Getting Back into the Flow

FISCAL YEAR 2021 ANNUAL REPORT

The Meadows Center
for Water and the Environment
Texas State University

MEMBER **THE TEXAS STATE UNIVERSITY SYSTEM**

WHY I GIVE

The Texas Hill Country Conservation Network was founded on the principles of collective impact and collaboration, and it's critical to our collective success that each of our partners has what they need to carry on their important conservation work. The pandemic caused a great deal of financial uncertainty for all of us, and thanks to the generosity of the Water Funder Initiative, the Network was in a position to support partners in maintaining their capacity during a trying time. The work of the Meadows Center is so important to the region, and we are proud to have them as a leader in the Network and to know their work carries on uninterrupted!

John Rooney,
Texas Hill Country Conservation Network Manager

FOREWORD

This past year was like no other for the Meadows Center family. It challenged us, made us adapt to new realities, and inspired us to think outside of the box. But most importantly, it made us proud of what our staff, faculty, and students can achieve together - even under great uncertainty.

With the theme "Getting Back into the Flow," this year's annual report chronicles how we overcame the enormous challenges of COVID-19 and advanced our mission of inspiring research, innovation, and leadership that ensures clean water for the environment and all humanity. We not only continued to run on all cylinders, but made important progress on core issues – and, exceeded our expectations.

Despite incurring historic deficits following park closures, we continued to provide outdoor learning experiences to children and visitors of all ages. After partially re-opening our education and dive operations to the public in September 2020, our staff navigated uncharted waters and adjusted in-person programming with grace and dedication. Even with our education programs running at 50 percent capacity for most of the year, we managed to engage over 46,000 visitors in environmental education at our site.

We undertook new initiatives to address the challenges of operating a historic site and made progress on efforts to provide a welcoming and engaging environment at Spring Lake for all. Inclusion and equity have always been important to the Meadows Center; now, with the Spring Lake Access For All initiative, we are making sure they are fully integrated into our facilities and education programming.

We also kept our attention on important science and policy developments where our contributions could make an impact. For example, the Texas Legislature's passage of Senate Bill 905, which will develop a regulatory guidance manual explaining the rules for direct potable reuse, happened in large part as a result of a study we conducted that examined regulatory hurdles for implementing One Water in Texas. The bill will create a clear path for water providers across the state to adopt this important management strategy.

We are grateful to all our partners, and especially the donors who continue to generously support the Meadows Center, on this journey. Together, we will continue to push toward the goal of a better and brighter water future for Texas and beyond.

A MESSAGE FROM THE EXECUTIVE DIRECTOR

As I gaze out my office window, San Marcos Springs bubbles up from the depths of the Edwards Aquifer, birthing a river and then—sometimes slowly, sometimes quickly—moving downstream, merging with the Blanco River, ultimately easing into an estuary and bay at the Gulf Coast. The springs have been reliable, year in and year out, even during the worst of droughts, and have been a source of water to people and the environment for more than 8,000 years.

Although COVID-19 shut down our in-person education activities for most of the past year, we were able to keep our team—traditionally reliant on ticket and service sales—together thanks to the generosity and support of the Meadows Foundation, the Cynthia and George Mitchell Foundation, the Jacob & Terese Hershey Foundation, H-E-B, and the Shield-Ayres Foundation, as well as the support of our team and the University. Not only will the springs continue to flow, but so will our education and research programs at this historic and special place. COVID-19 is still with us, but thankfully (and hopefully...), the worst is behind us. Although our education programs have struggled due to the plague, we have used this time well to develop long-term strategies, advance site accessibility, and elevate our research.

At the same time, our other research programs are experiencing a time of expansion and growth, as the realities of climate change that impacted our lives in 2021 wake a new sense of urgency in water resource planning. Our watershed team has extended in expertise and geographic scope with headwaters-to-tidewaters applied research across the Hill Country and the state and extending the footprint of One Water planning and implementation principles. Our field crew has actively expanded their reach and expertise - as have many across the Center. We published reports on Comanche Springs, Cypress Creek, Texas Beach Watch, Pecos River, water conservation in Houston, and Texas Stream Team and published academic papers on everything from One Water to the role of mindfulness in nature experiences.

And we have several exciting initiatives to look forward to in the new fiscal year. Due to a starting gift from the Meadows Foundation, we are embarking on an ambitious, multi-year effort to get Texas ready for climate change's effects on water resources through education, applied science, and policy analysis. We will be publishing reports on groundwater sustainability, environmental flows, and water conservation, among other topics. We will be begin fundraising to update Spring Lake Hall to be an interpretive research laboratory that uses technology to excite young Texans about water and the environment. And we will be celebrating our 20th anniversary as a research institute and 10th anniversary as the Meadows Center.

Like the springs at our site, we continue to flow forward, and we are ever grateful for your support.

Your friend in water and the environment,

Dr. Robert E. Mace

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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.

The Meadows Center fulfills its 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

LEADERSHIP
Transforming Knowledge Into Action

EDUCATION
Encouraging Life-long Learning

STEWARDSHIP
Cultivating a Stewardship Ethic

BY THE NUMBERS

23
research grants awarded to Meadows Center faculty and staff

214
new volunteer divers trained to help preserve Spring Lake

$2,723,854
research dollars awarded to our faculty and staff

364
citizen scientists trained in water quality monitoring for Texas Stream Team

$806,098
raised in donations to support our mission

20,519
volunteer hours dedicated to conservation

7,004
school children and university students engaged in virtual and outdoor learning

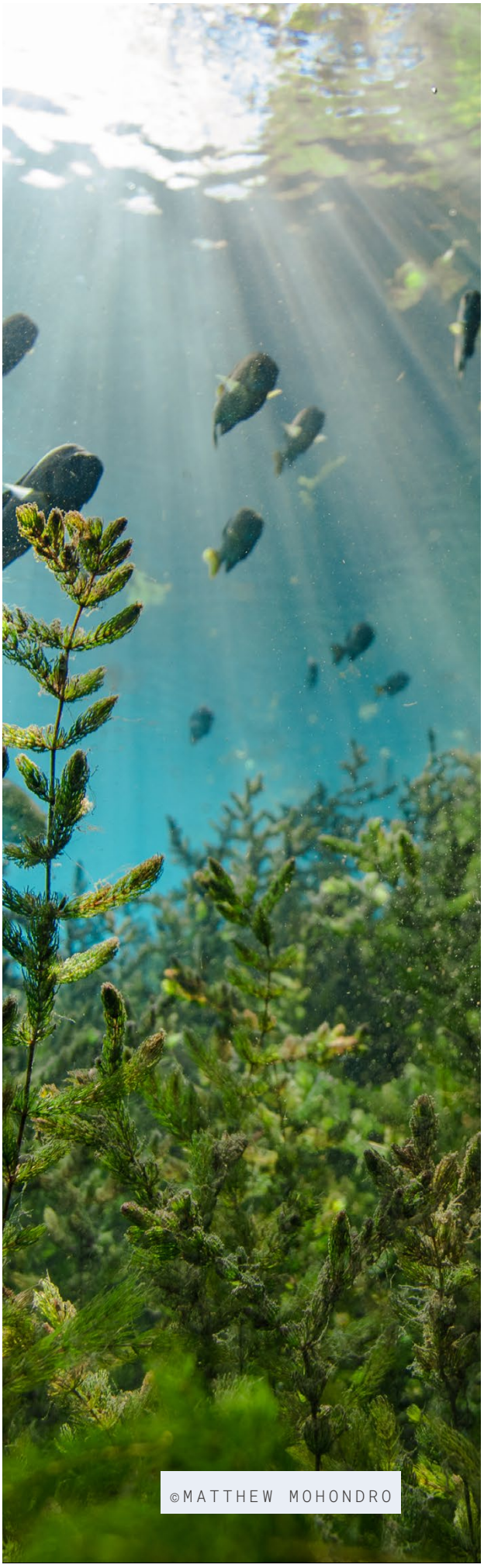
3,766
people reached through speaking engagements in Texas and beyond

46,384
visitors to Spring Lake

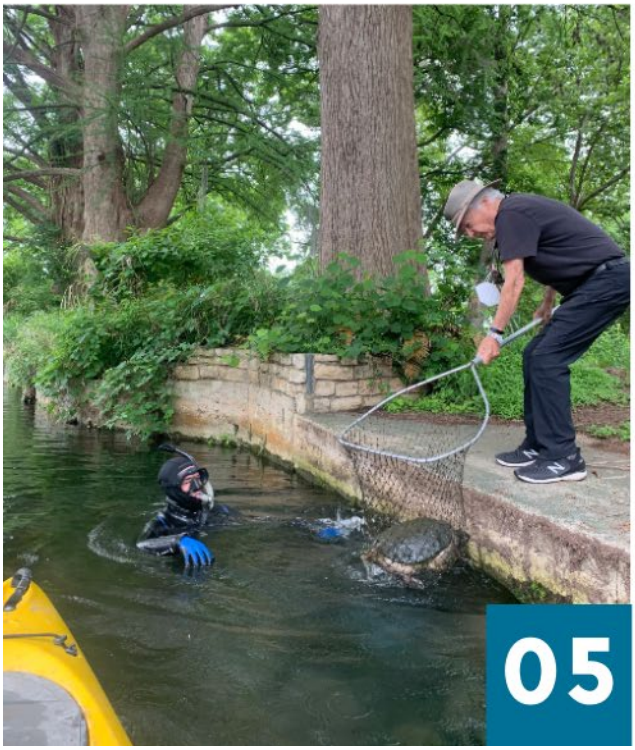
131
students supported by research and education projects

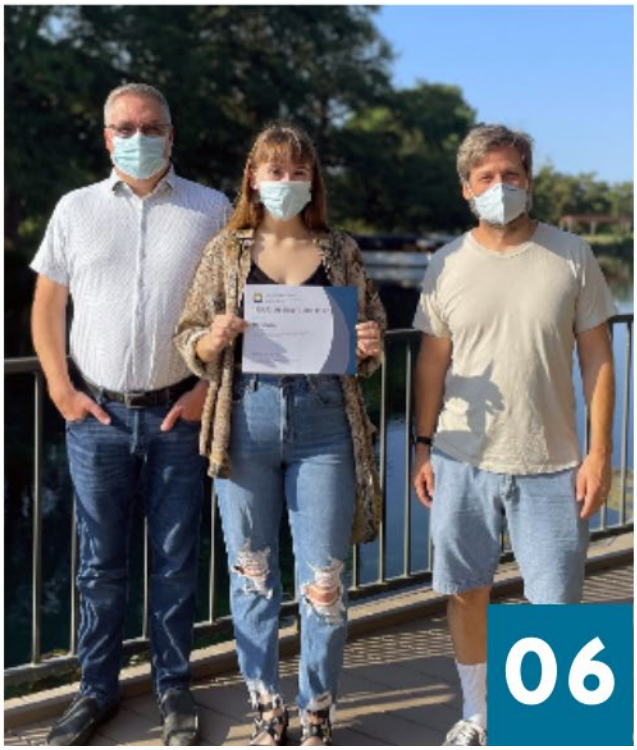
9,340
native species planted in Spring Lake and the Upper San Marcos River

45,899
square meters of non-native species removed from Spring Lake and the Upper San Marcos River



OUR YEAR IN PHOTOS





(01) Texas State University students attend Ring Celebration at Spring Lake.

(02) Maria and Mario Garza of the Indigenous Cultures Institute practice a traditional Coahuiltecan ceremonial song at the San Marcos Springs.

(03) Meadows Center Habitat Field Crew volunteer to remove golf balls from Spring Lake.

(04) Meadows Center staff attend Book Club on the Blanco River.

(05) Meadows Center staff help retired Texas State Biology Professor, Dr. Francis Rose, capture turtles for his 20-year research study of turtle populations at Spring Lake.

(06) Haley Tacker, Texas State graduate student, honored as the 2021 recipient of the Don & Reba Blaschke Scholarship for the Protection of the San Marcos River.

(07) Meadows Center Environmental Interpreters celebrate National Travel and Tourism Week on May 5, 2021 with #smtx shirts provided by the San Marcos Convention and Visitors Bureau.

(08) Meadows Center Education Manager, Meagan Lobban, filming a segment for our Online Learning Hub to teach students about watersheds.

CHANGING THE SCIENCE FOR A CHANGING CLIMATE

> Climate change is touching everything associated with water, whether it's water supplies, environmental flows, spring flows—we're seeing those impacts and expecting more change in the future.
>
> **Dr. Robert E. Mace,**
> Executive Director

On an ordinary February morning, many Texans woke up to an unusual scene outside their doors – snow! And, not the "Texas snow" that lasts a meager two seconds before dissolving back into the Earth – it was REAL snow.

The beautiful, yet terrible, "snowpocalypse" left a staggering 4.5 million Texas residents without water and power. And, in many cases, left them with busted pipes and flooded interiors when the thaw finally came. The 2021 winter storm is a glimpse into a future that will be defined by the impacts of climate change.

Texas has not sought to understand what climate change will mean for water in our state, which in turn will affect our environment, economy, and public health. State-mandated water and flood planning do not consider climate change, decreasing our resiliency to climate shocks, increasing costs to respond, and affecting all Texans - especially the disadvantaged.

However, the politics of climate change are changing as temperatures warm, as drought and floods become more common and intense, and

SNOW AT SPRING LAKE FROM FEBRUARY'S WINTER STORM.

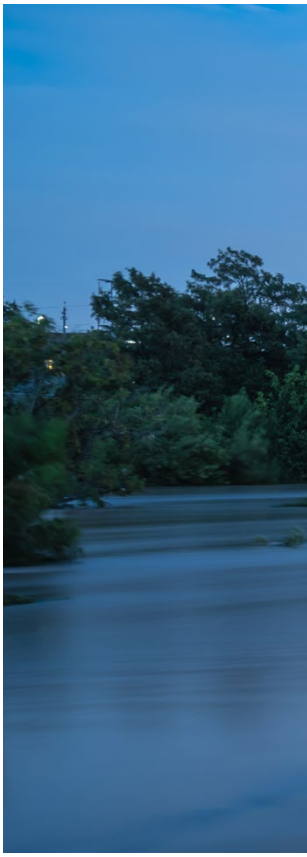
as more Texans experience the changes for themselves. We aim to provide statewide leadership as well as a structure to conduct the science, education, outreach, and policy analysis to put Texas in the best possible situation to be ready for a changing future.

Thanks to generous support from the Meadows Foundation, the Meadows Center is developing a large-scale climate program that can supply decision-makers with crucial climate change information so they can make scientifically informed decisions about how climate change is affecting their water resources, and what their options are for building resiliency against those effects.

Our solution is multi-pronged: changing science, changing education, changing conversations, and changing outcomes. Changing science means developing the first state-specific downscaled (from global to local) climate projections, developing actionable information on what climate change means for water resources, and making that information publicly available. Changing education involves developing climate education tools for all Texans. Changing conversations involves developing multi-platform content to share the science with the public. Changing outcomes involves identifying how to incorporate climate change into water decisions and engaging policymakers across the state in hands-on discussions.

Other plans in the works include developing a TEKS-aligned (Texas Essential Knowledge and Skills) curricula to educate students about climate change, which is desperately needed in a state that received an "F" grade for its teaching of climate change in public schools, and the addition of a climate expert to build the Meadows Center's capacity to conduct policy analysis to support the state in planning for future flooding events and making informed water management decisions.

MASTERING THE ART OF COMMUNICATING THE SCIENCE



We believe the ability to communicate science effectively across disciplines and audiences is critical to fostering collaboration, innovation, and understanding. We also believe the ability to organize scientists and experts from across disciplines to achieve a shared goal is critical to driving collective action and large-scale change.

Many partners seek the Meadows Center's expertise to bring people together around common water challenges and to build the public's understanding and appreciation for the value of our water resources. To that end, we share snapshots of five projects that highlight our role as communicators to ensure a flowing future for Texas' water resources.

STAKEHOLDER FACILITATION

Water challenges are often complex and multi-faceted. However, effective facilitation and stakeholder engagement can turn these challenges into opportunities for meaningful, innovative solutions. We are leaders in facilitating diverse perspectives to help our partners efficiently and collaboratively reach decisions, together.

Texas Integrated Flooding Framework

As the most expensive and most common natural disaster in the United States, flooding is a risk factor that state and local governments cannot ignore. Hurricane Harvey (2017) dropped nearly 33 trillion gallons of rain on Texas and Louisiana over six days and was noted as the second-most costly hurricane to hit the U.S. mainland since 1900 by the National Oceanic and Atmospheric Administration.

Flooding from extreme storm events, like Harvey, uncover the glaring need for state and regional flood planners to have more accurate understanding of coastal flood risks and reliable tools to prepare for and respond to the state's floods.

The Meadows Center is embarking on a four-year project with the Texas Water Development Board to facilitate the Texas Integrated Flooding Framework Planning Project, which is aimed at developing a comprehensive flood risk reduction planning project that will improve flood monitoring and planning for counties affected by Hurricane Harvey.

The project will engage governmental agencies, academia, and regional stakeholders to participate in expert technical advisory teams and build out the four components of the framework, which include (1) data and monitoring gap analysis, (2) data management and visualization, (3) integrated flood modeling framework and (4) planning and outreach.

Led by our Director of Operations, Carrie Thompson, the Meadows Center will serve as the lead facilitator of the project to support tasks such as eliciting expert opinion, creating action plans and crafting materials that effectively communicate the path forward to guide the project. In this role, we will guide the steering committee and the four advisory teams in completing the framework on task, on time, and on budget

REFLECTION OF HOUSTON SKYSCRAPERS ON FLOODWATERS FROM BAYOU RIVER TO ELEANOR PARK AFTER HARVEY TROPICAL STORM. © TRONG NGUYEN

Water Grand Challenges

Launched in 2012, the Water Grand Challenges Initiative brings together an influential and diverse group of stakeholders to grapple with urgent issues outside the normal envelope of water policy makers. With support from the Cynthia & George Mitchell Foundation, the Meadows Foundation, and BlueTriton Brands, the Meadows Center continued its Water Grand Challenges Initiative this year to further refine action plans and priorities culminating from the initiative's nine years of work.

Over the past three years, this impressive group of policy makers, non-profit executives, thought leaders, and water advocates have developed theories of change to solve the six most challenging water issues facing Texas. We reconvened the Working Group this year to determine how climate change and racial equity will influence our approach to these challenges.

While the funding for this effort is now being directed to some of the priorities identified in this process, the Water Grand Challenges Initiative has fostered lasting relationships and a shared commitment to the identified priorities.

The theories of change will be synthesized into a final report to help water leaders across sectors identify, coordinate, and divide work across organizations.

THE 6 WATER GRAND CHALLENGES

01 Providing adequate and **sustainable water supplies** for all Texans, allowing a thriving future for the state

02 Ensuring scientifically-sound **environmental flows** are equally prioritized within an enforceable regulatory framework

03 Sustainably **managing our surface water and groundwater resources** to meet current and future needs while avoiding unacceptable impacts

04 **Investing** in water resources to efficiently meet human and environmental needs

05 Cultivating **awareness and stewardship** of our vulnerable water resources

06 Ensuring all Texas waters are **clean, healthy, and life-sustaining**

SHARING OUR KNOWLEDGE WITH THE MASSES

Communication shapes how we see and value the world. And, how well we communicate about water issues will affect how *well* we address the challenge. We place great importance on communicating complex water issues to non-scientists to achieve a world where all people understand and embrace the value of water.

Texas+Water

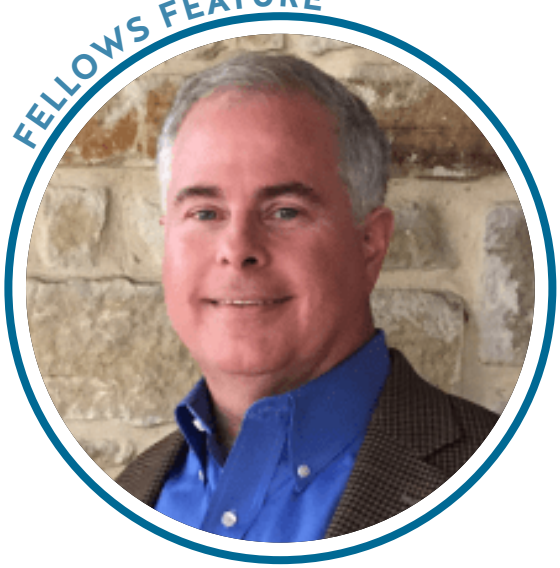
Although water touches people's lives every day, it often does not get the attention it deserves. To improve this reality, the Meadows Center partnered with the Texas Water Journal and the Texas Water Resources Institute in 2018 to launch Texas+Water, a monthly publication that provides timely information on the spectrum of Texas water issues including science, policy, and law.

Reaching over 7,000 subscribers from across the country, Texas+Water is one of the only news publications in state to focus on a single topic (water!) and bring to it unparalleled expertise.

Each issue offers a blend of curated stories and original articles written by the editorial team that explore the science, policy, and debates centered around water

Our editorial team, a mix of communicators and water experts, aims to build awareness around the water challenges Texas is facing by providing news and analysis in an easily accessible platform. This collaborative spirit allows Texas+Water to provide a non-partisan space for Texans to connect and contribute to our shared water future.

FELLOWS FEATURE



Texas+Water's most unique element is the way we have created new features. Some like think+water and opinions+water have been very popular. Others like poetry+water, not so much, but it has been fun experimenting and finding out what subscribers like and don't like as much. Another unique factor is the nimbleness and informality of our partnership. Large organizations that require multiple approvals and constant communication just to keep everyone on the same page, are necessary when you are building a rocket, but it is a disadvantage with what we are doing and makes it less fun.

Dr. Todd Votteler,
Meadows Center Fellow & Texas+Water Editor-in-Chief

Fahrenheit 140º

Climate change has historically been under-covered by Texas' mainstream media. It can also be extremely difficult to talk about. The Meadows Center is breaking the silence on this Texas taboo with the launch of the Fahrenheit 140º podcast.

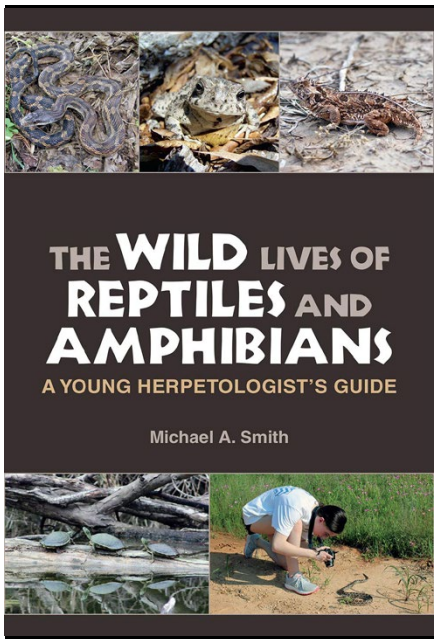
Fahrenheit 140º is the temperature that water scalds skin after six seconds, is a climate rant with a Texas slant. Each month, water pros Dr. Robert E. Mace and Carrie Thompson dive into stories and perspectives at the intersection of climate change and water. This podcast is produced by the Meadows Center and is sponsored by the Meadows Foundation.

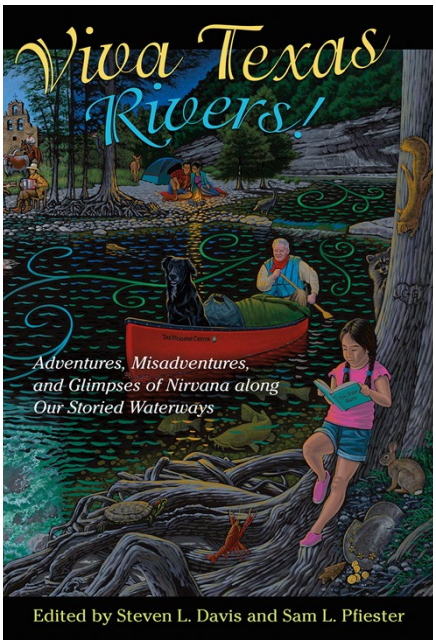
The Meadows Center Book Series, a partnership with Texas A&M University Press

Books are another important avenue that we use to encourage life-long learning about the environment—and people's relationship to the environment. The Meadows Center sponsors two book series focused on conservation leadership and river stewardship that serve as trusted sources of information on water and environmental topics. Each book includes a foreword written by our Founder, Andrew Sansom, and is published by Texas A&M University Press.

The Wild Lives of Reptiles and Amphibians is the newest addition to our Kathie and Ed Cox Jr. Conservation Leadership Book Series, which introduces readers to the exciting native species they can observe on a family nature trip or a walk through the local park. Author Michael A. Smith, cofounder of the Dallas–Fort Worth Herpetological Society, takes readers through creeks, rivers, and bottomland forests and across woods, deserts, and plains, profiling the herps to be found along the way with vivid photographs and helpful descriptions.

Although not part of our official series, we were proud to partner with The Wittliff Collection at Texas State University to publish *Viva Texas Rivers!* Many of Texas' leading writers have had their hearts captured by a river, and they have created sparkling accounts of the waterways they love. Now, editors Steven L. Davis and Sam L. Pfiester have assembled the best of those works (many sourced from previously-published Meadows Center books) into a revelatory collection of diverse literary voices. *Viva Texas Rivers!* brings you as close to the living nirvana of a Texas River as you can get without launching yourself into a canoe. It also features award-winning art from Clemente Guzman featuring our founder and series editor, Andrew Sansom!





TURNING RESEARCH INTO POLICY ACTION FOR ONE WATER IN TEXAS

Although researchers are often motivated by a sense of curiosity, we see science as a way of making the world a better place. For us, one of the biggest marks of success happens when our research is used to transform policies and practices to tackle natural resource issues.

The passage of Senate Bill 905 in the 87th session of the Texas Legislature is one example of this feat. The bill directs the Texas Commission on Environmental Quality to create regulatory guidance manual that explain state rules that apply to direct potable reuse to help entities understand the process for implementing a water reuse project.

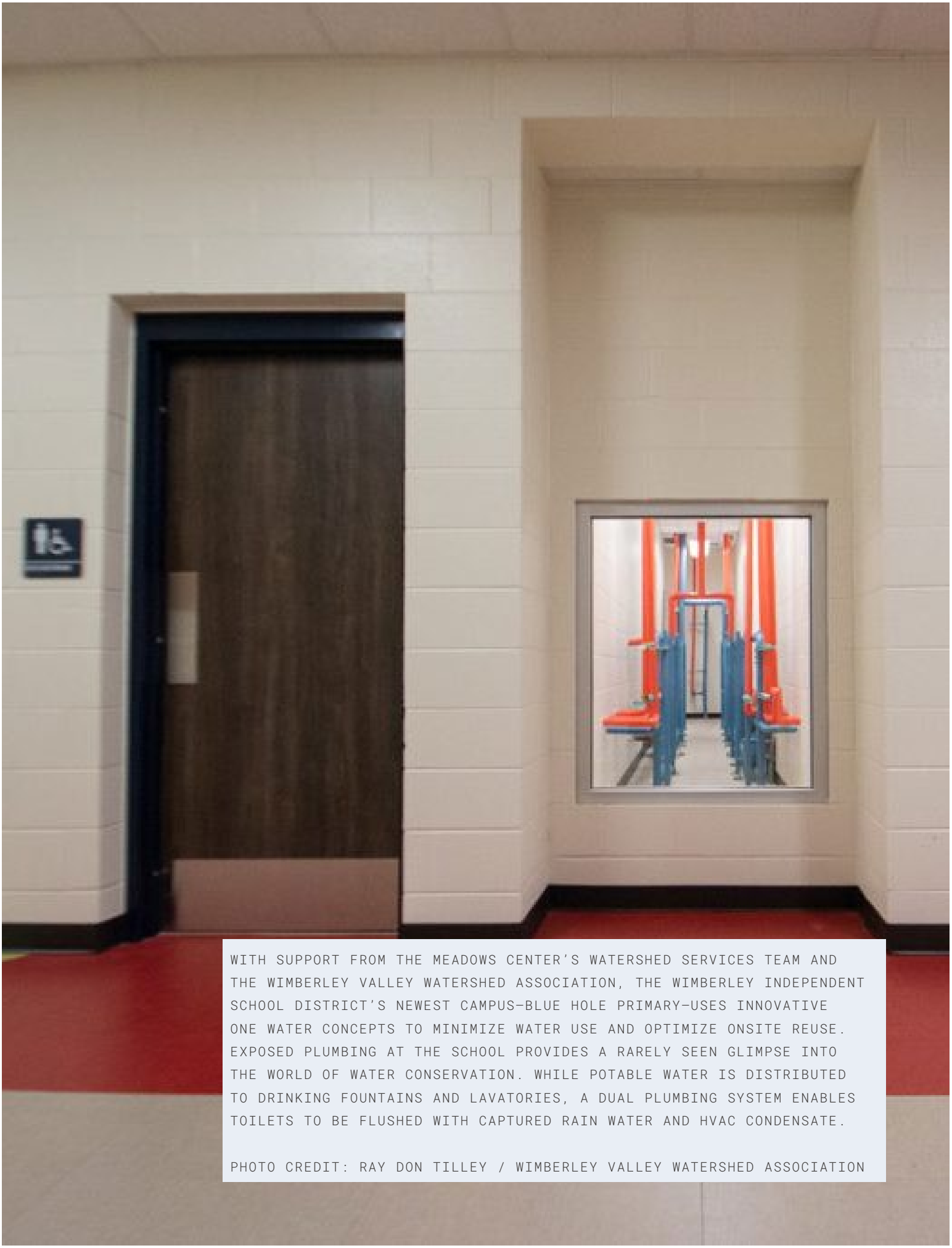
A report authored by Meadows Fellow, Vanessa Puig-Williams, and our Executive Director, Dr. Robert E. Mace, helped make the case for the bill's creation. The report, *Regulatory Impediments to Implementing One Water in Texas*, examined the laws and regulations in Texas that govern water use to identify regulatory roadblocks that impede Texas's ability to implement One Water projects.

One Water is an intentionally integrated approach to water that promotes the management of all water—drinking water, wastewater, stormwater, greywater—as a single resource. This integrated water management approach can help communities achieve long-term resiliency and reliability, for the benefit of both the environment and the economy.

The report identified that Texas's flexible regulatory framework and lack of regulatory direction and guidance related to onsite non-potable reuse was a hindrance to One Water projects in Texas.

The passage of Senate Bill 905 is an important step forward in expanding and refining Texas' regulatory framework to accommodate decentralized water management strategies and, in turn, ensure a resilient and sustainable water supply.

> The Meadows Center is such a high caliber research and policy institute— I knew that partnering with the center would draw attention to this important issue. The passage of Senate Bill 905 is indicative that Texas is thinking in a more innovative and holistic way about water. Up until now, there has not been a clear regulatory path to permit direct potable reuse facilities in Texas. The guidance created as a result of this bill will help applicants seeking a direct potable reuse permit understand the permitting pathway, which will hopefully result in more facilities receiving direct potable reuse permits.
>
> **Vanessa Puig-Williams**, Meadows Center Fellow



WITH SUPPORT FROM THE MEADOWS CENTER'S WATERSHED SERVICES TEAM AND THE WIMBERLEY VALLEY WATERSHED ASSOCIATION, THE WIMBERLEY INDEPENDENT SCHOOL DISTRICT'S NEWEST CAMPUS—BLUE HOLE PRIMARY—USES INNOVATIVE ONE WATER CONCEPTS TO MINIMIZE WATER USE AND OPTIMIZE ONSITE REUSE. EXPOSED PLUMBING AT THE SCHOOL PROVIDES A RARELY SEEN GLIMPSE INTO THE WORLD OF WATER CONSERVATION. WHILE POTABLE WATER IS DISTRIBUTED TO DRINKING FOUNTAINS AND LAVATORIES, A DUAL PLUMBING SYSTEM ENABLES TOILETS TO BE FLUSHED WITH CAPTURED RAIN WATER AND HVAC CONDENSATE.

PHOTO CREDIT: RAY DON TILLEY / WIMBERLEY VALLEY WATERSHED ASSOCIATION

DESIGNING NO DISCHARGE SOLUTIONS FOR THE CITY OF BLANCO

> The [Blanco] river doesn't know where the county line is. It goes through Hays County and is important to the Wimberley Valley—all of the county—on to San Marcos, and anything that might damage it is worth our attention. It's connected to our groundwater, and we want to make sure that we have the cleanest groundwater that we can.".

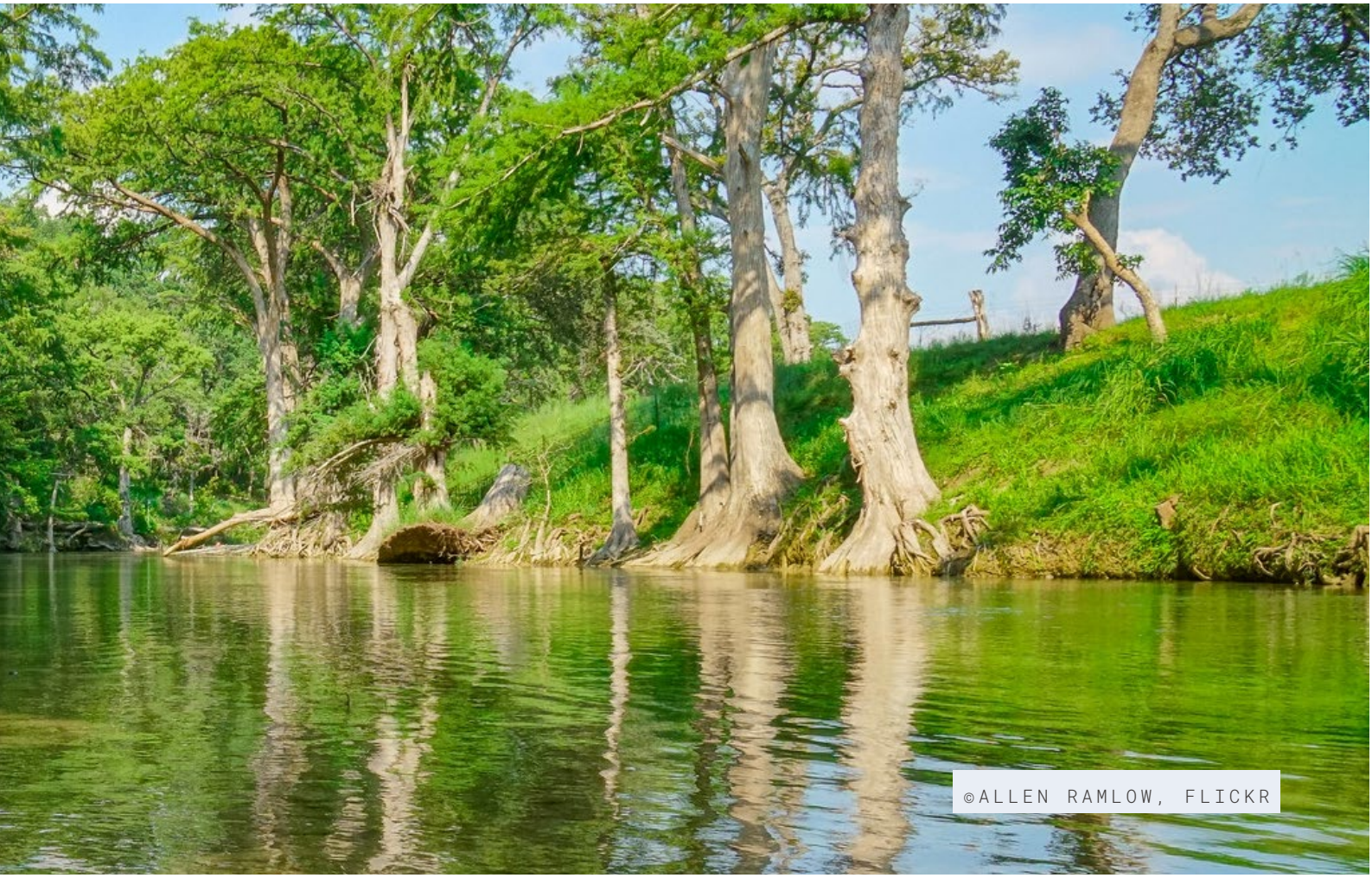
Lon Shell,
Hays County Commissioner - Precinct 3

Following the construction of a new wastewater treatment facility for the City of Blanco, in October 2018, the community began allowing treated effluent to flow directly into the Blanco River. By the spring of 2019, the Blanco River had become thick with algae immediately downstream of the wastewater discharge point.

The Blanco Water Reclamation Task Force (task force) was formed in September 2020 when the Blanco City Council, with a unanimous vote, committed to a partnership with local nonprofit, Protect Our Blanco, that would seek to identify and investigate alternatives to direct discharge that will allow the City of Blanco to grow while protecting water quality, water supplies, and habitat. Led by our Director of Watershed Services, Nick Dornak, the task force includes city council representatives, city staff, business representatives, and technical experts.

This year, the task force partnered with the engineering firm, AquaStrategies, to evaluate cost-effective near-term wastewater management recommendations as well as long-term One Water solutions for the City of Blanco that enables continued growth and development while protecting the health of the Blanco River and regional groundwater resources.

The task force presented the findings, published in the *Texas Pollutant*



Discharge Elimination System Refinement Study Report, to the Blanco City Council in July 2021 with the Council approving the following recommendations:

1. Doubling the capacity of the onsite storage ponds

2. Executing agreements with nearby land owners interested in using reclaimed water for irrigation, and building infrastructure to convey the water to the point of use

3. Continuing to support the task force with representation from the City of Blanco and invest in Phase 2: A One Water Pathway for the City of Blanco

The task force recommendation to withdraw Blanco's Texas Pollutant Discharge Elimination System Permit and submit a phased Texas Land Application Permit was tabled at the July meeting, and an additional study was commissioned with Aqua Strategies to compare the City's anticipated costs and administrative requirements for the two permitting options. (This study was still under review at the time of publication.)

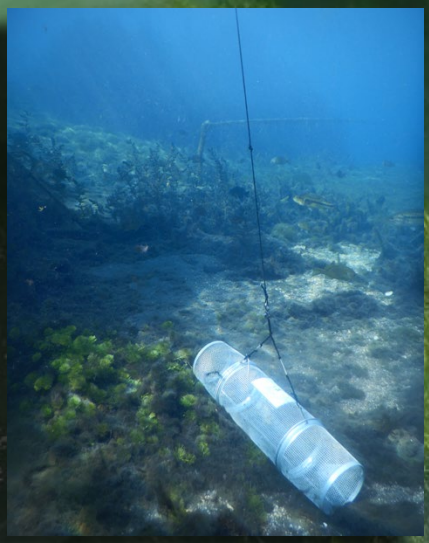
The Blanco City Council's adoption of a Municipal Utility District (MUD) Policy in July 2021, which sets expectations for negotiations with developers on details about what gets built in a MUD, marked another important win for the Blanco River that will ensure infrastructure standards for new developments that promote water quality.

The policy formalizes the City of Blanco's ability under Texas Water Code to require conditions on water, wastewater, road infrastructure, and financing, in exchange for the City's consent to the MUD. Provisions outlined in the policy preserve the quantity and quality of groundwater and streamflow in the Blanco River through set environmental goals for development that protect critical natural features and provide open spaces for aquifer recharge, buffer zones for creeks and rivers, and parks and trails.

OCEAN-DWELLERS IN OUR BACKYARD: STUDYING MOVEMENT BEHAVIOR OF THE AMERICAN EEL

There is something slimy in San Marcos' water systems. Hidden beneath the surface, slithering under the sediment, is the elusive American eel.

These relatively unknown inhabitants are one of the few aquatic species described as catadromous – meaning that they migrate from freshwater to the ocean to spawn. They are also facultative, which means they can live in a variety of environments such as freshwater rivers and lakes, or salty oceans.



THE TEAM WILL USE TWO STYLES OF MESH TRAPS TO CAPTURE THE AMERICAN EELS.

The species is a bit of a mystery among the researchers that study the creature's movement and patterns. Studies have been conducted on the movement of American eel populations within large rivers and estuaries where freshwater meets the sea, however, less is known about the eel's ecology at edges of their habitats in freshwater ecosystems, like spring sources.

American eels are an important component of the ecosystem, but have been one the decline over the past 30 years due to man-made impoundments, such as dams, and the introduction of invasive species. Understanding the movement behavior and trends of the American eel at the extremities of their distribution is essential for proper management and conservation of this ecologically significant species.

Meadows Center staff have collected several American eels by hand over the last five years, which means Spring Lake could represent a critical sanctuary for American eel during their freshwater life phase. But like many of its counterparts, little is known about the population that inhibit Spring Lake and the Upper San Marcos River.

The success in capturing American eels at Spring Lake presented a unique opportunity for our Habitat Field Crew and Dr. Josh Perkins, Assistant Professor for the Department of Ecology and Conservation Biology at Texas A&M University, to begin a pilot study investigating eel movement ecology in a freshwater terminus habitat – the San Marcos Springs!

The team is using captured American eels outfitted with ultrasonic transmitters to track movement and activity patterns in Spring Lake and the San Marcos River. This data will help uncover the eel's site fidelity, tendency to return to a previously occupied location, size of their home range as well as changes in daily and seasonal activity patterns.

If the pilot study proves successful in tagging and following eels in Spring Lake, then an interdisciplinary proposal involving faculty from Texas A&M University and the Departments of Biology and Geography at Texas State University will be submitted to federal funding institutions to test multiple components of the eel's movement behaviors.

SPRING LAKE ACCESS FOR ALL
OPENING THE DOOR TO THE OUTDOORS

For nearly 20 years our Spring Lake Education Program has been our “boots on the ground” realizing the success of outdoor learning and environmental education and providing abundant opportunities for schoolchildren and families to find connection to the natural world through interpretive tours at Spring Lake.

However, our work to inspire conservation leaders cannot be fully achieved without equity and accessibility. We believe access to nature is a human right. Alas, there are real barriers to nature access for many individuals and communities. Cost, physical accessibility, and needed safety upgrades are obstacles which often inhibit underserved youth and their families from fully experiencing Spring Lake.

For us, success means including everyone. Over the past year, we’ve been working to do just that. The “Spring Lake: Access for All” initiative is working to cultivate an inclusive learning environment that meets the needs of all people who visit Spring Lake.

Our team is examining the site’s existing trails, bus service, parking, and glass-bottom boats to develop tangible solutions that ensure all people can connect with San Marcos Springs.

With support from our partners at H-E-B as well as the Texas State University Facilities Department and University leadership, we have crafted a plan and are taking steps to make our site fully accessible in the next five years.

The Meadows Center took the first step toward realizing this goal with the renovation of our outdoor restrooms and ticket kiosk, a primary hub and gateway for our 120,000 annual visitors.

The work included the regrading of walkways surrounding the ticket kiosk as well as the addition of electronic doors and concrete thresholds to our outdoor restrooms, thus achieving full accessibility and compliance with the Americans with Disabilities Act.

Other key priorities we will address over the next four years include:

- Creating a wheelchair-accessible glass-bottom boat and boat dock
- Developing accessible education materials and curricula utilizing cutting-edge virtual reality technology
- Constructing an accessible outdoor shelter and classroom space
- Building an accessible trail from the parking lot to the dive training area

PERMEABLE PAVERS LEADING INTO THE HANDICAPPED ACCESSIBLE RESTROOMS AND VISITORS CENTER.

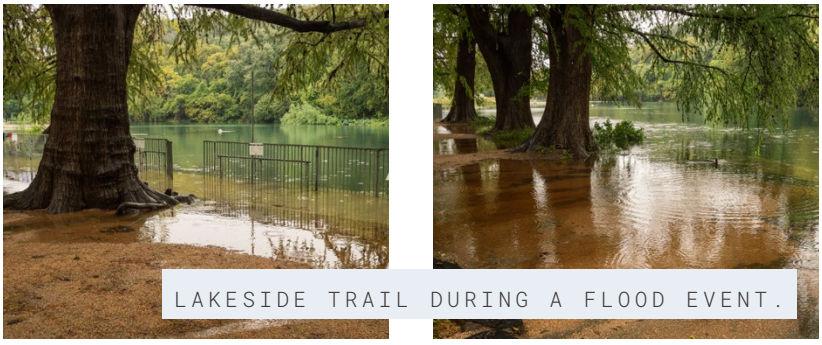
EXAMPLE OF THE RAISED BOARDWALK FOR THE LAKESIDE TRAIL.

As a part of this initiative, we secured a grant from Texas Parks and Wildlife Department this year to construct an extensive accessible trail leading to the glass-bottom boats.

The new trail will replace our Lakeside Trail, which links our ticket kiosk, Wetlands Boardwalk, Discovery Center, boat dock, dive facilities, and parking lots together. Trail improvements will include permeable pavers at the ticket kiosk which will lead to a raised (and wheelchair accessible) boardwalk over the existing Lakeside Trail. These improvements will not only alleviate flooding and eliminate erosion but also ensure equal recreational access for all.

If 2020 and 2021 taught us nothing else, it's that change is necessary - especially when it comes to accessibility to nature and environmental learning. We are committed to doing our part to ensure diversity, equity, and accessibility are at the forefront of our work.

CURRENT STATUS OF LAKESIDE TRAIL.



LAKESIDE TRAIL DURING A FLOOD EVENT.

PARKING LOT DURING A FLOOD EVENT.

AQUACORPS: SCUBA DIVING THEIR WAY TO A BLUE PLANET

Spring Lake is no ordinary scuba site. Located at the headwaters of the San Marcos River, hundreds of artesian springs bubble up to form Spring Lake. Here, human history stretches back more than 12,000 years to the last ice age, and natural history even further. The crystal-clear waters of Spring Lake have come to be a haven for Texas scuba divers. With 30 to 40 feet of visibility and a constant 72-degree temperature, divers from all over Texas come to volunteer their time and further their understanding of this delicate ecosystem.

As the entrusted stewards of Spring Lake, the Meadows Center is responsible for the management of this unique body of water and its natural and cultural resources. Helping us accomplish this are members of our AquaCorps that volunteer their time to one of the most unique habitat restoration projects in the country.

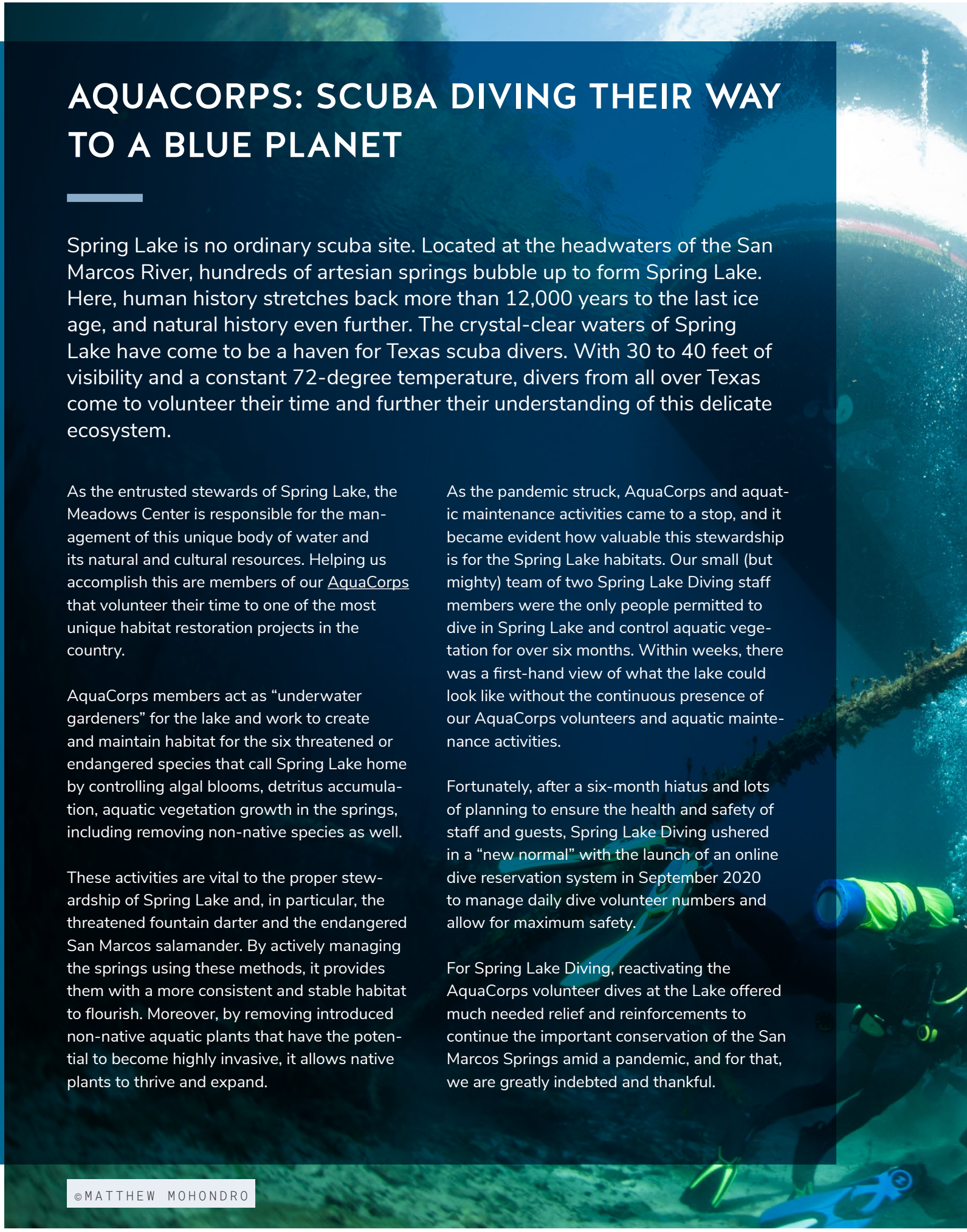
AquaCorps members act as "underwater gardeners" for the lake and work to create and maintain habitat for the six threatened or endangered species that call Spring Lake home by controlling algal blooms, detritus accumulation, aquatic vegetation growth in the springs, including removing non-native species as well.

These activities are vital to the proper stewardship of Spring Lake and, in particular, the threatened fountain darter and the endangered San Marcos salamander. By actively managing the springs using these methods, it provides them with a more consistent and stable habitat to flourish. Moreover, by removing introduced non-native aquatic plants that have the potential to become highly invasive, it allows native plants to thrive and expand.

As the pandemic struck, AquaCorps and aquatic maintenance activities came to a stop, and it became evident how valuable this stewardship is for the Spring Lake habitats. Our small (but mighty) team of two Spring Lake Diving staff members were the only people permitted to dive in Spring Lake and control aquatic vegetation for over six months. Within weeks, there was a first-hand view of what the lake could look like without the continuous presence of our AquaCorps volunteers and aquatic maintenance activities.

Fortunately, after a six-month hiatus and lots of planning to ensure the health and safety of staff and guests, Spring Lake Diving ushered in a "new normal" with the launch of an online dive reservation system in September 2020 to manage daily dive volunteer numbers and allow for maximum safety.

For Spring Lake Diving, reactivating the AquaCorps volunteer dives at the Lake offered much needed relief and reinforcements to continue the important conservation of the San Marcos Springs amid a pandemic, and for that, we are greatly indebted and thankful.



KEEPING IT COOL FOR SCUBA DIVERS AT SPRING LAKE

As many Texans can tell you, it gets hot outside here on those long summer days! Thanks to a generous donor, the Spring Lake Dive Training Area was equipped with a new shade pavilion to allow our volunteer and research divers to stay cool while they gear up.

TEXAS STREAM TEAM CELEBRATES 30 YEARS OF CITIZEN SCIENCE & STEWARDSHIP

The Texas Stream Team, our statewide citizen science program, celebrated 30 years of citizen science and environmental stewardship this year. Launched in 1991, Texas Stream Team has grown significantly from its humble beginnings with just a handful of citizen scientists tracking 19 sites in Texas. Today, the program boasts more than 11,000 citizen scientists trained who monitor more than 400 sites across the Lone Star State.

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A $1.2 million grant from the Texas Commission on Environmental Quality in late 2020 has allowed the program to continue to expand and strengthen its network to other regions.

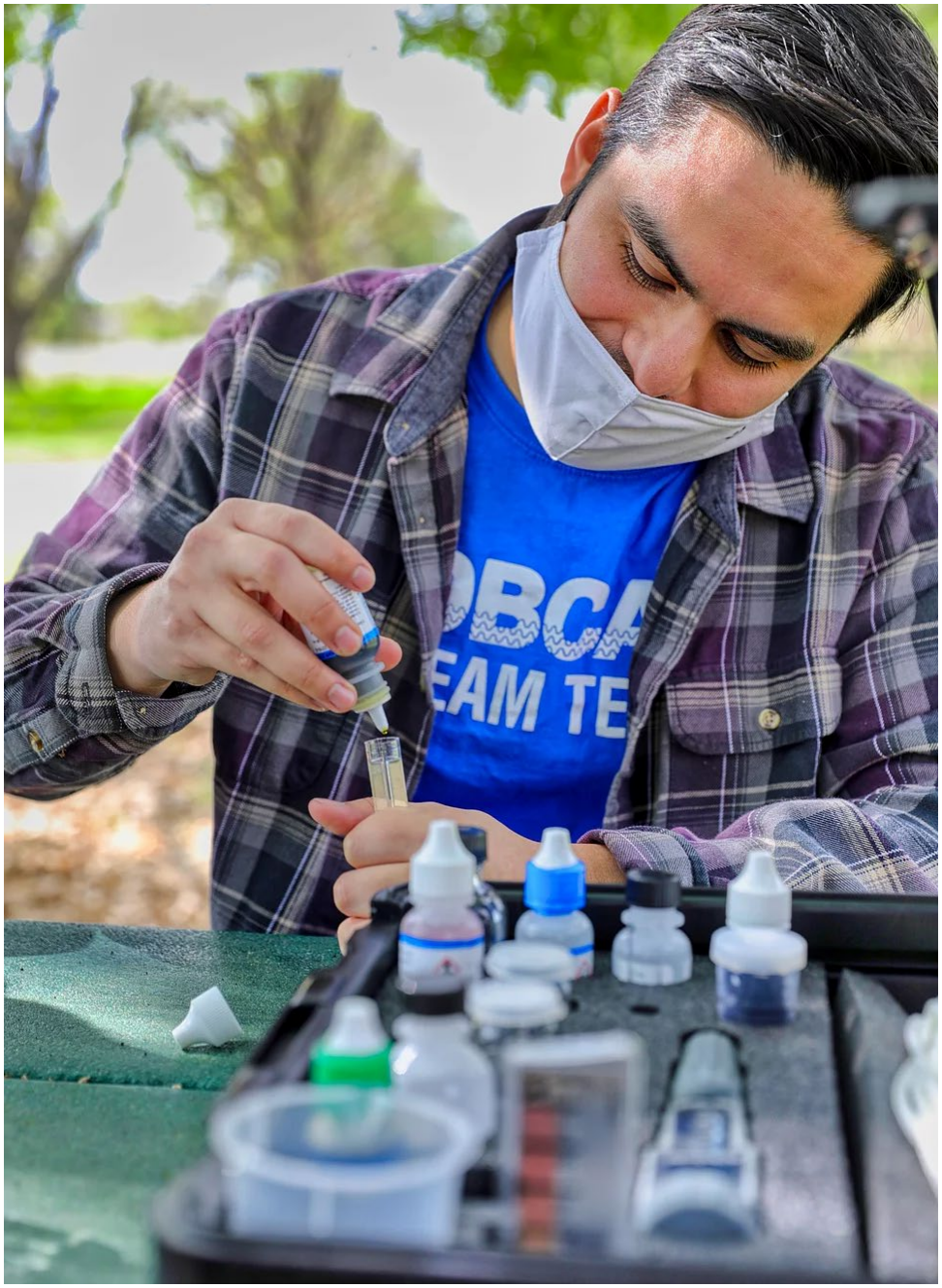
Aside from growing its partnerships and volunteer base, Texas Stream Team is focusing its efforts on increasing the amount of citizen scientist activity in areas that are developing, or implementing, watershed management plans. The program helps to facilitate community correspondence, stakeholder engagement, and science-based solutions to water quality issues.

These services have proven to be invaluable in protection efforts, especially in smaller communities where professional resources to evaluate environmental conditions are lacking. While state agencies in Texas often collect water quality data on a quarterly or annual basis, citizen scientists trained through Texas Stream Team collect data on a monthly basis. With three decades of water quality data available, this large-scale, ongoing data collection can help with identifying trends and environmental changes.

Yet, Texas Stream Team is about more than data collection; there are passionate people behind it. The program is fueled by dedicated citizen scientists who want to make sure their water is clean and safe for their kids and for future generations to enjoy. It's an excellent illustration of how citizen science can connect a community to its environment in a personal way and build an ethic of environmental stewardship.

"Water quality monitoring offers local residents and Texas State students an opportunity to take an active role in the protection and understanding of their natural resources," Rachel Sanborn, a citizen scientist of 23 years and active trainer with Texas Stream Team said. "Each monitor's data provides a piece in the larger puzzle of our river's natural cycles and by providing regular data on water quality along the San Marcos River, the community can better understand the impact of regional growth, water usage and can serve as an early warning system for potential water quality problems."

The program is also providing science, technology, engineering, and mathematics (STEM) education resources for teachers to use in public schools, universities, and other organizations to promote inquiry-based learning about the environment and equip students



> Thirty years from now, we hope the program's data will be comparable to the State's water quality data to sound the alarm on a broader scale, fill in research gaps, and continue to help the public understand the significance of collecting water quality data.
>
> **Aspen Navarro,**
> Watershed Services Program Coordinator

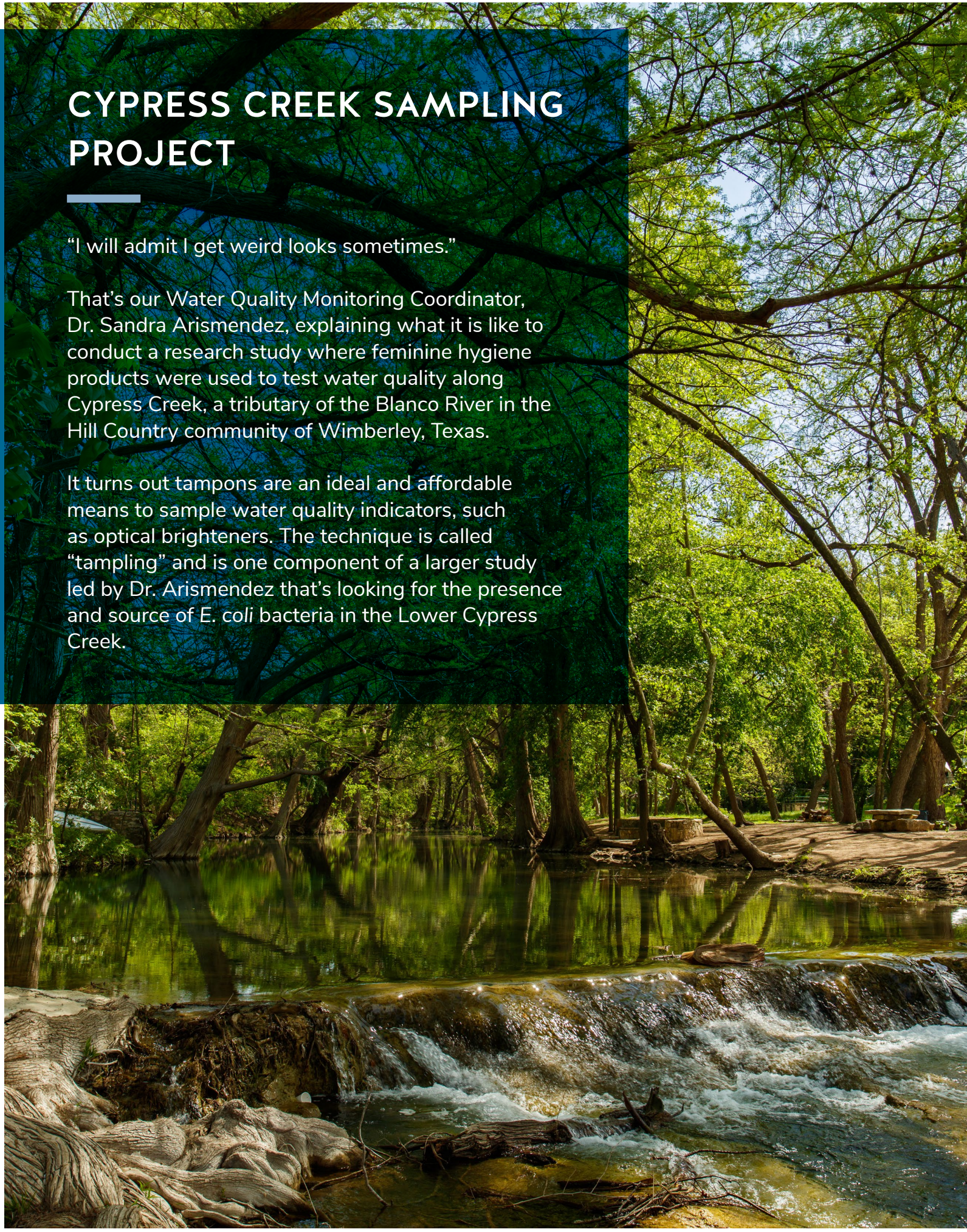
PHOTOS COURTESY OF THE EDWARDS AQUIFER AUTHORITY

with the skills to analyze and solve complex environmental issues — from floods to drought.

Outside of the classroom, Texas Stream Team gives real-life work experience to countless Texas State University students, many of whom go on to pursue environmental careers.

"As a student worker, I had the opportunity to see first-hand how passionate members of the public are about protecting our waterways, and how programs like Texas Stream Team empower us to make tangible environmental impacts. In my future career, I hope to continue working alongside citizen scientists to better understand how we can protect our precious waterways and natural resources," said Eryl Austin-Bingamon, former Meadows Center Student Research Assistant.

With Texas' 191,000 miles of waterways, there is no doubt that Texas Stream Team will serve an increasingly important role in fostering a healthy and safe environment through water education, data collection, and community action.

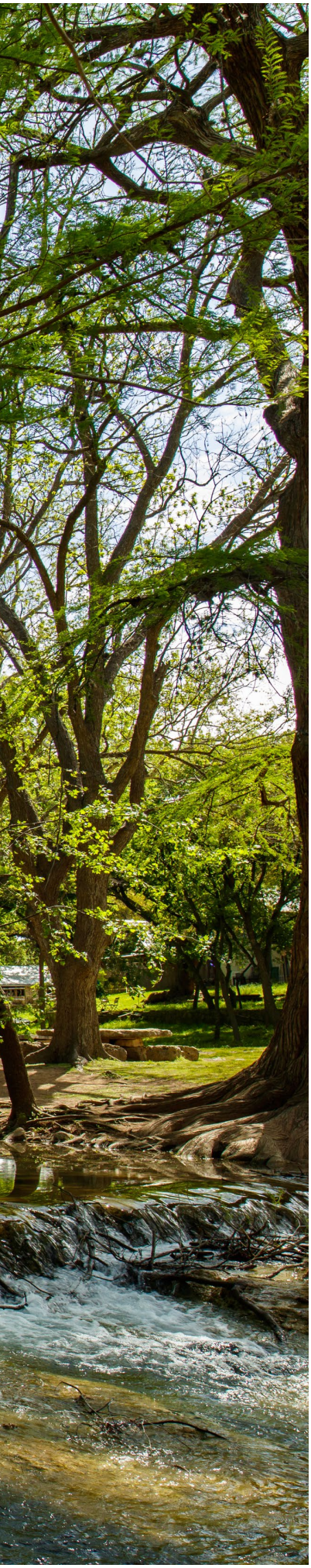


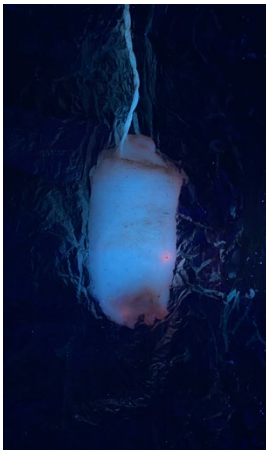
CYPRESS CREEK SAMPLING PROJECT

"I will admit I get weird looks sometimes."

That's our Water Quality Monitoring Coordinator, Dr. Sandra Arismendez, explaining what it is like to conduct a research study where feminine hygiene products were used to test water quality along Cypress Creek, a tributary of the Blanco River in the Hill Country community of Wimberley, Texas.

It turns out tampons are an ideal and affordable means to sample water quality indicators, such as optical brighteners. The technique is called "tampling" and is one component of a larger study led by Dr. Arismendez that's looking for the presence and source of *E. coli* bacteria in the Lower Cypress Creek.





(LEFT)TAMPLING SAMPLE IN THE FIELD.(RIGHT) TAMPLING BLACK-LIGHT ANALYSIS SHOWING FLUORESCENCE UNDER UV FLASHLIGHT, WHICH INDICATES A PRESENCE OF OPTICAL BRIGHTENERS.

The Cypress Creek watershed is experiencing rapid growth and development. And, area water quality monitoring trends show increasing concentrations of *E. coli* bacteria in the creek, which could be from sources such as discharge from wastewater treatment plants, malfunctioning septic systems, domestic and wild animal feces, and stormwater runoff.

E. coli is a species of fecal coliform bacteria that can be used as an indicator of sewage contamination. They are commonly found in human and animal feces and can be a health risk if consumed.

Optical brighteners are chemicals found in laundry detergents and paper products, including toilet paper, to keep items bright and white. Optical brighteners decompose relatively slowly, which make them ideal indicators of potential sewage contamination in rivers and streams. Their presence suggest that wastewater has escaped to places it is not supposed to be.

These dyes are invisible to the naked eye, but glow under ultraviolet light when present.

The team used a variety of sampling methods over a 13-week period to test for optical brighteners and *E. coli* bacteria at eight sites along Lower Cypress and Ozona Creeks. Samples were collected twice a week –on Sunday to target weekend activities and Thursday to target weekday activities.

While results from the study will not be released until October 2021, early results suggest that all samples at all sites have tested positive for the presence of optical brighteners. Weekend samples also show a higher concentration of *E. coli* bacteria when compared to weekday samples. When complete, the findings will help isolate potential sources of sewage contamination along the lower reach of Cypress Creek and identify problem areas that could be mitigated.

THE CLEAN COAST TEXAS COLLABORATIVE: IMPROVING WATER QUALITY & COMBATING WATER POLLUTION

The Meadows Center's Watershed Services team and the Texas General Land Office are working together to lead Clean Coast Texas, an initiative to provide coastal communities with technical assistance on best practices to reduce nonpoint source pollution and incorporate stormwater management techniques.

The recently launched Clean Coast Texas Collaborative includes scientists, educators, engineers, and communication professionals, who are working with communities throughout the Texas Coastal Zone to address stormwater management and water quality concerns.

The Collaborative draws on the strengths of each entity to ensure we deliver the support coastal communities need to improve water quality, community resilience, and floodplain management. Partners include the Texas A&M AgriLife Extension Services' Texas Community Watershed Partners, the Texas Sea Grant College Program, and Doucet & Associates.

Nonpoint source pollution is caused when rainfall, moving over and through the ground, picks up and carries natural and human-made pollutants, depositing them into lakes, rivers, wetlands, coastal waters, and groundwater supplies. Nonpoint source pollution degrades water quality which, in turn, can have harmful effects on drinking water supplies, recreation, fisheries and wildlife.

The Clean Coast Texas Collaborative is delivering customized local workshops in four communities on topics related to sustainable stormwater management such as green infrastructure case studies, data driven community planning for resilience, and determining optimal locations for small-scale green infrastructure projects like rain gardens.

In conjunction with the workshops, the collaborative is engaging with local officials to provide technical support for initiating community projects such as developing and refining local ordinances, the adoption of sustainable stormwater design manuals, building comprehensive plans specific to local demands including population and economic projects, and creating conceptual designs to construct, or improve, green infrastructure.

When implemented, these projects will showcase how Texas coastal communities can create tangible environmental benefits that can be easily translated to other coastal communities while supporting their local economies through the restoration of coastal natural resources, improved water quality, and mitigation of coastal erosion.

> "Through working with coastal communities and our partners in the collaborative, we will address effects of stormwater runoff on waterways, and create new opportunities to protect critical coastal economies, ecosystems and public health.

George P. Bush,
Former Texas Land Commissioner

Water is fundamental to the well-being of the planet. The water cycle, just like our planet, is a close system. Anything we do in land affects water quality on the coast. Texas has an extensive coast that supports people's livelihoods and diverse ecosystems as well as recreational and commercial activities.

The Clean Coast Texas Collaborative has enabled the Meadows Center to not only meet with communities across the coast to learn about their water quality needs but also help them find tangible solutions to achieve better water quality management.

Adriana Mendez-Jimenez, Meadows Center Coastal Coordinator

FY2021: A BIG YEAR FOR US, BUT THE BEST IS YET TO COME.

Your support in Fiscal Year 2021 made it possible for the Meadows Center to emerge strong from a difficult season. As we look beyond the pandemic, we envision a world that has closed the gap in inequity, built resilient strategies to address climate change, and better manages natural resources to improve the lives of all people. As we look forward to FY2022, we will focus on making strategic advances on the following programs and initiatives.

REIMAGINING SPRING LAKE HALL

The Meadows Center's location in the historic Spring Lake Hall offers a one-of-a-kind experience for researchers, students, and curious visitors alike. Situated on the banks of Spring Lake, the Center's staff and faculty use its natural surrounding environment as a classroom and a living laboratory to inspire research, innovation, and leadership that ensures clean, abundant water for the environment and all humanity.

To meet its growing needs, the Meadows Center is kicking-off a $15 million capital campaign to reimagine the Spring Lake Hall as a premiere interpretive research laboratory that will propel Texas State's work to prepare future environmental leaders, advance water and climate science, and bring innovative solutions to today's most urgent water challenges.

CHANGING TEXAS FOR A CHANGING CLIMATE

We are focusing our endeavors on the single greatest environmental threat facing the world: climate change. The Meadows Center and Texas State University will help the Texans address these issues by developing sound science which will inform public policy. It will change the way our natural systems operate and could impact the environmental services they provide.

In 2022, we aim to create a Director of Climate Science position at the Meadows Center to lead a multi-institutional effort to address the growing issues surrounding climate change. We will also develop climate change educational tools, TEKS-aligned curriculum, and climate monitoring technology to incorporate climate change into our educational program and priorities.

WHY I GIVE

SHIELD-AYRES FOUNDATION

"There is magic in the face of a child who peers beneath the water's surface to discover the beauty and abundance of life below. The Spring Lake Education Program helps students make connections with nature and water, and to understand their role in stewarding both. The Shield-Ayres Foundation is proud to support the restoration of the Meadows Center's glass-bottom boats so that generations of visitors can continue to be inspired.

Cindy Raab,
Executive Director - Shield Ayers Foundation

SAVING GLASS-BOTTOM BOAT #1978

Can you believe that we still conduct our educational tours on boats built in the 1950s and 1970s? Tours on the historic fleet of glass-bottom boats are essential to the Meadows Center's educational experience, but the aging boats can require as much as $100,000 a year for maintenance. Roughly 80 percent of the yearly glass-bottom boat maintenance costs are related to the wooden framed hulls, with issues ranging from dry rot by fungus, corrosion from fasteners, or less than perfect lumber.

To reduce maintenance costs, we've introduced new fiberglass hulls that are more water-resistant and increase the life of the boats from 5 to 25 years. Four of our six boats have been completely restored but funds are needed to renovate the remaining two boats ("1978" and "1956"). Restoration of the leaking boat #1978 is of immediate importance. If not addressed, we will soon be forced to pull the boat from the water and relegate it to dry storage.

ACCESS FOR ALL

The Meadows Center's offices, educational facilities, and historic glass-bottom boats are not ADA compliant; therefore, mobility challenged students and guests are not able to fully access facilities, or experience a glass-bottom boat tour at Spring Lake.

We aim to begin the research to design and build an accessible, ADA-compliant glass-bottom boat as well as fundraise for the Spring Lake Access For All menu of projects to ensure that we meet the needs of all people who visit Spring Lake.

ADVANCING ONE WATER POLICY AND RESEARCH

The Meadows Center has become a statewide leader in the advancement of One Water across the state. Over the last three years, we have established networks with dozens of NGOs, governmental agencies, and local communities to facilitate research and develop real-world solutions to water supply and water quality challenges.

Additional funding is necessary to better understand and develop the One Water projects, policy, and infrastructure and transfer the needed expertise to urban and rural communities throughout Texas to implement this resource-optimizing approach.

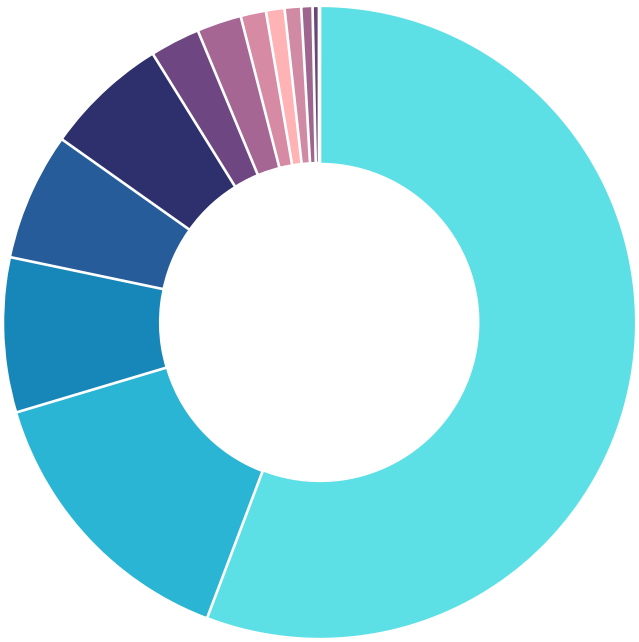
CONSERVATION AND RIVER BOOK SERIES

Over the last 15 years, the Meadows Center has published 36 books dedicated to Texas rivers and conservation leadership. We are working to guarantee that the book series amplifies the Center's strategic efforts and reputation as a leader in research and practice in these fields.

In 2022, we aim to keep telling the stories of Texas Rivers by securing funds to commission a book about the Devils River and to highlight the conservation leadership of flagship citizen science program, the Texas Stream Team.

FINANCIAL OVERVIEW

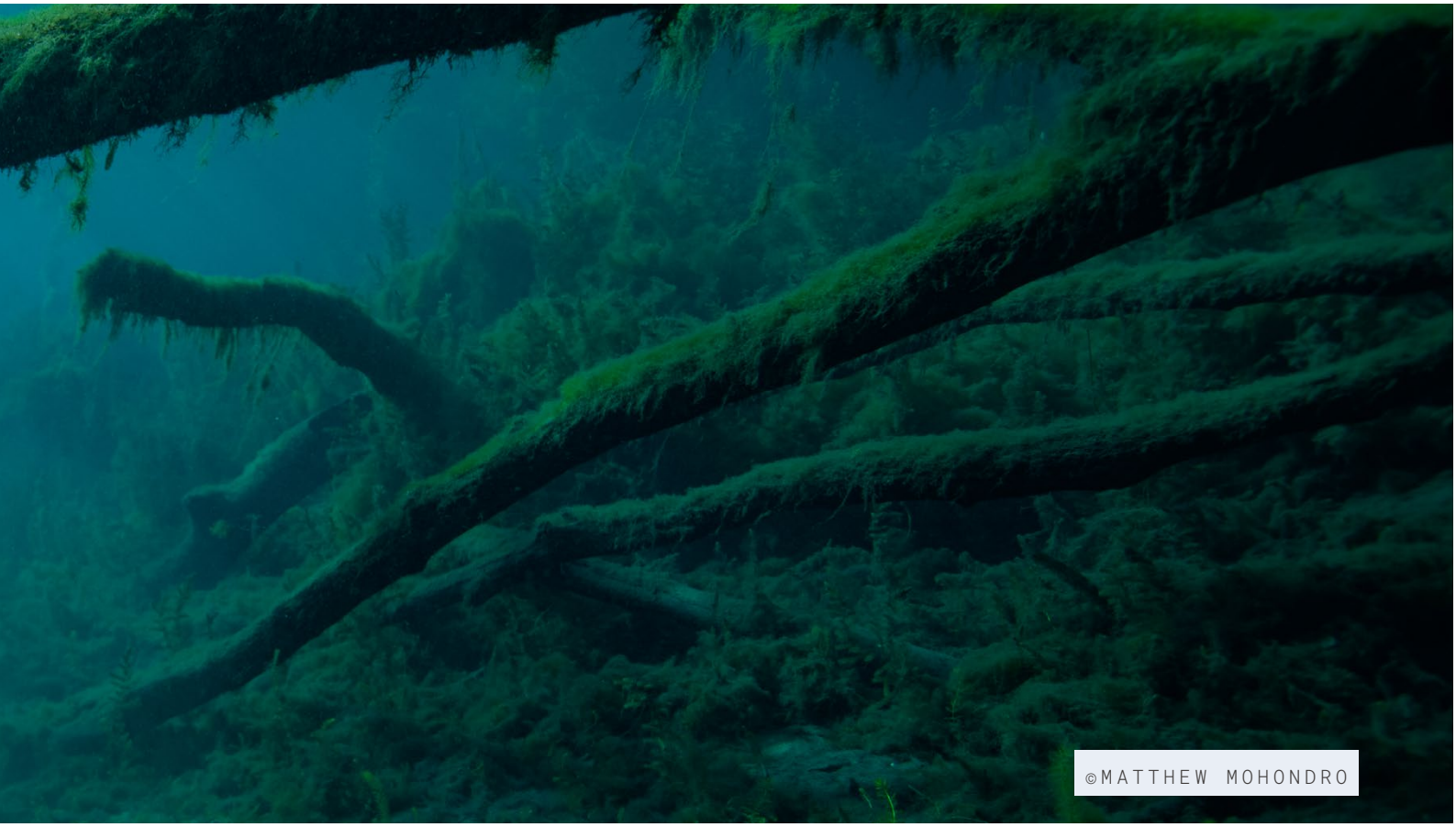
REVENUE



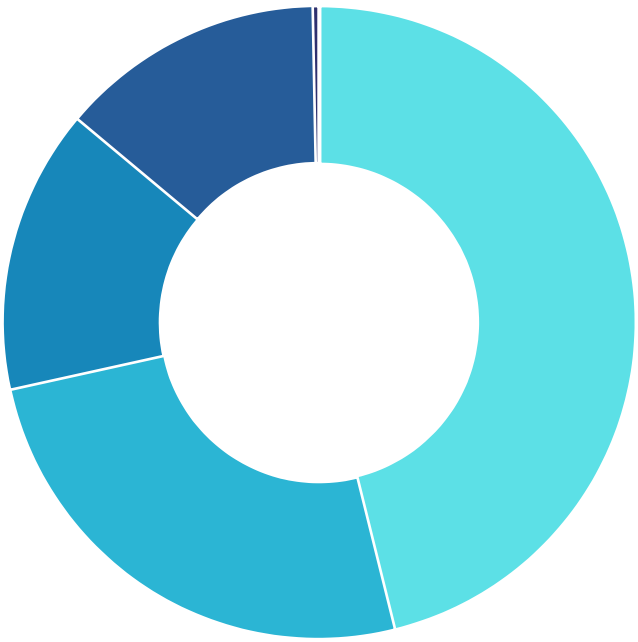
Grants Received	$2,649,190
Foundation Gifts	$695,000
Endowments	$375,650
University	$ 309,955
Spring Lake Education Revenue	$ 300,502
Professional Services Provided	$121,192
Dive Operations Revenue	$108,085
Meadows Generated Income*	$61,496
Texas Research Incentive Program Match	$45,000
Corporation Gifts	$40,000
Indirect Cost Recovery	$ 27,254
Individual Gifts	$18,331
Total Revenue	**$4,751,654**

**Sources of income include sale of books, hats, T-Shirts, book royalties and services rendered.*

- GRANTS RECEIVED **(55.8%)**
- FOUNDATION GIFTS **(14.6%)**
- ENDOWMENTS **(7.9%)**
- UNIVERSITY **(6.5%)**
- SPRING LAKE EDUCATION REVENUE **(6.3%)**
- PROFESSIONAL SERVICES **(2.6%)**
- DIVE OPERATIONS REVENUE **(2.3%)**
- MEADOWS GENERATED INCOME* **(1.3%)**
- TEXAS RESEARCH INCENTIVE PROGRAM MATCH **(0.9%)**
- CORPORATE GIFTS **(0.8%)**
- INDIRECT COST RECOVERY **(0.6%)**
- INDIVIDUAL GIFTS **(0.4%)**



EXPENSES



Professional Staff Salary and Benefits	$1,800,875
FY22 Non-Grant Encumbrances	$860,134
External Contracts	$474,591
Supplies and Facility Maintenance	$271,293
Student Staff Salary	$252,496
Travel and Meetings	$6,851
Total Expenses	**$3,666,240**

- PROFESSIONAL STAFF SALARY AND BENEFITS **(49%)**
- FY22 NON-GRANT ENCUMBRANCES **(23%)**
- EXTERNAL CONTRACTS **(13%)**
- SUPPLIES AND FACILITY MAINTENANCE **(7%)**
- STUDENT STAFF SALARY **(7%)**
- TRAVEL AND MEETINGS **(1%)**

OUR TEAM

Robert Mace, Ph.D.
Executive Director

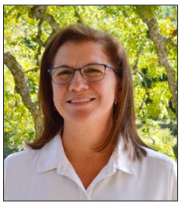
Andrew Sansom, Ph.D.
Founder

Thom Hardy, Ph.D.
Chief Science Officer

Rob Dussler, Ph.D.
Chief Education Officer

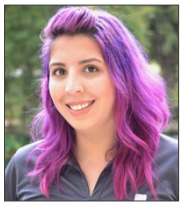
Nick Dornak, M.S.
Director of Watershed Services

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



Sandra Arismendez, Ph.D.
Water Quality Monitoring Coordinator

Claudia Campos, B.S.
Admin. Coordinator



Synthia De Hoyos, B.A.
Procurement Specialist

Collin Garoutte
Research Associate

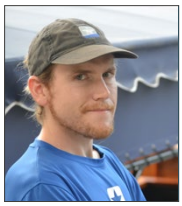
Sharla Gutierrez,
Business Manager

Susan Hankins, B.S.
Admin & Event Coordinator

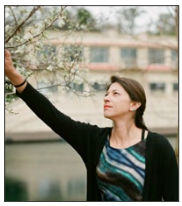
Tom Heard, M.S.
Research Associate & Fish Biologist

Caleb Henderson, B.A.
Dive Coordinator

Anna Huff, B.S.
Communications Manager



Sam Massey
Glass-Bottom Boats Manager

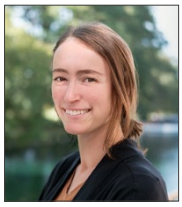


Erica Jane Meier, M.S.
Admin. Assistant II

Aspen Navarro, M.S.
Program Coordinator

Adriana Mendez-Jimenez, M.S.
Coastal Coordinator

Laura Parchman, B.A.
GIS & Data Management Associate



Bess Reisberg, B.S.
Education Manager

Christopher Riggins, B.S.
Research Associate

Ryan Spencer, M.A.Geo
Research Coordinator

Miranda Wait, B.S.
Deputy Director of Spring Lake Operations

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

Aaron Wallendorf, B.S.
Lake Manager

STUDENTS, INTERNS & PART TIME STAFF

Andrew Adams
Regina Allen
Carson Barr
Gracie Barret
Amanda Beck
Esther Betts
Allison Bigler
Noriel Brown
Kayla Burnett
Abygail Byckovski
Kannon Byckovski
Andrew Cook
Piper Cotton
Kaitlyn Eudy
Francesca Filippone
Shelby Fisher
Erin Frazee
Nohemi Galaviz
Priscilla Inostroza-Hernandez
Jesse Hernandez
Heather Hinchliffe
Nic Hrechko
Desiree Jackson
Winnie Johnson
Clayton Klingberg
Danny Koplitz
Olivia LaGrone
Angel Lopez
Claudia Loera
Akayla Martin
Rebecca Massey
Josef Mathews
Gabriela Molina
Catherine Morrice
Jaime Murata
Carl Nagel
Tania Pena
Jessica Powell
Morgan Richmond
Annabelle Rodriguez
Mario Amaro Salazar
Sophia Salo
Madison Sanchez
Emma Schuetz
Joe Shingledecker
Arayiah Stephens
James Taylor
Diego Torres-Martinez
Faith Tund
Daniel Vasquez
Taylor Wessley

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, 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.
"The Original Water Wizard"
Associate Professor, Department of Biology
Director, Edwards Aquifer Research Center

MEADOWS CENTER FELLOWS

Kelly Albus, Ph.D.
Adjunct Professor, University of North Texas

Mike Abbott, Ph.D.
Fellow of the Meadows Center

James Dodson, M.P.A
Principal/Consultant, GroundswellTX

Mario Garza, Ph.D.
Principal Founder, Indigenous Cultures Institute

Ronald T. Green, Ph.D., P.G.
Technical Advisor, Earth Sciences Section - Southwest Research Institute

Frederick 'Fritz' Hanselmann, Ph.D., M.P.A.
Lecturer and Director, University of Miami

Tom Hegemier, P.E., D.WRE, C.F.M.
Senior Project Manager, Doucet and Associates

Chris Horrell, Ph.D.
Research Associate

Sharlene Leurig
Chief Executive Officer, Texas Water Trade

Meredith Miller, M.S.
Director, William R. Sinkin Eco Centro

Vanessa Puig-Williams
Texas Water Program Director, Environmental Defense Fund

Warren Pulich, Jr., Ph.D.
Coastal Ecologist

Walter Rast, Ph.D.
Director, International Watershed Studies

Carlos Rubinstein
Principal, RSAH2O, LLC

Todd Votteler, Ph.D.
President, Collaborative Water Resolution, LLC

Bill Reaves, Ph.D.
Art Curator & Co-Editor, Joe & Betty Moore Series on Texas Art, Texas A&M Press

Linda Reaves, Ph.D.
Art Curator & Co-Editor, Joe & Betty Moore Series on Texas Art, Texas A&M Press

Rudolph Rosen, Ph.D.
Director, Institute for Water Resources Science and Technology

Shane Townsend, M.U.R.P.
Foreign Service Officer, Office of Agricultural Affairs, U.S. Embassy – Nairobi

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FY2021 RESEARCH GRANTS & CONTRACTS

Research is the foundation of all we do. It informs our programs in stewardship, education, and service. The following list details research grants and contracts awarded to our team in Fiscal Year 2021.

A Path Forward for Pecos Watershed Protection Plan
Principal Investigator: Jenna Walker
Funder: Friends of the Pecos River
Core Research Initiative: Watershed Management

Access for All Spring Lake Education Program
Principal Investigator: Miranda Wait
Funder: Alice Kleberg Reynolds Foundation
Core Research Initiative: STEM Education

Blanco River-Aquifers Assessment Tool for Water and Understanding Sustainability Trends
Principal Investigator: Robert Mace
Funder: Hays County, Greater Houston Community Foundation, Needmore River Ranch, Fifth Generation, Way Family Foundation
Core Research Initiative: Environmental Flows

Blanco "No Discharge" Study
Principal Investigator: Nick Dornak
Funder: Hays County
Core Research Initiative: Watershed Management

Caldwell County Feral Hog Program
Principal Investigator: Nick Dornak
Funder: Caldwell County
Core Research Initiative: Watershed Management

COVID-19 Resiliency & Spring Lake Education
Principal Investigator: Robert Mace
Funder: Jacob & Terese Hershey Foundation
Core Research Initiative: STEM Education

Clean Coast Texas Collaborative
Principal Investigator: Nick Dornak
Funder: Texas General Land Office
Core Research Initiative: Watershed Management

Determining the Potential of Cost-Effective Water Conservation for the City of Houston
Principal Investigator: Dr. Timothy Loftus
Funder: Houston-Galveston Subsidence District
Core Research Initiative: Water Conservation

Developing a Website for Living Shorelines Program
Principal Investigator: Carrie Thompson
Funder: Texas General Land Office
Core Research Initiative: Watershed Management

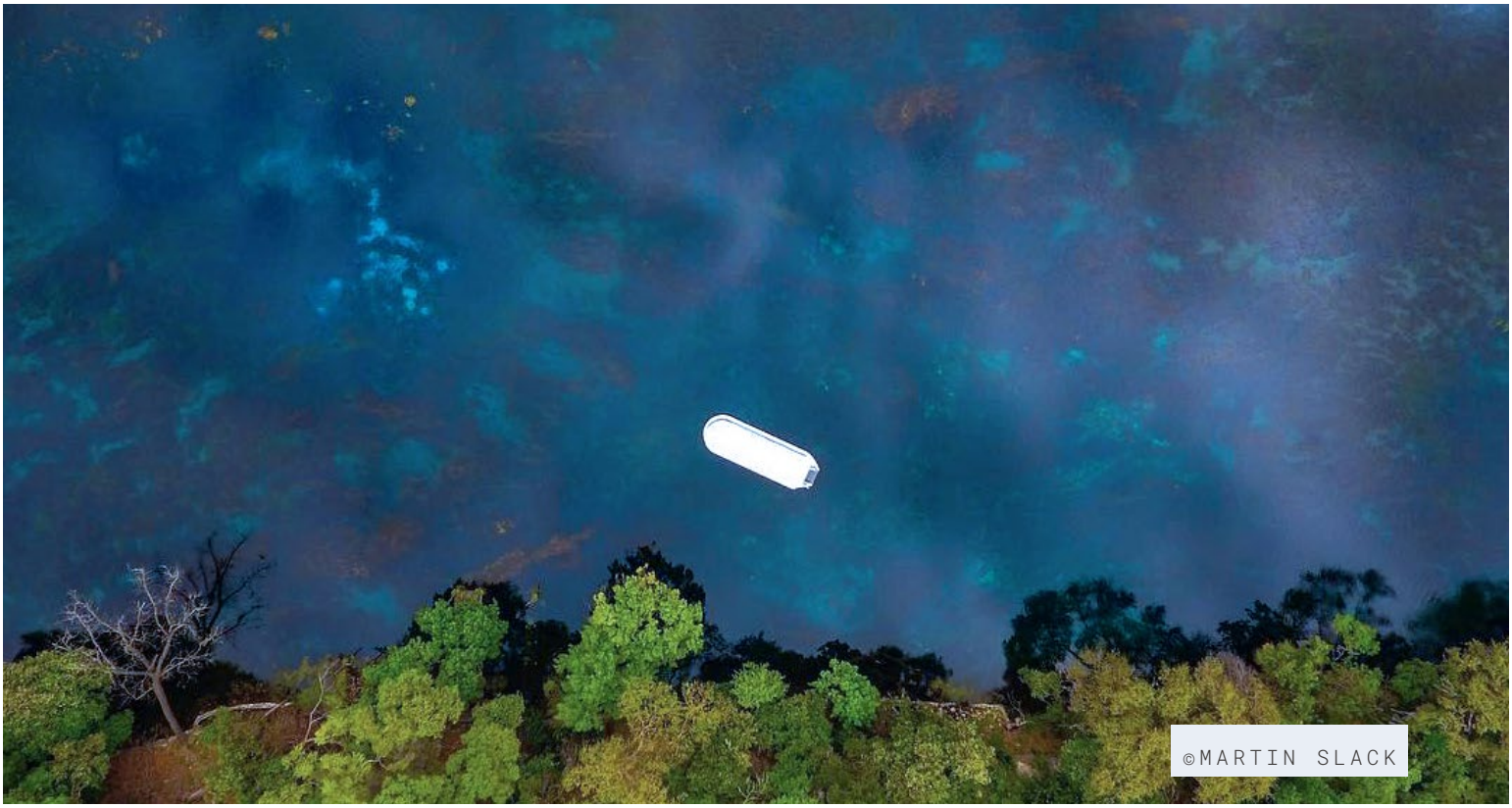
Evaluation and Refinement of Flow Resistance Equations for use in the XStream Software System
Principal Investigator: Dr. Thom Hardy
Funder: USDA Forest Service
Core Research Initiative: Environmental Flows

Hays County Feral Hog Program
Principal Investigator: Nick Dornak
Funder: Hays County
Core Research Initiative: Watershed Management

Habitat Conservation Removal of Non-Native Plants
Principal Investigator: Thom Hardy
Funder: City of San Marcos
Core Research Initiative: Watershed Management

Institutionalizing One Water in Austin and the Texas Hill Country
Principal Investigator: Nick Dornak
Funder: National Wildlife Federation
Core Research Initiative: Watershed Management

Krause Springs Occurrence of Flowing Water Study
Principal Investigator: Jenna Walker
Funder: Central Texas Groundwater Conservation District
Core Research Initiative: Watershed Management



Particulate Matter Air and Participation Study Texas: Using Citizen Science and GIS in the Classroom
Principal Investigator: Miranda Wait
Funder: University of North Texas
Core Research Initiative: STEM Education

Redesigning the Texas Oil Spill Prevention & Response Program Toolkit
Principal Investigator: Anna Huff
Funder: Texas General Land Office
Core Research Initiative: Watershed Management

Riparian and Instream Habitat Enhancement along the San Marcos River and Willow Springs Creek
Principal Investigator: Tom Heard
Funder: City of San Marcos
Core Research Initiative: Watershed Management

Spring Lake VR: Piloting Virtual Reality in K-12 Classrooms
Principal Investigator: Dr. Rob Dussler
Funder: Summerlee Foundation
Core Research Initiative: STEM Education

Spring Lake Digital Environmental Education Project
Principal Investigator: Miranda Wait
Funder: National Geographic
Core Research Initiative: STEM Education

Texas Integrated Flooding Framework
Principal Investigator: Carrie Thompson
Funder: Texas General Land Office
Core Research Initiative: Watershed Management

Texas Stream Team 2021 – 2023 Implementation
Principal Investigator: Jenna Walker
Funder: Texas Commission on Environmental Quality
Core Research Initiative: Watershed Management

Texas Stream Team FY22-23
Principal Investigator: Jenna Walker
Funder: Texas Commission on Environmental Quality
Core Research Initiative: Watershed Management

Trash Free Texas
Principal Investigator: Jenna Walker
Funder: North Central Texas Council of Governments
Core Research Initiative: Watershed Management

FY2021 STAFF PUBLISHED WORKS

The Meadows Center supports responsible water and natural resource policy in Texas and convene stakeholders to address the grand challenges that we will face in the decades to come. The following list provides a snapshot of the presentations and new publications from our staff, faculty, and students in Fiscal Year 2021.

PUBLISHED RESEARCH ARTICLES

Groundwater Science Advisory Committee (Ellis, J., Mace, R., Miller, G., Oliver, W., Seifert, J., Sharp, J., Tracy, J., and Wang, G.; facilitated by Glenn, S.,), 2021, *Review and Recommendations on "Subsidence Investigations—Phase 1" Report*: Houston Advanced Research Center, 14 pgs.

Collins, G., 2021. *Overruling the Rule of Capture: What Can Texas Learn from 10 Other States' Groundwater Law Updates?* Houston, Texas: Rice University's Baker Institute for Public Policy. 59 pgs. https://doi.org/10.25613/knsb-6g39

Dussler R., Deringer S.A., 2020, *Exploring the Effects of Interpreters' Experiences of Mindfulness Interventions on Their Connection with Nature and Subsequent Environmental Interpretation*: Journal of Interpretation Research, Vol. 25: pages 26-45. https://doi.org/10.1177%2F1092587220963556

TECHNICAL REPORTS

Mace, R.E., Leurig, S., Seely, H., Wierman, D.A. 2020. *Bringing Back Comanche Springs An Analysis of the History, Hydrogeology, Policy, and Economics.* San Marcos, Texas: The Meadows Center for Water and the Environment– Texas State University, 154 pgs.

Navarro, A.; Schlandt, A., 2020, *The Upper San Marcos River Watershed Protection Plan: Implementation Phase I Final Report*. San Marcos, Texas: The Meadows Center for Water and the Environment – Texas State University, 24 pgs.

Arismendez, S.A., E. Austin-Bingamon, A. Navarro, L.M. Parchman, and D. Vasquez. 2020. *Lower Nueces River Watershed Data Report.* San Marcos, Texas: The Meadows Center for Water and the Environment, Texas Stream Team – Texas State University, 30 pgs.

Dussler, R., Wait, M., 2020. *Research Roadmap: Spring Lake Education at The Meadows Center for Water and the Environment.* San Marcos, Texas: The Meadows Center for Water and the Environment– Texas State University, 14 pgs.

Arismendez, S., E. Austin-Bingamon, A. Navarro, L.M. Parchman, and D. Vasquez. 2020. *Oso Creek/Bay Watershed Data Report.* San Marcos, Texas: The Meadows Center for Water and the Environment, Texas Stream Team – Texas State University, 27 pgs.

Wierman, D.A.; Walker, J.; Schlandt, A.; Navarro, A.; Vasquez, D., 2021. *Cypress Creek Flow Study: Blanco and Travis Counties, Texas.* San Marcos, Texas: The Meadows Center for Water and the Environment, Texas Stream Team – Texas State University, 50 pgs.

Wierman, D.A.; Walker, J.; Schlandt, A..; Navarro, A.; Vasquez, D., 2021. *Krause Springs Occurrence of Flowing Water, Burnet County, Texas*. San Marcos, Texas: The Meadows Center for Water and the Environment, Texas Stream Team – Texas State University, 106 pgs.

Arismendez, S., D. Jackson, A. Navarro, L.M. Parchman, and D. Vasquez. 2021. *2021 Blanco River Watershed Data Report.* San Marcos, Texas: The Meadows Center for Water and the Environment, Texas Stream Team – Texas State University, 27 pgs.

Loftus, T.T., Murata, J.P., Stonecipher, T.H., 2021. *Exploring the Potential and Feasibility of Water-Use Conservation for Houston Water, Houston, Texas.* San Marcos, Texas: The Meadows Center for Water and the Environment – Texas State University, 40 pgs.

Austin, B., Aqua Strategies, Blue Creek Consulting, LLC, KIT, 2021. *Blanco TPDES Refinement Study.* San Marcos,

Texas: The Meadows Center for Water and the Environment – Texas State University, 44 pgs.

Dornak, D.N., Schlandt, A., Walker, J.J., 2021. *A Path Forward for the Pecos River Watershed Protection Plan.* San Marcos, Texas: The Meadows Center for Water and the Environment – Texas State University, 28 pgs.

Arismendez, S., D.N. Dornak, and L. Parchman. June 2021. *Texas Beach Watch Program Water Quality Data Summary Report.* The Meadows Center for Water and the Environment, Texas State University, San Marcos, Texas, 90 pgs.

Arismendez, S., A Navarro, L.M. Parchman, A. Schlandt, and D. Vasquez. 2021. *Pedernales River Watershed Data Report.* San Marcos, Texas: The Meadows Center for Water and the Environment, Texas Stream Team – Texas State University, 28 pgs.

Navarro, A.; Schlandt, A., 2020, *Best Management Practices Post Construction Report: The Upper San Marcos River Watershed Protection Plan - Implementation Phase I.* San Marcos, Texas: The Meadows Center for Water and the Environment – Texas State University, 18 pgs.

PRESENTATIONS

Wait, M. "Virtual Meadows Center: Navarro, A. 2021, "How to Utilize the Trash Free Texas AdoptASpot Map": presented at the Trash Free Texas Connecting Volunteers with Litter Cleanup Locations webinar hosted by North Central Texas Council of Governments; online presentation; January 19, 2021 [101]

Spencer, R, Daniel, K.L., Forsythe, M, & Witzig, S., 2021, "Education and Environmental Mindfulness at Informal Learning Centers": presentation virtually at the Annual Meeting of the Society for the Advancement of Biology Education Research West; January 20, 2021. [~20]

Mace, R.E., 2021, "Bringing Back Comanche Springs" presented to the Fort Stockton City Council and the Pecos County Commissioners Court, January 25, 2021; Fort Stockton, Texas [40+facebook live]

Mace, R.E., 2021, "Bringing Back Comanche Springs" The Meadows Center for Water and the Environment and Texas Water Trade joint briefing to funders and friends of Comanche Springs (with Sharlene Leurig), January 28, 2021; virtual [~40]

Cuddeback, Leah M. 2021, "Introduction to Clean Coast Texas": moderated and presented via statewide webinar hosted by Texas General Land Office; January 28, 2021. [180]

Thompson, Carrie L. 2021, "Collaborative Engagement in Public Policy and Sciencebased Decisionmaking": presented at Texas State University's MPA Lunch and Learn Series; virtual; January 29, 2021 [35]

Navarro, A., Arismendez, S., Campos, C., Lobban, M., Parchman, L., Walker, J. 2021, "Texas Stream Team Trainer Meeting": presented to Texas Stream Team trainers; online presentation; January 21, 2021 [27]

Fillipone, F.; Garoutte, C.; Hay, A.; Heard, T.; Kollaus, K.; Menchaca, N.; Perkin, J.; Riggins, C.; Rodriguez, Y.; Williamson, J., 2021. "Movement and Survival of Invasive Suckermouth Catfish within the San Marcos River": presented at the Texas Chapter of the American Fisheries Society; February 4, 2021.

Cuddeback, Leah M. 2021, "Introduction to Clean Coast Texas": moderated and presented via statewide webinar hosted by Texas General Land Office; February 4, 2021. [200]

Navarro, A. 2021, "Riparian Evaluation Monitoring: Utilizing Texas Stream Team Citizen Science to Evaluate Riparian Health": presented at the 2021 Urban Riparian Symposium hosted by Texas Riparian Association; online presentation; February 11, 2021

Mace, R.E., 2021, "Up from The Depths: Riparian Groundwater in Urban Settings": presented keynote address online at the 2021 Urban Riparian Symposium hosted by the Texas Riparian Association; February 12, 2021.

Arismendez, S., 2021, "Texas Surface Water Resource Management": presented to GEO 3313, Natural Resources Management, Texas State University, San Marcos, Texas; February 15, 2021. [~30]

Navarro, A. 2021, "Riparian Evaluation Monitoring: Utilizing Texas Stream Team Citizen Science to Evaluate Riparian Health": presented at the 2021 Riparian Restoration Conference hosted by Rivers Edge West; online presentation; February 18, 2021 [~40]

Navarro, A. 2021, "How to Utilize the Trash Free Texas Adopt-A-Spot Map":

presented at the Trash Free Texas Adopt-A-Spot Training hosted by HoustonGalveston Area Council; online presentation; February 25, 2021 [82]

Mace, R., 2021, "Groundwater and Surface Water in Texas" presented to GEO 4393/5395, Theory and Practice of Parks and Protected Areas, Texas State University, San Marcos, Texas; February 28, 2021 [virtual].

Navarro, A. 2021, "Upper San Marcos River Watershed Protection Plan Committee Meeting": presented at the biannual committee meeting hosted by The Meadows Center; online presentation; March 23, 2021 [10]

Arismendez, S. 2021, "Cypress Creek Watershed Protection Plan Data Summary" presented at the Cypress Creek WPP virtual committee meeting; March 31, 2021. [12]

Mace, R.E., 2021, "Groundwater and Surface Water in Texas": presented virtually to the CAMN 2021 Class, Central Texas Master Naturalist, April 10, 2021. [25]

Arismendez, S. 2021, "Texas Surface Water Resource Management": presented to GEO 3313, Natural Resources Management, Texas State University; San Marcos, Texas; April 13, 2021 [~30]

Mace, R.E., 2021, "Texas Water Development Board in Practice: The Regional Planning Process and SWIFT Advancing the Goals of Federal, State and Local Water Laws, Rules, and Policies": presented virtually to WATR 3312/5312; POLS3315, Texas A&M University at San Antonio, April 13, 2021.

Massey, S. "Invitation to The Meadows Center and Spring Lake for Texas State University Staff" at the Texas State University Staff Resources Virtual Fair hosted by the Texas State University Staff Resources Committee; San Marcos, Texas, April 15, 2021 [32]

Arismendez, S. 2021, "Water Quality Monitoring Data Comparability: Texas Stream Team Citizen Scientist vs. Professional": presented virtually at the 12th National Monitoring Conference; April 20, 2021 [~25]

Mace, R.E., "The Rise of Climate Science": interviewed Gerald North on his new book; April 20, 2020 [100]

Mace, R.E., "Oh no! I've got regulators in my reuse!": presented virtually to Annual Central Texas Water Efficiency Network Symposium—Proactive water conservation programs: In it for the long haul, April 21, 2021. [140]

Mace, R.E., 2021, "Water Resources Career Panel": hosted by the Geography Department at Texas State University for the Department Reunion, panelist, April 23, 2021.

Mace, R.E., 2021, Invited testimony on House Bill 4636 relating to the creation of the Val Verde County Groundwater Conservation District; providing authority to issue bonds; providing authority to impose fees, surcharges, and taxes; spoke about the hydrogeology of the county and what happened to Comanche Springs; April 27, 2021.

Mace, R.E., 2021, "Innovative water is good water": presented virtually at the Water Innovation Forum hosted by the West Houston Association, April 29, 2021. [70]

Arismendez, S. 2021, "Water Quality Monitoring in Central Texas Rivers and Creeks": to be presented to Microbiology and Environmental Science Classes, University of Tampa; Tampa, Florida; April 29, 2021 [~50]

Mace, R.E., 2021, "The Future of Aquifer Storage and Recovery in Texas": presented virtually at the ASR for Texas! 2021 Seminar; May 5, 2021. [75]

Thompson, C. 2021, "Ensuring One Water Delivers for Healthy Waterways": presented at River Rally hosted by River Network; Virtual Event; May 1720, 2021 [538]

Votteler, T.H., and Mace, R.E., 2021, "The Legislature + Water": presented to the Texas Water Research Network virtual spring meeting, May 19, 2021; virtual. [100]

Mace, R.E., 2021, "Will there be enough water for Central Texas?": presented to the Austin Area Research Organization; May 25, 2021. [12]

Escobar, V., Flato, T., Langford, D., Mace, R., PuigWilliams, V., and Yeates, D., 2021,"What's Next for Texas Water?" presented at a webinar panel discussion hosted by the Environmental Defense Fund, the Hill Country Alliance, and the Headwaters Alliance; June 7, 2021.

Mace, R.E., 2021, "Legislative Update": presented at the Texas Water Data Initiative Meeting, June 15 [30].

Mace, R.E., 2021, "In the future there will only be One Water": presented to the Association of Water Board Directors; San Antonio, Texas; June 19,

2021. [300]

Arismendez, S. and Navarro, A., 2021, “Texas Stream Team Advanced Water Quality Citizen Scientist Training”: presented in-person for training at The Meadows Center for Water and the Environment, Texas State University, San Marcos, Texas. June 19, 2021. [10]

Mace, R.E., de la Guardia, J., and Briher, C., 2021, “Water”: presented at panel for Materials Science and Infrastructure Live Webinar hosted by Texas State University and Panama Pacifico, June 22, 2021. [120]

Thompson, C. L., 2021, “Ensuring One Water Delivers for Healthy Waterways, A Framework for Incorporating Healthy Waterways into One Water Plans and Projects”: presented at the American Water Resources Association 2021 Virtual Summer Conference, July 19, 2021

Mace, R.E., and Thompson, C., 2021, “Setting the (Water) Table”: Fahrenheit 140 podcast, Episode 001, 59 minutes, July 23, 2021.

Arismendez, S. 2021. “Guadalupe Blanco River Authority Basin Steering Committee Meeting: Water Quality Monitoring Data Summary”: presented for virtual meeting on Teams. July 29, 2021. [~25]

Navarro, A. 2021, “Upper San Marcos River Watershed Updates”: presented at the annual CRP Steering Committee Meeting hosted by Guadalupe Blanco River Authority; online presentation; July 29, 2021 [33]

Arismendez, S. 2021. “Lower Cypress Creek Pilot Project: Concurrent Assessment of E. coli Bacteria and Optical Brighteners”: presented at virtual Cypress Creek Stakeholder Committee Meeting on Teams. July 29, 2021 [~15 attendees].

Arismendez, S. 2021. “Texas Stream Team Standard Core Water Quality Citizen Scientist Training”: presented in-person for training at Palacios Education Center, Palacios, Texas. August 14, 2021. [~10]

Mace, R.E., 2021, “Understanding OUR water”: presented at an event hosted by the City of Blanco and the Hill Country Alliance; Blanco, Texas; August 19. [70]

Mace, R.E., 2021, “Safe yield, sustainability, and science”: presented to INTERA; Austin, Texas; August 27, 2021.

Lopez, R., and Mace, R.E., 2021, “Rural land trends and what they mean for groundwater”: to be presented with Roel Lopez at the 2021 Texas Groundwater Summit, hosted by the Texas Alliance of Groundwater Conservation Districts, San Antonio, Texas, August 31, 2021.

Arismendez, S. and A. Navarro. 2021.”Water Quality Monitoring: Practical Guidelines & Lessons Learned”: to be presented in-person TWRI training at Mayan Ranch, Bandera, Texas. September 1730, 2021. [~30]

Mace, R.E., 2021, “Safe yield, sustainability, and science”: keynote to Association of Environmental & Engineering Geologist 64th Annual Meeting; San Antonio, Texas; September 22, 2021.

Hermitte, S.M., Blickenstaff, K., Brody, S., and Mace, R.E., 2021, “Moving the needle on flood data visualization and open water data”: Water for Texas 2021 Conference hosted by the Texas Water Development Board, September 2729, 2021.

Wait, M. “Virtual Meadows Center: Tour of the Wetlands Boardwalk and Glass-bottom Boat” to be presented at the Wetlands Training Class hosted by the Hays County Master Naturalist; San Marcos, Texas, September 1, 2020 [27]

Mace, R.E., “The Past, Present, and Future of Comanche Springs” presented virtually to the 2020 Virtual Texas Groundwater Summit hosted by the Texas Alliance of Groundwater Districts, September 3, 2020.

Mace, R.E., 2020, “Climate Change and Equity” presented to GEO 5309, Geographical Analysis, Texas State University, San Marcos, Texas; September 10, 2020 [30]

Navarro, A., and Arismendez, S. 2020, “Texas Stream Team Riparian Evaluation Citizen Scientist Training” to be virtually presented to the public, September 12, 2020. [20]

Mace, R.E., 2020, “If Water Could Talk: The History of Comanche Springs” presented virtually to the Fort Stockton Rotary Club. September 17, 2020 [30]

Mace, R.E., 2020, “The Hydro-history of Comanche Springs in Fort Stockton, Texas (and How It Changes Our Understanding of the Hydrogeology)” presented to GEO 5050, Geo Technical Sessions, Geosciences Department, Baylor University, September 18, 2020

[50]

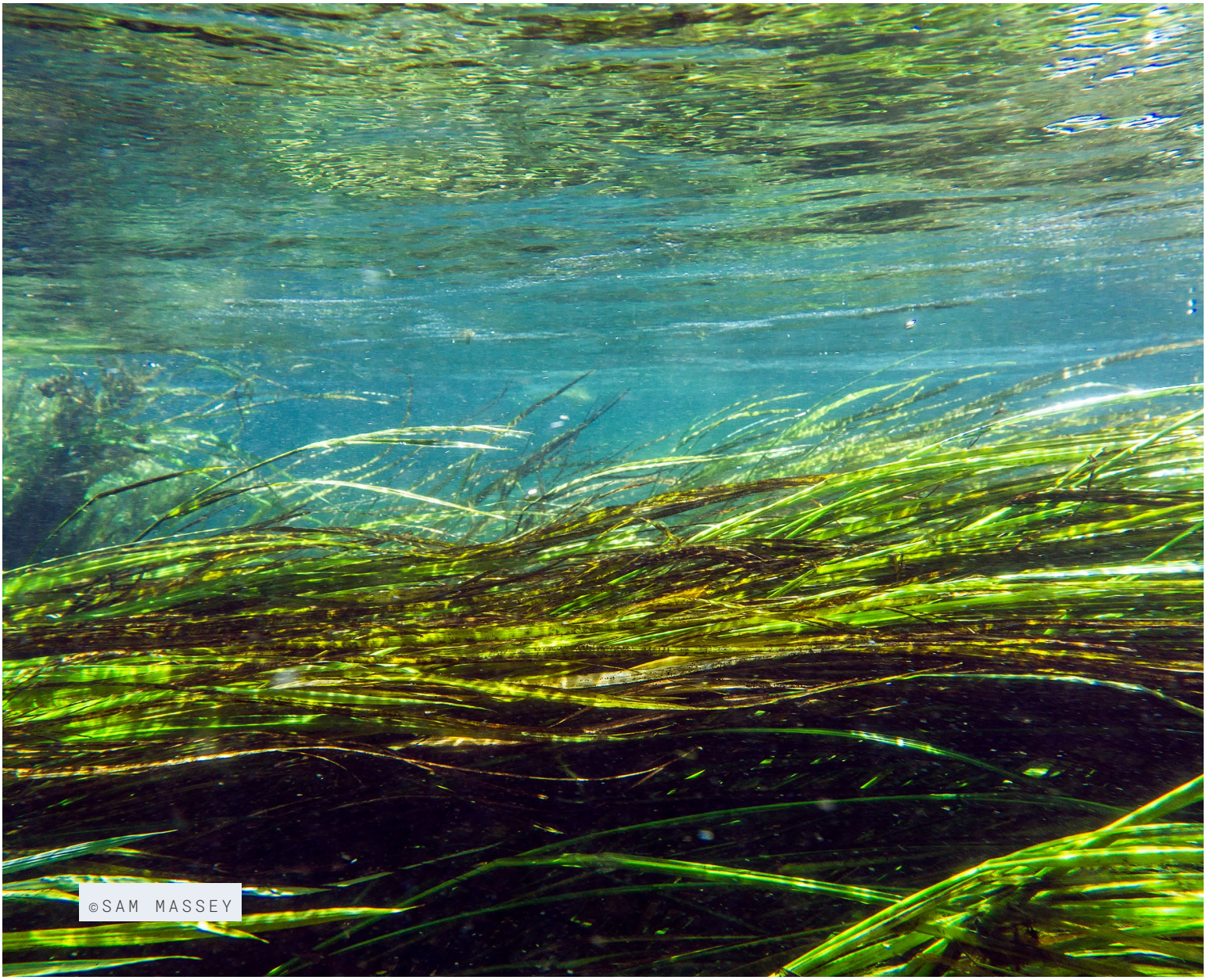
Cuddeback, Leah M. 2020, “Cultivating a Hill Country for All – Inspiring Stewardship, Conservation, and Communication” virtually presented at the Hill Country Leadership Summit 2020: The Future of Conservation in the Texas Hill Country hosted by the Hill Country Alliance, September, 22,2020. [panel moderator; ~140]

Mace, R.E., 2020, “The Meadows Center and the Blanco River Aquifer Assessment Tool” virtually presented at the Hill Country Leadership Summit 2020: The Future of Conservation in the Texas Hill Country hosted by the Hill Country Alliance, September 23, 2020. [120]

Arismendez, S. and J. Walker, 2020. “Citizen Science Water Quality Monitoring in Texas: Issues, Solutions, and Lessons Learned” to be virtually presented at the 2020 National Coastal and Estuarine Virtual Summit online on September 29 October 1, 2020. [~100]

Thompson, C., 2020, “Water and Planning: Ensuring One Water Delivers for Healthy Waterways” to be virtually presented to the American Planning Association Water and Planning Network. October 1, 2020. [~100]

Mace, R.E., 2020, “If Water Could Talk: The Hydro-history of Comanche Springs (and How They Could Return))” to be virtually presented to the annual meeting of the American Society of Agricultural and Biological Engineers—Texas Section, October 8, 2020.



Navarro, A., Arismendez, S. 2020, "Texas Stream Team Riparian Evaluation Citizen Scientist Training": to be virtually presented online at the statewide Texas Master Naturalist conference on October 15, 2020. [22]

Navarro, A., Arismendez, S. 2020, "Texas Stream Team Riparian Evaluation Citizen Scientist Training": presenting to the public: online presentation; October 17, 2020. [12]

Navarro, A., Arismendez, S. 2020, "Texas Stream Team E. coli Bacteria Water Quality Citizen Scientist Training": to be presented in-person on October 21, 2020. [2]

Cuddeback, Leah M. 2020, Exploring Undergraduate Research and Creating an Honors Thesis: presenting as part of a panel for Texas State University US1100 Honors students hosted by Texas State Honors College; San Marcos, TX; October 21, 2020 [~20]

Mace, R.E., 2020, Comanche Springs: Texas Water Development Board, October 23, 2020.

Walker, Jenna, J. 2020, "30 Years of Citizen Science Water Quality Monitoring in Texas: Challenges, Solutions, and Lessons Learned": presented at the National Nonpoint Source Training Workshop hosted by the United States Environmental Protection Agency; Virtual conference; October 27, 2020 [125]

Navarro, A., Arceneaux, L., and Simpson, S. 2020, "The San Marcos Green Alley Initiative: A Framework + Toolkit for Resilient, Green Infrastructure in Downtown San Marcos, Texas": virtually presented to San Marcos Area Chamber of Commerce; October 28, 2020 [27]

Wait, M., Evans, K., Miller, D., & Broughton, M. 2020, "Formal and Informal Learning Connections: Partnering to Support Learning in Our New Normal": virtually presented at the Conference for Advancement of Science Teaching hosted by the Science Teachers Association of Texas on November 6, 2020.

Arismendez, S. 2020. "E. coli Bacteria Texas Stream Team Training": presented in-person at the Headwaters of the Comal in New Braunfels, Texas, on November 14, 2020. [10]

Navarro, A., Campos, C. 2020, "Texas Stream Team Riparian Evaluation Citizen Scientist Training": presented to the public; online presentation; December 5, 2020. [10]

Navarro, A. 2021, "Texas Stream Team Background and Operations": presented at the Bobcat Stream Team March Meeting hosted by Bobcat Stream Team; online presentation; March 2, 2021 [6]

Dussler, Rob. 2021, "Nature Connection Stories and Research": presented to GEO 4323 Conservation Leadership at Texas State University; San Marcos, TX; March, 2, 2021. [20]

Navarro, A., Howard, M., Moreno, J., Schlandt, A., Weeks, E. 2021, "Upper San Marcos River Watershed Protection Plan Spring Meeting": presented at the biannual Upper San Marcos River watershed meeting hosted by The Meadows Center; online presentation; March 23, 2021 [28]

Arismendez, S. and C. Campos. 2021, "Texas Stream Team Riparian Evaluation Training": presented at the Riparian Evaluation Training hosted by Texas Stream Team; March 13, 2021.

Navarro, A., Arismendez, S. 2021, "Texas Stream Team E. coli Bacteria Water Quality Citizen Scientist Training": presented at the E. coli Bacteria Texas Stream Team training hosted by Texas Stream Team; online presentation; March 27, 2021 [9]

Mace, R., 2020, Water Sustainability: presented to SUST 5301, Texas State University, November 18, 2020. [20]

FY2021 EXTERNAL RESEARCH AND CREATIVE PROJECTS AT SPRING LAKE

Spring Lake is an environmentally, culturally, and archaeologically significant resource that serves as a living laboratory for researchers across the state.

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 that we supported at Spring Lake in Fiscal Year 2021.

CLASSROOM INSTRUCTION

BIO 4418: Bird Identification Field Trip
Dr. Green, Texas State Biology Department

Aquatic Biology
Dr. Schwalb, Texas State Biology Department

BIO 4400/5400: Plants Important for Wildlife
Dr. Daniel, Texas State Biology Department

ESS 4624: Outdoor Education
Dr. Griffin, Texas State Health & Human Performance Department

Field Biology of Plants
Dr. Lemke, Texas State Biology Department

Fundamental Field Biology Practices
Dr. Walter, Texas State Biology Department

GEO 4430: Field Methods
Dr. Krause, Texas State Geography Department

REC 2330: Leadership in Recreation and Leisure Services
Dr. Griffin, Texas State Department of Health & Human Performance Department

RESEARCH & CREATIVE PROJECTS

Blue Index
Madeline Wade, Texas State Biology Department

Geoarchaeological Coring at Spring Lake
Dr. Ahlman, Texas State Anthropology Department

Largemouth Bass Data Collection
Edwards Aquifer Authority

Palaemon texanus: Is It For Real?
Texas A&M University

Particulate Matter Air and Participation Study for Texas
University of North Texas

Phylogeographic Assessment of a Clade of Prawns
U.S. Fish and Wildlife Service/Texas A&M University

Population Structure of Heterelmis comalensis Before and After an Adverse Climatic Event
William Coleman, Texas State Biology Department

American Eel Movement Behavior Study
Texas A&M University Department of Ecology and Conservation Biology

Collections of Organisms for Edwards Aquifer Refugia
U.S. Fish and Wildlife Service

Deep in the Heart Documentary Filming
Ben Masters

Emergency Operations Safety Demo
Texas State Environmental Health, Safety & Risk Management

Grounds/Garden Maintenance
San Marcos River Foundation

Hydrophone Sample Collection
Southwest Research Institute

Invasive Removal Volunteer Days
Hays Master Naturalists, City of San Marcos

Mermaid Society SMTX's Mermaid Chats Filming
Mermaid Society SMTX

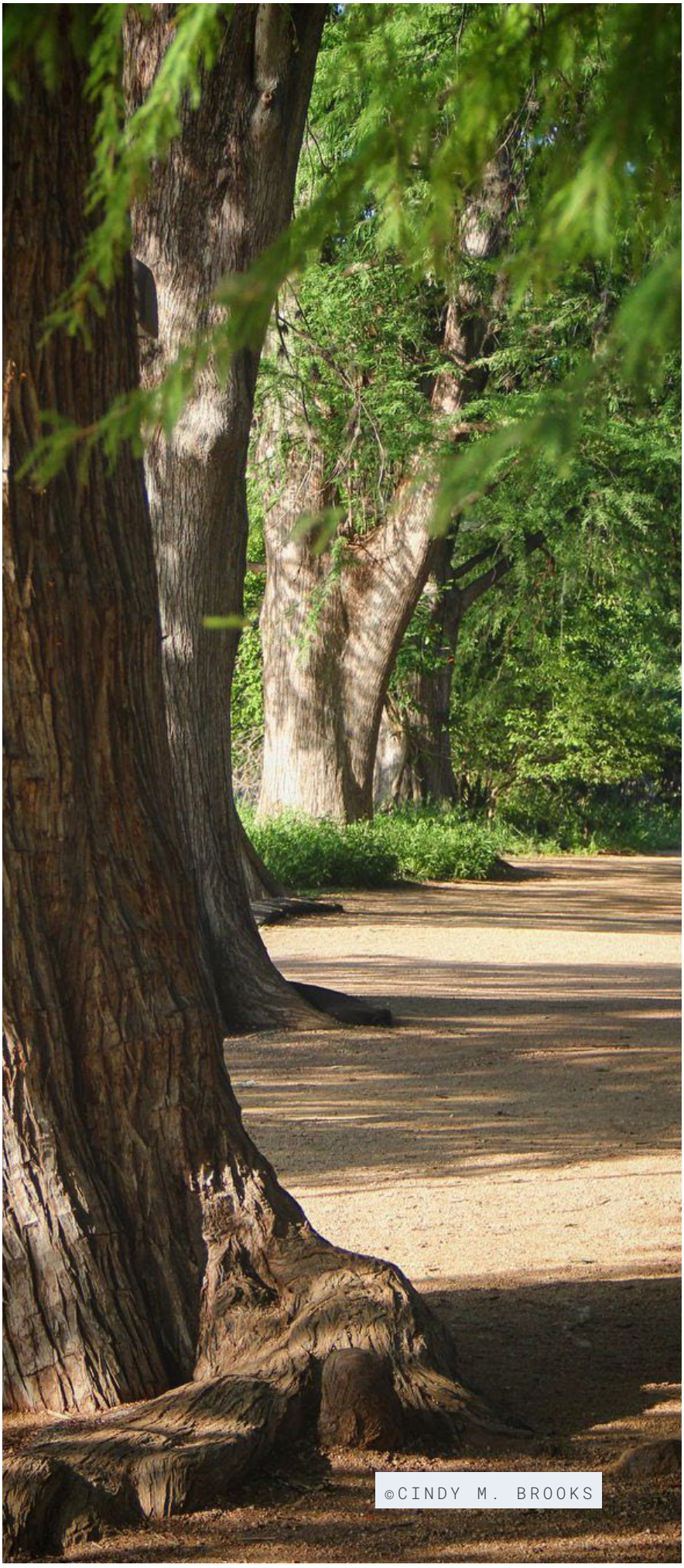
Nestbox Survey (dissertation research)
Rebekah Rylander, Texas Geography Department

Semi-Annual Fashion Show
Fashion Merchandising Association – Texas State University

Spring Lake Testing/Sampling of Hydrophone Array
Southwest Research Institute Division of Applied Physics

Texas School Safety Center PSA Filming
Texas School Safety Center

Water Quality Collection at Hotel Spring
Edwards Aquifer Authority



THANK YOU TO OUR 2021 DONORS!

The Meadows Center gratefully acknowledges the gifts made by the following corporations, foundations, individuals, and organizations in Fiscal Year 2021 (listed in alphabetical order). On behalf of our staff and students, thank you for strengthening our work.

INDIVIDUALS

Shannon Athey
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Jay Barr
Priscilla Beesley
Scott B. Birkey
Bryan Blauvelt
David W. Bolch
Kambra K. Bolch
Barbara E. Breier
Lt. Col. (Ret.) John A Brier
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FOUNDATIONS & CORPORATE DONORS

Alice Kleberg Reynolds Foundation
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Shield-Ayres Foundation
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The Cynthia & George Mitchell Foundation
The Meadows Foundation
The Summerlee Foundation
The Way Family Foundation
The Winkler Family Foundation
Way Family Foundation
Wells Fargo & Company

WHY I GIVE

The Meadows Center has been a special place for our family and has also become a big part of our efforts related to environmental education. It is a peaceful outdoor getaway for our family that we can count on to slow life down a bit. We are also grateful for the added benefit of the great role modeling displayed by the Texas State students who often lead or teach our children about the springs, wildlife, and the environment.

Michael Cummings,
Headwaters Fund Donor

The Meadows Center
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