

Want the opportunity to engage your students in citizen science?

Exploring Pathogen Pollution in Our Waters



WEEKS BAY RESERVE



AUBURN UNIVERSITY

ALABAMA AGRICULTURAL EXPERIMENT STATION

Water Resources Center

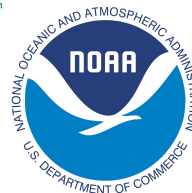


Alabama 4-H
Alabama Cooperative Extension System

Alabama Water Watch



extension
ALABAMA A&M & AUBURN UNIVERSITIES



Who is Alabama Water Watch?

Alabama Water Watch (AWW) is a statewide citizen volunteer, water quality monitoring program with the mission to improve both water quality and water policy through citizen monitoring and action.

Since 1992, AWW has been educating citizens of all backgrounds about the water environment, water pollution, and watershed stewardship. Citizens learn how to conduct water chemistry analysis, bacteriological monitoring, and stream biomonitoring.



900+

Waterbodies
Monitored



8,500+

Volunteer Monitors
Certified



2,400+

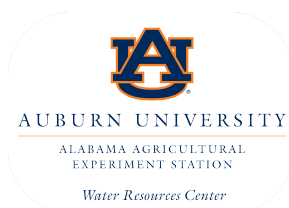
Sites Monitored



99,000+

Data Records
Submitted

AWW uses EPA-approved quality assurance plans for water chemistry and bacteriological monitoring. AWW supports volunteers by providing technical backstopping and tools such as the online Water Data portal that enable citizens to use their data to bring about positive changes in their communities. Examples include influencing water policy, implementing watershed management plans, and educating others, young and old alike.



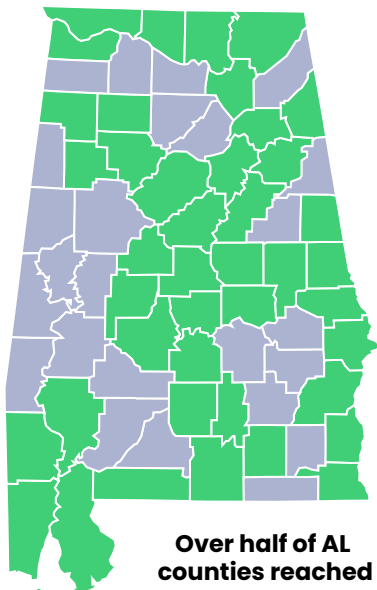
4-H Alabama Water Watch

The Alabama 4-H Program (AL 4-H) is the youth development and education program of the Alabama Cooperative Extension System (ACES). For more than 100 years, AL 4-H has helped young people learn to make decisions, think critically, build relationships, practice leadership, and develop a concern for their community and their world.

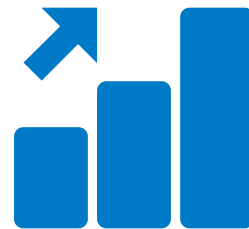


The 4-H Alabama Water Watch Program (4-H AWW) is a result of a partnership between Alabama 4-H and AWW. 4-H AWW prepares educators to teach students about water monitoring and stewardship.

*"Alabama Water Watch has changed my view on what I can do for the environment around me. Now, I feel like I have a way to truly make an impact on the health of my community's ecosystem."
-Senior from Ardmore High School*



35,000+ youth reached by programming since 2014



400+ data records submitted by 4-H AWW Groups

Project Description

Would you like an opportunity to engage your students in citizen science?

The 4-H AL Water Watch Project: Exploring Pathogen Pollution in Our Waters aims to provide formal and informal educators, volunteers, and 4-H agents with the training, materials, and support needed to engage students (ages 9 – 18) in coastal counties of Alabama, with Meaningful Watershed Educational Experiences (MWEEs) focused on understanding, detecting, and mitigating pathogen pollution in local waters.

The project is supported through the National Oceanic and Atmospheric Administration (NOAA) Bay Watershed Education Training (B-WET) Program. The term MWEE is used by NOAA to describe multi-stage activities that include learning both outdoors and in the classroom, and aim to increase the environmental literacy of all participants.

Selected educators will participate in online Professional Development training as well as a Field Day at the Weeks Bay National Estuarine Research Reserve in Fairhope, AL on June 11, 2021. Below are some additional educator benefits:

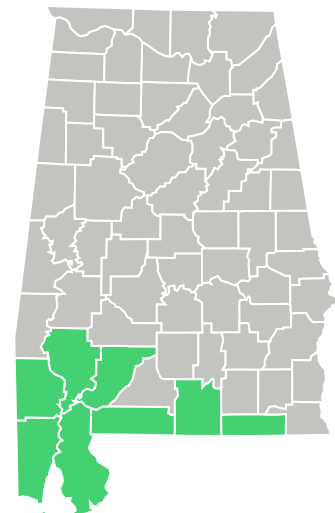
- Food, lodging, and a stipend of \$100 for their participation in the workshop.
- A copy of the project curriculum, Exploring Our Living Streams: Bacteriological Monitoring
- Continuing Education Units through Auburn University and PowerSchool
- Bacteriological monitoring materials and equipment to use with students
- Support from 4-H AWW with student certifications and data entry
- An additional \$400 stipend for completion of project requirements.

This project supports educators as they help students

- Increase their awareness and understanding of watershed issues, including those related to pathogen pollution
- Gain certification as 4-H AWW water monitors
- Cultivate critical thinking skills needed to identify problems related to water quality
- Engage in problem-solving that ultimately improves the health of their local watershed.

The project is limited to these eight counties:

Baldwin // Clarke // Covington // Escambia
Geneva // Mobile // Monroe // Washington



Why is this project important?

Pathogen pollution is one of the most common types of pollution in Alabama, and throughout the world...

- Pathogens are disease-causing microorganisms present in human and animal waste or free living. Most pathogens are viruses, or bacteria, such as *E.coli*.
- According to the EPA, pathogens impair more than over 10,000 waterbodies including more than 1,400 miles of Alabama's streams and rivers.
- Alabama has amazing aquatic resources and the most freshwater biodiversity of all US states.
- Pathogen pollution poses risks to human and aquatic health!

What causes pathogen pollution?

- There are many causes in both rural and urban environments that include discharges of wastewater treatment plants, pet wastes, animal feeding operations, grazing livestock, wildlife, manure fertilizer, and faulty septic or sewage systems.
- In 2016 alone, there were approximately 1,271 reported sewage spills in Alabama, which released between 28.8 and 46.2 million gallons of sewage into waterways.

Sewage overflow can be a cause of pathogens in waterbodies.



AWW volunteer monitor collecting bacteria samples.



What can be done?

- Educating citizens, especially youth, about the threats pathogen pollution pose to human and environmental health and how these threats can be prevented or mitigated is an integral step to improving environmental health.

Project Curriculum

The Exploring Our Living Streams: Bacteriological Monitoring curriculum is the third volume of the AWW Exploring Our Living Streams Curriculum. The original volume of this curriculum series was created by AWW and the Auburn University Department of Curriculum and Teaching in 2005.

The new curriculum uses hands-on lessons to guide students as they answer these questions:

- Why and how do we test water?
- What is the role of bacteria in the environment?
- How do we understand the results from our bacteriological water tests?
- How did pathogen pollution get into our water?
- What can we do about pathogen pollution?
- How can we use water data to clean up our watershed?



Why Test Water – this educational activity demonstrates that just because water appears clean, it could have harmful bacteria in it.



Teach students how land-based activities can pollute our waters.

Project Curriculum

The curriculum guides educators as they take students to a nearby waterbody to conduct bacteriological testing. AWW uses Coliscan Easygel by Micrology Labs to test water for *E. coli*, which is an indicator of fecal contamination. Students will measure air and water temperature, collect, plate, and incubate water samples, and complete the corresponding data form.



Bacteria plates, after incubation. *E. coli* colonies become blue-purple in color and can be counted.



Students will learn to determine the results of the bacteriological tests, which involves counting the number of *E. coli* and general coliform colonies on each plate. *E. coli* colonies display as a blue to purple color when incubated and general coliform colonies are pink to red. Once students count the total number of colonies on each plate, they will learn to calculate the bacterial concentration for a 100 mL sample, and they compare results to Alabama water quality standards.

Students collecting bacteria samples

Alabama Course of Study

The curriculum is correlated to the Alabama Course of Study.

Areas where the curriculum most closely aligns include:

- Grade 4 -8 Science
- Grade 4 -12 Digital Literacy and Computer Science
- Grade 4 - 12 Character Education
- Grades 10 -12 Health Education
- Grades 9 -12 Environmental Science
- Grades 9 -12 Biology

EOLS can also be utilized in a way that contributes to students (Grades 6-12) achieving the Literacy Standards for Science and Technical Subjects.

Alabama Water Watch is a State-Approved Stackable Credential for the Agriculture, Food, and Natural Resources Cluster, specifically for the Environmental and Natural Resources Systems and Aquaculture Programs.

Therefore, it is possible for students who complete AWW certification to list AWW certification on their High School Transcript.



Watershed Stewardship Component

Water monitoring, as promoted by this project, is itself a form of watershed stewardship. However, students will have a more meaningful experience if they can also take part in an action that prevents or mitigates pollution in their local watershed. AWW will support educators as they work with students to identify activities.

Ideas include litter clean ups, creation of educational signage, a social media campaign related to pathogen pollution, or presentations to local officials or citizens. Students will be encouraged to relate their water monitoring to the activity as much as possible.



Helpful tip: Always remember to take BEFORE and AFTER pictures of your stream clean up!



Educational signage is a great way to inform the public about our waters!

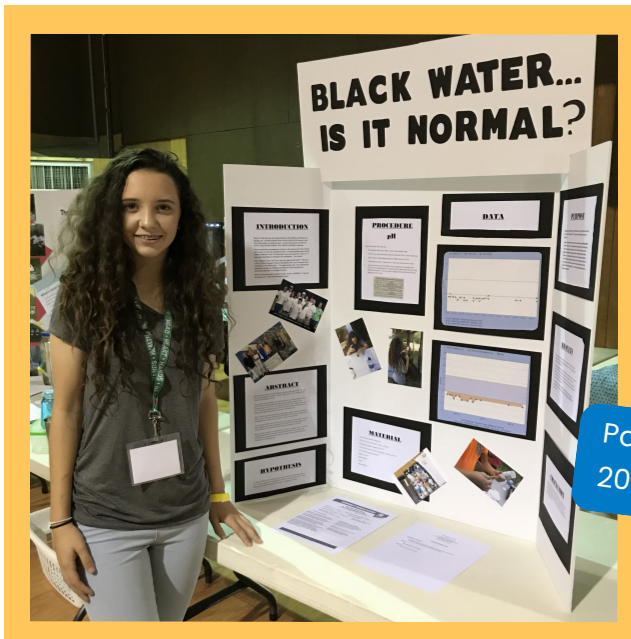


Creek Clean Ups are great ways to improve your watershed.

Student Project Forum

Throughout the school year, educators will guide students as they synthesize knowledge and skills gained through the 4-H AWW lessons and activities including fieldwork and data analysis into a project that addresses a real-life research question related to pathogen pollution.

Each participating school will have the opportunity to nominate a team of 3-5 students for participation in the Student Project Forum, which will take place in May 2022 at the Weeks Bay National Estuarine Research Reserve.



Student teams will make presentations highlighting the pathogen pollution projects they conducted during the year. They will also participate in a field experience focused on local water resources.

Past 4-H AWW Student who won in 2018 4-H Competitive Events Day.

Weeks Bay

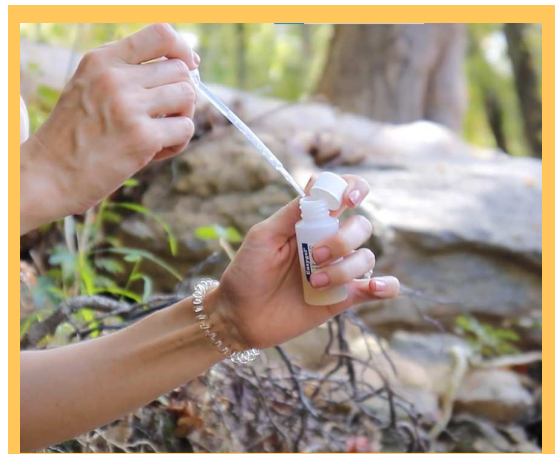


Professional Development

Alabama Water Watch Staff will certify participating educators as Bacteriological Monitors and will teach them to conduct curriculum activities with their students through a combination of an online course, webinars, and small in-person field work sessions. They will work with participating educators to plan for implementing the project with their students in the 2021-2022 school year.



Educators learn to collect, plate, and incubate samples from local waterbodies.



Professional Development Schedule

Project Kick-Off Zoom

Online Bacteriological Monitoring Course Opens
Wednesday, June 2nd from 10am-12pm

Bacteriological Monitoring Zoom Session

Tuesday, June 8th from 9am – 12pm

In-Person Field Day

Weeks Bay National Estuarine Research Reserve in Fairhope, AL
Friday, June 11th from 9am – 5pm



AWW will host periodic Zoom Sessions for participating educators after the initial Professional Development Training to provide updates and additional assistance with the project.

All in-person programming will follow guidelines set forth by Auburn University and the Alabama Cooperative Extension System regarding social distancing and safety with COVID-19.

Description of Project Implementation with Students

Educators will initiate the project with their students at the beginning of the 2021-2022 school year. To complete the minimum number of lessons required of the project, to conduct field work, implement watershed stewardship activity, and support students as they develop their projects, educators should allot at least 20 hours (during or after school). Additional time will be needed for lesson preparation. Educators will teach their students how to conduct bacteriological monitoring at the beginning of the semester. Throughout the remainder of the school year, they will conduct field sampling with their students.

Example Timeline for Project Implementation with Students:

| | |
|------------------|--|
| August | Lesson One // Lesson Two // Lesson Three // Lesson Four |
| September | Conduct Bacteriological Monitoring // Lesson Five |
| October | Conduct Bacteriological Monitoring // Lesson Six // Discuss project Watershed Stewardship Activity |
| November | Lesson Seven |
| December | Break or Supplemental Lesson |
| January | Conduct Bacteriological Monitoring // Lesson Eight |
| February | Conduct Bacteriological Monitoring // Supplemental Lesson // Students continue to work on their projects |
| March | Students present their project posters // Educator selects students to attend the Student Forum |
| April | Implement Watershed Stewardship Activity |
| May | Participate in Student Forum |

Commitment of Participating Educators

Project Participation Requirements

If you are interested in being part of this project, complete the project application at the link below by May 7, 2021. Please note that we will review applications as they are received, and it is possible that all spots may be filled before the deadline.

<http://www.aces.edu/go/exploring-application>

AWW will notify educators who have been selected to participate no later than May 14, 2021.

Selected educators must complete the following to participate:

- Register for professional development workshop in 4-H Online
- Fill out AU Vendor Voucher (to process stipend)
- Complete one-hour online 4-H Volunteer Training
- Complete AWW Professional Development Training
- Create a personal Project Plan prior to the start of the 2021 – 2022 School Year

Project Completion Requirements (to receive full stipend)



4-H AWW Teachers

All of the above, plus:

- Enroll Students in 4-H Online
- Implement Core Lessons with your students
- Engage students in at least four bacteriological monitoring events
- Submit water data to AWW database
- Design and implement watershed stewardship activity with students
- Submit student evaluations
- Complete B-WET National Evaluation Survey