COOL, CLEAR WATER

Dear Presenter,

This activity is 20 to 25 minute presentation and HANDS-ON lab activity with approximately 24 ten year olds. You must do this activity at home BEFORE you attempt to lead the activity during the water festival.

As each new group of students arrive, introduce yourself, and let the teacher know this is a hands-on lab activity and you will need assistance from him/her. If you do not ask for assistance, the teacher will assume that YOU are the expert and they are the observer. Plan when you will ask the teacher for assistance. Do no hesitate to call the teacher by name and get him/her involved.

As each session begins, introduce yourself to the students. "Good morning, my name is.....and I work for.., I am a ....., or simply I am happy to be here today." Then introduce the topic of the presentation. Each step of this presentation is explained in this packet. These are recommended guidelines and do not have to be followed exactly word for word. However, you may present this material just as written. Feel free to personalize the presentation to suit you.

Thank you for volunteering to present "Cool, Clear Water." Have fun, enjoy yourself and we hope you will consider volunteering again next year.

Big Sioux Water Festival

COOL, CLEAR WATER

MATERIALS LIST
(FOR 6 SESSION WITH 24 STUDENTS PER SESSION)

CONSUMABLES

- Large jar of instant iced tea mix
- 1 ziplock bag of sediment (preference would be for material with a fairly low clay content so that the sediment will settle out quickly)
- Water
- 180 student handouts - "Plant Chance" bookmarker - 1 per student
- Poster tac or masking tape

NON-CONSUMABLES

- 1:500,000 scale map of the state
- 3 - 1 quart clear plastic or glass jars with lids
- 3 small diameter secchi disks (4" - 5" in diameter)
- 3 lengths of string, knotted every 4", tied to the secchi disks
- Bathroom plunger
- Bucket (to store plunger in between uses)
- 3 water columns made from 8-10" diameter PVC pipe, approximately 3' long, sealed on one end
- Stand for water columns
- US EPA's "Citizen Lake Monitoring Program" video (optional)
- Television/VCR (optional)
- Text folder of instructions

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This activity is a hands-on activity. To best explain and supervise this activity you must do it at home BEFORE the actual presentation.

(Background information is provided as a basic overview with both general and specific information. Share this information with the students throughout the lab activity.)

Lakes are much more than places for groundwater, surface water, and precipitation to collect. They also control flooding, provide habitat for fish and wildlife and give us places to swim, boat, and fish. In addition, many people value lakes for their aesthetic appeal.

Each lake is unique in appearance, chemistry, biology, and physical characteristics. Even within lakes, these attributes can vary. For instance, water at the surface of deep lakes may be chemically and biologically different than water at the bottom. In shallow lakes, the differences between top and bottom waters are less.

Moderately deep lakes undergo a natural aging process known as eutrophication. They gradually fill in, becoming ponds, marshes, wetlands, and eventually, forests. Depending on the trophic states (or how biologically productive), lakes can be clear, nutrient-poor and with little life (oligotrophic); murky, nutrient-rich and full of life (eutrophic); or somewhere in between (mesotrophic). How a lake functions and ages is determined in part by its size and volume, how much sunlight it receives, the length of its shoreline and the health of its watershed.

We all want lakes to be healthy, with clean water, good recreational possibilities, plenty of fish and wildlife and no pesky insects or weeds. However, our everyday actions can profoundly affect these fragile aquatic ecosystems, degrading the very qualities that attracted us to them in the first place. For example, nutrients in fertilizers, detergents, failing septic systems, eroding soil and animal waste can cause algae to bloom and aquatic plants to grow and multiply rapidly. Algal blooms can greatly reduce water quality, and too many aquatic plants can clog lakes, interfering with swimming, boating, and other recreational uses. There are many other ways we can affect lakes. By removing dirt and native plants from a shoreline, we can unintentionally encourage erosion or allow non-native plants to take over.

Realistically, few lakes can satisfy all our individual desires. At best, we can strive for a balance - to keep each lake healthy and serve our needs too. There are many ways that people can help lakes that include joining a local lake association, protecting the lake by controlling runoff (minimizing the use of fertilizers, using environmentally friendly garden products and using native plants as buffers around shorelines), becoming a “healthy lake” advocate, and becoming a volunteer lake monitor (people or groups who caretake the lake by water sampling, planting native plants and monitoring turbidity periodically).

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Turbidity is the measure of water clarity or how much light can pass through water. Water clarity is reduced (and turbidity is increased) when there is too much material, such as soil particles, algae, plankton, microbes and other substances, in the water. Excessive turbidity over a period of time can negatively affect fish and other aquatic life by raising the temperature of the water, reducing photosynthesis or aquatic plants which in turn reduces the amount of oxygen available for fish and clogging fish gills.

Lakes and streams all have a level of turbidity that should be monitored to ascertain the health of the water body. Turbidity can be measured by lowering a secchi disk into the water body and immersing it until it's no longer visible. You then measure the depth at which it disappeared; this will determine the amount of turbidity in that water body, thus supplying the information needed to help determine the health of the lake or stream. The greater amount of turbidity, the less likely it is that the lake/stream and its inhabitants are healthy.

VOCABULARY WORDS
(When introducing these words, do not assume the students will already know the meaning of them. You will probably need to explain the meaning)

Algae	aquatic plants (usually microscopic in size) that can grow as single cells or long strands of cells
Eutrophication	the natural physical, chemical, and biological changes that take place as nutrients, organic matter, and sediment are added to a lake. When accelerated by human-caused influences, this process is called cultural eutrophication.
Monitoring	to watch, observe and check especially for a special purpose
Nutrients	something that nourishes or promotes growth and repairs the natural wastage of organic life
Sediment	materials or matter that settles to the bottom
Surface water	water that is on top of the ground
Turbidity	the measure of water clarity or how much light can pass through water

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AREA REQUIREMENTS

- 1 - 8' Table
- Close to a water source
- Source of electricity for TV/VCR

PRE-PREPARATION

Pre-preparation can include any or all of the following

- Check supplies against supply list
- Watch video and pick a place that shows your activity - someone measuring the turbidity of the lake. Mark your time on the VCR so that you can rewind to that section of the tape at the end of each presentation session. You should show no more than 3 minutes of video to the students
- Review background material from presenter packet
- Make 180 "Plant Chance" bookmarkers - bookmarkers are 5 per sheet (will need 36 copies) and will need to be carefully cut apart

PREPARATION - Approximately 1 hour to set up

- Fill each column with water and the additives. Each should be filled with water to approximately 8" from the top. Clear water should be in column 1. Add the sediment to column 2 and the iced tea mix to column 3 (Note: column 3 needs to have enough iced tea mix added to it so that the secchi disk is not visible when dipped in the column). Allow time after adding the soil and tea for the mixtures to "settle" in the columns.
- Affix map to table.
- Partially fill the 3 glass/plastic jars with water. In jar A: only clear water; in jar B - a small amount of soil; in jar C - a small amount of iced tea mix. These jars will be your demonstration models when doing your presentation.

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INTENDED STUDENT OUTCOMES

By completing this activity the students should be able to:

- Identify the steps and process involved in lake and river monitoring
- Understand why algae and other aquatic plants grow in water and determine what levels of turbidity are healthy for a lake
- Understand the effects of sedimentation on a water body.

PROCEDURE

1. Introduce yourself with enthusiasm to your students. Keep in mind when doing the activity that children will be as enthusiastic as you are and will want to discuss their ideas and concepts. Encourage each student to participate.

2. Referring to the map, ask the class to describe where in the state you can find lakes. Be sure to point out that there are both natural and man-made lakes. Ask them if there are a lot of lakes in the state. You should then briefly discuss why lakes are important to the state.

3. Show the video. Have a follow-up discussion about why type of citizen involvement was shown, how they, as a class, could participate in this type of program and what they learned about lake clarity as in indication of water quality in lake.

THE LAB ACTIVITY BEGINS

4. Divide the class into 3 groups. Assign an adult to each group (teacher, parent chaperone, guide, etc.). Group one should stand by Column 1; group two should stand by Column 2; group three should stand by Column 3.

5. Column 1 is clean water. Let several of the students lower one of the small secchi disks into the water. It should be visible all the way to the bottom. Use the glass jar with clean water to demonstrate the clarity to the rest of the class. Explain the circumstances to the class of the lake with clear water. Ask for comments about the health of such a lake. Responses to all the questions and discussions will vary.

6. Column 2 is water with the soil (sediment). Talk briefly about how sediment can enter a lake (through runoff and by other means). Have a few students measure the clarity of the water by dipping a second secchi disk into the column. Water clarity will not be as good a Column 1, but visibility should be fairly good. At this point, pick up the second jar and shake it up. Discuss with the class what happens to the lake by additional water entering it, recreational use (boats, jet skis, and others), wildlife, etc. Set the jar down and allow the sediment to settle back to the bottom. Use the plunger to agitate the sediment in the column. Have the students re-measure the water clarity now. What is the difference in their measurements? Ask for comments about the health of such a lake.

7. Column 3 is water with iced tea mix. This column is a representation of algae or other biological material that can grow in lakes that receive too many nutrients (an example to use is lake land owners over-fertilizing their lawns thus causing fertilizer to runoff and enter the lake). The tea mix should be dark enough so that the disk is no longer visible at the bottom of the column. Use the third jar to mix water and iced tea mix together, to demonstrate what is happening in the column. Have a few students dip the third secchi disk into the column of water and measure the turbidity. After measuring, refer back to the sediment jar and point out how the material in Column 3 does not "settle out" in the lake as it does in Column 2.

8. After completing the hands-on part of the activity, ask the students to reform in a group and be seated. Review the water quality in each "lake" (column). Ask group to identify the ways the water could have ended up as it is in each column (if it were a real lake). Lead a discussion with the class on options of getting involved with a local lake monitoring program.

SET UP FOR NEXT SESSION

- Give students a "Plant Chance" bookmarker. Encourage students to do the experiment at home. This is designed to re-enforce good water being needed to sustain healthy plants and ecosystems.
- Thank everyone for participating, compliment behavior and answer any questions the children may still have.
- Rewind video to the "clip" section

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FINAL CLEAN UP

Approximately 45 minutes

- Replace all instructions and cue cards in folder
- Rinse out each glass jar and thoroughly dry. Place in storage container
- Rinse off and dry plunger and bucket
- Return all unused supplies to storage container
- Empty water columns
- Rewind video and place in storage container
- Place presenter instructions, cue cards and unused student handouts in storage container