



Four Rivers Watershed Watch 2018 Annual Report

Report Prepared by: Maggie Morgan, 270-559-4422, maggie.morgan@jpf.org

Report Period: January 1 to December 31, 2018

Steering Committee

Four River Watershed Watch is directed by a Steering Committee that oversees the activities described below. The Steering Committee meets a minimum of biannually. The committee is open to all volunteers who express an interest in participating. In 2018, the following FRWW volunteers participated on the Steering Committee. Their contributions to FRWW are gratefully acknowledged. The Four Rivers Watershed Watch Steering Committee met on January 11, 2018 to plan activities for the 2018 calendar year and again on October 1, 2018 to plan for the Annual Conference.

Member Name	Email	Role
Angie Hayden	ahayden4@murraystate.edu	Laboratory Manager/Volunteer Support Coordinator
Bobby Lee	bobby.lee@kctcs.edu	Chair
Casey Madole	Caseymadole@gmail.com	Member
Jane Benson	jbenson1@murraystate.edu	Data Manager
Jason Arnold	jason.arnold@kctcs.edu	Vice Chair
Melanie Reason	mreason1203@gmail.com	Member
Mike Kemp	mkemp@murraystate.edu	Science Coordinator
Ray Smith	econut13@att.net	Member
Rhonda Lamb	rlamb@murraystate.edu	Member
Shelly Morris	mmorris@tnc.org	Member
Maggie Morgan	maggie.morgan@jpf.org	Volunteer Support Coordinator

Annual Conference

The 2018 Four Rivers Watershed Watch Annual Conference was held on November 1, 2018 at Murray State University in the Martha Layne Collins Center for Industry and Technology. Twenty four (24) people attended the conference, including volunteers and invited guests. The agenda for the conference included:

- Registration, Welcome, and Dinner
- Volunteer Recognition
- Clayton Creek Focus Study Review and Results to Date
- Four Rivers Watershed Watch Stream Program Data Review
- Four Rivers Watershed Watch Lakes Program Data Review

At the conference, Four Rivers Watershed Watch used the new format for the Annual Data Review Presentations, and presented the 2017 Four Rivers Basin Report to the volunteers. Both were very well received



Four Rivers Watershed Watch 2018 Annual Report

by volunteers. Conference presentations are available on the FRWW Website, Resources Page: <http://4rww.jpj.org/Resources.html>

Training

Four Rivers Watershed Watch held three (3) training events in 2018, including two Phase 1 trainings for the Core Monitoring Program, one Phase 2 training for the Core Monitoring Program, and one training for the Lake Monitoring Program. Ten (10) new volunteers were trained through the Phase 1 Core Monitoring Program, four (4) new volunteers were trained through the Phase 2 Core Monitoring Program, and two (2) volunteers were trained through the Lake Monitoring Program. Phase 1 trainings for the Core Monitoring Program include classroom training using presentations prepared by WWKY and KDOW, distribution of sampling kits, selection of sites, and hands on practice with field chemistry kits. Phase 2 trainings for the Core Monitoring Program include classroom training using presentations prepared by WWKY and KDOW, distribution of sampling kits, and a visit to a nearby stream to practice biological sample collection and habitat assessments. Trainings for the Lake Monitoring Program include presentations prepared by Four Rivers Watershed Watch and approved by KDOW, distribution of sampling kits, selection of sites, and a visit to Kentucky Lake to practice sampling methodologies.

Date	Location	Training Type	Instructor	Attendance
3/9/2018	Murray State University, Murray, KY	Phase 1 and 2, Core Monitoring Program	Rhonda Lamb, Maggie Morgan, Mike Kemp, Shelly Morris	10
4/6/2018	Hancock Biological Station, Murray, KY	Lake Monitoring Program	Maggie Morgan	4
4/28/2018	West Kentucky Community and Technical College, Paducah, KY	Phase 1, Core Monitoring Program	Maggie Morgan	14

Volunteer Monitoring

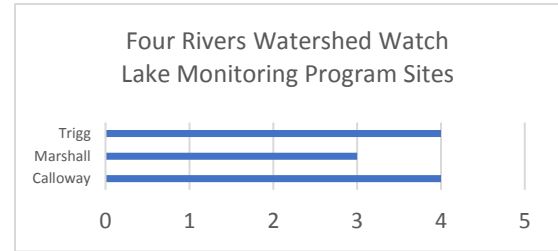
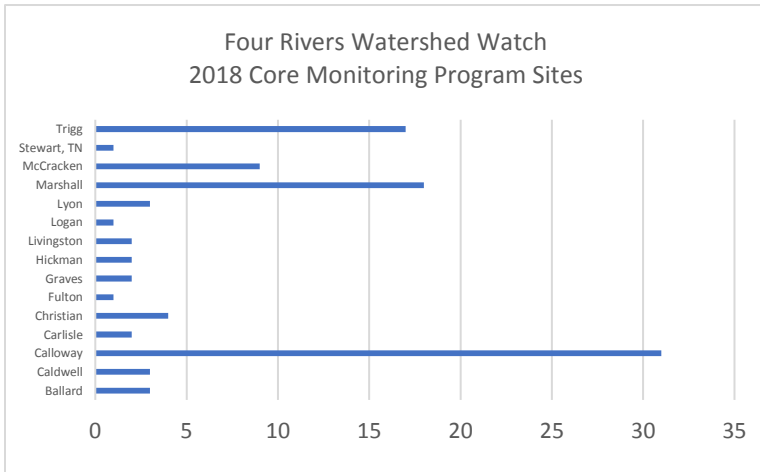
In 2018, the Watershed Watch Data Management Database identified 99 trained active volunteers, 99 active Core Monitoring Program sites, and 11 Lake Monitoring Program sites in the 17 county Four Rivers Region. The site distribution by county is shown on Figure 1.



Figure 1. Four Rivers Watershed Watch sampling sites in 2018.



Four Rivers Watershed Watch 2018 Annual Report



Four Rivers Watershed Watch Core Monitoring Program volunteers collect field chemistry data (dissolved oxygen, pH, conductivity, temperature) and *E. coli* samples in May, July, and September. For volunteers that are trained in the Phase 2 Core Monitoring Program, biological and habitat assessments are performed in May or June. All *E. coli* samples are analyzed at Murray State University’s Hancock Biological Station in Murray, Kentucky using the Colilert method to quantify concentrations as most probably number per 100 milliliters (MPN/100mL). Four Rivers Watershed Watch Lake Monitoring Program volunteers collect secchi depth data and observational data following the schedule defined by the aerial flyover conducted by the Landsat Program. The table below shows the types of data collected, sampling schedule and and the number of samples collected for each monitoring program.

Program	Data Type	Date	# Samples
Core Monitoring Program	E. coli and Field Chemistry	5/17-5/19/2018	53
Lake Monitoring Program	Secchi Depth and Observations	5/6/2018, 5/22/2018	16
Core Monitoring Program	Biological & Habitat Assessments	5/1-6/30/2018	13
Lake Monitoring Program	Secchi Depth and Observations	6/7/2018, 6/23/2018	20
Core Monitoring Program	E. coli and Field Chemistry	7/5-7/7/2018	42
Lake Monitoring Program	Secchi Depth and Observations	7/9/2018, 7/25/2018	17
Lake Monitoring Program	Secchi Depth and Observations	8/10/2018, 8/26/2018	17
Core Monitoring Program	E. coli and Field Chemistry	9/13-9/15/18	38
Lake Monitoring Program	Secchi Depth and Observations	9/11/2018, 9/27/2018	20
Lake Monitoring Program	Secchi Depth and Observations	10/13/2018, 10/29/2018	11

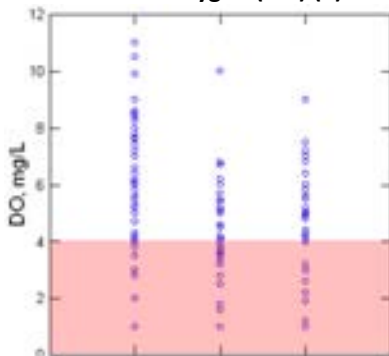
Field chemistry and laboratory results were reviewed and entered into the Watershed Watch Data Portal database (<http://kgs.uky.edu/kgsweb/waterwatch/index.asp>). Results were also made available on the KGS Data Portal (<http://kgs.uky.edu/wwky/main.htm>) and the Four Rivers Watershed Watch website (<http://4rww.jpf.org/FRWWDDataReq.php>). Volunteers were notified that monitoring results were available through these on-line resources at the end of the sampling season at the annual conference. Additionally, volunteers were given a packet at the Annual Conference that contained *E. coli* results for the basin, maps displaying *E. coli* results, and an interpretive document to help them understand their results. Volunteers not present at the Annual Conference had packets with results mailed to them.



Monitoring Results

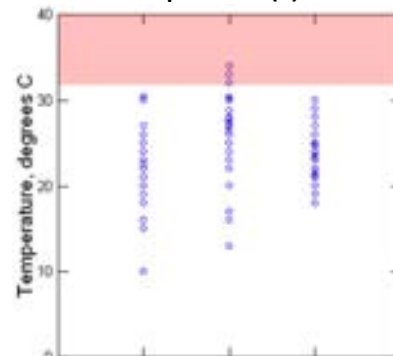
Monitoring results for 2018 are shown on the graphs below. Dissolved oxygen was greater than 4.0 mg/L in 80%, indicating good water quality with respect to dissolved oxygen. In the Four Rivers region, many streams are low gradient, and can experience low oxygen conditions. Water temperature measurements were below 31.7 degrees Celsius 98% of the time, indicating good water quality with respect to temperature. Conductivity measurements were below the benchmark of 400 $\mu\text{S}/\text{cm}$ 98% of the time. The benchmark of 400 $\mu\text{S}/\text{cm}$ was established by the Four Rivers Watershed Watch Science Advisory Team based on results observed throughout the region. pH measurements were within the Kentucky criteria 93% of the time, which requires pH between 6.0 and 9.0.

**2018 FRWW Monitoring Results
Dissolved Oxygen (DO) (1)**



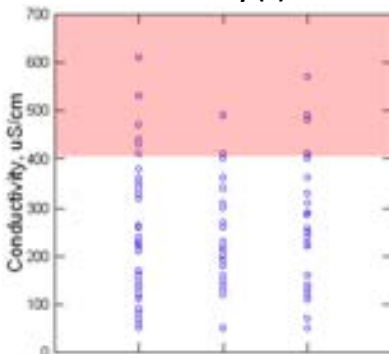
(1) Red shaded area does not meet KY Water Quality Criteria

**2018 FRWW Monitoring Results
Temperature (1)**



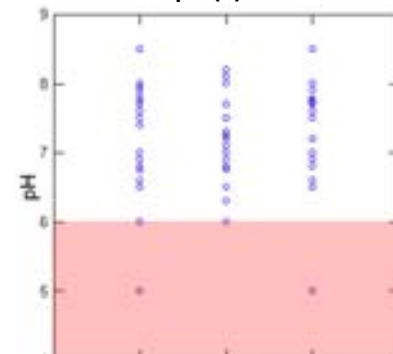
Red shaded area does not meet KY Water Quality Criteria

**2018 FRWW Monitoring Results
Conductivity (1)**



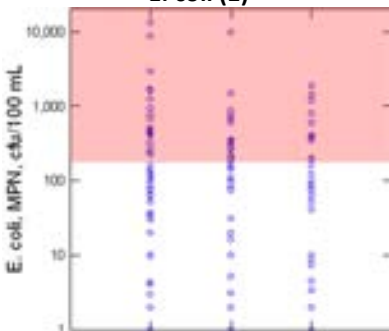
Red shaded area outside Four Rivers conductivity benchmark.

**2018 FRWW Monitoring Results
pH (1)**



Red shaded area does not meet KY Water Quality Criteria

**2018 FRWW Monitoring Results
E. coli (1)**

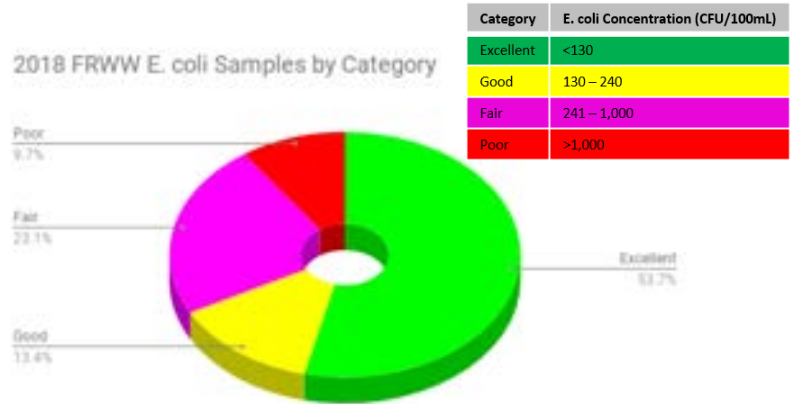


Red shaded area does not meet KY Water Quality Criteria

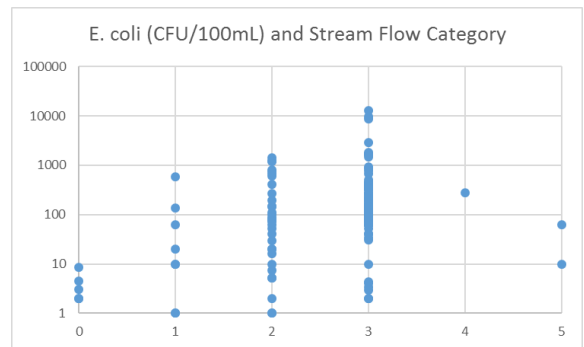


Four Rivers Watershed Watch 2018 Annual Report

Trained FRWW volunteers collected 135 bacteria samples in 2018. E. coli concentrations ranged from less than 1 MPN/100 mL to 12,997 MPN/100 mL. Results were compared to the Kentucky criterion of 130 MPN/100 mL and 240 MPN/100 mL comparison values. The Kentucky criterion of 130 MPN/100mL specifies five (5) samples in a thirty (30) day period. The Kentucky criterion of 240 MPN/100mL is based on 20% of samples taken during a thirty (30) day period not exceeding the value. This high sampling frequency is not possible with FRWW’s current resources, so results are used to indicate where potential problems with E. coli could be.



Eighty six (86) samples had low concentrations of E. coli bacteria (within the excellent and good categories) and 49 samples had high or very high concentrations of E. coli bacteria (within the fair or poor categories). The elevated concentrations occurred in all three sampling events. E. coli results were also compared to the flow, which ranges from 0-5 on a visual scale. Elevated E. coli occurred across a range of flow conditions, but did seem to be more of an issue at higher flow conditions. Elevated bacteria is a common problem throughout Kentucky and affects rural, suburban and urban streams.



Education and Outreach

In 2018, Four Rivers Watershed Watch participated in many education and outreach activities throughout the region:

- April 26, 2018 – volunteers participated in a discussion with the Murray Women’s Club about watersheds, water quality and Four Rivers Watershed Watch.
- April 17 and 18, 2018 – volunteers participated in the Calloway County Middle School Environmental Science Days, including partnering with the Murray State University Watershed Studies Institute to offer a hands on station where students learned about macroinvertebrates, water quality and participated in biological assessments, reaching approximately 200 students.
- April 20 and 21, 2018 – volunteers participated in the Four Rivers Watershed Sustainability Summit at Murray State University in partnership with the City of Murray and the Watershed Studies Institute. On April 20, educational seminars from professionals around the region that are participating in water quality related projects. Additionally, educational booths and exhibits were set up with information about water quality and conservation initiatives



Figure 3. Educational models used by volunteers at various events throughout the year, including the River Lab, Enviroscape and Stormwater Models.



Four Rivers Watershed Watch 2018 Annual Report

locally. On April 21, a litter cleanup event was held in the Damon Creek Watershed. Four Rivers Watershed Watch participated in all events and helped to plan this festival.

- April 26, 2018 – volunteers participated in a field day for St. Mary Elementary in partnership with the Clarks River National Wildlife Refuge. Approximately 50 students learned about water quality and fish.
- April 27, 2018 – volunteers helped to plan a litter cleanup event at Kentucky Dam Village with approximately 50 students from Marshall County High School. Students went throughout the park picking up litter from the shoreline of Kentucky Lake.
- May 18 and 19, 2018 – volunteers set up an educational booth about watersheds, water quality and Four Rivers Watershed Watch at the Lowertown Arts and Music Festival in Paducah, Kentucky in partnership with the Jackson Purchase Foundation.
- June 24, 2018 – volunteers partnered with the Calloway County Conservation District, City of Murray and Jackson Purchase Foundation to plan and host a Rain Barrel Workshop in Murray, Kentucky. Participants were given information about watersheds, runoff pollution and how rain barrels can make a difference. Over 25 participants attended this event.
- July 25, 2018 – volunteers participated in a Green and Healthy Schools Educator workshop, showing teachers how macroinvertebrates are used as indicators of water quality and how to use simple field chemistry kits in classroom settings, reaching approximately 15 educators.
- September 14, 2018 – volunteers took 4H members from Calloway County to different monitoring sites to show them how to conduct field chemistry analyses and biological assessments.
- September 19, 2018 – volunteers showcased a range of educational models with Watershed Studies Institute students, including the Enviroscape (showcasing runoff pollution and land use), the River Lab (showcasing erosion and flooding), and the Stormwater Model (showcasing the impacts of imperviousness on flooding and communities).
- September 27 and 28, 2018 – volunteers set up an educational booth about watersheds, water quality and Four Rivers Watershed Watch at the BBQ on the River Festival in Paducah, Kentucky in partnership with the Jackson Purchase Foundation.
- October 17, 2018 – volunteers participated in a field day for third graders in Marshall County, using the Enviroscape to teach students about how land use affects runoff pollution, reaching approximately 180 students.
- October 18, November 1 and 2, 2018 – volunteers used an Enviroscape to teach Murray Middle School students about how land use affects runoff pollution, reaching approximately 372 students.
- October 30, 2017 – volunteers taught a preschool group about water pollution using the Freddie the Fish lesson, where students introduce a variety of different types of pollution to an environment and describe how their fish feels, reaching 14 students.



Figure 4. Students from Calloway County Middle School participate in Environmental Science Day.



Figure 5. 4H members in Calloway County learn about water quality sampling and biological assessments.

In addition to these activities, Four Rivers Watershed Watch maintains a webpage (www.4rww.jpj.org) and a Facebook page to interact with volunteers and the community (<https://www.facebook.com/FRWSW/>). Volunteers are also mailed schedules and flyers throughout the year to keep them engaged in the program.



Data to Action

In 2018, Four Rivers Watershed Watch selected the Clayton Creek subwatershed in Calloway County as a focus study project.

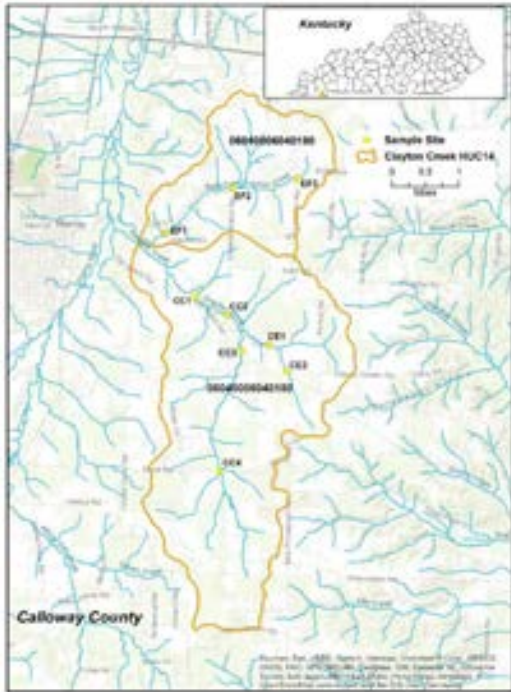


Figure 6. Map of the Clayton Creek subwatershed showing sampling locations.

Four Rivers Watershed Watch volunteers have sampled Clayton Creek and noticed high E. coli for several years. The Clayton Creek subwatershed was also selected as a priority watershed in need of additional BMPs in the Clarks River Watershed Based Plan produced in 2010 by Stand Associates, Inc. In order to implement BMPs in the Clayton Creek subwatershed, additional data collection is needed to better direct those efforts. Through this focus study, a bacteria watershed plan will be developed for the Clayton Creek subwatershed, identifying potential sources of E. coli and best management practices to address those sources. Four Rivers Watershed Watch received a grant from the Test A Racer program at Murray State University to hire an environmental engineering student to work with the Calloway County Watershed Coordinator to conduct sampling in the watershed and develop the data analysis section of the watershed plan. The Calloway County Watershed Coordinator will develop the background and implementation sections of the watershed plan.

In 2018, the Murray State University intern and Calloway County Watershed Coordinator conducted the sampling portion of the planning project, collecting E. coli samples and field chemistry data five times during a thirty day period in May and June, and sampling

monthly for the rest of the primary contact recreation season (July through October), per the Kentucky Water Quality Standards. A Quality Assurance Project Plan was developed by Four Rivers Watershed Watch and approved by the Kentucky Division of Water to direct these sampling efforts. Another Murray State University student is working with the Calloway County Watershed Coordinator to conduct habitat assessments throughout the watershed. We hope to have this watershed plan completed by summer of 2019, and then will work with partners to implement the strategies identified in the plan.

Grants and Financial Information

In 2018, Four Rivers Watershed Watch received a grant from the Virginia Environmental Endowment for \$750 to support volunteer sampling efforts in the region, and a grant from the Test A Racer program at Murray State University for \$5,000 to hire a student intern to work on the Clayton Creek focus study. Additional support was received from the City of Murray (\$1,500) and the Princeton Water and Wastewater Commission (\$300) to support sampling efforts in their respective areas. Support was also received from the Murray Women’s Club and volunteer donations (\$440). In 2018, Four Rivers Watershed Watch held several fundraisers to support our program, including rebate nights at Sirloin Stockade Restaurant in Murray, a cleanup event in Damon Creek Watershed in Calloway County and a Razoo Fundraiser in conjunction with Giving Tuesday, raising a total of \$244.08.

Total income in 2018 was \$8,221.52. Total expenses were \$7,647.25, resulting in a current account balance of \$4,373.12.



Four Rivers Watershed Watch 2018 Annual Report

2019 Plans

In 2019, Four Rivers Watershed Watch will continue our volunteer monitoring program, including participation in the WWKY Core Monitoring Program and the WWKY Lake Monitoring Program. The Four Rivers Watershed Watch Steering Committee will meet in January, 2019 to finalize the schedule and sampling plans for the year. We have tentatively planned for two Phase 1 Core Monitoring Program trainings, one Phase 2 Core Monitoring Program training, and one Lake Monitoring Program training. Core Monitoring Program volunteers will participate in three sampling events in 2019, one in May, one in July and one in September. For volunteers who have been through the Phase 2 Core Monitoring Program training, biological and habitat assessments will be conducted in May or June.

Additionally, Four Rivers Watershed Watch has tentative plans to participate in several educational events, including the Four Rivers Watershed Sustainability Summit, Calloway County Middle School Environmental Science Day programs, an Earth Day event, an educational display at the Lowertown Arts and Music Festival and the BBQ on the River Festival in Paducah, Kentucky, and an educational field day with Mayfield High School students at Kess Creek Park. We anticipate additional educational events throughout the year as opportunities arise.

Four Rivers Watershed Watch has tentatively planned focus study for 2019, looking at E. coli in the Bee Creek subwatershed in Calloway County. This focus study would likely be very similar to the focus study conducted in 2018 for Clayton Creek, collecting E. coli and field chemistry data with the intention of developing another watershed plan to improve water quality. Plans for this focus study will be finalized at the Four Rivers Watershed Watch Steering Committee meeting in January, 2019.

In the fall of 2018, Four Rivers Watershed Watch applied for a grant from the TVA Community Support Fund to support our program in 2019. We received word in November, 2018, that we were selected to receive \$3,900 to support our program in 2019. This funding will be used to support volunteer sampling efforts, including sampling kits and reagents, and sample analyses, and to fund our Bee Creek focus study project. We also anticipate receiving financial assistance from the City of Murray, City of Paducah, and Princeton Water and Wastewater Commission to support sampling efforts in their respective areas. Four Rivers Watershed Watch will hold several fundraisers in 2019 to support our program, including Rebate Nights at local restaurants and a litter cleanup event in Calloway County. Additional funds will be used for educational programs, purchasing supplies and other equipment as needed.