

# NEWS DROP

A Publication of The Edwards Aquifer Authority

## HEALTHY SOIL, HEALTHY WATER

Berm and Swale at the Edwards Aquifer Authority Field Research Park

ISSUE 2 - MAY 2023

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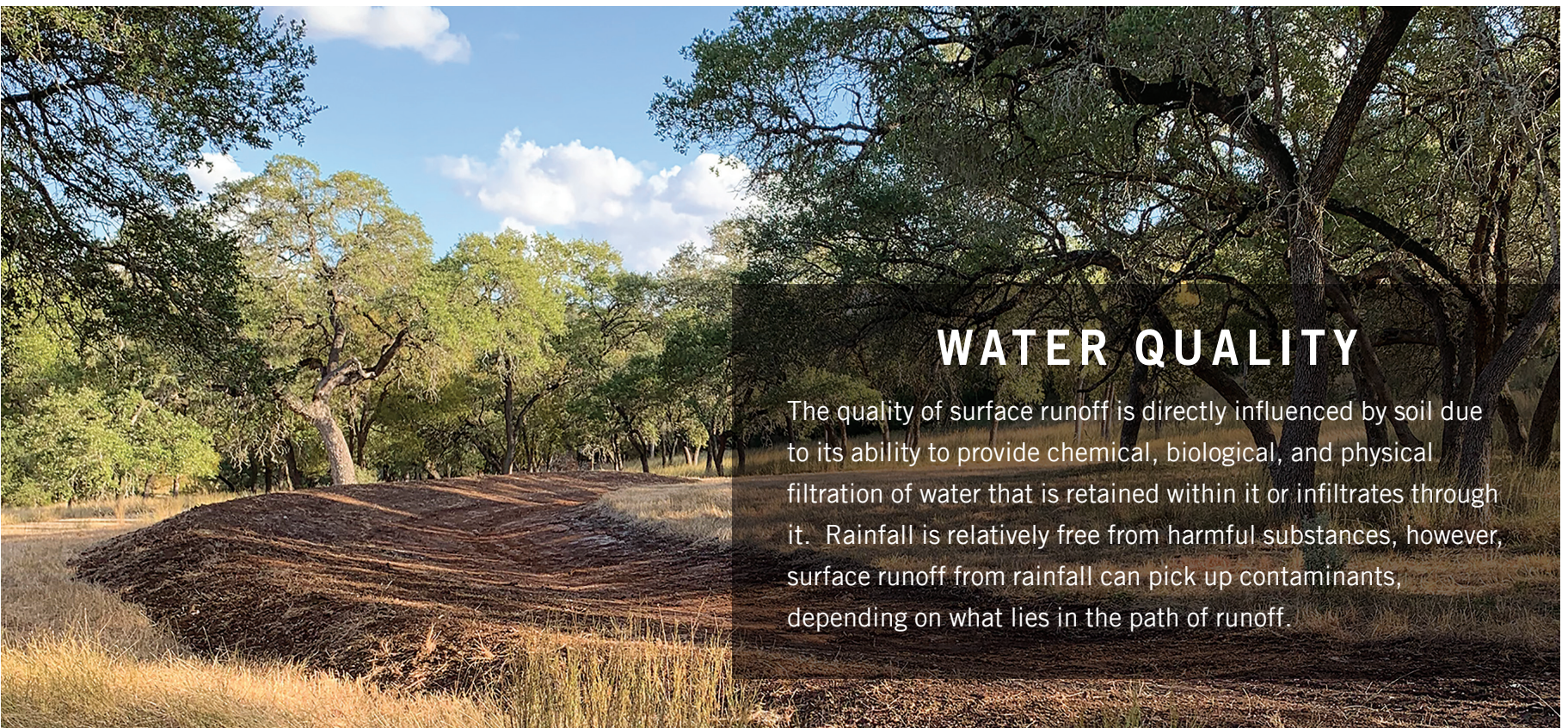


EDWARDS AQUIFER HABITAT  
CONSERVATION PLAN

## \$1 MILLION GRANT AWARDED

The Edwards Aquifer Habitat Conservation Plan got a grant from the U.S. Fish and Wildlife Service. The funds are authorized in Section 6 of the Endangered Species Act.

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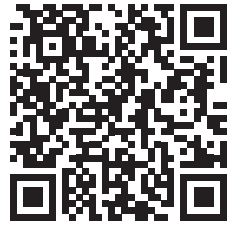


## WATER QUALITY

The quality of surface runoff is directly influenced by soil due to its ability to provide chemical, biological, and physical filtration of water that is retained within it or infiltrates through it. Rainfall is relatively free from harmful substances, however, surface runoff from rainfall can pick up contaminants, depending on what lies in the path of runoff.

Berm and swale at the FRP.

WATCH

EAA BOARD MEETING  
ON FACEBOOK LIVE:

# AQUIFER UPDATE



**An aquifer conditions update is reported every month at the EAA board meeting to inform board members and the public about the status of the J-17 Index Well, J-27 Index Well, the Comal Springs and the San Marcos Springs springflows. These index wells and springs are indicators of the health of the aquifer and critical to drought management.**

The EAA board meeting takes place every second Tuesday of the month at 4:00 P.M. You can watch the meetings on Facebook Live or click the link below:

<https://edwardsaquifer.legistar.com/Calendar.aspx>

# FIELD RESEARCH PARK

The Field Research Park (FRP).



By: **Mark Hamilton, EAA**  
Executive Director of Aquifer  
Management Services

**The Field Research Park (FRP)** is a hub for ground-water-related sustainability research.

At the FRP the EAA is demonstrating and evaluating various land management practices and their potential effects on aquifer sustainability.

The hypothesis driving the work is that the practices offer potential for improved soil health, added soil water holding capacity, better infiltration, and reduction of sediments in surface runoff.

Quantifying these effects is challenging, and the EAA has deployed multiple tools and methods designed to measure and analyze potential benefits of various land management techniques.

In addition to numerous meteorological and soil moisture sensors, we have recently added a nuclear magnetic resonance (NMR) tool.

This novel tool can detect the amount of water in the subsurface and will be used to measure land management-induced changes in the subsurface moisture profile.



Volunteer work at the FRP.

Volunteer work at the FRP.



Beyond our important research work, the FRP also provides a platform to share EAA's mission and story with stakeholders, corporate guests, research partners and other interested parties.

For example, in the past few weeks, EAA-hosted volunteer events have enabled regional landowners and EAA staff to learn first-hand about inexpensive land management practices that can support aquifer sustainability.

While much work remains, the FRP is integral to the EAA's applied groundwater research efforts and is a platform for building relationships.

**THE FRP IS INTEGRAL TO THE EAA'S APPLIED GROUNDWATER RESEARCH EFFORTS AND IS A PLATFORM FOR BUILDING RELATIONSHIPS.**



EAA's Aquifer Management Services.

# FIELD RESEARCH PARK

Nuclear Magnetic Resonance (NMR) deployment.



## SLOW IT, SPREAD IT, SINK IT.

A team of two geoscientists carefully lower “the dart”, a six-foot long javelin-like tool, down a borehole located within a berm and swale structure at the EAA’s Field Research Park (FRP). “Good measurement” one scientist monitoring the tool’s software calls to the other, who then lowers the instrument exactly another foot deeper to take the next reading. The geoscientists are using the dart, a nuclear magnetic resonance or NMR geophysical tool, to investigate the vadose zone, the area below the ground but above the water table of the aquifer.

NMR functions much like a medical magnetic resonance imaging (MRI) system and is one of only a very few methods capable of measuring the amount of water stored in rocks. Specifically, EAA researchers are interested in the storage and movement of water below the ground to begin quantifying the potential benefits of land management as a sustainability practice.

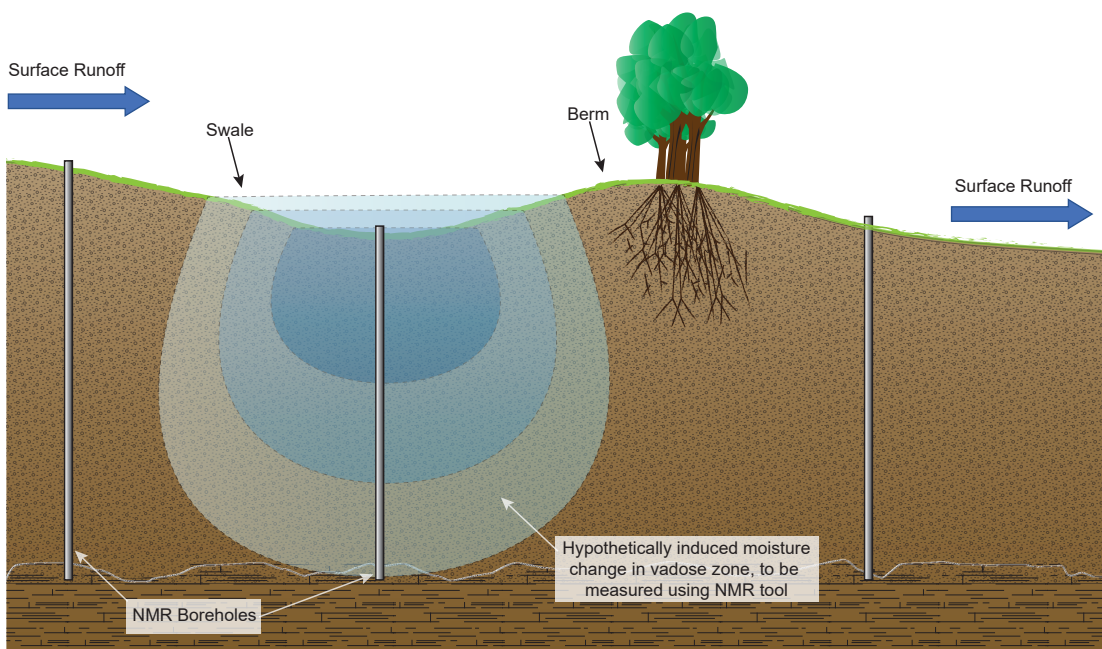
The EAA is investigating the use of natural infrastructure such as berm and swales and other “slow-it, spread-it, sink-it” techniques to minimize runoff so that more rainfall can infiltrate the soil, potentially leading to increased recharge in the Aquifer. During an intense storm, runoff generated upslope is halted by the berms and captured by the swales,

where it ponds, giving the water additional time to infiltrate into the soil. By reducing runoff and increasing infiltration, berm-and-swale structures help control erosion and increase soil moisture locally. The benefits generated by these land management structures have been documented worldwide qualitatively through observation. However, the EAA hopes to quantify those benefits, putting science behind the practice.

If proven effective, the use of natural infrastructure could be implemented across the region as an effective sustainability practice. The initial phase of the NMR monitoring research project has been ongoing since the beginning of 2023. In this phase, EAA researchers have been trained to use the NMR system, and a series of preliminary measurements have been made to characterize the NMR response at the field site.

Similar to the way the settings of a camera must be adjusted to fit the lighting of a scene, these preliminary measurements are being used to tune the NMR to provide the highest quality measurements possible. Initially, water storage will be measured at the monitored berm-and-swale sites at a weekly frequency. This will result in one of the highest-resolution time-lapse datasets of vadose zone water storage measured with NMR anywhere in the world.

THE EAA IS INVESTIGATING THE USE OF NATURAL INFRASTRUCTURE SUCH AS BERM AND SWALES AND OTHER “SLOW-IT, SPREAD-IT, SINK-IT” TECHNIQUES TO MINIMIZE RUNOFF SO THAT MORE RAINFALL CAN INFILTRATE THE SOIL, POTENTIALLY LEADING TO INCREASED RECHARGE IN THE AQUIFER.



The dart NMR tool uses electromagnetism and radio waves to determine the water content in the near sub-surface to help determine the potential effectiveness of land management practices at the FRP.

Ongoing monitoring will reveal how rainfall frequency and intensity translates to infiltration at the site. Preliminary results show that even after a long period without rain, water storage at the monitoring sites is considerable. Interestingly, the water that was measured in the ground had extremely fast NMR “relaxation times,” which suggests that all this water is likely immobile; it is too tightly bound by capillary and electrical forces in the tiny spaces between clay minerals to be useful for plants or likely to drain deeper in the soil profile. Proceeding monitoring and characterization of drill cuttings will reveal how changes in water storage translate to water mobility at the site, and thus how effective the berm and swale features are functioning. To be continued...

NMR monitoring.

# FIELD RESEARCH PARK



Volunteers at the Field Research Park.

## healthy soil, healthy water

Soil is often overlooked and undervalued as an important resource even though there are many reasons to consider soil health and appreciate the functions it serves for humans and our environment.

Soil health is defined by the Natural Resources Conservation Service to be the capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.

Water quality is directly influenced by soil due to its ability to provide chemical, biological, and physical filtration of water that is retained within it and infiltrates through it.

Rainfall is relatively free from harmful substances. However, surface runoff from rainfall can pick up contaminants, depending on what lies in the path of runoff. Soil's ability to filter water depends on the health of the soil and other physical factors.

Infiltration of water into soil provides moisture for plants and the soil food web, which are the organisms that live within the soil such as fungi, bacteria, protozoa, nematodes and arthropods, among other soil life.

These organisms break down leaves, roots, stems and even feed on each other to create decomposed organic matter and carbon within the soil.



Field Research Park.

Healthy soils contribute to quality of crops, water, air, rangelands, forests, and wildlife.

The EAA is particularly interested in how healthy soils are potentially contributing to the quality and quantity of water entering the Edwards Aquifer.

While a majority of water enters the Edwards Aquifer through faults, fractures, and sinkholes within river and stream beds, what happens to that water before it gets there is important.

It is this soil organic matter that plays an important role in the capacity of soil to hold water and aid in purifying that water. Therefore, healthy soil and water begin with the health of the soil food web.



## THE EXPERTS OPINION

The following five principles of soil health support a healthy soil food web:

### COVER

Bare soil is susceptible to water and wind erosion, extreme temperatures, and evaporation, which can kill soil biology.

Covering soil with mulches such as wood chips, straw, leaves or with living plants, armors the soil to help prevent compaction and create habitat for soil organisms.

### MINIMIZE DISTURBANCE

Common types of soil disturbance are categorized as chemical, biological, or mechanical.

Chemical disturbance includes the use of chemicals such as herbicides or pesticides, which can stress plant life and soil biology.

Biological disturbances are caused by excessive grazing or excessive activity from livestock or wildlife that can compact soils and remove vegetation. Lastly, mechanical disturbances such as tilling or bulldozing damages soil structure, depletes soil carbon, and removes vegetation. Limited soil disturbance supports the soil structure that microorganisms live within, maintains organic matter they feed on, and preserves soil carbon that fosters soil's capacity to hold and infiltrate water.

### LIVING ROOTS

Living plants provide armor and supply carbon to the soil food web and flowers for pollinators. They help construct soil aggregates (clumps of soil) and pore space which in turn improves infiltration of water and creates structure.



Golden Groundsel

Additionally, through photosynthesis, plants also release sugars and carbohydrates known as root exudates that feed soil microorganisms at the lowest levels of the soil food web.

### PLANT DIVERSITY

In natural ecosystems biodiversity creates a complex system that can withstand stressors from the environment. A diversity of plant species attracts a diversity of soil organisms that are dependent on their root systems, further enhancing the activity of the soil food web.

### LIVESTOCK INTEGRATION

While limiting disturbance is important, complete absence of animal life removes an important tool for recycling nutrients like carbon.

Livestock and wildlife consume plant material and convert it to manure that can feed plants and soil microorganisms. Their hoof action can also work to press seeds into the soil.

Following these principles of soil health protects and feeds the soil food web, which contributes to optimal soil water storage and infiltration.

While the soils covering the Edwards Aquifer recharge and contributing zones are often shallow, recognizing the potential that soil health may have on the quality and quantity of water recharging the Edwards Aquifer is important to understanding the future of aquifer sustainability.

**RECOGNIZING THE POTENTIAL THAT SOIL HEALTH MAY HAVE ON THE QUALITY AND QUANTITY OF WATER RECHARGING THE EDWARDS AQUIFER IS IMPORTANT TO UNDERSTANDING THE FUTURE OF AQUIFER SUSTAINABILITY.**



## LAND MANAGEMENT AT THE FIELD RESEARCH PARK (FRP)

**VOLUNTEER PARTICIPATION IN THIS PROJECT WILL ALLOW FOR DATA COLLECTION TO BE USED IN RESEARCH.**

Volunteers.



On Saturday March 25th, 2023 the EAA hosted a staff volunteer day at the Field Research Park for EAA staff and their family members. Volunteers were treated to hats, T-shirts, breakfast tacos and Bar-B-Q, while participating in spreading a wood chip mulch on interpretive trails within the FRP demonstration area and completed construction on a 'rock rundown' erosion control structure.

Over time, the trails and roads that are used for touring visitors and for staff working within the demonstration area have begun to erode and serve as flow paths for water during rain events.

In general, roads and trails, even on rural properties can serve as pathways that accelerate the runoff of water from an area. One of the land management goals of the Field Research Park is to retain and infiltrate as much water on the land surface as possible, rather than to accelerate runoff. The spreading of mulch on the 'double tracks' of the roads will assist in preventing the acceleration of runoff and soil erosion,

resulting in maintaining water holding capacity of the soils in these areas.

Additionally, volunteers were joined by Dr. Mollie Walton, a restoration ecologist who specializes in restoring areas impacted by soil and vegetation loss. Mollie instructed and led a crew of volunteers in completing a rock rundown that is designed to eliminate erosion, restore vegetation, capture sediment and hold moisture at an impaired area of an existing stock tank that was present on the FRP at the time the EAA acquired the property. Volunteer participation in this project will allow for data collection to begin that can be used in research aiming to quantify the impacts this type of practice can have on vegetation, soil health, and water holding capacity of the soil.

The participation of staff and family members at the volunteer day was certainly meaningful and memorable. The contributions of the volunteers to the mission of the FRP and EAA are greatly appreciated and deserving of a very big

**THANK YOU!**

1



Mulch and rock.

2



Prevent erosion.

3



Restore vegetation.

4



Hold moisture.



Rock rundown erosion control structure (above) and wood chip mulch (below).



ONE OF THE LAND MANAGEMENT GOALS OF THE FIELD RESEARCH PARK IS TO RETAIN AND INFILTRATE AS MUCH WATER ON THE LAND SURFACE AS POSSIBLE.

## Edwards Aquifer Habitat Conservation Plan (EAHCP)

# AWARDED \$1 MILLION GRANT

When you watch Snoopy do his happy dance, you can't help but smile.

And, you're probably hearing that upbeat Charlie Brown music in your head right now. The Edwards Aquifer Habitat Conservation Plan (EAHCP) staff recently had a great reason to break out their own happy dance moves as a \$1 million grant from the U.S. Fish and Wildlife Service was awarded to the Edwards Aquifer Authority for the EAHCP's permit renewal work.

"This is the second grant award the EAHCP has received from this fund and we will definitely be watching for future opportunities," said Ybarra.

While there are several ways these types of dollars can be spent on HCP programs, EAHCP Program Manager Scott Storment says they will be directing the grant funds toward renewing the EAHCP's current federal permit which expires in 2028.

"We have been working with our project consultant in implementing a detailed

meet this requirement," Storment said.

Ybarra, who was the project manager for the application, expounded on the number of team members who participated in developing specific portions of the document. She recognized Kristina Tolman for assistance on maps and GIS components, Damon Childs for budget preparation and analysis, and Dr. Chad Furl and Kristy Smith focusing on scientific research and planning components.



Fountain Darter.

The funds are authorized in Section 6 of the Endangered Species Act (ESA) and partly funded through the Land and Water Conservation Fund (CESCF).

"While we were confident that the EAHCP would receive some sort of funding in this round of the CESCF grant program, we weren't sure what the amount would be," said Olivia Ybarra, Habitat Conservation Coordinator II. "So, yes, it was very nice to see that big number come in and we did celebrate that accomplishment with the team," Ybarra said.

permit renewal work plan which will run over the next three to four years.

And while we haven't received the green light to spend the grant funds just yet, we will essentially put the dollars to use for the tasks associated with where we are in our program timeline when the funds become available," said Storment.

"Part of the grant award requirements is that we provide a 25 percent match to the overall award amount. Since we already have an approved budget to fund the permit renewal work, we did not have to find additional dollars to

She also worked closely with Storment and Jamie Childers in reviewing the wording approach for the proposal.

"As the funds begin to arrive for the EAHCP to use, we will have timelines to produce specific deliverables outlined in our application and that work will be observed by TPWD," Ybarra noted. "However, since our EAHCP federal permit renewal process must be closely coordinated with U.S. Fish and Wildlife, they will get to see first-hand how we progress in meeting our grant requirements," said Ybarra.



Olivia Ybarra and Scott Storment.

“In the end,” Ybarra continued, “all three agencies want this to be a successful process since the direct beneficiaries will be those endangered species the EAHCP is designed to protect,” concluded Ybarra.

“Obviously, this is a significant grant award and the project team, led by Olivia, did a really nice job in putting the application together,” Storment said.

“However, we would be remiss in not acknowledging that over the past 10 years, the EAHCP has been a very successful program and there are many professionals throughout the Edwards Region who have worked very hard to get us to this point today,” said Storment.

“And I’m certain that this program’s recognition as being a model HCP in the U.S. immensely helped our prospects for obtaining this valuable grant.” Storment concluded.

“THE DIRECT BENEFICIARIES WILL BE THOSE ENDANGERED SPECIES THE EAHCP IS DESIGNED TO PROTECT.”



Texas Blind Salamander.

# EDUCATION OUTREACH CENTER

Micro-Eye microscope at the EOC.



## COME COOL OFF WITH US ALL SUMMER LONG

In light of our past and intended future successes, we want to share the amazing things happening at the EAA Education Outreach Center (EOC).

This year we have already hosted 500 students on field trips. Students learn about the aquifer through a series of art and science activities. They not only tested for limestone using diluted hydrochloric acid, but also painted images related to water and the aquifer on muslin Aquiflags.

In addition to these hands-on activities, students explore the exhibits and learn all about the aquifer, from its plants and animals to its unique geology.

Adding to our usual school groups, we hosted over 300 guests for special Spring Break programming.

It included percussionist TBow Gonzales, who not only performed but led kids in crafting rain sticks from cardboard tubes, balloons, and rice.

The EOC was filled with rhythmic music as our elementary and middle school guests accompanied TBow's drumming with the sounds of rain.

Magician Mr. Pitts combined magic with science! His show was very interactive and featured an assistant puppet.

The audience left with a wide ear-to-ear grin.

Moreover, the week after Spring Break, we had Tom Kinsey at the Center for Wildlife Wednesday.

He brought several animals to show, including rats, doves, and toads. The kids and our staff all had a great time!

We have also welcomed many new faces into our ranks recently.

There are more people volunteering their time to help, and we recently hired two interns and three work-study students too.

They will no doubt be helpful in preparing for our endangered species day event on May 19!

It will be from 10 am to 3 pm and there will be STEAM activities featured.

Furthermore, Karston, our loveable and larger than life, Texas Blind Salamander will make an appearance for guests to have a photo op with.

There are a lot of exciting new things coming soon to the EOC as well.

We will be getting a game cam at our Wildlife Viewing Area in order to better observe the wildlife.

We are also in the process of building a pavilion in our field research park, a conservation easement with real, long-term research studies being conducted. It is just a short hike from the building and will provide a shady spot for students to learn or snack.

Lastly, we are working on finalizing our summer movies list, which will be shown throughout the summer and into the new school year to bring more guests into the EOC.

We will show them in the Cave with popcorn and snacks for everyone!

Come cool off with us all summer long if you are interested in watching movies like *The Boy Who Harnessed the Wind*, *Intelligent Trees*, *Kiss the Ground*, or *Fantastic Fungi*.

Altogether, we have had an amazing time here at the EAA EOC. We are looking forward to an incredible spring and summer season!

**MAY 19 IS  
ENDANGERED  
SPECIES DAY.  
COME JOIN US!**

**EOC**  
EDWARDS AQUIFER AUTHORITY  
**EDUCATION  
OUTREACH CENTER**

**Friday, May 19, 2023  
10 AM - 3 PM**

**ONLY PLACE IN SAN ANTONIO  
WHERE YOU CAN SEE ENDANGERED  
FOUNTAIN DARTERS AND A TEXAS  
BLIND SALAMANDER UP CLOSE!**

**ENDANGERED  
SPECIES DAY**

**FREE AND OPEN  
TO THE PUBLIC**

**RSVP AT  
WWW.EAAEOC.ORG**

**PERFORMANCES, ACTIVITIES, AND SWEET TREATS**

EDWARDS AQUIFER AUTHORITY  
MANAGE • ENHANCE • PROTECT

# PLANTING NATIVE

## TEXAS PLANTS & TREES



Purple Coneflower.

The vibrant blue of the bluebonnets coloring our landscape this time of year is breathtaking. Adding to their charm is that these flowers are native.

Born and raised Texans. However, the importance of native plants goes beyond state pride; they are vital to the entire ecosystem.

A species is considered native to a given region or ecosystem if it evolved naturally rather than through human intervention. They are suited to the habitat and provide food and shelter to regional animals.

For example, most San Antonio native plants will be adapted to drought. Take the prickly-pear cactus as an example. A non-native species, on the other hand, is one that has been accidentally or purposefully introduced outside of its natural range by human actions.

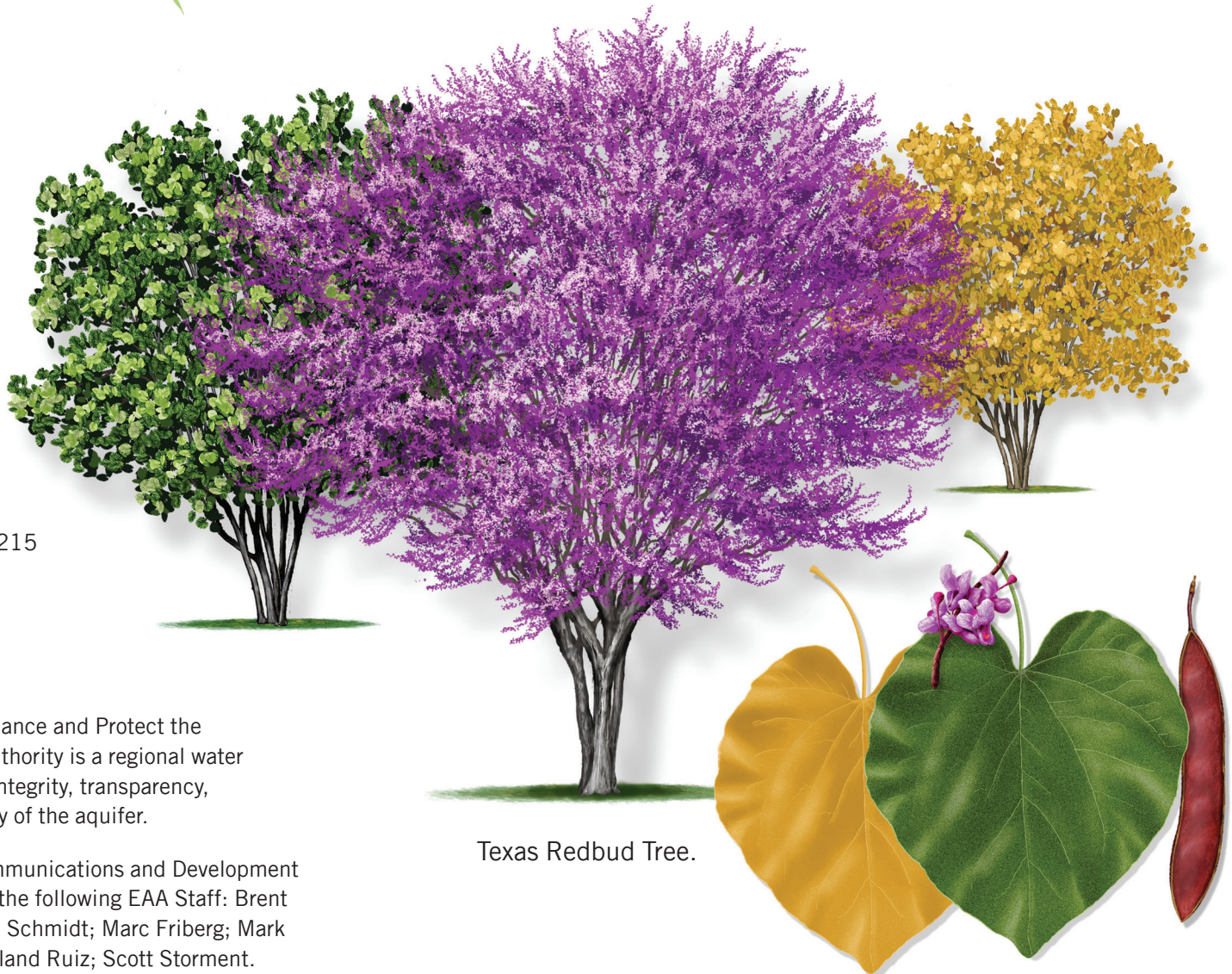
They can disrupt an ecosystem by severing food webs and degrading habitats.

On a practical note, planting native plants in your garden is easier and cheaper! Already adapted to the local climate, native plants require little care and less watering.

Native flowers like cedar sage, golden groundsel, purple coneflower, rock rose, redbuds, and more will add vibrant colors to your garden and attract butterflies and hummingbirds.

Want to see what a native garden looks like? Come visit the EOC! With over 20 native plant species, our garden showcases San Antonio's natural beauty.

Don't forget to ask for our FREE native seed packets!



Texas Redbud Tree.



EDWARDS AQUIFER  
AUTHORITY

MANAGE • ENHANCE • PROTECT

Edwards Aquifer Authority  
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[www.edwardsaquifer.org](http://www.edwardsaquifer.org)

### ABOUT US

The mission of the EAA is to Manage, Enhance and Protect the Edwards Aquifer. The Edwards Aquifer Authority is a regional water management agency that regulates with integrity, transparency, respect, and commitment to sustainability of the aquifer.

**NewsDrop** is a production of the EAA Communications and Development Department with helpful assistance from the following EAA Staff: Brent Doty; Damon Childs; Jewell Cozort; Logan Schmidt; Marc Friberg; Mark Hamilton; Olivia Ybarra; Paul Bertetti; Roland Ruiz; Scott Storment.