

Columbia STEM Alliance

Design Challenge: Filtration System for Groundwater Runoff



Registration Deadline: March 26th 5:00pm

Submission Deadline: April 9th 5:00pm

Earth's water is always in movement, and the natural water cycle, also known as the hydrologic cycle, describes the continuous movement of water on, above, and below the surface of the Earth. Water is always changing states between liquid, vapor, and ice, with these processes happening in the blink of an eye and over millions of years. Stormwater runoff is water that originates during precipitation events and flows over the land. It can pick up sediment, pollutants, and debris as it moves. The water quality of rivers, streams, lakes and ponds are adversely impacted by contaminated stormwater runoff. Every time it rains, water runs off impermeable surfaces, such as roofs or driveways, collecting pollutants such as particles of dirt, fertilizer, chemicals, oil, garbage, and bacteria along the way. The pollutant-laden water enters storm drains untreated and flows directly to nearby streams and ponds. The US EPA estimates that pollutants carried by rainwater runoff account for 70% of all water pollution. **How can we help reduce the negative impact precipitation has on our lakes and streams when it mixes with pollution on the ground?**

Our Water Cycle Design Challenge invites students to design a filtration system that will prevent various types of pollutants from entering the water system after precipitation events. Once you submit your registration, you are eligible to pick up one of the 30 available kits which includes: 1 bag of soil, 1 bag of sand, 1 bag of gravel, 3-5 coffee filters, 3-5 cotton balls, 1 section of cheesecloth, 1 section of screen, and 1 bottle cut in half.

We ask participants to use these supplies and the engineering design process to plan, design, build, test, and improve your solution to this problem. Participants will be asked to submit a diagram and written explanation of how to build their filter design. This will be used by a STEM Alliance committee member to build and test your filter design.

You can learn more about the water cycle and how to filter out pollutants by going to <https://sites.google.com/como.gov/sustain-edu-water-cycle-stem/home>. Here you will find research related to the water cycle that can help inspire your filtration system.

The contest is free and open to students in Kindergarten through 8th grade. Students will be divided into one of three groups based on age: K-2nd grade, 3rd - 5th grade, and 6th - 8th grade. Please read the rules and guidelines below to ensure your device plans meet all necessary requirements for submission.

Contest Rules and Guidelines:

- **You must register (for the contest) by March 26th at 5:00 pm.**
- An online submission form must be submitted by going to <https://forms.gle/PabYT4KRcguFhahEA>
- Entries must be received by STEM Alliance by 5:00 pm on **April 9th**
- **Only original work will be accepted.**
- **Device Plan Requirements:** Each participant will be asked to submit a sketch and written explanation on how to build their filter design and how it works to the STEM Alliance.
- **Testing Process:** All submitted designs will be tested using the same process...
 - a. A STEM Alliance committee member will test your filter design by building it based on your diagram and written explanation.
 - b. One of the three contaminated water sources (tea water, soil water, cornstarch water) will be randomly chosen and used to test your design's effectiveness.
 - c. Effectiveness will be determined using the chart below.

<u>Criteria</u>	<u>Filter Design Score</u>
How many of the visible particles did your filter remove?	All Some None

Did the filter remove the color from the water?	<p style="text-align: center;">Yes</p> <p style="text-align: center;">No</p>
How long did it take to filter ¼ cup of water?	<p style="text-align: center;">_____seconds</p>

How to submit:

- Upload your sketch with labels and written explanation on our submission form.

Mailing address:

Attn: Craig Adams - Columbia STEM Alliance
5640 Waterfront Dr.
Columbia, Missouri 65202

Judging criteria:

[Rubric Here](#)

Winners:

Winning entries will be awarded using the criteria above. Prizes are outlined below:

- Grand Prize – BEST OVERALL DESIGN – (1 winner) \$25 Gift Card
- First Prize – Best use of recycled materials. (2 winners) \$20 Gift Card
- Second Prize – (3 winners) \$15 Gift Card
- Third Prize – (3 winners) \$10 Gift Card

NOTE: All work submitted for the contest may be used for educational purposes and will become the property of the Office of Sustainability and Columbia STEM Alliance.

Checklist to think through before submitting your work:

- Submit registration information by **March 26th** to receive your materials kit (limited number of kits available)
- Contact us at Craigadams1965@gmail.com for any materials if needed
- Design your device
- Create a device sketch with labels and a written description that tells us exactly how to construct your filter system
- NOTE: Only original work will be accepted
- Submit final artwork by **April 9th**

