Volunteer Summer Study

South Fork at La Casita Crossing
Photo courtesy of Grant Thompson

2024

2024 Volunteer Summer Study

INTRODUCTION

The Guadalupe River is one of the highest rated recreational and scenic rivers in Texas and is Kerr County's central asset. The river provides water to the citizens for domestic, agricultural, municipal, and recreational purposes. Therefore, maintaining excellent water quality is essential. Water quality is determined by the amount of contaminants in the water; as contaminant levels increase, water quality decreases. There are many types of potential contaminants originating from many sources. The objective of this study was to determine the level of one contaminant, *E. coli.*

E. coli bacteria levels are commonly monitored to assess the quality of surface water because they are an indicator of water contamination. *E. coli* originates in the intestines of warm-blooded animals and the presence of *E. coli* indicates that warm-blooded animal feces have reached the water and that pathogens may be present. Sources of *E. coli* can include inadequately treated sewage, livestock, pets, birds, and mammals.

Each summer, the Upper Guadalupe River Authority (UGRA) tests for *E. coli* levels at popular swimming holes throughout Kerr County. The results of this Swimability Study are compared to the Texas Commission on Environmental Quality's (TCEQ) standards for contact recreation. For a single grab sample, the standard for contact recreation set by TCEQ is 399 colonies of *E. coli* bacteria per 100 milliliters (mL). If *E. coli* levels are greater than or equal to 399 colonies of bacteria per 100 mL, then there is a higher risk of contracting waterborne illness while swimming.

In 2004, UGRA began the Volunteer Summer Study Program to supplement data collected during the Swimability Study and to include interested members of the community in water quality testing. The information collected by the volunteers also helps identify areas in need of further investigation.

This summer we were assisted by 35 volunteers who collected 405 samples at 48 locations throughout Kerr County. UGRA commends the efforts of these volunteers for taking an active role in protecting the water quality of our river. Working together, we can maintain the pristine nature of the Guadalupe River and protect our community's most valuable natural resource.

2024 VOLUNTEERS AND SAMPLE SITE LOCATIONS

Location	Volunteer
North Fork Guadalupe River at MO-Ranch	MO-Ranch Staff
North Fork Guadalupe River at Benson Crossing	Bob & Karen Taylor
North Fork Guadalupe River at Wagon Wheel Crossing	Clinton Morse
North Fork Guadalupe River at Graham Crossing	Bob & Karen Taylor
North Fork Guadalupe River at Friedrich Crossing	Bob & Karen Taylor
North Fork Guadalupe River at Hope Crossing	Nancy Huffman
North Fork Guadalupe River at Lonestar Crossing	Bake Foster
North Fork Guadalupe River at Mayhugh Crossing	Bake Foster
South Fork Guadalupe River at La Casita Crossing	Grant & Randee Thompson
South Fork Guadalupe River at River Inn	Michael McCrea
South Fork Guadalupe River downstream from Angel Falls	Dee Elliott
South Fork Guadalupe River at Japonica Estates	Will Sumner
Guadalupe River at Rio Vista	Weezie Johnston
Guadalupe River downstream from Upper Cade Loop	Don Willoughby
Guadalupe River at Ingram Lake Boat Ramp	Nellwyn Sadler
Guadalupe River at Lower Cade Loop	Alice King
Johnson Creek at 230 Dowling Road	Melanie Ellsworth
Johnson Creek at Dowling Crossing	Melanie Ellsworth
Guadalupe River at Indian Creek Crossing	Nellwyn Sadler
Goat Creek at Headwaters	Maura Windlinger
Goat Creek near I-10	Palmore Baxter
Goat Creek at KOA	Palmore Baxter
Bear Creek at Bear Creek Road*	David Bartels
Guadalupe River at Nimitz Lake Cypress Park (Kayak)	Carl & Katy Kappel
Guadalupe River at Nimitz Lake Knapp Park (Kayak)	Carl & Katy Kappel
Guadalupe River at Guadalupe Park	Alice King
Town Creek at Town Creek Road	Deb and Phil Youngblood
Town Creek at Schreiner Street	Jim Gardner
Town Creek at River Trail Foot Bridge*	Michelle Yañez
Guadalupe River at Francisco Lemos Bridge	Lisa Flanagan
Guadalupe River at Louise Hays Park Footbridge	Sherry Wilson
Guadalupe River at G Street	Deb and Phil Youngblood
Quinlan Creek at Tivy*	Leslie Jones
Quinlan Creek at Habitat Park*	Leslie Jones
Quinlan Creek at 1st Street *	Leslie Jones
Quinlan Creek at E. Main Street *	Leslie Jones
Quinlan Creek at Hwy. 27*	Leslie Jones
Guadalupe River at 3030 Riverside Drive	Paul Hawkins
Guadalupe River at Flat Rock Lake Boat Ramp	Clark Williams
Guadalupe River at Flat Rock Lake Dog Park	Sherry Wilson
Guadalupe River at 230 Wharton Road	John Hornung
Turtle Creek at Rocky Hill Drive	Kathy Loring
Bushwhack Creek	Patricia Poore
Turtle Creek at Fall Creek Road	Kathy Loring

Guadalupe River at Government Crossing	Lorena Lozano
Guadalupe River Upstream of Lane Valley	Paz Lovett
Guadalupe River at Ehlers Road	Lorena Lozano

*Indicates fewer than 5 samples were taken.

RESULTS

The following pages contain the results of the Volunteer Summer Study for 2024. While all sample sites are included in the individual reports starting on page 10, not all are included in the geometric mean chart (see page 36) due to insufficient sample size. The results are displayed in chart format indicating the level of *E. coli* found at each site on the dates they were sampled. A picture of the sample site, if available, is placed next to the results along with the name of the volunteer monitor. A solid red line is displayed on some charts at 399 *E. coli* colonies per 100 mL to indicate the *E. coli* single sample standard set by the Texas Commission on Environmental Quality (TCEQ) for contact recreation. *E. coli* values above the red line represent conditions with increased risk of contracting waterborne illness. A dotted red line on a chart indicates the upper limit of the test. This means the specific sample result was not determined, but it is greater than the value indicated by the dotted red line. The last chart represents the geometric mean *E. coli* values for all sites sampled at least five times during the 2024 Volunteer Summer Study. While a five-sample minimum is needed to accurately calculate the geometric mean, various circumstances led to some sites being sampled on fewer than five occasions. Geometric means for the UGRA Summer Swimability Study are included in the report for additional context (see page 35). Geometric means are used to summarize *E. coli* values instead of an average because bacteria values have a wide range and can fluctuate greatly from week to week. TCEQ considers a geometric mean value greater than 126 *E. coli* colonies per 100 mL to exceed standards for primary contact recreation.

During the summer 2024 volunteer monitoring period, overall streamflow rates in the Guadalupe River were well below average as recorded by the U.S. Geological Survey streamflow gauge in Kerrville (see page 6). However, at the end of spring and throughout summer, Kerr County saw above average rainfall which kept streamflow from reaching extreme lows experienced in Summer 2023. Rainfall recorded by the Knipling-Bushland U.S. Livestock Insects Research Laboratory in Kerrville was used to create the chart on page 5, however, rainfall amounts throughout the county varied greatly. The greatest example of this is the flood experienced on July 23rd. While USDA only recorded 1.27 inches that day, many reports out of northwest Kerr County documented 6 inches or more. According to the U.S. Drought Monitor, most of Kerr County was in drought throughout the entire volunteer monitoring period (see pages 7-9). However, there was some reprieve from extreme drought conditions experienced during the last two years.

Bear Creek at Bear Creek Road not flowing in 2023 (left) and flowing on 7/29/2024 six days after a flood event (right).

During the 2024 Volunteer Summer Study, 20 out of 48 sites contained individual samples with *E. coli* values greater than or equal to 399 colonies per 100 mL. Many of these individual values followed the many rainfall events this area received throughout the monitoring period. For those not following rainfall events, it is likely that the majority of high *E. coli* values were a result of wildlife presence, minimal flow, and warm water temperature. A geometric mean value was compiled for each site with five or more samples to evaluate the overall bacteria level for the summer.

There were five volunteer sites with calculated geometric means greater than or equal to 126 colonies per 100 mL (see page 36). The Goat Creek at KOA, Guadalupe Park, and 3030 Riverside Dr. sample sites were above the standard due to a few extremely high single samples which skewed the geometric means. These spikes in *E. coli* coincided with rain events. At the Francisco Lemos Bridge site, there were two individual samples that coincided with rain events recorded at UGRA and at the USDA lab. In addition, this location is home to a colony of Mexican free-tailed bats that live under the bridge. Bat waste falling directly into the waterway can lead to spikes in *E. coli* levels. The Flat Rock Boat Ramp had two individual samples that were above the standard. One of those coincided with a rain event. The other sample can possibly be attributed to roosting turkey vultures upstream and abundant waterfowl.

One site that had insufficient samples to calculate a geometric mean was Bear Creek at Bear Creek Rd. In 2022 and 2023, this location could not be sampled as part of the Volunteer Summer Study due to drought conditions causing it to go dry. However, late into July, it began to flow again due to the consistent rainfall seen in our area. None of the values were greater than or equal to 399 colonies per 100 mL.

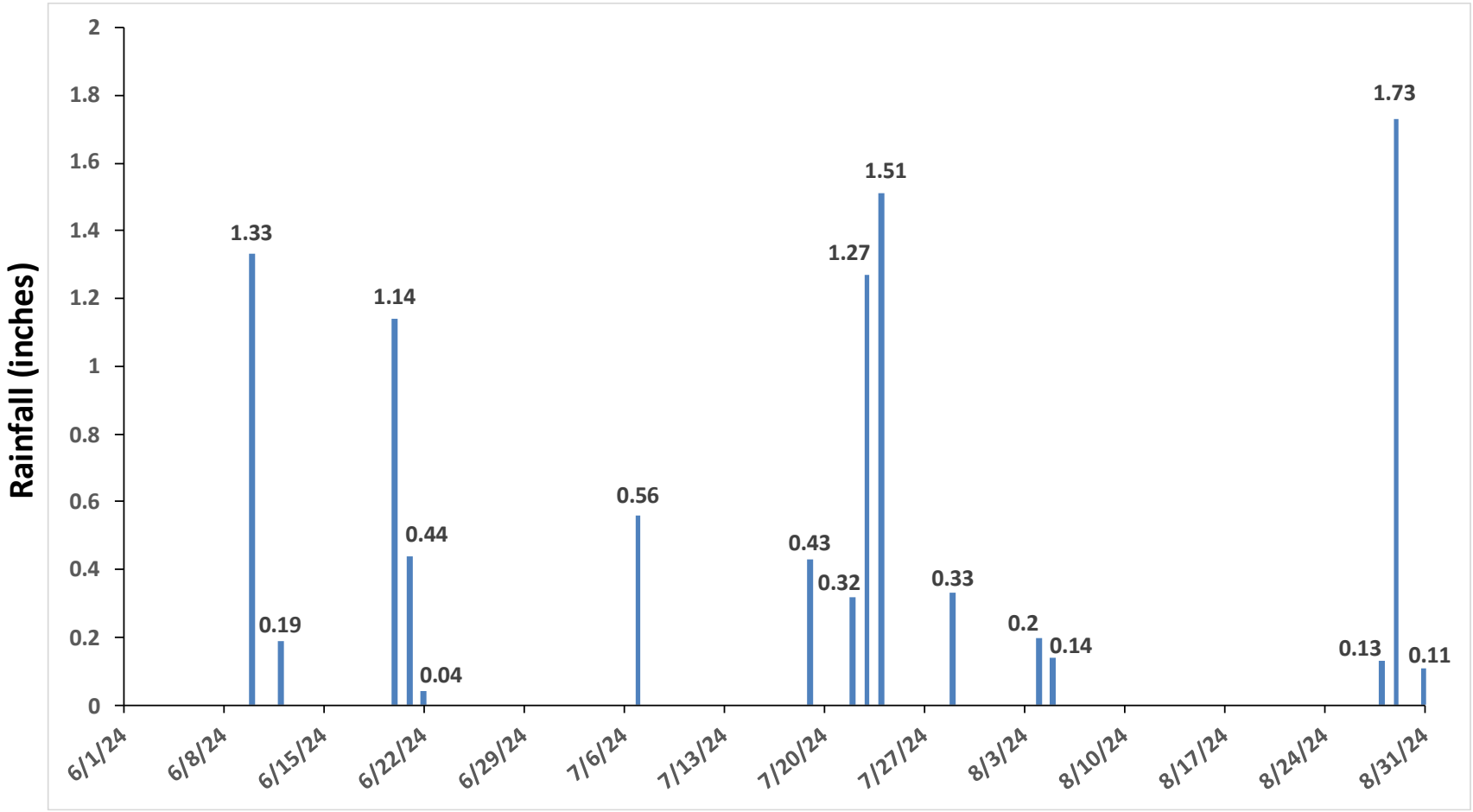
There were some sites that had extremely high *E. coli* levels in individual samples, but the sites had insufficient sample sizes to calculate a geometric mean. Town Creek at the River Trail Footbridge near Riverside Nature Center had three out of four samples greater than or equal to 399 colonies per 100 mL, but these coincided with rainfall events. Town Creek has also historically shown high *E. coli* values. All five of the Quinlan Creek sample sites had consistently high values that mostly coincided with rain events and likely would have produced geometric means greater than or equal to 126 colonies per 100 mL had there been a sufficient sample size. Quinlan Creek has historically shown high *E. coli* values and this year's high values could likely be attributed to the last two years of drought, rainfall events, the frequent use of this creek as a corridor for wildlife, and influence of urban stormwater runoff.

Information about nonpoint source pollution from urban runoff in Kerr County is discussed in the "Bacteria Reduction Plan for the Upper Guadalupe River" accessible through the UGRA webpage at www.ugra.org/major-initiatives/bacteria-reduction-plan.

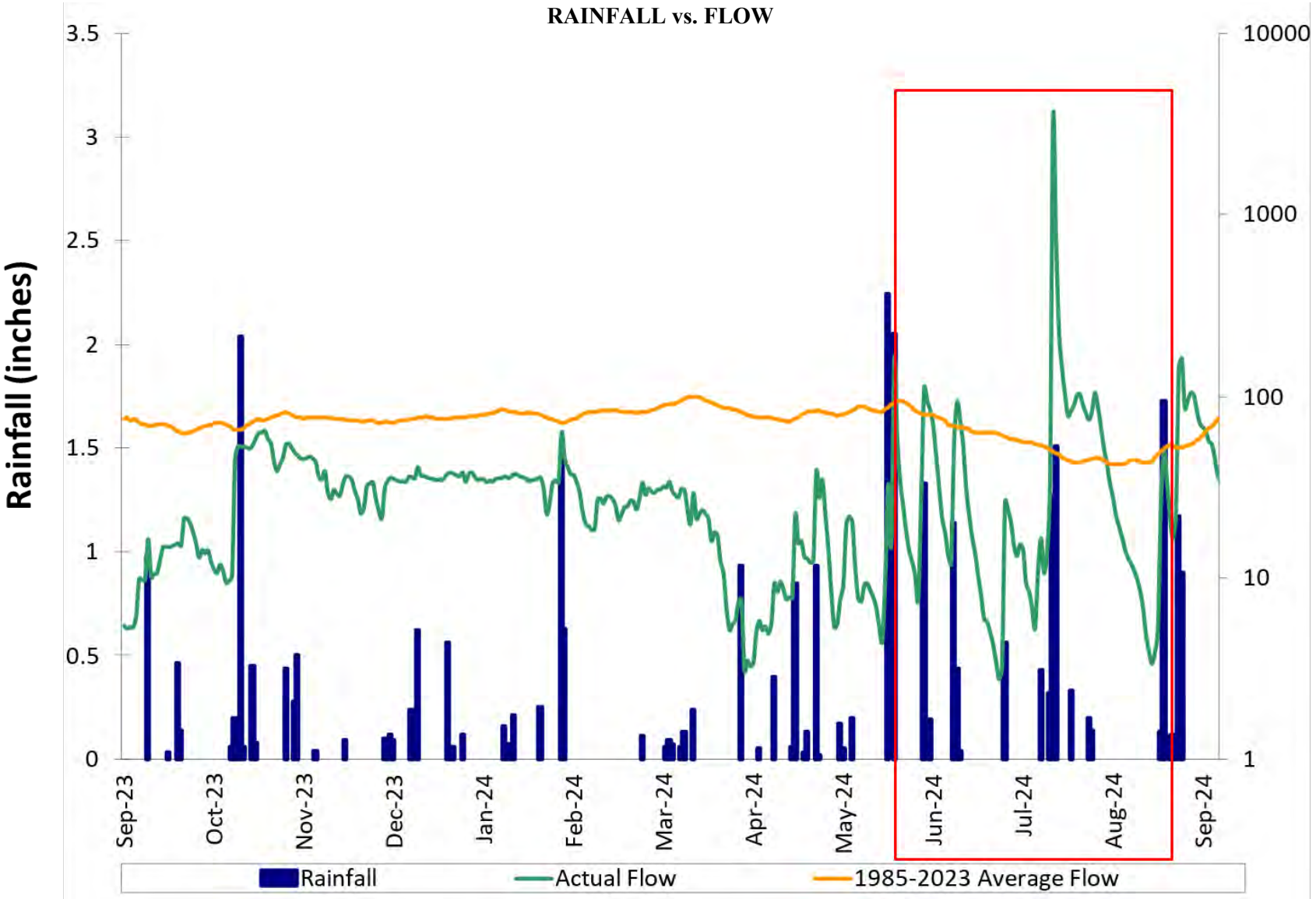
Many of the high *E. coli* values were likely caused by the rainfall events experienced throughout Kerr County. Overall, however, most locations sampled during the Volunteer Summer Study and the UGRA Summer Swimability Study had *E. coli* values below the standard.

2024 RAINFALL, FLOW, AND DROUGHT CONDITIONS

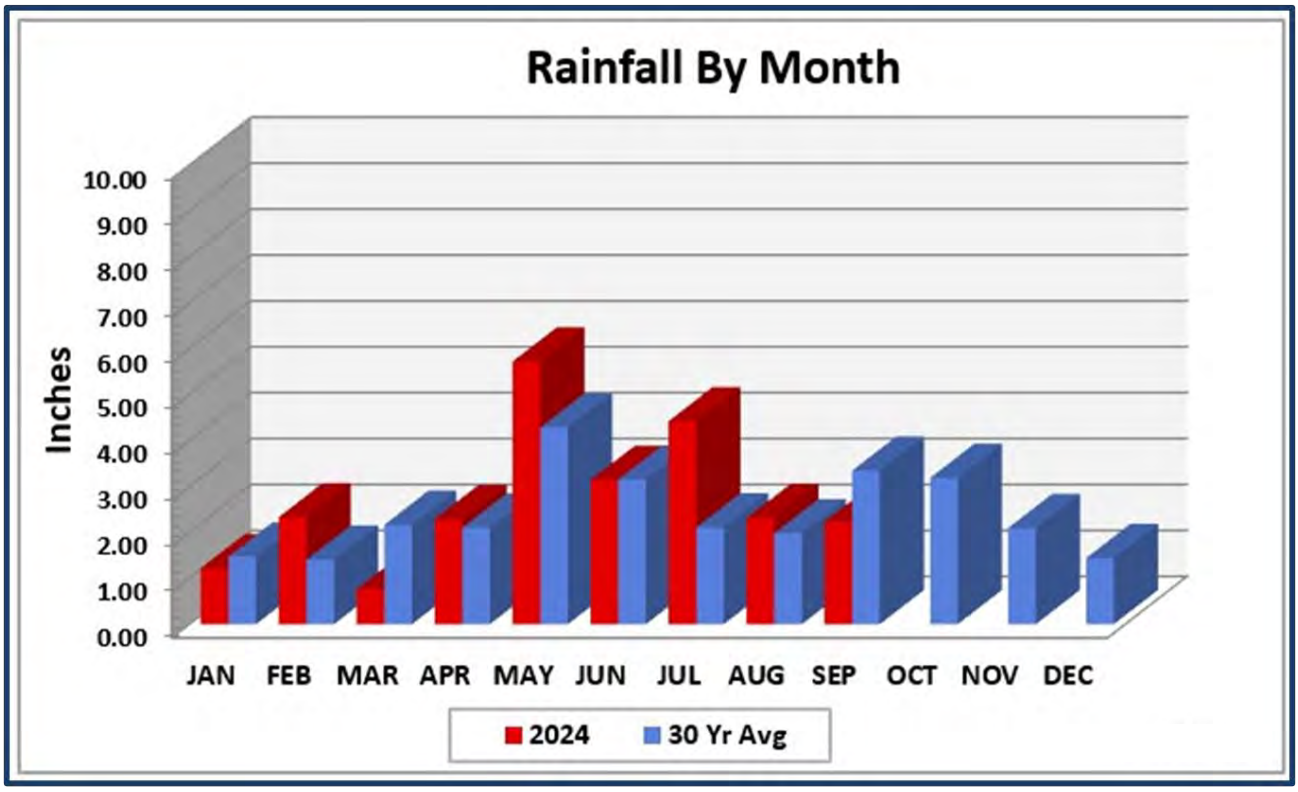
RAINFALL TOTALS 06/01/2024 – 08/31/2024



From June 1st – August 31st 9.87 inches of rainfall was recorded by the Knipling-Bushland U.S. Livestock Insects Research Laboratory in Kerrville. This does not include the 4.29 inches recorded in the end of May. This is a significant increase from the 1.42 inches recorded during last year's volunteer monitoring period.

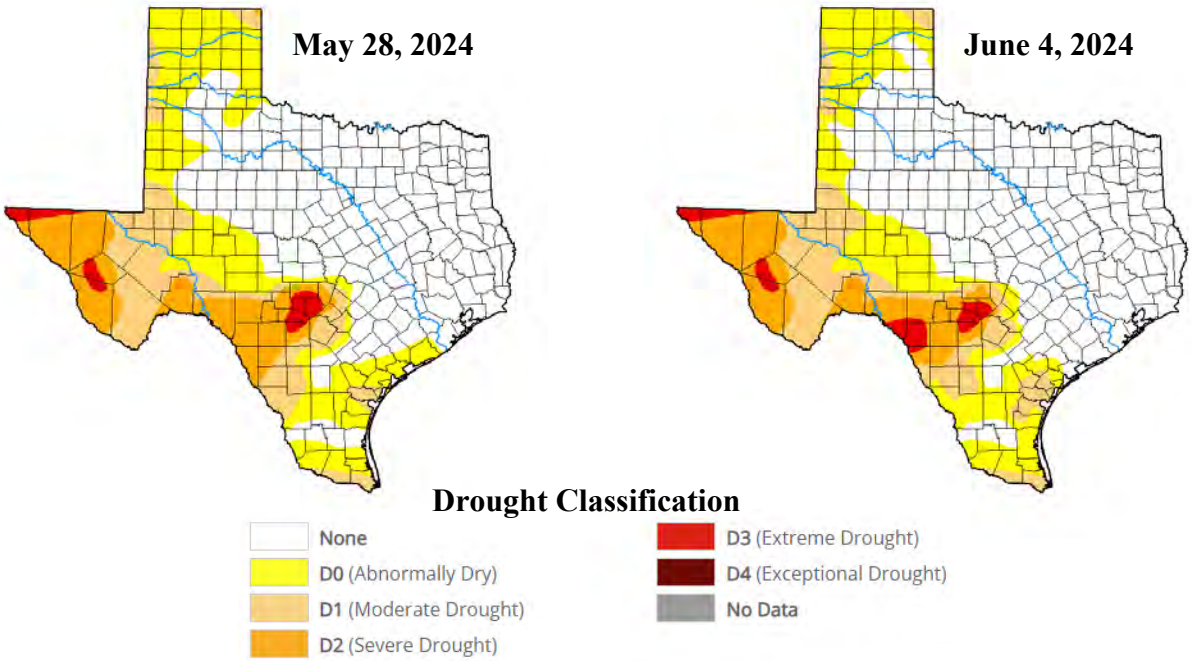


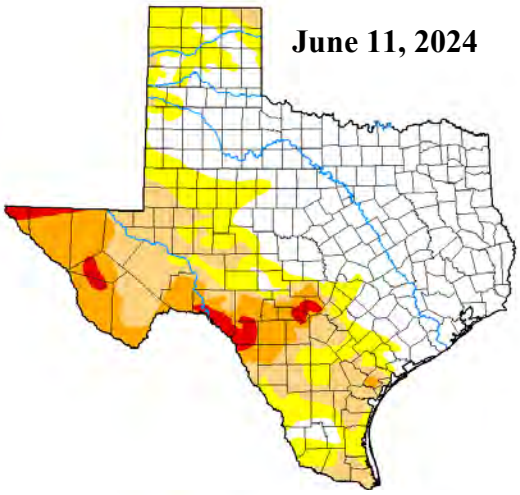
Above average rainfall in April, May, July, and August kept streamflow from reaching the extremely low levels experienced in Summer of 2023. Streamflow was well below the 30-year average for much of the volunteer monitoring period, but heavy rainfall events spiked flow to above average.



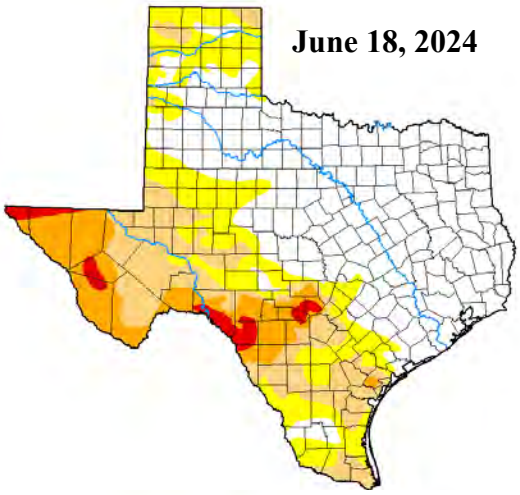
This area received above average rainfall in February, April, May, July, and August which helped relieve drought intensity in the area.

WEEKLY DROUGHT MAP COMPARISON

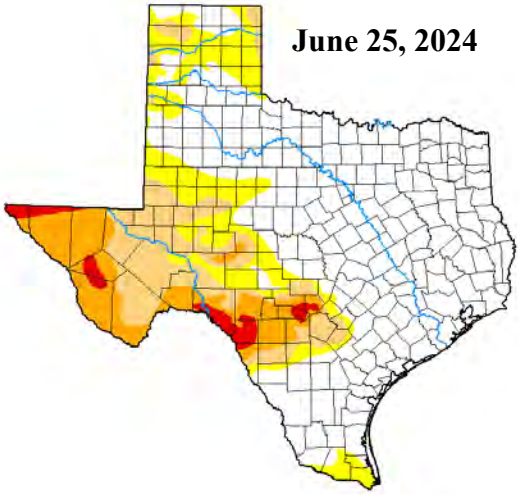




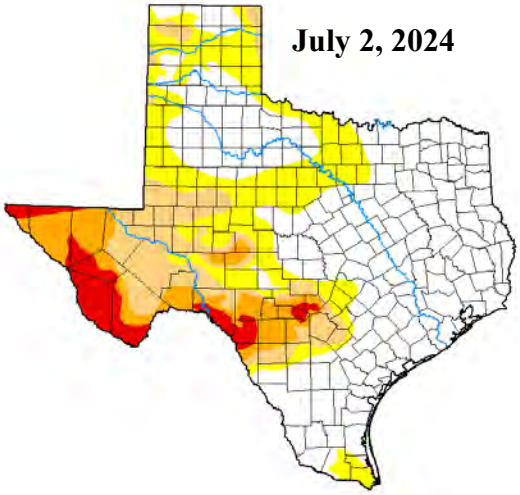
June 11, 2024



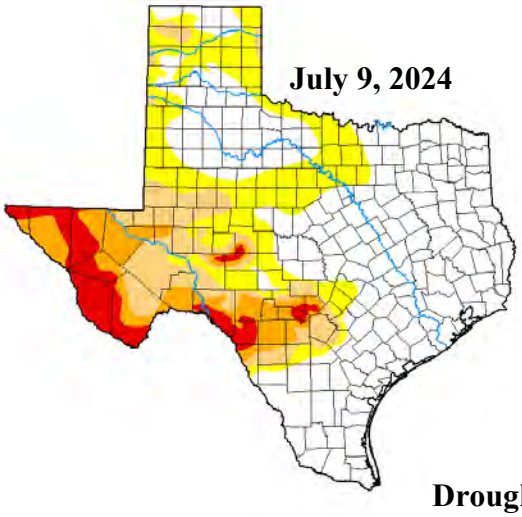
June 18, 2024



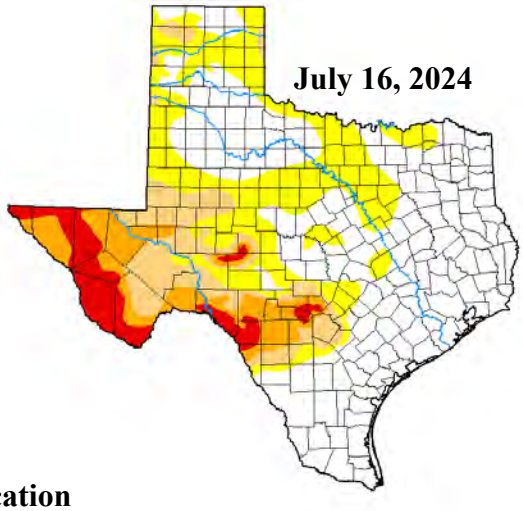
June 25, 2024



July 2, 2024



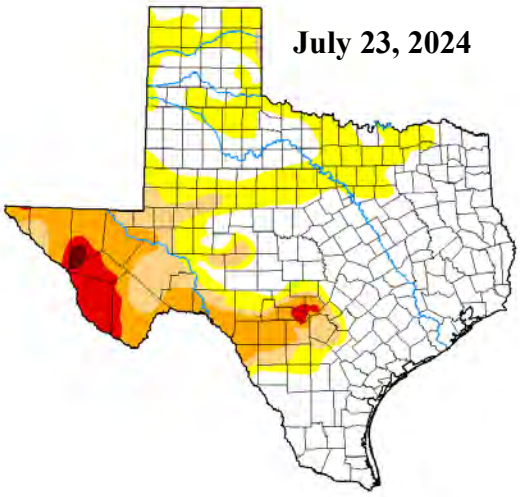
July 9, 2024

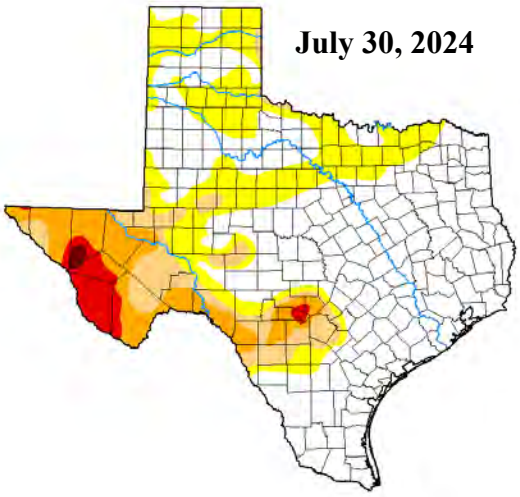


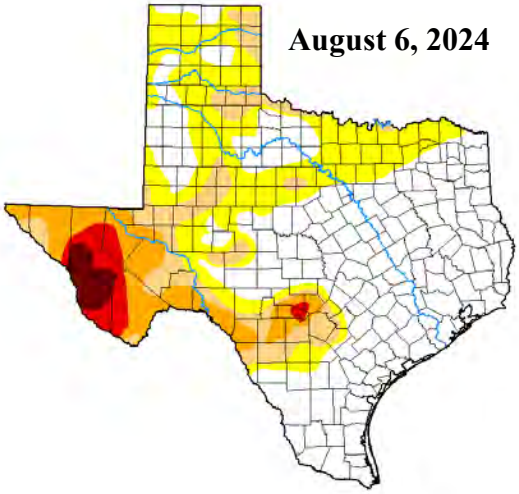
July 16, 2024

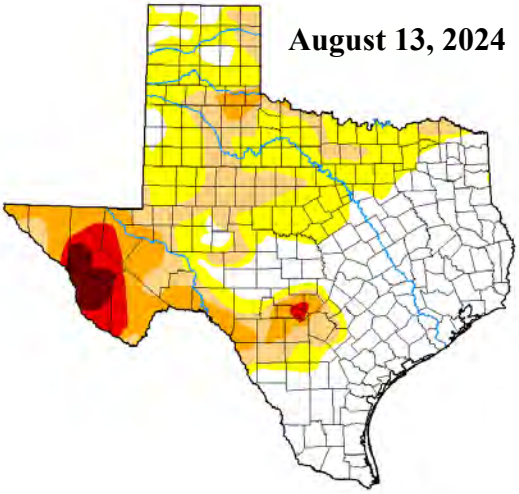
Drought Classification

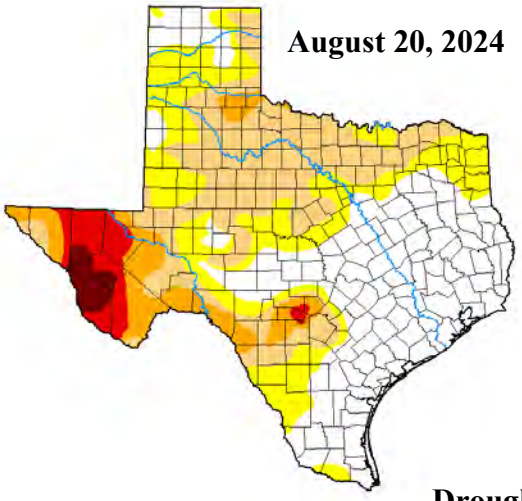
- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

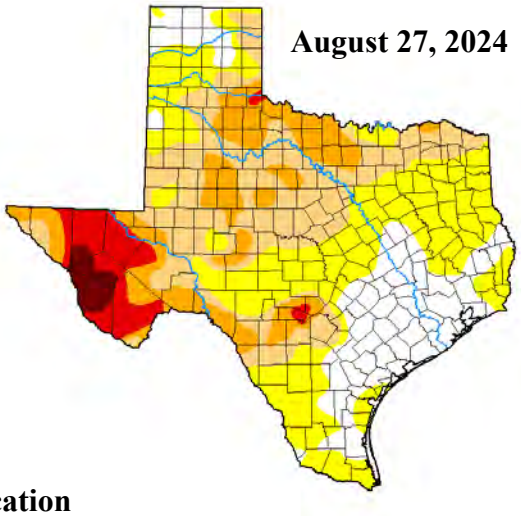










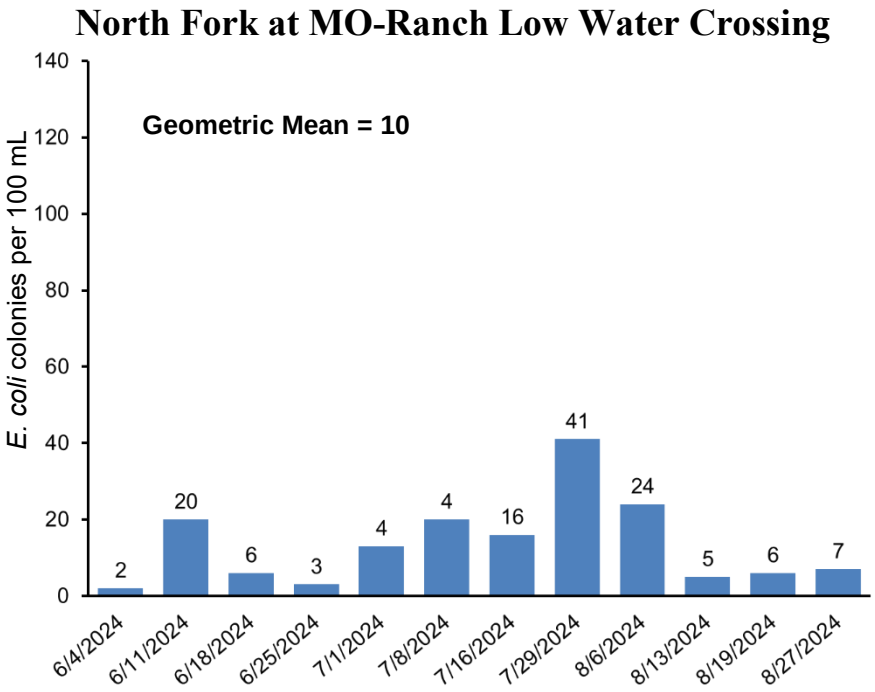


Drought Classification

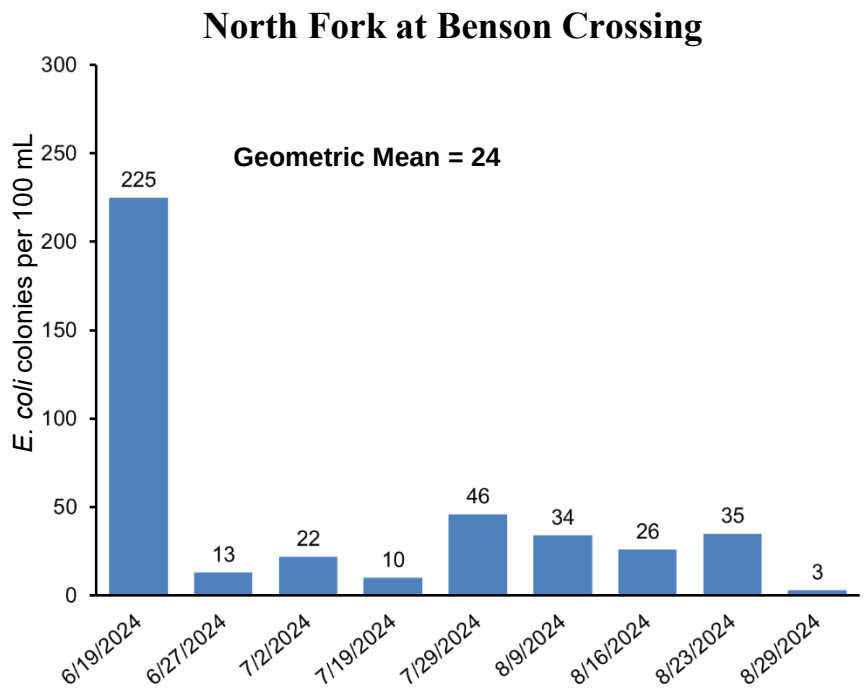
None
D0 (Abnormally Dry)
D1 (Moderate Drought)
D2 (Severe Drought)
D3 (Extreme Drought)
D4 (Exceptional Drought)
No Data

RESULTS BY SAMPLE SITE

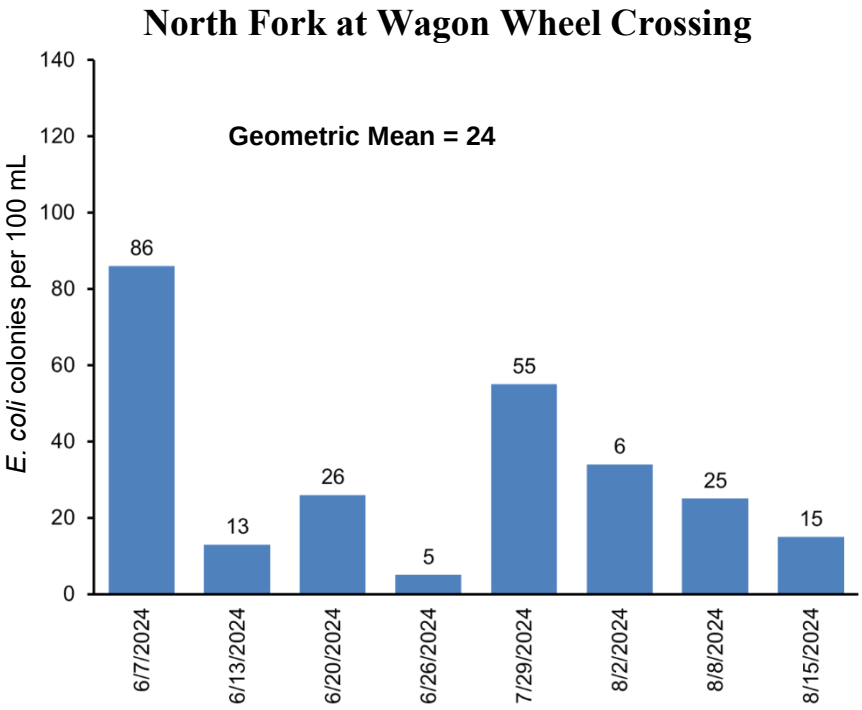
MO-Ranch Staff



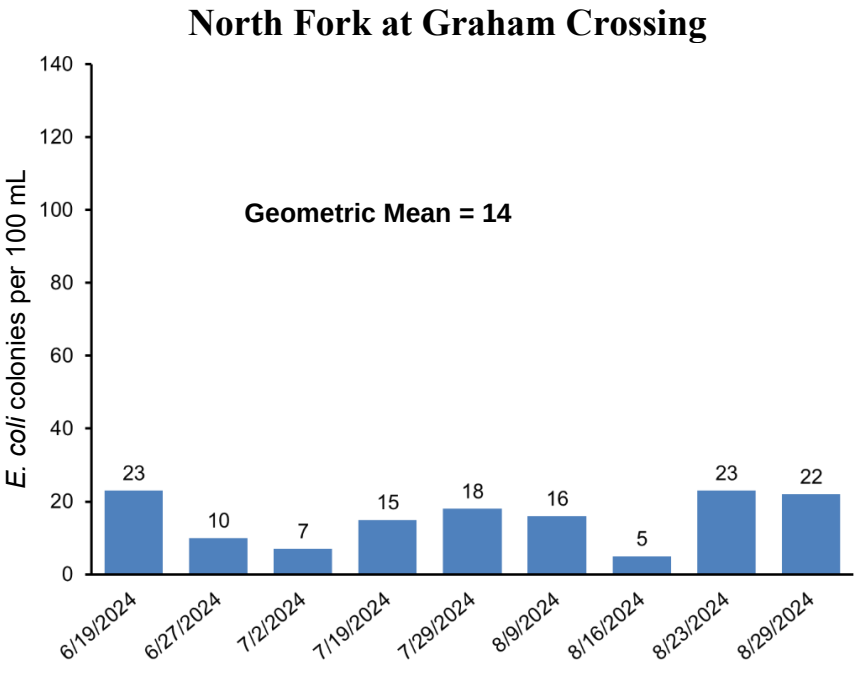
Bob and Karen Taylor



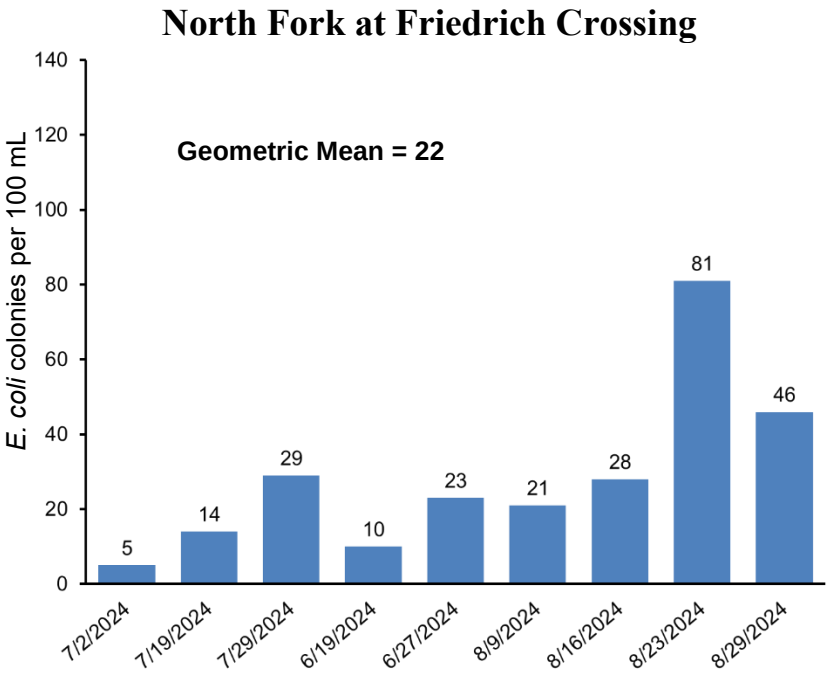
Clinton Morse

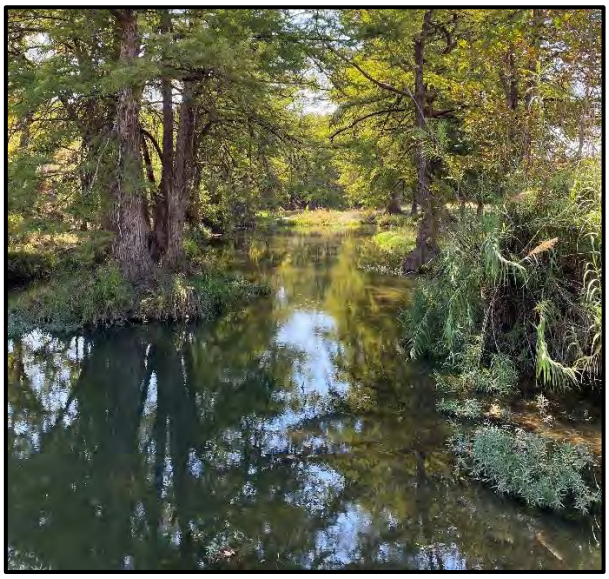


Bob and Karen Taylor

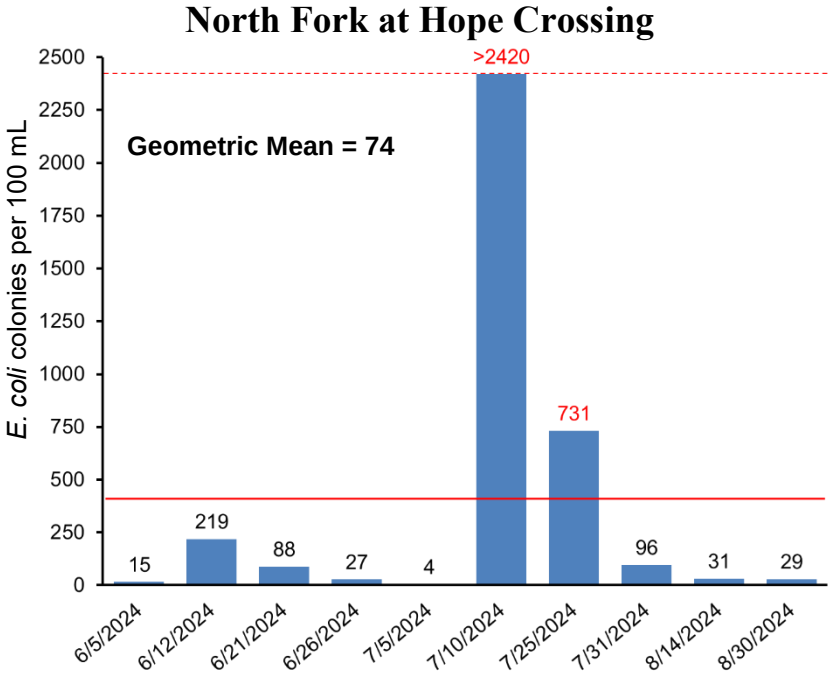


Bob and Karen Taylor

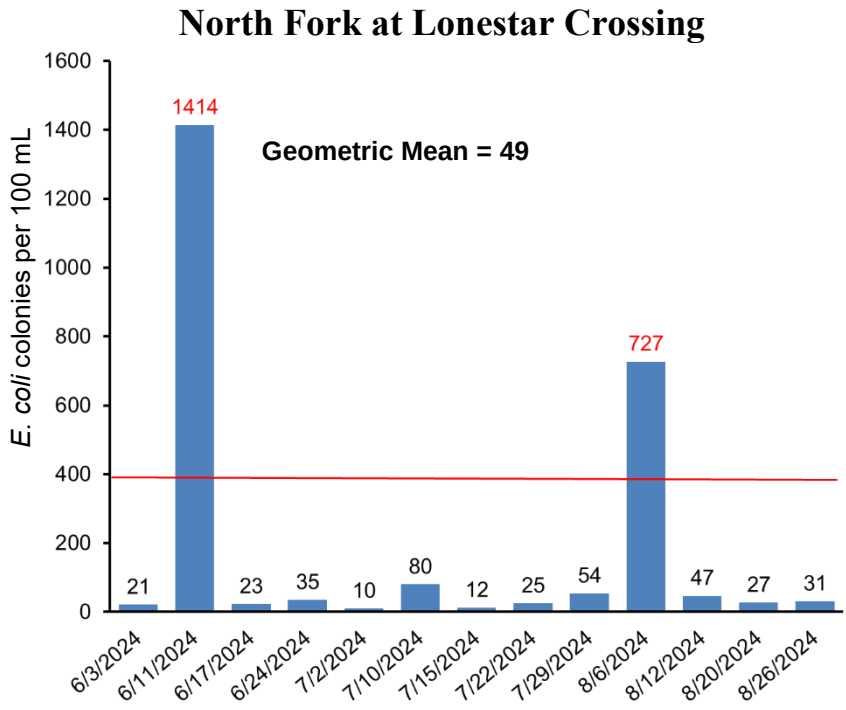




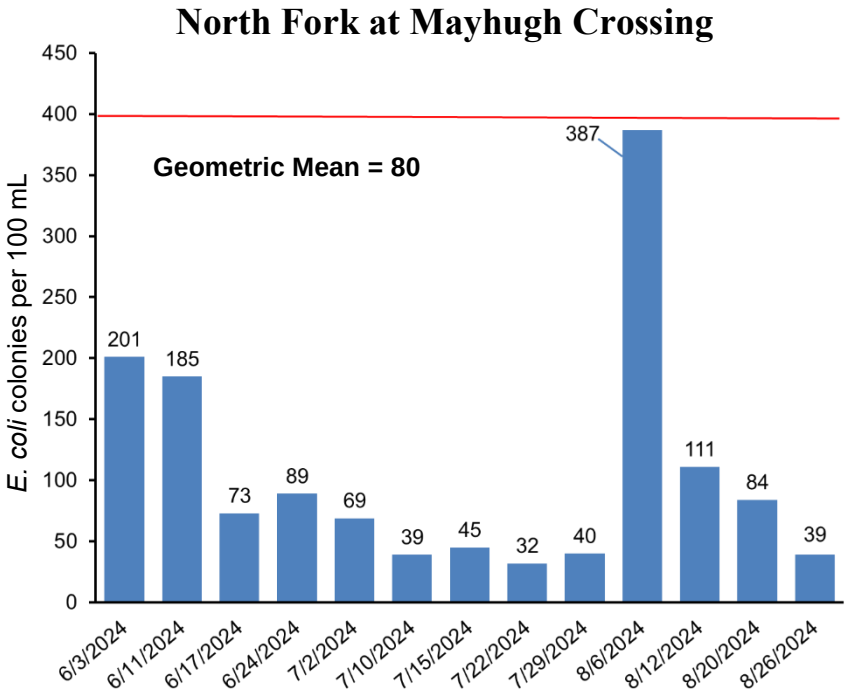
Nancy Huffman



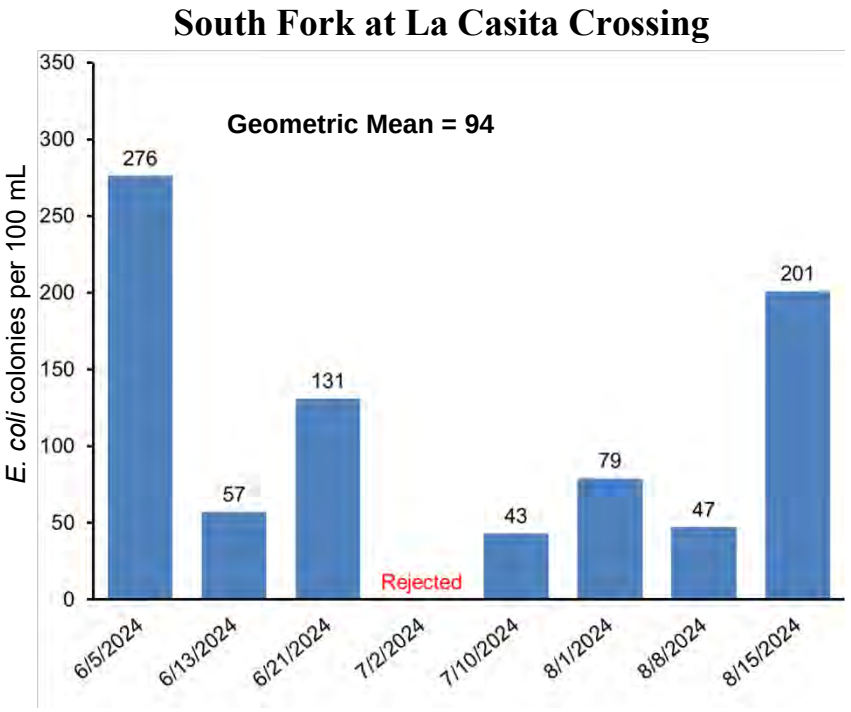
Bake Foster



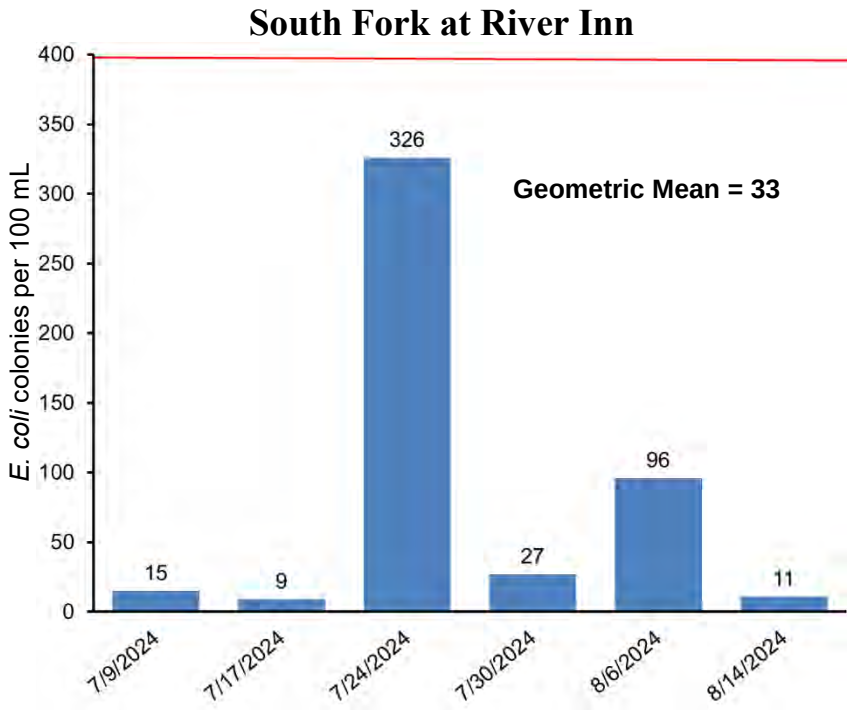
Bake Foster



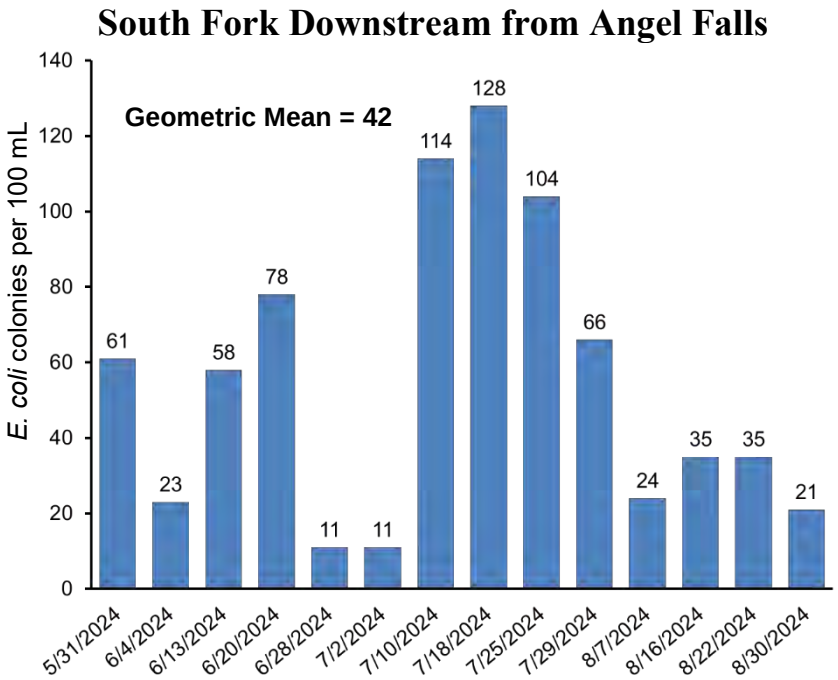
Grant and Randee Thompson



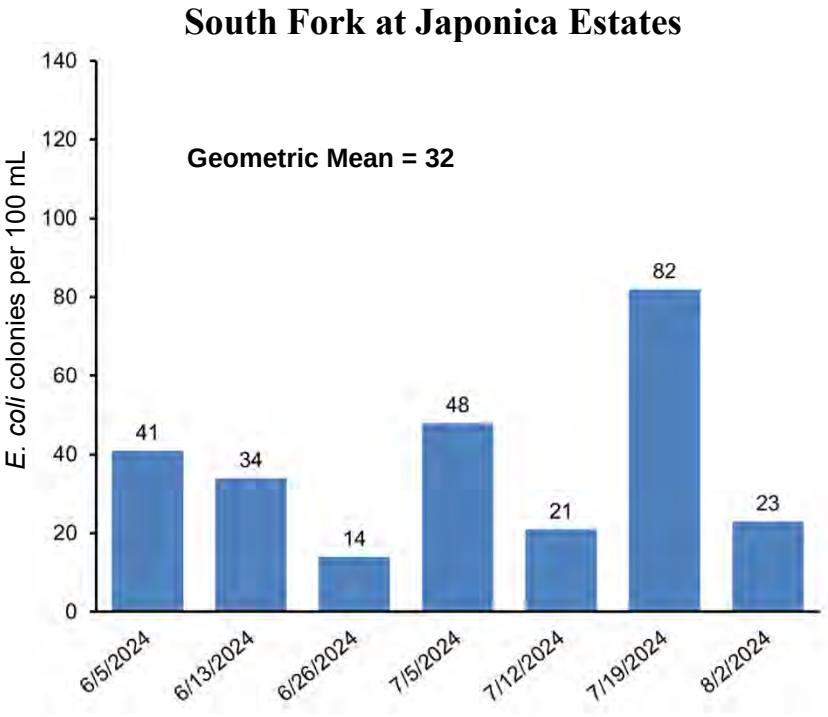
Michael McCrea



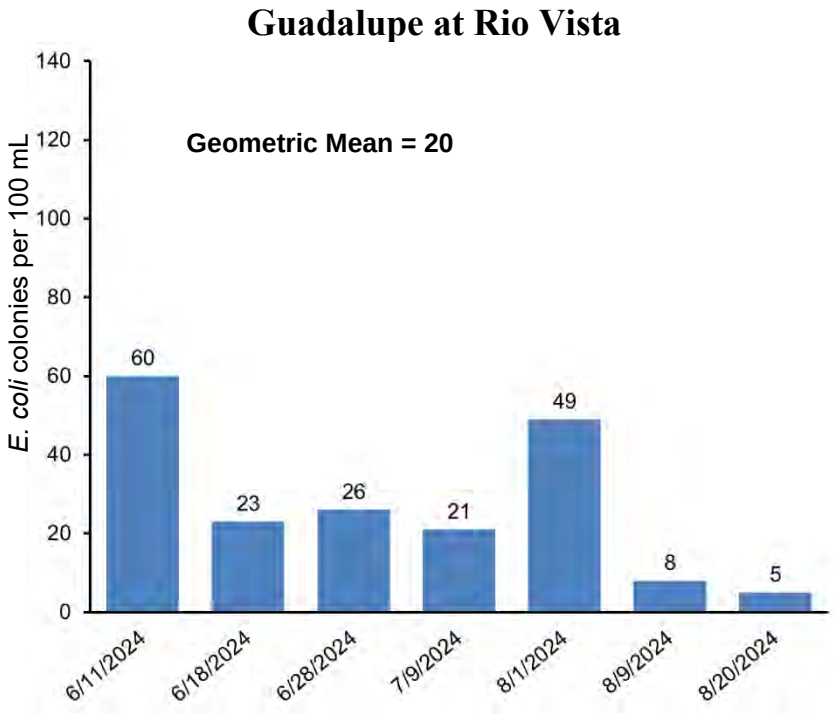
Dee and John Elliott



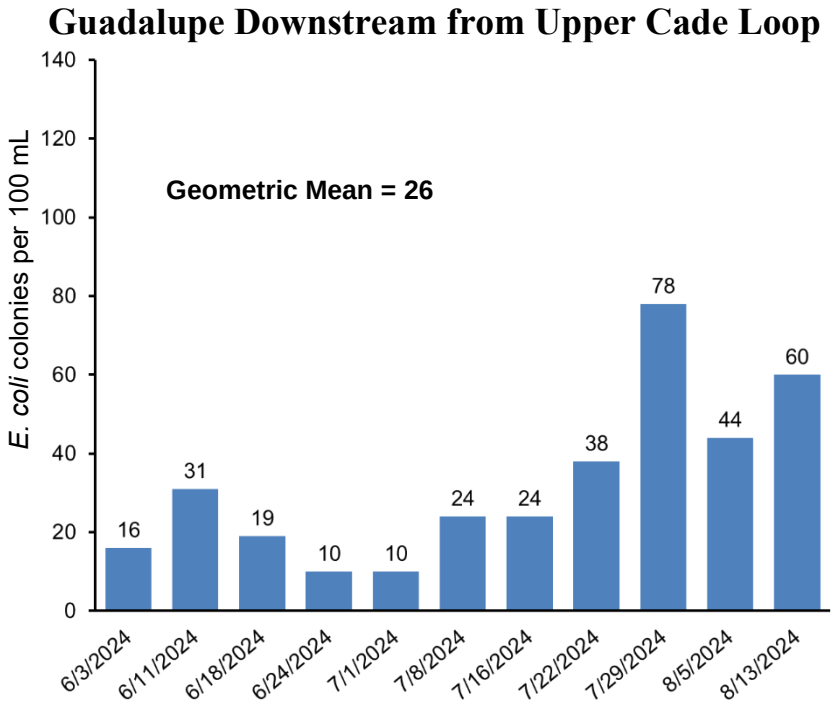
Will Sumner



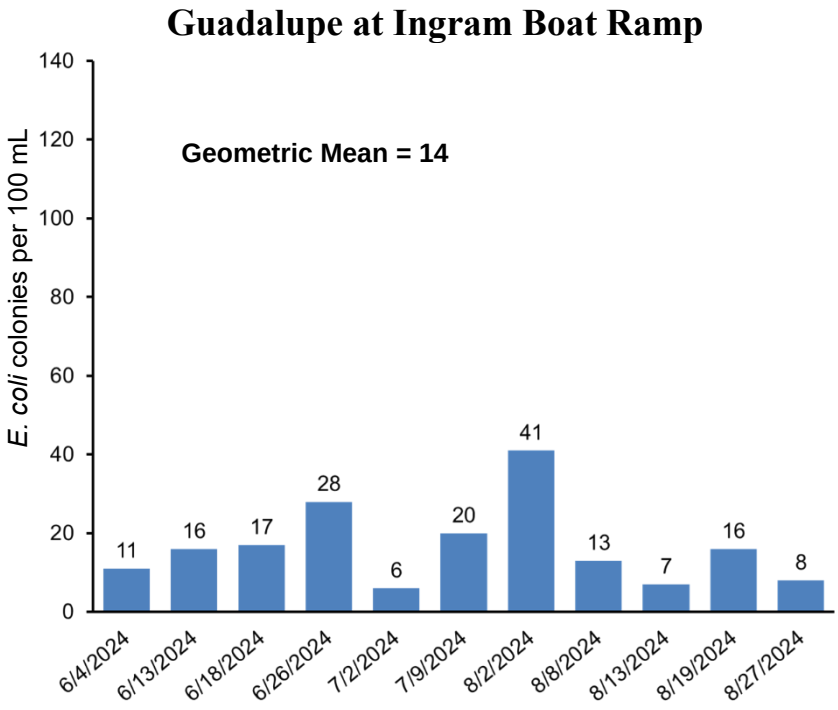
Weezie Johnston



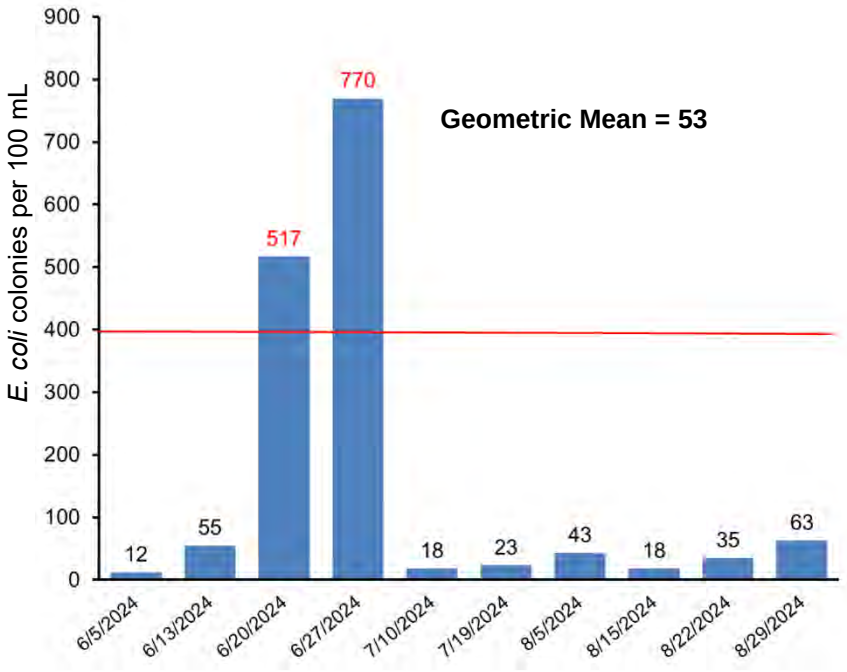
Don Willoughby



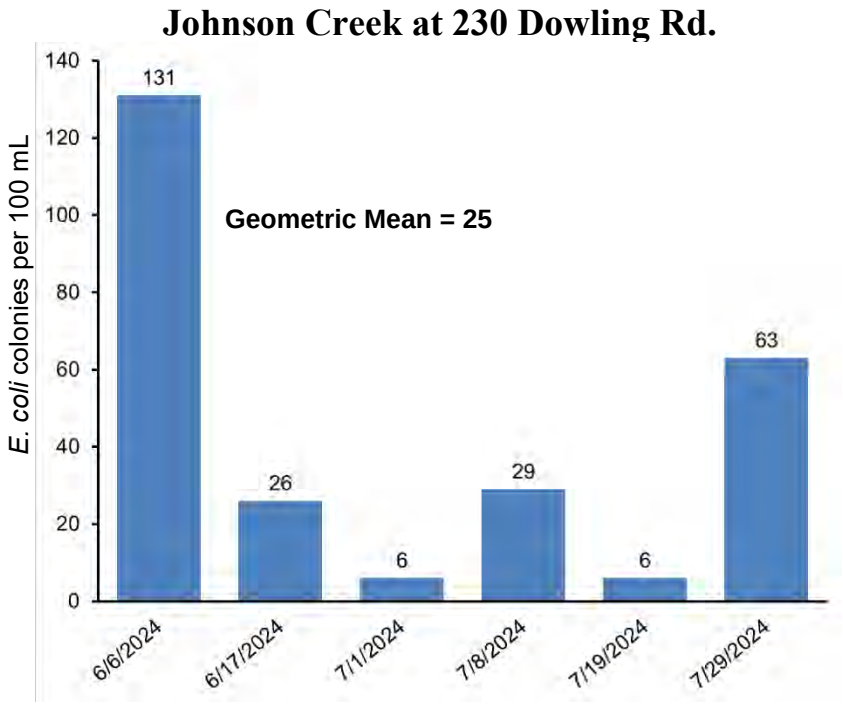
Nellwyn Sadler



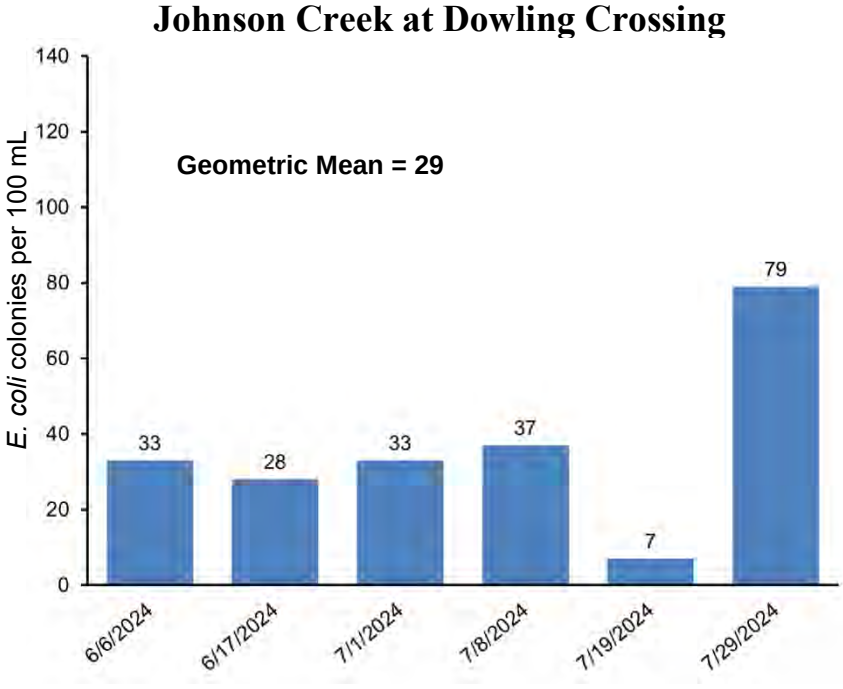
Alice King



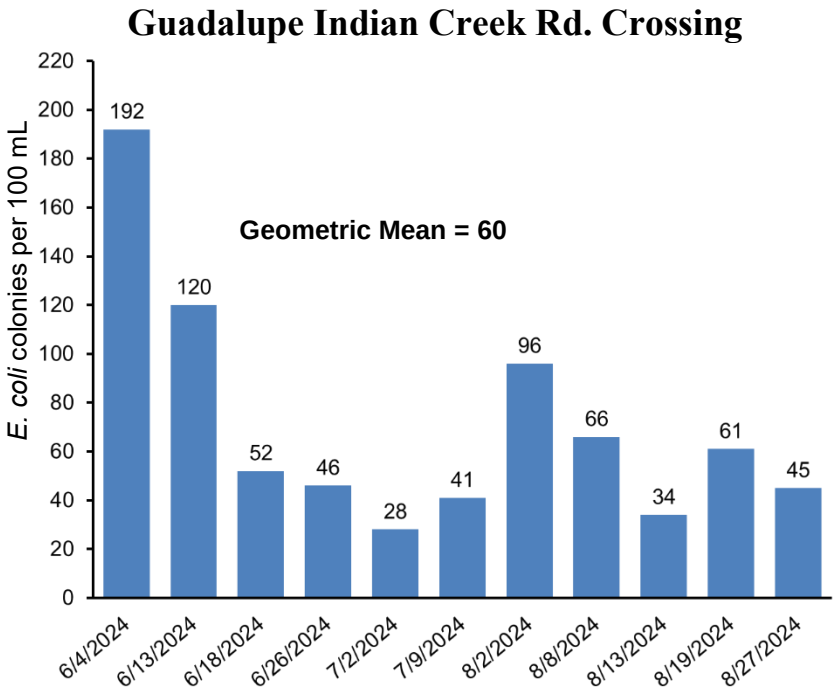
Melanie Ellsworth



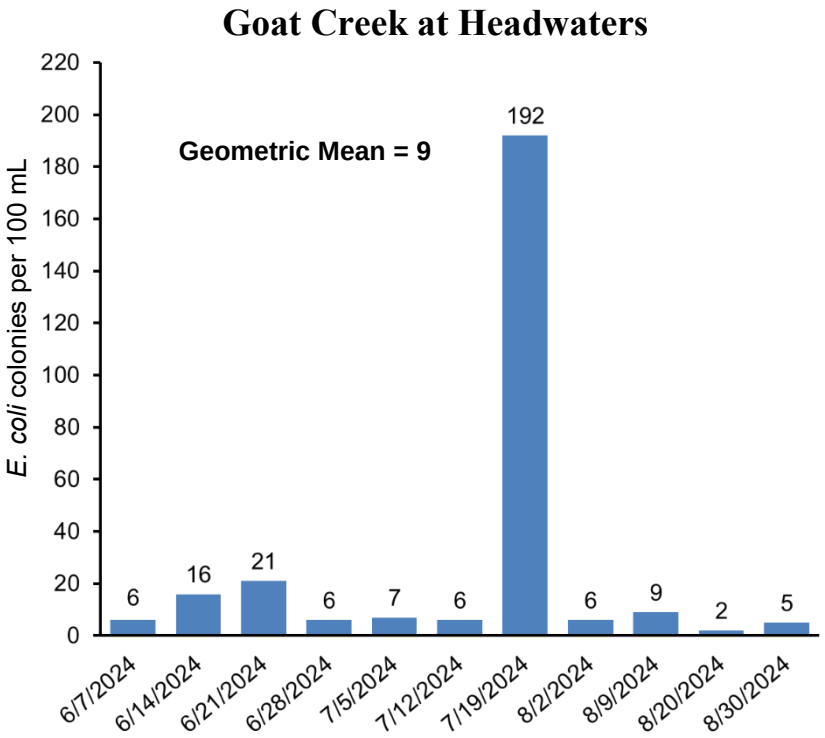
Melanie Ellsworth



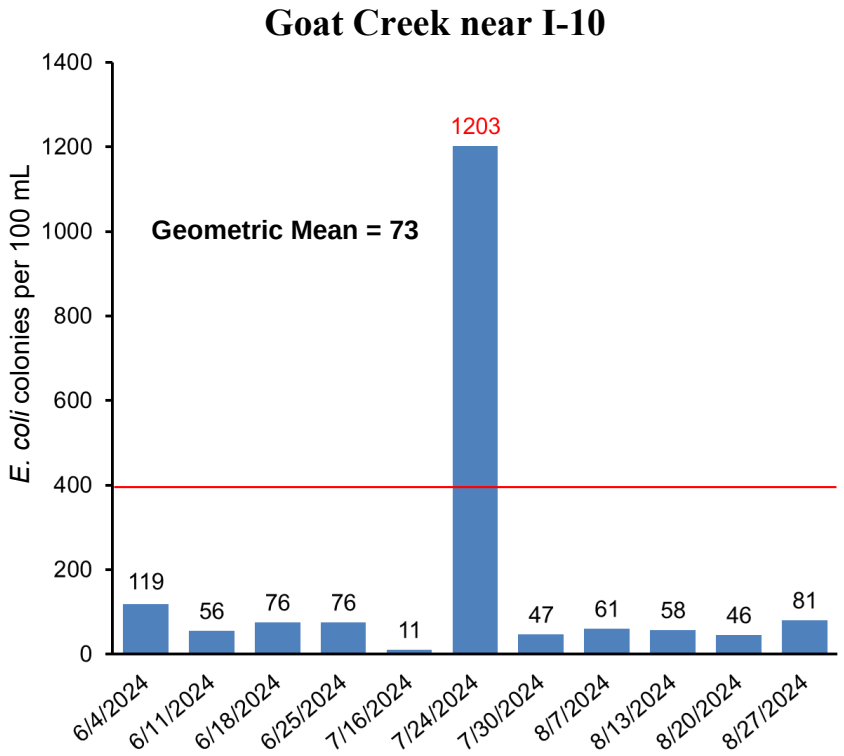
Nellwyn Sadler



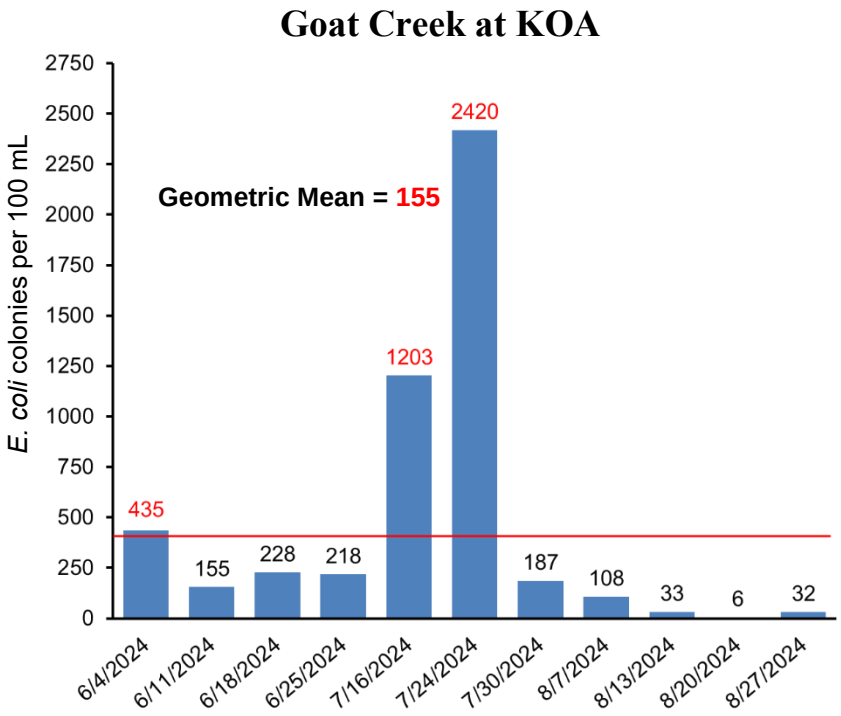
Maura Windlinger



Palmore Baxter

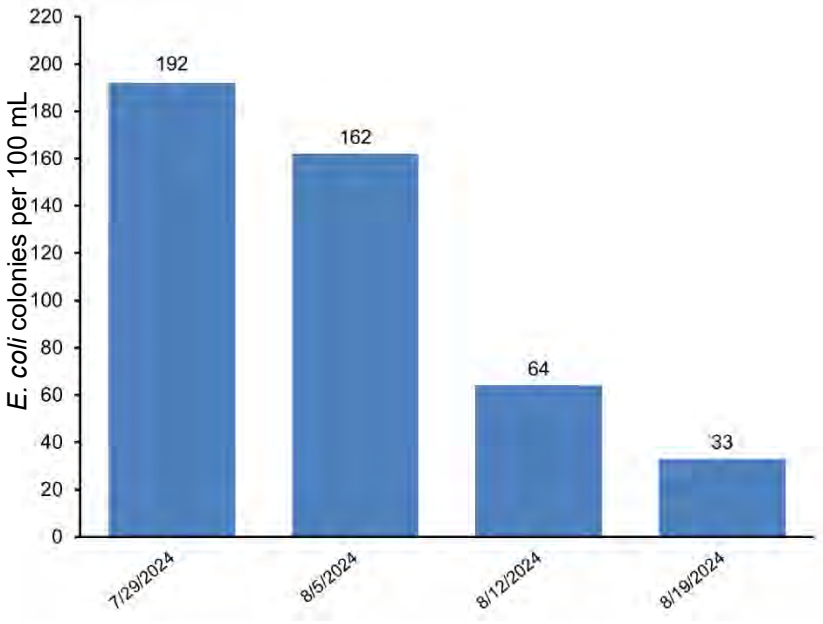


Palmore Baxter



David Bartels

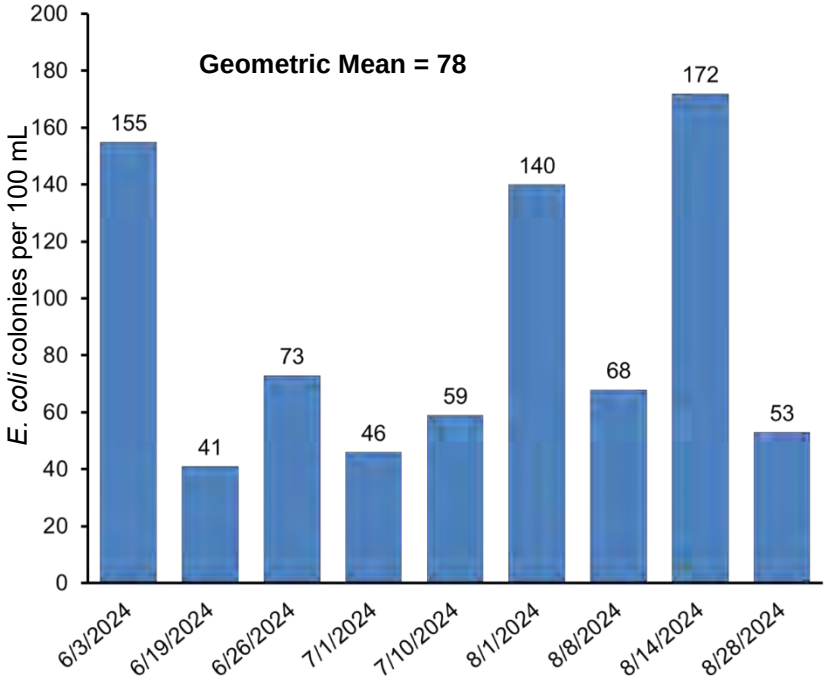
*Bear Creek at Bear Creek Rd.



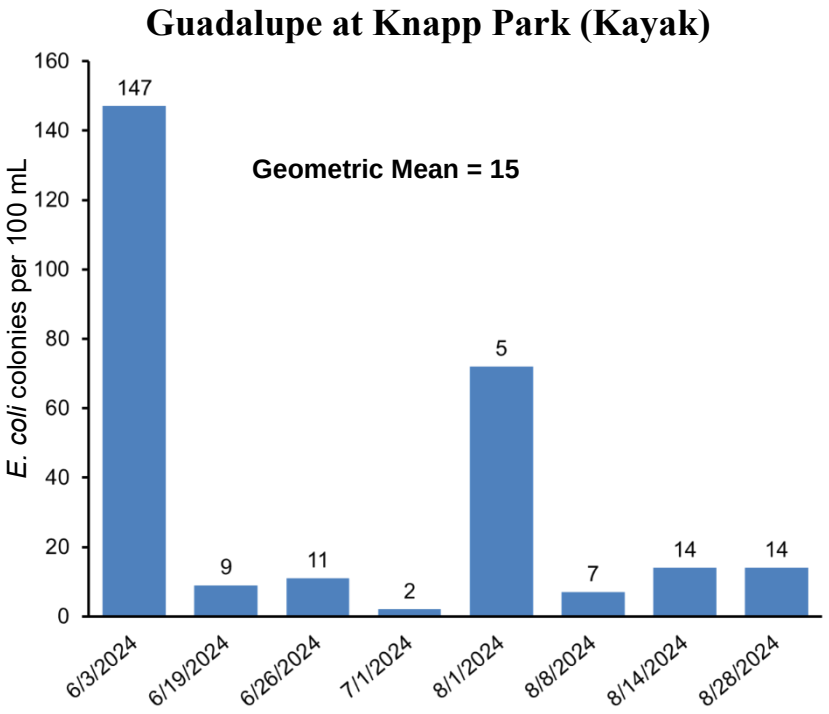
* Insufficient samples to calculate geometric mean; volunteer's sample site was dry at start of summer.

Carl and Katy Kappel

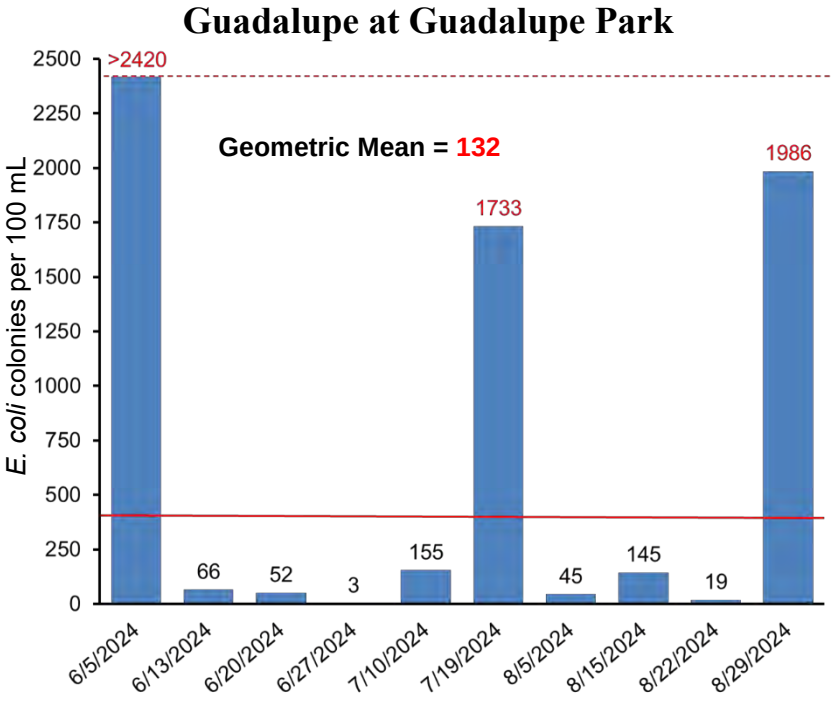
Guadalupe at Cypress Park (Kayak)



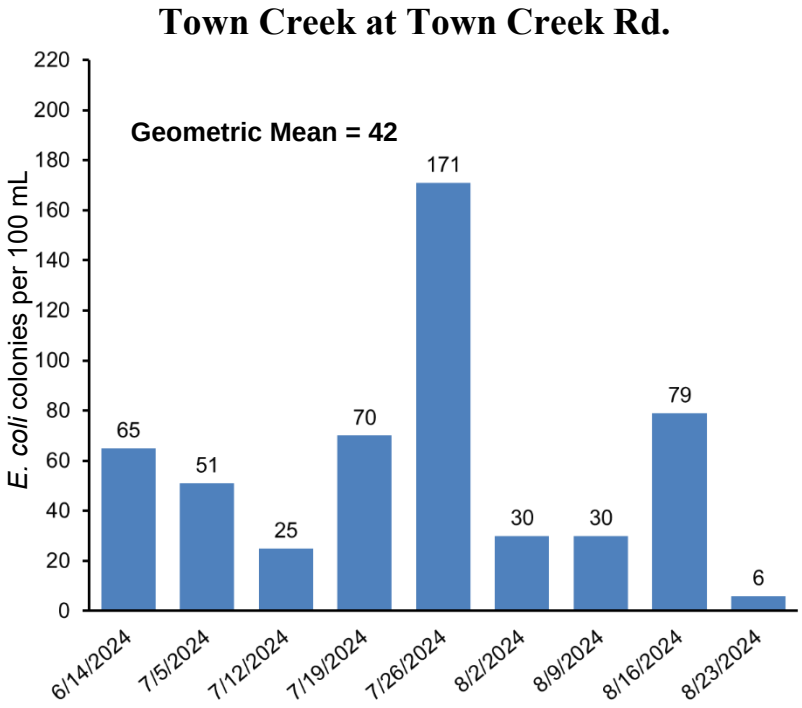
Carl and Katy Kappel



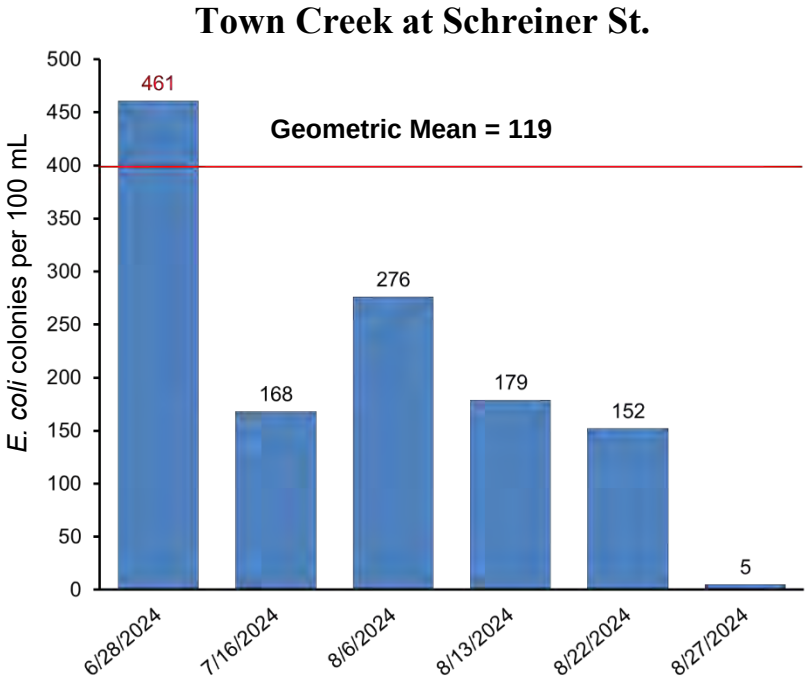
Alice King



Phillip Youngblood

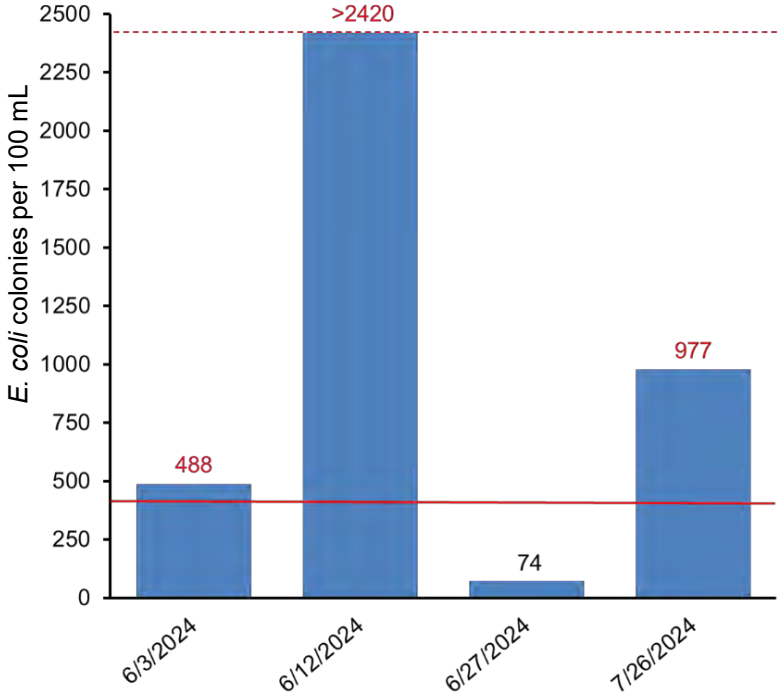


Jim Gardner



Michelle Yañez

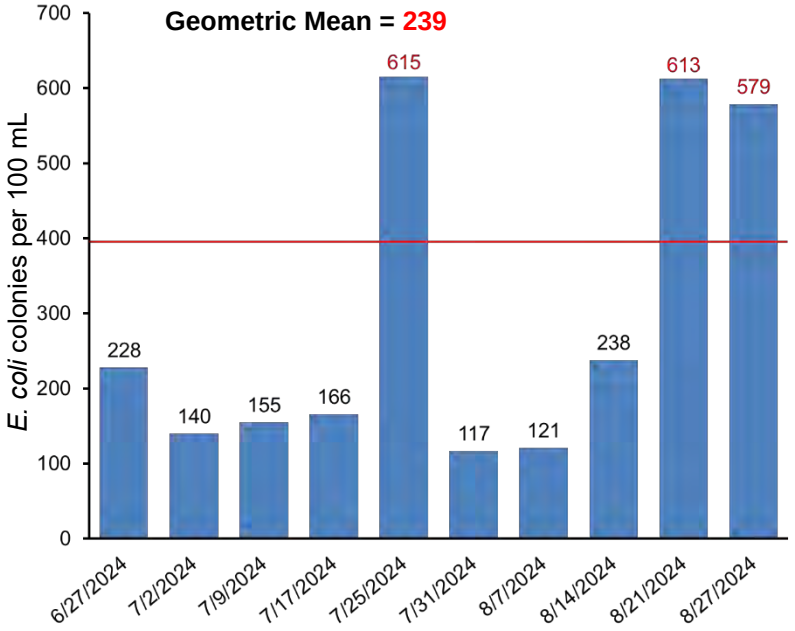
*Town Creek at River Trail Foot Bridge



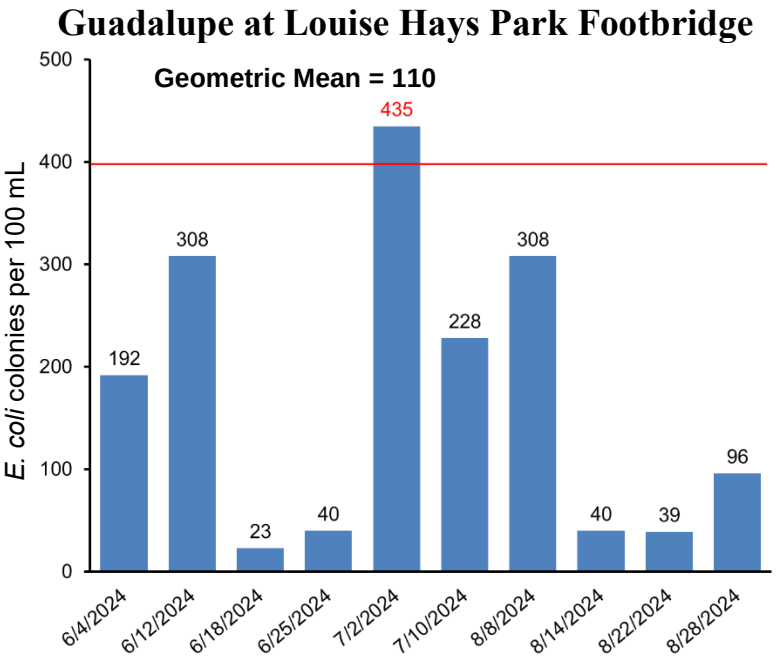
* Insufficient samples to calculate geometric mean.

Lisa Flanagan

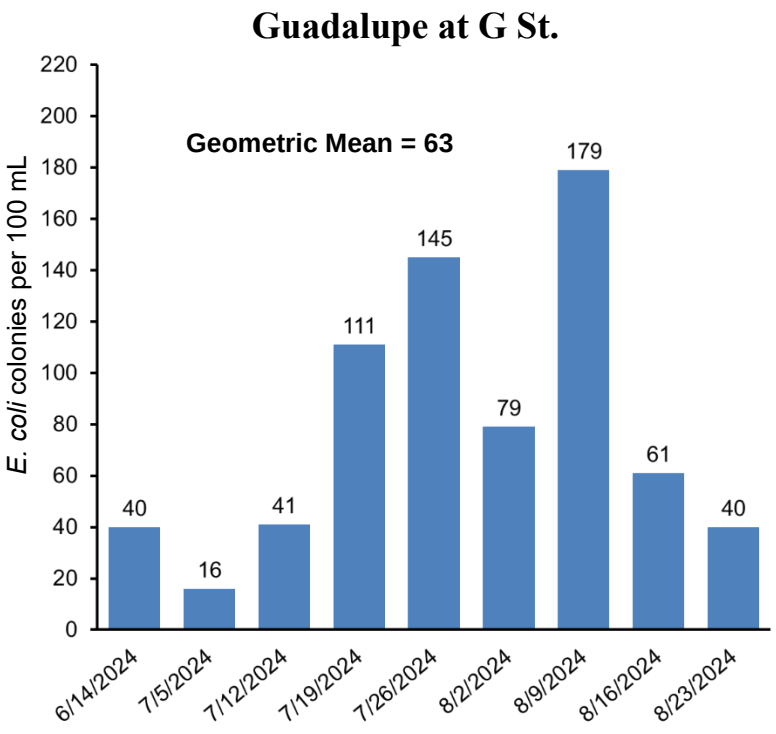
Guadalupe at Francisco Lemos Bridge



Sherry Wilson

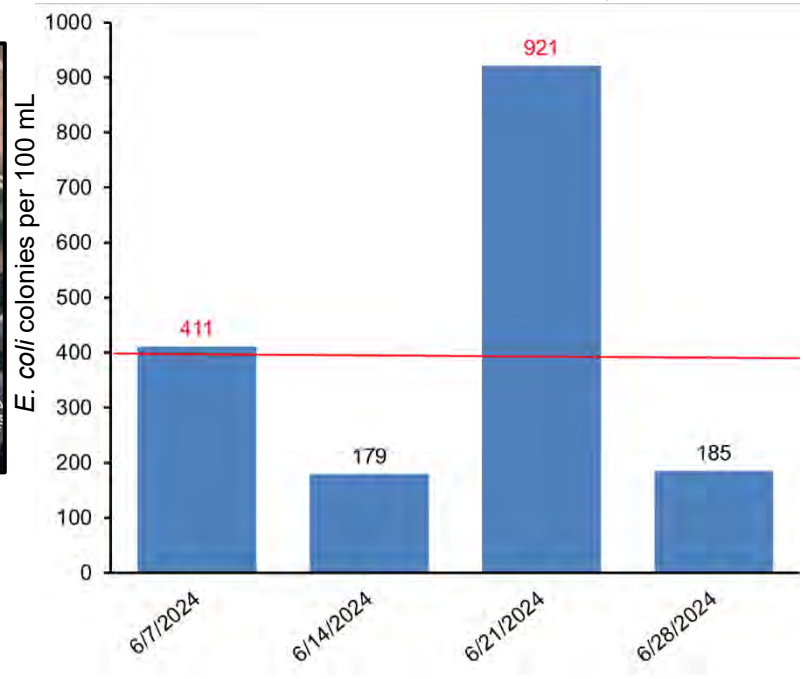


Deb Youngblood



*Quinlan Creek at Tivy St.

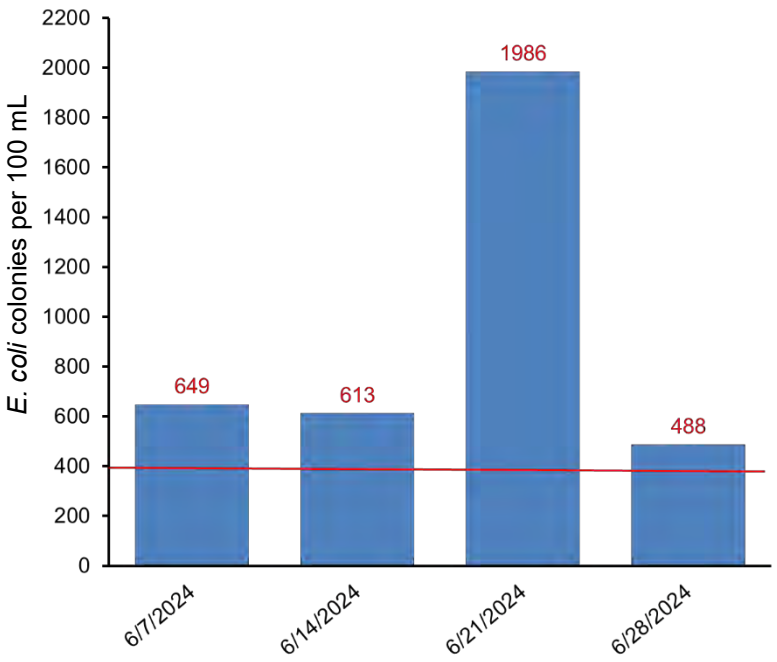
Leslie Jones



* Insufficient samples to calculate geometric mean

*Quinlan Creek at Habitat Park

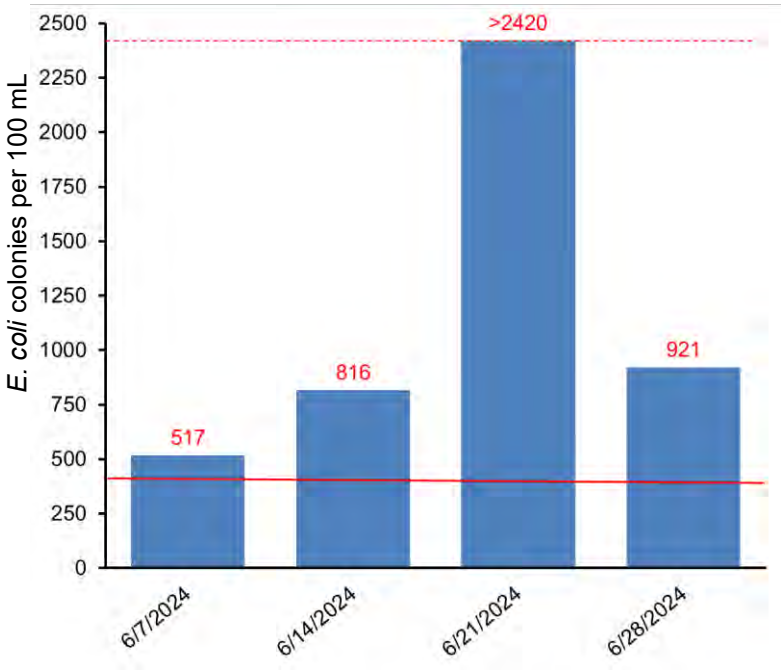
Leslie Jones



* Insufficient samples to calculate geometric mean

Leslie Jones

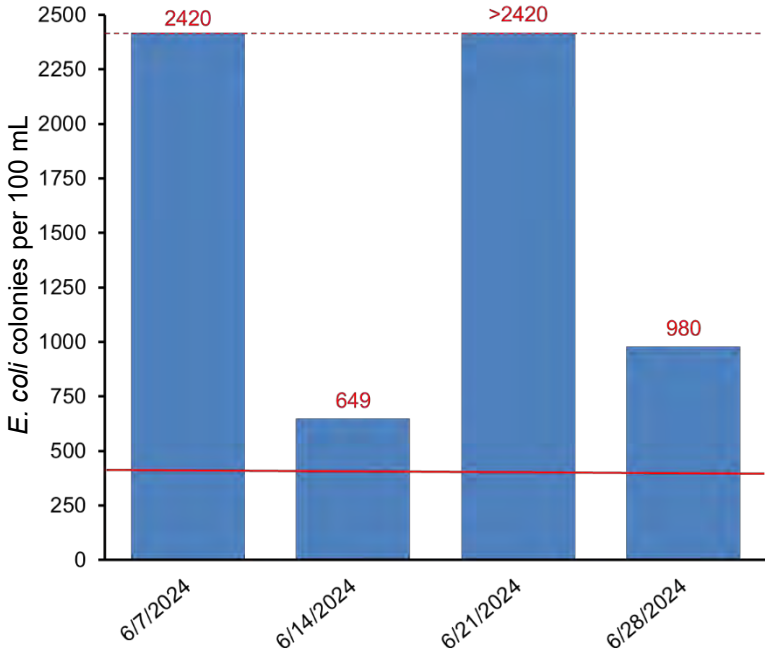
*Quinlan Creek at First St.



* Insufficient samples to calculate geometric mean

Leslie Jones

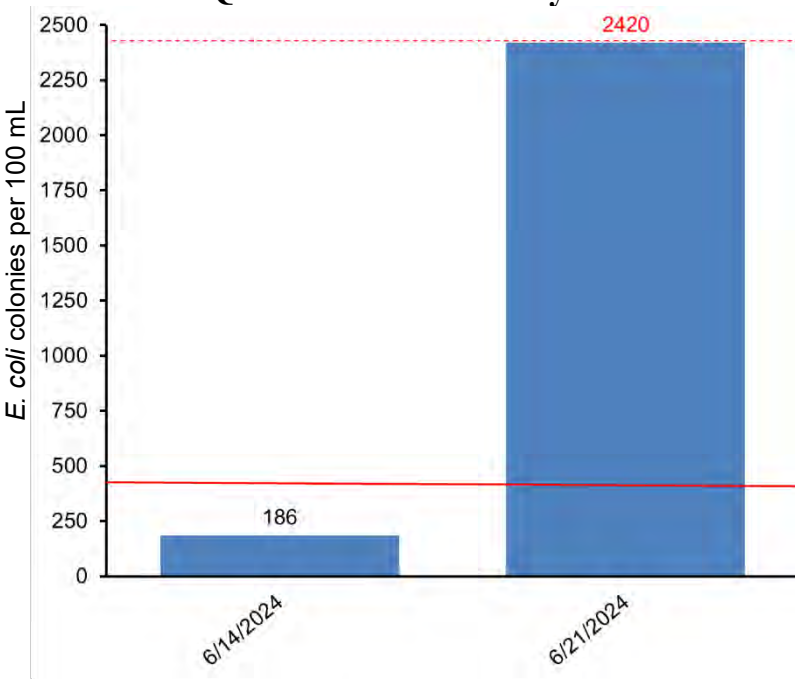
*Quinlan Creek at E Main St.



* Insufficient samples to calculate geometric mean

Leslie Jones

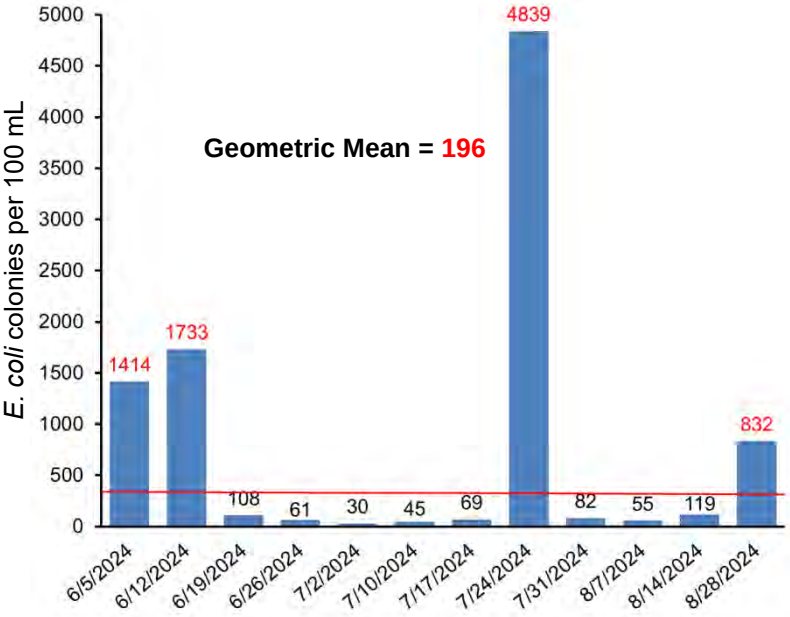
*Quinlan Creek at Hwy. 27



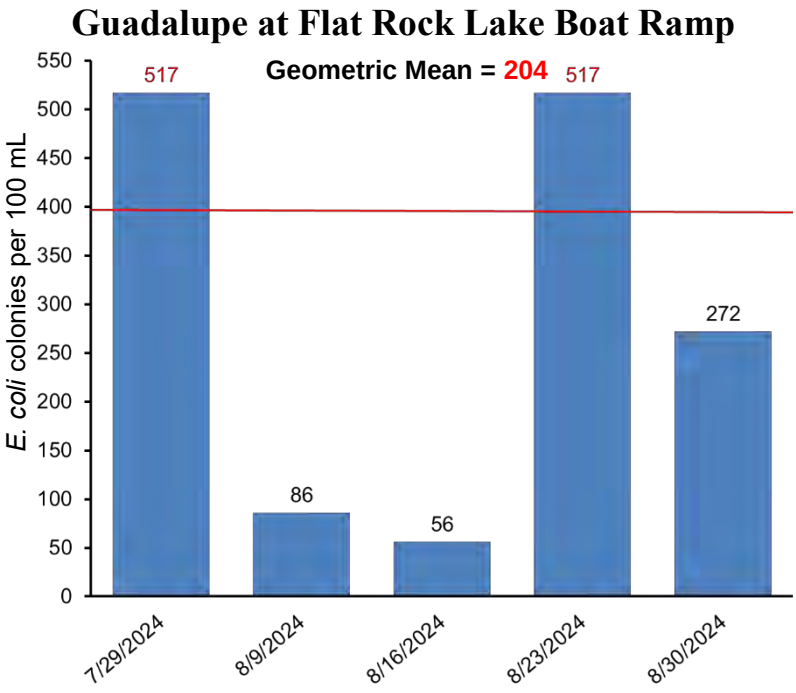
* Insufficient samples to calculate geometric mean

Paul Hawkins

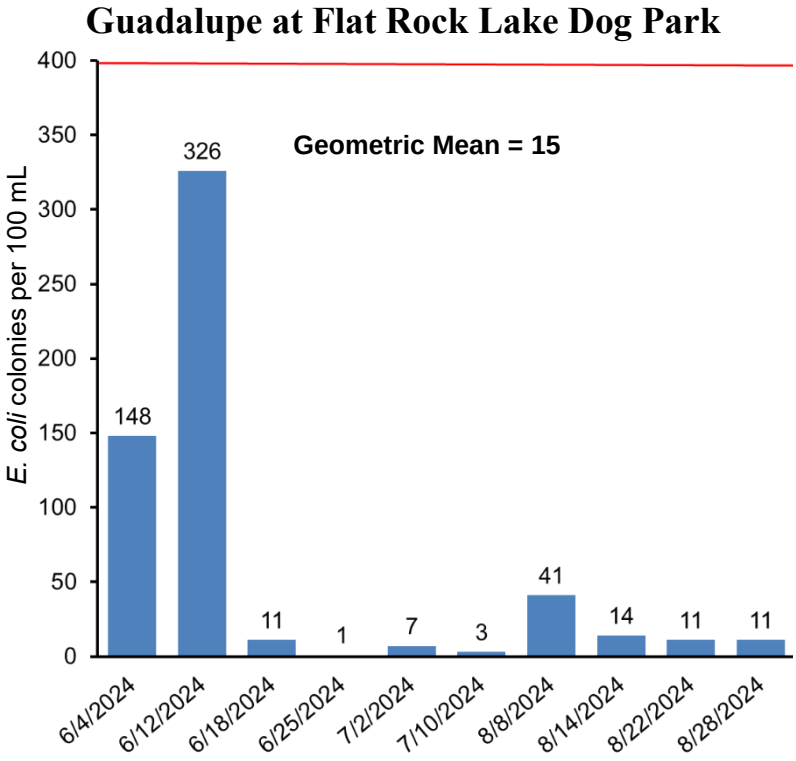
Guadalupe at 3030 Riverside Dr.



Clark Williams

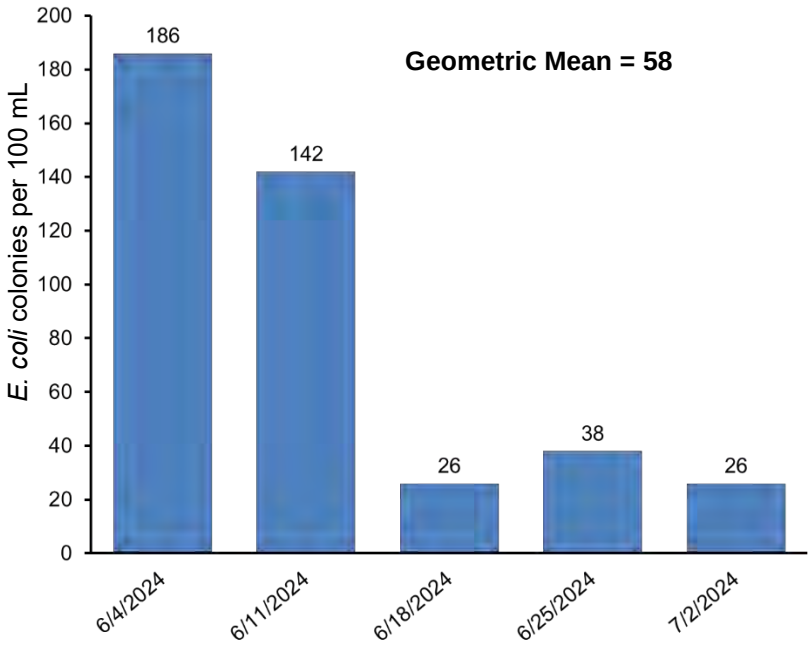


Sherry Wilson



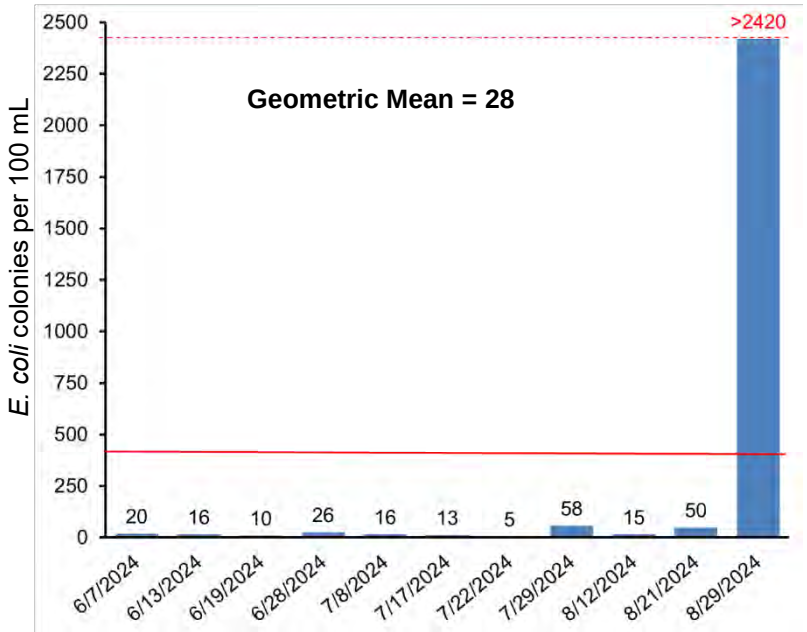
John Hornung

Guadalupe at 230 Wharton Rd.

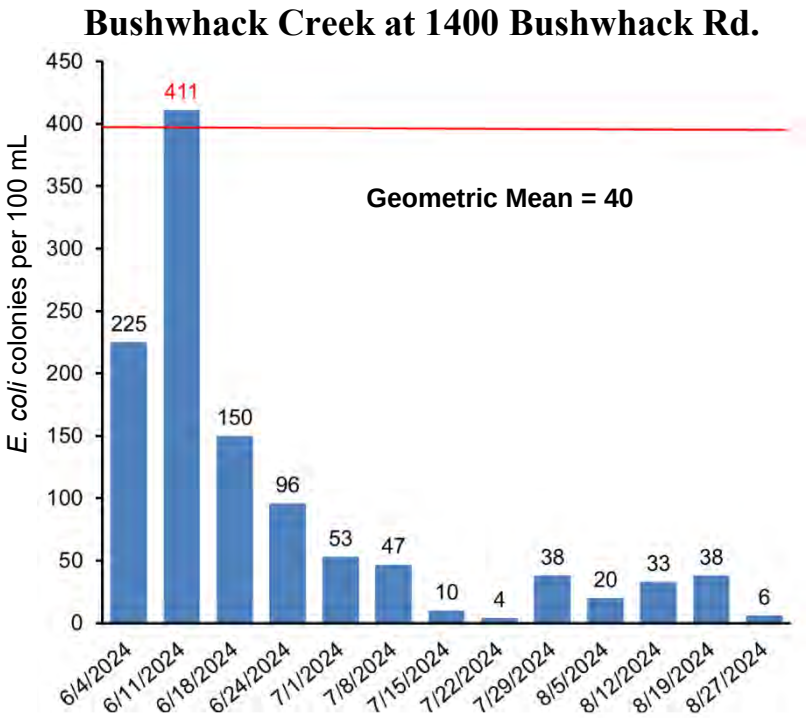


Kathy Loring

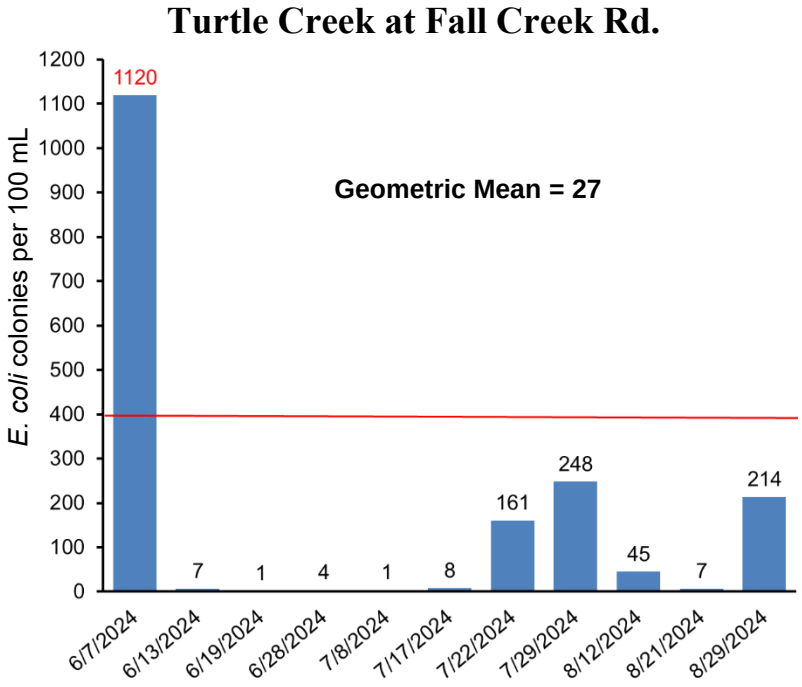
Turtle Creek at Rocky Hill Dr.



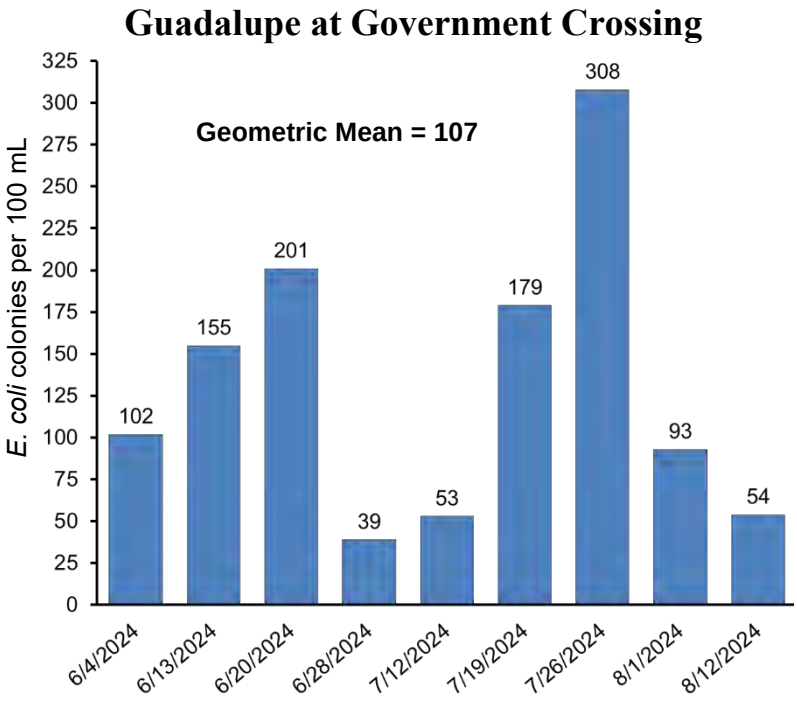
Patricia Poore



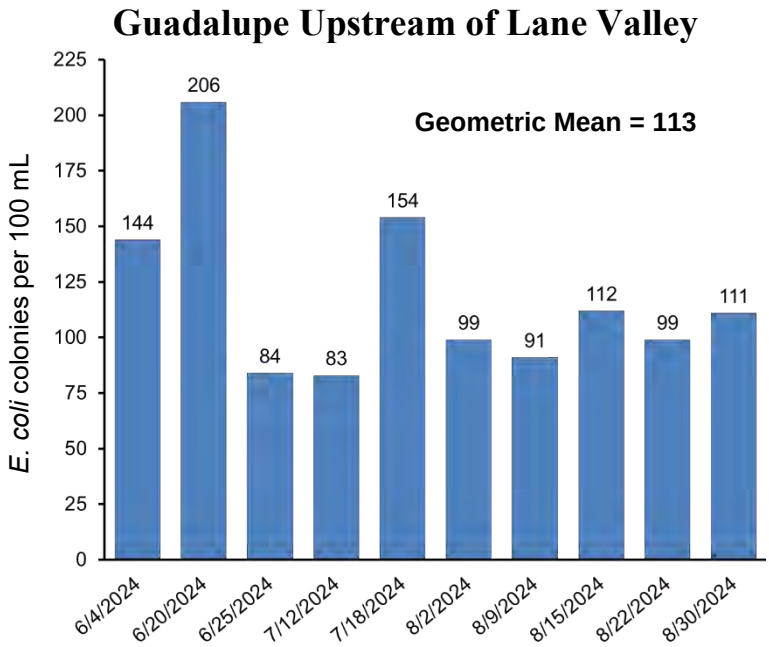
Kathy Loring



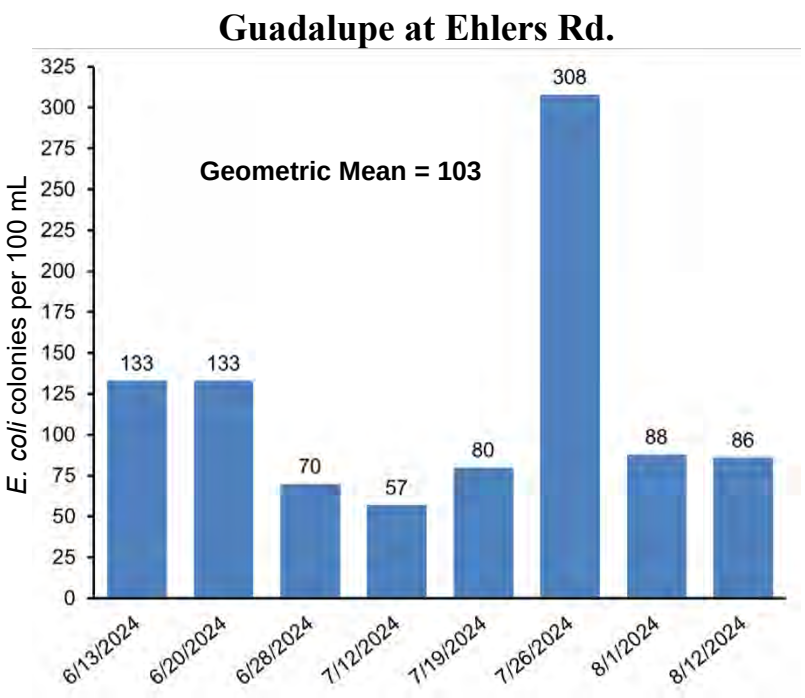
Lorena Lozano

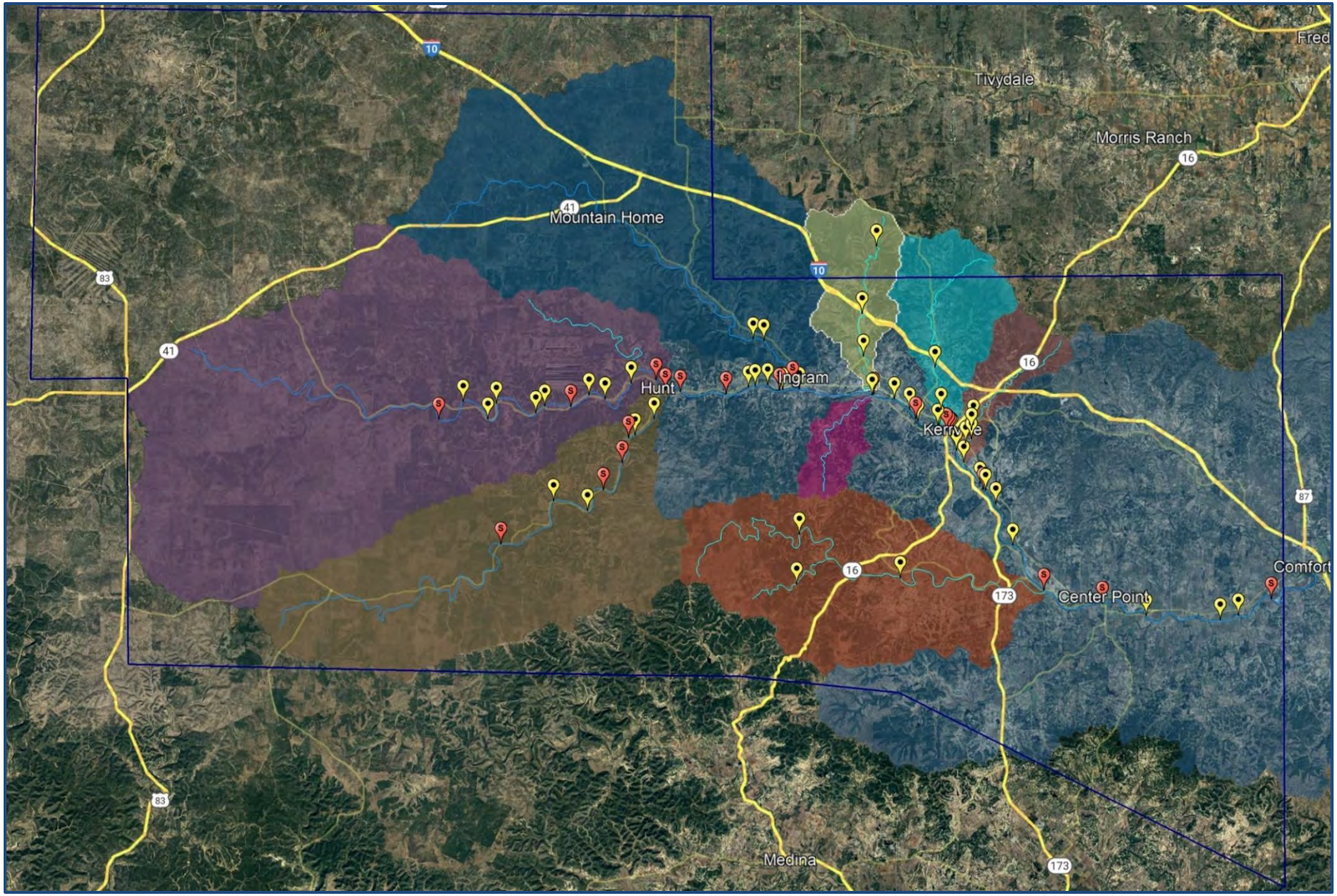


Paz Lovett



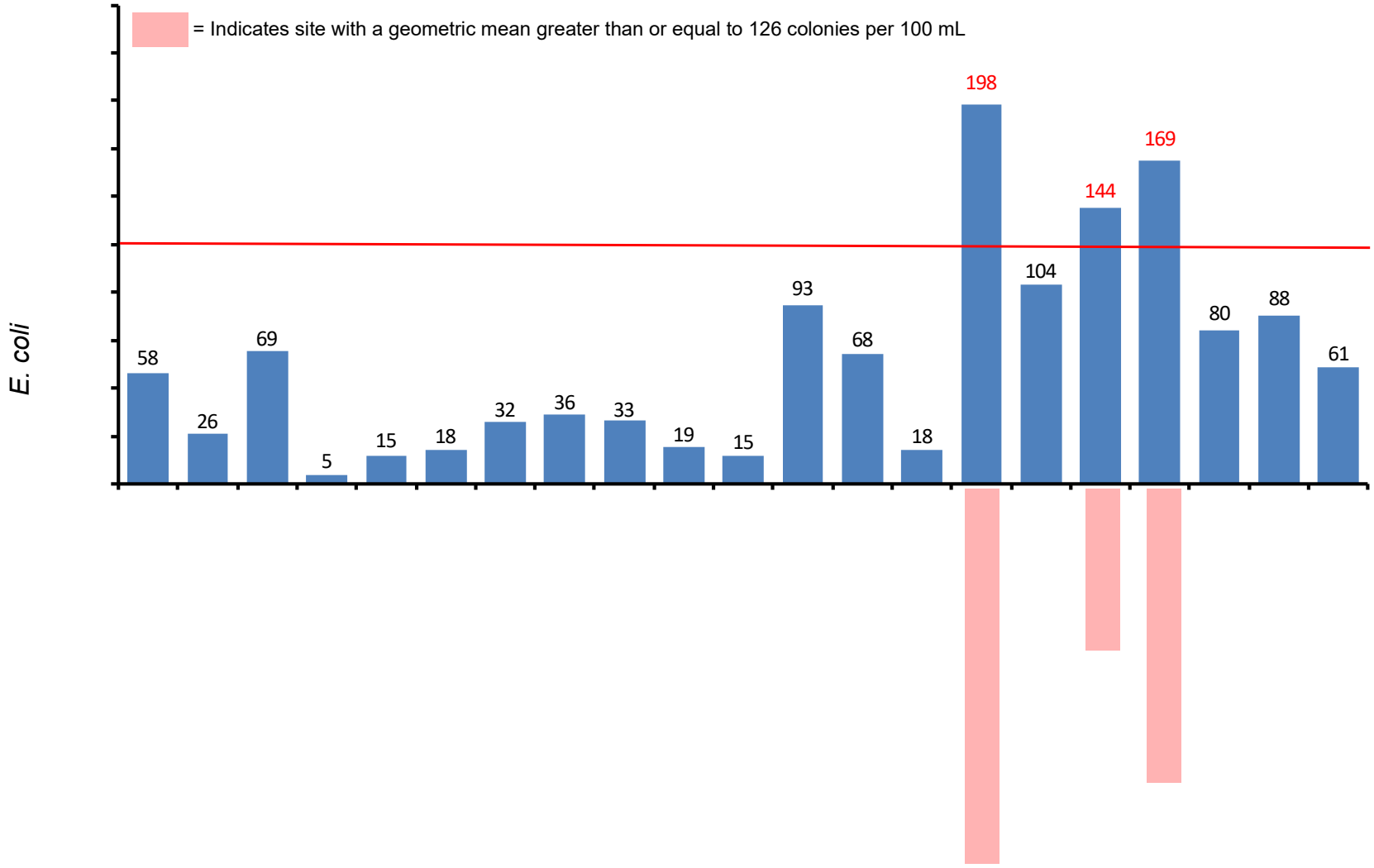
Lorena Lozano



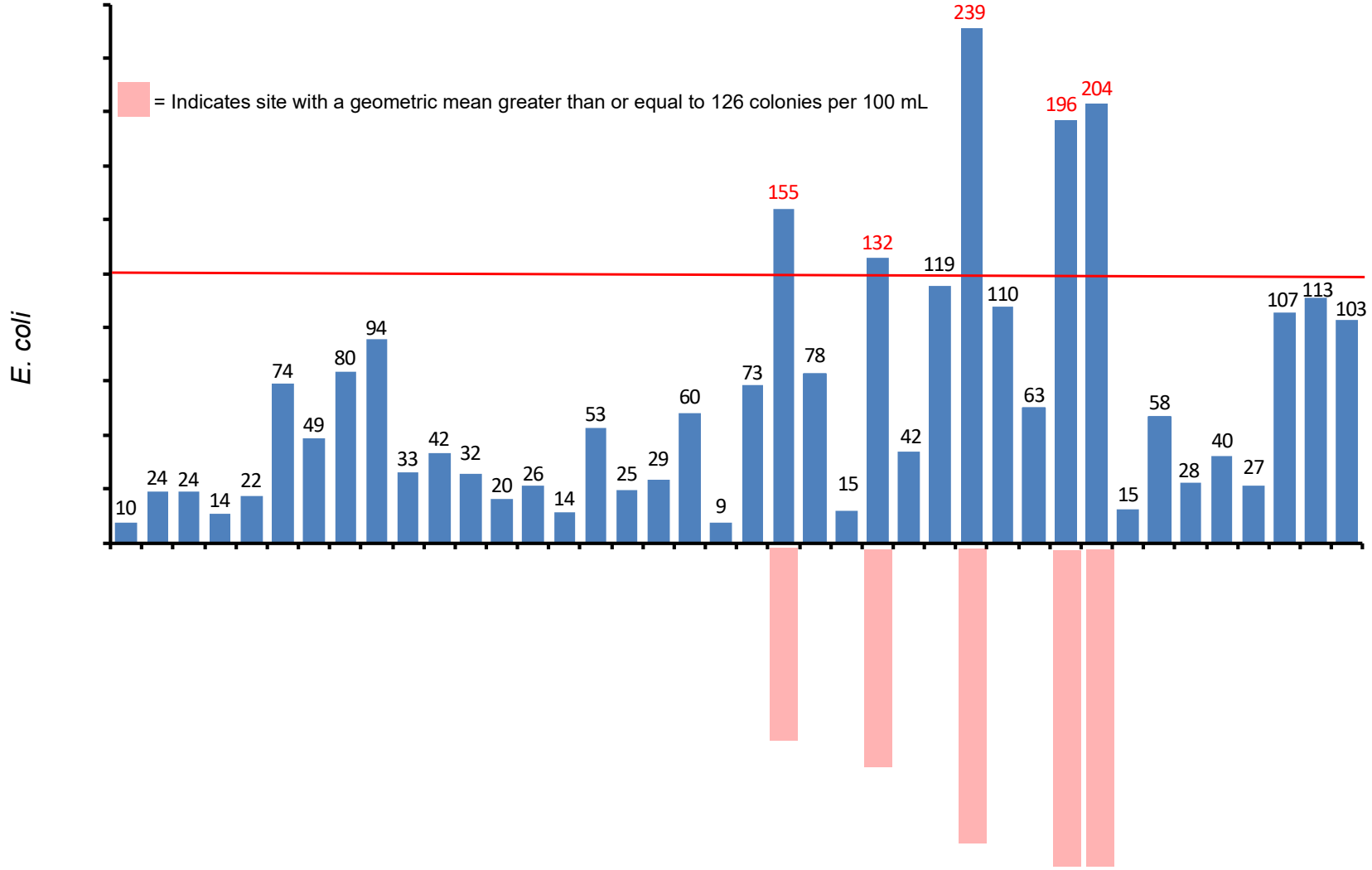


Upper Guadalupe River watershed map of 2024 Summer Swimability Study sampling locations (red dots) and Volunteer Summer Study sampling locations (yellow dots).

SUMMER SWIMABILITY STUDY
GEOMETRIC MEAN



VOLUNTEER SUMMER STUDY
GEOMETRIC MEANS



Great job volunteers!! Thank you for all your hard work and we hope you will participate in UGRA's Volunteer Summer Study next year.