrated Flooding Framework; April 18. [16]
- Adams, A., 2024, "Untapped: Fresh Voices in Water Resources Geography – Hydrosocial Relations": Chair and Primary Organizer at the Annual Meeting of the American Association of Geographers (AAG); Honolulu, Hawaii; April 19. [50]
- Adams, A., 2024, "Untapped: Fresh Voices in Water Resources Geography – Water Governance": Chair and Primary Organizer at the Annual Meeting of the American Association of Geographers (AAG); Honolulu, Hawaii; April 19. [50]
- Adams, A., 2024, "Untapped: Fresh Voices in Water Resources Geography – Planning & Policy": Chair and Primary Organizer at the Annual Meeting of the American Association of Geographers (AAG); Honolulu, Hawaii; April 19. [50]
- Adams, A., 2024, "Untapped: Fresh Voices in Water Resources Geography – Physical Systems": Chair and Primary Organizer at the Annual Meeting of the American Association of Geographers (AAG); Honolulu, Hawaii; April 19. [50]
- Adams, A., 2024, "Untapped: Fresh Voices in Water Resources Geography – Virtual": Chair and Primary Organizer at the Annual Meeting of the American Association of Geographers (AAG); virtual; April 19. [25]
- Mace, R.E., 2024, "Water in the Texas Hill Country—Cool, Clear, (but not necessarily) Calm": presented to the Sustainability Committee of The Texas Water Company; San Antonio, Texas (but remote); April 23. [20]
- Mace, R.E., 2024, "Revisiting Gunnar Brune's 'Major and Historical Springs of Texas' (with a Side of Fractals)": presented at the TWDB Virtual Brown Bag hosted by the Texas Water Development Board; Austin, Texas (presented remotely); April 26. [70]
- Mace, R.E. (moderator), and Tueme, A., 2024, "CEO Keynote—The Flow of Water": panel at Earth X; Dallas, Texas; April 23. [50]
- Mace, R.E., 2024, "Climate Considerations for This Region and Recent Research About Springs in Texas: Hamilton Pool Management Zone Stakeholder Group": hosted by the Travis County Groundwater Conservation District; Dripping Springs, Texas; April 29. [20]
- Mace, R.E., and Lopez, R., 2024, "Pines, Poop, and Pheasants—Thoughts for Strategic Thinking": presented at the U.S. Roundtable for Sustainable Beef, General Assembly Water Presentation; St. Louis, Missouri; May 2. [100]
- Mace, R.E., 2024, "Groundwater in Texas (and the Near Future)": presented to the Alamo Master Naturalists; San Marcos, Texas; May 5. [40]
- Thompson, C., 2024, "Tools for Understanding and Addressing Conflict": presented at Texas Water Leaders hosted by The Texas Water Foundation; Austin, Texas; May 8-9. [35]
- Mace, R.E., 2024, "Groundwater Sustainability—When a Dripping Spring Is Not Enough...": presented at Community Insights: Ideas Worth Sharing; Dripping Springs, Texas; May 9. [40]
- Navarro, A., 2024, "Texas Stream Team Community Science Program": presented at Water Wednesdays hosted by Texas A&M AgriLife Extension Service; online presentation; May 15. [54]
- Mace, R.E., 2024, "Groundwater Management": presented at the Groundwater Management Retreat hosted by the Hill Country Alliance; Rocksprings, Texas; May 16-17. [25]
- Mace, R.E., 2024, "Climate Change and the Hill Country": presented to the Hill Country Leadership Institute hosted by the Hill Country Alliance; Kickapoo Springs Ranch, Rocksprings, Texas; May 17. [25]
- Mace, R.E., 2024, "Water Resources and Rainwater Harvesting": presented to the Hill Country Master Naturalists; May 21. [40]
- Walker, J., 2024, "One Water: A Texas-Sized Opportunity for Sustainable Water Management": presented at the Water Resources Specialty Group Inaugural One Water Webinar Series hosted by the American Association of Geographers; virtual; May 23. [40]
- Barrera, F., Buzzini, W., Giner, M.E., Mace, R.E. (moderator), and Riquelme, R., 2024, "Water Across the Americas—Challenges and Solutions": presented at the All Americas Summit hosted by Sister Cities International; San Antonio, Texas; May 30. [40]
- Li, Boling, 2024, "Modeling Climate Change Impacts on the Effects of Heavy Metal Pollution": presented at the Meadows Center's Quarterly Staff Meeting; San Marcos, Texas; June 3. [40]
- Navarro, A., 2024, "Building Consistency: Lessons in Enhancing Resource Availability for Community Science": presented at the Conference for Advancing Participatory



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Sciences hosted by the Association for Advancing Participatory Sciences; online presentation; June 4. [19]

Vermeersch, N., and Perry, K., 2024, "Texas Stream Team Standard and Probe Core Water Quality Monitoring Training": presented at a training event in Rockport, Texas; June 11. [10]

Vermeersch, N., and Perry, K., 2024, "Texas Stream Team Bacteria Water Quality Monitoring Training": presented at a training event in Rockport, Texas; June 11-12. [10]

Navarro, A., 2024, "Texas Stream Team Community Science Program": presented at the Balcones Canyonlands Texas Master Naturalist Chapter Meeting hosted by the Balcones Canyonlands Texas Master Naturalist Chapter; online presentation; June 11. [40]

Mace, R.E., 2024, "Revisiting Gunnar Brune's 'Major and Historical Springs of Texas'—Are Springs Drying Up?" [keynote]: presented at the American Ground Water Trust; Austin, Texas; June 11-12. [50]

Mace, R.E., 2024, "There's Only One Water": presented to the Association of Water Board Directors; Fort Worth, Texas; June 14. [1,200]

Jackson, D., Huff, A., and Thompson, C., 2024, "Leading Texas: Water Stewardship in the Lone Star State | The Meadows Center for Water and the Environment": presented at the University Network for Collaborative Governance Annual Conference hosted

by Portland State University; Portland, Oregon; June 20. [45]

Mace, R.E., 2024, "Reliable Rainwater Is Just a Roof Away!": presented to Friends of the Little Blanco; Blanco, Texas; June 22. [25]

Jackson, D., and Huff, A., 2024, "Texas Integrated Flooding Framework Best Practices in Identifying Stakeholder Needs Around Flooding Workshop": facilitated virtually for the Texas Integrated Flooding Framework; June 28. [98]

Thompson, C., Huff, A., Jackson, D., and Wingfield, S., 2024, "State of the Devils River Symposium: Part 1 (Webinar)": facilitated virtually for the Devils River Watershed Project; July 3. [40]

Mace, R.E., 2024, TBA [Innovative Water]: presented at the Private Lands Summit hosted by the Texas Wildlife Association; San Antonio, Texas; July 11. [170]

Parchman, Laura M., 2024, "Texas Stream Team: Transforming Data Access and Engagement with Esri": presented at the 2024 Esri User Conference hosted by Esri; San Diego, California; July 16. [16]

Lopez, C., 2024, "How Can Water Resiliency Along the Texas Coast Be Improved? Barriers to Green Infrastructure and One Water Initiatives": presented at the Texas Water Action Collaborative's Bi-Monthly Stakeholder Meeting; virtual; July 16. [95]

Thompson, C., Huff, A., Jackson, D., and Wingfield, S., 2024, "State of the Devils River Symposium: Part 2 (Del Rio)": facilitated in-person for the Devils River

Watershed Project; Del Rio, Texas; July 25. [40]

Mace, R.E., 2024, "Groundwater": presented at the Environmental Super Conference; Austin, Texas; August 1-2.

Mace, R.E., and Potts, R., 2024, "[TBD: Water Conservation Policy on Soil Impacts and Agriculture]": via Ken Mix; San Marcos, Texas; August 5-6.

Thompson, C., and Jackson, D., 2024, "Texas Integrated Flooding Framework (TIFF) Model Coupling Workflow Workshop": facilitated in-person for the Texas Integrated Flooding Framework; Austin, Texas; August 6. [35]

Mace, R.E., 2024, "Groundwater Sustainability": presented at the Agriculture Water Sustainability Summit; Lubbock, Texas; August 7-9.

Thompson, C., Huff, A., and Jackson, D., 2024, "Texas Integrated Flooding Framework (TIFF) Year Two Report Findings - Technical Advisory Teams Webinar": facilitated virtually for the Texas Integrated Flooding Framework; August 8. [50]

Berglund, A., Jackson, D., and Navarro, A., 2024, "Texas Stream Team Bacteria Water Quality Community Scientist Training": presented at the Bacteria Texas Stream Team training hosted by Texas Stream Team; San Marcos, Texas; August 9. [5]

Mace, R.E., 2024, "Rainwater Harvesting": presented to the Texas Parks and Wildlife Department; virtual; August 14.

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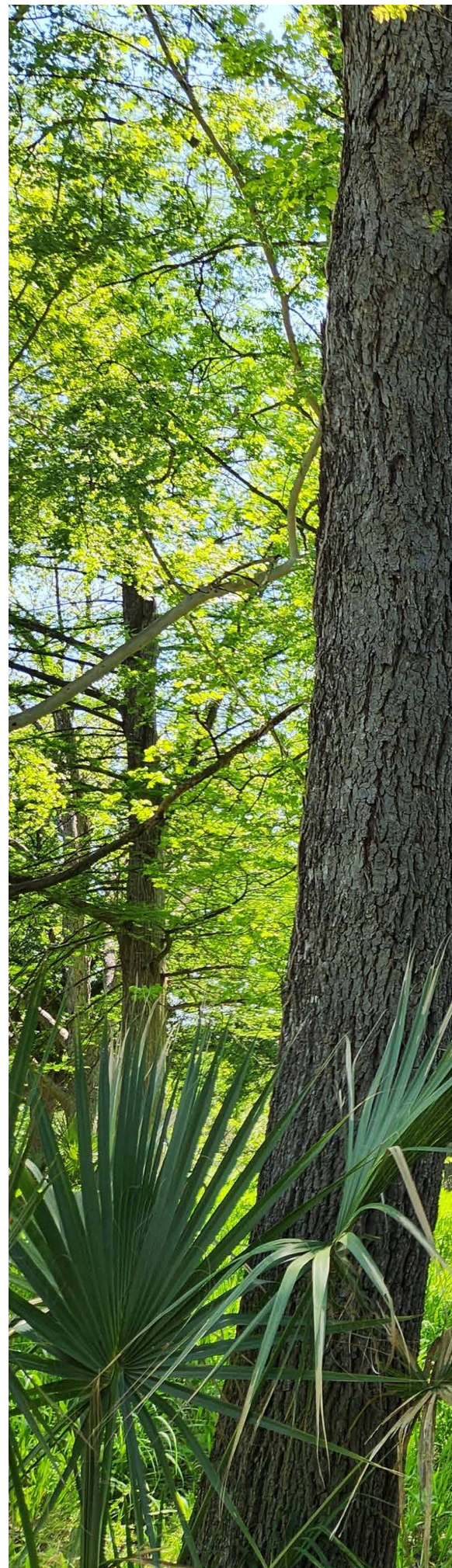
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KIMBERLY MEITZEN

Texas State Associate Geography Professor & Meadows Water Wizard





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