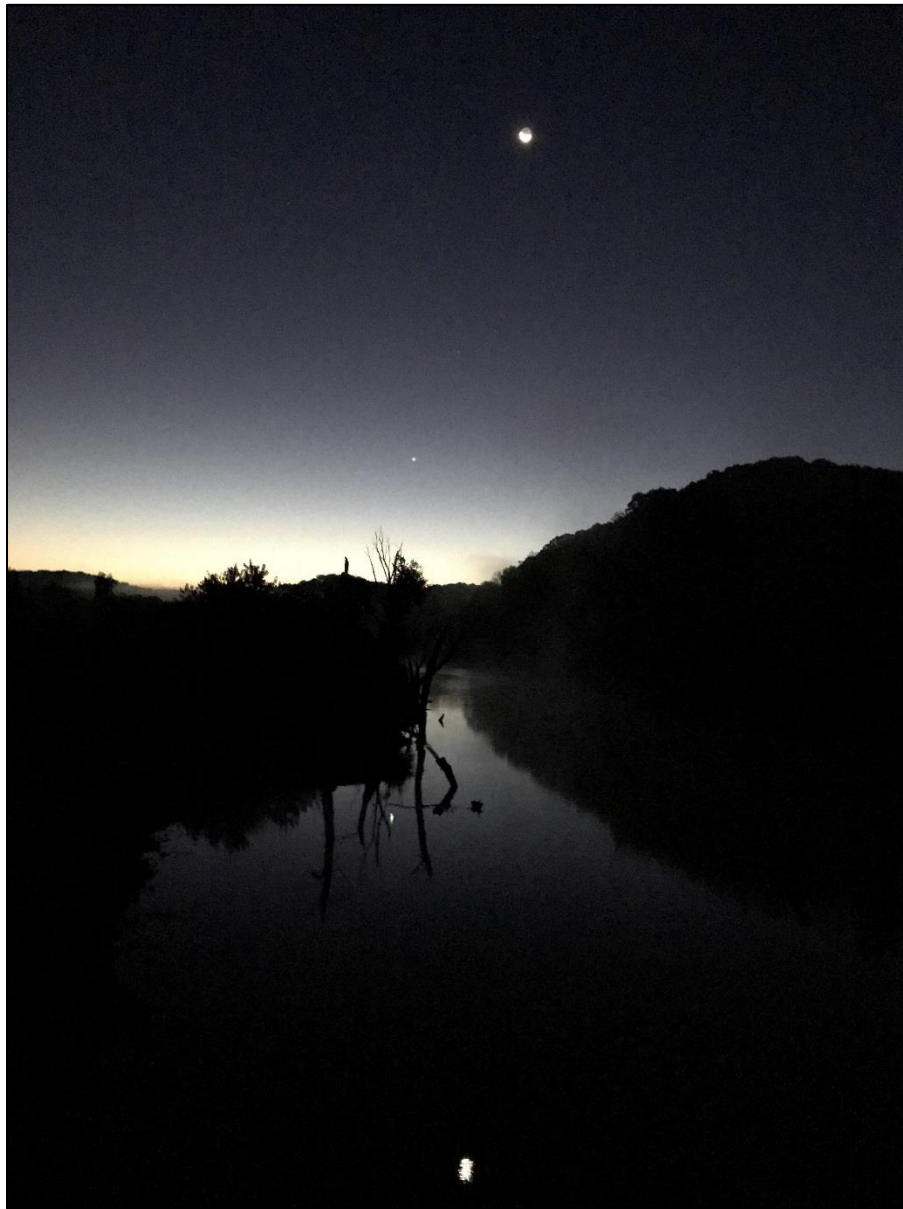


Streams of Boone County 2016-2017 Water Year Summary



Boone County Resource Management
October 31, 2017

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Cover photo: Looking upstream on Bonne Femme Creek from the bridge on S. Rippeto Road near the Missouri River, October 16, 2017, under the light of the moon and Venus

I. Introduction



Gans Creek in Rock Bridge Memorial State Park, January 15, 2016

The Stormwater Team at Boone County Resource Management is excited to deliver this snapshot of activities and information about the Streams of Boone County! This document will be an annual publication, coinciding with the end of the current water year. The water year runs from October 1st through September 30th, and is a useful measure of time to track the quality of our diverse water resources. We hope that this information will be useful to citizens of Boone County and would like to hear feedback from citizens about information to include in future publications. Thank you for reading!

II. Hinkson Creek



Hinkson Creek near Hinkson Creek Recreation Area on the University of Missouri campus,
June 28, 2016

A brief history. Hinkson Creek was placed on the list of impaired waters in 1998 for failure to fully support aquatic life. Under the Federal Clean Water Act, the list is generated by the Missouri Department of Natural Resources (MDNR) every other year and approved by the Missouri Clean Water Commission and the United States Environmental Protection Agency (USEPA). Failure to fully support aquatic life in this context means that the community of macroinvertebrates in the stream does not contain sufficient diversity of organisms, particularly organisms that are intolerant of pollutants in the water. Despite many years of research, MDNR and others have not been able to identify a pollutant in Hinkson Creek that is causing the impairment.

As a pollutant could not be identified, USEPA issued a Total Maximum Daily Load (TMDL) document that identified stormwater as a surrogate for a known pollutant. The TMDL would have

required Boone County, the City of Columbia, and the University of Missouri (PARTNERS) to reduce the loading of stormwater into the creek by approximately 37%. Because of the financial burden that would have accompanied such a massive stormwater reduction, PARTNERS sued the USEPA to have the TMDL rescinded. In 2011, an agreement was reached between USEPA, MDNR and the PARTNERS to settle the lawsuit, and the Hinkson Creek Collaborative Adaptive Management process was implemented.

What is Collaborative Adaptive Management? Collaborative Adaptive Management (CAM) is a process by which stakeholders involved in an issue work to identify and implement strategies for improving that issue. In this case, the issue is the impairment of Hinkson Creek. Strategies range from research to help identify the cause of the impairment to projects designed to reduce the transport of pollutants into the stream. Three groups work together on the CAM process: a stakeholder committee, an action team, and a science team. The process is iterative, so as more information becomes available, that new information informs the process moving forward. Projects that are implemented can discover decision-relevant science or generally improve the health of Hinkson Creek. For more information on CAM participation and processes, please see www.helpthehinkson.org.

Current thoughts about causes of impairment. After many years of scientific research, it has become clear that Hinkson Creek is a very complicated aquatic system and there is no single cause of impairment in the stream. Several key sources of pollution have been identified. There seems to be an overabundance of sediment moving along Hinkson Creek. Sediment is a well-known pollutant and can cause problems for aquatic life including transport of other pollutants (through chemical bonding), turbidity of the water (sediment can scour sensitive gills on macroinvertebrates and fish) and smothering

of habitat on the stream bottom. Recent studies have also pointed to chloride (used as a de-icing agent on roads) and low dissolved oxygen as other factors contributing to the impairment.

Where do we go from here? As the CAM process continues to evolve moving forward, the teams are working on strategies to take additional actions to improve the health of Hinkson Creek. Macroinvertebrate scores from recent sampling events have shown improvement in the upper reaches of Hinkson Creek. Improvement of the lower reaches of Hinkson Creek, in and below the more urban areas in the City of Columbia, is more challenging although some new methods and projects are under consideration. Streambank stabilization projects are being used by the City of Columbia to protect infrastructure in and near the stream. A level spreader project at Forum Nature Center is one approach to reducing sediment inputs into Hinkson Creek by restoring floodplain function. The level spreader is currently being monitored to see how well it is doing at this task. Other projects under consideration include large-scale riparian corridor restoration along the creek and major tributaries. A riparian corridor restoration has many benefits for aquatic life including shading, providing temperature reduction, and slowing down runoff that is moving across the landscape, allowing sediment to drop out before it reaches the stream. Please stay tuned as 2018 promises to be an exciting year for Hinkson Creek and the CAM process!

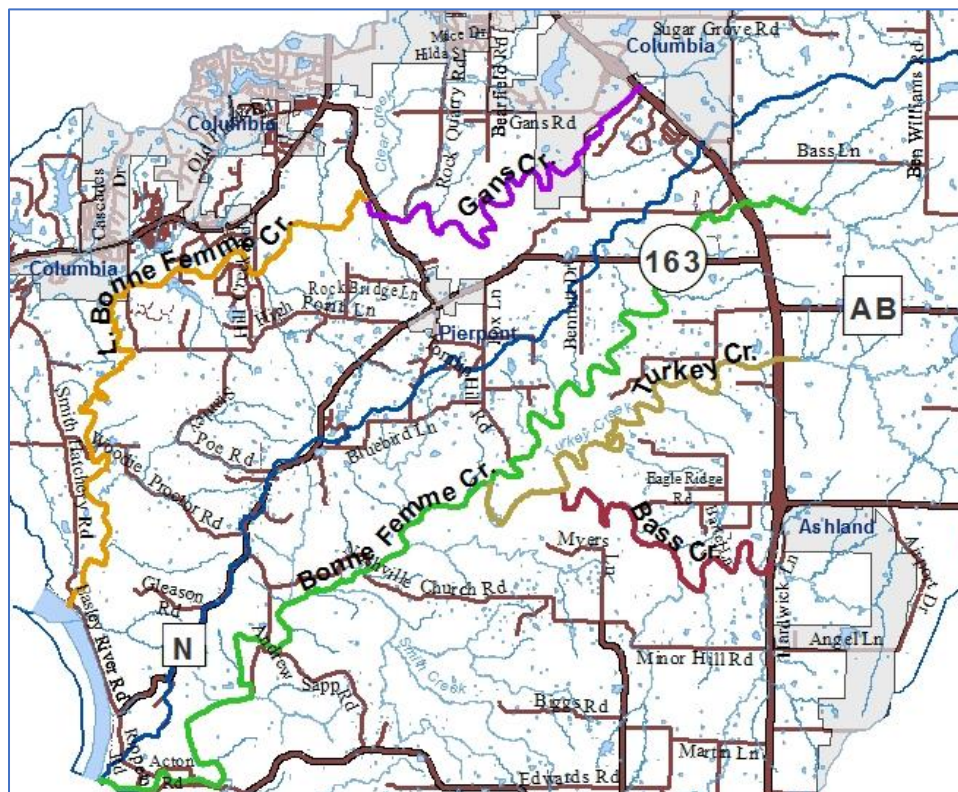
III. Bonne Femme Watershed Project



Little Bonne Femme Creek on the Springbrook Trail in Rock Bridge Memorial State Park, October 14, 2017

What is the Bonne Femme Watershed Project? The Bonne Femme Watershed Project is the revitalization and continuation of several projects from the past that sought to protect and conserve water quality in the Little Bonne Femme and Bonne Femme Watersheds in Boone County. The most recent watershed project, which concluded in 2007, resulted in the Bonne Femme Watershed Plan. The plan may be viewed in its entirety on www.cavewatershed.org . The map below shows much of the watershed with roads marked for reference. The five streams highlighted with bright colors show reaches that are impaired because *E. coli* levels in the water, on average (calculated as a geomean during

the recreational season which runs from April through October of each year), exceed the water quality standards set by USEPA and MDNR.



A map of the Greater Bonne Femme Watershed in Boone County, Missouri.

The impairment in the watershed is of particular concern as several of these streams are classified as outstanding state resource waters, known for clarity and quality of habitat for aquatic life.

Science. Due in large part to the commitment of Dr. Bob Lerch with the United States Department of Agriculture, Agricultural Research Service Unit at the University of Missouri – Columbia, data spanning several decades have been collected in the Greater Bonne Femme Watershed. While these data have not been collected continuously, they offer means to compare water quality in various streams from the late 1990s to present day. After the Technical Advisory Team for the Bonne Femme Water Project was assembled in 2016, a decision was made that Dr. Lerch would resume collecting water quality samples

at ten locations in the watershed during the first four weeks of each calendar quarter. The constituents analyzed for are as follows: Acetochlor, Alachlor, Atrazine, Deethylatrazine, Deisopropylatrazine, Metolachlor, Metribuzin, and Simazine (agricultural chemicals or their breakdown products); Nitrate, Ammonium and Phosphate (nutrients used in agricultural fertilization or found in animal / human waste); *E. coli*. In addition to the work of Dr. Lerch, Boone County recently facilitated the testing of five sites in the watershed for the presence of various chemicals often found in human wastewater. Some of these chemicals were found. The County has also been testing surface waters for heavy metals – this analysis is ongoing.

Education and outreach. Through partnerships with various state and local agencies, Boone County has participated in outreach and education events that focus on water quality and the unique natural resources found in the Greater Bonne Femme Watershed. These events include participation at the Rock Bridge Memorial State Park Water Festival during the summers of 2016 and 2017, and hosting a Water Quality Monitoring Blitz in an around Rock Bridge Memorial State Park using methods established by the Missouri Stream Teams program. A land management workshop is planned for February of 2018. Local and state agency personnel will provide information for landowners in the watershed on topics ranging from establishing pollinator habitat to effective best management practices for reducing nutrients in stormwater runoff.

9-element plan development. To be eligible to receive certain grants for reducing non-point source pollution, the Bonne Femme Watershed Management Plan must be expanded to incorporate the elements of a 9-element plan as laid out by USEPA. The County is currently working with a subcommittee of the Technical Advisory Team of the Bonne Femme Watershed Project and MDNR to determine how best to develop this plan and more information on this topic should be available soon.

IV. Stream Team #4794



Silver Fork Creek as it passes under Highway 63 in northern Boone County, June 19, 2017

Streams surveyed in 2017. The Boone County Stormwater Team actively participates in the Missouri Stream Teams program as Stream Team #4794. In 2017, team #4794 monitored water quality on Bonne Femme Creek, Turkey Creek, Little Bonne Femme Creek, the Devil's Icebox Spring Branch, Silver Fork Creek and Lick Fork, all in Boone County. Streams are monitored for chemical constituents (nutrients) four times per year, and macroinvertebrate sampling is conducted twice per year. These data become part of the larger dataset managed by the Missouri Stream Teams program.

Moving forward. The streams mentioned in this report are only a small fraction of the streams in Boone County. The Stormwater Team looks forward to monitoring additional streams in the future so that we can inform the understanding of water quality county-wide. Additional streams are already on our list to monitor moving forward, and we welcome suggestions for other waterways that may need a closer look or are currently exhibiting high water quality.

V. Concluding remarks



Looking downstream at Turkey Creek from the bridge on Tom Bass Road, October 15, 2017

Clean freshwater is an important resource. We depend upon water for so many things – our survival, recreation, and aesthetic sensibility are all tied to the waters on our landscape. As we develop more of the landscape for housing and urban centers, we need to be conscious of protecting our streams. While the stream buffer and stormwater ordinances in Boone County are specifically designed to protect our waterways, sometimes we see evidence that they may not be enough and are reminded to continue to be vigilant in our efforts.