



When Water Becomes Unusable:

Middle School Food and Agricultural Literacy Curriculum

Precepts

- C. Vision
 - C4. Adapt to opportunities and obstacles
- D. Character
 - D1. Live with integrity

National Standards

- NRS.01.01.01.b. Differentiate between renewable and non-renewable natural resources.
- NRS.02.06.01.a. Identify biogeochemical cycles.
- NRS.02.06.08.b. Describe the impact of pollution on natural resources.
- NL-ENG.K-12.12 – Applying Language Skills
- NS.5-8.2 – Physical Science
- NS.5-8.6 – Science in Personal and Social Perspectives
- NSS-GK-12.5 – Environment and Society

Student Learning Objectives

- As a result of this **unit** the students will...
- Explain the role of clean water in sustaining life.
- As a result of this **lesson** the students will ...
- Explain how water can be a non-renewable resource.

Content Outline

Objective 1. Explain how water can be a non-renewable resource.

I. Review the water cycle

- A. The movement of water from the earth to the atmosphere and back to the earth to renew and refresh water resources found on earth.

II. Review renewable vs. non-renewable resources

- A. Renewable is a resource that can be replenished when used through natural or human process

Time

Instruction time for this lesson: 45 minutes.

Resources

Environmental Protection Agency, Teacher Resources – Water. (1997). Pollution Prevention (P2) Education Toolbox. Retrieved August 9, 2009, from Environmental Protection Agency EPA Links. Web site: <http://www.epa.gov/reg5rcra/wptdiv/p2pages/p2.pdf>

Tools, Equipment, and Supplies

- Overhead or LCD projector
- Five clear cups/jars
- Water
- Chocolate syrup
- Shredded paper
- Oil
- Soil
- Blank 8.5x11" paper – one per student
- Crayons/Marker/Paints – shared for entire class
- MS.NR.3.3.TM.A-F
- MS.NR.3.3.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in ***bold italics***:

Water pollution

1. The definition of renewable is that it is a resource that can be exploited without depletion, because it is constantly replenished. A natural resource is a renewable resource if it is replaced by natural processes at a rate comparable or faster than its rate of consumption by humans. *****Some natural renewable resources such as geothermal power, fresh water, timber, and biomass must be carefully managed to avoid exceeding the world's capacity to replenish them.***
- B. Non-renewable is a resource that cannot be replenished when used through natural or human process
 1. The definition of non-renewable is a natural resource which in terms of human time scale is contained within the earth in a fixed quantity and therefore can be used once only in the foreseeable future, although a non-renewable may be recycled after its first use. This includes fossil fuels and is extended to include mineral resources and sometimes ground water although water and many



Lesson Number: MS.NR.3.3

Middle School Food and Agricultural Literacy Curriculum

When Water Becomes Unusable:

minerals are renewed eventually. The distinction is drawn according to time scale. If a resource will be renewed but only over a geological time span counted in millions of years, it is considered a non-renewable resource.

III. What is water pollution?

- A. The addition of harmful chemicals or substances to water

IV. How is water a non-renewable resource?

- A. When water becomes polluted, it becomes a nonusable resource
- B. When water becomes polluted, the water cycle is not enough to renew and refresh our water resources

Interest Approach

Before students arrive in class, obtain five clear cups, labeling them Cup A through E. Fill the cups as follows: Cup A – mixture of water and chocolate syrup, Cup B – mixture of water and shredded paper, Cup C – mixture of water and soil, Cup D – mixture of water and oil, and Cup E – plain water. Place the five labeled and filled cups at the front of the classroom for students to observe. Students will not know what is mixed in with the water. Use **MS.NR.3.3.TM.A** to aid in instruction via an overhead or writing surface available to display information.

Information can be written on a large poster board or piece of paper prior to class for easy access and instruction. If technology similar to an LCD or a SMART board is available, prepare the following information in presentation software prior to class meeting. This will be lengthy, so ensure enough time is allotted to transfer material. Make sure all students have appropriate writing utensils and paper to collect information discussed during the lesson.

Have you ever thought about what is in the water we consume? At the front of the classroom are five cups of liquid that represent water that you could receive. There are different things mixed with the water.

Reveal **MS.NR.3.3.TM.A**.

The following are tasks we will complete today, each with a different cup of water. When you hear the word GO, write down on a scrap piece of paper which task you would complete with which

cup. You will have one minute to complete this task with a partner, so don't waste too much time! What questions are there? Answer any questions that may come up. Ready? GO.

Depending on the classroom arrangement, you may allow students to get up and observe the cups up close. If the class is too large, make sure you have large glasses so that students can see the cups no matter where they are sitting in their room. If you allow for student movement, adjust time so that students are not rushed through the process. At the end of the time allowed, bring the class's attention back to the front of the room.

So the tasks you had to complete were brushing your teeth, taking a bath, washing clothes, drinking water, and watering your yard. Who will share their decisions with the class?

Allow as many students to give their results as there is time.

Which cup would you have no problem taking a drink out of right now? The majority of groups will probably agree that Cup E is the only water that they would like to do anything with.

Thanks for sharing! Since most of you were unsure of what was in the cups, I do not blame you for being hesitant to use just any cups to brush your teeth or wash your clothes.

Very quickly, let's go over what is in these cups of water and see if you would really want to do the tasks you matched them with. Cup A is actually water mixed with chocolate syrup. Cup B is water mixed with shredded paper. Cup C is water mixed with soil. Cup D is water mixed with oil, and finally Cup E is plain water.

How often do we use water that has foreign substances in it that we do not know about? We may not realize it, but water is an important resource that, if dirty, can lose its main purpose or use. It's a resource that we all too often take for granted. What happens to this water if it becomes unusable? Today we're going to talk about when water becomes a non-renewable resource and how it affects our daily lives. This will be a difficult task to accomplish, so let's prepare our minds today for some interesting and challenging information!



When Water Becomes Unusable:

Summary of Content and Teaching Strategies

Content outline can be found on **MS.NR.3.3.TM.B**. If you would like this to aid in instruction, have an overhead or writing surface available to display information.

Let's learn some background information before we get going. Look at this diagram.

Display **MS.NR.3.3.TM.C**.

Does this look familiar to anyone? If content from MS.NR.3.2 was covered in class, then students should recognize the illustration as the water cycle. If it has not been covered prior to this lesson, please refer to MS.NR.3.2 for instruction of content on the water cycle.

Objective 1. Explain why water is a non-renewable resource

I. Review the water cycle

- A. The movement of water from the earth to the atmosphere and back to the earth to renew and refresh water resources found on earth.

That's right! It's the water cycle! Remember when we talked about the water cycle? Who will tell us in your own words why the water cycle is important?

Allow a few students to explain in their own words the importance of the water cycle.

Thank you for sharing! The water cycle is the movement of water from the earth to the atmosphere, then back to the earth to renew and refresh water resources. The water we saw in the cups today surely needed some renewing, didn't it? You will get a consensus from the class since the majority of the group was not interested in touching anything but Cup E. Do you think the water cycle could completely refresh those cups of water? Wait for answers. Some students will agree, but others will be more hesitant. What would happen if we could not refresh that water through the water cycle? Would that water then become unusable?

II. Review renewable vs. non-renewable resources

- A. Renewable is a resource that can be replenished when used through natural or human process
- B. Non-renewable is a resource that cannot be replenished when used through natural or human process
 - 1. A nonusable resource can also mean it is non-renewable

We commonly consider water to be a renewable resource. Who will, in their own words, share what a renewable resource is? Students should have prior knowledge of renewable/ non-renewable resources from MS.NR.1.1. If MS.NR.1.1 was not delivered to the class, refer to this lesson for content outline and information for instruction. Allow a few students to share what a renewable resource is in their own words.

Great job. When we talked about renewable resources, we said they were resources that can be replenished when used, either through natural or human processes. Who will give me an example of a renewable resource? Have a few students share a few different examples of renewable resources. That's right. Examples we are often familiar with are water, crops, wind, and solar. But let's look at the water in the cups we have here in the classroom today. Would you use any of the water from Cups A through D? Would that water still be considered renewable?

Allow for student input.

Look at these pictures.

Display **MS.NR.3.3.TM.D**.

These pictures are from areas of the world that have water that is not cleaned and filtered like we are so privileged to have. When we see this water, it might often remind us of a resource that we cannot use because it is polluted. Even though water is considered a renewable resource, in situations like these, we often consider them as nonusable.

III. What is water pollution?

- A. The addition of harmful chemicals or substances to water



Lesson Number: MS.NR.3.3

Middle School Food and Agricultural Literacy Curriculum

When Water Becomes Unusable:

Utilize the *Hole-in-One e-Moment®*

So how does water get to the point of being unable to be used or unavailable for human, plant, or animal use?

Referring still to **MS.NR.3.3.TM.D**.

Water that is unclean or has the addition of harmful chemicals or substances is often called polluted. **Water pollution** is a common problem not only in situations like these, but in areas right here in our country.

Display **MS.NR.3.3.TM.E**.

In this picture we see a house with a beautiful lawn. Now close your eyes.

Imagine the picture we just saw was your house. Your parents have asked you to help with yard work this year as a part of your allowance. One of the projects they would like to complete is to fertilize the yard. Fertilizer is food for the grass to grow. You agree and as you fertilize the yard you accidentally spill a whole bag in the front yard. You think nothing about it, pick up as much as you can, and then start the sprinklers when you're done. Open your eyes.

Display **MS.NR.3.3.TM.F**.

Here is a picture of runoff from your yard. That extra fertilizer, instead of making your grass greener and healthier, has actually run off into your sewer system and contaminated the water. Just imagine if this was not only you that experienced this same problem – but several people on your block. Those chemicals that are in the fertilizer are now being forced into the water system and have polluted the local water ways. How could you have handled the situation differently? How could you have changed your actions in dealing with the fertilizer spill to possibly prevent the contaminated runoff?

Allow students to discuss ways that they could have used skills such as teamwork or problem-solving to come up with a better solution to the problem. Once discussion is complete, display **MS.NR.3.3.TM.D** again.

Even though our water does not look like this, we still can have the same issues and concerns that make our water a non-renewable resource.

IV. How does water become an unusable or unavailable resource?

- A. When water becomes polluted.
- B. When water becomes polluted, the water cycle is not enough to renew and refresh our water resources.

So how can water become an unavailable or unusable resource? When water becomes so polluted it becomes nonusable.

Even though water is often considered renewable, there are many things in this world that create **water pollution** causing water to become nonusable. Clean or unpolluted water is important to vitality of communities and it is important to remain aware of how water can become renewable.

Review/Summary

Utilize the *Picasso e-Moment*.

Thinking about water being a renewable resource but pollution can make it either unusable or unavailable for use. If you were an artist, how would you paint the picture for the world to see? Would it be in color or black and white? What would be in the picture? When you hear the word PAINT, take the remainder of today's class time to pictorially illustrate water as a polluted and unusable resource. Think about **water pollution**, the pictures of polluted water runoff from yards, or the pictures from around the globe that showed us examples of water made unusable as a resource.

At this point, advise students about materials, etc. they can use to complete the illustration. Depending on classroom supplies, crayons, markers, paints, or other supplies could be used.

Remember, if you could not say one word to a person but wanted to tell them all about water as a valuable renewable resource, how would you do it? This will be your exit ticket for today. What questions are there?

Answer any questions the students might have.

Great. Ready? PAINT.



When Water Becomes Unusable:

When we started today, we thought of water as only a resource we could consider as renewable. Through the lesson today, we have seen that when water becomes polluted, it not only becomes unusable, but often cannot be renewed or refreshed through such processes as the water cycle. We often take our water for granted. Only by being conscience citizens can we mindfully work toward preventing this pollution and keeping our water as a usable resource. Give your brain a break tonight, but come back tomorrow ready to learn more about **water pollution**!

Application

Extended classroom activity:

Depending on time, allow students to display their pictorial representation from the Picasso e-Moment of water as a non-renewable resource and have students perform a “gallery walk.” This is a great opportunity to showcase what students have worked on, and also have them see how their classmates view water as a non-renewable resource, which could be very different from their views. Have students write comments on sticky-notes about what they like or dislike about the pictures. You could also have students explain or talk about how they came up with their view for their illustration.

FFA activity:

FFA members can perform water quality testing at local water sources to determine if water could be considered unusable based on pollution components near them.

SAE activity:

Research the impact of local farms or local communities on water quality. Determine if water becomes a non-renewable resource because of chemicals or other pollutants.

Evaluation

MS.NR.3.2.ASSESS.A

Answers to Evaluation

1. Water is important because it moves water from the earth to the atmosphere and back to the earth to renew and refresh water resources.
2. A renewable resource is a resource that can be replenished when used through natural or human process. A non-renewable resource is a resource that cannot be replenished when used through natural or human process
3. Water, Solar, Trees, Wind (Answers may vary – only two required)
4. **Water pollution** is the addition of harmful chemicals or substances to water.
5. When water becomes polluted, it can be considered a non-renewable resource. Water can also be considered non-renewable when the water cycle is not enough to renew and refresh our water resources. Water can be made an unavailable or unusable resource that can have a huge impact on human, plant, and animal life. Pollution is the key factor in making water unusable, and lack of conservation methods and overuse/waste can make water unavailable.



Daily Tasks that Need to Be Completed

- **Brush Teeth**
- **Take a Bath**
- **Wash Clothes**
- **Drink**
- **Water Yard**



How does water become a non-renewable resource?

Objective 1. Explain how water can be a non-renewable resource.

I. Review the water cycle

- A. The movement of water from the earth to the atmosphere and back to the earth to renew and refresh water resources found on earth.

II. Review renewable vs. non-renewable resources

- A. Renewable is a resource that can be replenished when used through natural or human process
 - 1. The definition of renewable is that it is a resource that can be exploited without depletion, because it is constantly replenished. A natural resource is a renewable resource if it is replaced by natural processes at a rate comparable or faster than its rate of consumption by humans. **Some natural renewable resources such as geothermal power, fresh water, timber, and biomass must be carefully managed to avoid exceeding the world's capacity to replenish them.
- B. Non-renewable is a resource that cannot be replenished when used through natural or human process
 - 1. The definition of non-renewable is a natural resource which in terms of human time scale is contained within the earth in a fixed quantity and therefore can be used once only in the foreseeable future, although, a non-renewable may be recycled after its first use. This includes fossil fuels and is extended to include mineral resources and sometimes ground water although water and many minerals are renewed eventually. The distinction is drawn according to time scale. If a resource will be renewed but only over a geological time span counted in millions of years, it is considered a non-renewable resource.

III. What is water pollution?

- A. The addition of harmful chemicals or substances to water

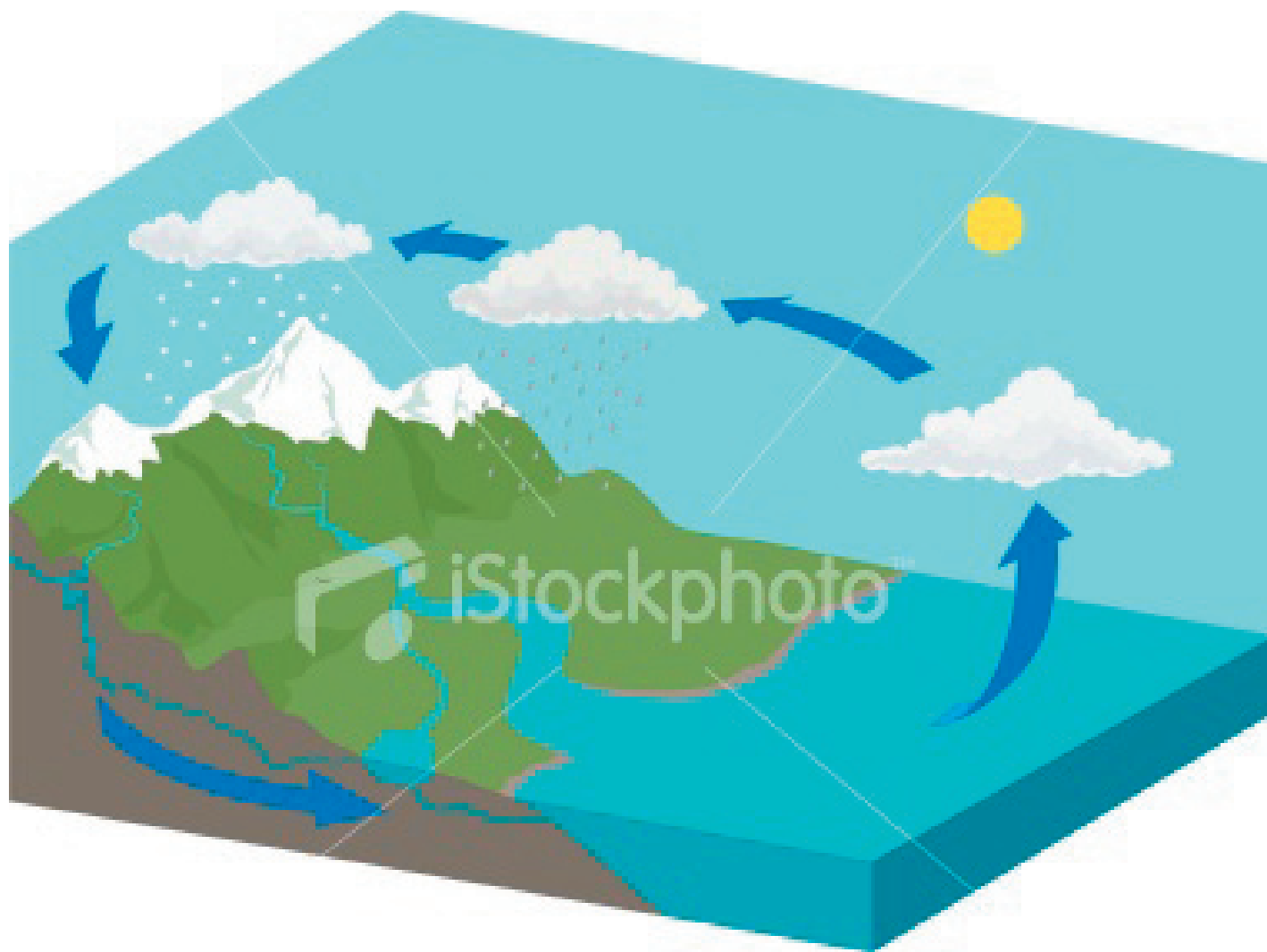
IV. How is water a non-renewable resource?

- A. When water becomes polluted, it becomes a nonusable resource
- B. When water becomes polluted, the water cycle is not enough to renew and refresh our water resources



MS.NR.3.3.TM.C

The Water Cycle: Illustrated



Poor Water Quality around the World





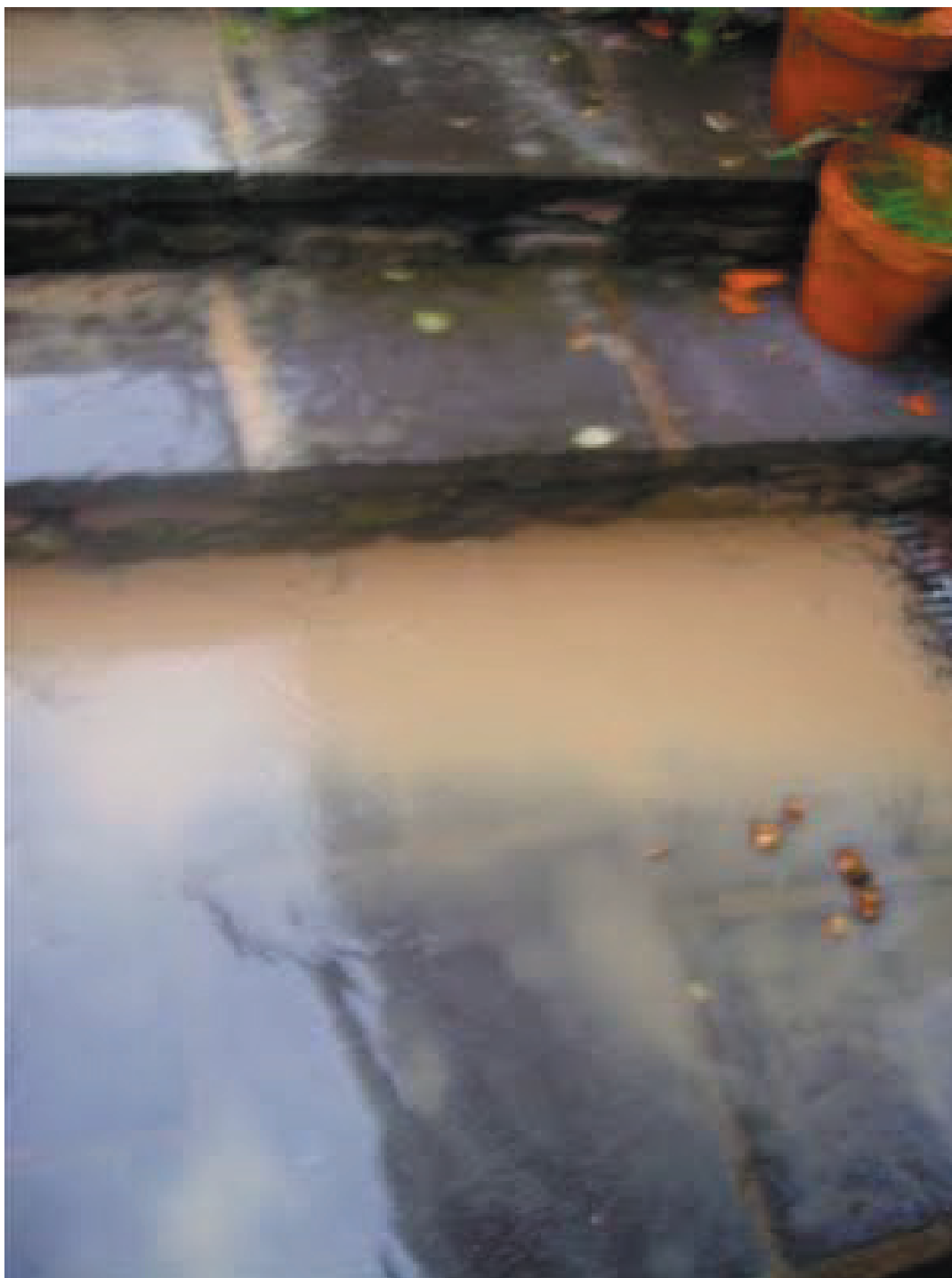
MS.NR.3.3.TM.E

Could this House be Yours?





Contamination Causes This?





Water as a Non-renewable Resource

Name _____

Short Answer

Directions: Answer the following questions in complete sentences.

1. Why is the water cycle important?

2. What is the difference between a renewable and non-renewable resource?

3. What are two examples of a renewable resource?

4. What is water pollution?

5. Explain how water can be considered an unusable resource.
