2010 National Science Experiment 4-H_2O

18 USC 707

4-H National Youth Science Day
YOUTH WORKSHEETS

As our nation grapples with important environmental issues such as climate change and sustainability, water is at the center of the discussion. For the 2010 4-H National Youth Science Day, 4-H_2O will help youth understand and engage in the important environmental issues our global community faces together, and the opportunities available for a greener tomorrow.

4-H PLEDGE

I pledge my Head to clearer thinking,
my Heart to greater loyalty,
my Hands to larger service,
and my Health to better living,
for my club, my community, my country and my world.

INTRODUCTION

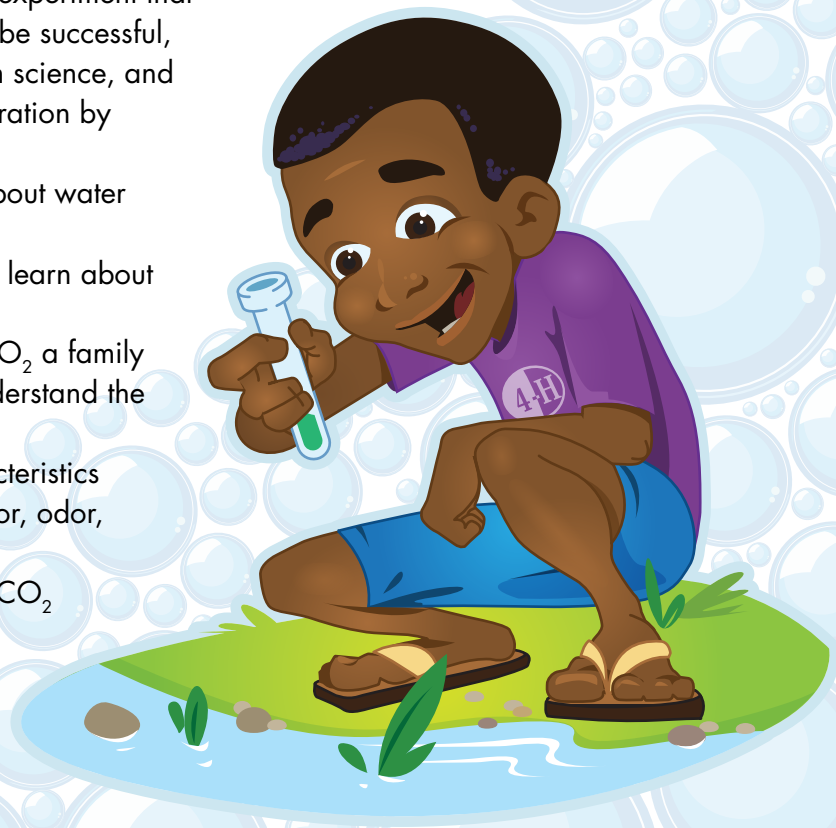
4-H is proud to introduce "4-H_2O," the National Science Experiment that will introduce youth across the nation to water quality and its connection to climate change.

Millions of young people will actively participate in a live demonstration of how carbon dioxide builds up in the atmosphere. They will also learn how increased carbon dioxide levels due to human action have led to global warming, which could raise the earth's temperature to the point where significant changes will take place. Examples include melting polar ice caps, tsunamis, floods, warmer than normal weather, increases in plant growth, and an impact on water quality.

The experiment, designed in conjunction with North Carolina A&T State University Extension and North Carolina 4-H, offers several activities to showcase, at the simplest level, how CO_2 can affect aquatic animals, plants, and other living organisms in lakes, streams, rivers, and oceans. 4-H_2O features a series of interactive activities and discussions to demonstrate the importance of water quality and its relevance to climate change. Using typical chemistry tools, worksheets, online guides, and Web-based demonstrations, the experiment will help youth learn and then connect back to their own lives by encouraging the measurement of their own personal impact on the environment, along with the impact of their families.

OBJECTIVES AND OUTCOMES:

- Youth across the nation will engage in an experiment that is simple enough for even the youngest to be successful, eye-catching enough to increase interest in science, and deep enough to allow for continued exploration by older participants.
- Participants will engage in a discussion about water quality and global climate change.
- Through experimentation, participants will learn about the effect of CO_2 levels on water quality.
- Participants will calculate the amount of CO_2 a family contributes to the atmosphere to better understand the human impact of the carbon footprint.
- Participants will understand the key characteristics used to observe water quality, such as color, odor, aquatic plants, and animals.
- Participants will understand the impact of CO_2 and nutrient runoff on the over-growth of algae in lakes, leading to changes in water quality.



BEFORE YOU BEGIN: SAFETY PRECAUTIONS

As with all science experiment, youth and adults should be cautious while working with the various science materials. In this experiment, youth will be using a solution of 0.04% Bromothymol Blue (BTB).

Facilitators must emphasize that youth should not ingest the solution. As a general safety precaution, youth should wear goggles, aprons and gloves. In the experiment, 4-H participants will blow bubbles into a BTB solution; clear plastic wrap will be used to help prevent the liquid from splashing.

Extracted information from the Material Safety Data Sheet (MSDS) for 0.04% BTB is provided below. A link to the full MSDS report is available at www.4-H.org/NYSD.

Product Identification

Synonyms: 3,3′,-Dibromothymolsulfonphthalein, sodium salt in aqueous solution; Bromothymol Blue 0.04% (w/v) Aqueous pH 6.0 to 7.6
CAS No.: 34722-90-2
Molecular Weight: 646.35
Chemical Formula: C27H27Br2O5SNa
Product Codes: D472

Composition/Information on Ingredients

INGREDIENT	CAS NO	PERCENT	HAZARDOUS
Bromothymol Blue Sodium Salt	34722-90-2	< 1%	No
Water	7732-18-5	> 99%	No

Hazards Identification

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.
Ingestion: Large doses may cause stomach upset.
Skin Contact: Not expected to be a health hazard. May cause slight irritation.
Eye Contact: Splashes may cause irritation.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

First Aid Measures

Inhalation: Not expected to require first aid measures.
Ingestion: If large amounts were swallowed, give water to drink and get medical advice.
Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage, direct sunlight, and freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

Exposure Controls/Personal Protection

Airborne Exposure Limits: None established.
Ventilation System: Not expected to require any special ventilation.
Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.
Skin Protection: Wear protective gloves and clean body-covering clothing.
Eye Protection: Safety glasses.

Disposal Considerations

Dilute with water and flush to sewer if local ordinances allow, otherwise, whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

DO THE EXPERIMENT

How do people increase the amount of CO_2 building up in the atmosphere?

Have you ever thought about how you and your family impact the environment? Get ready to learn about your carbon footprint, which is determined by the amount of CO_2 that is released into the environment from activities such as driving a car. Ultimately, you'll discover how CO_2 builds up and adds to the earth's increasing temperatures.

MATERIALS:

- Two 16 oz or larger clear plastic cups
- 0.04% Bromothymol blue indicator solution (BTB)
- Two packets of effervescent antacid tablets
- 1 flexible straw
- Plastic wrap
- Water
- Eyedroppers for each group or participant
- 3 sandwich-sized plastic bags with zipper seals

TIME REQUIREMENT:

30 minutes total

Part 1: 10 minutes
Part 2: 10 minutes
Worksheet and discussion: 10 minutes

IMPORTANT SAFETY NOTE:
BE SURE TO ONLY BLOW BUBBLES INTO THE LIQUID. AVOID LIQUID GOING INTO YOUR MOUTH. DO NOT DRINK THE LIQUID.

PROCEDURE:

EXPERIMENT PART 1

1. Fill a 16 oz plastic cup half full with water.
2. Using an eyedropper, add 1 dropper full of bromothymol blue solution to the cup. Stir water with one end of the straw. The water will turn a light aquamarine blue color.
3. Tear a piece of plastic wrap to use to cover the top of the cup.
4. Insert the straw into the cup. Cover the top of the cup with the plastic wrap and with the straw sticking out on one side. The plastic wrap helps prevent splashing of the liquid during step 5.
5. Slowly blow bubbles into the cup. As you are blowing, count to 3 and watch what happens to the water that has been dyed blue. Does the water change color?
6. Blow into the liquid again and count until the water changes color again. What color is the liquid now?

Let's try again, this time with more people blowing

1. Fill a new 16 oz cup half full with water.
2. Using eyedropper add 1 dropper full of bromothymol blue solution. Stir water with one end of the straw. The water will turn a light aquamarine blue color.
3. Cover the cup with a piece of plastic wrap leaving several straws sticking out on the sides.
4. Have two or three students slowly blow bubbles into the cup. What happened? Did the color change faster or slower compared to when one person blew bubbles into the cup? Why do you think the blue water turned yellow faster with more people blowing in the cup?

EXPERIMENT PART 2

1. Let's see how CO_2 levels can build up in earth's atmosphere. The sandwich bags will represent the earth's ability to capture greenhouse gases.
2. You will need three plastic sandwich bags and two packets of effervescent antacid tablets for this experiment.
3. Using two packets of effervescent antacid tablets (4 tablets), break one tablet in half. Leave the other three tablets whole.
4. Fill one of the 16 oz cups half full with water. Pour the water into a plastic sandwich bag.
5. Seal the bag so that only a small portion of the zipper is still open and press the air out of the bag.
6. Add the broken ½ tablet to the bag through the small opening (be sure to not let air into the bag). Quickly seal the bag and shake the contents for 3 seconds. Place the bag on the counter and allow it to rest. (Make sure the bag is completely sealed.) The bag will begin to fill with gas from the tablets.
7. Fill the 16 oz cups again half full with water. Add the water to the second plastic sandwich bag.
8. Seal the second bag so that only a small portion of the zipper is still open and press the air out of the bag.
9. Add one whole tablet to the second bag using the same method from step 5. Quickly seal the bag and shake the contents for 3 seconds. Place the bag on the counter and allow it to rest. (Make sure the bag is completely sealed.) The bag will begin to fill with gas from the tablets.
10. Fill the 16 oz cups again half full with water. Add the water to the third plastic sandwich bag.
11. Seal the third bag so that only a small portion of the zipper is still open and press the air out of the bag.
12. Add two tablets to the third bag. Quickly seal the bag and shake the contents for 3 seconds. Place the bag on the counter and allow it to rest. (Make sure the bag is completely sealed.) The bag will begin to fill with gas from the tablets.

13. Observe the bags as the seltzer tablets release the gas. Then, when the tablets finish fizzing, look at the differences in the bag sizes.
14. Each bag will fill with CO_2 gas at different levels. This represents different amounts of CO_2 gas that can be released into the atmosphere based on the carbon footprint. The smaller the carbon footprint (e.g. 1/2 tablet) the less CO_2 released (the less air that fills the bag). The larger the carbon footprint the more CO_2 gas being released (e.g. 2 tablets). The buildup of greenhouse gases leads to increases in temperature.
15. In one 16 oz cup, fill the cup half full of water and add 2 droppers filled with bromothymol blue solution.

    Write down what you think will happen to the solution:

16. Now, add the last ½ tablet to the cup. What Happens? Why?

THINGS TO THINK ABOUT:

Keep notes about the experiment using the questions below (or other questions that come to mind), then login to www.4-H.org to join the discussion.

EXPERIMENT PART 1

What did you observe about the solution?

Which colors were present in the solution?

Did you observe color changes in the solution? The colors you may have seen were blue green, green, and yellow. Why do you think green is one of the colors that you could see before the water turned yellow?

What happened when more than one person blew in the cup?

EXPERIMENT PART 2

What happened when you added the effervescent antacid tablets?

Why do you think the reaction occurred so quickly?

Bromothymol blue is a chemical solution that can detect if something is basic or acidic. If an acid is added to a solution containing bromothymol blue, a yellow color will be produced. If a base is added to a solution containing bromothymol blue, the solution will remain blue. Do you think water with CO_2 is basic or acidic?

Have you discussed in your science class the impact of acid rain?

If high levels of CO_2 are in our atmosphere, do you think CO_2 can also enter water?

CO_2 is a gas that can slowly return to the atmosphere from water. What do you think will happen to the yellow solutions you produced by blowing in CO_2 if you allow the water to sit for a few hours and the CO_2 returns back to the atmosphere?

CALCULATE YOUR CARBON FOOTPRINT

What is *your* carbon footprint?

Calculate the carbon footprint for the "Green Family" by using the information provided below. You can calculate the amount of CO_2 the Green family releases into the atmosphere each year based on car and gas/electricity usage. Then discover your own family's carbon footprint by calculating the CO_2 usage of "The Average Family."

The Average Family:	The Green Family:
Average family car travel 1,000 miles per month	The Green Family travels **1,000 miles per month**
Average gas miles per gallon Traditional car: 13 - 20 miles per gallon Hybrid or energy efficient car: 30 - 40 miles per gallon	The Green Family has one car that is not energy efficient and travels at **18 miles per gallon.** The Green Family has one energy efficient car that travels at **33 miles per gallon.**
Average bus or train rider miles 10 – 30 miles per day	The Green Family does not take the bus or train.
Average family travel from state to state 500 – 1000 miles	The Green Family flew **700 miles last year.**
Average electricity use 500 - 900 kWh	The Green Family uses **750 kWh of electricity in one month.**
Average gas use Summer = 12 - 30 Therms Winter = 50 - 85 Therms	The Green Family on average used **60 Therms of gas in one month.**
Propane Tanks Families can use propane tanks for a variety of purposes, such as powering a gas grill.	The Green Family did not use any propane tanks.

The Green Family Carbon Footprint

Using the data from the table about the Green Family, calculate the family's carbon footprint. Later at home or at www.4-H.org/NYSD, you can calculate your family's carbon footprint.

1. Does your family drive a traditional gas powered car?

If your family has a car or cars that use traditional gasoline and are not considered energy efficient, then your family car or cars will have an average gas mileage of 13 - 20 miles per gallon of gasoline.

The Green Family has one car that is not energy efficient. The family drives 1000 miles per month and the car travels 18 miles per gallon

NUMBER OF CARS		MILES PER MONTH TRAVELED		MONTHS PER YEAR		MILES PER GALLON		POUNDS CO_2 PER GALLON		TOTAL POUNDS OF CO_2 FROM DRIVING PER YEAR
	x		x	12	÷		x	22	=	

2. Does your family drive a hybrid or energy efficient car?

If your family car is an energy-efficient car or a hybrid, on average it can travel longer distances per tank of gas. Most energy-efficient cars or hybrids can travel 30 - 40 miles per gallon of gasoline.

The Green Family has one energy efficient car. The family drives 1000 miles per month and the car travels at 33 miles per gallon

NUMBER OF CARS		MILES PER MONTH TRAVELED		MONTHS PER YEAR		MILES PER GALLON		POUNDS CO_2 PER GALLON		TOTAL POUNDS OF CO_2 FROM DRIVING PER YEAR
	x		x	12	÷		x	22	=	

3. Does your family ride the bus or use the metro/train to travel?

The Green Family does not take the bus or train.

NO. OF FAMILY MEMBERS WHO USE THE BUS/TRAIN		MILES PER DAY TRAVELED		DAYS PER WEEK TRAVELED		WEEKS IN ONE YEAR		POUNDS CO_2 PER MILE		TOTAL POUNDS OF CO_2 FROM BUSSES OR TRIANS PER YEAR
	x		x		x	52	x	0.5	=	

4. Did your family travel by airplane this year?

The Green Family flew a total of 700 miles last year

MILES TRAVELED BY PLANE IN YEAR		POUNDS CO_2 PER MILE		TOTAL POUNDS OF CO_2 FROM AIR TRAVEL PER YEAR
	x	0.9	=	

5. Electricity

If you look at your family's electricity bill you will find the amount of kWh of electricity your family used during the month. The average U.S. family uses between 500 and 900 kWh of electricity per month.

The Green Family uses 750 kWh of electricity in one month.

KWH ELECTRICITY USED IN ONE MONTH		MONTHS PER YEAR		POUNDS CO_2 PER KWH		TOTAL POUNDS OF CO_2 FROM ELECTRICITY PER YEAR
	x	12	x	1.5	=	

6. Using Gas or Electricity for Heat

Most people use gas or electricity to heat their homes. If your family uses gas to heat your home, looking at your family's gas bill will help you determine the exact number of Therms your family used during the month. The average US family that uses gas in their home use 20-30 Therms during the summer and 50-80 Therms during the winter per month. Choose a number for either summer or winter gas use.

The Green Family on average used 60 Therms of gas in one month.

THERMS USED IN ONE MONTH		MONTHS PER YEAR		POUNDS CO_2 PER THERM		TOTAL POUNDS OF CO_2 FROM GAS PER YEAR
	x	12	x	11	=	

7. Propane used for Electricity for Cooking or Heating

Many families use a propane tank to heat an outdoor grill.

The Green Family did not use any propane tanks.

NO. OF PROPANE TANKS		GALLONS IN ONE TANK		POUNDS CO_2 PER GALLNON		TOTAL CO_2 FROM PROPANE PER YEAR
	x		x	13	=	

Add up the total CO_2 produced each year to calculate your family's carbon footprint or CO_2 released by your family's activities. (ADD ALL BLUE BOXES)

TOTAL pounds of CO_2 from my family = _____

Now that you have calculated the carbon footprint for the Green Family you should calculate your own carbon footprint using information for your family.

Things to Think About

- How can you reduce your family's carbon footprint? What are things you can do to help reduce CO_2 or your carbon footprint?
- If we do not reduce CO_2 levels, what will happen to the weather, people, plants, and water on earth?

JOIN THE DISCUSSION

The amount of CO_2 released from common sources

SOURCE	Amount of CO2 Released
Gasoline used for driving	22 pounds CO_2/gallon
Air travel	0.9 pounds CO_2/mile
Mass Transit - buses and trains	0.5 pounds CO_2/mile
Electricity Measured as kilo-Watt Hour (kWh)	1.5 pounds CO_2/kWh
Gas for electricity or heat Measured as a Therm	11 pounds CO_2/Therm
Propane gas for electricity or heat	13 pounds CO_2/gallon

Explain:
Write down some of your notes or go right to 4-H.org to discuss what you think with others.

Elaborate:
Here are some ways you can explore this experiment further:

- Allow one of the cups that you blew CO_2 into and turned the water yellow to stay undisturbed on the table. Observe what happens to the water a few hours later or the next day. Why do you think this happened?

- Try repeating the experiment by adding a few drops of bromothymol blue to water in a cup turning the water light blue. Add a few drops of lemon juice or soda. The solution will turn yellow due to the acid.

Evaluate:
Visit 4-H.org for a fun online resource to see just how much you learned!

To learn more or for a complete FAQ sheet, visit www.4-H.org/NYSD and click on resources under "The Experiment."

EXPAND YOUR LEARNING

The Algae Experiment

The following is an additional experiment that youth can explore following 4-H National Youth Science Day.

Water Quality: Increased CO_2, Temperature, Nutrients, and Algae

Ponds, lakes, and rivers are home to a photosynthetic organism known as algae. Algae are simple aquatic plants that use green chlorophyll, CO_2, H_2O, and sunlight energy from the sun to grow—a process called "photosynthesis."

Most of the time, algae in water are beneficial because they provide oxygen and are a food source for fish and many other animals. You may have visited a lake that appears green or even has a green mat of algae growing on the surface.

During the summer with longer daylight hours, algae growth can increase rapidly. Over-growth of algae is due to a combination of factors, such as increasing light, water temperature, nutrients from fertilizers entering the water, and CO_2.

How does global warming lead to a negative impact on water quality?

1) Increased atmospheric CO_2 levels with sunlight increase algae growth.

2) Increased atmospheric CO_2 increases air and water temperature, also increasing algae growth.

3) Overabundance of algae in lakes causes large mats of algae.

4) Blocked light penetration in water kills algae, plants, and fish.

When algae impair water

Warmer water temperatures due to global warming and nutrients from human use of fertilizers can cause algae to grow faster and for longer periods of time. This upsets the ecosystem balance. When algae over-populate a water system, they will undergo more respiration than photosynthesis.

This will lead to oxygen depletion in the lake. Algae will begin to die and decay. The water will become cloudy and dead algae will collect at the bottom of the lake. Reduced visibility in the lake blocks sunlight from penetrating the water, leading to reduced available oxygen to support aquatic life.

The dead algae will, over time, completely fill in the lake, leading to the death of living organisms in the lake known as eutrophication (pronounced – yoo-tro-fi-ka-shun). If this happens, the lake will no longer be suitable for humans to use for recreation or for animals and plants to live. To learn more, visit **www.4-H.org/NYSD**

Let's see what happens when we create a warm environment with lots of nutrients for algae to grow in water.

MATERIALS

- Water from a nearby lake, river, stream, pond, or tap water*
- Algae culture solution (kit)**
- Markers that can write on plastic bags
- Fertilizer (5 multipurpose plant food pellets or 10 drops of houseplant fertilizer liquid)
- Three plastic sandwich bags
- Three Styrofoam bowls
- Straws
- Eyedroppers

TIME REQUIREMENT

10 - 15 minutes for the experiment plus at least **3-7 days** for the algae to grow.

You'll see the algae growing in approximately three days. Observe and discuss the results approximately one to five weeks after starting the experiment.

* Note: When using tap water, fill a gallon jug with hot tap water and allow it to rest for 24 hours. Cap the bottle after 24 hours and use for the experiment. This will give time for any chlorine in the water to be released from the solution.

** Note: Algae culture solution can be found from natural sources like a pond or a fish tank at a local pet store; they can also be purchased from commercial algae growers. To find an algae supplier, please visit www.4-H.org/NYSD

STEP-BY-STEP INSTRUCTIONS

1. Label three bags with the following: (1) Algae Control, (2) Algae + Fertilizer, and (3) Global Warming.

2. Using the algae solution, swirl the contents and then open the bottle.

3. Add to each of the three plastic bags 1/3 cup of water* and 5 droppers of algae culture. Use the Styrofoam bowls to help hold the plastic bags stable so they will not spill. You may want to do this one bag at a time.

4. Place bag #1 (labeled Algae Control) and the bowl in a sunny location. Do not seal the bag. Use the bowl to hold the bag so it will not spill.

5. Add 5 multipurpose plant food pellets or 10 drops of houseplant fertilizer liquid to bag #2 (labeled Algae + Fertilizer) and bag #3 (labeled Global Warming).

6. Place bag #2 (labeled Algae + Fertilizer) and the bowl in a sunny location. Leave the bag open. (Use the bowl to hold the bag so it will not spill.)

7. For bag #3 (labeled Global Warming), seal the bag leaving only a small opening for the straw.

8. Insert the straw through the opening just enough to blow into the bag like a balloon. This will add additional CO_2 into the bag. Pull out the straw and seal the small opening to trap the CO_2 inside. The bag should look inflated.

9. Make sure the bag is sealed well. Place it in the bowl to hold the bag so it will not spill.

10. Place this bowl and bag in a sunny location with bags #1 and #2. The Global Warming bag (#3) will act like a terrarium or a mini "solar room" because the plastic will be able to trap extra heat from the sun inside the bag. Hence, the bag is like the earth trapping sunlight and heat in the atmosphere.

Special note

You can try different variables with the extra algae water, such as making bags where you vary the amount of fertilizer, the types of fertilizer used, and where you place some of the bags in the dark to see the effect on algae growth.

You can individually try to grow algae from samples that you collect from natural water using the same methods detailed above in the experiment without the need to purchase algae cultures. If you are growing algae from natural water, it's best to do it during the summer months when water temperatures are favorable for natural algae growth.

JUST FOR FUN!

Here are some additional ways to make the most of your experiments. Visit **www.4-H.org/NYSD** for more fun experiments!

Part 1:

- After turning the water with the BTB solution green or yellow by blowing it, do not pour out the water. Let the cups remain still for 24 hours. See what happens to the water the next day. Why do you think this happened?

The Algae Experiment:

- During the summer: Try different types of water samples from your community to see how much algae grow. Add fertilizer and CO_2 to sandwich bags with the water. You can even use water from a fish tank!

- Try this experiment with different types of fertilizer.

- Using sandwich bags fill half full with water, algae culture solution and fertilizer. Place one bag in the dark and place the other in sunlight. See what happens to the algae that does not receive sunlight.

GLOSSARY OF TERMS

Water Quality:
A term that is based upon the characteristics of water in relation to the standards of what is suitable for human consumption and for all usual domestic purposes, including personal hygiene

Carbon Dioxide:
A colorless gas that is a minor component of the Earth's atmosphere, formed in combustion of carbon-containing materials, in fermentation, and in respiration of animals, and used by plants in the photosynthesis.

Oxygen:
A colorless and odorless gas essential to living organisms that convert it to carbon dioxide.

Algae:
Members of a group of mostly aquatic, photosynthetic organisms.

Eutrophication: The gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in an aging aquatic system such as a lake.

Here are 5 easy ways you can conserve water:

1. Don't let the water run while washing dishes. Fill one sink with wash water and the other with rinse water.
2. For cold drinks keep a pitcher of water in the refrigerator instead of running the tap.
3. Wash fruits and vegetables in a pan of water instead of running water from the tap.
4. Shorten your shower by a minute or two and you'll save up to 150 gallons per month.
5. Turn off water faucets tightly after each use.

Did you know?

Facts about water quality and global warming:

- Water vapor (H_2O) and carbon dioxide (CO_2) are among the greenhouse gases responsible for the greenhouse effect. In recent years, environmental pollution with nutrients (especially nitrogen and phosphorus) has become a global problem, particularly the release of sewage effluent and agricultural runoff carrying fertilizers into natural waters.
- America is the largest contributor to global warming — releasing a quarter of the world's carbon dioxide – a major factor in global warming. What's coming from power plants, traffic jams and industrial smog is causing our ozone to disappear, ice caps to melt, and temperatures to rise.

NOTES

NOTES

For more than 100 years, 4-H has been at the forefront of teaching youth about science, engineering, and technology. 4-H National Youth Science Day is an annual event – and is part of 4-H's national *One Million New Scientists. One Million New Ideas.* campaign, with a bold goal of attracting one million new youth to science, engineering, and technology programs by the year 2013.

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This experiment is a joint project of North Carolina 4-H, North Carolina Extension, North Carolina Agricultural & Technical State University, National 4-H Council, 4-H National Headquarters, NIFA, USDA, and the National 4-H Science Management Team.

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North Carolina A&T State University

NC State University A&T State University Cooperative Extension — Empowering People · Providing Solutions

4-H National Headquarters USDA

National 4-H Council

Learn more about 4-H at www.4-H.org or find us on Facebook at www.facebook.com/4-H.

4-H is a community of six million young people across America learning leadership, citizenship, and life skills. National 4-H Council works to advance the 4-H Youth Development movement, building a world in which youth and adults learn, grow and work together as catalysts for positive change. National 4-H Council partners with the Cooperative Extension System of Land-Grant Universities, 4-H National Headquarters located at the National Institute of Food and Agriculture (NIFA) within USDA, communities, and other organizations to provide technical support and training, develop curricula, create model programs and promote positive youth development to fulfill its mission. National 4-H Council also manages National 4-H Youth Conference Center, a full-service conference facility, and National 4-H Supply Service, the authorized agent for items bearing the 4-H Name and Emblem. National 4-H Council is a nonprofit 501(c)(3) organization. National 4-H Council is committed to a policy that all persons shall have equal access to its programs, facilities and employment without regard to race, color, sex, religion, religious creed, ancestry or national origin, age, veteran status, sexual orientation, marital status, disability, physical or mental disability. Mention or display of trademark, proprietary product or firm in text or figures does not constitute an endorsement by National 4-H Council or National 4-H Headquarters and does not imply approval to the exclusion of suitable products or firms.