Clean Water Challenge

TURBIDITY

Created by The Groundwater Foundation

Event Guide

EVENT
Students will be asked to alter a water sample so that the turbidity of the sample decreases and is within the EPA Drinking Water Standard for turbidity which is 1 NTU.

ROOM SET-UP
Students will be in teams of up to 2 people. Enough space will be needed so that teams are spread throughout the room. A lab station classroom setup would be an ideal space for the event.

It is recommended to designate a few tables "testing stations," allowing teams to approach the testing area when they are ready to test their water sample. All testing stations must have the same testing equipment.

TIMING THE EVENT
Students will have 30 minutes to design and test a method that alters their water sample. Students will have an additional 15 minutes to complete any written work and answer questions about water quality, drinking water standards, and the selected standard (turbidity). The event supervisor will need to keep time. A stop watch or kitchen timer is recommended. It is also helpful to give the students time updates.

TESTING THE SAMPLE
Students may not be familiar with and are not expected to be familiar with the selected testing device. Therefore it is recommended that event supervisors recruit volunteers (judges) to assist and observe students as they test their sample. Once a sample is tested, the measurement should be recorded in ink by the judge or the judge should initial the record (this ensures fairness between teams). Only results recorded or initialed by a judge will count towards the teams final score.

Every team is allowed to test their water sample at least twice during the 30 minute design/build and test phase of the event. Event supervisors may choose to allow for additional tests but this must be stated in the instructions given to the students at the start of the event.

JUDGES
It is recommended that volunteers are recruited to assist running the event. Depending on the number of students participating during each 50 minutes session, one person may find it difficult to manage testing stations, monitor the time, and monitor the room.

Judges should have knowledge about groundwater, water quality, and drinking water standards and should also be familiar with the testing method and equipment used for the event. Judges should not provide feedback, suggestions, or answer questions during the event. Suggested individuals to recruit for event support include USGS hydrologist or hydrogeologist, EPA officials, university/college professors with knowledge of water science or related field, graduate students with studies in water related fields, and extension educators.

SUPPLIES
The event supervisor will need to provide all materials for the event.

<u>Building and Design</u>
Event supervisors will need to decide what materials to provide for the students. These materials will be used to decrease the turbidity of their water sample. Materials that may not be helpful to solve the problem can also be provided. All materials must be identical in type and quantity for each team of students.

Suggested materials

plastic cups	2-liter pop bottle
milk jugs	cotton balls
Screen	coffee filters
nylon hosiery	sponges
rubber bands	scissors
activated charcoal	sand, gravel, and/or clay
paper towels	baking soda
table salt	corn meal
Sugar	alum
graduated cylinder	scale
ruler	syringe
measuring cups	spoons/scoops
cheese cloth, felt, etc	

Water Sample

Water sample can be from a local water source (lake, pond, or river) or can be created with tap water and sand, soil, and/or other organic mater.

Testing Equipment

There are a variety of methods for testing turbidity including use of a turbidity meter, a colorimeter, and a turbidity tube. Since turbidity measurement devices and units of measurement vary, let students know what device or method will be used and what units the device measures in. Do not be discouraged if an electronic testing device cannot be obtained and manual testing methods are used. Observation skills are part of scientific inquiry and their importance should not be overlooked.

Score Sheet

Students will need blank lined paper for recording their process and answers to questions. Event supervisors will need to provide the paper. Suggest using "blue books" or essay exam books or provide staplers as a way to keep student's work together and prevent loose or lost papers.

Writing Utensils

The event supervisor will decide what type of writing utensil to provide pens or pencils or both. Rules indicate students may bring their own writing utensil but it is not required, therefore please make then available.

HELPFUL WEBSITES:

General Drinking Water Information

http://www.groundwater.org/
http://health.usgs.gov/dw_contaminants/
http://pubs.usgs.gov/fs/FS-047-97/
http://capp.water.usgs.gov/GIP/gw_gip/
http://water.usgs.gov/owq/FieldManual/Chapter6/6/7_contents.html
http://ga.water.usgs.gov/edu/characteristics.html
http://www.epa.gov/safewater/mdbp/pdf/turbidity/chap_07.pdf
http://www.epa.gov/volunteer/stream/vms55.html
http://www.epa.gov/safewater/contaminants/index.html
http://www.epa.gov/safewater/standards/html

Clean Water Challenge Sample Quiz

TRUE/FALSE

1. The Safe Drinking Water Act (SDWA) regulates contaminants in public and private drinking water supplies.

2. SDWA gives states the opportunity to set and enforce their own drinking water standards if the standards are at least as strong as the national standards.

3. Secondary drinking water regulations are enforceable guidelines for contaminants that may cause health risks.

4. People who are not healthy as a result of illness, age, or weakened immune systems are more likely to be at risk from certain contaminants.

5. Turbidity is caused by suspended matter or impurities that interfere with the clarity of water.

6. Excessive turbidity can cause water temperature and dissolved oxygen levels to rise.

7. Controlling turbidity is a safeguard against pathogens in drinking water.

MULTIPLE CHOICE

8. Under the SDWA _____ sets the legal limits of the levels of regulated contaminants.
a. Congress
b. Each individual state
c. The Environmental Protection Agency
d. Each public water system

9. The level of a contaminant in drinking water below which there is no known or expected health risk is the _____.
a. Maximum Contaminant Level Goal
b. Maximum Contaminant Level
c. Treatment Technique Level Goal
d. Treatment Technique Level

10. Typical sources of turbidity in drinking water include:
a. Waste discharge
b. Runoff
c. Algae
d. All of the above

[Answers: 1) False 2)True 3) False 4) True 5) True 6) False 7) True 8) C 9) A 10) D]