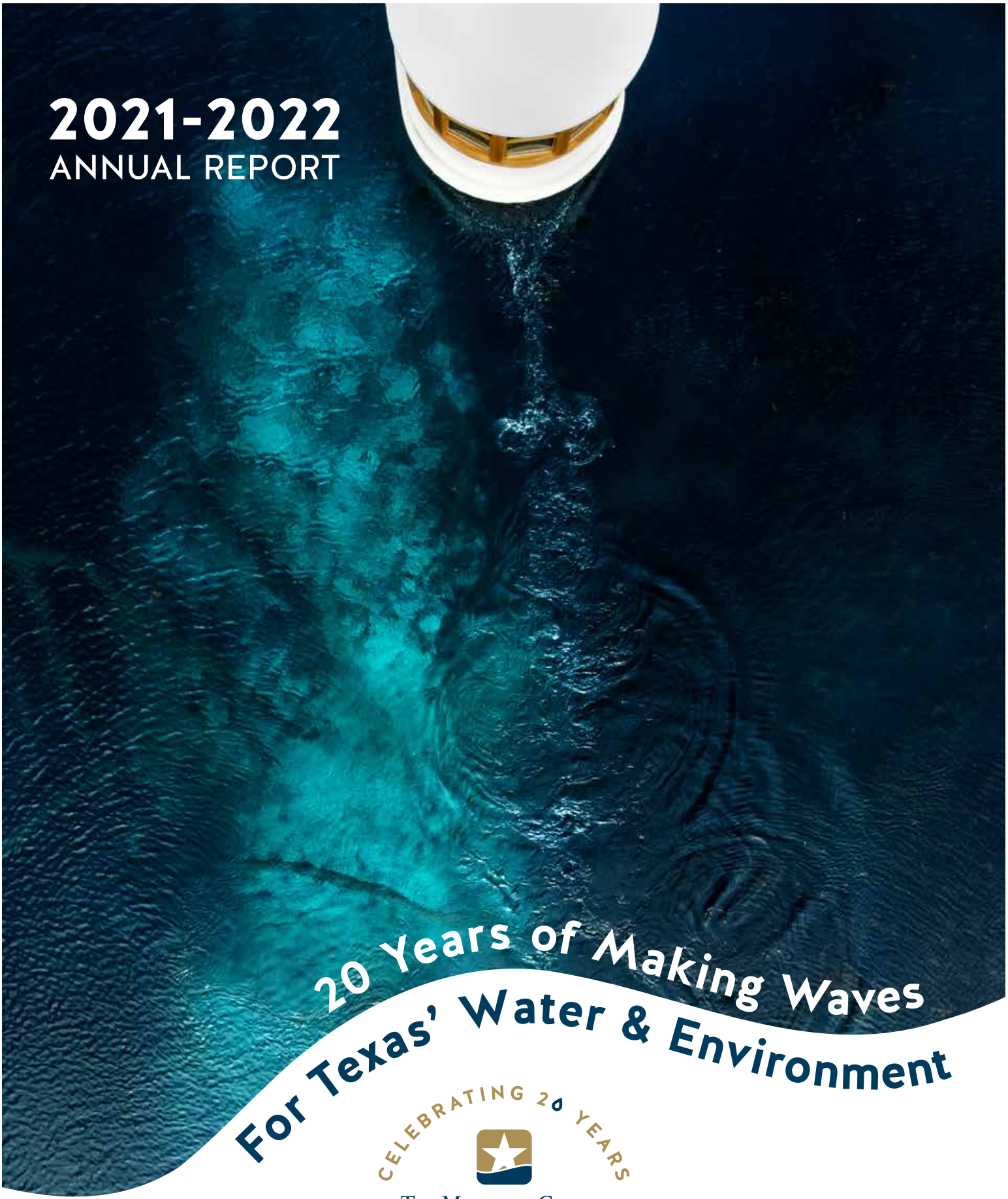


2021-2022 ANNUAL REPORT

20 Years of Making Waves For Texas' Water & Environment

CELEBRATING 20 YEARS

The Meadows Center
for Water and the Environment
Texas State University

MEMBER **THE TEXAS STATE UNIVERSITY SYSTEM**

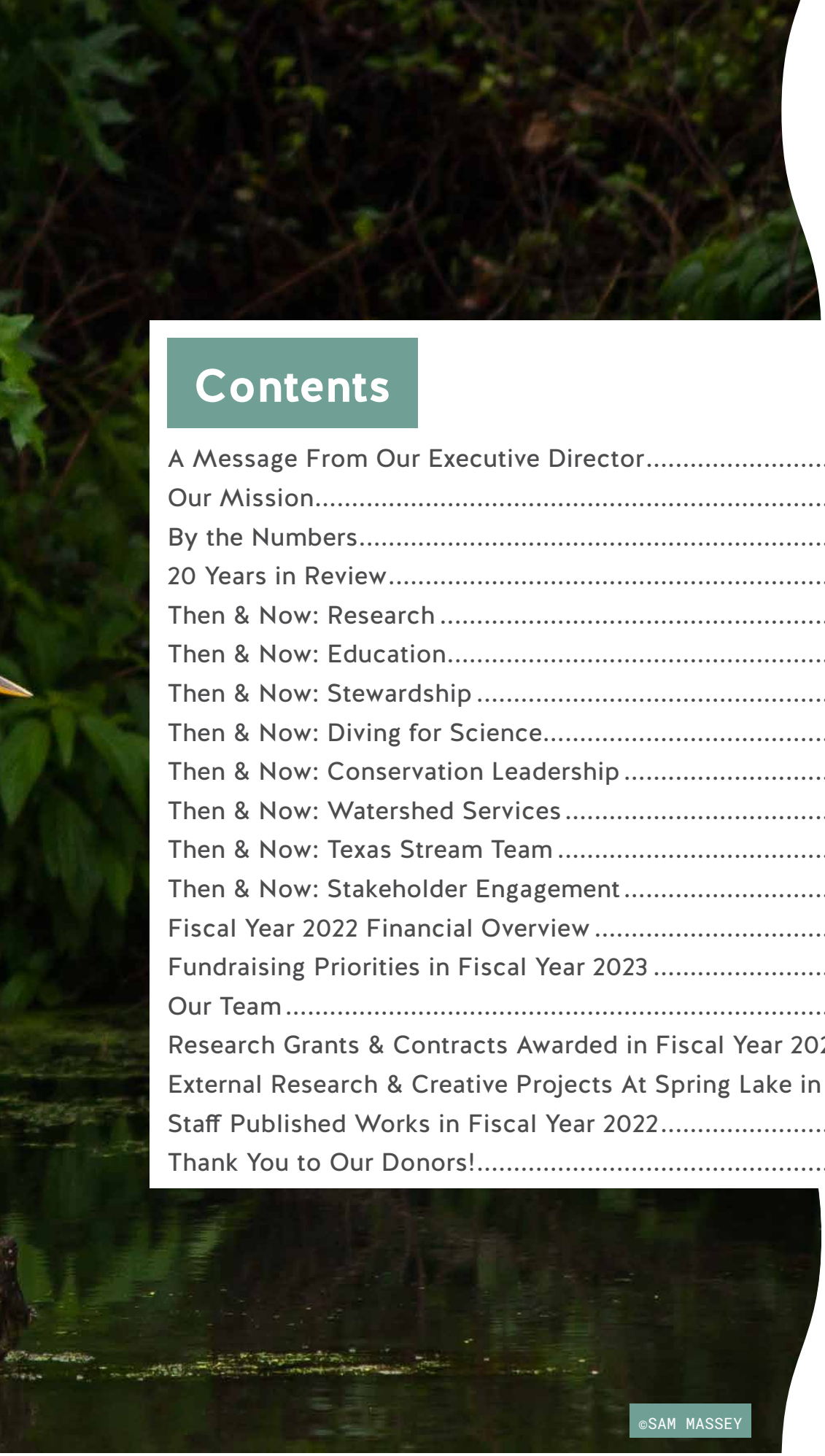
Foreword

2022 marks the 20th Anniversary of The Meadows Center for Water and the Environment – 20 years of connecting children and people of all ages to the natural resources that nourish and sustain; 20 years of providing communities with research and tools to plan for uncertainty and build resilience; 20 years of restoring iconic Texas rivers and building science to inform policies that support their long-term protection.

Anniversaries are a time to celebrate achievements, big and small, but also an opportunity to examine how we have navigated the challenges along the way. Please enjoy this commemorative report as we acknowledge the good work and the good people that make the Meadows Center a truly special place and the impact we have made with the support of our donors and friends.

While we are proud of our achievements in 2022 and over our 20-year journey, there is much more to be done to ensure abundant water for the environment and all humanity. We are committed to making even bigger waves for Texas water as we — with your help — face some of the greatest challenges yet.

Scan the code with your phone's camera to view a digital version of this report, or visit **fy22.MeadowsWater.org**.



Contents

THE ENDANGERED FOUNTAIN DARTER LIVES EXCLUSIVELY IN THE SAN MARCOS AND COMAL RIVER HEADWATERS ©SAM MASSEY

A Message From Our Executive Director

When my grandparents celebrated their 50th wedding anniversary, it was quite the shindig. Family, extended family, and friends flew into Chicago from across the country to honor their partnership. My grandparents met during World War II when he was in the Army, and she was in the Women's Army Corp. Thankfully, he came back from Europe after stints at the Battle of the Bulge and Patton's march on Germany and married my grandmother. As he proudly viewed the swirling mayhem of his children, grandchildren, and great-grandchildren, he leaned over to me and whispered, "See what a little kiss did?"

The spark for the Meadows Center was a little conversation between Andy Sansom, then executive director of Texas Parks and Wildlife Department, and Jerome Supple, then president of Southwest Texas State University (now Texas State University), after a legislative budget hearing in 2001. With support from The Meadows Foundation and the Houston Endowment, Andy and Texas State established the International Institute for Sustainable Water Resources in January 2002 as a leadership initiative to coordinate and further university-wide efforts in the field of aquatic resource management. In 2005, Texas State renamed the institute the River Systems Institute to reflect a focus on river systems. A generous gift from The Meadows Foundation in August 2012 welcomed a name change — The Meadows Center for Water and the Environment — and an expanded focus on all aspects of water and the environment.

Twenty years in, we have hosted more than **1.3 million visitors** to Spring Lake (since 2006), including more than **450,000 students**; trained more than **11,500 citizen scientists** as part of the Texas Stream Team; trained more than **1,700 volunteer divers** to maintain spring habitat; removed more than **140,000 square feet of non-native plants** and planted more than **180,000 square feet of native plants** in the San Marcos Springs and San Marcos River; and **supported more than 1,100 students** through research and education projects. The Center has hosted numerous conferences and meetings, published numerous reports, and worked at the forefront of numerous issues, including environmental flows, climate change, flooding, groundwater sustainability, and water conservation, among others. Andy could easily lean over and whisper in my ear, "See what a little conversation did?"

As we celebrate our 20th anniversary as a research center and our 10th anniversary as the Meadows Center, it's also important to look forward because our work is not done. In fact, with ever-increasing growth and climate change, you could argue that our work is just beginning, its importance amplified with each new subdivision and each upward tick in temperature. With the continued support of our talented team, inspiring students, and conscientious funders, we will continue to support educating the public, understanding our water and our environment, and informing decisionmakers on water-sensitive and environment-sensitive options for meeting the state's needs while keeping Texas, Texas. And we will do this in our backyard — the Hill Country, across Texas, and the world.

Your friend in water and the environment,

Dr. Robert E. Mace

VIEW OF SPRING LAKE FROM A GLASS-BOTTOM BOAT ©ALI CHAN

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.

Our Pillars

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

LEADERSHIP

EDUCATION

STEWARDSHIP

Fiscal Year 2022 By the Numbers

$1,552,052
research dollars awarded to our faculty and staff

$276,704
donations raised to support our mission

125
students supported by our research and education projects

74,961
visitors to Spring Lake

21,144
children and university students engaged in outdoor learning

401
new citizen scientists trained

16,165 m²
non-native species removed from Spring Lake and the San Marcos River

7,391
native species planted in Spring Lake and the San Marcos River

138
volunteer divers trained to help preserve Spring Lake

20 Years By the Numbers

1,112
students supported by our research and education projects since 2002

1,406,848
visitors to Spring Lake since 2006

463,206
children and university students engaged in outdoor learning since 2006

11,683
citizen scientists trained since 1991

181,394
native species planted in Spring Lake and the San Marcos River since 2013

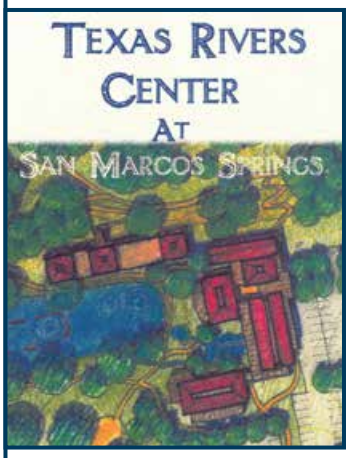
143,618 m²
non-native species removed from Spring Lake and the San Marcos River since 2013

1,732
volunteer divers trained to help preserve Spring Lake since 2014

20 Years in Review

2003

Construction begins on the Texas Rivers Center at the San Marcos Springs.



2006

The Texas Rivers Center is unveiled at a grand reopening event. Our headquarters move to Spring Lake Hall, and Texas Watch becomes a part of the River Systems Institute.

2008

Texas Watch is renamed to Texas Stream Team to better align with its goals and mission.

2002

Texas State receives startup funding from the Houston Endowment Inc. to establish the International Institute for Sustainable Water Resources and Dr. Andrew Sansom, one of Texas' most beloved conservationists, is selected to develop, analyze, promote, and facilitate the holistic management of river systems.

Preliminary plans for the construction of a Texas Rivers Center at the San Marcos Springs are approved.

RIVER SYSTEMS INSTITUTE
Texas State University

2004

The International Institute for Sustainable Water Resources is renamed the River Systems Institute and is given responsibility for the development and operation of the Texas Rivers Center and the Aquarena Center.

2009

U.S. Rep. Patrick M. Rose secures a $1 million legislative appropriation for the River Systems Institute to begin the San Marcos River Observing System project to contribute scientific expertise to the Edwards Aquifer Recovery Implementation Program.

Texas State and the family of A.B. Rogers, founder of the original Aquarena Springs Resort in 1928, establish a permanent endowment in hopes that the glass-bottom boats are maintained for generations to come.

2013

The Edwards Aquifer Habitat Conservation Plan is approved and the City of San Marcos begins partnership with the Meadows Center to support the plan's implementation in Spring Lake and the Upper San Marcos River.

2016

The White House honors the Meadows Center and its partners for the Texas Environmental Flows Initiative at the first-ever Water White House Summit.

THE WHITE HOUSE
WASHINGTON
WHITE HOUSE
WATER SUMMIT 2016

2020

Following a national search, Texas State selects Dr. Robert Mace to serve as Executive Director of the Meadows Center.

2012

The Meadows Foundation gives a transformational gift to the River Systems Institute, which is then renamed as The Meadows Center for Water and the Environment.

2014

Texas State and the U.S. Army Corps of Engineers complete the $3.7 million Spring Lake Aquatic Restoration Project, removing many of the relics of the former theme park.

2021

Texas Stream Team celebrates 30 years of citizen science and trains its 11,000th citizen scientist.

2022

A $2 million legislative appropriation secured by U.S. Rep. Lloyd Doggett for the Climate Change Impact on Water Initiative is coupled with a half-million-dollar gift from the Meadows Foundation to lay the path for the Meadows Center's leadership on climate issues in Texas.

Then & Now: Research

Research has always been central to our mission and informs our education and stewardship programs. This brief history offers a glimpse into some of the milestones of the Meadows Center's research.

A Vision For Holistic River Management – The International Institute for Sustainable Water Resources

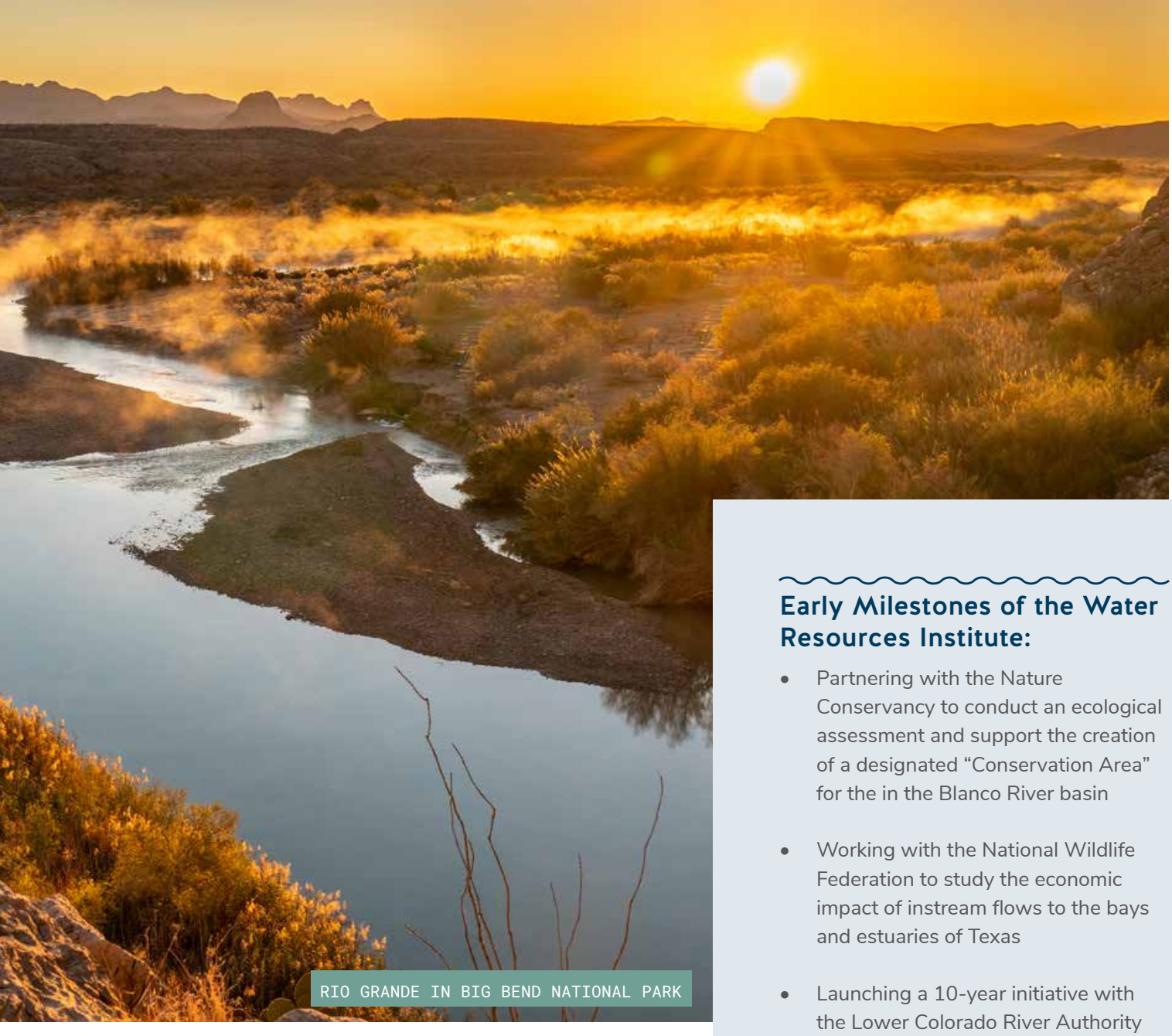
With the spring-fed San Marcos River born and running through the heart of its campus, Texas State University was always well-positioned to become the leading academic authority and resource on water issues in Texas and beyond.

In the early 2000s, in the midst of a severe drought, it became apparent that Texas' water policies were not up to the task of addressing the state's water needs. Science was needed to identify management solutions and the various university-led water institutes in existence at that time focused on the engineering and technological aspects of water resources. There was a clear need for an academic institution to deliver science and solutions to address the crucial environmental, social, and political elements of water issues.

In January 2002, the Houston Endowment Inc. provided the seed funding to establish the International Institute for Sustainable Water Resources (Water Resources Institute) and Dr. Andrew Sansom, one of Texas' foremost and most beloved conservationists, was selected to lead the endeavor.

The Water Resources Institute was unique in its devotion to comprehensive, integrated water resource management. Its research was rooted in a solutions-driven approach to address real-world issues and inform science-based solutions from which decisionmakers could make choices.

The Institute was small by design, with only two full-time staff in its infancy, and functioned as a connector and hub for university-wide efforts in water management. With the startup funding from the Houston Endowment Inc., the Institute began developing integrated watershed management models in the Rio Grande, Colorado, and Guadalupe river basins, pulling expertise from Texas State's Geography, Biology, and Political Science Departments to create models that provided guidance for achieving sustainable freshwater resources and addressed dispute resolution for water rights issues.



RIO GRANDE IN BIG BEND NATIONAL PARK

A Foundation of Research – The River Systems Institute

In 2005, the Institute was renamed the River Systems Institute to establish a unique niche for the program and reflect a sharpened emphasis on its research of river systems. Over the next seven years, the Rivers System Institute built its reputation of connecting decisionmakers with Texas State researchers ready to contribute to solving real-world water problems and entered into a variety of projects with major state, federal, and international players in natural resource management.

With the addition of Dr. Thomas Hardy, an internationally recognized leader in ecohydraulics and river system modeling, during a period of substantive state-wide work on instream flows, the River Systems Institute became a

Early Milestones of the Water Resources Institute:

- Partnering with the Nature Conservancy to conduct an ecological assessment and support the creation of a designated “Conservation Area” for the in the Blanco River basin
- Working with the National Wildlife Federation to study the economic impact of instream flows to the bays and estuaries of Texas
- Launching a 10-year initiative with the Lower Colorado River Authority and the San Antonio Water System to convene a scientific review panel to research the feasibility of a long-range transfer of water from Colorado to the San Antonio River
- Initiating a seven-year bi-national partnership with the National Autonomous University of Mexico to study the Rio Grande from Colorado to the Gulf of Mexico
- Working with the University of Texas to monitor health of seagrass systems in Texas bays and estuaries

known authority on environmental flows and the fragile habitats of our rivers, bays, and estuaries.

With funded research growing to 1.5 million, the addition of resident scientists enhanced a growing reputation and built Texas State's scientific capacity in the water arena. Between 2005 and 2012, the Institute's team grew from five to 17 full-time positions.

Research + Education + Stewardship + Leadership – The Meadows Center for Water and the Environment

2012 brought yet another name change, but this time it would stick. The Meadows Foundation contributed a transformational $5 million gift to Texas State, endowing the Institute and enabling an expansion of research into water conservation, environmental flows, watershed protection, and environmental education.

The Meadows Foundation's gift supported the recruitment of several key leadership positions to realize this expanded vision, including the initial hiring of Dr. Robert E. Mace, former deputy executive administrator of the Texas Water Development Board, who was selected to serve as Chief Water Policy Officer in 2017 (and later Executive Director in 2019). With his experience in state government, Dr. Mace brought intricate knowledge of how science can be effectively used in the policy world.

The new Meadows Center brand would be the key to achieving the research and education vision for the former theme park known as Aquarena in a program called Spring Lake Education and provide the opportunity to stitch the decades-old citizen science expertise of the Texas Stream Team with the years of in-house river conservation expertise in a program called Watershed Services.

The River Systems Institute received a million-dollar legislative appropriation in 2009 to launch the San Marcos River Observing System. The results of this research established a long-term monitoring program as well as a comprehensive management plan for Spring Lake and the San Marcos River.

THE SAN MARCOS SPRINGS ©JENNIFER IDOL

REP. LLOYD DOGGETT JOINED DR. ROBERT MACE TO UNVEIL THE DETAILS OF THE MEADOWS CENTER'S CLIMATE CHANGE STUDY DURING A PRESS CONFERENCE HELD AT SPRING LAKE IN JUNE 2022

What's NEXT?

Today, the Meadows Center continues to make waves across the Lone Star State. Our team has grown from two to 28 full-time staff who carry out our founder's mission of leading research that bridges the gap between academia, non-profit organizations, and policymakers. And after two decades, the Center's role is more important now than ever as rapid population growth, land development, and climate change are intensifying stresses on water and the environment.

Thanks to a generous starting gift from the Meadows Foundation, we have embarked on an ambitious, multi-year effort to prepare Texas for climate change's effects on water resources through education, applied science, and policy analysis. Bolstered this year by a $2 million congressional appropriation to develop climate change models aimed at analyzing the impact on surface water and groundwater at the local level, this work will enable us to provide a policy roadmap for individual stakeholders, communities, and public officials to prepare Texas for challenges related to water resources, the environment, and the economy.

Like life on Earth, the Meadows Center's research constantly evolves. We are studying the connection between groundwater and surface water, facilitating stakeholder committees to advance our knowledge of freshwater systems in countless communities, and leading One Water projects across the state. And, while our reach has expanded far beyond the role of academic hub – now making waves in environmental education, citizen science, local community planning, groundwater sustainability, our brand is the same. Past, present, future, and from whatever source – water is what we do.

SEE MORE

Scan the code with your phone's camera to learn more about the Meadows Center's research, or visit **meadowscenter.txst.edu/Research.**

Then & Now: Education

In 1994, Texas State University became the steward of one of the most unique ecosystems in the world when it purchased the Aquarena Springs resort and theme park. The 90-acre (and $7 million) acquisition of the beautiful, ecologically fragile San Marcos Springs opened endless possibilities for Texas State and started a multi-decadal effort to move the resort facilities in an educational and environmental direction.

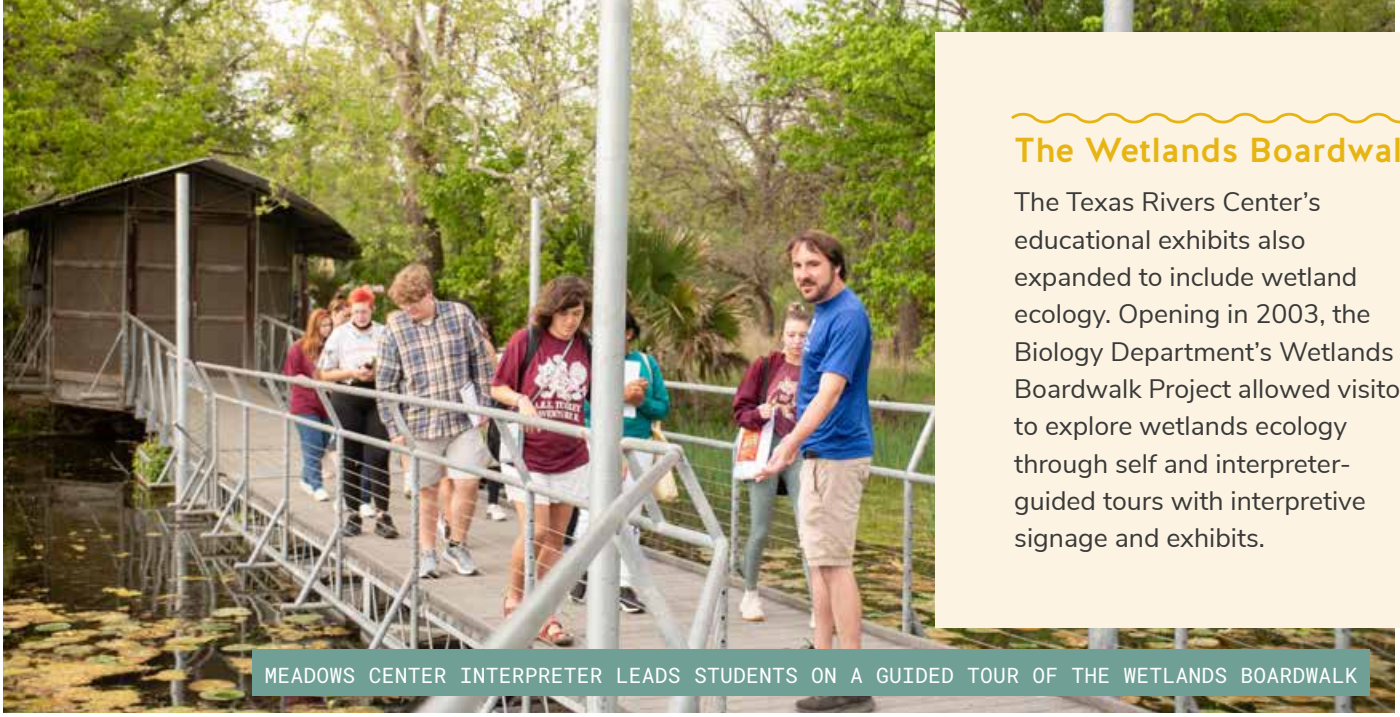
From Historic Resort to Premier Environmental Programming

After a couple of years of trying to continue the park operations with this new emphasis, and a couple of million dollars sunk in the endeavor, Texas State began the true transformation of the property from a commercial-use theme park to an educational and research facility. While the glass-bottom boats would remain in operation, the dancing mermaid shows and theme park-like rides were eliminated.

Initially designated as Aquarena Center under the Office of Continuing Education, the Center became the first designated field station in Texas (making it eligible to receive National Science Foundation funding) and added educational public programming including seven different interpreter-led tours – from bird watching and botanical tours to the infamous glass-bottom boat tours. The Center also joined the Texas Education Agency's Environmental Education Advisory Committee, and tours were customized to meet specific grade levels and classroom learning goals, including the Texas Essential Knowledge and Skills (known as TEKS).

In 1998, Texas State entered into an agreement with Texas Parks and Wildlife to transform historic Spring Lake Hall into a multi-million dollar education facility that incorporated meeting rooms, laboratories, and conference facilities to be named the Texas Rivers Center. Completed in 2006, this renovation removed many of the former resort's remaining buildings, roads, and parking lots and converted the former Aquarena Springs Inn into administrative offices, classrooms, interpretive exhibits, and a gift shop. By completion, more than 100,000 square feet of impervious cover had been removed and replaced with vegetation moving the site closer to ecological restoration.

AERIAL VIEW OF SPRING LAKE IN 1969 (LEFT) AND 2018 (RIGHT)



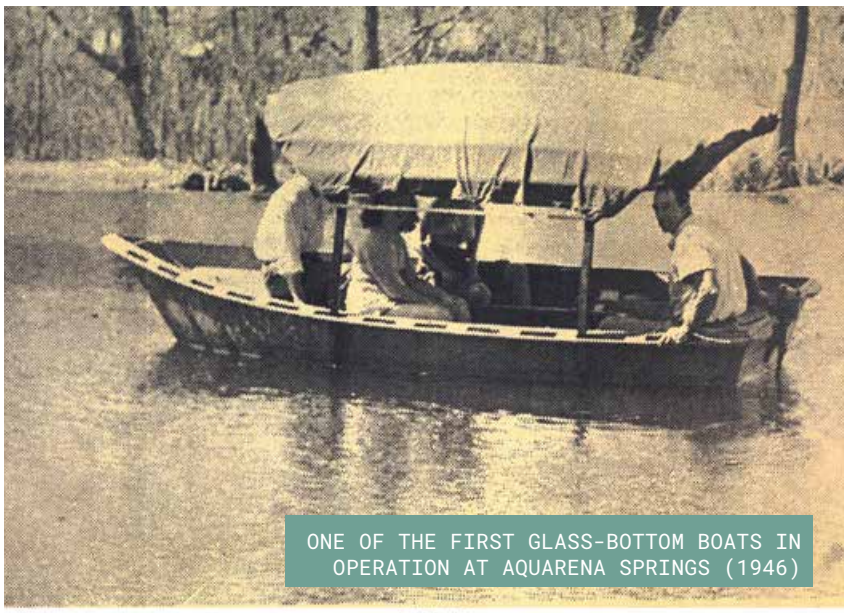
MEADOWS CENTER INTERPRETER LEADS STUDENTS ON A GUIDED TOUR OF THE WETLANDS BOARDWALK

The Wetlands Boardwalk

The Texas Rivers Center's educational exhibits also expanded to include wetland ecology. Opening in 2003, the Biology Department's Wetlands Boardwalk Project allowed visitors to explore wetlands ecology through self and interpreter-guided tours with interpretive signage and exhibits.

The Texas Rivers Center became a showcase for the San Marcos Springs, but this time not for the kitschy theme park attractions – visitors were coming from all over the world to make a connection with the critical role that the water plays in their lives.

Despite all of the other changes, there was still no better way to experience the wonder of the San Marcos Springs than by touring them on the historic fleet of glass-bottom boats that have characterized Spring Lake for over 60 years. And with the support of the family of the original 1928 resort's founder, A.B. Rogers, Texas State created a permanent maintenance endowment in 2009 in hopes of keeping the glass-bottom boats in operation for generations to come.



ONE OF THE FIRST GLASS-BOTTOM BOATS IN OPERATION AT AQUARENA SPRINGS (1946)

Under the leadership of the River Systems Institute, the Center received over 75,000 annual visitors in 2010, with roughly 22,000 of those being school children on field trips. And programming expanded to include weekend kid programs, senior tours, and Girl and Boy Scout merit badge programs to serve the diversity of individuals in the local community. After 16 years of devoted commitment from the staff, the re-branded educational destination finally turned its first profit. Boat ticket sales and community support still provide the funding that keeps the boats running and the educational programming available to our community.

RIBBON CUTTING HELD IN 2018 TO WELCOME RESTORED BOAT #1963 BACK TO SPRING LAKE

Under the banner of the Meadows Center, Spring Lake became the first informal education center

GUIDED STAND-UP PADDLEBOARD TOUR AT SPRING LAKE ©BEE ABOVE MEDIA

to be named a Texas Aquatic Science Certified Field Site by Texas Parks and Wildlife. The Center also launched a new teacher program to give educators the tools and training to incorporate more environmental education in the classroom. Teachers can now earn Texas Environmental Education Advisory Committee professional development credit while their students are on a field trip at Spring Lake.

In 2017, Dr. Rob Dussler's selection as the Chief Education Officer ushered in a new era and direction for the Center's education programs that emphasizes immersive programs (like snorkeling, kayaking, and paddleboarding) and research related to education, interpretation, mindfulness, and nature connection.

Mindfulness At The Meadows

Dr. Dussler teamed up with Texas State Professor Dr. Anthony Deringer in 2020 to investigate the value of incorporating mindfulness training into the practice of interpretation.

Findings from their research have led to a new Mindfulness at the Meadows educational program, which helps students hone their nature observation skills through mindful approaches and techniques. In this program, students use mindful practices to find answers to research questions about their environment.

SNORKELER EXPLORING SPRING LAKE ©ZAC WITTE

In 2020, recognizing that the state had not yet incorporated climate change science in the state curriculum, the Meadows Center began to expand the impact of its expertise in environmental curriculum development and teacher training by creating TEKS-aligned content related to climate change.

We are proud to continue the legacy of this special site and continue to create lasting memories and connections to nature for the 35,000+ Texas children who visit each year.

What's NEXT?

As the Meadows Center enters its next decade, we have big plans for our educational programming to keep them relevant and impactful.

On-site, we continue to work toward an inclusive learning environment that meets the needs of all people who visit our site through the "Spring Lake: Access for All" initiative. With support from partners like H-E-B, we are taking steps to make our site fully accessible in the next four years.

And while connecting students with nature at Spring Lake will always be central to our work, the pandemic taught us that we can also strengthen students' connection to the outdoors through distance learning.

Innovations in distance learning are enabling us to reach students who might never have the opportunity to visit Spring Lake due to economic or geographic barriers. We have created a virtual reality educational experience that allows adults and children to explore the underwater realms of Spring Lake in a 360-degree virtual platform. Participants can interact with the lake and its species to augment their learning and understanding.

We will be working harder than ever to expand our reach far beyond Spring Lake and are committed to starting the climate change conversation in Texas schools. Our new TEKS-aligned educational field trip called the Climate Explorers' Program teaches students how to be solution-based in their thinking about environmental stewardship. And our new educator resource hub assists educators in their climate change educational efforts and interests. Future initiatives include teacher workshops and professional development opportunities for educators to increase their skills in incorporating climate change into curricula and environmental interpretive programs across the state.

SEE MORE

Scan the code with your phone's camera to learn more about education at the Meadows Center, or visit ***meadowscenter.txst.edu/Education.***

WHY I GIVE

"I have been at Texas State for 37 years and have watched how the Meadows Center has evolved. I am extremely grateful for the important work they do to preserve Spring Lake. Equally as important is the education they provide to the public about one of our most important resources – water. One of my most favorite traditions is taking a glass-bottom boat ride. It reminds me of how important it is to protect this area and how changes here can literally have downstream effects. I am thrilled to be able to contribute to this wonderful Center."

MELISSA HYATT

HEADWATERS FUND DONOR

Then & Now: Stewardship

The San Marcos Springs is one of the largest freshwater springs systems in the state. As the entrusted stewards, the Meadows Center ensures that Texas State University fulfills its commitment as guardian of Spring Lake by carefully managing and maintaining its ecosystems.

Securing San Marcos Spring Flows and River Ecology

Thanks to forward-thinking individuals and decades of work that resulted in the 2013 Edwards Aquifer Habitat Conservation Plan, the use of the aquifer that feeds these springs is now being managed to keep the springs flowing and the unique species here thriving in perpetuity.

This monumental achievement, however, was preceded by decades of uncertainty for the springs – and even the extinction of at least one of the unique species of Spring Lake.

Meadows Center leadership worked alongside policy-makers to help pass Senate Bill 3 in the closing hours of the 80th Texas Legislative Session in 2007. The result was that all Edwards Aquifer stakeholders were mandated to participate in the creation of a federally-approved Habitat Conservation Plan for the Comal and San Marcos Springs.

The new legislation also tasked the Meadows Center to assist in forming an expert science subcommittee to analyze species requirements related to spring discharge rates and aquifer levels. Our Chief Science Officer was selected to direct the subcommittee in leading research to determine measures to protect flow at Comal and the San Marcos Springs.

The Habitat Field Crew

Implementing the Habitat Conservation Plan is more than managing water use and springflows. The health of the species and their habitats is also dependent on the management of the recreational activities, impacts from development, and competing/invasive species that affect the San Marcos Springs and River. So, 2013 also marks the birth of the Meadows Center's Habitat Field Crew. Led by Research Associate and Fish Biologist, Tom Heard, this team of highly skilled biologist divers works directly with the City of San Marcos to rehabilitate aquatic habitats and conduct research to strengthen conservation efforts in Spring Lake and the San Marcos River.

Aquatic habitat restoration is a tough job, especially in crystal-clear waters and consistent temperatures that allow for abundant (often invasive) aquatic growth. Our Habitat Field Crew continuously monitors Spring Lake and the San Marcos River for non-native and native plants. Non-native species are removed by hand and sent to composting, while native aquatic plants are grown on campus to be replanted in the river.

HABITAT FIELD CREW STUDENTS REMOVING INVASIVE VEGETATION, RAIN OR SHINE

Protecting Texas wild-rice

Dr. Hardy's research led the Texas Parks and Wildlife Commission to designate a two-mile segment of the Upper San Marcos River as a State Scientific Area in 2011 to address recreational impacts on the endangered Texas wild-rice.

The designation made it unlawful to uproot the Texas wild-rice. It also allowed for the creation of restricted areas when the river's streamflow falls below 120 cubic feet per second to temporarily limit access to areas where Texas wild-rice was present.

Today, the City of San Marcos and Texas State frequently use this designation as a tool to achieve species protection while balancing the needs of recreational users.

SIGNAGE DESIGNATING THE STATE SCIENTIFIC AREA THAT PROTECTS TEXAS WILD-RICE

TEXAS WILD-RICE GROWING IN THE TEXAS STATE RACEWAYS

BULK REMOVAL OF HYDRILLA IN THE SAN MARCOS RIVER

SCUBA DIVERS DEPLOY TRACKING EQUIPMENT TO STUDY MOVEMENT PATTERNS OF SUCKERMOUTH ARMORED CATFISH

Over the past 10 years, the Habitat Field Crew's efforts have nearly doubled the endangered Texas wild-rice distribution – increasing areal coverage from 5,019 square meters in 2013 to 14,747 square meters in 2021. Texas wild-rice is only found in the San Marcos River, so it's important to have larger distributions to ensure its survival.

The crew has also significantly reduced the presence of invasive species in the river. Most notably, our efforts have led to an 80 percent removal of Hydrilla, one of the world's worst aquatic invasive plants! Hydrilla is the primary invasive species in the San Marcos River and can persist for years following the initial removal due to the reproductive capabilities of its root structure. This requires our scuba divers to routinely perform extensive searches of the river to prevent Hydrilla from re-establishing.

The Habitat Field Crew also assists faculty and staff from Texas State and other institutions on research projects that require aquatic fieldwork. Recent projects have included scuba dives to conduct mark-recapture population surveys on the big claw river prawn and tagging suckermouth armored catfish to track population movements and quantify habitat associations.

In the past, we have worked alongside San Marcos Aquatic Resources Center on annual Texas wild-rice surveys, performed visual surveys to estimate endangered fountain darter populations, and identified macroinvertebrates collected to assess the ecological health of the San Marcos River.

These nimble field biologists have also collaborated with organizations on projects involving the use of unmanned aerial vehicles to gather aerial imagery across many parts of Texas, including surveys of bird populations along the Texas Coast and desert lizard habitat in the Permian Basin.

COLLECTING TRASH FROM THE SAN MARCOS RIVER

What's NEXT?

Initially created to implement the Habitat Conservation Plan, the Habitat Field Crew's success has attracted additional partners looking to capitalize on their expertise and almost daily presence in the river. The San Marcos Lions Club has partnered with the team to collect litter from under the water's surface while performing their regular invasive plant management scuba dives – a huge benefit to a community that brings in thousands of visitors to recreate in its waters.

It is difficult to imagine the protection of the San Marcos River without this dedicated crew working every day to clean the river. The Habitat Field Crew represents conservation at its finest, and perhaps no other work we do reflects the visible contrast of a "then" before the Meadows Center and "now" with the Habitat Field Crew stewarding the river we call home.

PLACING ARTIFICIAL MUSSELS IN THE SAN ANTONIO RIVER

Building Artificial Mussels

Our Habitat Field Crew is working with Utah State University on a large project funded by the U.S. Army Corps of Engineers that uses 3D printing technology to create specific species of freshwater mussels. These artificial mussels are now being tracked by our team in the Mission Reach of the San Antonio River.

SUBSTRATE ANALYSIS FROM SAMPLES COLLECTED FROM THE MISSION REACH OF THE SAN ANTONIO RIVER

SEE MORE

Scan the code with your phone's camera to learn more about the Habitat Field Crew, or visit ***meadowscenter.txst.edu/Stewardship/HabitatFieldCrew.***

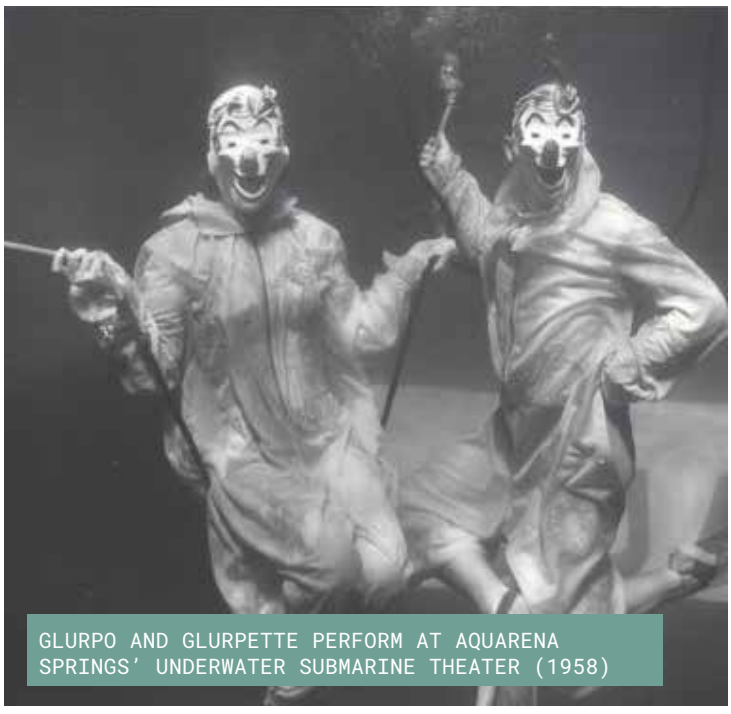
Then & Now: Diving for Science

Scuba diving in Spring Lake, for any reason, is complicated by the delicate nature of the environment. Declared a "Critical Habitat" for endangered species in 1980, the federal Endangered Species Act governs activity in Spring Lake. The lake is also a registered Archaeological site, governed by the Texas Antiquities Law. Consequently, there is no recreational diving in Spring Lake.

SCUBA for Stewardship

Despite these intricate dynamics, there is a long, rich, and varied history of diving in Spring Lake – starting with the clowns, magicians, and aquamaids who performed at Aquarena's submarine theater from 1950 until 1995. Volunteer scuba divers also helped with underwater maintenance for these shows, completing tasks such as cleaning the view portals. Commercial diving and underwater construction also took place throughout this period while building the submarine theatre, boat docks, and installing underwater sets. There were even two underwater weddings – and the world's only underwater fashion show!

After Texas State University assumed the property in 1994, diving priorities for Spring Lake shifted to environmental sustainability and recreational diving was no longer allowed. Recognizing that volunteer divers were going to be essential to the lake's management, Texas State hosted a workshop and dive demonstration for the U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, and U.S. Geological Survey to allay any fears that divers would negatively impact the sensitive ecosystem.



GLURPO AND GLURPETTE PERFORM AT AQUARENA SPRINGS' UNDERWATER SUBMARINE THEATER (1958)

NEWLYWEDS EXIT SPRING LAKE AFTER EXCHANGING VOWS (1954)

VOLUNTEER DIVER PLUCKS PLANT MATERIAL FROM THE SAN MARCOS SPRINGS OPENINGS ©MATTHEW MOHONDRO

VOLUNTEER DIVER EXITING THE TRAINING AREA ©MATTHEW MOHONDRO

VOLUNTEER DIVER PRACTICES BUOYANCY CONTROL SKILLS ©JACOB MEHR

The formal creation of the Diving for Science program soon followed in late 1996 and volunteer divers have been enlisted to assist with "underwater gardening" projects to support the conservation efforts for the San Marcos Springs ecosystem ever since. These volunteers complete a two-day Diving for Science course that includes training on the springs' natural and cultural significance, must pass a rigorous series of diving skills and written tests, and are always under the supervision of the Spring Lake Aquatic Maintenance Supervisor.

These certified divers agree to volunteer their services at least once a year on conservation projects such as removing non-native plants and planting native species.

Over the next decade, the Meadows Center made several improvements to the dive facilities and programs offered at Spring Lake. The former underwater arena that once hosted aquamaid performances was refurbished into a designated scuba training area. Certified dive instructors who completed the Diving for Science course could now bring student divers to the lake for open-water training. And new protocols were established, such as a Gear Wash Protocol, to eliminate any possibility of harmful invasive species entering the lake due to volunteer divers.

When the Meadows Center and the U.S. Army Corps of Engineers launched a $3.7 million aquatic restoration project at Spring Lake to remove the old Aquarena structures and restore Spring Lake's natural habitat to its original condition in 2011, the Diving for Science program was also revamped to further align with other conservation efforts. The improved Spring Lake Dive Authorization Course launched in 2014 and included new scientific components specific to Spring Lake, integrating requirements outlined in the Spring Lake Management and Habitat Conservation Plans.

Among the "underwater gardening" tasks, volunteer divers would now contribute to a bio-monitoring system by collecting data like species counts and vegetation growth. Those who complete the course become members of the Meadows Center AquaCorps and are a vital part of one of the most unique habitat restoration projects in the country – all while enjoying dives in the beautiful crystal-clear water of Spring Lake.

SEE MORE

Scan the code with your phone's camera to learn more about our dive programs, or visit ***meadowscenter.txst.edu/Stewardship/Diving.***

COLORADO RIVER IN AUSTIN, TEXAS ©JASON FINN

Then & Now: Conservation Leadership

Sound water policy requires sound science. Research plays a vital role in devising the lasting solutions necessary to overcome the daunting water problems facing the state. When stakeholders in academia, government, philanthropy, and industry collaborate to design research that speaks to their individual and shared interests, it creates informed and lasting water policy.

The Meadows Center shines brightest when reaching beyond our own walls to connect policy-makers and communities to research that addresses the questions they really care about. From the beginning, we have worked to bridge the academic world to help decisionmakers make smart choices about water – whether it's through providing a science-based perspective to water problems, or facilitating conversations about how these problems can be solved.

Connecting the Dots: Science, Policy, and Decision-Making

Leveraging the well-known cachet of our Founder, Dr. Andrew Sansom, one of the Center's first projects became a hallmark of what the center would become. In 2002, the Texas Legislature authorized the exploration of an unprecedented transfer of water from the Colorado River to San Antonio. The newly minted Meadows Center was asked to lead a seven-year study and independent scientific review to determine if San Antonio's future water needs could be met by Colorado River flows (it could not).

The project illuminated the challenges that legislators faced in making policy for environmental flows (the quantity and timing of freshwater needed to maintain ecologically healthy streams, bays, and estuaries). With skyrocketing population growth and a limited water supply to support this growth, Texas was at a crossroads and needed defensible science. The Texas Legislature enacted Senate Bill 1639 during the 78th Legislative Session to establish a Study Commission on Water for Environmental Flows (the Study Commission). Dr. Sansom was appointed by the Lieutenant Governor to serve on the 15-member Study Commission tasked with analyzing existing research and the best available science to establish environmental flow recommendations and standards for all Texas river basins and estuaries.

The Meadows Center was instrumental in creating consensus among environmental and development interests in Texas on a regulatory framework for protecting environmental flows. The findings of the Study Commission were subsequently embodied in Senate Bill 3, which was passed by the 80th Texas Legislature in 2007 and directed the state to adopt comprehensive environmental flows standards for major river and bay systems using a science-advised stakeholder process to help define each system's flow needs.

Our early involvement on environmental flows legislative action catapulted the Meadows Center's reputation of using research as a means to address important societal questions and inform policy. Soon, the Center would undertake many more policy-driven research projects at both the state and local level.

While the Meadows Center was growing its work, state leaders and local officials in the Texas Hill Country were scrambling to protect the streams and aquifers vital to the region. Due to rising demands and continuing drought in Hays County, groundwater resources were depleted to the point that spring flow at Jacob's Well, the source water of Cypress Creek, virtually stopped. However, the Hays Trinity Groundwater Conservation District (the District), the agency charged with managing groundwater for the county, had very little authority to regulate groundwater use in its jurisdiction and no significant funding.

To address this urgent situation and find consensus among stakeholders in the Wimberley Valley, the District formed a scientific-technical committee of groundwater scientists and a stakeholder advisory committee to delineate a protective corridor for Jacob's Well using a science-based approach. The Meadows Center's Dr. Robert Mace and Nick Dornak served on the stakeholder advisory committee.

The resulting Jacob's Well Groundwater Management Zone was established as a final rule in 2019 and created curtailment requirements for permitted wells during drought periods. This was the first time a groundwater district deployed the use of a special management zone, as permitted by the Texas Water Code. The Jacob's Well Groundwater Management Zone serves as a model for other groundwater districts across the state grappling with the conservation of their aquifer systems and associated springs.

GALVESTON ISLAND STATE PARK ©DAN THIBODEAUX

Water Transactions As A Tool For Environmental Flows

The Passage Senate Bill 3 spurred interests in using water transactions for conservation purposes to protect environmental flows. To demonstrate environmental water transactions as an effective tool for achieving conservation outcomes in bays and estuaries, the Meadows Center launched a three-year pilot study in 2014 called the Texas Environmental Flows Initiative.

The pilot brought more than $3 million in funding toward the development of the legal and scientific frameworks necessary to implement water transactions for three priority bays in the Gulf of Mexico: Galveston Bay, Matagorda Bay and San Antonio Bay. Completed in 2019, the initiative generated new knowledge and a better understanding of, and support for, water transactions as a tool for meeting environmental flow objectives around the state.

Then & Now: Watershed Services

Born out of the successes in groundwater management for Cypress Creek in the early 2000s and under the leadership of program Director Nick Dornak, the Meadows Center's Watershed Services program seeks to connect our water expertise with the research and education needs of communities facing water challenges. Water issues can be complex and multifaceted, and local leaders faced with decisions about water quality or supply need tools to help them address uncertainty.

Serving the Diverse Water Needs of Communities

We provide technical expertise to municipalities, policymakers, and citizens working through today's many water and environmental problems. We also work alongside our partners to secure funding to protect and improve their local waterways. The successes of this program now span across the state from headwaters to tidewaters.

Launched with our first watershed protection planning project in the Wimberley Valley, the Meadows Center has directed three state and federally approved watershed protection plans and has initiated countless projects in communities across the state to develop critical knowledge and practical solutions.

Watershed Planning in the Wimberley Valley

We began working with the Wimberley community to develop a watershed protection plan for Cypress Creek in 2008. While the plan was approved by the State of Texas and the Federal government in 2015, it was just the beginning of our work to build a clean, flowing future for the Wimberley Valley.

Today, perhaps no watershed protection plan in Texas has accomplished as much as Cypress Creek. Since its approval, we have secured more than $1 million in federal funds to support community partners in implementing the strategies laid out by the plan, such as installing green infrastructure and best management practices that treat and prevent water pollution.

We have also laid the groundwork for several significant policies adopted by the community to ensure careful water management, including the Hays-Trinity Groundwater Conservation District's adoption of Rule 15 and new water quality ordinances that ensure nonpoint source pollution in 2050 will have no greater impact than 2020 development levels.

THE CISTERN AT WIMBERLEY'S BLUE HOLE REGIONAL PARK CAN HARVEST APPROX. 35,000 GALLONS OF RAINWATER ANNUALLY

Watershed Planning in the Upper San Marcos River

We have secured more than $350,000 in funding to support the San Marcos community in fulfilling the Upper San Marcos Watershed Protection Plan since its approval in 2018. Working alongside the City of San Marcos, the Meadows Center and Texas State implemented several best management practices in the watershed to combat potential contaminants and other pollutants from reaching the San Marcos River.

We have also leveraged funds to partners with local organizations and strength stewardship efforts. The Mermaid Society has developed curriculum to enhance its current programs with area schools by teaching students about the importance of preventing pollution and steps they can take to help protect the watershed. The San Marcos Greenbelt Alliance led an extensive restoration in the Sessom Creek Natural Area, completing tasks such as removing invasive species and installing vegetative filter strips to filter stormwater runoff before it enters the creek.

BIOFILTRATION POND IN SAN MARCOS CAPTURES AND TREATS STORMWATER RUNOFF

MERMAID SOCIETY SMTX HOSTS A MERMAID CHAT TO EDUCATE LOCAL STUDENTS ABOUT THE WATERSHED

JENNA WALKER, DOUG WIERMAN, AND TEXAS STATE STUDENTS COLLECT DATA FOR A STUDY ON THE PEDERNALES RIVER (2016)

CONDUCTING A DYE TRACE STUDY ON THE PEDERNALES RIVER TO UNCOVER GROUNDWATER AND SURFACE WATER INTERACTIONS (2017)

AERIAL OPERATIONS FOR FERAL HOG MANAGEMENT

"How Much Water is in the Hill Country?"

After designing a watershed-based measurement methodology in 2014 that could be replicated across river basins within the Texas Hill Country, the Meadows Center initiated a research series focusing on creating a better understanding of how the aquifers, iconic springs, and rivers in the Hill Country interact to help make critical decisions that will ensure there is enough water in the future for the environment and people alike. To date, studies have been completed for Onion Creek, Krause Springs, and the Blanco, Guadalupe, and Pedernales Rivers. The results of our findings have helped quantify how much of the surface flows of the rivers come directly from groundwater and vice versa. In a state that manages interconnected groundwater and surface water separately, these findings have direct relevance to many communities that rely on Hill Country streams and rivers as the source of their drinking water and livelihood as well as ecosystems that depend on these waterways for survival.

Leading Through Innovative Partnerships

The Meadows Center works to consider all of stressors on our watersheds. The Central Texas Feral Hog Task Force serves Hays, Caldwell, and Guadalupe counties to mitigate ecological and property damage caused by booming populations of feral hogs. To date, over 17,000 feral hogs have been removed by feral hog management, education, and direct landowner support.

Leading One Water

One Water is an intentionally integrated approach to water that promotes the use of all water—drinking water, wastewater, stormwater, greywater—as a single resource and is a natural extension of our work to assist communities in understanding, managing, and protecting their freshwater resources. The Meadows Center is fast gaining a reputation as a leader in One Water efforts throughout Texas. Our local watershed specialists teamed up with the Wimberley Valley Watershed Association to help the Wimberley Independent School District secure funding to design and build the first-ever One Water school in Texas. The school's One Water design helps reduce

groundwater consumption by an estimated 90 percent of what a traditional school this size would use. Green infrastructure, exposed plumbing, and an internet dashboard provide built-in educational components for students, educators, and visitors.

The Texas Legislature's passage of Senate Bill 905 in 2020, which developed 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 creates a clear path for water providers across the state to adopt this important management strategy.

Transferring Successes to the Coast

Through a partnership with the Texas General Land Office, our watershed services now expand to the Texas Coast, where we provide coastal communities with technical assistance to reduce nonpoint source pollution and incorporate stormwater management techniques. With the support of Texas A&M AgriLife Extension Services' Texas Community Watershed Partners, the Texas Sea Grant College Program, and Doucet & Associates, the Clean Coast Texas Collaborative is delivering customized local workshops in four coastal 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 also engages with local officials to provide technical support for initiating community projects such as developing local ordinances, adopting sustainable stormwater design manuals, and creating conceptual designs for green infrastructure. These projects will showcase how Texas coastal communities can create tangible environmental benefits that can be easily replicated in other coastal communities while supporting their local economies through the restoration of coastal natural resources, improved water quality, and mitigation of coastal erosion.

SEE MORE

Scan the code with your phone's camera to learn more about our Watershed Services program, or visit ***meadowscenter.txst.edu/Leadership/WatershedServices.***

GUTTERS AND FIRST FLUSH DIVERTERS INSTALLED AT THE ONE WATER SCHOOL HELP OPTIMIZE RAINWATER COLLECTION FROM OVER 78,000 SQUARE FEET OF ROOF ©WIMBERLEY VALLEY WATERSHED ASSOCIATION

TEXAS STREAM TEAM TEACHING WIMBERLEY VALLEY STUDENTS ABOUT WATERSHEDS AT JACOB'S WELL (2008)

Then & Now: Texas Stream Team

Three massive fish kills occurred along the Pecos River from 1988 to 1995, resulting in more than 2.5 million dead fish. The only known cause was algae that had never been found in the United States. **Why were massive toxic algal blooms occurring? And, why was there no documentation of prior problems?**

Investigating the kills was difficult due to the extreme remoteness of the river. The local community did not know who to contact and was distrustful of the state-run agencies. In addition, technical questions remained unanswered regarding the physical and chemical conditions that created the toxicity in the river. The need for more information about the Pecos River and improved communication with local communities lead to the creation of Texas Watch in 1991 (now known as Texas Stream Team) – a statewide citizen science water quality monitoring program.

Leading Through Citizen Science

Working directly with the public, Texas Watch served an essential role for the State's environmental agency by creating an interface for free and open exchange about environmental issues. The program bridged information gaps between citizens, environmental regulators, and the private sector. It was instrumental in establishing supportive networks that transcend geographic and political boundaries. In fact, the Texas Commission on Environmental Quality reported that many professionals who model streams for permitting requirements began requesting that Texas Watch sites be established on segments with little or no professional monitoring.

The 2001 Texas Watch Monitoring Procedures Manual established procedures for monitoring surface water quality in Texas, standardizing the approach between the Texas Commission on Environmental Quality's regional offices and the monitoring programs, like Texas Watch, that submit water quality data to the state. This became the groundwork for the Texas Stream Team Core Water Quality Citizen Scientist Training, which trains citizen scientists to collect parameters such as pH, dissolved oxygen, conductivity, total depth, Secchi depth, and various field observations. The Core Water Quality Citizen Science Manual continues to be updated and improved.

Facing challenges in meeting the growing needs of its volunteers and partners, the Texas Commission on Environmental Quality moved Texas Watch to the Department of Geography at Texas State University in 1999. The program moved to the Meadows Center in 2006 to provide an expanded platform to pursue its goals.

The “Texas Stream Team” brand was unveiled in 2008 to facilitate a growing need for the program to work with private landowners, members of the agricultural community, and watershed stakeholders. The enhanced focus on new programs and trainings to reach more Texans quickly produced results:

- By 2009, Texas Stream Team had trained more than 5,000 citizen scientists who were monitoring roughly 250 sites at waterways across the state.
- Partnerships were established across campus to enhance STEM (science, technology, engineering, and mathematics) education at the university and at the Kindergarten-12th grade level, resulting in TEKS-correlated curriculum that brings Texas Stream Team concepts into the classroom and also provides opportunities for teachers to receive Continuing Professional Education credits.
- In 2015, Texas Stream Team introduced two new training programs to help watershed coordinators and stakeholders across the state better understand the health of their local waters. The Riparian Evaluation Training teaches citizen scientists how evaluate riparian health and function, and the Macroinvertebrate Bioassessment Training teaches citizen scientists how to use aquatic insects to determine the water quality of a given water body.
- In 2020, University of North Texas Research Scientist and Meadows Center Fellow, Dr. Kelly Albus, validated the accuracy of our volunteer data confirming that long running volunteer programs, like Texas Stream Team, can maintain excellent agreement with professional data over time.

Creating a Trash Free Lone Star State

In 2020, the Meadows Center formed a partnership with North Central Texas Council of Governments and the Houston-Galveston Area Council to create a statewide citizen science volunteer network, Trash Free Texas. Our team is leading the development of the program’s website and its online mapping tool to enable litter cleanup activities across Texas by connecting volunteers with litter cleanup locations. Texas Stream Team is also mobilizing its citizen scientist base to help keep waterways litter-free by cleaning up trash at their monitoring sites.

WHY I GIVE

“Texas State University and the Meadows Center are at the forefront of Texas water science, education, policy, and action. They develop the leaders who will innovate solutions to the water challenges facing our Great State for generations to come! The Water Grand Challenges policy discussions, One Water recycling and infrastructure, and The Texas Stream Team highlight critical education and raise awareness beginning at the local watershed level. In addition, the students, faculty, and staff also put every bit of their dedication into the sustainability education, conservation, and habitat restoration experience at Spring Lake. Ozarka® and BlueTriton Brands, Inc. are very proud to support these important initiatives.”

TREY W. MIXON, III, P.E.
NATURAL RESOURCES MANAGER
BLUETRITON BRANDS, INC.

TEXAS STREAM TEAM STAFF ACCEPTING THE TEXAS ENVIRONMENTAL EXCELLENCE AWARD IN 2019

JENNA WALKER AND ANDREW SANSOM POSE WITH MIKE BIRA, ONE OF THE PROGRAM FOUNDERS FROM TCEQ, AT STREAM TEAM FEST IN 2018

Texas Stream Team continuously refines the program's data collection procedures to ensure the accuracy of its data. Monitoring manuals, water quality parameter training videos, and field guides for each training course provide citizen scientists with refreshers on the proper procedures for collecting data to help them get their work done. And, new this year is the addition of electronic monitoring forms that limit user input errors and guarantee high-quality data.

After training its 10,000th citizen scientist in 2019, the Texas Commission on Environmental Quality awarded Texas Stream Team with a Texas Environmental Excellence Award for bringing together partners and thousands of citizen scientists to monitor and protect water quality across Texas. The impact of 10,000 citizen scientists and 31 years of data is proudly displayed in our new datamap.

SEE MORE

Scan the code with your phone's camera to learn more about Texas Stream Team, or visit **www.TexasStreamTeam.org.**

SCIENCE TEACHER MS. ZIELLA ARIOJA AND HER STUDENTS PERFORM DISSOLVED OXYGEN TEST IN BIG BEND RANCH STATE PARK FOR TEXAS STREAM TEAM

What's NEXT?

With the momentum from an army of trained citizen scientists across Texas and over 30 years of vetted, local citizen science, the Texas Stream Team will continue to expand its reach and relevance.

Thanks to the generous support of the Trull Foundation, Texas Stream Team is developing a state-wide Bacteria Coastal Water Quality Monitoring program to better understand our bays and estuaries. Over the next few years, we will leverage local partnerships and volunteers to build a coastal network that monitors the health of Texas bays and estuaries, with an emphasis on the Matagorda Bay system. Results of this work will serve as a model for other coastal counties facing similar issues and will provide critical bacteria water quality data from areas with historically high levels of bacteria.

As you'll see in the coming pages of this report, our successes in the One Water realm have shined the light on a significant need for more resources and expertise for the communities seeking these

RENDERING OF THE WIMBERLEY VILLAGE LIBRARY'S ONE WATER EXPANSION

NICK DORNAK JOINS COMMUNITY PARTNERS AT A WIMBERLEY ISD BOARD MEETING TO CELEBRATE THE COMPLETION OF THE FIRST ONE WATER SCHOOL IN TEXAS

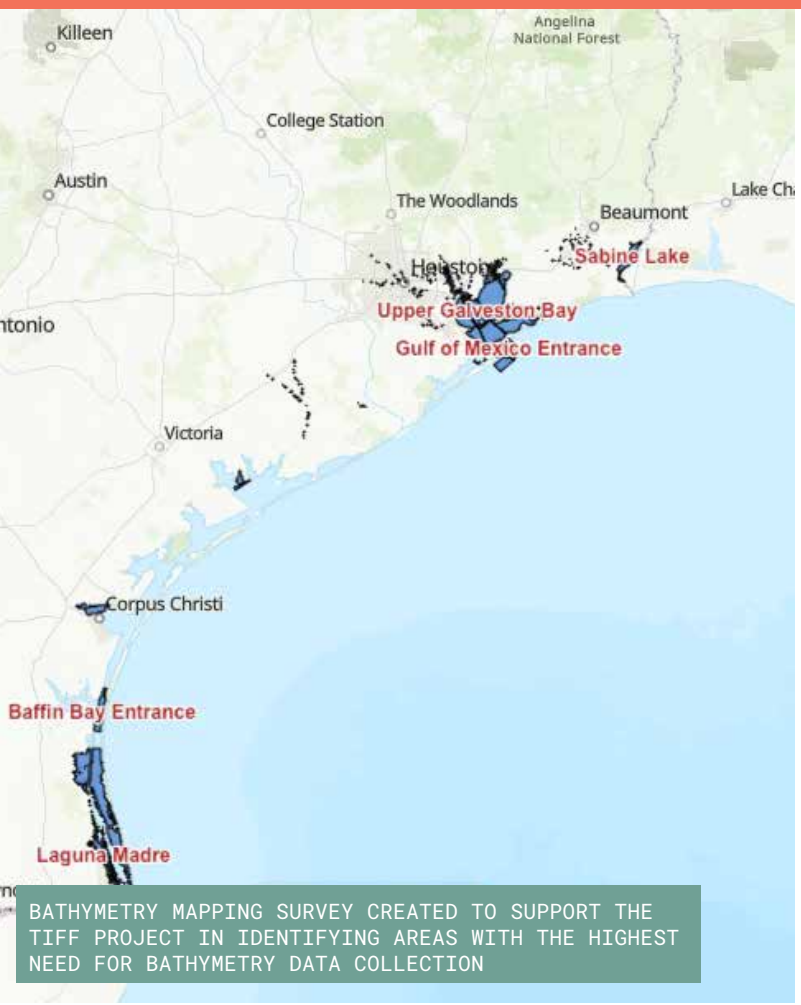
changes to attain water resiliency. Cultivating these technical and financial resources is one of our top five priorities for the year ahead.

And, we're already moving forward with our next One Water projects. Following on our success with Wimberley's One Water School, we've partnered again with the community to transform the Wimberley Village Library's 15,000-square-foot library expansion and 3.8-acre lot into a community laboratory and educational resource for natural resource protection for both water conservation and water quality protection. Construction will begin in Fall 2022 to include best management practices such as rainwater harvesting, HVAC condensate collection, and green stormwater infrastructure.

We are also leading the charge for One Water strategies in the City of Blanco. The Blanco City Council approved the creation of the Blanco Reclamation Task Force in 2020 to study cost-effective wastewater options that provide for growth, without adding polluted discharge to the Blanco River. Following a 12-month investigation, the Task Force's recommendations were approved and the City worked to negotiate a new Texas Land Application Permit with a phased adoption of no discharge. Not only will this save the City of Blanco $1,090,000 when compared to a discharge permit, it will also allow the City of Blanco to grow while protecting water quality, water supplies, and habitat.

As the world changes and new water issues emerge, our Watershed Services program will continue to offer expertise and resources to bring people together to make important decisions about water. In each instance, we will bring a multi-disciplinary perspective, science-based solutions, and a dedication to the sustainability of our water resources and Texas communities.

Then & Now: Stakeholder Engagement



BATHYMETRY MAPPING SURVEY CREATED TO SUPPORT THE TIFF PROJECT IN IDENTIFYING AREAS WITH THE HIGHEST NEED FOR BATHYMETRY DATA COLLECTION

From the beginning, the Meadows Center has been the place where science-backed collaborations lead to game-changing policy innovation. Modeled after the strengths of our Founder, we have built our reputation as an informed, pragmatic convener able to bring varied viewpoints together for lasting and impactful natural resource solutions.

Leading Change Through Stakeholder and Scientific Process Design and Facilitation

As demonstrated throughout this report, this distinction has put the Center front-of-mind for Legislators grappling with water policy impasses, for local communities facing seemingly intractable conflicts, and for scientific endeavors requiring diverse and interdisciplinary expertise.

The practice is at the heart of our Watershed Services work, but the 2019 addition of our Operations Director, Carrie Thompson, a specialist in natural resource mediation and facilitation, has catalyzed the Meadows Center on a journey to further formalize the Center's historic role as

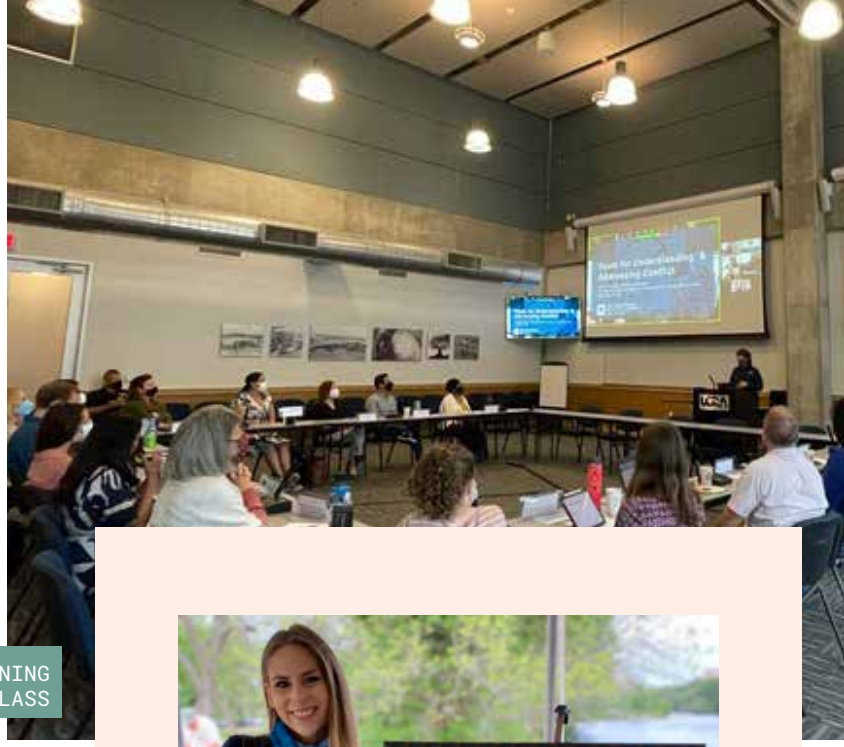
Texas Integrated Flooding Framework (TIFF) Planning

In 2020, we were asked to partner with the Texas Water Development Board, U.S. Army Corps of Engineers, and U.S. Geological Survey to facilitate the Texas Integrated Flooding Framework Planning Project, a long-term collaboration to develop comprehensive flood risk reduction planning to improve flood monitoring and preparation for counties affected by Hurricane Harvey and the Texas Coast.

The project is engaging governmental agencies, academia, and regional stakeholders to participate in expert technical advisory teams and build out the four components of the framework, which include data and monitoring gap analysis, data management and visualization, integrated flood modeling framework and planning and outreach.

As Facilitators, the Meadows Center staff design processes to elicit expert opinion, create action plans, and craft materials that effectively communicate the path forward to guide the project. In this role, we also coach the project's leaders to create and implement the framework approach on task, on time, and on budget.

CARRIE THOMPSON LEADS A CONFLICT RESOLUTION TRAINING FOR THE TEXAS WATER FOUNDATION'S WATER LEADERS CLASS



a convener and expert in stakeholder processes. Partnering with national organizations like the Association for Conflict Resolution, the University Network for Collaborative Governance, and the University Council on Water Resources, we are also working to enhance our academic presence around public and scientific engagement topics.

What's NEXT?

There is no mistaking the themes emerging in our current work: flooding, drought, water reuse, water rights, loss of springflow, degraded water quality. They all point to the coming (and present) challenges of climate change. With the 2020 and 2021 infusions of seed money from the Meadows Foundation and the National Oceanic and Atmospheric Administration, the Meadows Center is gearing up to change the climate conversation in Texas.

Not only will we work to produce and make available the most up-to-date and relevant data to inform local decisionmakers, we will convene decisionmakers and scientists to answer the most important questions and produce solutions that fit the needs of local communities.

We will facilitate conversations about how to best reach and engage communities that have historically been excluded from the decisions that affect their communities, and will work to ensure that information produced by our scientists is informed by, relevant to, and usable by all of the diverse stakeholders of Texas.

ANNA HUFF MANAGES A DISPLAY OF THE MEADOWS CENTER'S RIVER BOOK SERIES PUBLICATIONS

Meadows Center Publication Featured at 2021 Texas Book Festival

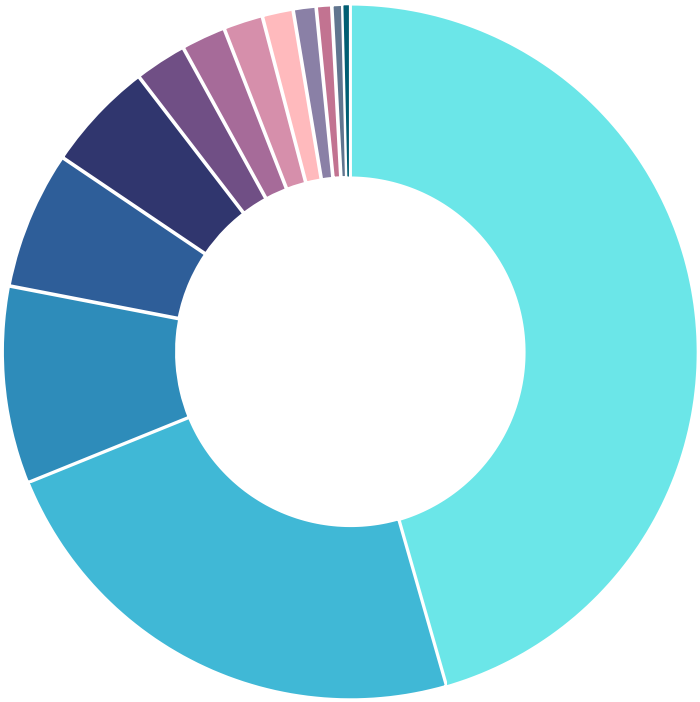
Texas artist, Clemente Guzman, was selected as the featured poster art for the 2021 Texas Book Festival. Guzman's artwork also serves as the cover of a Texas A&M University Press book *Viva Texas Rivers! Adventures, Misadventures, and Glimpses of Nirvana along Our Storied Waterways*, which was published in partnership with the Meadows Center River Books Series and The Wittliff Collections Literary Book Series.

The artwork celebrates the state's life and culture on the banks of Texas rivers and features a cameo of our Founder, Dr. Andrew Sansom!

Fiscal Year 2022 Financial Overview

Revenue

Federal – 45%	$2,850,000
Grants Received – 23%	$1,460,795
Spring Lake Education Revenue – 9%	$571,405
Endowments – 6%	$401,225
University – 5%	$320,218
Foundation Gifts – 2%	$152,000
Dive Operations Revenue – 2%	$129,751
Corporation Gifts – 2%	$115,000
Professional Services Provided – 2%	$90,257
Meadows Generated Income* – 1%	$66,782
Texas Research Incentive Program Match – 1%	$45,000
Indirect Cost Recovery – 1%	$30,212
Individual Gifts – 1%	$23,614
Total Revenue: $6,256,259	

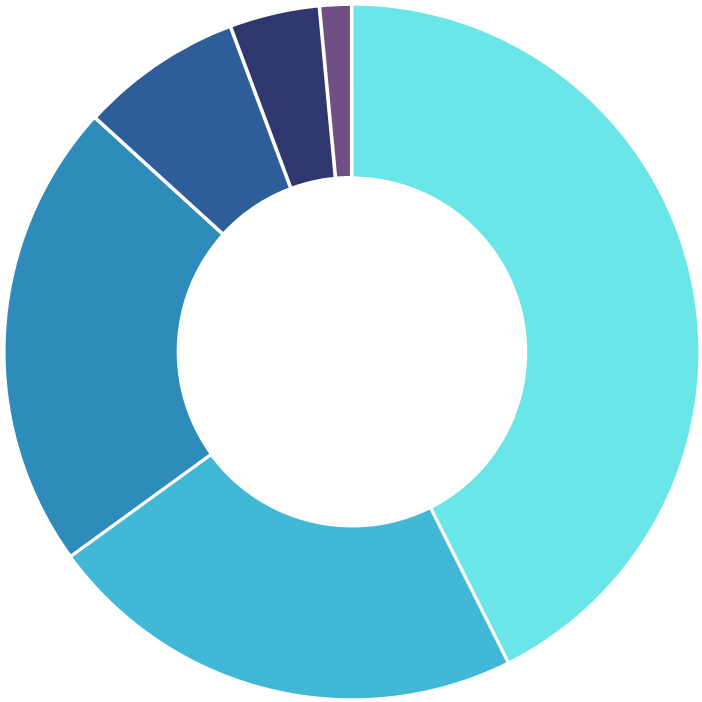


*Sources of income include sale of books, hats, T-Shirts, book royalties, and services rendered.

TREE BLOSSOMS OVER THE SAN MARCOS RIVER

Expenses

Professional Staff Salary and Benefits – 43%	$1,800,875
FY22 Non-Grant Encumbrances – 22%	$860,134
External Contracts – 22%	$474,591
Supplies and Facility Maintenance – 8%	$271,293
Student Staff Salary – 4%	$252,496
Travel and Meetings – 1%	$6,851
Total Expenses: $3,666,240	



Fundraising Priorities in Fiscal Year 2023

RENDERING OF PLANNED DISCOVERY HALL UPGRADES

Introducing Our First Director of Climate Science, Dr. Mona Wells!

The Meadows Center selected Dr. Mona Wells, an interdisciplinary environmental scientist, to serve as the inaugural Director of Climate Science. In this role, she will develop a robust climate research program as it relates to water, policy, economics, and education. One of Dr. Wells' first priorities includes the creation of the Climate Dashboard, which will incorporate the first Texas-specific climate models to project potential long-term impacts of climate change on our natural resources.

Re-imagining Discovery Hall

Our Discovery Hall connects thousands of visitors with the wonder of an aquatic ecosystem like no other, Spring Lake. Children and their families engage with endangered species, learn about watersheds, and develop an appreciation for the incredible natural and cultural resources located here in the San Marcos Springs. Discovery Hall has tremendous potential to offer even more and the Meadows Center has launched a capital campaign to renovate its interpretive exhibits to meet the needs of a changing generation. The new facility will support innovative technology that lets visitors take a virtual dive into the lake, storytelling by the original peoples of the region, expanded educational opportunities, and modernized exhibits.

Changing Texas for a Changing Climate

We are focusing on the single greatest environmental threat facing the world: climate change. The Meadows Center will help Texans address these issues by developing sound science to inform public policy. Changes to our climate affect the way our natural systems operate and could impact the environmental services they provide. In 2023, under the leadership of our new Director of Climate Science, Dr. Mona Wells, we will build a multi-institutional collaboration to downscale climate data, calibrate

tools to model its impact, and better understand how anthropogenic climate change will impact water resources in Texas.

Access for All and ADA Compliance

The Meadows Center's historic offices, educational facilities, and historic glass-bottom boats do not meet Americans with Disabilities Act (ADA) accessibility requirements; therefore, mobility-challenged students and guests are not able to fully access facilities or experience a glass-bottom boat tour at Spring Lake. Over the last two years, the Meadows Center has raised hundreds of thousands of dollars to expand access for every member of our community and we're still a long way from converting the historic facilities (some more than 100 years old!) to accessible standards. This year, we will add a new ADA-accessible boardwalk to aid access to our glass-bottom boat dock. We will also incorporate permeable pavers around our ticket kiosk that both improve runoff infiltration and ease access challenges. Funds to expand access and improve interpretative experiences for all who visit the San Marcos Springs are a high-priority need.

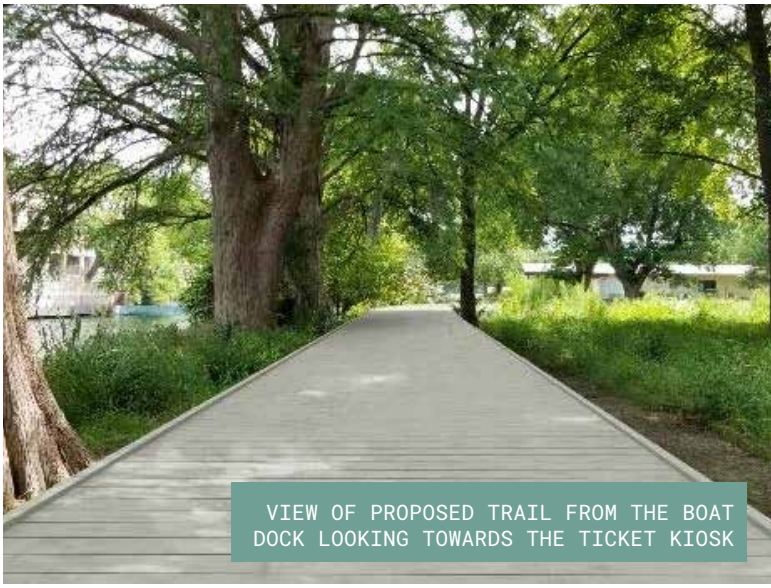
Advancing One Water Policy and Research

The Meadows Center has emerged as a statewide leader in advancing One Water principles across Texas. Over the last three years, we have established networks with dozens of non-profit organizations, 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 develop One Water projects, policies, and infrastructure and transfer the expertise to urban and rural communities throughout Texas to implement this resource-optimizing approach.

Operational Resilience

Like most organizations, the COVID-19 pandemic shined a light on our financial resiliency – and areas that need bolstered resiliency. With 90 percent of our resources coming from federal and state grants, professional service contracts, donor support, and the revenues from our glass-bottom boat rides, we remain too vulnerable to external factors. The

VIEW OF THE PROPOSED TRAIL FROM KIOSK TO BOAT DOCK



VIEW OF PROPOSED TRAIL FROM THE BOAT DOCK LOOKING TOWARDS THE TICKET KIOSK

Meadows Center is developing an intentional, strategic, and diverse approach to fundraising to ensure our staff is protected from external volatility, our research projects are carried through to their respective conclusions, and that we never waver in pursuit of our mission even in the most turbulent of financial times. As our organization grows in size and reach, we will strengthen our financial infrastructure and internal systems to enable us to scale up our impact. We will protect the investments that our supporters have made and ensure that our organization's essential functions are maintained in perpetuity.

MAKE AN IMPACT

Scan the code with your phone's camera to make a tax-deductible donation to the Meadows Center, or visit **meadowscenter.txst.edu/Donate.**

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Founder & Professor of Practice, Department of Geography

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

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FELLOWS FEATURE

Once one of the five largest springs in Texas, Comanche Springs quit its flow in the 1950s due to significant groundwater pumping upstream. Over the last decade, however, the once-quiet springs have begun flowing again in the late winter months. In 2021, Texas Water Trade's Sharlene Leurig and the Meadows Center completed a two-year study on the feasibility of restoring Comanche Springs to perennial flows using voluntary markets. Now, Texas Water Trade is engaging with landowners and irrigators upstream of the springs to see if they could be incentivized to reduce their groundwater pumping to restore year-round flows.

> "Given the importance of agriculture to Fort Stockton and Pecos County, our goal for this study was to identify the optimal solution for restoring the spring while maintaining agricultural productivity – and doing so with the voluntary cooperation of local groundwater owners. We believe this market-based approach will offer win-win solutions for Fort Stockton's economy and environment."

SHARLENE LEURIG, CEO
TEXAS WATER TRADE

Research Grants & Contracts Awarded In Fiscal Year 2022

Advancing One Water in Texas
Funder: National Wildlife Federation
Core Research Initiative: Water Conservation

Assessing Suckermouth Armored Catfish Abundance, Sex Ratio, and Space Use to Enhance Control Efforts
Funder: Texas Parks and Wildlife Department
Core Research Initiative: Watershed Management

Blanco River-Aquifers Assessment Tool for Water and Understanding Sustainability Trends
Funder: Hays County & Edwards Aquifer Authority
Core Research Initiative: Watershed Management

Bobcat Stream Team and Texas Stream Team Chapter Collaboration
Funder: Texas State Environmental Services Committee
Core Research Initiative: Watershed Management

Central Texas Feral Hog Task Force Caldwell County
Funder: Texas A&M AgriLife Extension
Core Research Initiative: Watershed Management

Central Texas Feral Hog Task Force Hays County
Funder: Texas A&M AgriLife Extension
Core Research Initiative: Watershed Management

Climate Change Impact on Water Initiative
Funder: HR 2471, "Consolidated Appropriations Act"
Core Research Initiative: Climate Change

Comparative Flows Analysis between the Pedernales River and Barton Creek
Funder: Save Our Springs Alliance
Core Research Initiative: Watershed Management

Developing Implementation Resources of the Coastal Nonpoint Source Pollution Control Program
Funder: Texas General Land Office
Core Research Initiative: Watershed Management

Earth Day 2022
Funder: Texas State Environmental Service Committee
Core Research Initiative: Interpretive and Experiential STEM Education

Glass-bottom Boat Restoration Project
Funder: The Powell Foundation
Core Research Initiative: Interpretive and Experiential STEM Education

Groundwater Analysis for the Post Oak Savannah Groundwater Conservation District
Funder: Intera, Inc.
Core Research Initiative: Watershed Management

WAVES ON BEACH IN CORPUS CHRISTI ©INSUN-HWANG

Habitat Conservation Plan and Management of Key Recreation Areas
Funder: City of San Marcos
Core Research Initiative: Watershed Planning and Management

Little Blanco Project
Funder: Edwards Aquifer Authority
Core Research Initiative: Watershed Management

Lost Pines GCD GMZ Stakeholder Facilitation
Funder: Lost Pines Groundwater Conservation District
Core Research Initiative: Watershed Management

Living Shorelines Program Website Maintenance
Funder: Texas General Land Office
Core Research Initiative: Watershed Management

Operation Appreciation (Veteran Dive)
Funder: H-E-B Veteran Affairs
Core Research Initiative: Interpretive and Experiential STEM Education

Outdoor Education for a New Generation
Funder: H-E-B Environmental Affairs
Core Research Initiative: Interpretive and Experiential STEM Education

SARP Aquatic Habitat Restoration Program
Funder: City of San Marcos
Core Research Initiative: Watershed Management

Strengthening Experiential Education Opportunities in Central Texas
Funder: Texas Parks and Wildlife Department Community Outdoor Outreach Program
Core Research Initiative: STEM Education

Shoal Creek Watershed Action Plan Implementation
Funder: Shoal Creek Conservancy
Core Research Initiative: Watershed Management

Texas Stream Team and Water Grand Challenges
Funder: BlueTriton Brands, Inc.
Core Research Initiative: Watershed Management

Texas Stream Team Program
Funder: Texas Commission on Environmental Quality
Core Research Initiative: Watershed Management

Upper San Marcos River Watershed Protection Plan Implementation Riparian Restoration
Funder: Texas Commission on Environmental Quality
Core Research Initiative: Watershed Management

TEXAS STATE STUDENTS VISIT SPRING LAKE TO LEARN ABOUT TURTLE SPECIES FOR AQUATIC BIOLOGY CLASS

External Research & Creative Projects At Spring Lake in Fiscal Year 2022

Classroom Instruction

ANTH 3361: Archaeological Field Methods
Dr. Smith – Anthropology Department

ANTH 5318/5313: Site Visit to Spring Lake
Dr. Smith – Anthropology Department

BIO 1331: Site Visit to Spring Lake
Dr. Gabor – Biology Department

BIO 3320: General Science
Maureen Lemke – Biology Department

BIO 4410/5410: Field Biology of Plants
Dr. Lemke – Biology Department

BIO 4435: Techniques in Wildlife Management
Dr. Walter – Biology Department

BIO 5435: Fundamental Field Biology Practices
Dr. Walter – Biology Department

BIO 7336: Evolutionary Ecology Field Visit
Dr. Gabor – Biology Department

GEO 3434: Geography and Environmental Studies
Tasnuva Udita – Biology Department

US1100: University Seminar
University College

Research & Creative Projects

American Eel Movement Behavior Study
Texas A&M University

Aquatic Fauna of the San Marcos R. Headspring
U.S. Geological Society

Aquatic Nitrite Effects on Maternal Immune Transfer in a Live-Bearing Species
Ashlety Hendrix – Biology Department

Blue Index
Madeline Wade – Biology Department

Do Tufted Titmice and Black-crested Titmice Occupy Different Habitats Within Their Hybrid Zone?
Carli Martinez – Biology Department

Distributions of North American Beaver
Dr. Meitzen – Geography Department

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

Filming for FMA Fashion Show
Texas State University Fashion Merchandising

Geospatial Water Quality Sensor Collection Platform
Joel Warner – PadIMe LLC

Impacts of Place-Based Pedagogy and Environmental Mindfulness at an Informal Science Institution
Ryan Spencer – Biology Department

Largemouth Bass Data Collection
Edwards Aquifer Authority

Maintenance at the EAA Monitoring Well
Edwards Aquifer Authority

Nestbox Survey
Rebekah Rylander – Geography Department

Non-Native Floating Plants Removal (EAHCP)
City of San Marcos/San Marcos River Foundation

Particulate Matter Air and Participation Study
Meadows Center/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 – Biology Department

Quantifying Groundwater Use Of Oak and Juniper Trees
Evan Simons – Biology Department

Status of the Freshwater Turtles in the San Marcos River, including its Headwaters
Dr. Forstner – Biology Department

Spring Lake Outdoor Education Project
Dr. Griffin – Health & Human Performance Department

Texas School Safety Center PSA Filming
Shawna White – Texas School Safety Center

Texas State University Ring Celebration
Texas State Alumni Relations

Texas Stream Team Water Quality Monitoring
San Marcos River Foundation

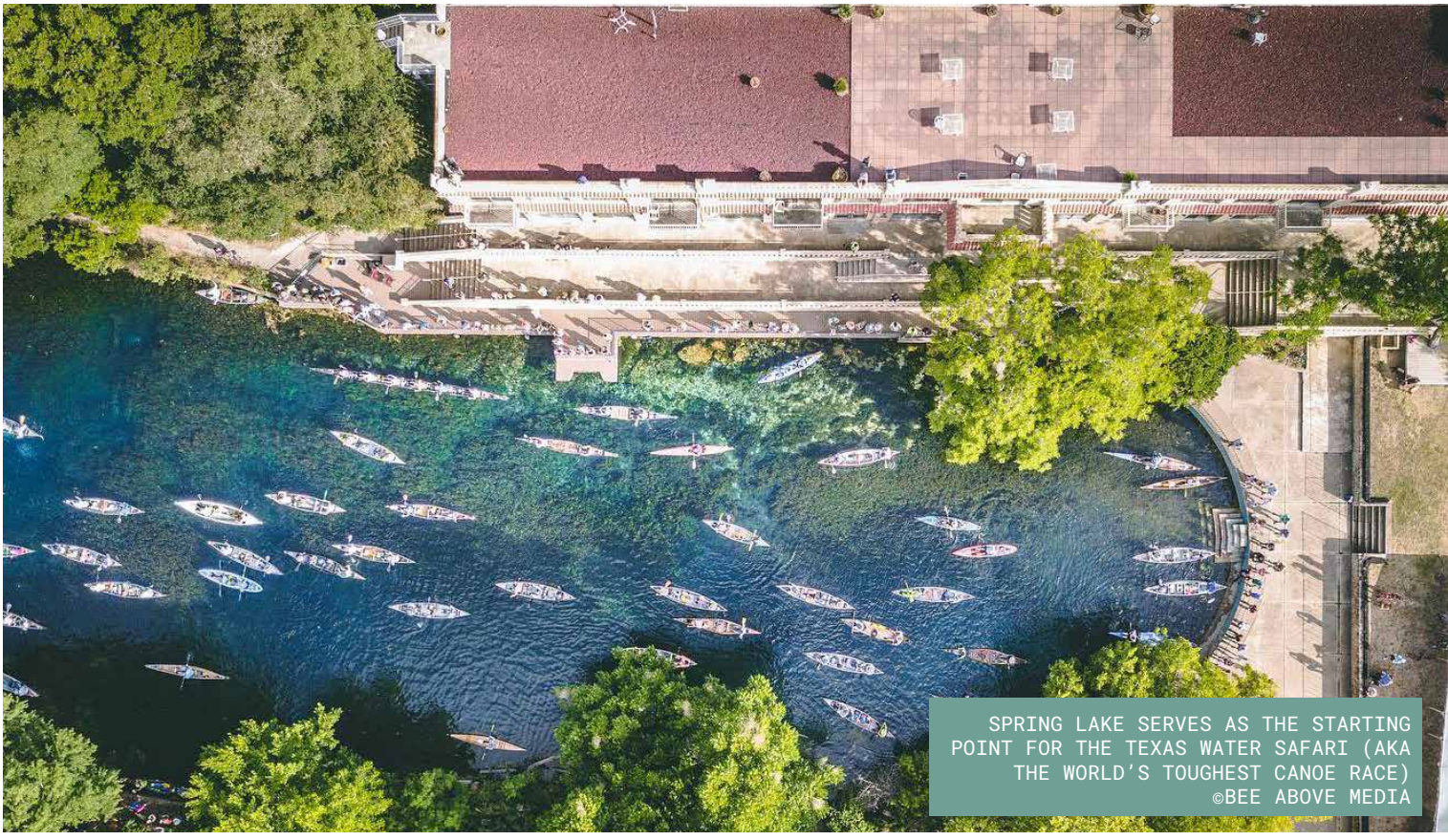
San Marcos Springs "Pin Drop" Video, Travel Texas
Atlas Obscura

Texas Water Safari Filming & Photography
Scott Bauer and Erich Schlegel

Use of Phenotypic Variation in Asexual Fish
Allison Davis – University of Texas Ecolab

Water Quality Collection at Hotel Spring
Edwards Aquifer Authority

Water Quality Collection for the Edwards Aquifer
Edwards Aquifer Authority



SPRING LAKE SERVES AS THE STARTING POINT FOR THE TEXAS WATER SAFARI (AKA THE WORLD'S TOUGHEST CANOE RACE)
©BEE ABOVE MEDIA

Staff Published Works in Fiscal Year 2022

Published Papers, Abstracts, Commentaries, and Manuscripts

Trombley, C. A., Schwalb, A. N., Hardy, T. B., & Cottenie, K. (2021). Spatio-temporal analyses show conflicting evidence of the role of an invasive minnow in the decline of an endangered desert fish endemic to the south-western U.S.A. Freshw Biol., 12 pgs.

Stevens, L.E., Aly, A.A., Arpin, S.M., Apostolova, I., Ashley, G.M., Barba, P.Q., Barquín, J., Beauger, A., Benaabidate, L., Bhat, S.U., Bouchaou, L., Cantonati, M., Carroll, T.M., Death, R., Dwire, K.A., Felippe, M.F., Fensham, R.J., Fryar, A.E., Pascual I Garsaball, R., Gjoni, V., Glazier, D.S., Goldscheider, N., Gurrieri, J.T., Guðmundsdóttir, R., Guzman, A.R., Hájek, M., Hassel, K., Heartsill-Scalley, T., Solé I Herce, J., Hinterlang, D., Holway, J.H., Ilmonen, J., Jenness, J., Kapfer, J., Karaouzas, I., Knight, R.L., Kreiling, A.-K., Lameli, C.H., Ledbetter, J.D., Levine, N., Lyons, M.D., Mace, R.E., Mentzafou, A., Marle, P., Moosdorf, N., Norton, M.K., Pérez, G.G., Perla, B., Saber, A.A., Sada, D., Segadelli, S., Skaalsveen, K., Springer, A.E., Swanson, S.K., Schwartz, B.F., Sprouse, P., Tereke, M., Tobin, B.W., and Tshibalo, E.A., 2021, The ecological integrity of spring ecosystems—A global review: in Imperiled—The Encyclopedia of Conservation, Chapter 60014, 16 p.

Mace, R.E. Glenn, S., Ellis, J., Miller, G., Oliver, W., Seifert, W.J., Sharp, Jr., J.M., Tracy, J., and Wang, G., 2021, Observed and potential Land subsidence in the Gulf Coast Aquifer of Montgomery County, Texas: GeoGulf Transactions, v. 71, p. 455.

Walker, J.J. and Wierman, D.A., 2021, Gain/Loss Studies in the Central Texas Hill Country - Observations and Lessons Learned: GeoGulf Transactions, v. 71, pg. 311–316.

Glazer, Y.R., Tremaine, D.M., Banner, J.L., Cook, M., Mace, R.E., Nielsen-Gammon, J., Grubert, E., Kramer, K., Stoner, A.M.K., Wyatt, B.M., Mayer, A., Beach, T., Correll, R., and Webber, M.E., 2021, Winter Storm Uri: A test of Texas' water infrastructure and water resource resilience to extreme winter weather events: Journal of Extreme Events., 27 pgs.

Tarasewicz, N.A and Jönsson, A.M., 2021, An ecosystem model based composite indicator, representing sustainability aspects for comparison of forest management strategies: Journal of Ecological Indicators, Volume 133, 16 pgs.

Mace, R.E., 2021, Comment on "Exploring Groundwater Recoverability in Texas: Maximum Economically Recoverable Storage" by Justin C. Thompson, Charles W. Kreitler, and Michael H. Young: Texas Water Journal, v. 12, n. 1, p. 202-204.

Mace, R.E., 2021, Planning for Climate Change (When You Can't Plan for Climate Change): Water Resources Impact, v. 23, n. 6, p. 5-7.

Rubinstein, C., Seaton, C., & Mace, R. E., 2022, Beyond Senate Bill 3: How to Achieve Environmental Flows in Texas Under Prior Appropriation: Texas Water Journal, v. 13, n. 1, p. 13-26.

Hay, A., Riggins, C.L., Heard, T. et al. Movement and mortality of invasive suckermouth armored catfish during a spearfishing control experiment. Biol Invasions (2022).

Mace, R.E., in press, *Groundwater Sustainability—Birth, Development, Application: Palgrave Studies in Environmental Sustainability*, Palgrave Macmillan.

Maleki, S., Wait, M., Warren, E., Hagelman, R. R., & Navarro, A. Investigating Children's Field Trip Experiences Through Sketch Maps. Research in Geographic Education at the Grosvenor Center - Texas State University: San Marcos, Texas.

Hay, A., Riggins, C.L., Heard, T., Garoutte, C., Rodriguez, Y., Fillipone, F., Smith, K.K., Menchaca, N., Williamson, J., Perkin, J.S., 2021. *Movement and mortality of invasive suckermouth armored catfish during a spearfishing control experiment:* Biological Invasions Journals.

Presentations

Mace, R.E. (moderator), Champagne, B., De La Cruz, J., Ikehata, K., Stockmayer, P., Williamson, S., 2021, "*Water & Smart Technologies*": Digital 360 Summit 2021, The Premier Event for Industrial Digitalization, Decentralization, and Decarbonation, San Marcos, Texas, September 1. [15]

Mace, R.E., and Galaviz, N., 2021, "*Revisiting Gunnar Brune's 'Springs of Texas'*": presented to GEO 4346 Hydrogeology, Baylor University, Waco, Texas, September 9. [15]

Thompson, Carrie L. 2021, "*Tools for Understanding and Addressing Conflict*": presented at Texas Water Leaders Cohort Training hosted by The Texas Water Foundation; Austin, Texas; September 10, 2021. [20]

Mace, R.E., 2021, "*The Hydrohistory of Comanche Springs in Fort Stockton, Texas*": presented to GEO 4393/5326: Parks and Protected Places, Texas State University, San Marcos, Texas, September 15 [25].

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.

Walker, Jenna, J. 2021, "*Little Blanco River Gain/Loss Study Kickoff Meeting*": presented at a stakeholder meeting hosted by the Meadows Center for Water and the Environment; San Marcos, Texas; September 22, 2021 [20]

Mace, R.E., 2021, "*The future of water in Texas*": presented at the 100th Annual Agriculture & Rural Affairs Conference, Texas Bankers Association, Austin, Texas, September 24. [30]

Arismendez, S. and A. Navarro. 2021. "*Water Quality Monitoring: Practical Guidelines & Lessons Learned*": presented in-person at TWRI training in Mayan Ranch, Bandera, Texas. September 29, 2021. [25]

Hermitte, S.M., Blickenstaff, K., Brody, S., Mace, R.E., and Ward, A., 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 27-29. [50]

Mace, R.E., and Galaviz, N., 2021, "*Revisiting Gunnar Brune's 'Springs of Texas'*": presented to GEO 377k/391k, Applied Karst Hydrogeology,The University of Texas at Austin, Austin, Texas, September 30. [25]

Navarro, A. 2021, "*All About Texas Stream Team – Overview and Operations*": to be presented at Stream Team Fest hosted by Texas Stream Team; online presentation; October 12, 2021 [64]

Navarro, A. 2021, "*Starting a Texas Stream Team Group Workshop*": to be presented at Stream Team Fest hosted by Texas Stream Team; online presentation; October 13, 2021 [57]

Arismendez, S. 2021. "Texas Stream Team's Quality Assurance Program": presented at Stream Team Fest hosted by Texas Stream Team; online presentation; October 13, 2021. [~60]

Arismendez, S. 2021. "*Texas Stream Team Fest: Tricks of the Trade Panel*" presented at Stream Team Fest hosted by Texas Stream Team; online presentation; October 14, 2021. [~60]

Armirano, E.W., Kowalski, T., Mace, R.E., and TBA, 2021, "*Two rivers named Colorado—Collective (and urgent) responses to protecting the Colorado River Basin*": to be presented at Philanthropy Southwest 73rd Annual Conference, Oklahoma City, Oklahoma; October 21. [20]

Arismendez, S. and C. Campos. 2021."*Riparian Habitat Evaluation Training*": to be presented virtually at the Texas Master Naturalist Annual Statewide Conference; October 22, 2021. [~30]

Mace, R.E., 2021, "*Water in Texas 101—Science, Regulatory Framework*": short course for GEOGULF2021, Austin, Texas, October 26.

Walker, Jenna, J., and Wierman, Doug, A. 2021, "*Gain/Loss Studies in the Texas Hill Country – Observations and Lessons Learned*": Annual Gulf Coast Geoscience Convention hosted by the Bureau of Economic Geology and the Austin Geological Society; Austin, Texas; October 27, 2021.

Mace, R.E. Glenn, S., Ellis, J., Miller, G., Oliver, W., Seifert, W.J., Sharp, Jr., J.M., Tracy, J., and Wang, G., 2021, "*Observed and potential Land subsidence in the Gulf Coast Aquifer of Montgomery County, Texas*": GEOGULF2021, Austin, Texas, October 28.

Dussler, R. 2021, "*Mindfulness and Reconnection with Freshwater Ecosystems*": presented to PHIL 4053, 6780 Introduction to Sub-Antarctic Biocultural Conservation, University of North Texas; Denton, Texas; October, 28, 2021 [20]

Thompson, Carrie L. 2021, "Leveraging Conservation for Groundwater Invertebrates": presented at the Texas Groundwater Invertebrate Forum by Edwards Aquifer Data Center at Texas State University, San Marcos, TX; October, 29, 2021 [100]

Walker, J.J., 2021, "*Texas Stream Team Through the Years Panel: A Walk Down Memory Lane*": Stream Team Fest hosted by Texas Stream Team; online presentation; October 14. [120]

Walker, J.J., 2021, "*Gain/Loss Studies in the Texas Hill Country – Observations and Lessons Learned*": Annual Gulf Coast Geoscience Convention hosted by the Bureau of Economic Geology and the Austin Geological Society; Austin, Texas; October 27. [60]

Mace, R.E., 2021, "*It's all One*Water": invited presentation for the 2021 Environmental Excellence Awards Program, City of Fort Worth Water Department, Fort Worth, Texas, November 3. [100]

Navarro, A. 2021, "*Upper San Marcos River Watershed Protection Plan Committee Meeting*": presenting at the biannual committee meeting hosted by The Meadows Center; online presentation; November 8. [11]

Arismendez, S.S., D.N. Dornak, and L.M. Parchman. 2021. "*Meta-analysis of Texas coastal monitoring data to investigate recreational beach water quality status and trends*": presenting at Virtual Coastal and Estuarine Research Federation (CERF) 2021 Biennial Conference. November 10. [~200].

Navarro, A. and S. Arismendez. 2021, "*Texas Stream Team E. coli Bacteria Water Quality Citizen Scientist Training*": presenting at the E. coli Bacteria Texas Stream Team training hosted by Texas Stream Team; online presentation; November 13. [20]

Schlessinger, S.R. (moderator), Mace, R.E., and Puig-Williams, V., 2021, "*Surface water, groundwater, and sustainability*": presented at the Water, Texas film festival hosted by the Texas Water Foundation, November 16. [120]

Lopez, R., and Mace, R.E., 2021, "*Rural land trends and what they mean for groundwater*": presented at the Bell County Water Symposium, November 17. [100]

Navarro, A. 2021, "*Texas Stream Team: How Citizen Science Helps Sustain our Water Resources*": presenting to Texas State's Sustainability 5301 class hosted by Christopher Serenari, Ph.D; online presentation; November 18. [23]

Dussler, Rob. 2021, "Mindfulness as a Powerful Conduit for Promoting Nature Connection in Children and Adults at The Meadows Center for Water and the Environment": Texas Children in Nature Summit; Fort Worth, Texas; December, 2 [50].

Mace, R.E., 2021, "*Groundwater water sustainability—How long is forever?*": presenting to the Texas Commission on Environmental Quality Brown Bag, December 7 [40].

Mace, R.E., 2021, Water! radio show guest, "*Into the Gray*" hosted by Jeremy Garrett, KZSM, San Marcos, Texas, December 17.

Arismendez, S. and N. Dornak. 2021. "Lower Cypress Creek Pilot Project: Concurrent Assessment of E. coli Bacteria and Optical Brighteners": presenting in December 2021 [~20].

Mace, R.E., 2022, "*Revisiting the springs of Texas*": Blue Bag for The Meadows Center for Water and the Environment, Texas State University, January 10, 2022 [20].

Mace, R.E., 2022, "*Texas*": webinar for the National Ground Water Association's Hydrogeology of States series, virtual, January 13, 2022 [50].

Navarro, A. and Reisberg, B., 2022, "*Texas Stream Team Standard Core Water Quality Citizen Scientist Training*": presented at the Standard Core Texas Stream Team training hosted by Texas Stream Team; San Marcos, Texas; January 13, 2022 [5].

Navarro, A., Arismendez, S., Campos, C., and Parchman, 2022, "*Texas Stream Team Trainer Meeting*": presented at Texas Stream Team Annual Trainer Meeting hosted by Texas Stream Team; online presentation; February 3. [28]

Navarro, A., Howard, M., Moreno, J., Murray, P., and Weeks, E., 2022, "*Annual Upper San Marcos River Watershed Protection Plan Meeting*": presented at the annual Upper San Marcos River watershed meeting hosted by The Meadows Center; online presentation; February 9. [20]

Mace, R.E., 2022, "*Five gallons in a ten-gallon hat—The (un)sustainable development of groundwater in Texas*": keynote speech for the Geography and Environmental Studies Student Research Symposium, San Marcos, Texas, February 11.

Lopez, R., and Mace, R.E., 2022, "*Rural land trends and what they mean for groundwater*": presented at the 6th Biennial Water Conservation Symposium hosted by the Panhandle Groundwater Conservation District, Amarillo, Texas, February 16.

Dussler, R. 2022. "*Mindfulness and Nature Connection*": presented Cypress Creek Project meeting; Wimberley, TX; February 22. [15]

Mace, R.E., 2022, "*The Devils is in the Details: Hydrology of the Devils River*": lunch and learn webinar for The Devils River Conservancy, February 24.

Mace, R.E., (panel chair), Drebelbis, J., Oates, K., Scott, S., Stokes, B., and Wolf, C., 2022, "*Texas Conservation Challenges & Opportunities 2022 and Beyond*": Texas Land Conservation Conference hosted by the Texas Land Trust Council, Austin, Texas, March 4.

Schlandt, A. 2022, "*Floods and Global Environmental Change*": presented to GEO 2310 (Global Environmental Change) hosted by Dr. Tom Ptak (Texas State University Department of Geography and Environmental Studies; San Marcos, Texas; March 8, 2022. [40]

Mace, R.E., and others, 2022, "*Panel on Groundwater Availability*": 2022 TWCA Annual Convention hosted by the Texas Water Conservation Association, Fort Worth, Texas, March 10.

Mace, R.E., 2022,"*Bringing back Comanche Springs—Historical analysis to inform*

contemporary environmental analysis": American Society for Environmental History Annual Conference, Oregon (virtual), March 24.

Arismendez, S. and D. Jackson. 2022. "*Texas Stream Team Riparian Evaluation Training*": presenting at the Estella Avery Education Center, San Antonio, Texas, April 9. [10]

Reisberg, B. 2022, "*Spring Lake Education Outreach*": presented at the STEAM Fair hosted by San Marcos High School; San Marcos, TX; April, 9. [~500]

Mace, R.E., 2022, "*Bringing back Comanche Springs—Historical analysis to inform contemporary environmental analysis*": presented at the virtual panel on The History of Central-West Texas Water Conservation: From Natural Springs to the Whooping Crane American Society for Environmental History, ASEH 2022 Conference April 9, 2022; Eugene, Oregon.

Huff, A.L., 2022, "*Leveraging Social Media to Promote the Meadows Center*": presenting to MC 3314 Social Media for Strategic Communication class, Texas State University, San Marcos, Texas, April 11. [25]

Mace, R.E., 2022, "*Groundwater sustainability*": presented to the Desired Future Conditions Workgroup for the Post Oak Savannah Groundwater Conservation District, April 12. [15]

Mace, R.E., 2022, "*Groundwater sustainability and the Carrizo-Wilcox*": presented to the groundwater conservation districts of Groundwater Management Area 12, Milano, Texas, April 22 [20].

Mace, R.E., 2022, "*The relationship between surface water and groundwater*": TREAD Talk hosted by the Texas Real Estate Advocacy & Defense Coalition, via the interwebs, April 19 [30]

Mace, R.E., 2022, "*State of water in Texas*": presented to the Central Water Coalition's Water Roundtable, Buchanan Dam, Texas, April 21 [30].

Navarro, A., Howard, M., and TBD. 2022, "*Restoration in the Upper San Marcos River Watershed*": presenting at the San Marcos Urban Riparian Workshop hosted by Texas Water Resources Institute; San Marcos, TX; April 20. [~40]

Arismendez, S. 2022. "*Texas Stream Team*": presented virtually to Texas Hill Country Conservation Network – Water Team; virtual; April 21. [12]

Navarro, A. 2022, "*Upper San Marcos River Watershed Updates*": presented at the FY22 Annual Clean Rivers Program Steering Committee Meeting hosted by Guadalupe Blanco River Authority; Seguin, TX; April 28, 2022 [TBD]

Dornak, N., Jackson, D. and Arismendez, S. 2022, "*Lower Cypress Creek Pilot Project: Assessment of E. coli Bacteria and Optical Brighteners*": presented in-person to GBRA CRP Basin Steering Committee; Seguin, Texas; April 28. [20]

Schlandt, A. 2022, "*Texas Stream Team Statewide Water Quality Citizen Science Program*": presented at the Texas Master Naturalist Virtual Volunteer Fair hosted by Texas Master Naturalists. San Marcos, Texas; May 5, 2022. [102]

Navarro, A. and Schlandt, A. 2022, "*Texas Stream Team Riparian Evaluation Training*": presented at the Riparian Evaluation Texas Stream Team training hosted by Texas Stream Team; San Marcos, Texas; May 5, 2022. [9]

Jackson, D. and Arismendez, S. 2022, "*Texas Stream Team Probe Core Water Quality Citizen Scientist Training*": presenting at the Probe Core Texas Stream Team training hosted by Texas Stream Team; Rockport, TX; May 14. [10]

Balboa, B., and Navarro, A. 2022, "*Texas Stream Team Probe Core Water Quality Citizen Scientist Training*": presented at the Probe Core Texas Stream Team training hosted by Texas Stream Team; Rockport, TX; May 14, 2022 [8]

Morris, C., Navarro, A., and A. Schlandt. 2022, "Texas Stream Team Riparian Evaluation Citizen Scientist Training": presented at the Riparian Evaluation Texas Stream Team training hosted by Texas Stream Team; online presentation; May 14, 2022 [5]

Jackson, D. and S. Arismendez. 2022. "*Development of a Concurrent Citizen Science E. coli and Optical Brightener Monitoring prototype as a Pollution Screening Tool*": poster presentation at the Joint Aquatic Sciences Meeting; Grand Rapids, MI; May 16.

Dussler, R. 2022, "*Nature Connection and Research at the Meadows Center*": presented at Bluebonnet Lion's Club; San Marcos, Texas; May, 17, 2022. [15]

Mace, R.E., 2022, "*Groundwater in Texas—Ludicrous mode!*": presented at the Groundwater Roundtable hosted by The Cynthia and George Mitchell Foundation and Environmental Defense Fund, San Antonio, Texas, May 17. [15]

Riggins, C. 2022, "Movement and mortality of invasive suckermouth armored catfish during a spearfishing control experiment": poster presented at the 2022 Annual Meeting of the Texas Chapter American Fisheries Society in Hunt, Texas, May 17-19.

Rodriguez, Y. 2022, "Piercing and patching the armor: Assessment of abdominal incision closure and healing during transmitter insertion on invasive suckermouth armored catfish": poster presented at the 2022 Annual Meeting of the Texas Chapter American Fisheries Society in Hunt, Texas, May 17-19.

Mace, R.E., 2022, "*How long will our aquifers last?*": presented online at the Sunday Evening Conversations on Creation, hosted by Christ the King Lutheran Church, Houston, Texas, May 22. [15+]

Navarro, A., and L. Parchman. 2022, "*Enhancing Data Access and Application to Maximize Citizen Science Retention*": presenting at the C*Sci 2022 conference hosted by Citizen Science Association; online presentation; May 23-26 [18]

Thompson, Carrie L. 2022, "*Tools for Understanding and Addressing Conflict*": presented at Texas Water Leaders training hosted by Texas Water Foundation; Austin, TX; May, 24, 2022. [25]

Mace, R.E., 2022, "*How many springs in Texas have gone dry since 1980? Why and where and should we care?*": presented at the Texas Groundwater Conference hosted by the American Groundwater Trust, June 2.

Reisberg, B. 2022, "*Time Travelling at Spring Lake*": presented at The Boys and Girls Club; San Marcos, Texas; June, 8, 2022. [60]

Jackson, D., Navarro, A., Reisberg, B., and A. Schlandt. 2022, "*Texas Stream Team Standard Core Water Quality Citizen Scientist Training*": presented at the Standard Core Texas Stream Team training hosted by Texas Stream Team; San Marcos, TX; June 13, 2022. [30]

Wait, M., Reisberg, B., and Massey, S. 2022, "*PMAPS for Texas: Summer 2022 Teacher Workshop*": presented at the Meadows Center for Water and the Environment and Lewisville Outdoor Learning Area; San Marcos and Lewisville, Texas; June 21-23, 2022. [16]

Thompson, Carrie L. 2022, "*Earth Day Every Day at the Meadows Center*": presented at Earth Day Every Day hosted by The City of Dallas; Virtual; June, 23, 2022. [300]

Navarro, A. 2022, "*Texas Stream Team San Antonio*": presented at the National Rivers Month Texas Stream Team Meet and Greet Day hosted by the San Antonio River Authority; San Antonio, TX; June 23, 2022. [22]

Massey, S. 2022, "*Essential Information about the Meadows Center, Spring Lake Access, The Edwards Aquifer, and Turtles of The San Marcos River*": presented at Cat Camp hosted

by the Department of Student Involvement; San Marcos, Texas; June 25, 2022. [~212]

Arismendez, S. and Navarro, A. 2022, "*Texas Stream Team Advanced Water Quality Citizen Scientist Training*": presented at the Advanced Texas Stream Team training hosted by Texas Stream Team; San Marcos, TX; July 7, 2022. [5]

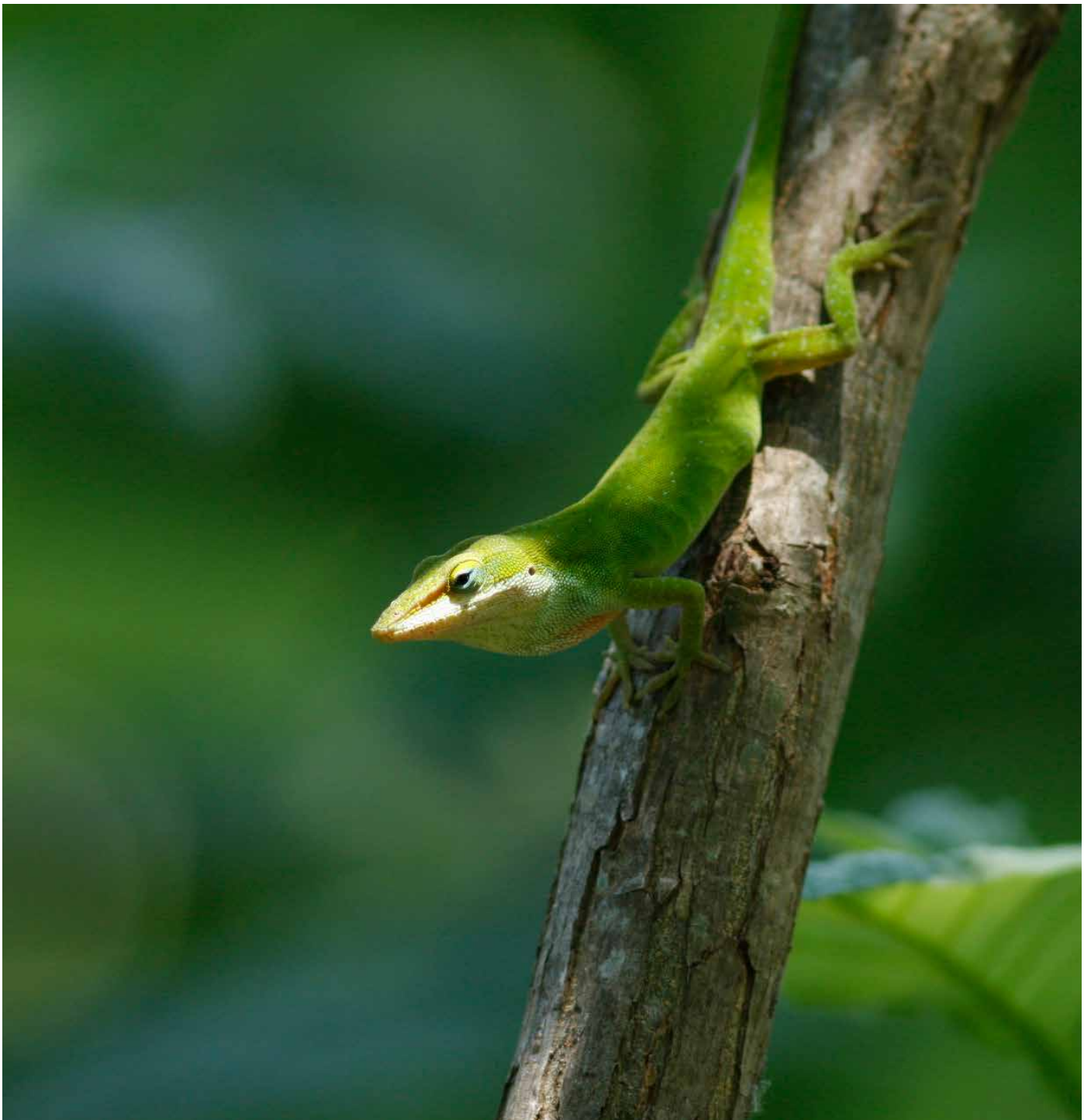
Howard, M., and Navarro, A. 2022, "*Restoration in the Upper San Marcos River Watershed*": presented at the San Marcos Urban Riparian and Stream Restoration Training hosted by Texas Water Resources Institute; San Marcos, TX; July 27, 2022. [30]

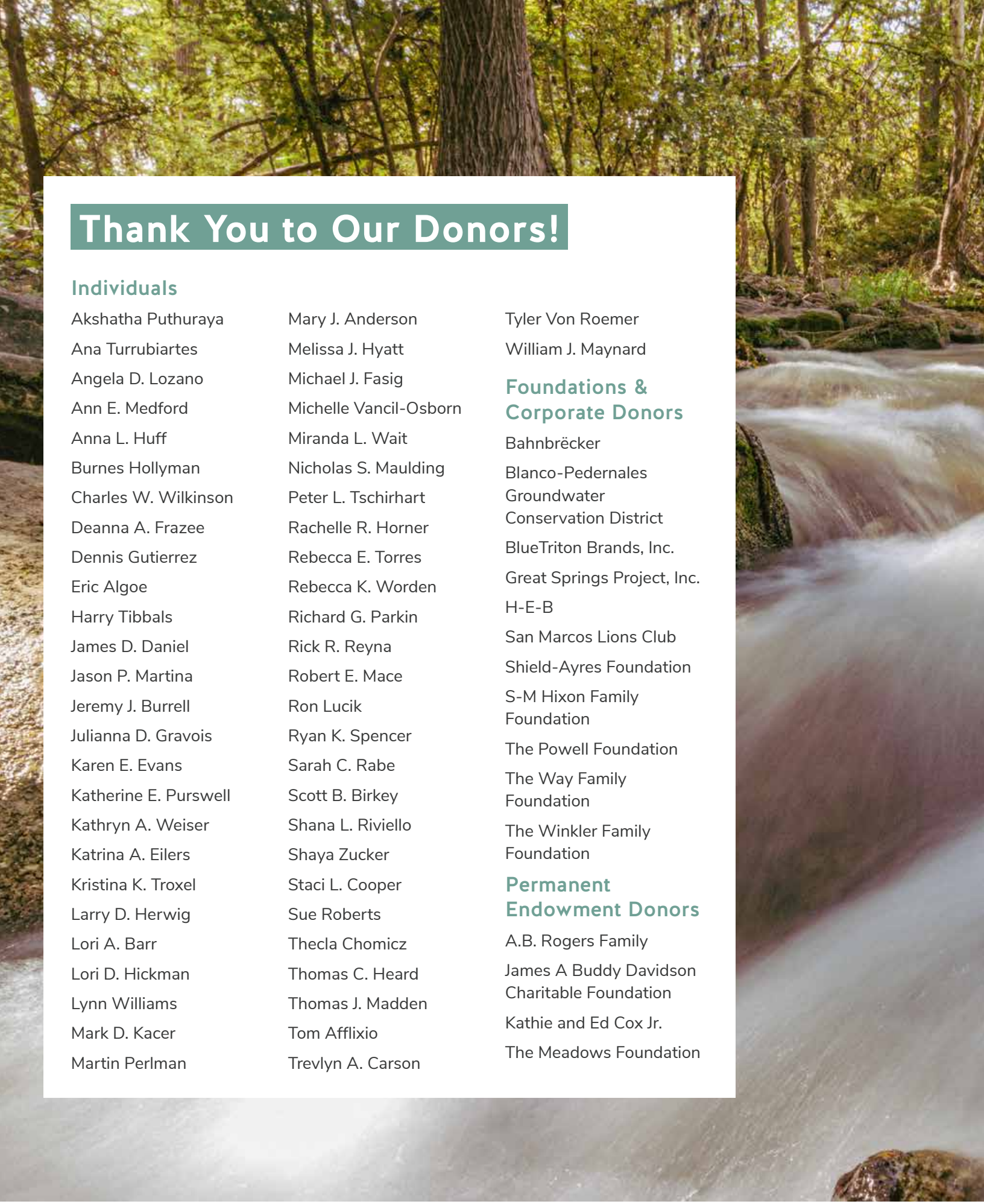
Arismendez, S. 2022, "*Texas Stream Team Advanced Water Quality Citizen Scientist Training: Dedicated to understanding and protecting the 191,000 miles of Texas waterways*": presented at Waco Wetlands Center training event; Waco, Texas; August 13, 2022. [~20]

Schlandt, A. 2022, "Texas Stream Team Statewide Water Quality Citizen Science Program": presented at the Upper Trinity River Basin Coordinating Committee meeting hosted by the North Central Texas Council of Governments. San Marcos, Texas; August 16, 2022. [19]

Thompson, Carrie L. 2022, "*From Redundancy to Synergy; the Texas Integrated Flooding Framework*": presented at The 2022 Technical Summit hosted by Texas Floodplain Management Association; Bastrop, Texas; August, 26, 2022. [200]

Schlandt, A. 2022, "*Texas Stream Team Statewide Water Quality Citizen Science Program*": presented at the Texas Watershed Planning Short Course hosted by the Texas Water Resources Institute. Bandera, Texas; August 31, 2022. [26]





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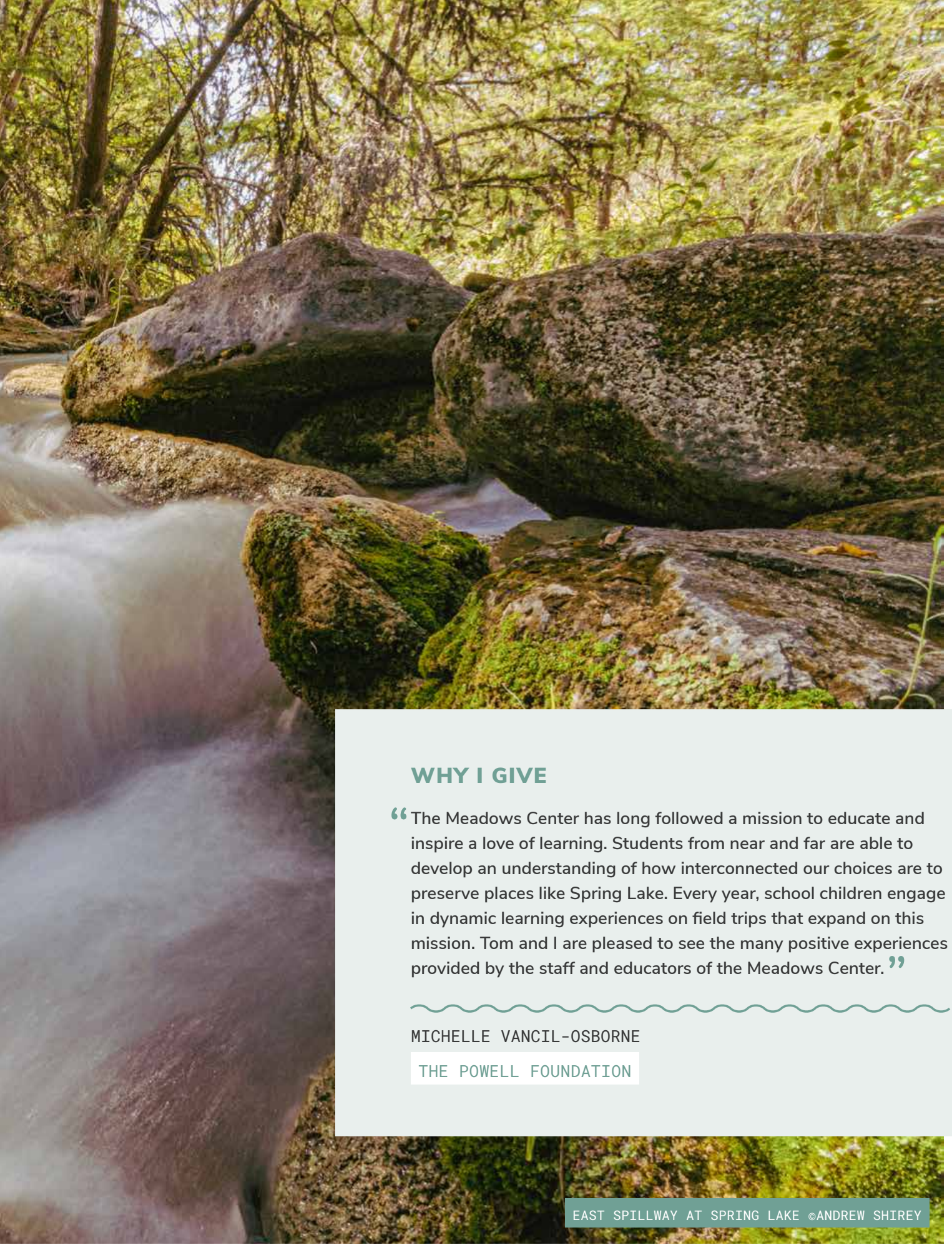

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"The Meadows Center has long followed a mission to educate and inspire a love of learning. Students from near and far are able to develop an understanding of how interconnected our choices are to preserve places like Spring Lake. Every year, school children engage in dynamic learning experiences on field trips that expand on this mission. Tom and I are pleased to see the many positive experiences provided by the staff and educators of the Meadows Center."

MICHELLE VANCIL-OSBORNE

THE POWELL FOUNDATION

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