THE MEADOWS CENTER FOR WATER AND THE ENVIRONMENT

No natural resource is more important to our future than Water. Water is what we do.

RESEARCH | STEWARDSHIP | SERVICE | EDUCATION

The Meadows Center
for Water and the Environment
Texas State University

Dr. Andrew Sansom
Executive Director

Nick Dornak
Watershed Services Program Coordinator
nickdornak@txstate.edu
512-245-6697

No natural resource is more important to our future than Water. Water is what we do.

RESEARCH | STEWARDSHIP | SERVICE | EDUCATION | SERVICE

The Meadows Center
for Water and the Environment
Texas State University

CYPRESS CREEK

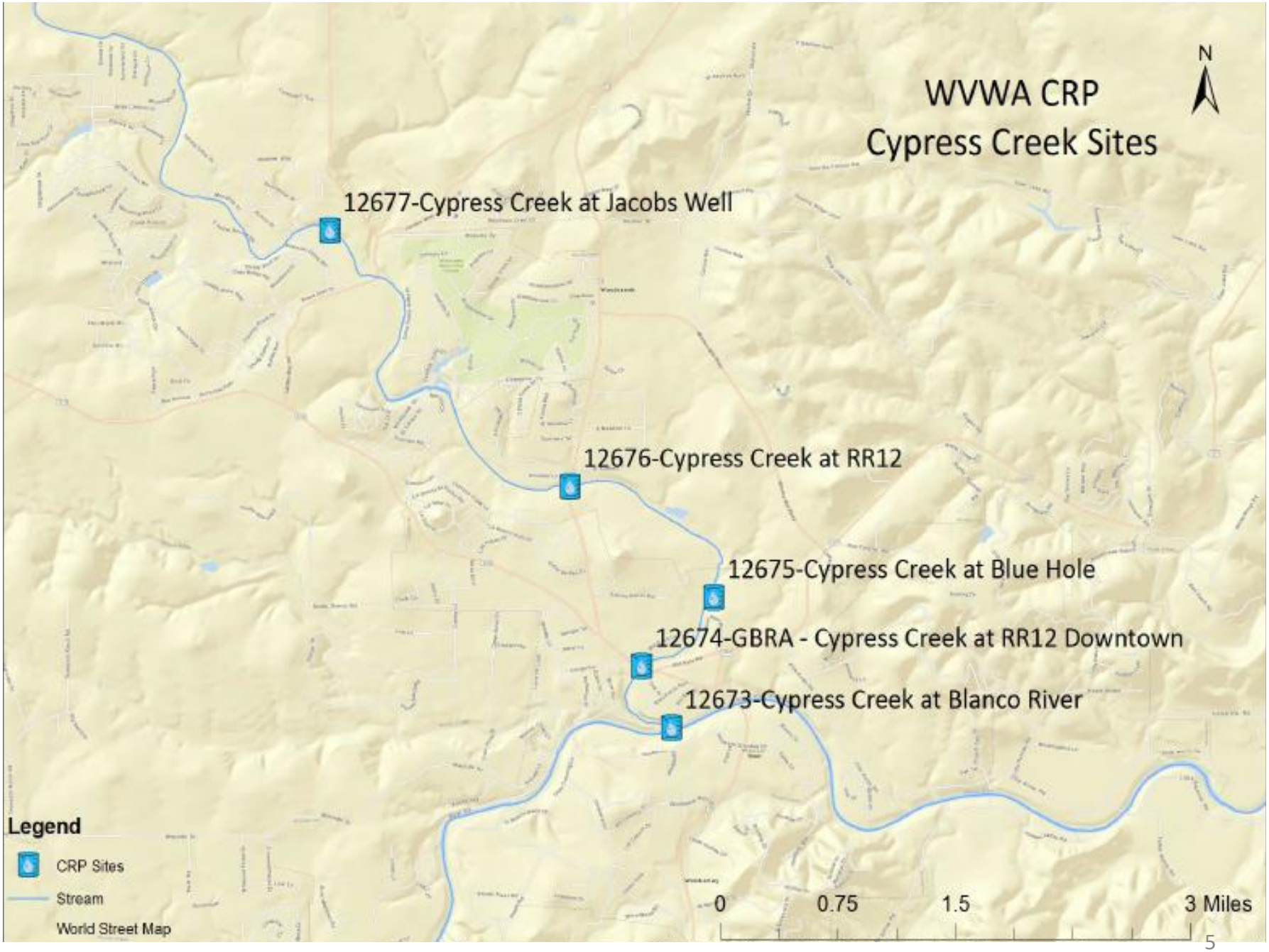
Let's keep it clean, clear & flowing

The Meadows Center for Water and the Environment
201 San Marcos Springs Drive | San Marcos, TX. 78666
Ph. 512.249.9200 | meadowscenter@txstate.edu

GBRA - Clean Rivers Program

- GBRA partners with TCEQ to administer the Clean Rivers Program (CRP) for the Guadalupe River and Lavaca-Guadalupe Coastal Basins.
- The Wimberley Valley Watershed Association (WVWA) began funding the program with help from the City of Wimberley in 2003. The program contributes monitoring data collected under the Guadalupe Basin CRP quality assurance project plan (QAPP) from the Blanco River and Cypress Creek watersheds.
- TCEQ and USEPA quality assure data and program efforts.
- Meadows Center staff (trained by GBRA and listed in the QAPP collects data. GBRA laboratory analyzes data/samples.
- TCEQ uses the data for decision making purposes, water quality impairment listings
- Data has been collected on many sites since 1998

https://www.tceq.texas.gov/waterquality/clean-rivers


WVWA CRP
Cypress Creek Sites
N
12677-Cypress Creek at Jacobs Well
12676-Cypress Creek at RR12
12675-Cypress Creek at Blue Hole
12674-GBRA - Cypress Creek at RR12 Downtown
12673-Cypress Creek at Blanco River
Legend
CRP Sites
Stream
World Street Map
0
0.75
1.5
3 Miles

Clean Rivers Program

Sites previously monitored monthly, now quarterly for:

- Temperature
- Conductivity
- Dissolved Oxygen
- pH Nitrate/Nitrite-Nitrogen
- Total Phosphorus
- Total Suspended Solids
- Ammonia
- E. coli (#/100 mL)
- Flow

The Meadows Center for Water and the Environment
201 San Marcos Springs Drive | San Marcos, TX. 78666
Ph. 512.249.9200 | meadowscenter@txstate.edu

Cypress Creek Watershed Protection Plan

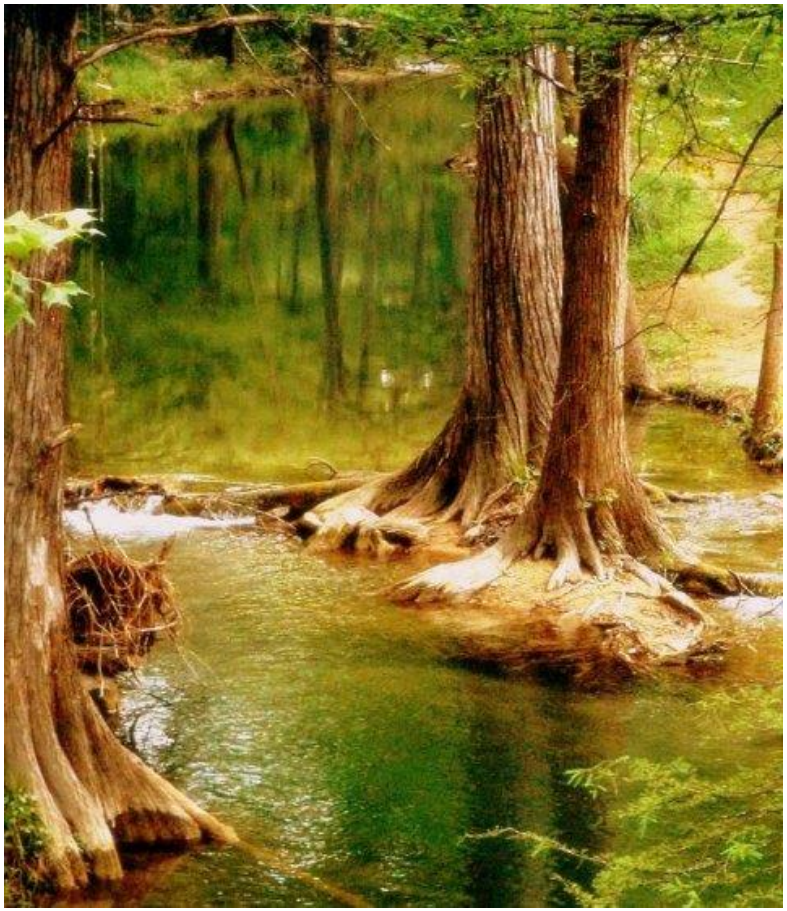
- Background – Listed in 2000 for inadequate DO. That year, and in subsequent years, the creek stopped flowing.
- Stakeholder partnership formed, led by Local Stakeholders, City of Wimberley, City of Woodcreek, Hays County, Wimberley Valley Watershed Association.
- TCEQ 319 funding to develop a science-based, stakeholder driven Watershed Protection Plan

Water Quality, Land Use and Desired Conditions

	Concerns
Nitrogen	Residential and Commercial fertilizer applications, OSSFs, animal waste, overland flow/impervious cover, atmospheric deposition and low flows.
Total Suspended Solids	Anthropogenic activities, disturbed land cover, impervious cover and natural processes on undeveloped land, low flows.
E. coli	OSSFs, pets, wildlife, low flows.
Dissolved Oxygen	Low base flows limit aeration of water downstream of ground/source waters.
Oil and Grease	Residential wastewater, transportation corridors, improper waste management.
Impervious Cover increases	Increased urbanization.
Preferred Base Flows	Increased water use and well pumpage.

Cypress Creek Watershed Protection Plan

- Accepted by TCEQ and EPA
- Implementation grant funded
  - State/Federal Contribution $804,843
  - Partner and stakeholder Contributions $529,362
  - Total Cost: $1,334,205
- Timeline: Sept 2016– Aug 2019
  (anticipated extension through Feb 2020)



Cypress Creek Watershed Goals

- Activities to prevent pollution, protect flow
- Preserve water quality through local permitting, ordinances
- Improve tools for decision makers to calculate effects of land use changes on water quality
- Site-specific LID/Green Infrastructure demonstration sites
- Outreach and education efforts
- Monitoring and modeling water quality changes

The Meadows Center for Water and the Environment
201 San Marcos Springs Drive | San Marcos, TX. 78666
Ph. 512.249.9200 | meadowscenter@txstate.edu

Cypress Creek Watershed Plan Components

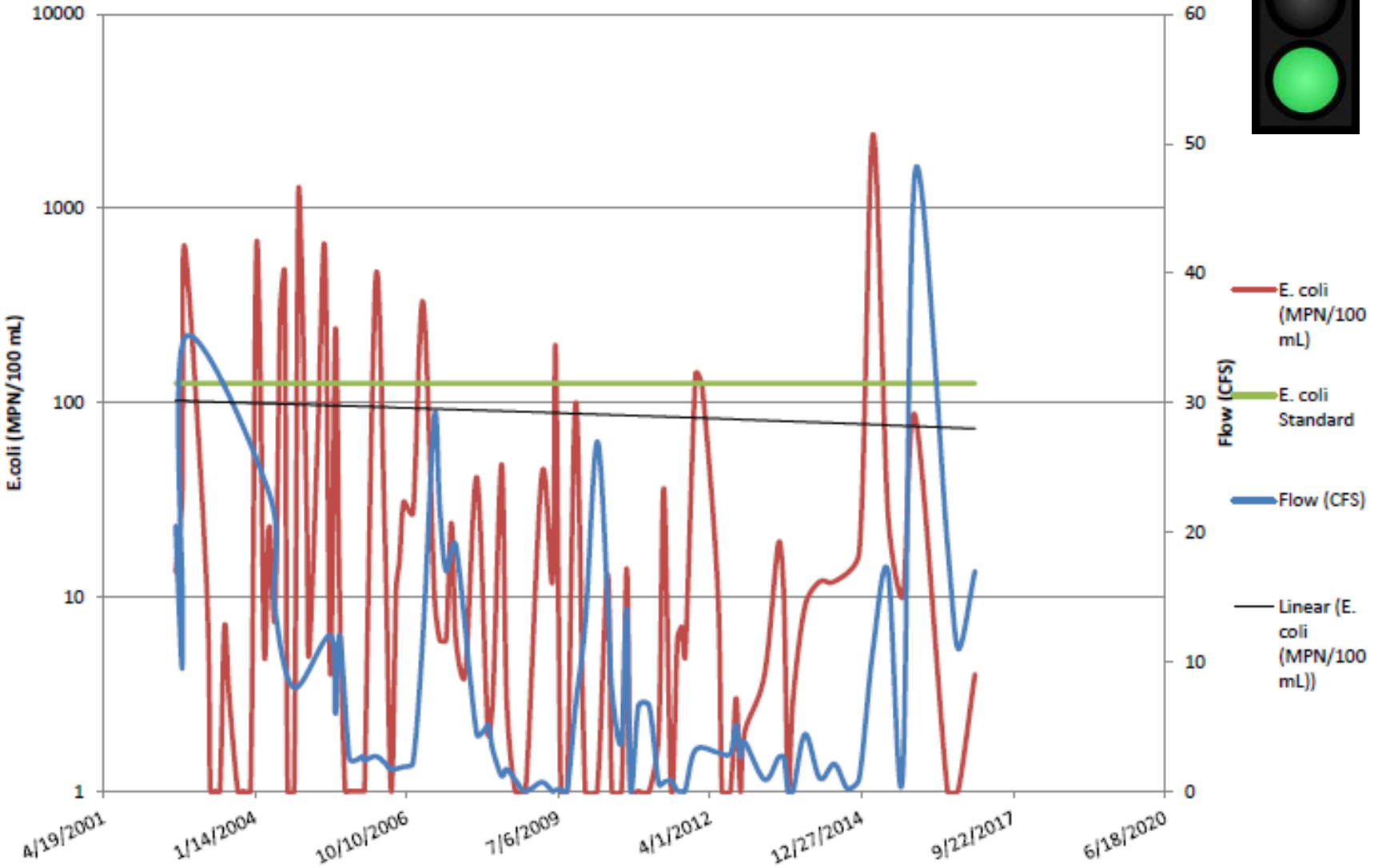
- Structural BMPs
- Non-structural BMPs (incentives, regulations, education)
- Source water protection
- Land management, conservation
- Research
- Monitoring

The Meadows Center for Water and the Environment
201 San Marcos Springs Drive | San Marcos, TX. 78666
Ph. 512.249.9200 | meadowscenter@txstate.edu

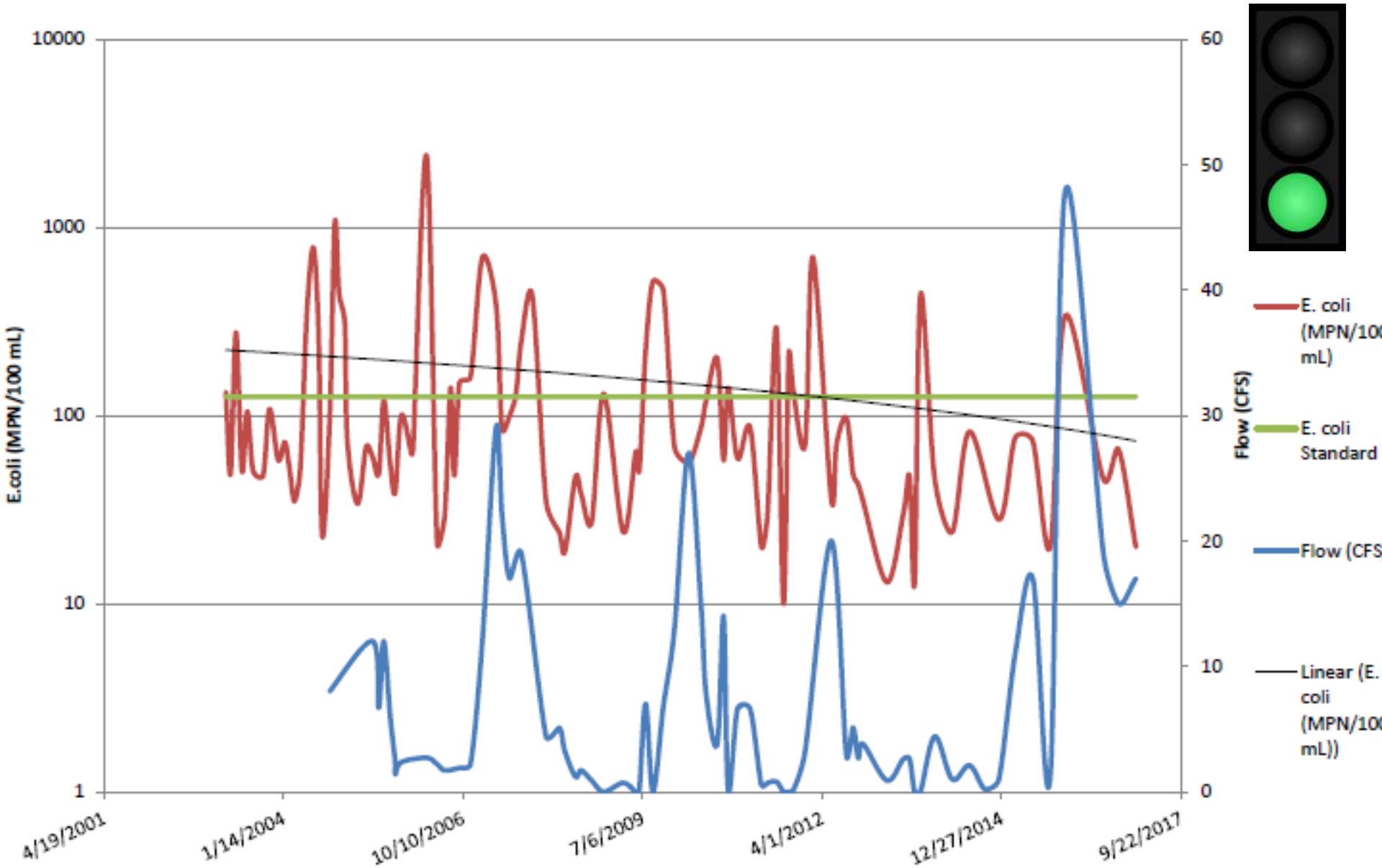
Ongoing/Historical Water Quality Monitoring

- Texas Clean Rivers Program – quality assured
- Watershed Plan (previous) - quality assured
- Watershed Plan (new) - quality assured
- Citizens' Wimberley Water Advisory Group – limited quality assurance
- City staff monitoring
- Texas Stream Team - quality assured

Fecal Coliform at Jacob's Well

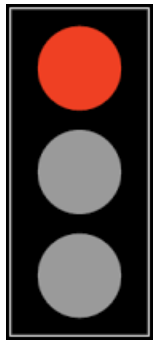


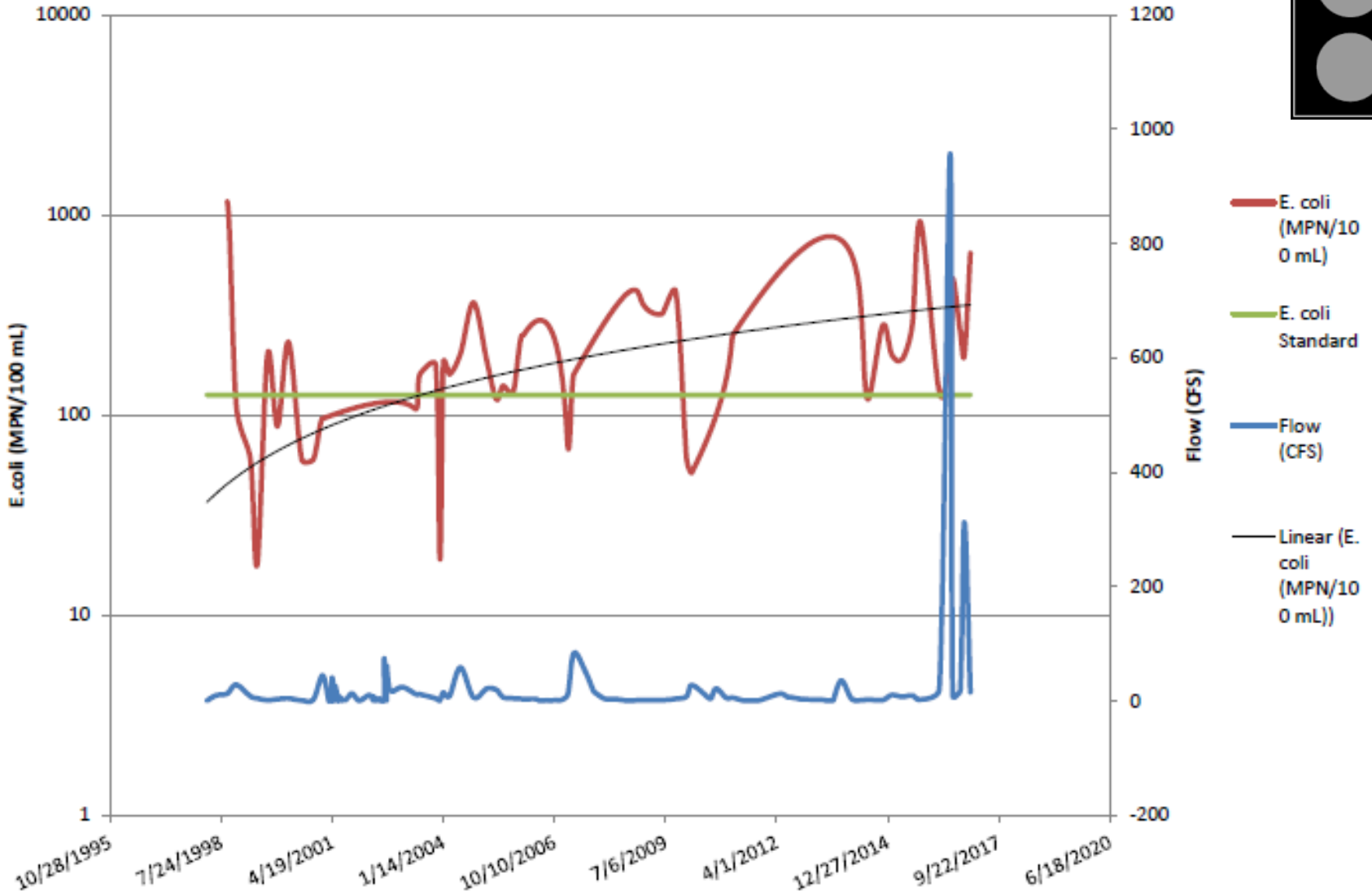
Fecal Coliform at Leeway Cottages (RR 12 Upstream)



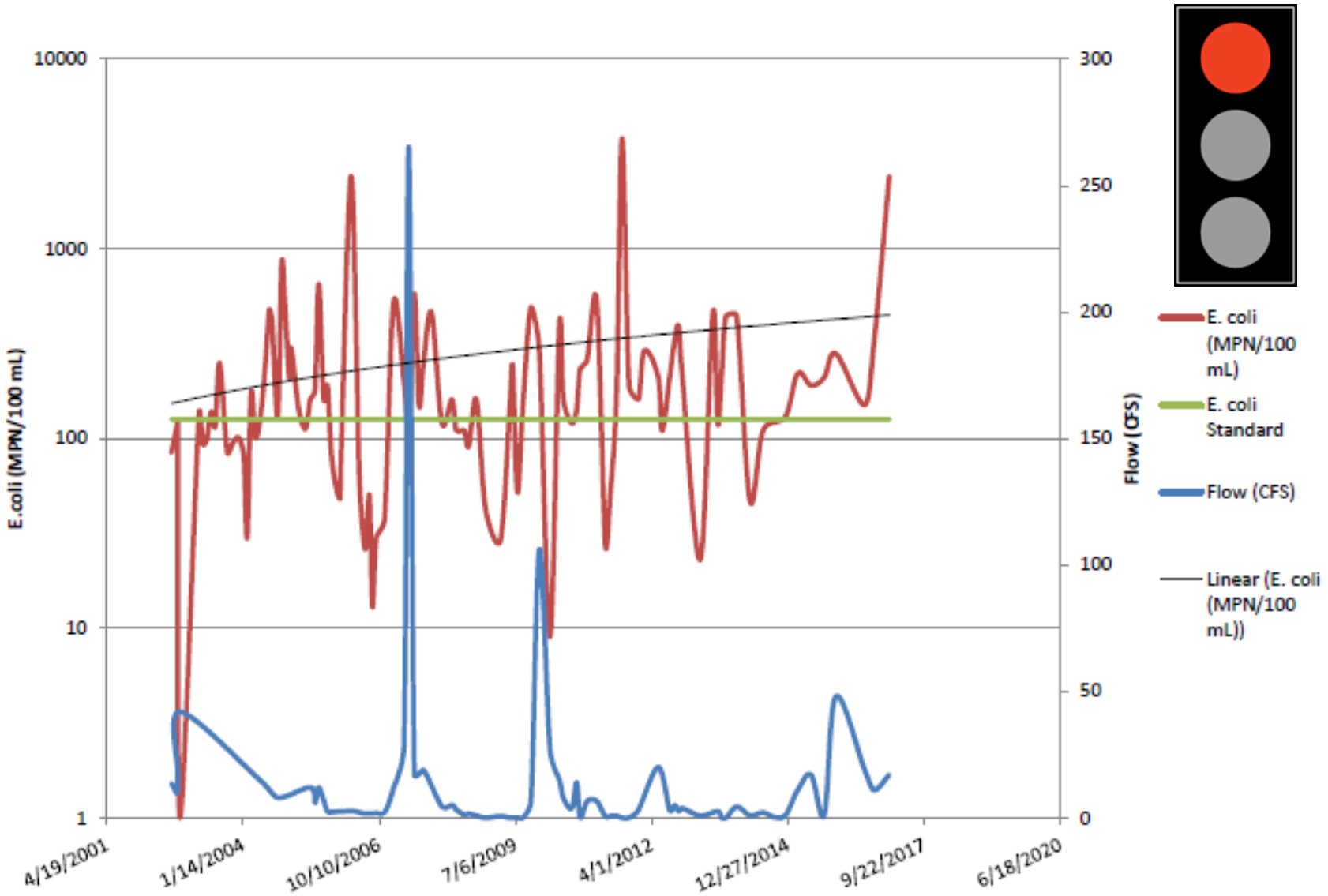
Fecal Coliform at Blue Hole

Fecal Coliform at Downtown Wimberley



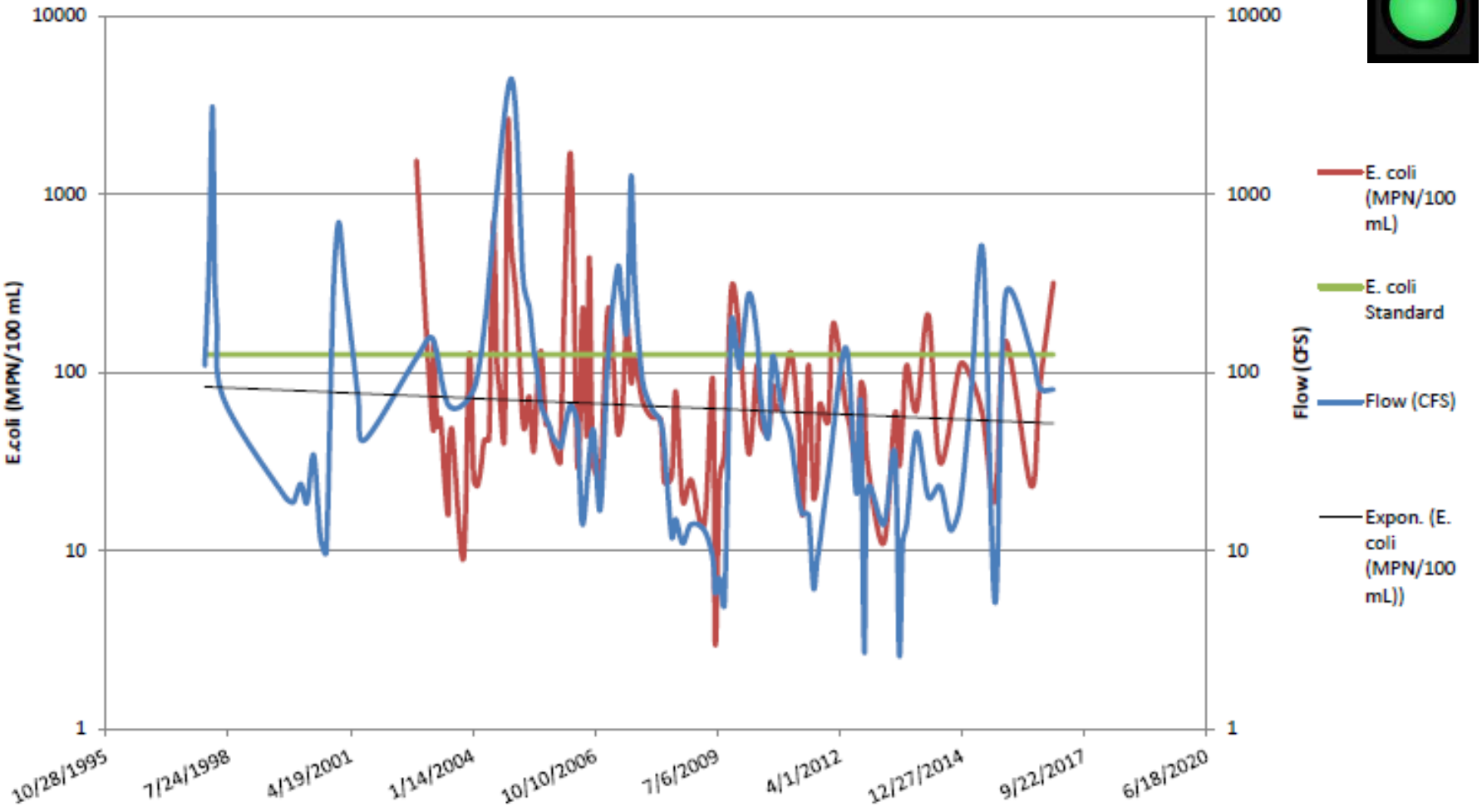


Fecal Coliform at Cypress/Blanco Confluence



Fecal Coliform at RR 12 Bridge

Blanco River



Another Way to Look at the Data

1. Cypress Creek at Jacobs Well (CRP/TST)

This site is at the perennial headwaters of Cypress Creek. The inflow of groundwater highly influences Jacob's Well in terms of water chemistry. The creek continues upstream of Jacobs Well, but this section is usually dry unless there is precipitation. Jacobs Well is an artesian spring. The Well is approximately 3 – 4 m wide and about 13 m deep. At the bottom of Jacobs Well is an entrance to an underwater network of caves that enters into the Hays Trinity Aquifer. The spring flow of Jacobs Well is around 1 – 3 cubic feet per second and is the major source of water in Cypress Creek. The surrounding area contains limestone boulders, and the riparian vegetation consists of cypress, junipers and live oaks. Jacob's Well is part of a nature preserve and interpretive center.

Monitoring samples at Jacob's Well are taken off of the concrete ledge on the well side. Because this is a surface water infusion of a groundwater source, DO data is often low.

UNDERSTANDING THE DATA

This site is also monitored by Texas Stream Team. Please visit their database for their info on this site's parameters.

TST DATABASE FOR THIS SITE

LAST FOUR QUARTERS

CRP Data: Cypress Creek at Jacobs Well				
Date	Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)	Days Since Rain
01/11/17	17	6	4	37
03/28/17	16	6.1	2	17
06/1/17	8.6	5.9	2	1
11/2/17	11	5.7	1	2

SEVEN YEAR GEOMEAN (03/18/10-11/02/17)

CRP Data: Cypress Creek at Jacobs Well		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
7	6.4	5

AVERAGE OF ALL COLLECTED DATA (SINCE 08/08/02)

CRP Data: Cypress Creek at Jacobs Well		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
8	6.0	8

http://www.cypresscreekproject.net/main-water-quality/

6. Cypress Creek at RR12 (CRP)

This site is located approximately one mile north of Wimberley, at the Leeway Cottages on Scudder Ln. The inflow of groundwater highly influences RR12 North in terms of water chemistry. Access to Cypress Creek at Leeway Cottages is private. Monitoring is performed upstream of the RR12 bridge.

UNDERSTANDING THE DATA

LAST FOUR QUARTERS

CRP Data: Cypress Creek at RR12 North				
Date	Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)	Days Since Rain
01/11/17	17	9.3	20	37
03/28/17	16	7.8	22	17
06/01/17	8.6	6.6	52	1
11/02/17	10	6.9	45	2

SEVEN YEAR GEOMEAN (03/18/10-11/02/17)

CRP Data: Cypress Creek at RR12 North		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
7	5.9	60

AVERAGE OF ALL COLLECTED DATA (SINCE 02/27/03)

CRP Data: Cypress Creek at RR12 North		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
7	6.2	80

7. Cypress Creek at Blue Hole (CRP/TST)

This site is located at The Blue Hole, a popular local swimming hole. The inflow of groundwater highly influences Blue Hole in terms of water chemistry. The monitoring location is off of a dock along the creek bank. The water at this site is deep and clear. Cypress trees on both banks shade most of the creek. One side of the creek is a park that receives many visitors, especially during the summer. The other side of the creek is private property, and is undeveloped ranch land.

UNDERSTANDING THE DATA

This site is also monitored by Texas Stream Team. Please visit their database for info on this site's parameters.

TST DATABASE FOR THIS SITE

LAST FOUR QUARTERS

CRP Data: Cypress Creek at Blue Hole				
Date	Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)	Days Since Rain
1/11/17	17	8	64	37
3/28/17	16	7.6	120	17
06/01/17	6.8	6	120	1
11/2/17	10	6.2	130	22

SEVEN YEAR GEOMEAN (03/18/10-11/02/17)

CRP Data: Cypress Creek at Blue Hole		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
7	5.7	50

AVERAGE OF ALL COLLECTED DATA (SINCE 12/27/05)

CRP Data: Cypress Creek at Blue Hole		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
7	5.6	62

http://www.cypresscreekproject.net/main-water-quality/

9. Cypress Creek at RR12 Downtown (CRP/TST)

GBRA monitors this CRP site on Cypress Creek. The site is located at the RR12 bridge in downtown Wimberley. This is monitored on a different schedule than the rest of the CRP sites.

UNDERSTANDING THE DATA

This site is also monitored by Texas Stream Team. Please visit their database for info on this site's parameters.

TST DATABASE FOR THIS SITE

LAST FOUR QUARTERS

CRP Data: Cypress Creek at RR12 Downtown				
Date	Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)	Days Since Rain
01/9/17	14	9.9	650	N/A
05/10/17	10	8.1	120	N/A
08/16/17	1.5	7.1	1000	N/A
10/02/17	6	8.3	240	N/A

SEVEN YEAR GEOMEAN (01/11/10-10/02/17)

CRP Data: Cypress Creek at RR12 Downtown		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
7	8.1	277

AVERAGE OF ALL COLLECTED DATA (03/17/98)

CRP Data: Cypress Creek at RR12 Downtown		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
11	8.4	183

http://www.cypresscreekproject.net/main-water-quality/

11. Cypress Creek at Blanco River (CRP)

This site is located on private property where Cypress Creek enters the Blanco River. Monitoring is done just upstream of the confluence, in the middle of the stream.

UNDERSTANDING THE DATA

LAST FOUR QUARTERS

CRP Data: Cypress Creek at Blanco River				
Date	Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)	Days Since Rain
01/11/17	17	9.7	2400	37
03/28/17	16	8.5	120	17
06/01/17	8.6	8.2	340	1
11/02/17	10	8.9	870	2

SEVEN YEAR GEOMEAN (03/18/10-11/02/17)

CRP Data: Cypress Creek at Blanco River		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
8	8.7	300

AVERAGE OF ALL COLLECTED DATA (08/08/02)

CRP Data: Cypress Creek at Blanco River		
Flow (CFS)	DO (mg/L)	E. coli (MPN/100 mL)
13	8.0	152

http://www.cypresscreekproject.net/main-water-quality/

Trends in Bacteria – Downtown and Blanco Confluence

- *E. coli* values downtown are consistently higher than those upstream
- Data trends show a steady increase in bacteria downtown and at the confluence with the Blanco
- Blanco River *E. coli* concentration are low above Cypress Creek and return to lower levels downstream of the confluence

Bacterial Source Tracking – March 2017

- Submitted proposal to Texas Commission on Environmental Quality in 2015 & Texas Soil and Water Conservation board in 2016 to do BST – not funded

- Coordinated with Plum Creek WPP and Texas A&M to combine BST efforts
  - Secured funding and matched funding from Hays County
  - Quality assurance plans for data collection and analyses
  - Professional secondary analyses

Recent City Bacterial Source Tracking

Limitations included

- Data/analyses for determining sites
- Limited number of sampling locations and events

Would be helpful to have a more robust sampling regime

- Quality assured data and professional analyses to determine sampling locations
- Number of sampling events, sites
- Number of bacteria isolates analyzed
- Type of data collected (birds, bats, pets, humans and other wildlife)

2017 Bacterial Source Tracking - Observations

Excerpt from Cypress Creek BST Final Report Analysis and Recommendations

- Livestock or wildlife were identified as the source for 90% (18 of 20) of the isolates analyzed by SAML using a 7-way ID.
  - While this does not eliminate other sources, it indicates that livestock and wildlife are a substantial source of *E. coli* bacteria present in this reach of Cypress Creek during both dry and wet weather conditions
- This study indicates substantial bacteria loading in Cypress Creek at one or more locations over the approximately ½ mile reach of Cypress Creek studied.
  - Considerable increases in recorded *E. coli* concentrations noted during each sampling event (both wet and dry weather conditions) moving from upstream Site #1 to downstream Site #2
  - Data indicate Site #1 is achieving water quality protective of safe contact recreation during baseflow conditions while *E. coli* concentrations at Site #2 exceeded contact recreation standards during each sampling event
- For more information on this project, please visit the http://www.cypresscreekproject.net/bacterial-source-tracking/

For Thought - Drivers of Water Quality

Declining groundwater levels – lower flows result in worsening water quality

Impacts of drought – lower flows, increased temperatures negatively affect dissolved oxygen and bacteria

Growth, development – increased impervious cover/increased stormwater flows; nonpoint source pollution from homes, cars, businesses; changes in wildlife habitat/patterns; aging infrastructure

Recent CCWPP Efforts

- Contract revision/amendment
  - EPA approved; TCEQ currently reviewing
- Finalizing Monitoring and Data Acquisition QAPP
  - Will begin monitoring surface water and groundwater sites in 2018
- Land conservation prioritization study completed (Phase I)
- Bacterial Source Tracking Study

Recent CCWPP Efforts

- Education and Outreach Activities
  - 6/1/17 TAMU Riparian & Stream Ecosystem Workshop
  - 7/13/17 Blanco River / Onion Creek Water Forum
  - 7/27/17 TWON "Well-Educated" Workshop
  - 10/13/17 Texas A&M AgriLife Extension Service "Healthy Lands and Healthy Waters" Workshop
  - 10/21/17 Rainwater Harvesting Demonstration Workshop
  - 3/3/18 National Center for Appropriate Technology (NCAT) Soil for Water Workshop
  - TST Water Quality Monitoring trainings held and more to be scheduled in Wimberley this spring

Blanco River/Onion Creek Water Forum – Q & A Portion

CCWPP BMPs

- Demonstration BMPs
  - Rainwater cisterns and rain gardens
  - First BMP installed at the Patsy Glenn Refuge as a demonstration workshop on 10/21/17
    - Partners included the Wimberley Birding Society, Hays County Master Naturalists and the Wimberley Valley Watershed Association
    - http://www.cypresscreekproject.net/patsy-glenn-rwh-system
- Biofiltration and Stormwater BMPs coming soon

THANK YOU

Explore Spring Lake | Join Us | Partner Up | Sponsor a Project | Put Us to Work

twitter facebook YouTube Instagram

The Meadows Center
for Water and the Environment
Texas State University

The Meadows Center for Water and the Environment
201 San Marcos Springs Drive | San Marcos, TX. 78666
Ph. 512.249.9200 | meadowscenter@txstate.edu

EXPLORE SPRING LAKE.ORG