Citizen Science on Stinking Creek: Community-University Partnerships in Knox County, Kentucky

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Introduction

Beginning in fall 2020, the Lend-A-Hand Center in Walker, Kentucky, in partnership with the UK Appalachian Center, the Kentucky Division of Water, Groundwater Division, the Kentucky Water Resources Research Institute, the Kentucky Riverkeeper, and Kentucky Watershed Watch has conducted a multifaceted project involving surface water testing, tap water testing, community creek cleanups, resource fairs, arts projects, educational demonstrations, and well maintenance demonstrations, bringing together local residents, government agencies, nonprofit organizations, college students, and University units.

Funded through the UK Center for Appalachian Research in Environmental Sciences Community Engagement Project Grant, this project seeks to explore issues relating to water and health in the Stinking Creek watershed of Knox County, focusing on citizen science and educating the public about surface and well water, as well as making connections between pollution, well upkeep, stream health, and human health. The project has involved four day-long cleanup events where community members, partners, and students met at the Center, participated in a series of workshops and activities, and went to nearby streams and removed trash. For each cleanup, approximately two 16 foot trailer loads of trash was collected from the local streams.

During the cleanups, participants were given gift cards and other items for their participation in the event. Participants learned about a number of topics including water quality, water testing, well water contamination, and state and local resources relating to water. Participants were given packets and information from participating water related organizations. The also participated in different environmental arts projects facilitated by Pat Banks, the Kentucky Riverkeeper.

Phase one of the project involved surface and tap water testing for bacteria and trace elements described in further detail below. Phase two of the project focused on well water and providing information and a demonstration project to area residents. After finding concerning levels of barium during the first round of testing, the Center switched over to city water. Further testing on the well was conducted by the Kentucky Division of Water which found concerning levels of Barium, Sodium, and glysophate. A certified well inspector inspected the well finding cracks within the well casing. Based on recommendations we changed the surface covering of the well and re-routed the shutoff valves. We were advised that further treatment to bring the well water up to human health standards would be cost prohibitive (or that a new well would need to be dug without the guarantee of being able to tap into clean water), but we were able to show the process of the testing and well setup and valve structure to demonstrate to the community the importance of well testing and maintenance. We were able to serve as a demonstration project for other well owners in the area and have been able to give referrals to community members who would like their wells tested.

Coliform bacteria was present in the well water and all surface water samples. E. coli was detected in all surface water samples.

Methods

During phase one of the project, water samples were tested for coliform bacteria, Escherichia coli (E. coli), and 20 trace elements: Aluminum (Al), Beryllium (Be), Vanadium (V), Chromium (Cr), Manganese (Mn), Iron (Fe), Cobalt (Co), Nickel (Ni), Copper (Cu), Zinc (Zn), Arsenic (As), Selenium (Se), Strontium (Sr), Molybdenum (Mo), Cadmium (Cd), Antimony (Sb), Barium (Ba), Mercury (Hg), Lead (Pb), and Uranium (U).

Three trace elements samples were taken each from Kinningham Branch, Stinking Creek, and Roaring Fork, all near the Center, as well as one sample each from well water and city water from the main Center building. These samples were stored in coolers and sent to the lab at UK for processing. Sterile blanks were also tested to ensure validity.

The trace elements results showed elevated levels of Aluminum and Barium in the well water, and elevated levels of Manganese in Stinking Creek. The trace elements results also showed slightly elevated levels of Arsenic in the city tap water, Kinningham Branch, Stinking Creek, and Roaring Fork. The biggest health concern from these results is the elevated levels of Barium found in the well water. The presence of Barium in drinking water could have serious effects on human health, especially with long-term ingestion/exposure. Eating or drinking very large amounts of barium compounds that dissolve in water can cause changes in heart rhythm or paralysis in humans. Some people who eat or drink somewhat smaller amounts of barium for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, and muscle weakness.

Two samples from each site were taken to test for coliform bacteria and E. coli using the presence/absence IDEXX Colilert test kit. Samples were mixed with a reactive agent and incubated for 24 hours at 35° C. Sterile blanks were also tested to ensure validity. Samples were compared to a comparator (vial with tinted water). Samples that looked as dark or darker than the comparator indicated the sample was positive for total coliforms. Coliform Bacteria was found in all samples except for the city water. Using a fluorescent viewer, samples were compared with the comparator to check for the presence of E. coli. Samples that appeared yellow/fluorescent under the viewer indicated the presence of E. coli. E. coli was found in all surface water samples. E. coli in drinking water shows the presence of recent fecal contamination and makes anyone who drinks the water more susceptible to pathogens. Diseases acquired from contact with contaminated water can cause gastrointestinal illness, skin, ear, respiratory, eye, neurologic, and wound infections. The most commonly reported symptoms are stomach cramps, diarrhea, nausea, vomiting, and low-grade fever.

Project Goals & Outcomes

Provide environmental health educational opportunities for community members and young people on Stinking Creek.
Offer opportunities for community members to learn about the connections between their watershed and health.
Showcase resources available to the community.

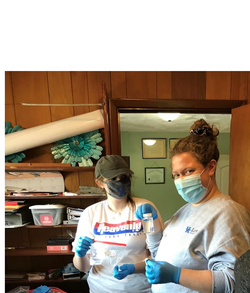
- Hosted four very successful creek cleanup/resource fair events with approximately 45-75 participants each event
- Educated the community and students about a number of environmental health issues including well water maintenance, health and water quality, stream health and macroinvertebrates, trace elements, and water testing methods through presentations and workshops
- Showcased the resources and opportunities from several organizations including the Kentucky Division of Water, Kentucky Water Resources Research Institute, Watershed Watch, and the Kentucky Riverkeeper

Gather data about surface and well water quality on Stinking Creek, promoting citizen science and helping ensure safe water for residents.

- Tested surface water samples from Kinningham Branch, Stinking Creek, and Roaring Fork for coliform bacteria, E. coli, and trace elements, and collated and presented findings to the community
- Tested the Lend-A-Hand Center well through the Kentucky Division of Water, Groundwater Division, setting up a registered well site for future testing, and also finding several areas of concern
- Presented resources and referrals for water testing for Stinking Creek residents
- Presented a demonstration well configuration and information about well remediation to the community

Improve the quality of the Creek and its tributaries and remove possible health and safety hazards by removing trash.

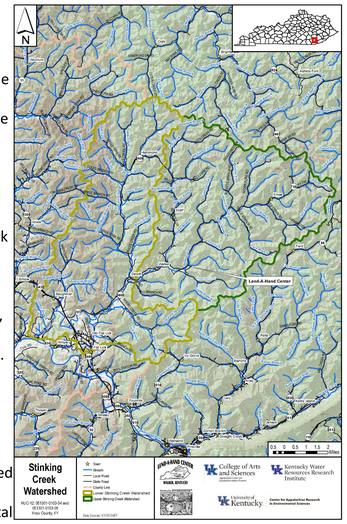
- Collected trailer loads of trash during each cleanup event, removing waste from Roaring Fork and Stinking Creek
- Involved young people showing the importance of not littering or dumping into waterways



Takeaways & Next Steps

- Importance of maintaining and testing your well water. Routine testing is important to ensure health. Citizens with concerns about the quality of water in private wells or springs should contact their local health department or the Groundwater Branch of the Kentucky Division of Water.
- Not drinking surface or spring water because of the possible presence of E. coli and other contaminants that may make the water unsafe to drink. Surface water should be purified before drinking or use in cooking.
- Maintaining your septic tank is also important to prevent bacteria from seeping out of your septic tank and into your water supply. Proper treatment of sewage is vital for the health of our waterways.
- Keeping waterways and roadsides free from trash. Be sure to put litter in its place for the health, safety, and beauty of our community.
- Importance of community-University partnerships. Collaborations between universities, state agencies, nonprofit organizations, and local residents produce meaningful projects that speak to the needs of communities and pool resources and expertise.

The Lend-A-Hand Center and partners have submitted for a third round of the UK-CARES grant to further investigate stream health and promote environmental education in the community.



Partner Organizations

Kentucky RIVERKEEPER®
Kentucky Energy & Environment Cabinet
LEND-A-HAND CENTER WALKER, KENTUCKY
Kentucky Water Resources Research Institute
WATERSHED WATCH IN KENTUCKY Explore. Connect. Protect.
University of Kentucky
Center for Appalachian Research in Environmental Sciences

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