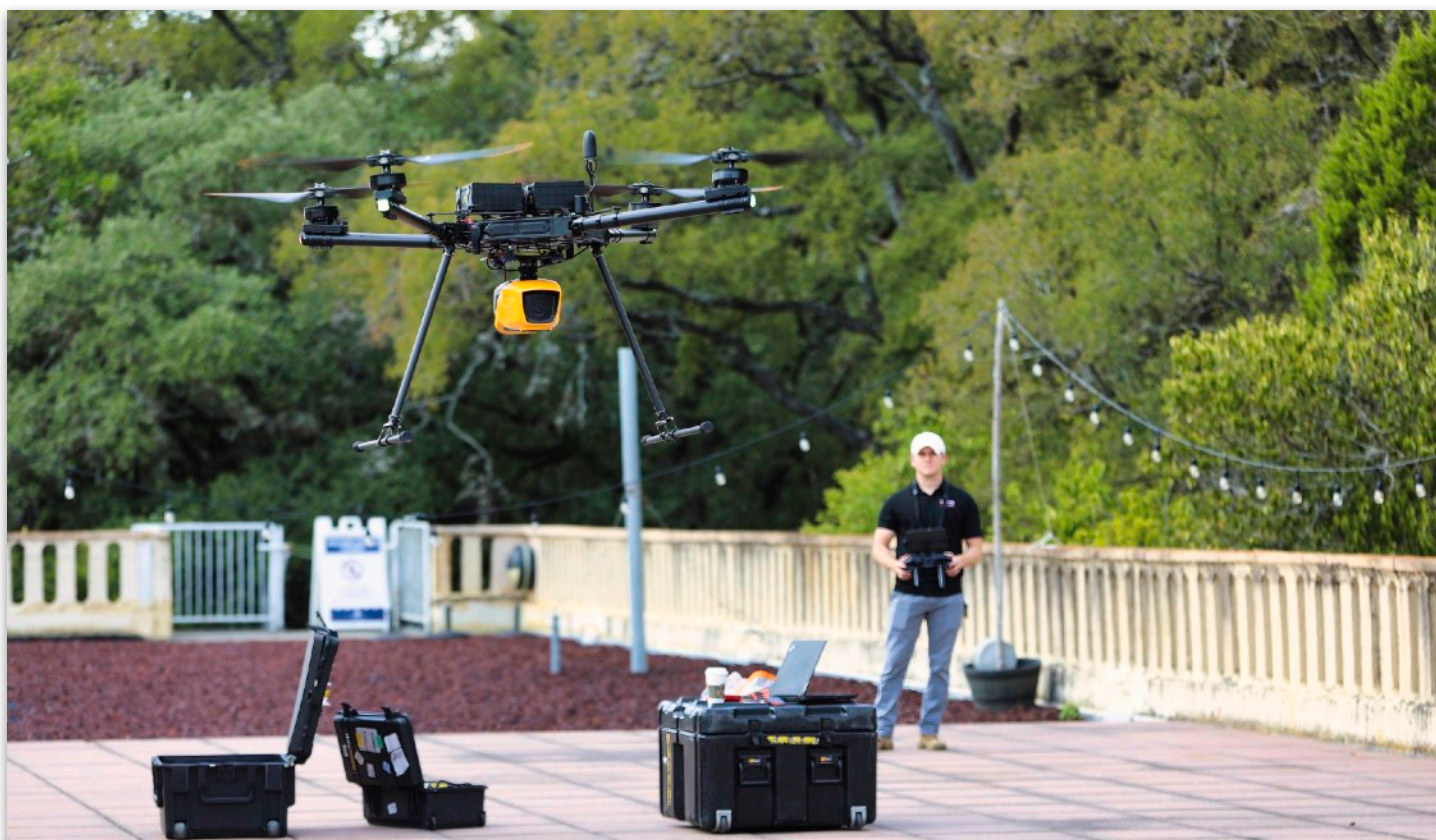


EAHCP STEWARD

News from the Edwards Aquifer Habitat Conservation Plan - Nov.-Dec. 2025



Getting to the Bottom of Things

EAHCP team pilots new drone-based LiDAR technology

Austin Rains launches a drone with a YellowScan Navigator LiDAR sensor attached at Spring Lake in San Marcos.

Bathymetric LiDAR.

That's not your typical kitchen table term, and there is good reason for that lack of familiarity. Bathymetric LiDAR is a type of technology that pushes boundaries in the topographical mapping world. With the Edwards Aquifer Habitat Conservation Plan (EAHCP) team always looking for innovative ways to protect and evaluate the Edwards Aquifer-fed ecosystems they're responsible for, the team decided to find out just how deeply this type of LiDAR can enhance its current vegetation mapping in the San Marcos River and Spring Lake.

Getting to the Bottom of Things - Continued

According to the United States Geological Survey (USGS), LiDAR, commonly written as “lidar,” stands for Light Detection and Ranging. It is a technology used to collect high-resolution topographical 3-Dimensional (3-D) terrain maps of elevation and/or depth characteristics with an accuracy of about four inches. A lidar instrument principally consists of a laser-scanner, and a specialized GPS receiver. Airplanes and helicopters are



the most commonly used platforms for acquiring lidar data over broad areas. However, drones are now being utilized as go-to aircraft for collecting lidar measurements. The two types of lidar are topographic and bathymetric. Topographic lidar typically uses an infrared lasers to map the land, while bathymetric lidar uses water-penetrating green wavelength lasers to also measure seafloor and riverbed elevations.

“This new type of lidar instrument should be able to give us a fresh look at our vegetation maps in Spring Lake and portions of the San Marcos River we’ve been restoring over the last several years,” said Christopher Riggins, a wildlife and fisheries biologist at the Meadows Center for Water and Environment in San Marcos (MCWE). “Routine sampling of Spring Lake includes species counts and surveys of specific sections of Spring Lake. With these bathymetric lidar 3-D data, we will have a much more detailed look at the lake bed, the amount of aquatic habitat, and the aquatic vegetation density and plant morphology (plant structure).”

Riggins’ team, the Ecological Research Group at MCWE, has two primary roles. One is habitat restoration which includes removing invasive, non-native plants from Spring Lake and San Marcos River. They also dislodge vegetation or algal growth that could be impeding springflows from the five major springs and more than 100 minor spring openings. Additionally, they plant native aquatic vegetation in those water bodies to replace and enhance aquatic habitat for other native species, primarily the endangered fountain darter fish. Spring Lake is critical habitat for five of the EAHCP’s covered species: fountain darter, Texas wild-rice plant, San Marcos salamander, Texas blind salamander, and a small population of the Comal Spring riffle beetle.

Both the San Marcos River and Spring Lake are national tourist destinations due to the extremely clear and cool water that emanates from the San Marcos Springs. A critical part of the EAHCP programming is measuring the impacts of recreation on the San Marcos Springs ecosystem. The new bathymetric lidar images could also play into how the City of San Marcos and Texas State University teach people about

Getting to the Bottom of Things - Continued



Spring Lake in San Marcos.

water, the endangered species that thrive there and how people enjoying the San Marcos River can actively help protect those natural resources.

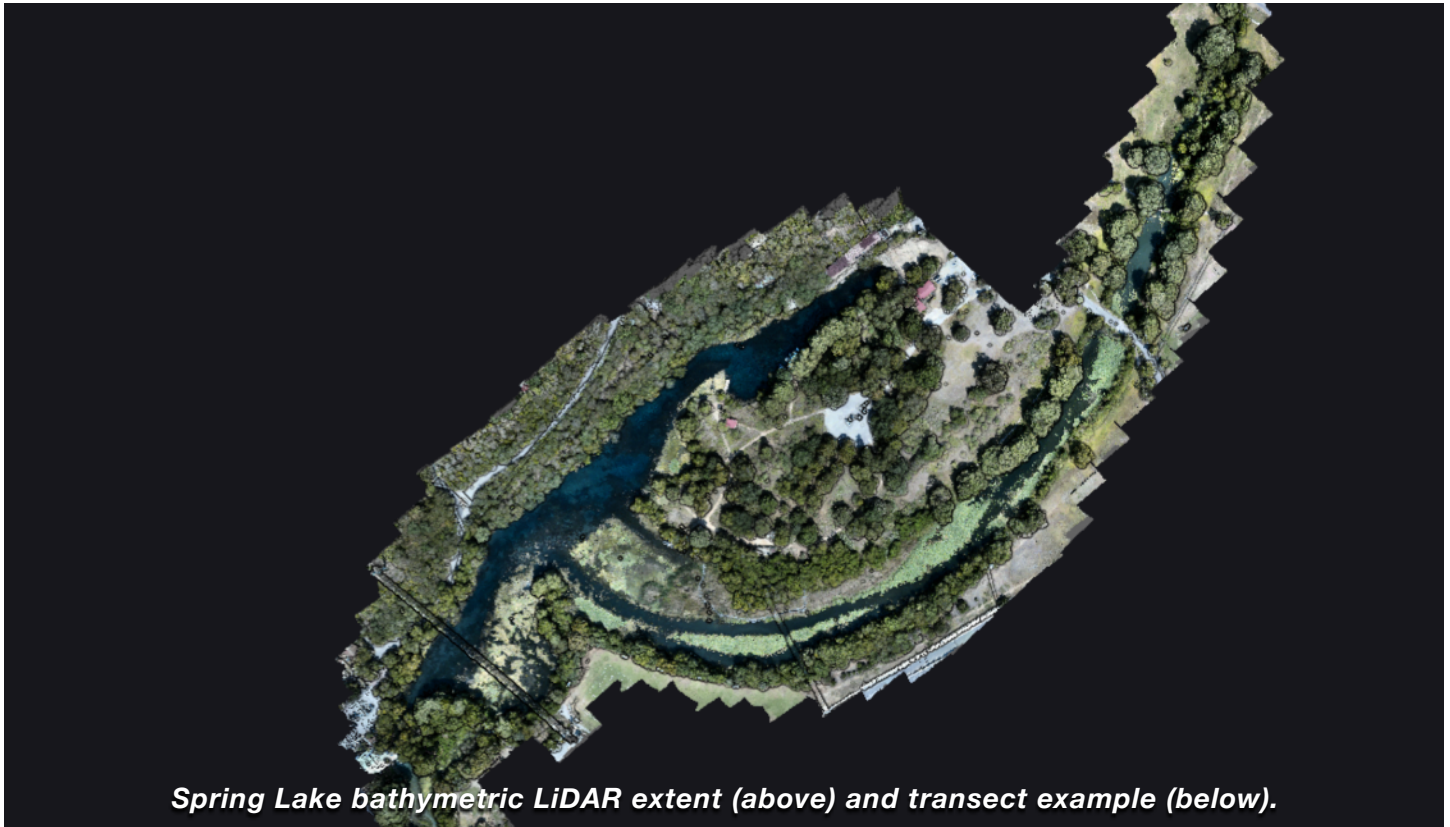
The drone-mounted bathymetric lidar equipment was provided by Frontier Precision and operated by Austin Rains, Frontier's regional sales manager in the Southern U.S.

"What was so enticing about this project in Spring Lake is that the water here is so clear," Rains explained. "Spring water is perfect for this type of technology because a LiDAR sensor can see all the way to the lake bed with no difficulty. We've done projects in Louisiana and other places with very turbid water which will not yield the level of detail for the client that this location will. Lidar data is initially collected as a "point cloud" of millions of data points reflected from the land surface, river bottom, trees and other vegetation and even structures that might be there. Those data points are then assembled into detailed three-dimensional maps. The EAHCP program and professionals, like Chris, who are responsible for these mapping programs, can then assess trends over time. We'll be very interested to learn how the higher-detailed maps this technology affords helps with upcoming Spring Lake assessments."

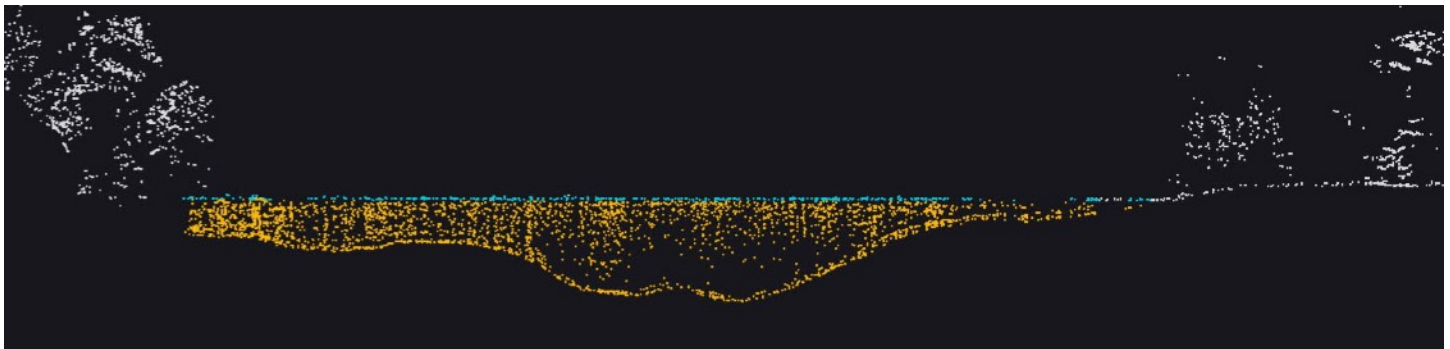
To that end, Riggins noted that since this is the first time using bathymetric lidar in San Marcos, part of the learning process will focus on how they can use the technology. In the past, the team manually mapped the aquatic vegetation of Spring Lake with 2-dimensional polygon shapefiles. That type of process will not yield a 3-D type of map. The orders of magnitude of data this lidar will provide over manual mapping will not only help save tremendous amounts of time in data gathering but provide a much more detailed assessment of aquatic habitat conditions.

"There are some specific points of interest we will be looking for," Riggins said. "For example, the considerable amount of new data and associated map details of the open substrate in the lake will help us assess the status of the San Marcos salamanders which live in and near the spring openings. Also, the 3-D map will give us a better gauge of the volume of plants we are tracking."

Getting to the Bottom of Things - Continued



Spring Lake bathymetric LiDAR extent (above) and transect example (below).



Traditional lidar is based on the machine's laser sending out pulses from the air to the first hard object encountered on the ground. Those pulses reflect to the airborne receiver and vertical space data is captured. The type of bathymetric lidar Frontier employs is called "full wave lidar" or "green wave lidar." There are two extremely strong lasers on board the drone which do not use pulses but are always connected to the targets on land or in water. Traditional lidar can work through tree canopies and other vegetation, but it will only measure the tops of water bodies. Full wave lidar is designed to penetrate water until it hits a hard object at the bottom of the water body.

"We've been doing vegetation mapping since 2010, but the level of data and the frequency of how often we collect that information has been increasing over time. The bathymetric lidar collection will be the most data we've ever collected in the shortest amount of time. In two hours of flying the drone, Austin was able to cover around 40 acres and gather much higher densities of data than we can using current methods. Also, we will now have a colorized, survey-grade representation of Spring Lake's lake floor which we could not have produced with traditional mapping techniques. And that is a truly exciting type of development in our work to protect the unique ecosystem in San Marcos."

[You can learn from about Frontier Precision at this link.](#)

EAHCP STEWARD SHORT TAKES

Full Circle Attained - Thank You for the Opportunity of a Lifetime



I wasn't much of a Jon Bon Jovi devotee (Earth, Wind and Fire was more my style), but there is a quote attributed to JBJ that fits this occasion rather well. It says, "You just stay the course, and do what it is that you do, and grow while you're doing it. Eventually it will either come full circle, or at least you'll go to bed at night happy." I've been fortunate to have had both of those outcomes in my work in the field of water and the environment over the past 35 years.

When I started as communications director for the City Water Board in 1989, I knew nothing about the Edwards Aquifer. Lucky for me, a guy named Tom Fox joined the organization as the water resources director. Tom had been the general manager of the Edwards Underground Water District and was an expert on our region's unique resource. I'd wander up to Tom's office, knock on the door, he'd smile, shake his head and nod to the seat in front of him. The teaching and learning would commence.

The decade of the 1990s, with severe drought years and an endangered species lawsuit, shook the Edwards Aquifer Region into an understanding that the Edwards Aquifer was not an infinite source of water, although some people claimed it was. So my job put me on the front lines of informing and involving the community in coming to grips with why it was critically important to

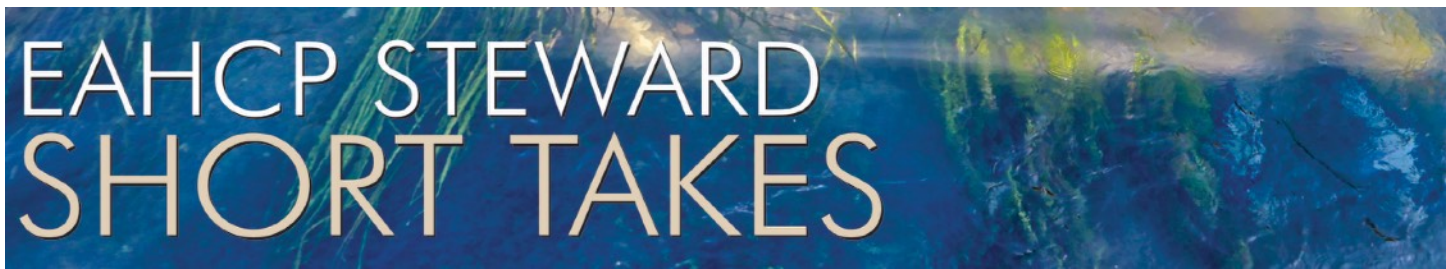
responsibly manage the Edwards Aquifer so it would remain a key component of San Antonio's long-term water future.

May 19, 1992 (May 19 was my Dad's birthday), the City of San Antonio merged the City Water Board and City's Wastewater Department to form the San Antonio Water System (SAWS). 1996 brought about a key first step in the development of the San Antonio's water conservation programs. I was actually at a SAWS/city officials/business leaders water meeting the morning of July 30, 1996, before I dashed off to be at the hospital for my son's birth. 1998 brought about San Antonio's first 50-year water plan. The year 2000 was the time a funding mechanism was created to give the City a means to diversify its water resources. And, with SAWS in a great position from a water resources standpoint, I left the organization to work and learn in the private sector.

When the owner of that marketing company retired and closed its doors eight years later, I started my own company at the suggestion of a friend (Steven Schauer) at the San Antonio River Authority. Yes! Back in the water game. Toward the end of 2013, I was fortunate (there's that word again) enough to be hired by the Edwards Aquifer Habitat Conservation Plan team to help build its communications program. It turns out that this program was about to begin the scientific research on the Edwards Aquifer ecosystem I used to tell the community in the 1990s the region needed to accomplish in order to further our abilities to manage the Edwards.

So as I'm stepping away from contract work with the EAHCP and EAA at the end of 2025, I can say with great fulfillment that we've stayed the course, done what we do best, and grown immensely in knowledge and friendships. And while my work might be at that full circle stage, there are many others just starting theirs. Just know that the work you do here is unquantifiably significant. And, at the end of each work day, you can rest well knowing you are contributing to the well-being of our communities' future.

Your Friend and Colleague,
John Boggess



EAHCP Steward Podcast and Archives

Listen to November-December EAHCP Steward Podcast by [clicking here](#). It features an interview with Austin Rains and Chris Riggins.

Previous articles and podcasts can be found at the [EAHCP Steward Archives](#) page.

Upcoming EAHCP Meeting

EAHCP Implementing and Stakeholder Committee Meeting

Date: Thursday, December 18, 2025 Time: 10:00 AM

Location: Edwards Aquifer Authority & Teams

EAHCP 2026 Meetings Calendar



2026 EAHCP Committee Meeting Calendar

| EAHCP Committee | Date | Time | Location |
|---------------------------------------|-------------------------------|----------|---------------------------------|
| Implementing Committee | Thursday, February 5, 2026 | 10:00 AM | Pauline Espinosa Community Hall |
| Stakeholder & Implementing Committees | Thursday, March 26, 2026 | 10:00 AM | Edwards Aquifer Authority |
| Science Committee | Wednesday, April 15, 2026 | 9:00 AM | TXST LBJ – San Marcos |
| Implementing Committee | Thursday, June 4, 2026 | 10:00 AM | Edwards Aquifer Authority |
| Stakeholder & Implementing Committees | Thursday, August 6, 2026 | 10:00 AM | Edwards Aquifer Authority |
| Science Committee | Wednesday, September 16, 2026 | 9:00 AM | STAR Park - San Marcos |
| Implementing Committee | Thursday, October 8, 2026 | 10:00 AM | Pauline Espinosa Community Hall |
| Stakeholder & Implementing Committees | Thursday, December 17, 2026 | 10:00 AM | Edwards Aquifer Authority |