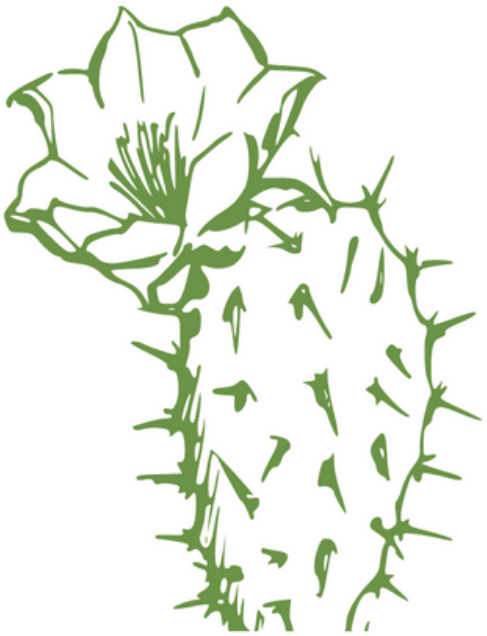

# TPCC 2023

## Texas Plant Conservation Conference

## *Seeds & Needs*

August 14-15, 2023

Fort Worth Botanic Garden

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Wildlife and Natural Resources

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**SCHEDULE AT-A-GLANCE**

| **Monday 14-Aug-2023** | **Tuesday 15-Aug-2023** |
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| 07:30a Registration<br>08:30a Welcome Remarks<br>09:00a Keynote Address<br>10:00a Break<br>10:30a Session 1: Resources & Needs<br>12:00p Lunch<br>01:30p Session 2: Plant by Plant<br>03:00p Break<br>03:30p Session 3: General Session<br>04:45p Break<br>05:00p - 07:00p Poster Reception | 08:00a Morning Mingle<br>08:30a Special Presentation<br>09:00a Session 4: The Long View<br>10:15a Break<br>10:30a Special Presentation<br>11:30p Closing Remarks & Lunch<br>----------<br>01:00p Workshop 1<br>01:00p TORCH Business Meeting<br>01:00p Collections Tours<br>03:00p Workshop 2 |

# Code of Conduct

The TPCC 2023 organizers value the diversity of views, expertise, opinions, backgrounds, and experiences reflected within our community and are committed to providing a safe, productive, and welcoming environment for all participants. This Code of Conduct is intended to prevent incidents of harassment, discrimination, and violence, and to promote an inclusive, supportive, and collaborative environment for all people and cultures along with maintaining high quality scientific and professional discourse.

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| **Expected Behavior** | **Unacceptable Behavior** |
|---|---|
| • Treat everyone with kindness, respect, and consideration, valuing a diversity of views and opinions (including those you may not share).<br>• Exhibit professional behavior at all times.<br>• Communicate openly, with respect for others, critiquing ideas rather than individuals.<br>• Make space for new people to join in your conversations. | Harassment, intimidation, or discrimination in any form including, but not limited to:<br>• Written, or verbal abuse<br>• Exclusionary behavior and microaggressions related to age, appearance or body size, employment or military status, ethnicity, gender identity & expression, individual lifestyle, marital status, national origin, physical or cognitive ability, political affiliation, sexual orientation, race, or religion<br>• Unwanted sexual attention<br>• Use of sexual or discriminatory images or language<br>• Deliberate intimidation, stalking, or following<br>• Sustained disruption of talks or other events<br>• Bullying behavior, including intentional microaggressions<br>• Retaliation for reporting unacceptable behavior<br>Unacceptable behavior intended in a joking manner still constitutes unacceptable behavior.<br>• Avoid jokes about a specific group (e.g., “undergrads”)<br>• Avoid making derogatory comments toward a specific individual<br>• Avoid use of profanity or offensive language |

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If you feel that you are the subject of unacceptable behavior, have witnessed any such behavior, or have other concerns, report the incident details to ResearchAdmin@fwbg.org as soon as possible. Conference organizers will work with you to resolve the situation. Conference organizers will treat all reports seriously and will work to understand the situation through prompt investigation, including conversations with relevant individuals and witnesses before determining an appropriate course of action.

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# Keynote Address

*Naomi Fraga, PhD; Naomi hiking in the Amargosa Desert; a tiny Phrymaceae flower*

We're excited to welcome this year Naomi Fraga, PhD, to deliver our keynote address entitled "Seed banking the California flora: Promise and progress." Dr. Fraga is the Director of Conservation Programs at the California Botanic Garden and Research Assistant Professor of Botany at Claremont Graduate University. As a part of the conservation program at the Garden she oversees the activities of the California Seed Bank which is the largest seed bank dedicated to California native plants. Her research focuses on floristics, systematics of monkeyflowers, rare plants and conservation of the native flora. Naomi serves as Secretary for the Southern California Botanists, Treasurer for the Amargosa Conservancy, and on the board of the Claremont Wildlands Conservancy.

We look forward to learning from her experience leading amazing conservation work in California!

# Day 1: Monday

*14 August 2023*

*All events take place in the Lecture Hall of the Garden Center, unless otherwise noted*

7:30 AM Registration

8:30 Welcome Address

9:00 **Keynote Address**
Seed Banking the California flora: Promise and progress—Dr. Naomi Fraga, Director of Conservation Programs, California Botanic Garden.

10:00 Morning Break

10:30 **Session 1: "Resources & Networks"**

Seed-Spec: A native seed blend development tool—Rob Cook, George Peacock

NEON in the Southern Plains: Terrestrial plant data and samples to understand changing ecosystems–Canaan Sutton, Eric Becker

Overview - Native Plant Society of Texas Programs—Meg Inglis, Kim Conrow

The Role of the USDA-NRCS Plant Materials Program in Developing and Distributing Plant Materials to Address Conservation Needs–Brandon Carr

Creating Outreach Art for Your Research–Natch Azure

12:00 PM Lunch Break
Oak Hall (Garden Center)

1:30 **Session 2: "Plant By Plant"**

An Overview of Aquatic Plant Species Found in the Ephemeral Wetlands of South Texas and Davis Mountains, Texas–Casey Williams, Michael Eason, Dr. Jeff Back, Dr. Nic Tippery

Que *Quercus*–Michael Eason

Establishing a Baseline for *Eriocaulon koernickianum*–Rachel Carmickle

Conserving Quillworts: Amphibious lycophytes of the Llano Uplift rock outcrops–Lisa George, Alejandra Vasco, Sarah George, Jerry Stacy, Marsha Stripe

*Zizania texana* During the Anthropause–Casey Williams

Preliminary Status Review and Site Ecology of *Penstemon grandiflorus* (Plantaginaceae) Populations in North Texas–Allan Nelson, Taylor Price, Bill Freiheit, Randy Deming

Ongoing Conservation of Texas Prairie Dawn, *Hymenoxys texana* (Asteraceae) and Associate Endangered Species at Harris County Prairie Dawn Preserve–Anita Tiller, Kari Hernandez, Zoe Matranga, Stephen Dubois

3:00 Afternoon Break

3:30 **Session 3: "Lightning Talk General Session"**

Conserving Big Red Sage (*Salvia pentstemonoides*) Through Plant Surveys and Seed Banking–Sean Griffin, Andrea DeLong-Amaya, Eric Keith

Developing Propagation Protocols for Rare and Uncommon Plants at San Antonio Botanical Garden–Hayden LaBarr

Inspiring the Conservation of Native Texas Cacti and Ferns–Jay R. Caddel

Trees of the Fort Worth Botanic Garden–Savannah Thomas

Building the Better Brushpile - A project on what to do after clearing brush–Chase Brooke

Thirsty Plants: Water uptake strategies in an urban green landscape–Erica Almance, Ricardo Sánchez-Murillo, Brooke Byerley Best

Broadening the Focus Beyond Species: Ex-situ conservation of imperiled oak syngameons in Texas–Adam Black

4:45 Break (last chance to visit with exhibitors)!

5:00 **Poster session and reception**

BRIT Building

# Day 2: Tuesday

*15 August 2023*

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8:00 AM Morning Mingle

8:30 **Special Presentation**
Preparing for the Supernova: What have we done and what can we do better?–Anna Strong, Texas Parks and Wildlife Department

9:00 **Session 4: "The Long View"**

Policy as a Foundation for Plant Conservation at Fort Worth Botanic Garden–Seth Hamby, Benjamin Durrington

The Need for a Texas Plant Conservation Alliance–Jesse White, Sean Griffin

Dairy to Prairie–Julie Mattox

Prairie Phenology and Participatory Conservation: Exploring ecology and engagement through community science–Megan O'Connell, Ashley Titus

10:15 Morning Break

10:30 **Special Presentation**
Our National Grazing Lands: The Great Barrier Reef of North America–Meredith Ellis

11:30 Closing Remarks & Lunch
Lunch served from Redbud Hall; enjoy in the garden at your leisure

# Post-Conference Activities

*15 August 2023*

1:00 PM — Workshop 1: Establishing Communications and Building Relationships With Private Landowners (pre-registration required)
Redbud Hall (Garden Center)

1:00 — TORCH (Texas-Oklahoma Regional Consortium of Herbaria) annual business meeting (open to public)
Commons (BRIT Building)

1:00 — FWBG-BRIT collections tours (inquire at Registration Desk)

3:00 — Workshop 2: Trustees for the Texas Threes: How to increase seed for S3 species (pre-registration required)
Classroom (BRIT Building)

# Speaker Abstracts

*Alphabetical by first author*

### Thirsty Plants: Water uptake strategies in an urban green landscape

Almance, Erica[1]; Sánchez-Murillo, Ricardo[1]; Byerley Best, Brooke[2] --- [1]Tracer Hydrology Group, Department of Earth and Environmental Sciences, University of Texas at Arlington; [2]Botanical Research Institute of Texas at Fort Worth Botanic Garden

Urban green infrastructure serves to mitigate water pollution due to flashy stormwater events. However, the understanding of plants' role in partitioning the urban water cycle is limited. We present a study in the Fort Worth Botanic Garden to understand water uptake strategies of three common species (Elderberry, *Sambucus canadensis*; Cherry laurel, *Prunus caroliniana*; and Boxelder maple, *Acer negundo*) from late February to June 2023. Stem isotopes ($\delta^{18}O$ & $\delta^{2}H$) are compared to four endmembers: rainfall, throughfall, surface water, and soil water at different depths. Water from discrete stems, roots, and soil samples was extracted by centrifugation (11,000 rpm at 5°C for 1.5 hrs). Isotope ratios were obtained using laser spectroscopy. In addition, weekly soil water samples were obtained from suction lysimeters. Mean soil $\delta^{18}O$ values from centrifugation (-3.65‰) and lysimeters (-3.48‰) agree with recent precipitation input in the DFW area (-3.34‰). Remarkably, stem $\delta^{18}O$ values exhibited a strong temporal trend from high variability at the end of winter to more uniform values during the spring. The stem $\delta^{18}O$ mean value (-3.11‰) in Cherry laurel agrees with the seasonal soil water values. Elderberry $\delta^{18}O$ ratios evolved from ~ -1.0‰ (winter) to -3.37‰ (spring), indicating slower uptake and mixing of new water within the sap flow. Boxelder maple (-0.17‰) exhibited enriched values, suggesting longer water residence time as well as a preference for deeper water sources (+0.08‰ in $\delta^{18}O$; nearby swamp). Our results highlight plant water uptake strategies and the connectivity between precipitation and evapotranspiration in an urban green landscape.

### Creating Outreach Art for Your Research

Azure, Natch --- Botanical Research Institute of Texas at Fort Worth Botanic Garden

Conservation is a relationship between knowing something and doing something. As researchers we certainly like to hope we know something! - but what can we do with all our data and field stories that inspires others to act? How much does your local community know about the work you are putting into their land? In this short talk we'll walk through what the world of science communication and conservation outreach looks like, why it matters, why it's fun… and how you can share your own stories through art!

### Broadening the Focus Beyond Species: Ex-situ conservation of imperiled oak syngameons in Texas

Black, Adam --- Bartlett Tree Research Laboratories and Arboretum

Out of all species native to the US, The Conservation Gap Analysis of Native U.S. Oaks (Beckman et. al., 2019) identified four species of oaks (*Quercus* spp.) native to the Trans-Pecos region of Texas as being in most critical need for ex-situ conservation action, and furthermore identified an additional four species from

the region that are of high conservation priority. Current research (Hipp et. al., unpublished) and ongoing field surveys intended to better guide conservation efforts are shedding new light on the highly complex red oak (*Quercus* sect. Lobatae) and white oak (*Quercus* sect. Quercus) syngameons of the region. Rampant local hybridization is resulting in morphotypes that have likely been erroneously assigned species status, and initial molecular indications show that there are likely cryptic, highly localized and genetically stable new taxa within these complexes. Many dwindling Pleistocene relict species in the region are freely hybridizing with multiple sympatric species that are more adaptable to the region's rapidly changing climate. For the purposes of conservation, it is proposed that we need to consider preserving as much of the local *Quercus* genetics both in-situ and ex-situ as opposed to strictly focusing on the chosen individual taxa as they have been traditionally recognized.

### Building the Better Brushpile - A project on what to do after clearing brush

Brooke, Chase --- Texas A&M AgriLife Extension Service

Plant debris is a regular byproduct of routine land management activities such as land clearing, timber thinning, and native rangeland restoration among others. Commonly, this debris is piled on-site for future disposal – often via burning. Despite the ubiquitous nature of brush piles, and the common use of fire in removing them, there is astonishingly little research or policy around managing this debris. Despite brush piles being the top cause of wildfires in Texas, there are few research-based recommendations by regulatory or educational agencies that address the specific construction of brush piles to reduce fire risk. Additionally, programs like the NRCS Environmental Quality Incentives Program has projects and specifications to manage woody plant removal via a wide variety of means but has little guidance or specification on how to manage the debris generated for the landowner. This presentation will provide context and details on a new collaborative project by the Texas A&M AgriLife Extension Service's Small Acreage program to address this gap. Currently, the project is collecting initial pile burn data on private and public lands focusing on the characteristics of pile construction, environmental conditions, location, timing, and burn duration to develop practical, research-based recommendations for landowners and land managers. Future work includes opportunities to focus on other areas such as the effects of burning piles on soil, vegetation, and wildlife.

### Inspiring the Conservation of Native Texas Cacti and Ferns

Caddel, Jay R. --- Lady Bird Johnson Wildflower Center

The Lady Bird Johnson Wildflower Center has taken up the conservation challenge of creating two new collections: Native Texas Cacti and Native Texas Ferns. Our goal of both these Collections is to educate the public and inspire the conservation of native plants via accredited collections by the APGA. For many years the Center has housed a cactus collection that has been tended to by staff and volunteers. We decided to inventory and catalog the cacti to determine a list of target species with known provenance. According to the Wildflower Center's Native Plants Database, NPONA, there are 162 species, subspecies, and varieties of cacti found in Texas. Approximately one hundred of these occur in the state's Trans-Pecos Region, one of the most cactus-rich regions of the United States. Through collection in the field, as well as building

relationships with other gardens and conservationists, we hope to collect specimens of all the cacti native to Texas and be able to display them to the public. Native Texas ferns have been a passion for one of the Center's donors for the past twenty-five years. She is supporting us collecting Texas native ferns and displaying them for everyone to enjoy. She has graciously donated sixteen ferns to add to our collection. We estimate that there are over 100 native fern taxa within Texas, many of which surprisingly come from West Texas. Our goal is to collect all of the native ferns of Texas and educate people about their rich history and importance.

### Establishing a Baseline for *Eriocaulon koernickianum*

Carmickle, Rachel --- Botanical Research Institute of Texas at Fort Worth Botanic Garden

Determining the current species status of *Eriocaulon koernickianum* at known sites in the westernmost extent of the range, validating a predictive habitat model to identify potential reintroduction sites, and conducting a germination study to inform potential reintroduction efforts.

### The Role of the USDA-NRCS Plant Materials Program in Developing and Distributing Plant Materials to Address Conservation Needs

Carr, Brandon --- USDA-NRCS James E. "Bud" Smith Plant Materials Center

Protecting our natural resources requires developing and distributing specific plants to address our most critical conservation needs. The mission of the USDA-Natural Resources Conservation Service Plant Materials Program is to deliver needed plants and plant technology to address resource concerns in different geographical regions in the United States. The success of meeting these needs depends on the adaptation and performance of tested and proven seed sources. The Plant Materials Program uses an extensive plant evaluation, selection, and release process for conservation plants to address specific resource concerns. This process includes identifying plant species with attributes to address the resource concern, assembling germplasm indigenous to the area of intended use, evaluating the plants for specific characteristics, and supplying limited amounts of seed and plant material to seed producers for commercial production. Currently, the Plant Materials Program maintains more than 450 native seed sources of conservation plant releases to ensure their commercial availability for conservation plantings.

### Seed-Spec: A native seed blend development tool

Cook, Rob[1]; Peacock, George[2] --- [1]Bamert Seed Company, National Grazing Lands Coalition; [2]Object Modeling Systems Laboratory, Colorado State University

Establishing native vegetation in any restoration project can be a challenging task. The species and varieties that match the site must be identified and used to help ensure adequate establishment and persistence. Data exists to help project managers identify what species are native to a given area and commercially available, but can be cumbersome, not user friendly, and time consuming. Bamert Seed Company has worked with Colorado State University to develop a web application to easily identify a project area of interest (AOI) and provide information on native species composition for the AOI. The tool will provide a list of commercially available species that correspond to the plants that grow natively in the AOI and intuitively

walk the user through developing a site-specific native seed blend. The recommended seeding rate from NRCS will be used to calculate the pounds of pure live seed (PLS) that will be needed for the project. Users will have the ability to adjust the seeding rate based on their establishment objectives and seeding method they will be using. Having this tool will allow the reclamation specialist a timely way to determine the best blend for their AOI and get the seed blend to a vendor/seed dealer with knowledge that the species selected will work for their specific site.

### Que *Quercus*

Eason, Michael --- San Antonio Botanical Garden

Presumed extinct for over a decade, the search for *Quercus tardifolia*, the Late-leaf Oak, began in 2021. It was rediscovered in May of 2022 by a multi-institutional team of researchers funded by US Botanical Garden. This work, stemming from a broader western red oak study headed by Morton Arboretum, is the story of not the lost oak, but how laboratory work, field work, public and private land access, collaboration, media outreach, and horticulture come together successfully conserve the last known individuals of the Late-leaf oak and other fagaceous oddities found in West Texas.

### Our National Grazing Lands: The Great Barrier Reef of North America

Ellis, Meredith --- G Bar C Ranch

A discussion on ranching's ability to preserve our dwindling ecosystems.

### Conserving Quillworts: Amphibious lycophytes of the Llano Uplift rock outcrops

George, Lisa[1]; Vasco, Alejandra[1]; George, Sarah[2]; Stacy, Jerry[3]; Stripe, Marsha[1] --- [1]BRIT, Botanical Research Institute of Texas; [2]North Carolina State University; [3]Inks Lake State Park

We have begun a multi-year study to locate, identify and conserve Texas quillworts in the Llano Uplift of central Texas. Their high levels of morphological variability due to character polymorphism and environmental plasticity make distinguishing quillwort taxa very difficult. We have concentrated on habitat characterization and plant phenology in the field as well as genetic barcoding methods in the lab in order to delineate quillwort species. We have located six sites with multiple quillwort species: 2 on protected state-owned property and 4 on private property that is currently secure. We have observed that the majority of the plants in our protected sites depart significantly from their type descriptions, and we are initiating a population genetic study to assess patterns of diversity and examine the role that hybridization may play in this enigmatic group of species. Long term quillwort monitoring at Inks Lake State Park indicates that the endemic rock quillwort (*Isoetes lithophila*) is unexpectedly resilient to drought but may be more immediately threatened by invasive wild pigs.

### Conserving Big Red Sage (*Salvia pentstemonoides*) Through Plant Surveys and Seed Banking

Griffin, Sean[1]; DeLong-Amaya, Andrea[1]; Keith, Eric[2] --- [1]Lady Bird Johnson Wildflower Center, University of Texas at Austin; [2]Raven Environmental Services, Inc.

Big Red Sage (*Salvia pentstemonoides*) is critically imperiled across its range, with fewer than 10 populations known in the Edwards Plateau ecoregion of Central Texas. Though this species has exhibited some success in cultivation, the provenance of the source stock is generally unknown, and there is evidence that these individuals may exhibit low genetic diversity compared to wild populations. Thus, cultivated plants may be of limited use for conservation actions such as reintroduction or seed banking. To protect this species in the face of continued environmental threats, we plan to survey for previously unknown populations in the wild and use careful nursery grow-out, propagation, and seed banking to increase the number and genetic diversity of seeds available for future conservation of this rare Texas endemic.

### Policy as a Foundation for Plant Conservation at Fort Worth Botanic Garden

Hamby, Seth; Durrington, Benjamin --- Fort Worth Botanic Garden

Botanic gardens house one-third of all known plant species and protect 40 percent of threatened and endangered species (Botanic Gardens Conservation International). Gardens are ever-evolving institutions that serve myriad scientific, social, and environmental purposes. Botanic gardens are powerhouses of plant conservation, integrating both In-situ and Ex-situ approaches through living and preserved collections, research, horticulture, and education. Because of the countless ways in which staff and the public interface with plant material, it is critical to build a solid policy framework to ensure appropriate interaction with the living collections. This framework should clearly highlight and define purpose, scope, documentation, plant records management, acquisition, care, use, access, and responsibilities. Additionally, comprehensive audits and inventories should be conducted to determine the state and composition of the collections as well as to evaluate their conservation and research value. Armed with a strong living collections policy and a detailed understanding of the current state of collections, a living collections strategic plan should be created to guide the development of coherent, conservation-focused, and mission-driven plant collections.

### Overview - Native Plant Society of Texas programs

Inglis, Meg; Conrow, Kim --- Native Plant Society of Texas; Native Prairies Association of Texas; Texas Society for Ecological Restoration

The Native Plant Society of Texas has supported plant conservation for over 40 years. This presentation gives an overview of our activities and programs dedicated to our mission of conserving and utilizing native plant and plant habitats through education, outreach and example. One of the greatest threats to native habitats is urbanization. Natural habitat is destroyed and typically replaced with nonnative plants which can spread and overwhelm ecosystems. These nonnative invasive plants are not recognized and utilized by our wildlife and may not be adapted to local ecoregion conditions, thereby robbing us of the ecosystem services that native plants can provide. Development mitigation should include landscaping with native plants to offset habitat destruction and build back natural habitat over time. Our 33 local chapters currently engage in a number of initiatives to educate the public about the importance of native plants to our ecosystems. One of our goals is to guide Texas residents towards making thoughtful choices about their landscape plants so that they may take advantage of the benefits of native plants. Kim Conrow, Immediate Past PResident of the

Native Plant Society of Texas, will give a brief overview of Society programs designed to educate the public about the importance of using native plants in the landscape.

### Developing Propagation Protocols for Rare and Uncommon Plants at San Antonio Botanical Garden

LaBarr, Hayden --- San Antonio Botanical Garden

Since late 2021, the San Antonio Botanical Garden has taken strides to expand its living collection. Over the past 2 years, more than 230 taxa have been newly incorporated into the garden's collection. For many of these taxa, little information concerning their cultivation exists. Once collected vegetative material is brought back from time afield, the next challenge is often producing such information from scratch. Many of these taxa face growing threats to their habitats, so it is essential that protocols are developed for their large-scale production and dissemination. Through ample documentation, much trial and error, assistance from volunteers, and collaboration with experienced growers, an even greater body of relevant information will continue to be amassed for the future propagation of rare and uncommon Texas plants.

### Dairy to Prairie

Mattox, Julie --- Texas Grazing Land Coalition

Tallgrass prairie restoration requires patience in the best of conditions; tallgrass prairie restoration on an old dairy farm will fully test that patience. I relocated to East Texas in 1996 to a home on one acre that was surrounded by my neighbor's 70-acre pasture that was once a dairy. There were several species of wildlife and birds utilizing the property for nesting and wintering. Three years later, in 1999, this 70-acre property reopened as a small dairy milking at times over 200 cows. The pasture became severely overgrazed and the wildlife soon disappeared. No native grassland birds, no insects other than flies, no snakes, only the occasional raccoon or opossum. All plant diversity was lost. I was faced with three choices: live with the current conditions, move, or buyout the dairy farm. After several years of negotiations, I purchased that dairy in 2010. The cows moved on and I stated I never want to see a cow on my property again. That's when the journey really begins. Working with Texas Parks & Wildlife, the NRCS and yes, adding cattle to facilitate the restoration has been an education. However, restoration did not go like I thought it should. A lesson in patience, it's taught me the art of observation and I wish I could control the weather. Dairy to prairie has a long way to go, but to the birds, insects and other wildlife, they have a home again.

### Preliminary Status Review and Site Ecology of *Penstemon grandiflorus* (Plantaginaceae) Populations in North Texas

Nelson, Allan[1]; Price, Taylor[1]; Freiheit, Bill[2]; Deming, Randy[3] --- [1]Tarleton State University, Biological Sciences Department; [2]Tarrant County College; [3]Big Country Master Naturalist

We examined the status of *Penstemon grandiflorus* in Callahan, Montague, and Taylor counties in North Texas. NatureServe list the species as in need of review in Texas. Towards this goal, we have been able to access four sites where populations have been reported. Two that we located were in Callahan County but

only one persisted. One population was located in Montague County but had been greatly reduced by road work in the area. A fourth population had been extirpated in Taylor County, likely by road work and associated housing development. We compare number of plants, flower and fruit numbers, associated species, richness, and coverage among and between the two populations that persist. We are also working to locate new populations and comparing habitat from two restored populations in a protected natural area in northwestern Illinois where it is state endangered. Based on preliminary ecological work and two-thirds of the populations we examined in Texas being extirpated or reduced in number due to development, it appears that *P. grandiflorus* may be threatened or endangered in Texas as well as Illinois.

### Prairie Phenology and Participatory Conservation: Exploring ecology and engagement through community science

O'Connell, Megan[1]; Titus, Ashley[2] --- [1]Botanical Research Institute of Texas at Fort Worth Botanic Garden; [2]Texas Christian University

As prairie plant communities in North Texas continue to be compromised by development, agriculture, and climate change, pursuing community-engaged research programs that foster impact are becoming increasingly important. To address these issues, collaborators at FWBG-BRIT, the Quivira Coalition, and Texas Christian University's Andrews Institute and Institute of Ranch Management worked together to begin a community science campaign that investigates the intersection of ecological and community engagement research on rangelands in North Texas. Through a multi-faceted research program, researchers worked with local regenerative ranchers and TCU undergraduates to use timelapse and herbarium-based imagery to begin collecting contemporary and historic phenological data to better inform grazing management tools that optimize for the conservation of plant and pollinator communities in working prairies. Additionally, participating TCU students collected image-based data through a structured classroom module to examine how participatory research alters their attitudes toward conservation. We will present preliminary data from this research and discuss the potential and pitfalls of community-engaged research in plant conservation in the region.

### Preparing for the Supernova: What have we done and what can we do better?

Strong, Anna --- Texas Parks and Wildlife Department

As a state with 268,600 square miles, 12 ecoregions (including coastal areas, prairies, forests and mountain ranges) and over 400 plant Species of Greatest Conservation Need (SGCN), Texas plant conservation agencies and organizations have their hands full. Plant conservation today relies heavily on the solid foundation built on earlier work done at the Rare Plant Studies Center, Texas Organization of Endangered Species, TPWD's Natural Heritage Program (now the Nongame and Rare Species Program), The Nature Conservancy, several Center for Plant Conservation participating institutions (i.e., TX botanic gardens) and others. Surveys and monitoring have been conducted, species have been seedbanked, and reintroductions have been initiated. Federal and state funding continues to conserve land, allows for research and management of SGCN plants and for updates to the Texas Natural Diversity Database (the information

center for all rare Texas species). For the first time in 2020, 8 SGCN plants were added to the state threatened list without first being added to the federal list. However, increasing population growth, development and urbanization throughout the state combined with the vast amount of private land in Texas, challenges our ability to keep pace with the growth and numbers of rare species. The need for more plant conservationists and coordination/cooperation between existing players and interested future parties is considerable and should be a priority in coming years.

### NEON in the Southern Plains: Terrestrial plant data and samples to understand changing ecosystems

Sutton, Canaan; Becker, Eric --- National Ecological Observatory Network - D11 Southern Plains

The National Ecological Observatory Network (NEON) is a continental-scale observation facility that collects long-term, open access ecological data to better understand how ecosystems are changing across the United States. NEON will provide 30 years of data from 81 field sites, four of which are located in the Southern Plains. NEON data cover a range of subject areas within ecology, including organismal observations, biogeochemistry, hyperspectral imagery, and micrometeorology. All samples and data collected by NEON are publicly available and can be accessed digitally through the NEON website. By providing free and open standardized data, NEON is engaged in the global effort to expand the scope of science and make scientific data access easier for all. This talk will provide an introduction to NEON as well as an overview of the kinds of terrestrial plant data NEON collects , including plant biomass, productivity, diversity, abundance, phenology, and chemical properties. Additionally, it will showcase published research that uses NEON plant data and samples to demonstrate how NEON science can be an integral co-benefit of protecting and preserving plant communities within the Southern Plains and beyond. Lastly, it will briefly demo how to access and download NEON data from the NEON data portal.

### Trees of the Fort Worth Botanic Garden

Thomas, Savannah --- Fort Worth Botanic Garden

Tree inventories are essential for effective urban forest management. They contribute to informed planning and maintenance that aids in the conservation of tree species. The collection of herbarium vouchers provides an additional layer of historical and preserved data on species characteristics. The main objective of the Living Collections Summer 2023 Internship is to collect data on the spatial distribution and species composition of the garden's trees. Google My Maps was used to visualize the tree data, new tree points were recorded on Google Maps, and an iPad was used for collecting data in the field. Expected products from this internship include specimen vouchers of Fort Worth Botanic Garden tree species, a ground-truthed, consolidated dataset and map of trees on the property, and documentation of procedures used throughout the process. This project will provide significant data on the urban forest at the Fort Worth Botanic Garden and contribute to tree preservation and maintenance.

### Ongoing Conservation of Texas Prairie Dawn, *Hymenoxys texana* (ASTERACEAE), and Associate Endangered Species at Harris County Prairie Dawn Preserve

Tiller, Anita; Hernandez, Kari; Matranga, Zoe; Dubois, Stephen --- Mercer Botanic Gardens

The long-term success or failure of Texas prairie dawn, *Hymenoxys texana*, Asteraceae within a small 3.6-acre preserve in Harris County (HC) will provide valuable information for management strategies, particularly in urban environments, for *H. texana*, its rare associates, and their unique habitat. *H. texana*, ranked G2S2 and listed as endangered in 1986, is a rare, vernal, annual wildflower endemic to saline prairie habitats in East Texas. On July 29, 2005, HC and its parks facility, Mercer Botanic Gardens (MBG) committed to the long-term protection and management of the tract containing *H. texana* within a site of proposed construction of W. Greens Rd. from SH 249 to Cutten Rd. A 2004 biological assessment prepared by the Texas Department of Transportation and Turner Collie and Braden, Inc. guided construction in 2012-2013 of an enclosure preserve designed to repel contaminated runoff and maintain hydrology for the long-term survival of *H. texana*. Seeds and plants of *H. texana* and rare associate species, Houston camphor daisy, *Rayjacksonia aurea*, Asteraceae, ranked G1S1 and Texas windmill grass, *Chloris texensis*, Poaceae, ranked G2S2 were rescued from areas threatened by construction and banked at MBG and Center for Plant Conservation partner facilities for the National Collection of Endangered Plants. Ongoing research at this biodiverse prairie preserve and the preserve's role for outreach about ecological services provided by remnant prairies to urban areas are presented.

### The Need For a Texas Plant Conservation Alliance

White, Jessi; Griffin, Sean --- Lady Bird Johnson Wildflower Center, University of Texas at Austin

Texas is one of the fastest growing states in the US, and our native plant species are under constant threat due to rapid human development. There is an urgent need for a unified effort toward conservation of these species. The new Texas Plant Conservation Alliance intends to address this need by serving as a network of conservation organizations across the state. The goal of this network will be to facilitate collaboration on conservation efforts by sharing knowledge, resources, and skills to efficiently pursue projects related to rare, threatened and endangered plant species. This talk will address the need for the TxPCA and encourage TPCC attendees to voice their interest, address their needs as an organization, and submit their feedback via a survey presented at the end of the talk and at the TxPCA table.

### An Overview of Aquatic Plant Species Found in the Ephemeral Wetlands of South Texas and Davis Mountains, Texas

Williams, Casey[1]; Eason, Michael[2]; Back, Dr. Jeff[3]; Tippery, Dr. Nic[4] --- [1]BIO-WEST Inc.; [2]San Antonio Botanical Gardens; [3]Baylor University; [4]University of Wisconsin - Whitewater

In 2021 and 2022 we botanized around the ephemeral wetlands and aquatic habitats present in south Texas and the Davis Mountains of Texas. In south Texas ephemeral wetlands occur in low lying areas, typically around crop production land, where rain water collects during seasonally wet periods. Aquatic species to be found here include *Nymphaea elegans*, *Echinodorus cordifoloius* and *Sagittaria longiloba*. We also located

several new sites for *Heteranthera mexicana*, a rare species of conservation concern. We collected and identified associated pollinators and palynivores from two *Nymphaea elegans* populations and one *Heteranthera mexicana* population. South Texas ephemeral wetlands are hotspots of bio-diversity for migratory birds. In the Davis Mountains, ephemeral to semi perennial streams and ponds were visited following historical records and new locations. Species identified in this region included multiple *Potamogeton* species with one rare hybrid of *Potamogeton berchtoldii* subsp. *berchtoldii* × *Potamogeton berchtoldii* subsp. *clystocarpus* from Limpia Creek. Other interesting aquatic plant species included *Stuckenia pectinata*, *Bacopa rotundifolia* and *Heteranthera rotundifolia*. During collection we also sampled water chemistry (pH, conductivity and alkalinity) as well as water nutrients to better characterize the aquatic habitat. Since ephemeral habitats are typically not protected by federal law it is of utmost importance to consider these areas for conservation by other means in order to preserve these plant communities.

### ***Zizania texana*** **During the Anthropause**

Williams, Casey --- BIO-WEST Inc.

From March 2020 to September 2020 the City of San Marcos closed all public access to the San Marcos River, critical habitat of the federally listed Texas wild-rice (*Zizania texana*). During that time monitoring of the species continued.

# Poster Abstracts

*Alphabetical by first author*

### Preserving Biodiversity Amidst Urbanization: A floristic study of Silphium Prairie at Rock Creek Ranch Park

Affleck, Jade; Morton, Kate; Perez, Gabrielle; Wolfe, Gabriela; Byerley Best, Brooke; Rehman, Tiana --- Botanical Research Institute of Texas at Fort Worth Botanic Garden

In response to the rapid urbanization of Fort Worth prairies, this study utilizes iNaturalist and herbarium vouchers to investigate floristic composition, richness, and nativity at Silphium Prairie in Rock Creek Ranch Park.

### Thirsty Plants: Water uptake strategies in an urban green landscape

Almance, Erica[1]; Sánchez-Murillo, Ricardo[1]; Byerley Best, Brooke[2] --- [1]Tracer Hydrology Group, Department of Earth and Environmental Sciences, University of Texas at Arlington; [2]Botanical Research Institute of Texas at Fort Worth Botanic Garden

Urban green infrastructure serves to mitigate water pollution due to flashy stormwater events. However, the understanding of plants' role in partitioning the urban water cycle is limited. We present a study in the Fort Worth Botanic Garden to understand water uptake strategies of three common species (Elderberry, *Sambucus canadensis*; Cherry laurel, *Prunus caroliniana*; and Boxelder maple, *Acer negundo*) from late February to June 2023. Stem isotopes ($\delta^{18}O$ & $\delta^{2}H$) are compared to four endmembers: rainfall, throughfall, surface water, and soil water at different depths. Water from discrete stems, roots, and soil samples was extracted by centrifugation (11,000 rpm at 5°C for 1.5 hrs). Isotope ratios were obtained using laser spectroscopy. In addition, weekly soil water samples were obtained from suction lysimeters. Mean soil $\delta^{18}O$ values from centrifugation (-3.65‰) and lysimeters (-3.48‰) agree with recent precipitation input in the DFW area (-3.34‰). Remarkably, stem $\delta^{18}O$ values exhibited a strong temporal trend from high variability at the end of winter to more uniform values during the spring. The stem $\delta^{18}O$ mean value (-3.11‰) in Cherry laurel agrees with the seasonal soil water values. Elderberry $\delta^{18}O$ ratios evolved from ~ -1.0‰ (winter) to -3.37‰ (spring), indicating slower uptake and mixing of new water within the sap flow. Boxelder maple (-0.17‰) exhibited enriched values, suggesting longer water residence time as well as a preference for deeper water sources (+0.08‰ in $\delta^{18}O$; nearby swamp). Our results highlight plant water uptake strategies and the connectivity between precipitation and evapotranspiration in an urban green landscape.

### Silver Bluestem as a Catalyst for Restoring Juniper Encroached Grasslands

Atkinson, Hannah; Johnston, David; Navar, Lillian; Delahoussaye, Chloe; Dunn, Bryan; Breeden, Jeff --- Tarleton State University, Department of Wildlife and Natural Resources

Grasslands comprise 20 to 40 percent of earth's ecosystems and are on a global decline. Woody plant encroachment is transitioning grassland ecosystems to shrublands, impacting soil health and plant community composition. Within central Texas, overgrazing, fire suppression, and urban expansion has enabled native Ashe Juniper to expand beyond its historical niche and encroach on grasslands. Ashe juniper

will convert historical grasslands into a monocultural landscape reducing herbaceous layer biodiversity. The loss of native deep-rooted grasses due to juniper encroachment impacts the hydrology of grasslands, impacting surface water percolation by increasing bare ground, eliminating deep rooted native perennial bunch grasses, and increasing surface water runoff and erosion. Ashe Juniper monoculture ecosystem is limiting to wildlife and livestock, reducing forage, browse, and habitat availability resulting in understory vegetation consisting of few fibrous rooted plants. Here, we investigate the efficacy of removing junipers, reintroducing native grasses using silver bluestem seeded directly into juniper duff for prairie restoration, and minimizing soil disturbance. We hypothesize that silver bluestem, an early successional native grass species, can germinate and thrive in juniper duff piles restoring the herbaceous grass layer and increasing surface water percolation.

### Harnessing the Power of Community Science to Digitize the Plants of Texas: The Armchair Botanist Program

Bordelon, Ashley; Rehman, Tiana F. --- Botanical Research Institute of Texas at Fort Worth Botanic Garden

Community science is a powerful tool to engage the public as contributors and as advocates for natural history collections. We developed the Armchair Botany program in 2020 to engage with community scientists for the purpose of digitizing herbarium specimens utilizing remote video-conferencing software, a digital transcription platform, and in-person events. The main focus of our program has been the digitization of specimens collected in Texas, as part of our National Science Foundation funded “American Crossroads: Digitizing the Vascular Flora of the South Central United States”. In 3 years, over 2479 unique users have transcribed >58,000 Texas-collected herbarium specimen labels through 31 expeditions launched in the online Notes from Nature platform. Since the Armchair Botany program’s inception, herbarium staff have hosted over 120 virtual events, and delivered in-person events out of the herbarium or at community partner events –the Texas Master Naturalist Program being of particular note. Recruiting and engaging plant-enthusiast organizations has proven rewarding and successful in engaging community scientists with specimens to address resource and space limitations in herbaria.

### Building the Better Brushpile - A project on what to do after clearing brush

Brooke, Chase --- Texas A&M AgriLife Extension Service

Plant debris is a regular byproduct of routine land management activities such as land clearing, timber thinning, and native rangeland restoration among others. Commonly, this debris is piled on-site for future disposal – often via burning. Despite the ubiquitous nature of brush piles, and the common use of fire in removing them, there is astonishingly little research or policy around managing this debris. Despite brush piles being the top cause of wildfires in Texas, there are few research-based recommendations by regulatory or educational agencies that address the specific construction of brush piles to reduce fire risk. Additionally, programs like the NRCS Environmental Quality Incentives Program has projects and specifications to manage woody plant removal via a wide variety of means but has little guidance or specification on how to manage the debris generated for the landowner. This presentation will provide context and details on a new

collaborative project by the Texas A&M AgriLife Extension Service's Small Acreage program to address this gap. Currently, the project is collecting initial pile burn data on private and public lands focusing on the characteristics of pile construction, environmental conditions, location, timing, and burn duration to develop practical, research-based recommendations for landowners and land managers. Future work includes opportunities to focus on other areas such as the effects of burning piles on soil, vegetation, and wildlife.

### Effects of Minimizing Soil Disturbance on Restoring Woody Encroached Riparian Grasslands

Delahoussaye, Chloe; Johnston, David; Navar, Lilliana; Atkinson, Hannah; Breeden, Jeff; Dunn, Bryan --- Tarleton State University Department of Wildlife and Natural Resources

Woody encroachment on grasslands is a global phenomenon that is transitioning grasslands to shrubland ecosystems, altering native soil and plant community composition. Grasslands comprise 60% of ecosystems in Texas providing ecosystem services that support native plants communities essential for pollinator and wildlife biodiversity and health. Native, perennial, warm-season grasses' deep and fibrous root systems provide nutrient cycling, surface water infiltration, and soil stability. Within central Texas, Historical riparian grasslands are transitioning to closed canopy hardwood forests with understories dominated by cool-season, annual grasses, and forbs, such as Texas Wintergrass, Vine Mesquite, invasive Hedge Parsley, or are devoid of the herbaceous layer. Historical remote sensing images in areas of the Cross Timbers and Prairies region of Texas indicate that without proper management, native Cedar Elm can become the dominant woody plant species creating a monoculture that drastically alters the herbaceous plant community. Here, we investigate the efficacy of restoring a woody encroached riparian grassland through different seeding methods and minimizing soil disturbance. We hypothesize that native warm-season grasses can be successfully seeded into woody encroached historical riparian grasslands with minimal soil disturbance to support and inform management decisions of central Texas grasslands.

### Increasing Biodiversity for Riparian Ecosystems

Dunn, Bryan --- Tarleton State University

Texas is experiencing exponential population growth which is intensifying human impacts on native ecosystems due to urban sprawl and alteration of land cover and use. Fracturing and change in land use significantly affects plant biodiversity by reducing species richness and population sizes and affects the movement of native wildlife. Disturbance caused by changes in land use allows for the introduction and establishment of exotic plant species in grasslands, further exacerbating negative effects on ecosystems. These exotic species threaten biodiversity due to lack of inherent controls present in historical ranges allowing them to outcompete native species for resources. Grassland-embedded riparian ecosystems are crucial for ground cover and erosion prevention with many native shrubs that are uniquely adapted for survival within harsh, often water constrained, environments of Texas. These adaptations include long stratification times and severe scarification requirement for seed germination hindering availability for the landscaping trade and ecosystem restoration and sustainability efforts. Here we investigate different

sewing times and embryo hormonal treatments to increase germination success for native buckeyes. We theorize that in vitro hormonal treatments and direct sewing of immature buckeye embryos will reduce the severity of stratification and scarification requirements for germination and increase their availability for landscaping and ecosystem restoration.

### Characterizing Temporal Changes in Microbial Diversity in Herbarium Specimens from Guadalupe Mountains National Park

Hosaka, Mara; Bullock, Madison; Price, Sherese; Johnson, Matthew --- Texas Tech University

Microbial endophytes (fungi and bacteria that live within plant cells) are understood to play a significant role in the ecology of their plant hosts, but little is known of their response to climate change. Now, the diversity of microbes can be easily quantified with DNA sequencing, but there is little historical data with which to compare modern findings. Herbarium specimens may provide an historical record of bacterial and fungal endophyte communities, allowing for study of how endophytic communities may have changed over time. In this study we analyzed changes in endophyte biodiversity over the past 50 years in the Guadalupe Mountains, a biodiversity hotspot in Texas spanning seven ecoregions. We sample roots and leaves of herbarium specimens from several species collected from Guadalupe Mountains National Park. For each species we take samples from both an older specimen collected from 1973-1977 and from a recent specimen collected in 2022. We extract and sequence DNA from herbarium specimens and analyze data using standard microbiome data processing pipeline. We characterize endophyte species richness and phylogenetic relatedness across time points and plant host species and contribute to building a better understanding of the change in composition of plant microbiomes over fifty years.

### The Effect of Non-Native Invasive Grasses on Major Soil Properties in a Central Texas Prairie

Montoya, Summer[1]; Young, Michael[1]; Griffin, Sean[2] --- [1]University of Texas at Austin; [2]Lady Bird Johnson Wildflower Center, University of Texas at Austin

Prairie conservation in Central Texas requires a full understanding of non-native invasive grasses and their impact on an ecosystem. Above ground interactions have been a major aspect of invasive grass studies but less attention is paid to the impact on soils. This study seeks to determine the influence of non-native invasive grasses on major soil properties in a diverse Central Texas prairie. Volumetric soil water content, soil temperature, bulk density, light to soil, and saturated hydraulic conductivity are observed under *Nassella leucotricha*, *Bouteloua curtipendula*, *Bothriochloa laguroides*, *Sorghum halepense*, and *Bothriochloa ischaemum*. The invasive grasses (*Sorghum halepense* and *Bothriochloa ischaemum*) are hypothesized to correlate with lower soil bulk density, less light to soil, cooler soil temperature, higher volumetric water content, and a faster dry-down period compared to native species (*Nassella leucotricha*, *Bouteloua curtipendula*, and *Bothriochloa laguroides*). The results of this study are expected to highlight possible long term effects of non-native invasive grasses on valuable soil properties. This will be increasingly important to understand as conservation efforts continue in Texas prairies.

### Impact of Minimizing Soil Disturbance on Restoring Mesquite Encroached Grasslands

Navar, Liliana; Johnston, David; Delahoussaye, Chloe; Atkinson, Hannah; Breeden, Jeff; Dunn, Bryan --- Tarleton State University, Department of Wildlife and Natural Resources

Woody encroachment is estimated to result in the loss of 75% of potential grass biomass across the Great Plains. In the western United States, 25% of rangelands experience sustained tree cover expansion; due to rapid urbanization and woody encroachment. Woody plant encroachment into grasslands reduces forage production and decreases habitat availability for wildlife. Additionally, soil disturbance within grasslands damages roots, modifies soil composition and structure, and has negative impacts throughout the plant community. Overgrazing, urban expansion, and wildfire suppression have significantly impacted native grasslands throughout central Texas. Woody encroachment on Texas native prairies alters the grassland ecosystem providing opportunity for exotic invasive grass species to become established and out-compete native grasses, resulting in a decline in desirable warm-season native perennial bunch grasses. As the percent composition of Honey mesquite canopy cover increases, so does the density and longevity of annual cool season grasses with subsequent decreases in availability and native grasses. Here we investigate the efficacy of minimizing soil disturbance on establishing native grass within a Honey mesquite encroached grassland in central Texas. We hypothesize that native warm season grasses can be successfully seeded into historical grassland ecosystems with minimal soil disturbance.

### Community Composition of a Mesic Edwards Plateau Cliff on Flat Rock Creek in Bosque County, Texas

Price, Taylor; Nelson, Allan; Chraïbi, Victoria; Venkataraman, Kartik; Menefee, Dorothy --- Tarleton State University, Department of Biological Sciences

A rare cliff community comprised of layers of limestone and sandstone occurs on the Blackwell Ranch in Bosque County, Texas. Bosque County occurs in the Cross Timbers and Prairies ecoregion and the Cliff community is currently only known as part of the Edwards Plateau of Texas. The community has tentatively been identified as a Mesic Edwards Plateau Cliff (MEPC), which is rare in Texas. It occurs along Flat Rock Creek, a stream that traverses the ranch and is 180 meters above sea level. The MEPC includes lush vegetation, including the chatterbox orchid (*Epipactus gigantea*), the maidenhair fern (*Adiantum capillus-veneris*), the maiden fern (*Thelypteris ovata*), and the Cliff-Break fern (*Pellaea atropurpurea*). These communities are little known, but they appear to have similarities with other cliff communities, such as Western hanging gardens and moist igneous, limestone, sandstone, and chert cliffs. These are typically small communities of ferns, mosses, and other, often rare plants that grow from shallow bedrock soil near a spring or a seep. Diatoms are also frequently found in these rare cliff communities on the walls of the cliffs as well as the seep or spring associated with the community. We are currently examining the algal and plant species composition of the MEPC since little is known about the ecosystem.

## Grassland Restoration Mediates Plant-Pollinator Species Interaction Network Reassembly

Raulinaitis, Livia[1,2]; Caballero, Michael[1,2]; Griffin, Sean[2]; Lichtenberg, Elinor[3]; Baum, Kristen[4]; Jha, Shalene[1,2] --- [1]University of Texas at Austin; [2]Lady Bird Johnson Wildflower Center, University of Texas at Austin; [3]University of North Texas; [4]Oklahoma State University

The maintenance of species-level diversity is a primary goal of grassland restoration, but it is often complicated by the potentially distinct influences of common restoration practices, such as prescribed fire, on target taxonomic groups. Further, beyond species composition, it is essential for effective restoration to consider the impacts of management on species interaction networks, especially for mutualistic species interactions, such those between plants and pollinators. In this project, we quantified the impact of three commonly employed grassland restoration practices on plant-pollinator network composition. Specifically, we evaluated the effect of 1) large-scale prescribed burning, 2) small-scale prescribed burning, and 3) small-scale burning plus seeding, relative to control plots, in each of 10 grasslands in the Cross Timbers ecoregion of Texas and southern Oklahoma. We compared pre- and post-restoration grassland plant-pollinator species interaction networks to determine the extent to which plant and pollinator communities and their species interactions reassemble following a restoration intervention, and to additionally identify if key local and landscape factors, such as local bare ground availability and surrounding grassland habitat cover impacted network architecture. We found that restoration-induced habitat changes, especially bare ground cover, were found to have significant impacts on overall pollinator abundance and plant-pollinator interaction networks.

## Creating an Effective Junior Volunteer Project to Process Specimen Backlog

Reed, Conor; Lane, Jessica --- Botanical Research Institute of Texas at Fort Worth Botanic Garden

Unprocessed herbarium specimens risk damage and loss of scientific value. Like most herbaria, the Philecology Herbarium has a backlog of unprocessed specimens, and not enough staff to process them. A set of 150 specimens was discovered after being stored in two cardboard boxes for over a decade. These specimens–collected in Texas, with many in state parks and nature conservancy land–were repaired, transcribed, and imaged by a junior volunteer, and are now filed in the herbarium where they are protected from damage and accessible for research. The Fort Worth Botanic Garden accepts junior volunteers age 14-17 to volunteer at the organization. The herbarium has 1-3 junior volunteer projects in progress over the summer, with some continuing through the rest of the year. Junior volunteers are trained and guided by staff on an assigned project. An effective junior volunteer project engages the curiosity of the volunteer by explaining the history of the material and its scientific significance. Working with staff to create a project workflow and assess goals and progress gives the volunteer ownership over their work. The project provides minors with valuable experience for future school and work endeavors, and encourages botanical interest in a new generation of potential scientists.

## Building a Seed Database for Texas Native Plant Conservation

Rumpa, Mafia Mahabub; Ifagbayi-Adeniran, Anjola; Maier, Camelia --- Texas Woman's University

Texas Woman's University (TWU) initiated two butterfly garden containing 90+ native plant species from 20 plant families for pollinator conservation and sustainability education. These urban native gardens provide food and nesting sites for native bees and butterflies whose populations are declining. Pollinators are crucial for plant reproduction, seed set, and conservation of native plant populations in the current habitat loss situation. Pollen studies are carried on to establish plant-pollinator relationships. The goal of this study was to observe seed morphology and build a seed database to be added to the virtual TWU Herbarium for scientific purposes. Seeds were collected from the native plants in the butterfly gardens and observed with a Hitachi TM3030Plus scanning electron microscope. Pictures of seed surface ornamentations were taken at magnifications of 40-3,000x. Liatris seed had one of the most interesting seed morphology. It is cone-shaped with feathery pappus at the top which helps with seed dispersal by wind. Seed body had well defined lines with hairs from top to bottom and what seems to be round glandular hairs in the spaces between lines. The seed database will help scientists identify native plant seeds by providing them a visual online resource.

## Development of Integrative Taxonomic Resources for the Global Composite Database: A case study in the ironweed tribe, Vernonieae (Compositae)

Schmeder, I.; Gostel, M. R. --- Botanical Research Institute of Texas at Fort Worth Botanic Garden

A key challenge for biological sciences in the 21st century is the necessary coordination and integration of biological collections and their associated data. Collections-based research is in the process of undergoing a renaissance that is driven largely by the mobilization of worldwide digitization efforts. The development of online databases to share plant taxonomic information with the public and link this information to digital collections resources is a priority for biodiversity research and conservation. Decades of international plant conservation expertise culminated in 2002 with the establishment of the Global Strategy for Plant Conservation (GSPC), which was adopted by the United Nations' Convention on Biological Diversity and has included 16 targets – the first of which was to establish "a widely accessible working list of all known plant species." The GSPC has led to a number of breakthroughs for the systematics community, including the World Flora Online (WFO). To mobilize taxonomic expertise, the WFO recognizes taxonomic expert networks (TENs), that contribute to this international effort. One of these TENs, the International Compositae Alliance (TICA) has recently launched the Global Compositae Database (GCD). The GCD is an expert-curated repository of taxonomic information that is publicly accessible through an expansive, permanent, and integrative online platform and helps to facilitate collections management, train the next generation of taxonomists, and advance collective knowledge regarding the diversity and evolution of these enigmatic plants. Here, we present the development of taxonomic reference data using the GCD and a case study in one of the largest tribes in this family, the "ironweed tribe" (Vernonieae). The "ironweeds" comprise approximately 1,500 species, a broad geographic distribution, and until recently, most species in the tribe (>1,000) were placed into a single, broadly defined genus, Vernonia. While this genus has been reduced to

include only 21 species restricted to the Americas, in the Eastern Hemisphere, more than 200 species still remain in Vernonia, awaiting placement in segregate genera. The convoluted taxonomic history of the ironweeds has resulted from many factors, including high species richness distributed across a broad geographic range. Moreover, taxonomists who have specialized in this group historically have spanned vast geographic and generational distances, which has led to various disagreements and/or the perpetuation of taxonomic errors, likely due to unintentional mistakes. We are developing resource-rich taxonomic reference pages using the GCD to clarify the challenging taxonomic history of this tribe and here present some examples of dynamic content and features that this public database can provide. As TICA continues to refine and improve the GCD, we hope to recruit additional taxonomic specialists as contributors and inspire other TENs to develop similar databases.

### How Distance From Groundwater Affects the Water Status of Trees at San Marcos Springs

Simons, E.[1]; Schwinning, S.[2]; Schwartz, S.[2] --- [1]College of Science and Engineering, Texas State University; [2]Department of Biology, Texas State University

The impact of perennial woody vegetation and the role of landscape topography on karst aquifer freshwater supplies is still poorly understood. To gain perspective on this question, I conducted a study at a site where the depth of a shallow groundwater table was indicated by the water level of a spring-fed lake and the distance of trees from groundwater was determined by their position on an escarpment above the lake. I tested the hypotheses that trees at higher elevations developed greater water-stress and used less groundwater than trees closer to or at lake level. I also expected that different tree species responded differently to elevation, presumably related to differences in rooting depth. I monitored several tree species common to the Edwards Plateau of Central Texas (U.S.A.) during the unusually dry summer of 2022. This included measuring predawn and midday water potentials, as well as the stable isotope ratios of hydrogen and oxygen in plant xylem-, soil-, and lake water in regular intervals. The hypotheses that trees at higher elevations developed a greater degree of water-stress and that there would be species-specific differences were supported; however, there was no evidence that any tree used substantial amounts of groundwater, not even those that grew immediately adjacent to lake level. Isotope ratios seemed to indicate a common source of water for all trees, most likely derived from winter precipitation and variably enriched by evaporation. Similar studies conducted on the Edwards Plateau and elsewhere similarly indicated that trees near flowing water sources avoid their uptake even during drought, instead taking water from some deeper regions of the vadose zone. My study adds to the mounting evidence that tree impacts on groundwater resources are complex, warranting further investigation of bedrock-associated water sources for trees of the Edwards Plateau and how bedrock storage might interact with groundwater recharge.

### Plant DRIPS—Plant Drought Response and Insect Pollinator Studies: Plant–pollinator interactions across flowering perennials in North–Central Texas

Singleton, Addison; Mitchell, Adam --- Tarleton State University

Plant-pollinator interactions are of considerable importance in understanding ecosystem health, global biodiversity, and crop productivity. Pollinator declines have been documented in North America with loss of habitat attributed to urbanization, intensive agriculture, and climate change. In Texas, climate models suggest increased frequency and severity of drought, which can reduce wild floral resources in areas that are already limited by other factors in the landscape. Identifying plants that provide robust floral resources under environmental stressors can provide guidance on maintaining the integrity of ecosystem services provided in both anthropogenic and natural settings. The purpose of this study is to identify perennials commercially available in the landscape that improve pollinator diversity and resource use under projected drought stress for North-Central Texas. We established 12 garden beds (2 m x 14 m) containing 11 species of Texas native drought-tolerant perennials commonly used in urban landscapes. We observed pollinator visitors for 60 seconds weekly for each plant from May to November 2022. We sampled pollinator abundance and resource use using a vacuum sampler. Extreme drought conditions persisted for the duration of the growing season and limited native floral resources. Gregg's mistflower had the highest number of flower visitors. Seasonal shifts in flower visitors were correlated with courtship behaviors and flower phenology.

### Do Arbuscular Mycorrhizal Fungi Influence Texas Grassland Plant-Pollinator Interactions?

Szebelledy, Isabella[1]; Mitchell, Adam[2] --- [1]Tarleton State University; [2]USDA-NIFA-Capacity Building Grants for Non-Land Grant Colleges of Agriculture

Long-term studies show declines in global pollinator abundance and floral resources, necessitating efforts to improve conservation for pollinator-plant relationships at local scales. Likewise, grassland ecosystems have declined significantly in North America, leading to further vulnerability of pollinator communities. Although primarily wind pollinated, grasses are important for pollinator success, providing nesting structure and supplemental floral resources when other resources are limited, particularly during drought. Arbuscular mycorrhizal fungi (AMF) associate with plants and influence plant reproduction by uptaking nutrients and improving plant defense. We seek to assess the efficacy of AMF-grass interactions on pollinator communities by addressing the following objectives: (1) Quantify pollinator networks associated with a suite of native grasses infected with AMF during the flowering period in Texas, and (2) Assess AMF infection on pollen productivity and nutritive value at early and late flowering stages. We will develop a randomized split plot design using a suite of 5 warm season perennial grass species under 3 treatments: AMF inoculum, nutrient load, and drought stress. We will collect data on soil, pollen, and flower visitor characteristics. We seek to provide a baseline for understanding aboveground-belowground trophic interactions associated with grass and pollinator health and guide conservation efforts in grassland ecosystems.

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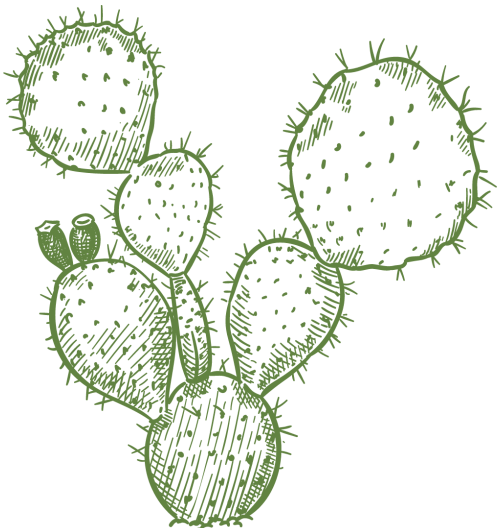

# Exhibitors

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## Tarleton State University

*www.tarleton.edu/wildlife*

The mission of the department is to provide comprehensive undergraduate and graduate degree programs that meet the academic and professional needs of the student in a diverse and ever-changing natural resources field. We place emphasis on strong student engagement in the learning process so that each attains personal fulfillment, success, and respect as a leader in their chosen profession, community, and state. We strive to serve and support the student recognizing each as an individual with his or her own unique history, talents, and goals.

### USDA-NRCS *www.nrcs.usda.gov*

Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service (SCS), is an agency of the United States Department of Agriculture (USDA) that provides technical assistance to farmers and other private landowners and managers. Its mission is to improve, protect, and conserve natural resources on private lands through a cooperative partnership with state and local agencies.

### Tarrant Regional Water District

*www.SaveTarrantWater.com*

Tarrant County water conservation through sustainable landscaping.

### Texas Plant Conservation Alliance

*www.texasplants.org*

The newly revived and revised Texas Plant Conservation Alliance intends to operate as a decentralized collaborative entity consisting of conservation professionals across the state of Texas. Our members will work together to share resources and expertise on species based projects. Members of the TxPCA will be encouraged to engage with their local Native Plant Societies, Master Naturalist Chapters, and other community stakeholders to gain volunteer participation and insight on conservation opportunities to share with the network.

### U.S. Fish and Wildlife Service, Partners for Fish and Wildlife Program

*www.fws.gov/program/partners-fish-and-wildlife*

The Partners for Fish and Wildlife Program provides free technical and financial assistance to landowners, managers, tribes, corporations, schools and nonprofits interested in improving wildlife habitat on their land. Since 1987, we have helped more than 60,000 landowners restore more than 7 million acres of forest, prairie, wetland and stream habitat for wildlife.

# NOTES

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