

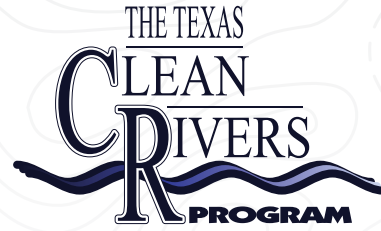


SAN ANTONIO  
RIVER AUTHORITY

# **San Antonio River 2024 Basin Highlights Report**

THE PREPARATION OF THIS REPORT WAS FINANCED  
THROUGH GRANTS AND IN COOPERATION WITH THE  
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
THROUGH THE TEXAS CLEAN RIVERS PROGRAM





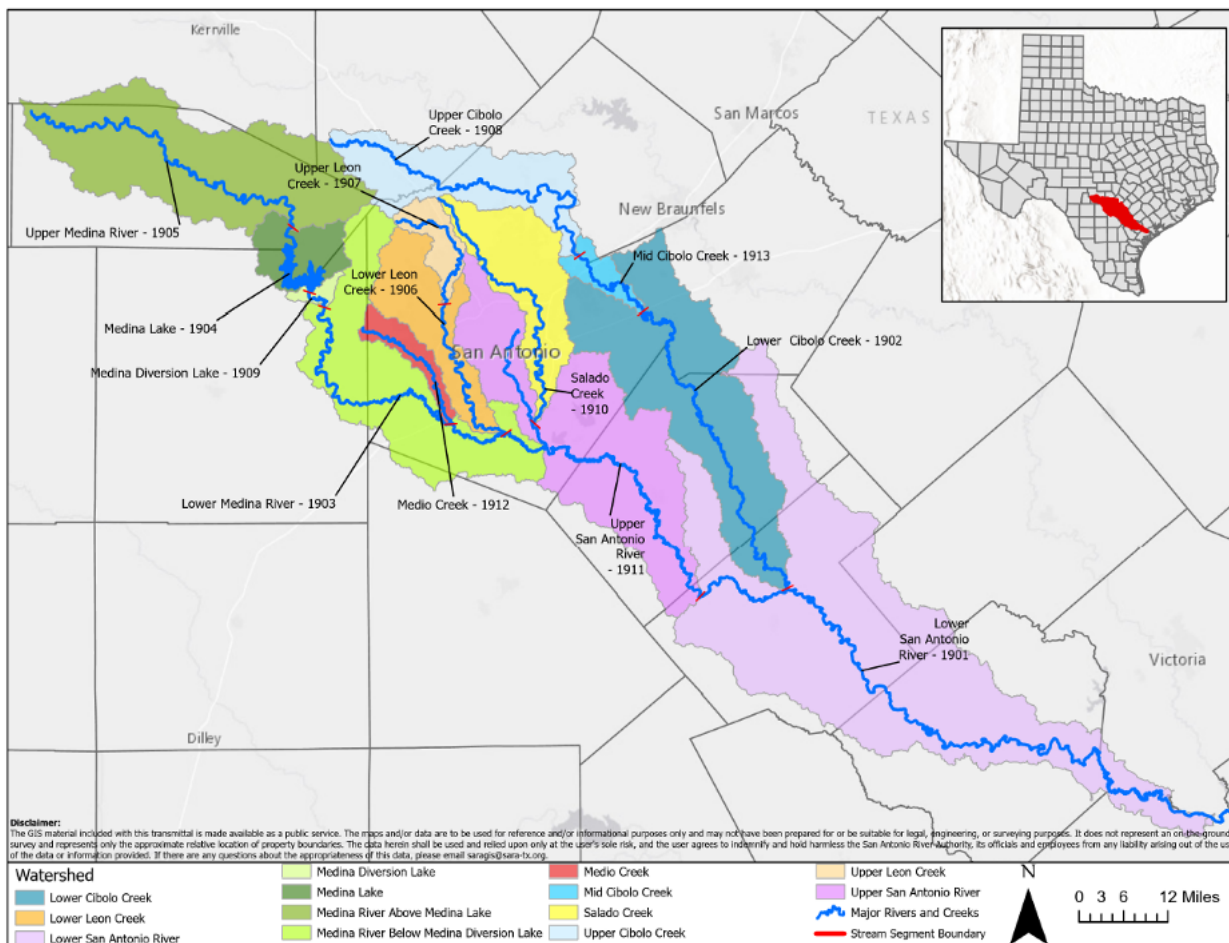
*San Antonio River Walk south of downtown San Antonio.  
Photo by H. Botello.*

# Introduction

## The San Antonio River Basin

The basin originates in the northeast corner of Bandera County forming the headwaters of Medina River. Medina River, Helotes Creek, Upper Leon Creek, Olmos Creek, Upper Salado Creek, Upper Cibolo Creek and numerous ephemeral streams traverse the Edwards Aquifer Recharge Zone in northwest Bexar and Medina Counties. As these streams cross the recharge zone, their water flows into the Edwards Aquifer. Most of these streams become intermittent as they cross the recharge zone and emerge as perennial downstream of the recharge zone.

Texas Commission on Environmental Quality (TCEQ) identifies five major perennial streams: Medina River, Cibolo Creek, Salado Creek, Leon Creek, and Medio Creek which all flow directly or indirectly into the San Antonio River. The San Antonio River, which originates on the grounds of the University of the Incarnate Word just north of downtown San Antonio, flows in a southeast direction through Bexar, Wilson, Karnes, and Goliad counties. The river then becomes the county line separating Refugio and Victoria counties before converging with the Guadalupe River about ten miles from San Antonio Bay.



San Antonio Basin with major watersheds identified.



The San Antonio River Authority (River Authority) has been monitoring the San Antonio River and its tributaries since 1968 and providing that information to the TCEQ. However, in 1991 the Texas Legislature passed the Texas Clean Rivers Act. The TCEQ contracted with 15 partner agencies including the River Authority. The implementation of the Clean Rivers Program (CRP) allowed the River Authority to expand our monitoring program. With the resources provided by CRP and the assistance of our partners, The Bandera County River Authority and Groundwater District and the City of Boerne, monitoring has been expanded to include the entire basin.

The purpose of this report is to provide an update of major activities, public outreach, monitoring activities, and water quality and biological communities' issues.



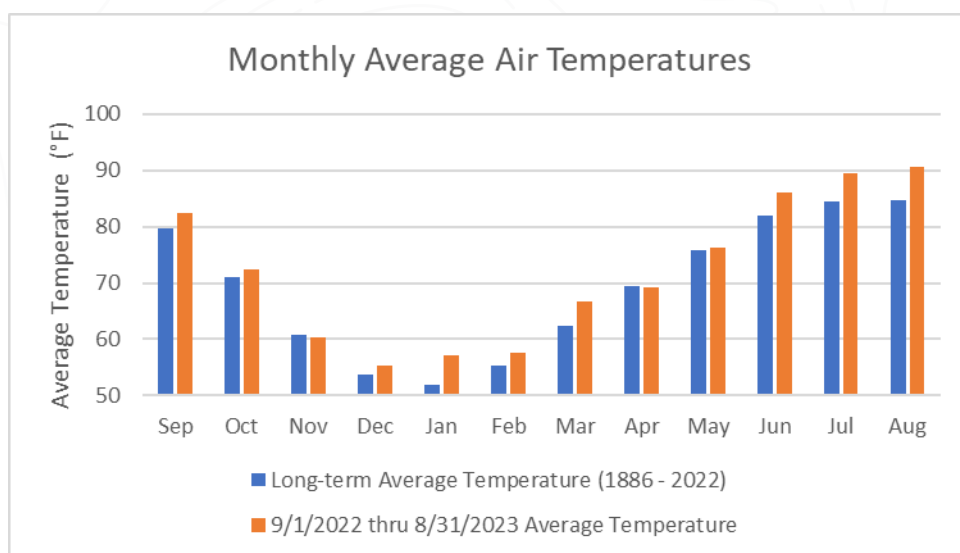
*San Antonio River Authority staff conducting a biological sampling for fish with a backpack shocker on the San Antonio River at Camino Coahuilteca, just downstream of downtown San Antonio. The backpack shocker stuns the fish to allow capture, measurement and identification. Fish are revived and released back into the stream.*

## Events Affecting Water Quality & Aquatic Communities

### Weather:

Weather was the dominant event during fiscal year 2023 (FY23), which ran from 9/1/2022 thru 8/31/2023. It affected water quality, flow, and aquatic communities. The La Niñas weather pattern dominated last year. During a La Niñas year in Texas, temperatures tend to be warmer and drier conditions tend to occur. That was certainly the case in the San Antonio River Basin.

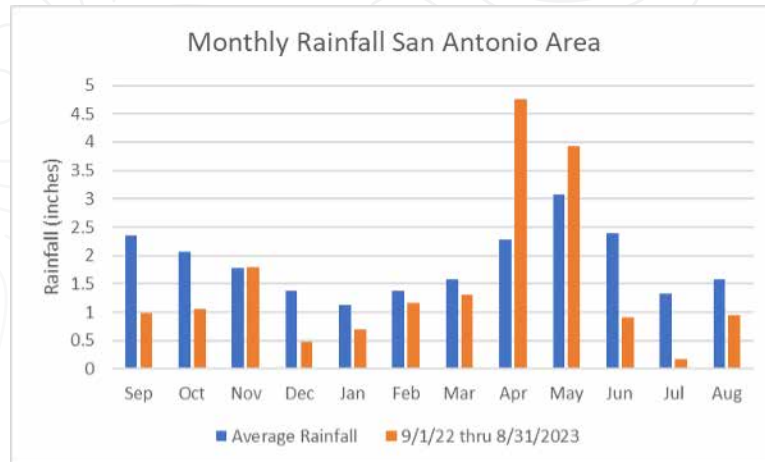
For the San Antonio area, this was the hottest summer on record. The average temperature was 88.7°F (Borchard, 2023). There was a total of 75 days of triple-digit temperatures with five days of high temperatures of 106°F from June 16 to September 24, 2023.



*Graph showing the long term average monthly temperature (from 1886 thru 2022 for the San Antonio Area) was less than the actual average temperature in 10 out of 12 months during the CRP last contract year. Data from National Oceanic and Atmospheric Administration (NOAA) NOWData website.*

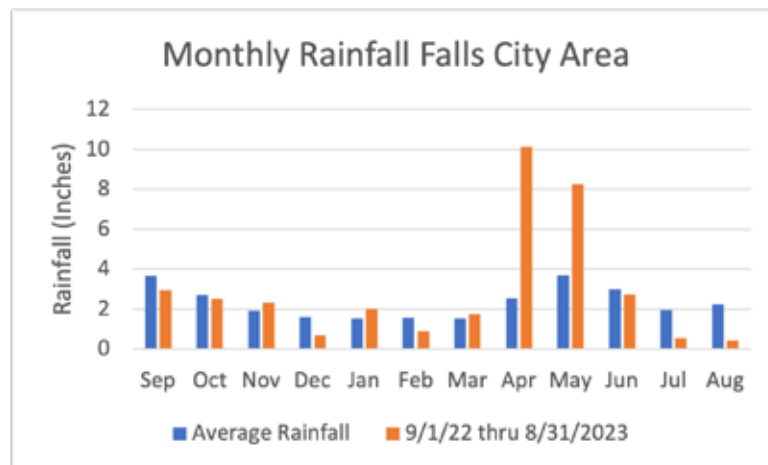
The Northwest portion of the basin near the town of Medina, according to the National Oceanic and Atmospheric Administration (NOAA) NowData, had an average annual rainfall (from 1966 through 2023) of 34.97 inches. Last year (September 1, 2022 through August 31, 2023) the Medina area had only 19.48 inches of rain.

According to NOAA, the annual average rainfall for the San Antonio area (from 1886 through 2022) was 29.0 inches. Last year, the San Antonio area only got 11.5 inches of rain.



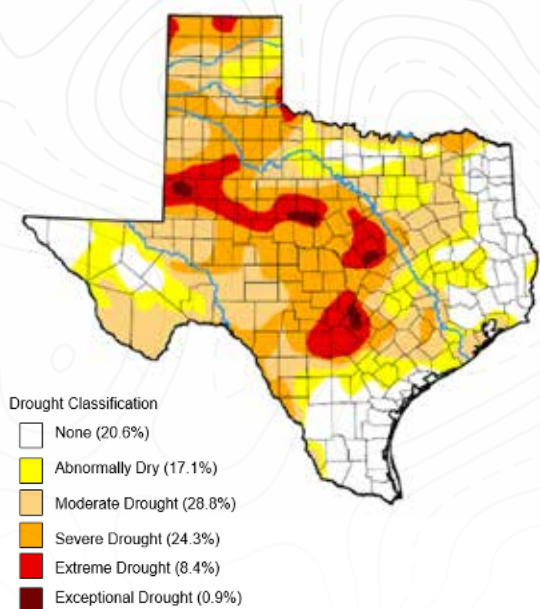
Graph showing monthly rainfall for last year against the long-term average rainfall for the area. The long-term monthly average precipitation was greater than last year's monthly precipitation for 9 out of 12 months. Data from NOAA NOWData website.

However, rainfall varied greatly throughout the basin for much of the year. Near Falls City in the southern part of the basin, the annual average rainfall (1946 – 2023) was 27.58 inches, last year, the rainfall was 35.28 inches. However over 10 inches occurred during the month of April with 4.6 inches falling on April 6, 2023, which is not normal. After a wet April and May, July and August were very dry.



Graph showing monthly rainfall for last year against the long-term monthly average rainfall for the Falls City area. The average monthly precipitation is greater than the actual precipitation in 7 out of 12 months. April and May had unusually high rainfall last year, while July and August had unusually low rainfall. Data from NOAA NOWData website.





*September 6, 2022, US Drought Monitoring*

Many of the major rivers (San Antonio, Lower Medina River and Lower Cibolo Creek) are dominated by re-use and wastewater discharges that keep water flowing in the rivers, but streams and reservoirs that are normally dominated by spring flow such as the Medina River and Medina Lake are drying up.

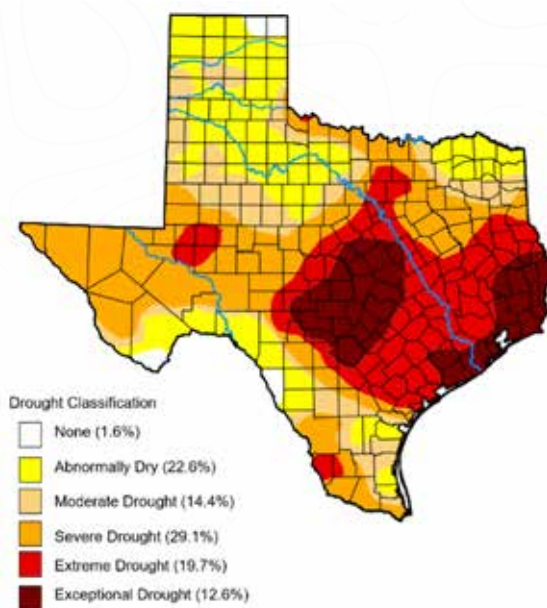
The last time that Medina Lake was full was July 7, 2019. Since then, it has steadily dropped to 4.4 percent storage on August 31, 2023. There are multiple reasons for this drop. The Texas Hill Country has been in a drought with high temperatures which cause elevated evaporation of waterbodies.

In general, the low rainfall in the area combined with the high temperatures put much of Texas in a drought.

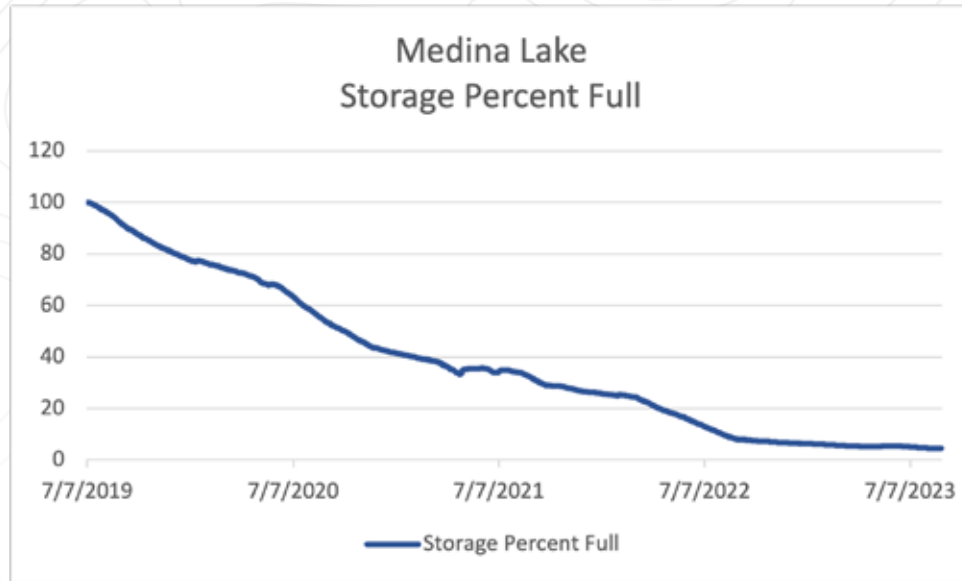
In September of 2022, 33.6% of Texas was classified in severe to exceptional drought. The rest of the state was classified as no drought to moderate drought.

The portion of the San Antonio River Basin located in the Texas Hill Country was under severe drought, the central part of the basin was identified as extreme drought with a portion of Cibolo Creek's drainage area classified as exceptional drought. Parts of the lower basin were identified as abnormally dry.

By August 29, 2023, 61.4% of Texas was classified in severe to exceptional drought.



*August 29, 2023, US Drought Monitor*



Medina Lake storage percent full from July 7, 2019 (the last time that the lake was full) thru August 31, 2023. Data from Water Data for Texas. Data from NOAA NOWData website.



Medina River near Bandera, TX. Dry creek bed with shallow pools.



## Spills

### Truck in the River:

On December 5, 2022, a pickup truck was found partially submerged on the east bank of the San Antonio River at Loop 410 South. The vehicle lost approximately 1 quart of transmission fluid that leaked into the river. River Authority staff contained the spill with booms and absorbent pads at the site of the crash, and a secondary boom was deployed further downstream at Camino Coahuilteca low water crossing.



*Truck in the San Antonio River.*



*Absorbent pads and boom in the river.*

A contractor employed by the River Authority used a vacuum truck to skim all the transmission fluid and removed the contaminated booms and absorbent pads for disposal.

There was no fish kill or impacts to other wildlife identified. The TCEQ and Texas Parks and Wildlife (TPWD) were notified of the incident.

### Oil Spill:

Due in part to heavy rains and a power outage on April 21, 2023, an estimated 9 to 12 gallons of oily water spilled into the San Juan Acequia and made its way to the Mission Reach of the San Antonio River.

The refinery took swift action to clean up the oil. They deployed absorbent pads and booms to contain the oil spill, but the heavy rains hampered the cleanup. They also employed vacuum trucks to suction the oily water.

The River Authority also deployed pads and booms to contain the spill.

River Authority field staff did not observe any evidence of wildlife mortality or harm while on site.

Soil samples collected in San Juan Acequia on May 1, 2023 showed no contamination. Contamination was found inside the refinery and the Union Pacific Railroad ditch. Remediation was conducted at these sites.

River Authority staff worked with National Park Service and TCEQ staff along with refinery staff and their contractors to protect the San Juan Acequia, the San Antonio River and the aquatic communities that rely on them.

Accidental spills are often unavoidable and can cause destruction of habitat and death of wildlife. It is important to respond quickly to spills to minimize the damage they cause. The San Antonio River Authority have staff that are trained for quick response to spills. Staff also train with first responders from multiple jurisdictions so a coordinated clean up can occur.

## Construction Projects Runoff

Construction projects that disturb the land and expose the soil, such as bridges, buildings, roads, and subdivisions can allow soil and construction debris to wash off the land and be carried into storm sewers and streams. Excessive sediment washing into a stream can affect aquatic communities, especially those species that live at the bottom of streams such as mussels and aquatic insects. Sediment washed into a stream can also negatively affect water clarity, nutrient, and dissolved oxygen levels.



*Sediment from a construction site running off into the street, where it will be carried to a storm drain and then directly into a river.*

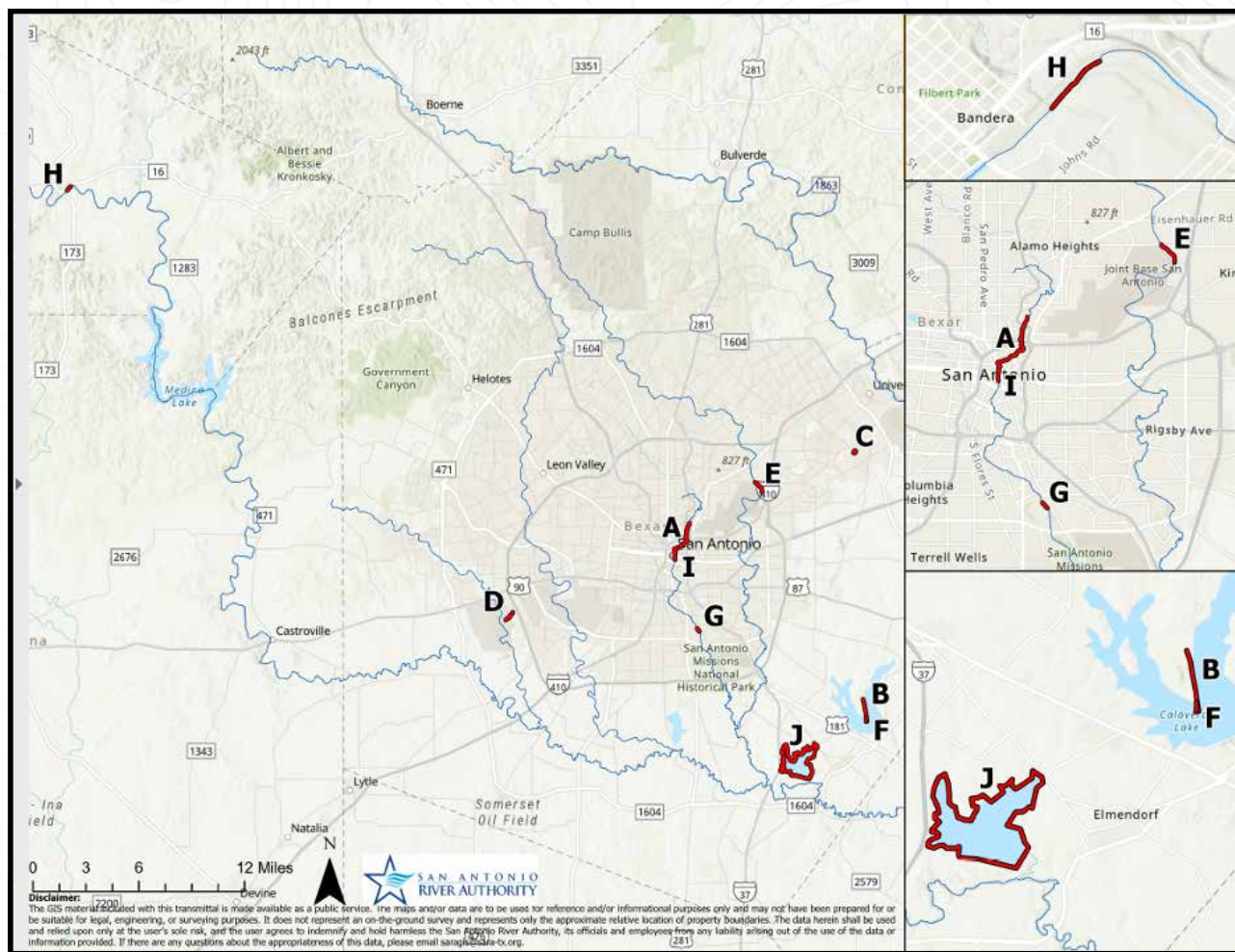
### To protect our waterways from construction site runoff:

- If it is your own project, apply silt fencing to retain the disturbed soil on your property.
- If you see stormwater sediment washing off a construction site, contact your local government (in San Antonio - call 311). You can also contact the San Antonio River Authority's Environmental Investigator at (210) 227-1373 or (866) 345-7272.



## Fish Kills:

The data presented is from the Texas Parks and Wildlife's (TPWD) Spills and Kills database.



Map of fish kills in the San Antonio River Basin from TPWD's database from 9/1/2022 to 8/31/2023. Note that the only fish kills called in to TPWD were in Bexar and Bandera Counties.

### A. September 8–9, 2022:

Approximately 2030 fish were found dead on the San Antonio River by River Authority staff. Fish species found dead included: Longear Sunfish, Redbreast Sunfish, Largemouth Bass, Channel Catfish, Tilapia and minnows. The suspected cause of the fish kill was low dissolved oxygen levels due to nonpoint source runoff of organic material.

### B. September 10, 2022:

Approximately 1000 Red Drum were found dead in an intake canal at Calaveras Lake. City Public Services notified TPWD. Calaveras Lake is highly stratified, and it is believed that the Red Drum died when they went into hypoxic (low dissolved oxygen) water. The dissolved oxygen level was 0.5 mg/L at the intake canal. Short term exposure to dissolved oxygen levels below 3 mg/L cause stress to most fish found in the San Antonio River basin, long term exposure can cause death.

C. September 30, 2022:

Approximately 200 fish were found dead in the south lake of Converse Twin Lakes Park. The main fish species found dead was Blue Gill Sunfish. Largemouth Bass, Channel Catfish and White Crappie were also found. The suspected cause of the fish kill was low dissolved oxygen due to excessive algae growth. Excessive algae growth is caused by excessive nutrients particularly in hot and sunny conditions.

D. October 14–15, 2022:

Approximately 200 fish were found dead in an unnamed tributary of Medio Creek. TPWD was notified by San Antonio Water Systems' staff. The fish kill was due to a sewage lift station failure with approximately 50,000 gallons of untreated waste entering the tributary. Cleanup was completed on Oct. 15, 2022.

E. July 6–7, 2023:

Approximately 50 dead fish were reported to TPWD on Salado Creek. River Authority staff walked the area, but no dead fish were found. Dissolved oxygen levels were low and there was evidence of a recent rain. The suspected cause of the fish kill was low dissolved oxygen levels due to nonpoint source runoff of organic material.

F. July 25, 2023:

Approximately 1000 Red Drum were found dead at the mouth of an intake canal at Calaveras Lake. City Public Services notified TPWD. Calaveras Lake is stratified during the summer, and it is believed that the Red Drum died when they went into hypoxic (low dissolved oxygen) water. Dissolved oxygen levels dropped to 0.1 mg/L at a depth of 23 feet.

G. July 25–26, 2023:

Nine hundred eighty three fish were found dead on the Mission Reach of the San Antonio River near Padre Park. River Authority staff found 972 dead Gizzard Shad and 11 dead Largemouth Bass. The suspected cause of the fish kill was low dissolved oxygen levels due to nonpoint source runoff of organic material.



*Two dead Gizzard Shad from the fish kill at the Mission Reach of the San Antonio River.*



H. August 8, 2023:

Twelve Central Stonerollers were found dead in Medina River. TPWD walked Medina River and it was almost entirely dry with occasional isolated pools with algae. The suspected cause of the fish kill was the lack of flow in the river which led to the isolated pool with low dissolved oxygen levels.

I. August 18, 2023:

River Authority staff found ten sunfish dead on the San Antonio River in the downtown Riverwalk area. While dissolved oxygen levels were within normal range, the water was stagnant with considerable algae. The suspected cause of the fish kill was low flow conditions with an algal bloom which led to low dissolved oxygen levels at night.

J. August 23, 2023:

Approximately 300 fish were found dead at Braunig Lake. Fish species found dead include Red Drum, shad, carp and tilapia. The suspected cause of the fish kill was low dissolved oxygen following a rain event.

Several of the fish kills were due to stormwater runoff. Small urban storms that create just enough runoff to flush pollutants into a stream, but don't produce enough runoff to dilute the pollutants, cause low dissolved oxygen levels which lead to fish (and other aquatic organism) kills.

Except for one fish kill in Banderita County where the Medina River was drying up, all other fish kills were in Bexar County. This is an urban area, where impervious cover allows rain events to pick up pollutants from the ground and transport them into the river.

The lack of reported fish kills in our rural counties may be due to lack of fish kills in the area, or they may be due to no one seeing and reporting a fish kill.

If you see a fish kill or suspect a pollution event, please call TPWD at (512) 389-4848 (this number is staffed 24 hours a day).

To protect our waterways:

- Use pesticides and fertilizers sparingly, always follow manufacturer's directions and never apply when rain is in the forecast.
- Pick up after your dog.
- Manage livestock manure so it does not wash off the site.
- Reduce stormwater runoff by landscaping using rain gardens and grassy swales, capture rain from your roof using rain barrels, redirect downspouts into garden areas and away from hard surfaces like driveways and sidewalks.
- Maintain your vehicle so it does not leak fluids onto the streets and parking lots.
- Always clean up spills outside, especially on hard surfaces, so they don't get picked up by stormwater runoff and washed into our streams.

***The key to stormwater management is slow it down, spread it out and soak it in.***

## Public Involvement

Professionals at the River Authority conduct public outreach for constituents and various community groups regarding many different topics related to watershed health, flood safety, and river recreation. Residents of the San Antonio River Basin regularly interact with our staff members regarding information about environmental sciences, engineering and flood risk management, wastewater treatment and tours, watershed and park operations, K-12 education programming, volunteer efforts, social media engagement, blog posts, and many recreational events. Altogether, this outreach serves to inform and inspire citizens of the San Antonio River Basin to keep our local creeks and rivers safe, clean, and enjoyable.

From September 1, 2022, to August 31, 2023, River Authority staff reached approximately 30,000 people across more than 430 in-person events. Among these are community events, education programs, volunteer opportunities, professional presentations, and tours.

**Volunteer Opportunities:** Our River Warrior volunteers are a large group of dedicated individuals who are focused on supporting the mission and vision of the River Authority. Volunteers can select projects and attend trainings based on their interests. The River Warrior volunteer program provides multiple avenues for the public to get involved and develop their own skills while contributing to the health and well-being of the San Antonio River watershed. Between September 1, 2022, to August 31, 2023, over 1,700 River Warriors were involved in almost 100 volunteer events!



*San Antonio River Authority's River Warriors Volunteer participants.*



As many of us know, the River Authority's River Warriors are no ordinary group of volunteers. River Warriors are seen as an extension of the River Authority and River Foundation family, stewards to the San Antonio River, and ambassadors of the River Authority and Foundation's mission of being committed to safe, clean, and enjoyable creeks and rivers.

- Over 500 River Warriors participated in 16 litter clean-up events, removing a total of 15,000 lbs. of trash from both water and land.
- Trained River Warriors assisted with the removal of Apple Snails and their eggs. Apple Snails are a non-native invasive species that have invaded the Upper San Antonio River. The River Warriors have removed 5063 Apple Snail egg cases and 6352 Apple Snails. River Warriors removed 36.3% of the total snails removed by the River Authority.
- 20 River Warrior citizen scientists monitor 18 sites throughout the watershed to test for pH, dissolved oxygen, temperature, field conditions, and more. This data is turned over to the Texas Stream Team and contributes to a larger database of water quality data throughout Texas.
- Citizen scientists utilized the iNaturalist app to make 20,168 observations of 2549 species within our watershed and beat Austin for the first time for 3rd place in the state during the City Nature Challenge 2023 in April, & placed 7th in the State for the Parks for Pollinators Bioblitz. These observations can become research-grade data utilized by scientists nationwide to document species of particular interest, migratory patterns, invasive species, and more.



*Volunteer scraping Apple Snail eggs off a wall*



*Citizen scientists using the iNaturalist app to document plants in the Mission Reach of the San Antonio River.*

This year, River Warriors and corporate/community partners participated accrued approximately 3,000 volunteer hours from November 2022 to November 2023. Way to go, River Warriors!

To learn more about the River Warriors or to volunteer contact the San Antonio River Authority at [www.sariverauthority.org/volunteer](http://www.sariverauthority.org/volunteer).



*Environmental Science interacting with the public at the 2022 River Symposium.*

**Community Events:** River Authority staff from multiple departments supported events coordinated by the Watershed and Park Operations staff and Public Affairs division. We activated our parks to reach constituents throughout our 4-county service area. Notable events include Drum Circles at San Pedro Creek Culture Park, the River Symposium at Confluence Park, River of Lights during the holiday season, disc golf tournaments, several paddling races, fishing clinics, household hazardous waste events, and public meetings for project feedback. These community events provide the public with opportunities to voice comments, questions, and concerns; learn more about their local waterways; and feel a sense of stewardship in their protection.

**Education Programs:** Students in grades K-12 have the opportunity to visit River Authority parks along the San Antonio River for field trips and interact with staff from multiple departments. Teachers can request a field trip from three choices: Flooding, Engineering, and the San Antonio River; River Ecosystem Exploration; and Don't Let Litter Trash Your River. Additionally, the Education Team visits public schools, universities, and various community organizations to conduct presentations on a wide variety of topics tailored to each group. Professional development sessions for educators and conference presentations are also conducted by River Authority education staff. Between September 1, 2022 to August 31, 2023, the Education Team served over 13,000 individuals across approximately 110 events!



**Professional Presentations:** The River Authority employs many experts in various fields related to water. Staff in the Environmental Sciences, Engineering, Utilities, Watershed Park and Operations, Public Affairs, and Information Technology departments have provided

professional presentations to many audiences. Topics include sustainable development, the freshwater mussel reintroduction project, ecosystem restoration, and flood risk mitigation, among many others. Keeping the public informed and invested in these projects serves to strengthen the connection between the local community and their freshwater resources.

**Tours:** Members of the public regularly request tours of River Authority projects. Guided tours of the San Pedro Creek Culture Park, Mission Reach, wastewater treatment facilities, and new parks inspire constituents to feel a sense of ownership in their local amenities, leading to greater support for the protection of these areas.



*Utilities staff members provide a tour of the Martinez II wastewater treatment facility to a group of educators during a professional development session.*

To request a presentation or tour, visit our website at: **[www.sariverauthority.org/education/request-presentation](http://www.sariverauthority.org/education/request-presentation)**.

**Digital Media:** Digital media is another aspect of the River Authority's presence in the community. Our blog reaches over 4,300 subscribers with a total of 86 blogs published between September 1, 2022, and August 31, 2023. Additionally, our social media platforms are followed by thousands of people: Facebook (21,531 followers), Instagram (13,913 followers), LinkedIn (6,098 followers), X formerly known as Twitter (19,258 followers), and YouTube (1,313 followers). Content on the blog and social media platforms regularly includes information about environmental sciences, current projects, events, and partnerships.

Furthermore, the River Authority website contains a wealth of information about the watershed as well as regularly updated interactive maps and dashboards that the public can use to keep track of water quality parameters, stay updated on invasive species removal, and assess their flood risk. The website also provides information on the CRP. The current Quality Assurance Project Plan is posted on the website. This document identifies where we are monitoring, exactly what we are monitoring, the analytical methods that we are using and quality control measures to determine if the data is acceptable. The website also has past reports produced by the CRP.



*A sample social media post directing people to the blog for information about new River Authority Parks.*



**Environmental Advisory Committee (EAC):** The EAC acts as the steering committee for the Texas Clean Rivers Program, but it is much more. The EAC meets quarterly, providing input and reviewing environmental projects managed by the San Antonio River Authority. It is made up of interested citizens that represent different interests in the basin (e.g., industry, agriculture, environmental, recreation). They make requests for presentations they would like to hear, and staff bring presentations they would like to share with the committee. Presentations provided to the EAC, meeting minutes, and announcements about the next meeting are also on the River Authority's website.

The March meeting is identified as the CRP Steering Committee meeting. The EAC members and additional guests are invited (e.g., fee payers, state agencies, private citizens) and together they make up the CRP Steering Committee. The CRP Steering Committee is asked to provide meaningful input to the San Antonio River Basin's CRP. They are asked about sampling location, to review reports, what type of special studies they would like to see, and what parameters we should be monitoring. While all of our meetings are open to the public, we provide additional advertisement on our website [www.sariverauthority.org](http://www.sariverauthority.org) for the Steering Committee meeting.

The River Authority employs a wide variety of public outreach methods, all with the same goal: to inform and inspire. When citizens appreciate their local natural resources, they are more inclined to protect them. It is through this outreach that the River Authority endeavors to support safe, clean, and enjoyable local creeks and rivers.



*Volunteers celebrate removing over 1,000 lbs. of trash along the San Antonio River.*

## Water Quality Monitoring

The San Antonio River Authority, Bandera County River Authority and Groundwater District (Bandera), City of Boerne (Boerne), Texas Commission on Environmental Quality (TCEQ) and the Guadalupe Blanco River Authority (GBRA) meet annually to coordinate the CRP monitoring in this basin. Information from stakeholders and participating agencies are used to ensure that the basin is being effectively monitored, eliminate duplication of effort, and address basin priorities.

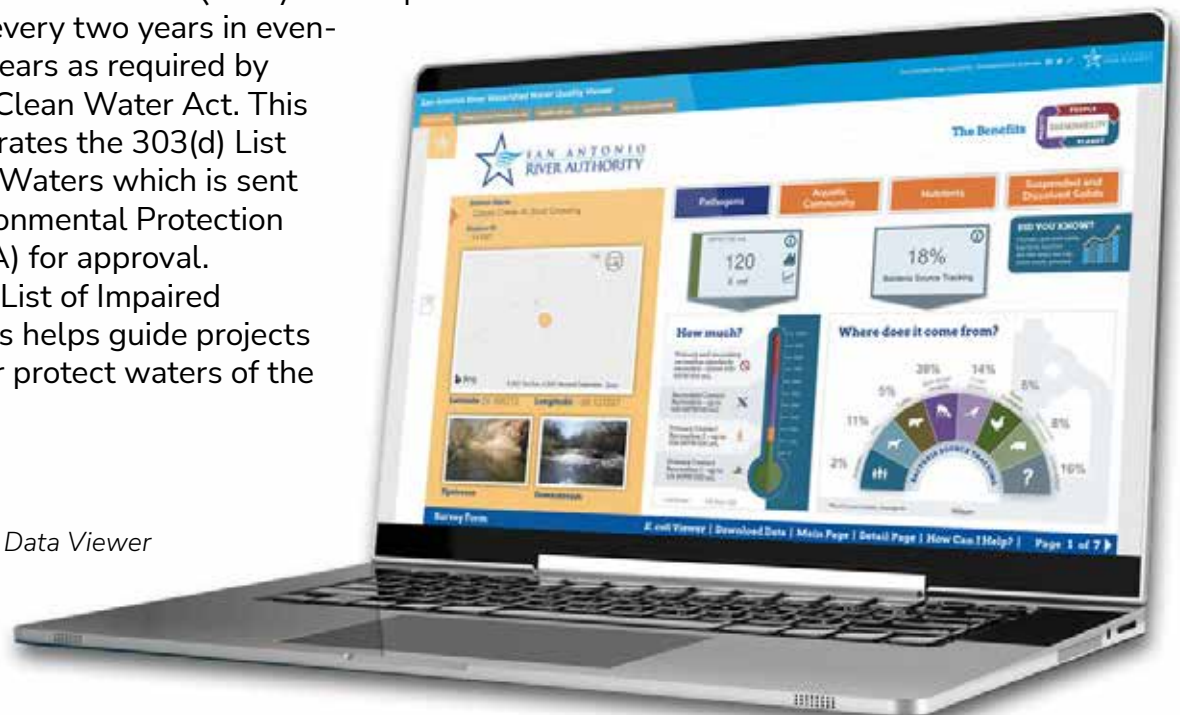
In the CRP at the River Authority, there are two types of monitoring: routine and seasonal. Routine monitoring is conducted year-round and usually includes the following parameters at a fixed interval: dissolved oxygen, pH, conductivity (est. total dissolved solids), temperature, field observations, flow, *E. coli* bacteria, nutrients, chlorides, sulfates, total suspended solids, chlorophyll-a and metals. These samples are usually collected every other month or quarterly at each sample site. Seasonal monitoring is conducted during a specific season of the year and may include parameters such as 24 hour dissolved oxygen, habitat assessment, fish and benthic macroinvertebrate communities. Seasonal sampling is usually conducted once or twice a year only. Routine monitoring parameters may also be collected in conjunction with seasonal monitoring.

To determine exact sampling locations, frequency of sampling, and parameter groups being collected, view the Coordinated Monitoring Schedule at: [cms.lcra.org](http://cms.lcra.org).

All data collected through the CRP for the entire state is available to the public through the TCEQ's Surface Water Quality Web Reporting Tool at: [www.80.tceq.texas.gov/SwqmisPublic/index.htm](http://www.80.tceq.texas.gov/SwqmisPublic/index.htm). Data managed by the River Authority (River Authority, Bandera, and Boerne) is available in an easy to use website using the River Authority's Water Quality Data Viewer at: [www.sariverauthority.org/services/river-health](http://www.sariverauthority.org/services/river-health).

Data collected by the CRP is used by TCEQ to generate the Texas Integrated Report of Surface Water Quality. This report is required every two years in even-numbered years as required by the federal Clean Water Act. This report generates the 303(d) List of Impaired Waters which is sent to the Environmental Protection agency (EPA) for approval. This 303(d) List of Impaired Waterbodies helps guide projects to restore or protect waters of the State.

Water Quality Data Viewer Website.

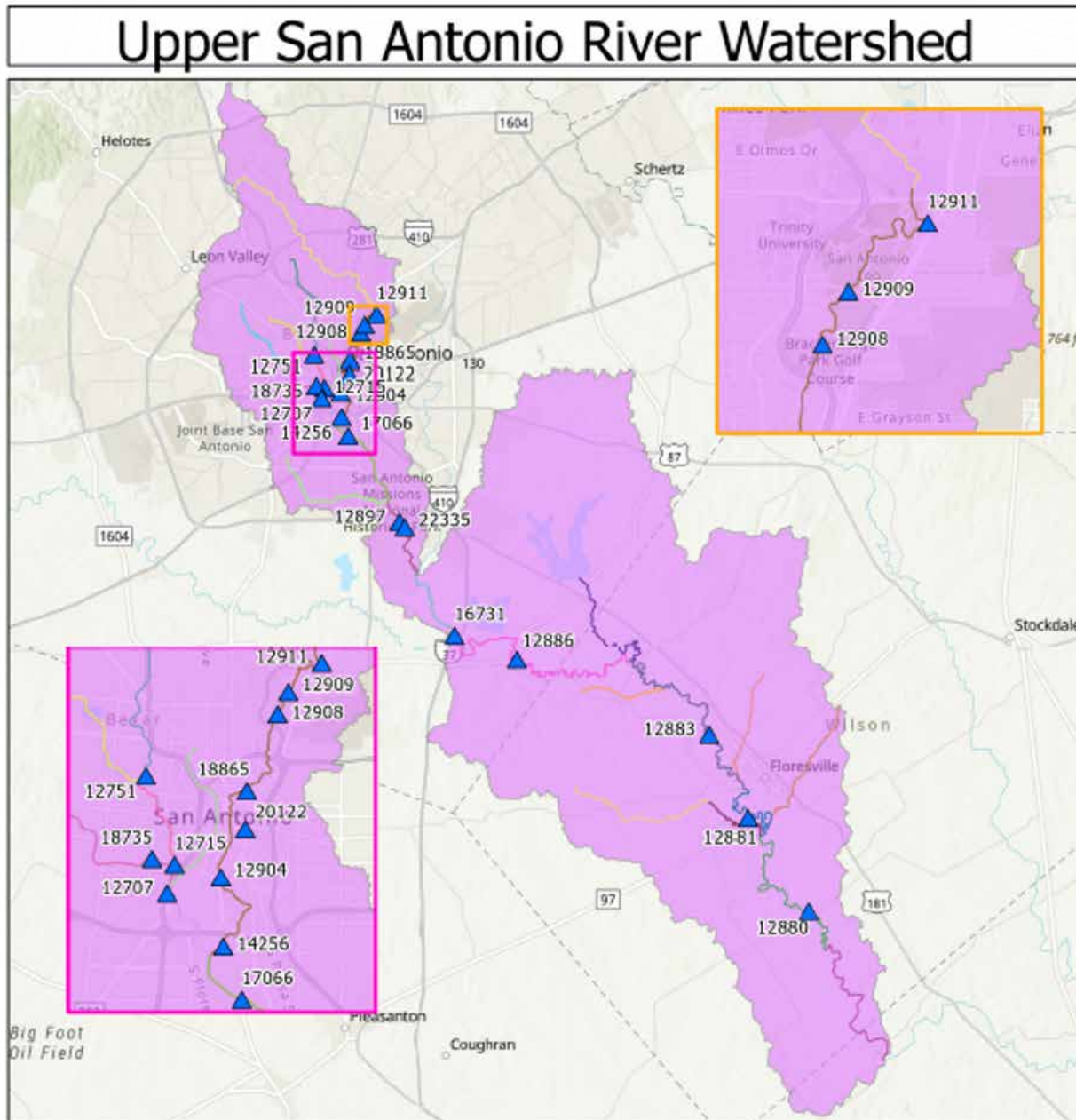




## San Antonio River Watershed

### Segment 1911: Upper San Antonio River:

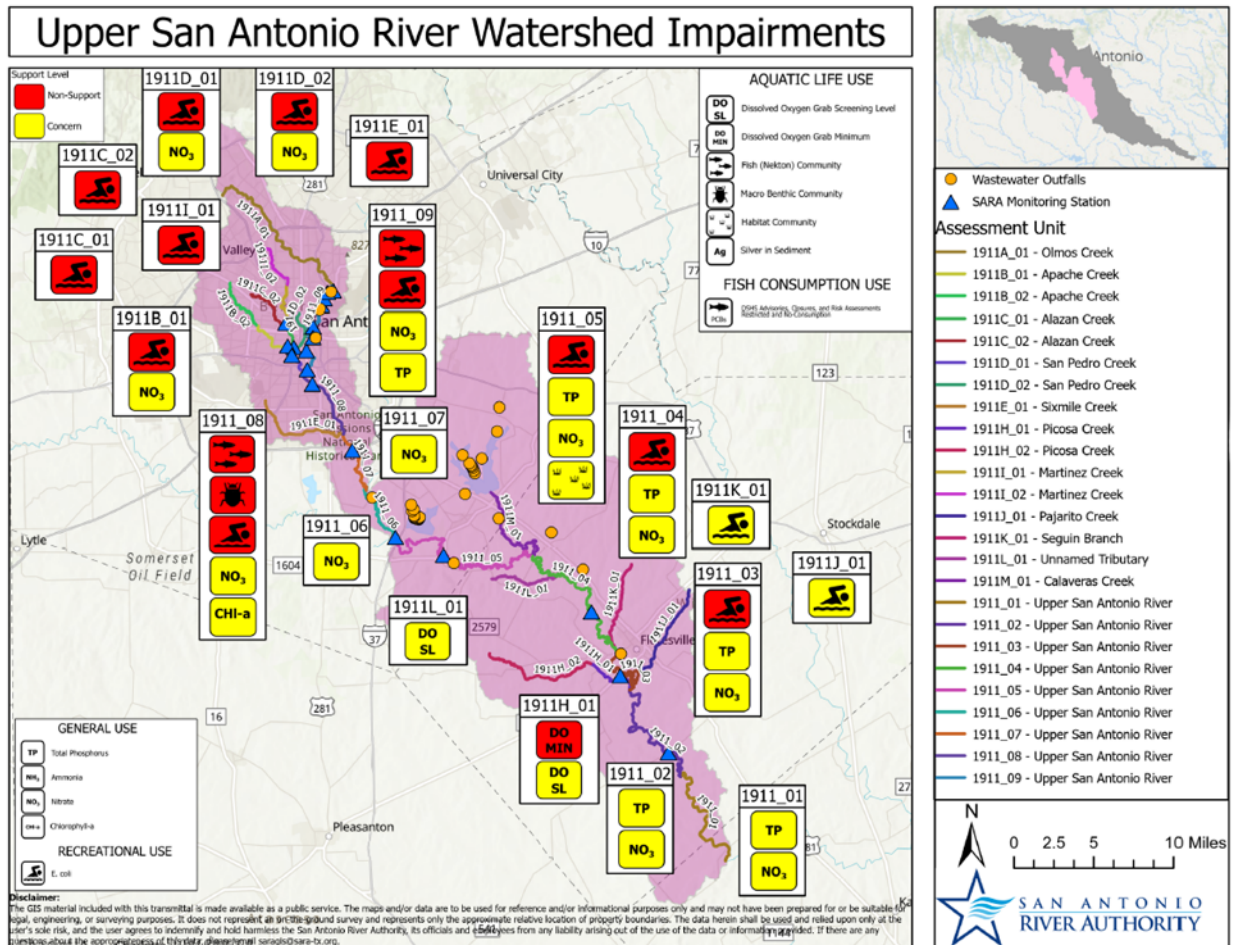
For FY23, there were 14 routine monitoring sites sampled on the main stem of the Upper San Antonio River, 5 routine sites on tributaries and 1 routine outfall from the San Antonio Zoo that flows into the San Antonio River. Seasonal monitoring was conducted at 5 sites on the San Antonio River. The San Antonio River Authority sampled all sites.



FY23 Upper San Antonio River Watershed stations. Blue triangles are monitored by the River Authority.

For FY24, the San Antonio River at Dietzfield Road (Station 12880) will be dropped due to unsafe conditions and will be replaced the San Antonio River 425 meters downstream of FM541 (Station 22419). The San Antonio Zoo Outfall #1 (Station 15722) will be dropped from the CRP. This station will continue to be monitored for *E. coli* bacteria under the River Authority Stream Monitoring Program.

The TCEQ's 2022 Integrated Report (2022 TCEQ IR) identified the following impairments and concerns for the Upper San Antonio River and its tributaries:



Upper San Antonio River Watershed impairments and concerns.





Breeding populations of several invasive species are in the Upper San Antonio River in Bexar County. Invasive species include tilapia and armored catfish which have the potential of outcompeting native species for food. However, the invasive species that causes the most concern in the Upper San Antonio River is the Apple Snail. The Apple Snail can grow to the size of a large apple, and they are prolific breeders. A female can lay a clutch of eggs twice a month (during warm months) and the clutch can contain over two thousand eggs. The Apple Snail climbs out of the water and attaches bright pink egg clutches to walls, rocks or even plants.

*Apple Snail clutch of eggs.*

They feed on a wide variety of aquatic vegetation and can harm the aquatic habitat and outcompete native snails.

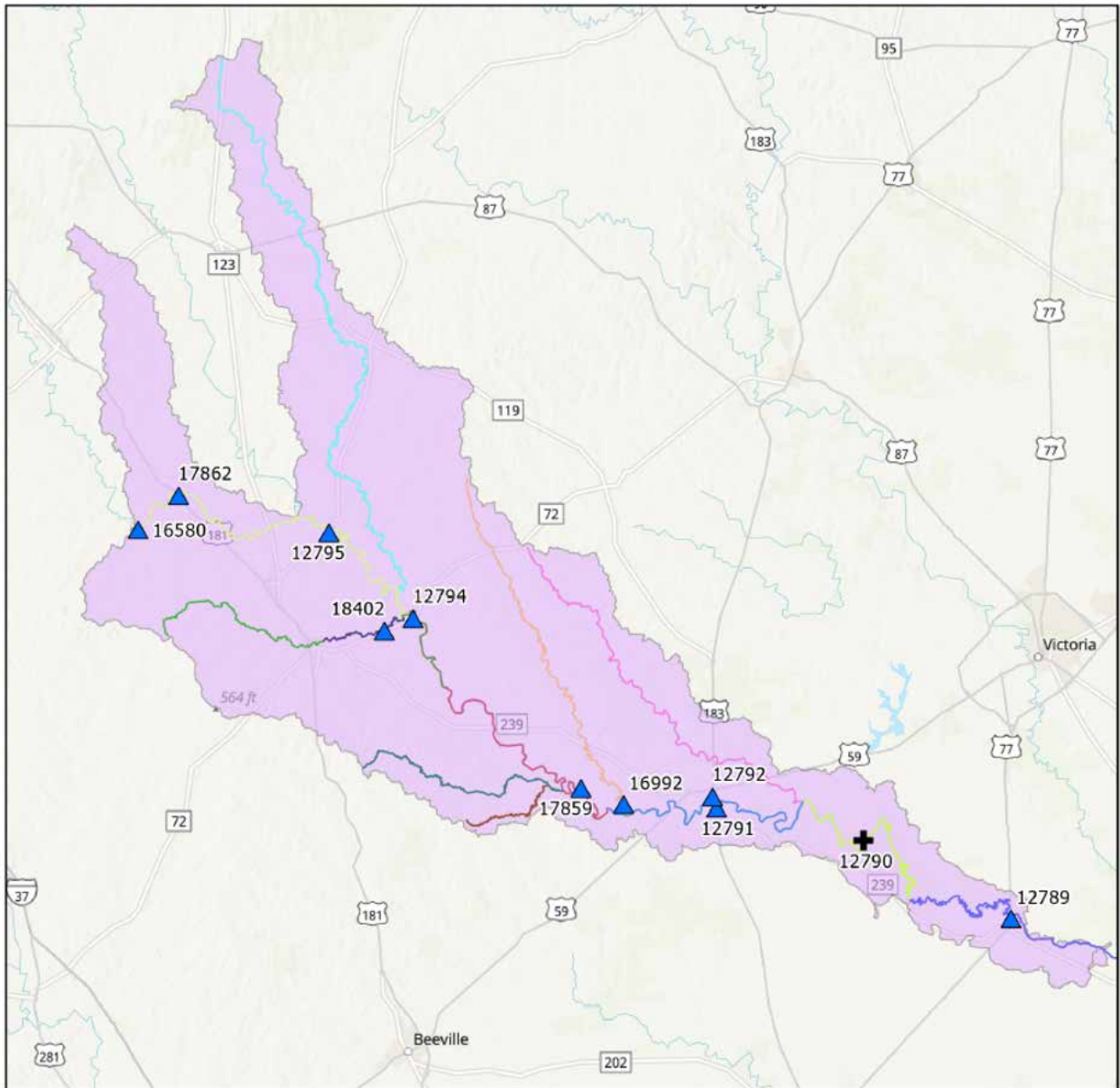
The San Antonio River Authority along with our River Warriors remove and destroy egg clutches and adult snails in an attempt to manage the population and prevent them from spreading.



*Apple Snail found in the Upper San Antonio River.*

### **Segment 1901: Lower San Antonio River:**

FY23 Lower San Antonio River Watershed stations. Blue triangles are monitored by the River Authority, the black cross is monitored by the Guadalupe-Blanco River Authority. For FY23, there were 10 routine monitoring sites. Seasonal monitoring was conducted at two stations. One routine site was monitored by the Guadalupe Blanco River Authority, the remainder of sites were monitored by the River Authority.

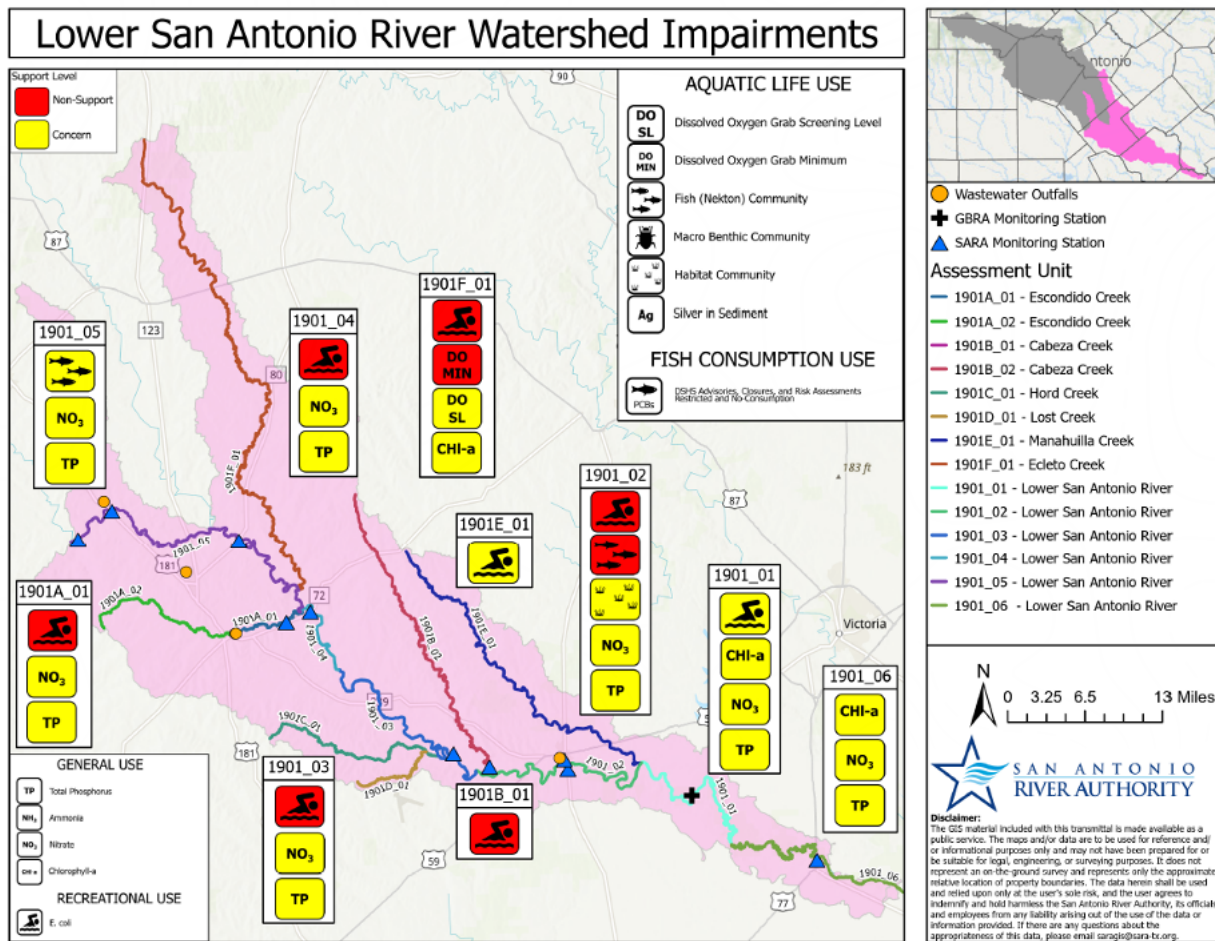


*FY23 Lower San Antonio River Watershed stations. Blue triangles are monitored by the River Authority, the black cross is monitored by the Guadalupe-Blanco River Authority.*



For FY24, the San Antonio River SW of Falls City (Station 17862) was dropped due to unsafe sampling conditions. Cabeza Creek (Station 16992) was also dropped due to the site frequently being dry. Ecletto Creek (Station 20539) was added and is currently being collected for both routine and 24 hour dissolved oxygen.

The 2022 TCEQ IR identified the following impairments and concerns for Lower San Antonio River and its tributaries:

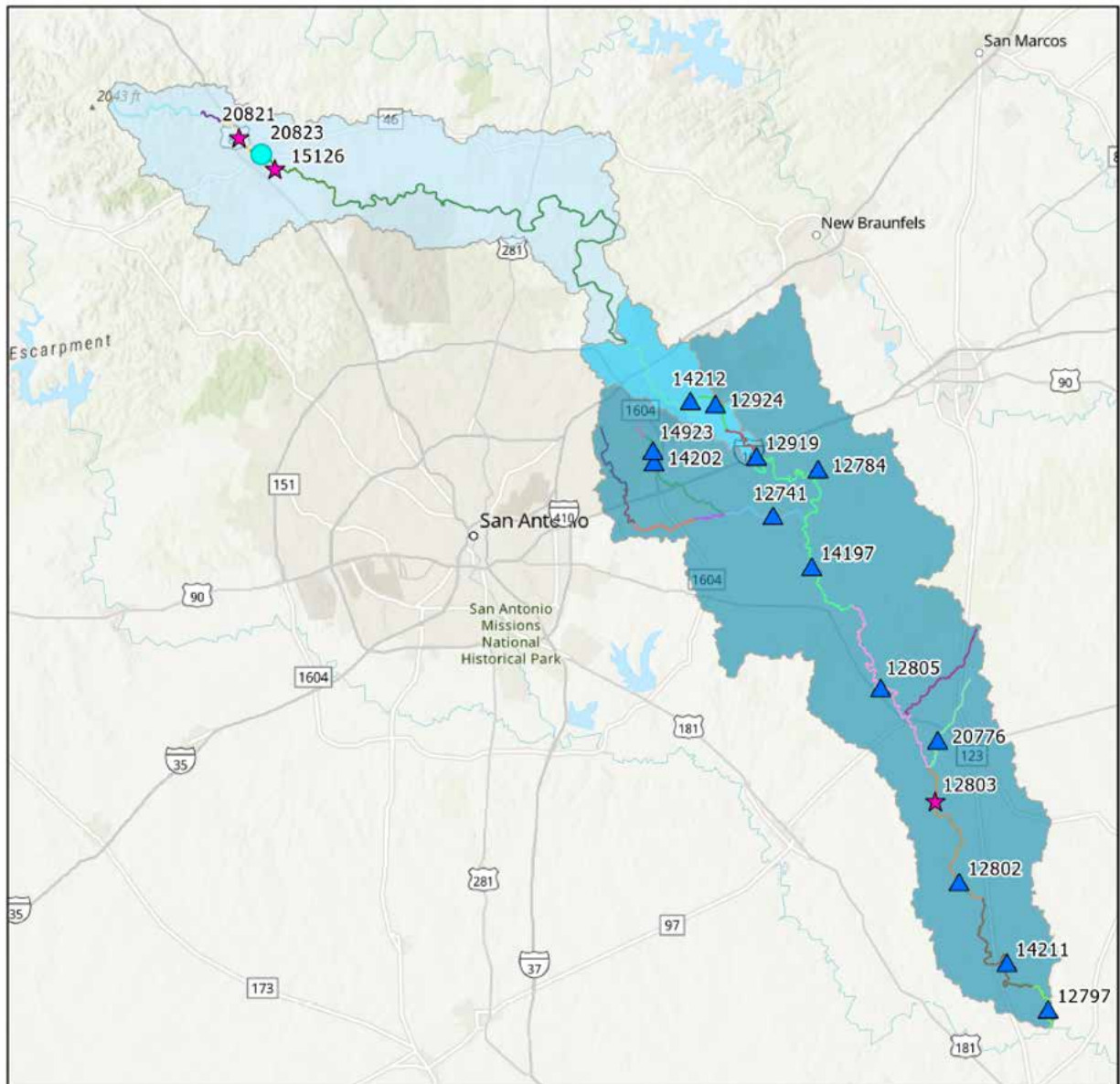


Lower San Antonio River Watershed impairments and concerns.

# Cibolo Creek Watershed

## Segment 1908: Upper Cibolo Creek:

For FY23, there were three routine monitoring sites. Two sites were monitored by the TCEQ, and one site was monitored by Boerne. There was no seasonal sampling conducted for this segment. There are no changes anticipated for FY24.

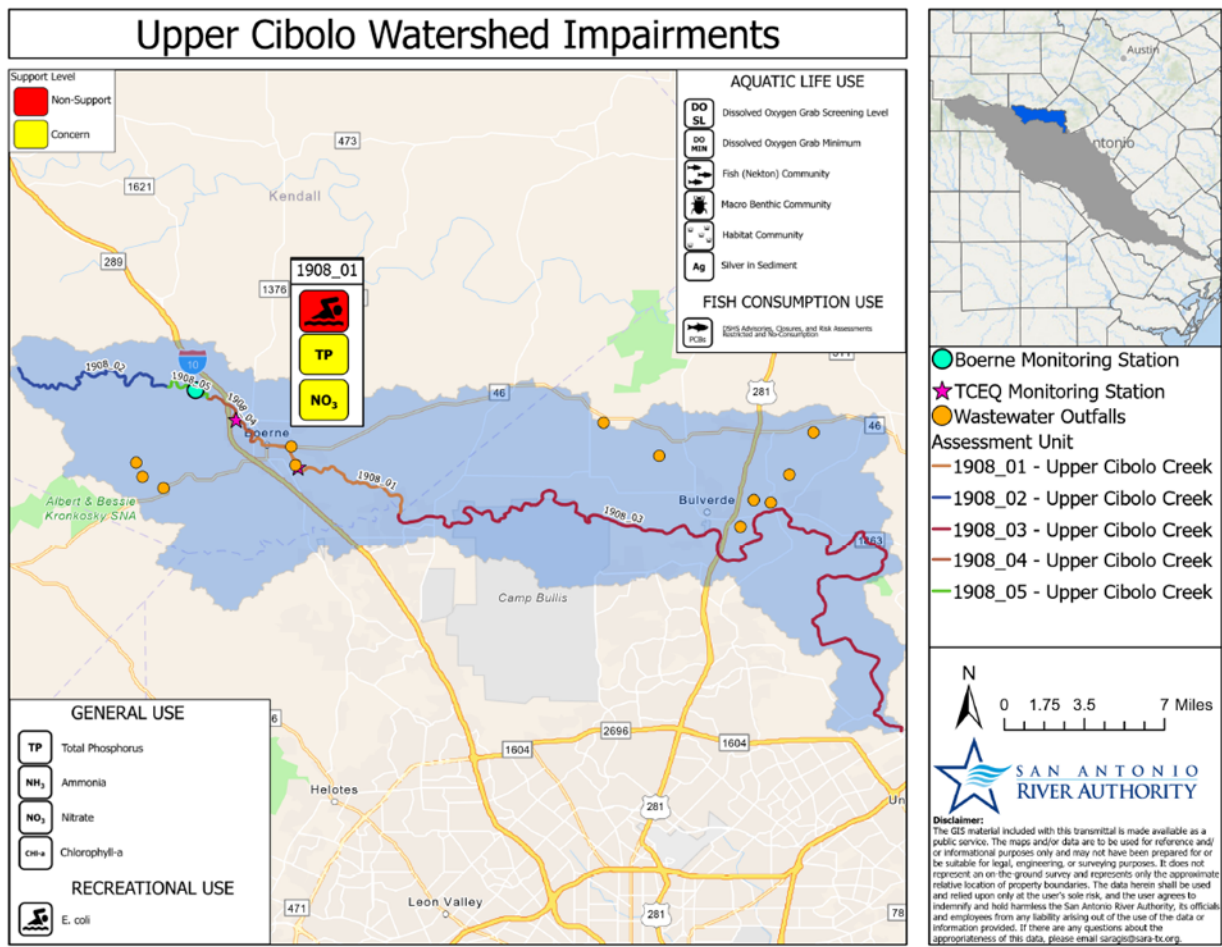


FY23 Cibolo Creek Watershed stations. Blue triangles are monitored by the River Authority, the blue circle is monitored by the City of Boerne, and the red stars are monitored by the TCEQ.



Cibolo Creek is perennial in the Boerne area, but downstream of Boerne the creek recharges into the Edwards Aquifer and becomes intermittent. Thus, sampling is centered around the Boerne area.

The 2022 TCEQ IR identified the following impairment and concern for Upper Cibolo Creek:

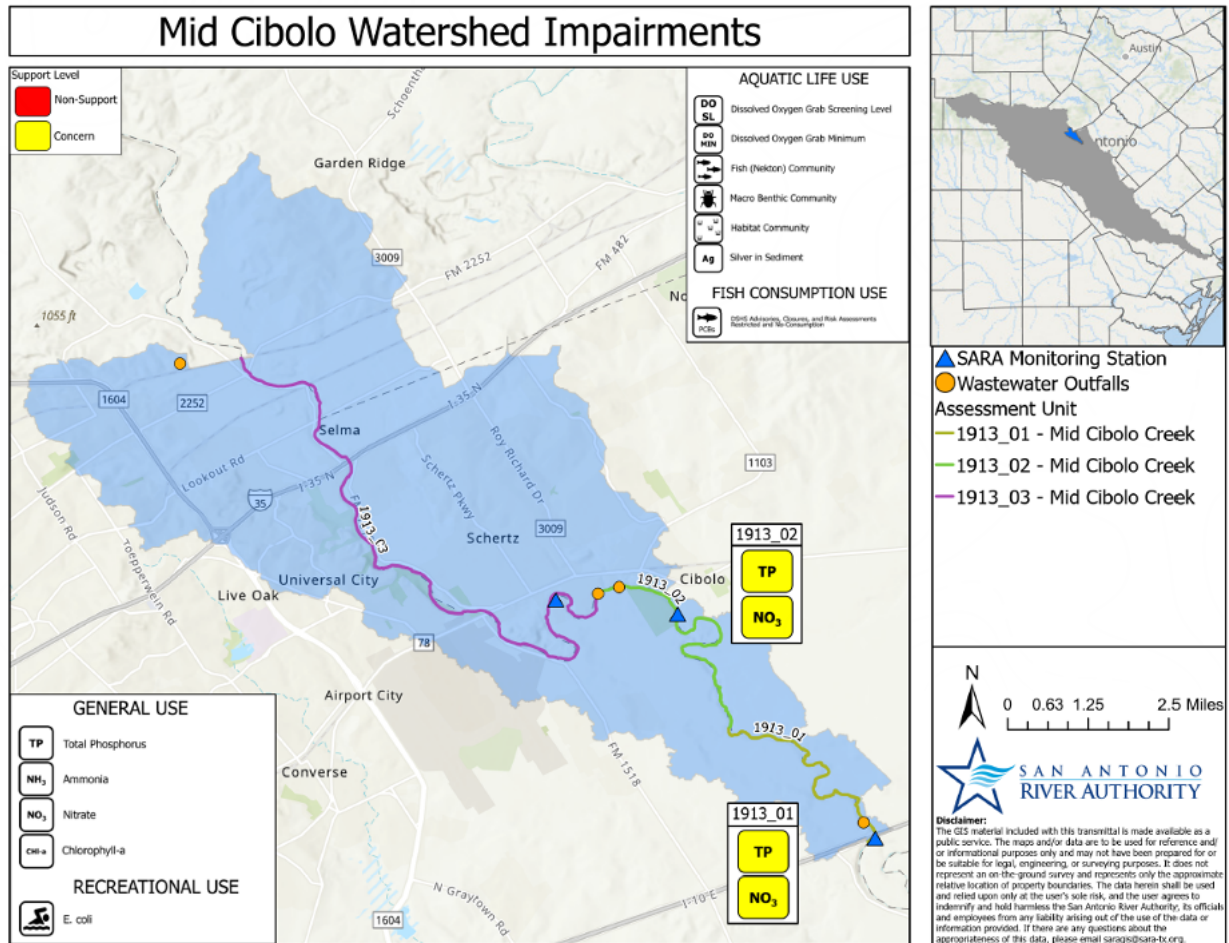


Upper Cibolo Watershed impairment and concerns.

### Segment 1913: Mid Cibolo:

For FY23, there were three routine monitoring sites on the Mid Cibolo and no seasonal sampling. All sites were monitored by the River Authority. The upper portion of this segment is intermittent, with the lower portion of the segment being perennial. There are no changes anticipated for FY24.

The 2022 TCEQ IR identified no impairments and a concern for nutrients only on the Mid Cibolo Creek:



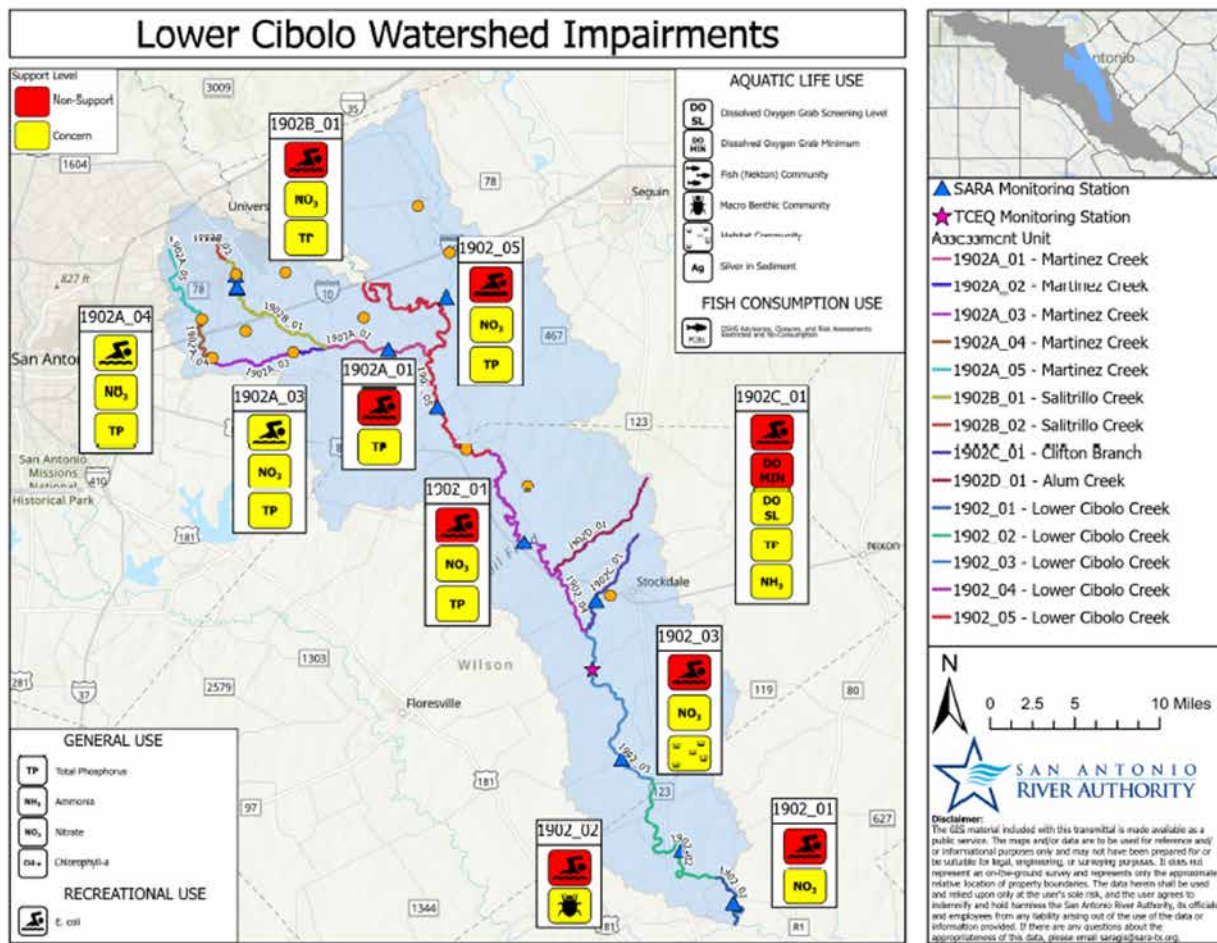
*Mid Cibolo Watershed concerns (no impairments).*



## Segment 1902: Lower Cibolo Creek:

For FY23, there were 10 routine sites monitored by the River Authority. One site was monitored by the TCEQ San Antonio Office, the remainder of sites were monitored by the River Authority. Seasonal monitoring was conducted at four sites. No changes are anticipated for this segment for FY24.

The 2022 TCEQ IR identified the following impairments and concerns for Lower Cibolo Creek and its tributaries:

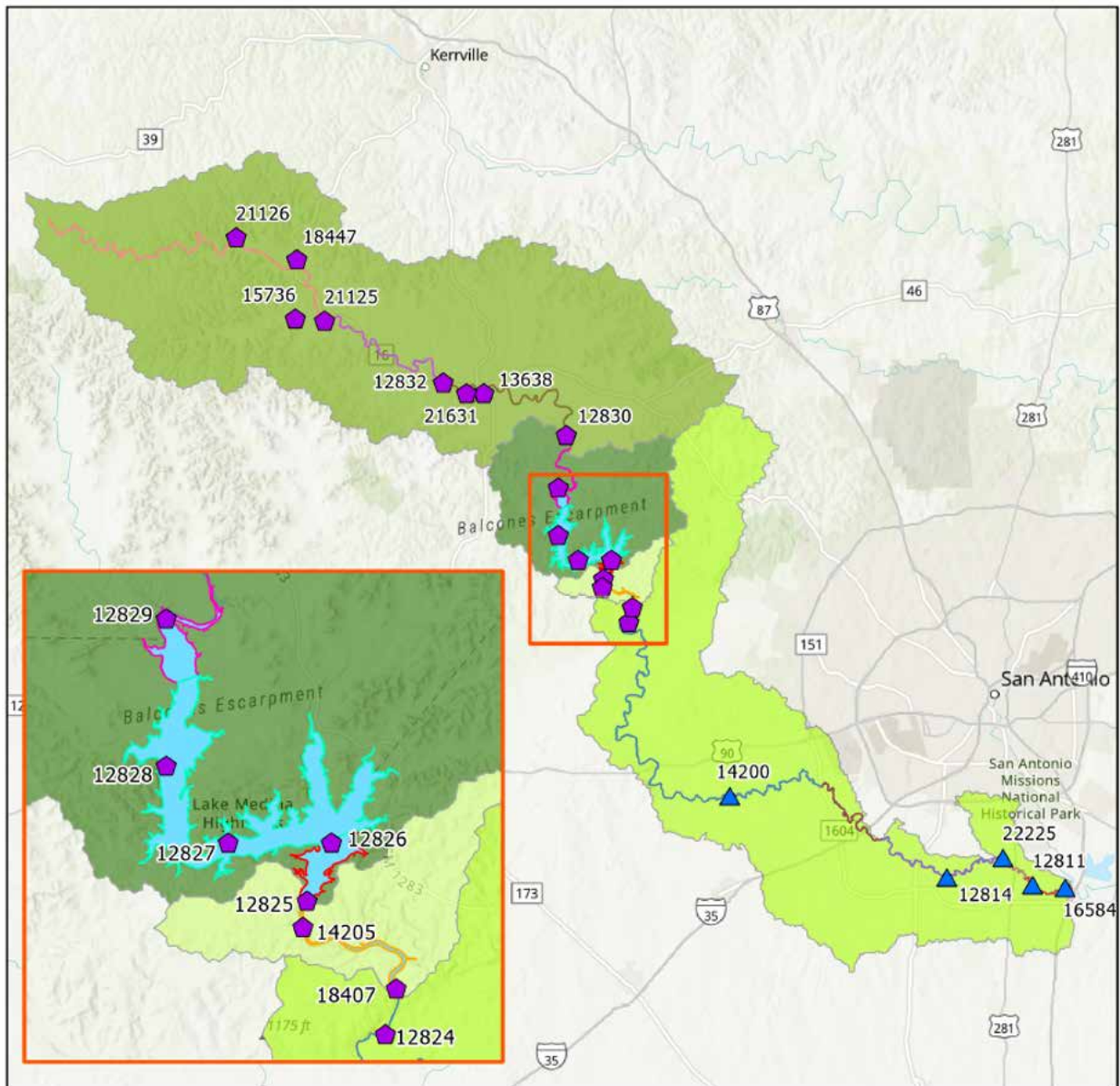


Lower Cibolo Watershed impairments and concerns.

## Medina River Watershed

### Segment 1905: Medina River Above Medina Lake:

For FY23, there were eight routine monitoring sites, all monitored by Bandera. Seasonal monitoring was conducted jointly by the River Authority and Bandera. For FY24, no changes are anticipated, but if the drought continues, this stretch of the Medina River may go dry and sampling may be impossible.



FY23 Medina Watershed stations. Blue triangles are monitored by the River Authority, and the purple pentagons are monitored by the Bandera County River Authority and Groundwater District.



## Segment 1904: Medina Lake:

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For FY23, there were five routine monitoring sites, all monitored by Bandera. No seasonal sampling was planned. Unfortunately, only three sites could be monitored due to low water creating unsafe conditions launching the boat and on the lake. For the August sampling, no sites could be monitored due to unsafe conditions due to drought. For FY24, it is planned to sample all 5 sites, but unless the drought breaks, and we get rain in the Medina Watershed, that won't be possible.



*Zebra mussels. Courtesy of Bandera County River Authority and Groundwater District.*

The 2022 TCEQ IR found no impairments or concerns for Medina Lake.

Medina Lake is infested with Zebra Mussels. Zebra Mussels are a small invasive species that are very destructive. One female Zebra Mussel can release up to 1 million eggs in a year. They can outcompete native mussels both reproductively and in filtering out plankton for food. Unlike native mussels that attach themselves into sediment using a foot, Zebra Mussels have thread like structures that allow it to adhere to almost any substrate including native mussels. They can clog intake pipes and foul equipment. They are sharp and can hinder recreation causing cuts and scrapes for people and animals.

The San Antonio River Authority has developed eDNA analysis in our laboratory. We are now able to test water from a waterbody and determine if Zebra Mussel DNA is present.



*Settlement sampler for Zebra Mussels. The settlement sampler is left submerged in a waterbody. Zebra mussels attach to the metal plates. The settlement sampler is pulled out of the water after several months so biologist can determine if any Zebra mussels are present. .*

The San Antonio River Authority also has settlement samplers out at various sites in the basin. Sediment samplers provide a surface for Zebra Mussels to grow. Staff routinely check the samplers to determine if Zebra Mussels are attached to the sediment samplers. To date, no Zebra Mussels have been found in the basin, except for the infested lakes, Medina Lake and Medina Diversion Lake.

The River Authority is working with CPS Energy and Texas Parks and Wildlife Department (TPWD) to sample for Zebra Mussel Larvae (called veligers) at Braunig and Calaveras Lakes.

One of the most common ways that Zebra Mussels spread is by attaching to boats and hitching a ride to another water body. They may also be spread between waterbodies through bait buckets, live wells and bilge water. The River Authority has placed stickers at put-ins and take-out locations on canoe trails warning about Zebra Mussels and how they spread. The River Authority also participates in a public outreach

program by TPWD about how to stop the spread of Zebra Mussels.

For more information about Zebra Mussels check out our blog: River Threats: Zebra Mussels: [www.sariverauthority.org/blog-news/river-threats-zebra-mussels](http://www.sariverauthority.org/blog-news/river-threats-zebra-mussels) or [www.texasinvasives.org](http://www.texasinvasives.org).



*Dead Zebra Mussels on Medina Lake shore. Courtesy of Bandera County River Authority and Groundwater District.*



### **Segment 1909: Medina Diversion Lake:**

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For FY23, there were two routine monitoring sites, both monitored by Bandera. No seasonal sampling was planned. During FY23 sampling was challenging on the Medina Diversion Lake. At site 14205 – Medina River downstream of Medina Reservoir in Mico, TX at the low water crossing a fence was installed that prevented access to the river. Bandera notified the TPWD game warden that access was prevented, and the game warden resolved the issue. At site 18407 – Medina Lake near Dam, no samples were collected. Two events were attempted but there were issues with access and twice the site was dry. For FY24, no changes are anticipated. The 2022 TCEQ IR found no impairments or concerns for Medina Diversion Lake. Medina Diversion Lake has also been identified by TPWD as infested for Zebra Mussels.



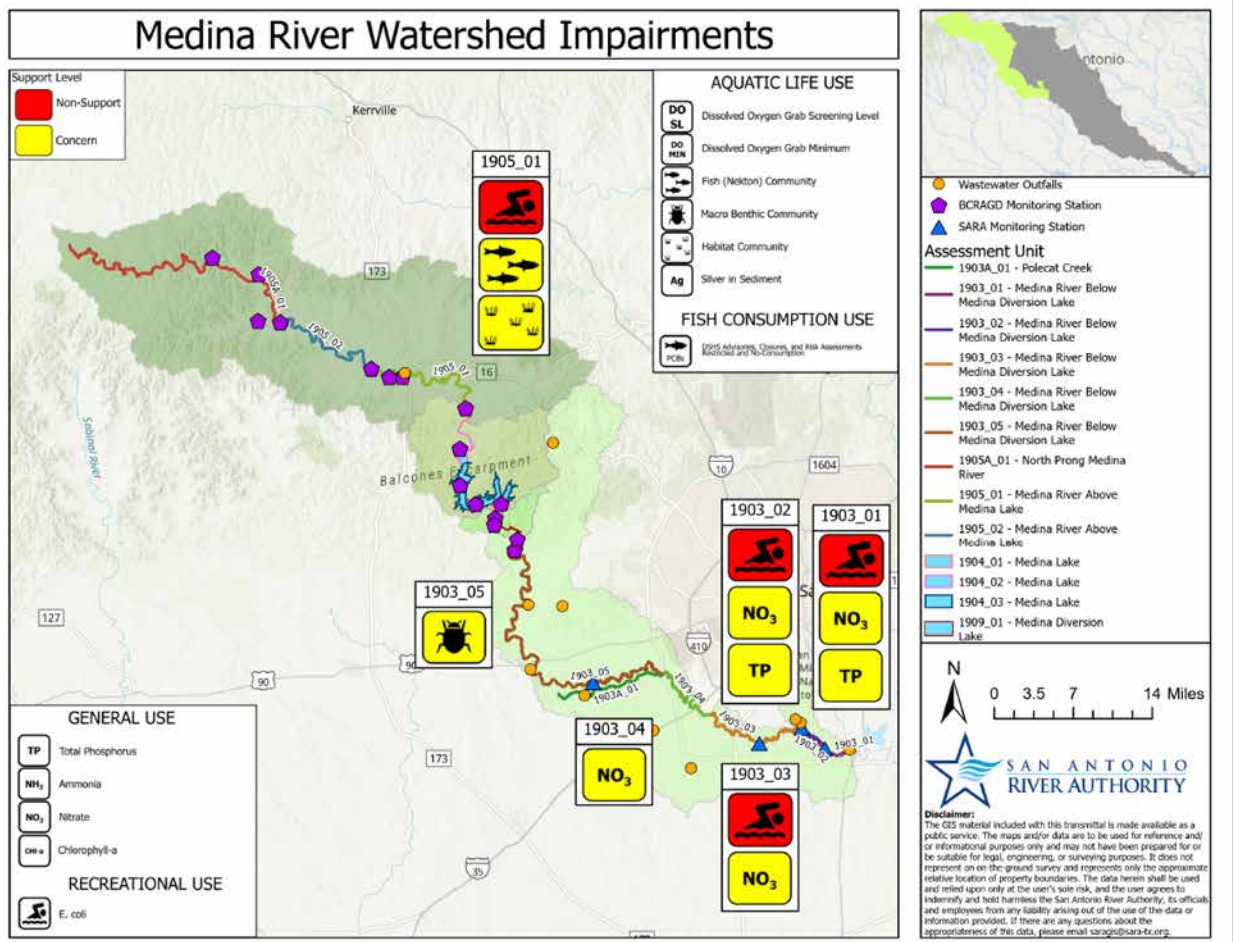
*Fence blocking path to sampling site 14205: Medina River downstream of Medina Reservoir in Mico Texas, at low water crossing. Image courtesy of Bandera River Authority and Groundwater District.*

### Segment 1903: Medina River Below Medina Diversion Lake:

For FY23, there were 6 routine monitoring sites. Seasonal monitoring was conducted at one station, Medina River at CR484 (station 14200). One routine site was monitored by Bandera, the remainder of sites were monitored by the River Authority.

For FY24, benthic macroinvertebrate sampling will be added to station 14200.

The 2022 TCEQ IR identified the following impairments and concerns for the Medina Watershed:

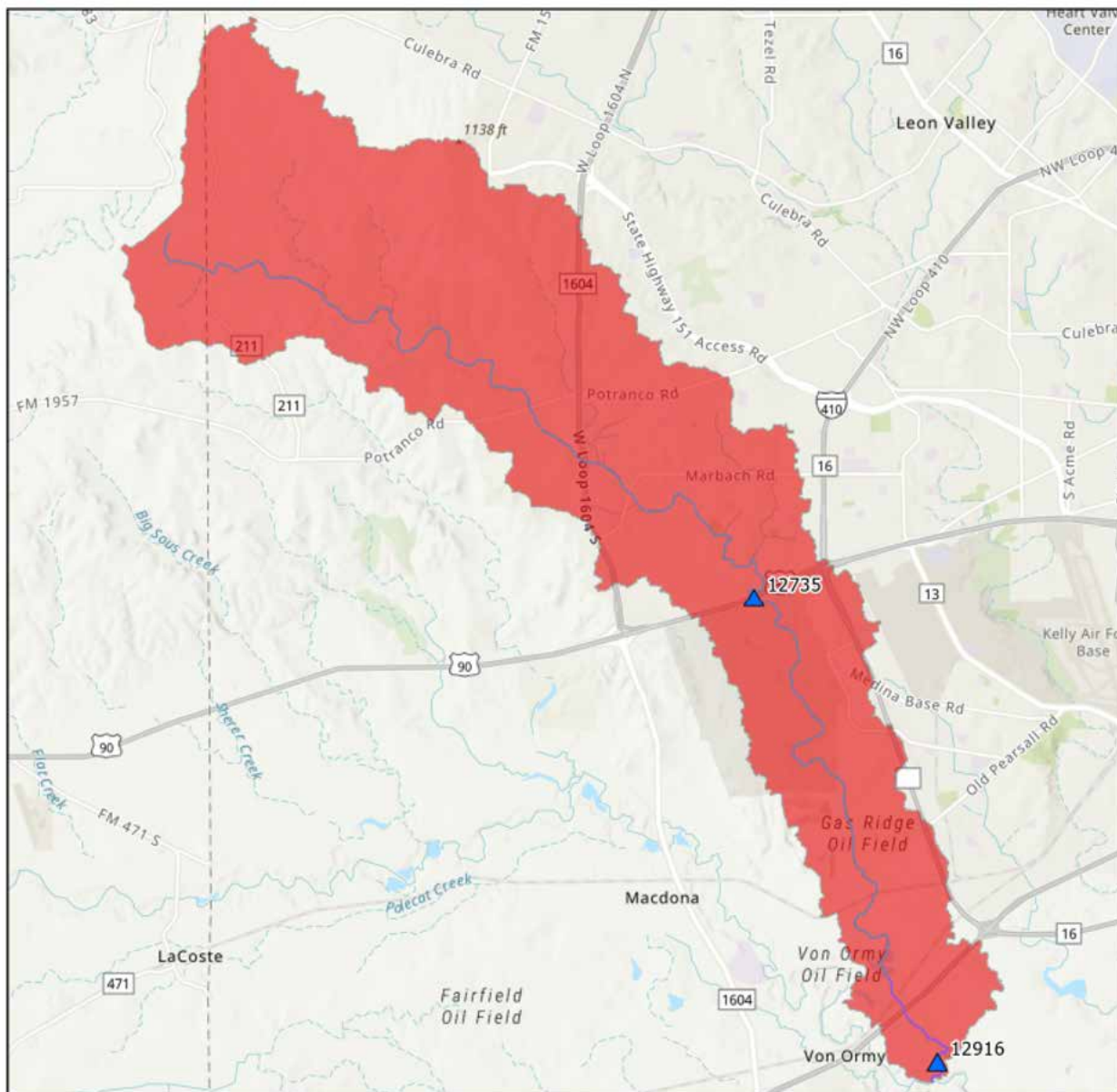


Medina River Watershed impairments and concerns.



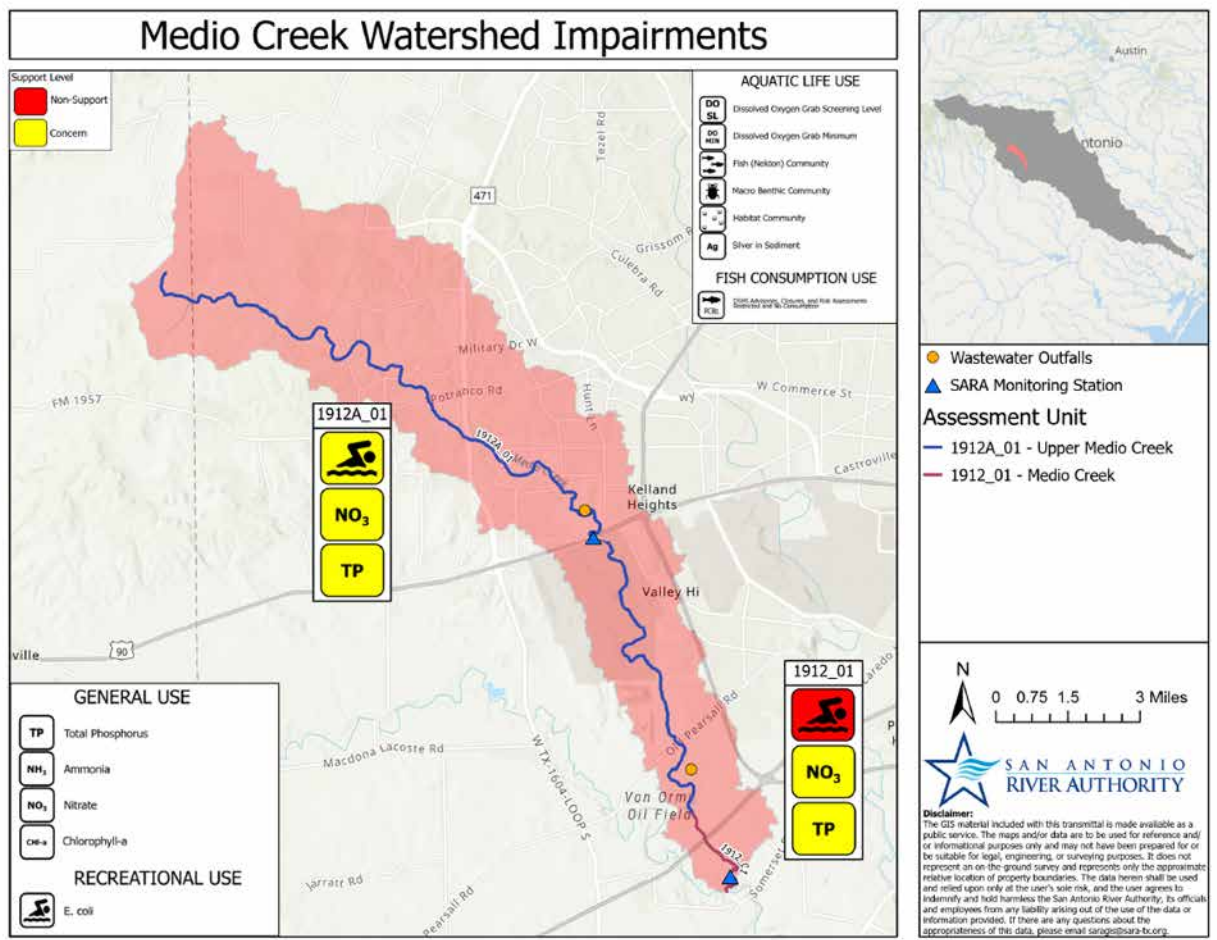
## Segment 1912: Medio Creek:

For FY24 it is anticipated that no changes will be made for routine monitoring, but benthic macroinvertebrates will be added at Medio Creek at Hidden Valley Campground (station 12916).



*FY23 Medio Creek Watershed stations. Blue triangles are monitored by the River Authority.*

The 2022 TCEQ IR identified the following impairment and concerns for Medio Creek.



Medio Creek Watershed impairments and concerns.

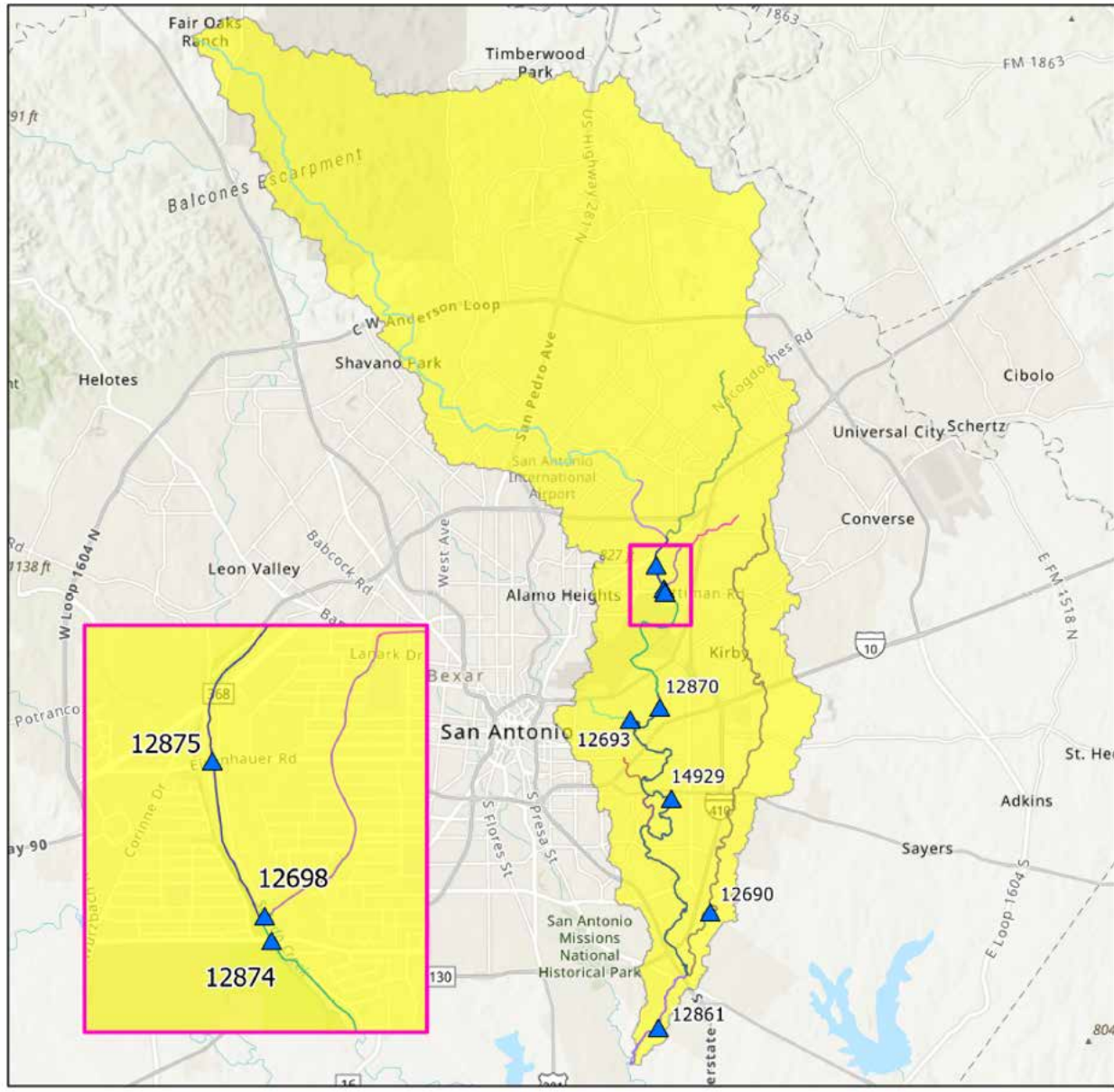


## Salado Creek Watershed

### Segment 1910: Salado Creek:

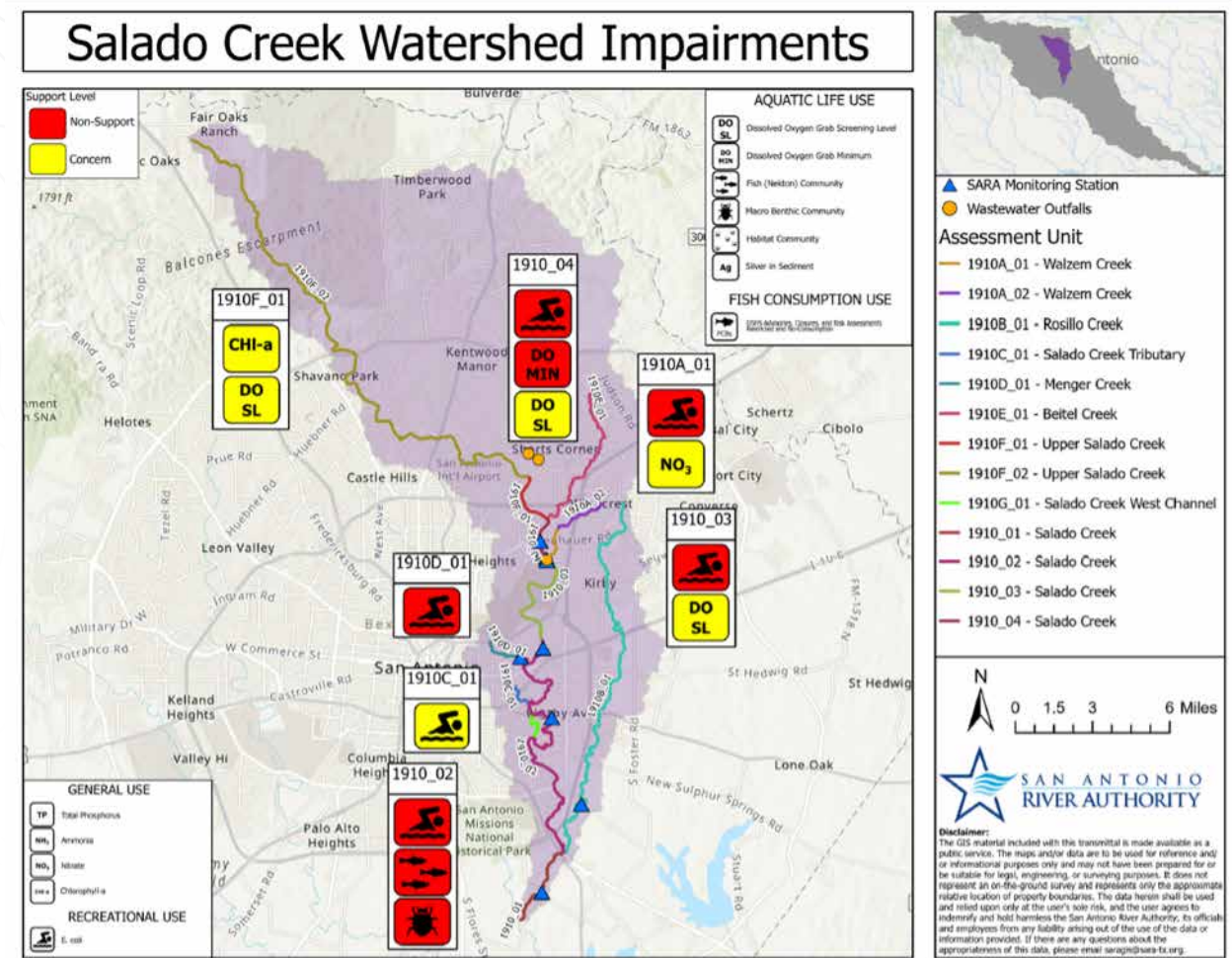
For FY23, there were five routine monitoring sites sampled on the main stem of Salado Creek, and three routine sites on tributaries. Seasonal monitoring was conducted at 5 sites all on Salado Creek. All sites were monitored by the River Authority.

For FY24, no monitoring changes are anticipated.



FY23 Salado Creek Watershed stations. Blue triangles are monitored by the River Authority.

The 2022 TCEQ IR identified the following impairments and concerns for Salado Creek and its tributaries:



Salado Creek Watershed impairments and concerns.



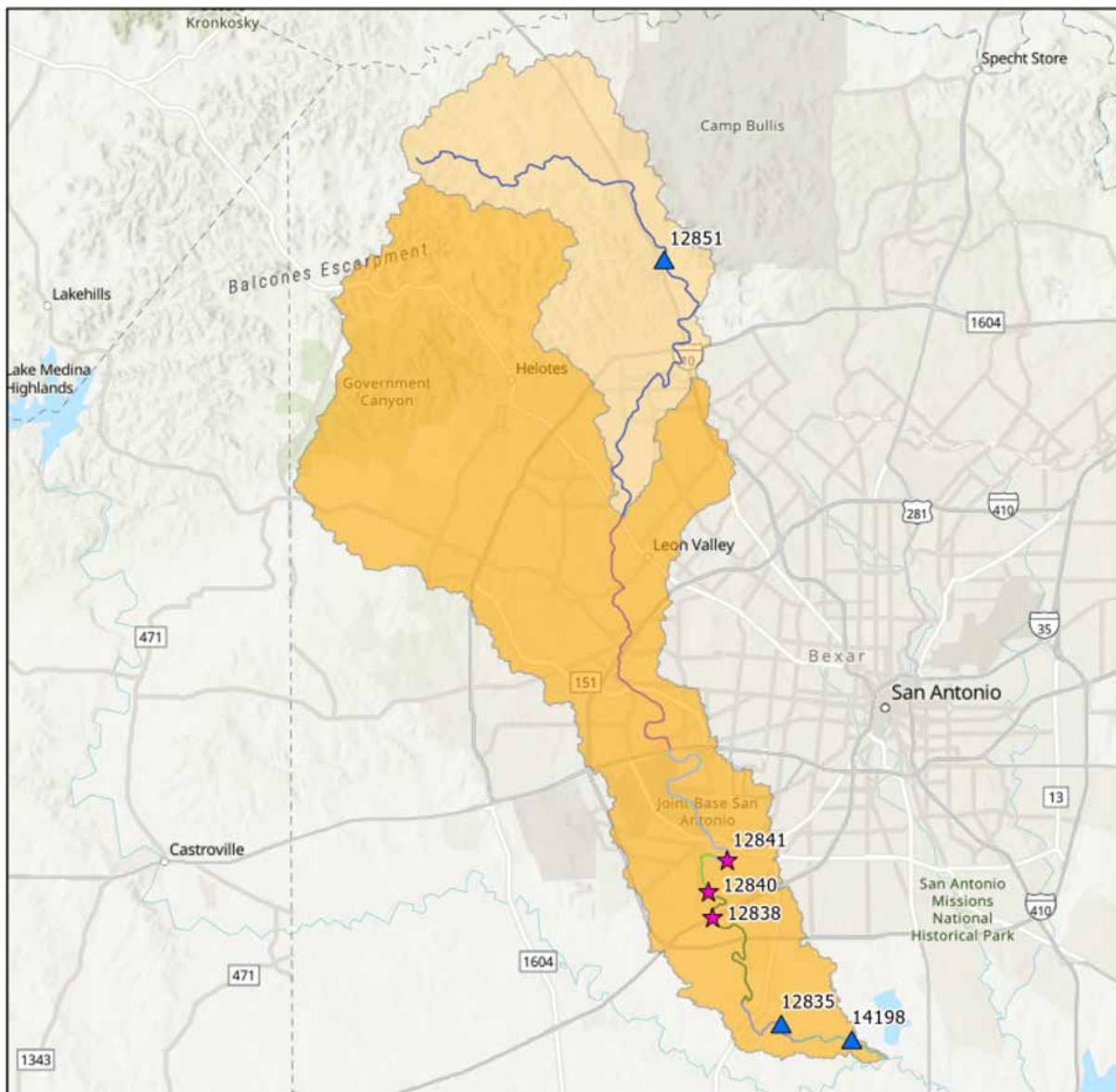
## Leon Creek Watershed

### Segment 1907: Upper Leon Creek:

In FY23, there was one routine monitoring site on Upper Leon Creek, Leon Creek in Raymond Russel Park (Station 12851). It is one of the few sites where the creek normally has water, although it is often pooled. Much of Upper Leon Creek is on the Edwards Aquifer Recharge Zone and Transition Zone. Last year, 5 of the 6 samples collected were collected from a pool due to no flow.

For FY24, no monitoring changes are anticipated.

The 2022 TCEQ IR found no impairments or concerns for Upper Leon Creek.



FY23 Leon Creek Watershed stations. Blue triangles are monitored by the River Authority, and the red stars are monitored by the TCEQ.

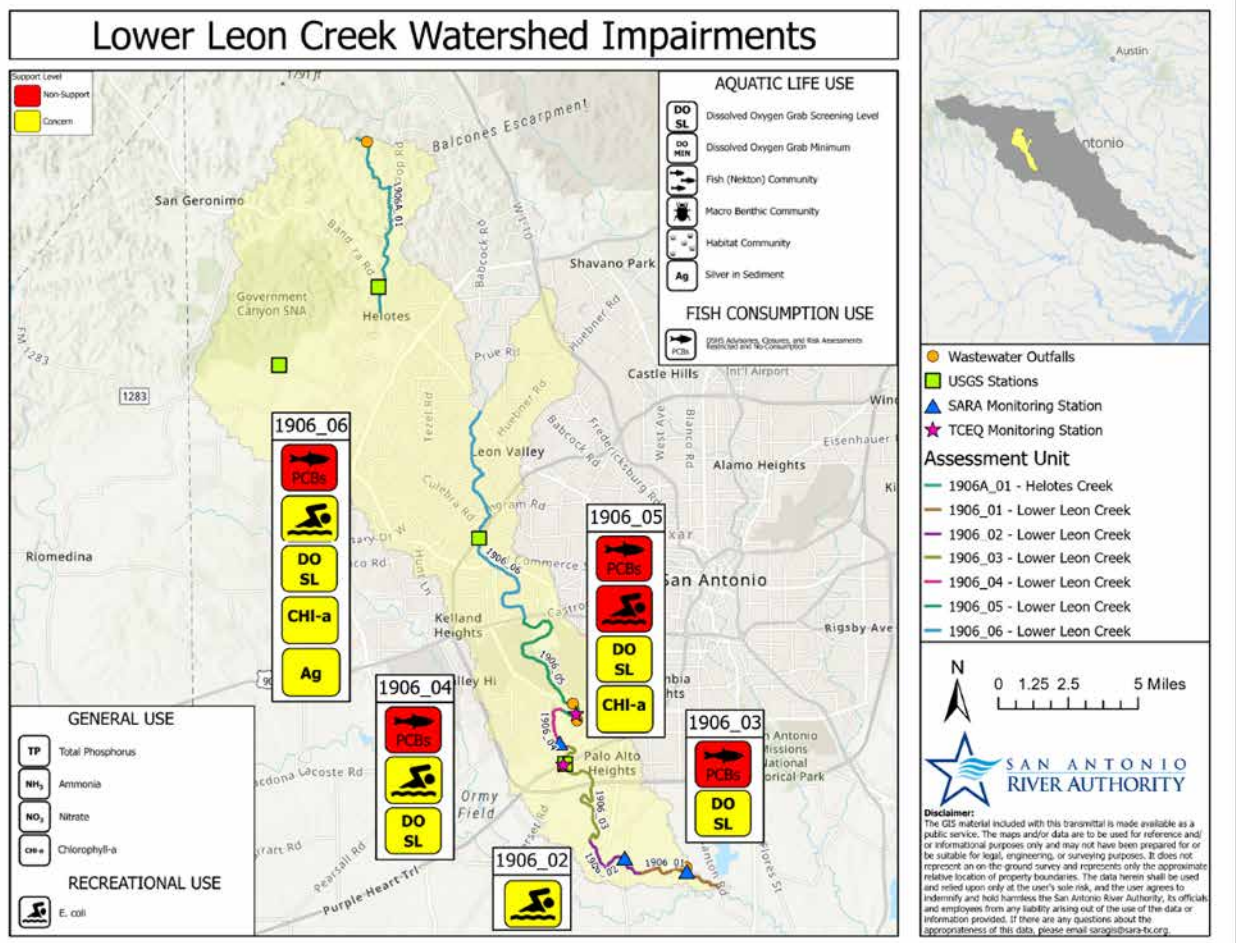
## Segment 1906: Lower Leon Creek:

For FY23, five sites were routinely monitored on Lower Leon Creek. Three sites were monitored by the TCEQ, and two routine sites were monitored by the River Authority. Seasonal monitoring was conducted at one site, Leon Creek upstream from the Leon Creek Wastewater Treatment Plant (14198).

For FY24, the River Authority anticipates adding benthic macroinvertebrates collection at Leon Creek at Ruiz Ranch (Station 12841). All other sampling should remain the same.

The 2022 TCEQ IR identified the following impairments and concerns for Lower Leon Creek:

Texas Department of State Health Services issued a fish advisory for PCB for a portion of Lower Leon Creek in 2003. In 2010, they expanded the advisory from Old US Hwy 90 bridge downstream to the Loop 410 bridge. The advisory states that persons should not consume any species of fish from these waters. This is due to PCBs in fish tissue.



Lower Leon Creek Watershed impairments and concerns.



## Summary of Monitoring in the San Antonio River Basin:

FY 23 Monitoring in the San Antonio River Watershed September 1, 2022 – August 31, 2023											
Agency	Routine Monitoring						Seasonal				
	Conventional	Bacteria	Field	Flow	Chlorophyll-a	Metals in Water	Flow	Fish Community	Aquatic Habitat	Benthic Macro Invertebrates	24 hr. Dissolved Oxygen
San Antonio River Authority	57 sites bimonthly*	50 sites bimonthly* 8 sites weekly 1 site 3 times a year		45 sites bimonthly* 7 sites weekly 1 site 3 times a year	45 sites bimonthly*	8 sites twice a year	3 sites twice a year	11 sites twice a year 4 sites once a year		2 sites twice a year 2 sites once a year	14 sites twice a year 5 sites once a year
Bandera County River Authority and Groundwater District	15 sites quarterly 1 site bimonthly*			9 sites quarterly 1 site bimonthly*	5 sites quarterly 1 site bimonthly*			**	**		**
City of Boerne	1 site quarterly										
Texas Commission on Environmental Quality	6 sites quarterly										
Guadalupe Blanco River Authority	1 site monthly										
*	For this table, bimonthly means every other month										
**	San Antonio River Authority and the Bandera County River Authority and Groundwater District coordinate and do seasonal monitoring twice a year together at Medina River at the Mayan Ranch West of the City of Bandera.										

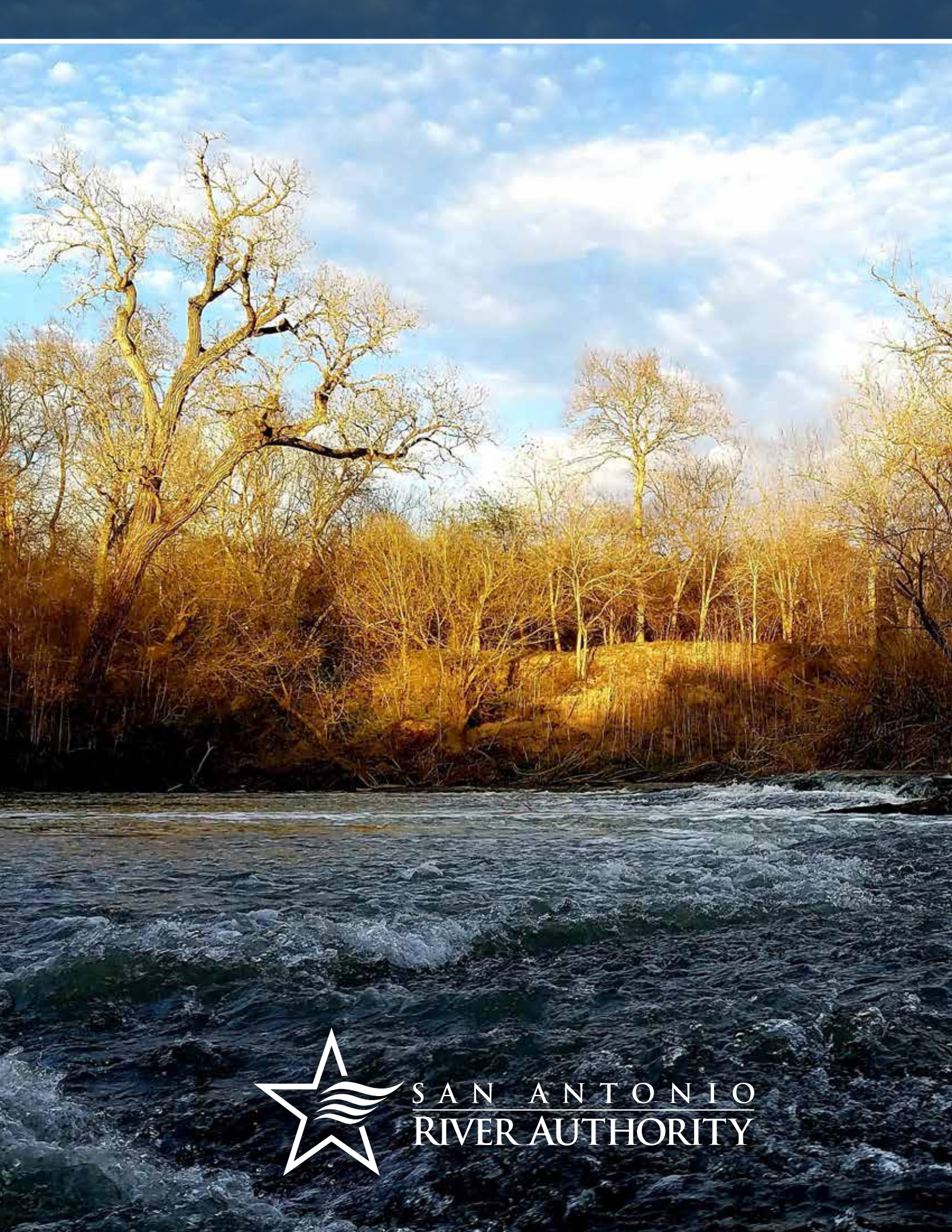
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