

Nature Recycles Too!



Do you recycle? Did you know nature does too? In this activity, we will compare how nature recycles with how we recycle and

GRADES
K-4



ISRI
Voice of the Recycling Industry



NEXT GENERATION SCIENCE STANDARDS

- Science and Engineering Practices: Developing and Using Models
- Crosscutting Concepts: Systems and System Models
- Disciplinary Core Idea: K-2-ETS1 Engineering Design
- Disciplinary Core Idea: LS2.A Interdependent Relationships in Ecosystems



PREPARE

Time required: 2 class periods, plus time for recording data over the course of one to two weeks

- Make copies of the student data sheet and the Nature Recycles a Tree handout for each student.
- Gather materials (see activity pages). Note that students will be designing an experiment, so there may be additional materials required.



MOTIVATE

- Ask students what a cycle is. Ask them to name some cycles they have heard of (life cycle, rock cycle, recycle, water cycle).
- Explain that there are many cycles in nature. A cycle is one type of system that starts and ends in the same place. A system has many different parts that work together to make it function or work. In this lesson you are going to focus on system we find in nature - how nature recycles a tree and a system humans have created - how humans recycle other materials. We'll see how these two systems are similar and different.
- Show students a picture of a tree and then a picture of soil (see activity pages). Ask students how they think the tree became soil. Then show them a picture of a plastic bottle and a plastic toy. Ask them how the bottle became the toy. Accept several ideas.



Part 1: Observe

- For this first part, you will need to find at least one piece of decomposing wood for students to observe. If you cannot find this on school property, you can bring in an example from another location. If you do this, you will need to place the log into a container so any decomposers stay with the log. You can also leave a piece of firewood or a large branch outside for a week or two before the activity begins, and it should attract decomposers. Place the log in a shady spot, near other trees if possible, and keep it moist.
- The log observation is best done outside, even if you bring a log from somewhere else. If you are looking at only one log, divide students into groups and have them take turns observing the log. It works best if groups cycle through so that they each have a few chances to observe and record what they see.
- After students have a chance to observe the log, turn it over so they can see underneath it. This is where you will find the best evidence of decomposers, as well as the bugs that feed on them.
- There are many kinds of decomposers. The images on page 8, *Nature Recycles a Tree*, shows some decomposers, such as fungus, lichen, and bugs such as sow bugs and carpenter ants. The specific decomposers on your logs will depend on where you are and even what kind of log it is. Although you do not need to know every specific decomposer, it is helpful to recognize some basic kinds to expect in your area. Note that you may also find bugs and insects that feed on the decomposers, but are not themselves decomposers. Some examples are spiders and beetles.
- Discuss with students how the log and its decomposers form their own system. For the system to work, all the parts of the system have special roles or functions. For example, a new plant depends on the decomposers to break down the the old, decaying log into nutrients the plant can use. Each part of the system is connected, and works together. Explain that in other places, a log might have different decomposers.
- Have older students write descriptions of what they see on their data sheet. They should include drawings to show all the different parts of what they see (the log, the dirt, the worms . . . etc.), and model how these parts might work together. Younger students should draw two to three things that they observe. Back in the classroom, discuss what students observed.
- After the log observation, distribute page 8, *Nature Recycles a Tree*, to each student. Discuss the stages shown on the handout. Ask students how this process is a cycle, and have them explain their answer. Discuss some common types of decomposers, as shown on the page.
- Allow students to observe the log again, now that they have some knowledge of different kinds of decomposers. This time, they can look for examples of each.
- For homework, have students look for examples of each stage shown on page 8, *Nature Recycles a Tree*.

Part 2: Experiment

- Make the connection between nature recycling a tree and students recycling items such as plastic or metal. In both cases something is broken down and then used to make something new.
- Ask students for ideas about why we need to recycle plastic. Can't nature recycle it, like it recycles a tree?
- To help answer this question, have students design an experiment to compare how a plant breaks down to how a piece of plastic breaks down. One way to do this is to put soil into two plastic bags and add fruit or vegetable matter into one bag and plastic into the other. Then observe both bags periodically until the fruit or vegetable matter is fully decomposed or for a specified period of time. To work properly, the bags must contain air when sealed. Students may come up with other ideas.
- For younger students, work together as a class to design the experiment. Come up with a guiding question and a hypothesis. Identify elements of the experiment you will control and how you will collect your data. Write the steps on the board. You can have students set up the experiment in small groups and report their data to the class.
- Older students can design their own experiments in small groups, although you may want to come up with the guiding question as a class. Make sure that students write a hypothesis, plan out the steps they will take, and identify how they will control conditions and how they will collect the data. Because different fruit and vegetable matter will decompose at different rates, you may want to have all students use the same type or set a time limit of two or more weeks for students to collect data.
- Students should observe their experiment on a regular basis. Some ways they might collect data are to make written observations, take photos, or weigh the vegetable matter.

- If students want to observe the complete breakdown of the vegetable matter, advise them to use something that breaks down quickly, such as lettuce, an apple core, or the inside of a banana. On the other hand, if they want to weigh the material, advise them to use something that will break down over a longer period of time, such as a carrot.
- When students have completed their experiments, discuss the results. Connect back to the idea of why some things have to be recycled by people instead of by nature.

Part 3: Engineer

- Review parts 1 and 2 with students. Have them look again at the Nature Recycles Trees handout and share what they remember from their own observations of the decomposing log. Ask them to recall how little the plastic decomposed in their experiment compared to the plant matter.
- Tell students that engineers and inventors are always looking for better ways to recycle items such as plastic. Challenge students to design a way to recycle plastic. Encourage them to use some of the processes they saw in the breakdown of a tree to help them with their ideas. For example, trees are broken down into smaller and smaller parts by some decomposers. Lichen use chemicals to break down the tree. How could those things apply to breaking down plastic? Have students draw their idea. Encourage them to be as specific as possible and to show how their idea would work. Older students can also create a model of their idea. These models should have some moving parts, though they will likely not be able to complete the whole process. For example, a model might focus just on how the plastic will be moved through the process or how it will be cut down, rather than showing the whole process.
- Show students the Sesame Street Video “Murray Monster Watches Milk Jug Recycling.”
- How was this different or like the idea they modeled above?

Have students compare the plastic recycling process they saw in the video to how a tree is recycled in nature. Younger students can draw their ideas, while older students can add captions or write paragraphs to compare the two.



REFLECT/ASSESS

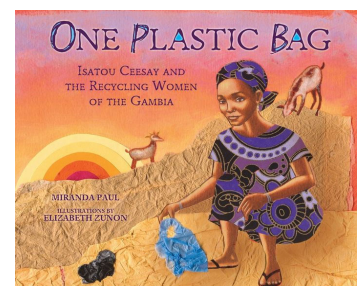
Students should be able to:

- Explain how nature recycling a tree is a system and identify the parts of the system that work together.
- Evaluate their experiment.
- Explain how what they observed in their experiment helps to explain why we recycle plastic.
- Explain how they got ideas for ways to recycle plastic from observing how nature recycles trees.
- Compare how plastic is recycled to how nature recycles trees.



EXTEND

Sometimes it is hard to recycle because people don't always have the information, technology or tools they need. Read the book *One Plastic Bag* with students. Describe how the women of Gambia got rid of the piles of plastic bags. Ask students to find some items at home that can be reused to make something new. Have them bring their creation to class to share.



JOURNAL QUESTION

Have students reflect on how nature can inspire ideas for solving problems.



WEBLINKS

Murray Visits a Recycling Center (Sesame Street)

<https://www.youtube.com/watch?v=-0ijMPvly-U>

Nature Recycles

<https://dnr.wi.gov/files/pdf/pubs/wa/CE5013.pdf>



TEACHER TIPS

Background

Many items that we use today were inspired by things found in nature. Velcro, for example, was inspired by a close observation of how burrs stick to dogs. In fact, engineering inspired by nature has its own term – biomimicry. This activity asks students to examine how a tree is broken down into smaller parts and then used as the building block for something new to inspire their own designs for ways to recycle plastic. When trees decompose, they are helped along by insects and other bugs, animals such as birds, and fungi and lichen. First the tree is broken down by fungi and wood-boring insects, such as bark beetles, that are specially equipped to break down the tough wood of a newly fallen tree. Once the tree has begun to break down, other insects and bugs join in to break it down further. This makes room for animals such as voles and birds to make their homes in the trees, breaking them down further still. Eventually the tree is completely broken down into soil, which provides nutrients for a new tree to grow. Similarly, in plastic recycling, the plastic is chipped down into smaller pieces. Like a tree provides the basic materials for a new tree to grow, plastic is melted down into pellets, which can be used to make a new plastic product.

Part 1

- Explain how nature recycling a tree is a system and identify the parts of the system that work together.

Part 2

- Sealing the items in a plastic bag is just one possible way for students to observe the breakdown of the vegetable matter and the plastic. They might also place them in bins, etc. To prevent mold spores (and bad smells!) from spreading in the classroom, have students keep any open containers with vegetable matter outside.
- Plan time for students to check on their experiments over at least two weeks. Avoid having students check on them every day; changes will be more noticeable if they only observe them once or twice a week. Observations and recording data should only take 5-10 minutes.
- A blank table is provided on the student data sheet. Students can adapt this table or create their own. When creating their tables, students should identify what type of information they want as column labels and as row labels. For example, students might want to include the date, their observations, and the weight:

Date	I saw...	The bag weighed...

Part 3

- Students may need help getting started. For younger students, a class discussion for steps 4 and 5 might suffice. For older students, include the writing pieces.

Nature Recycles Too!



Nature recycles trees. Bugs help. Other animals help. People recycle too. We recycle plastic bottles. We turn them into something new.

Materials:

- Decomposing wood
- Soil
- Plastic bags
- Fruit or vegetable pieces
- Other items needed for your experiment

Part 1: Observe

1. Your teacher will show you a log. The log is decomposing. That means it is breaking down. Observe the wood closely. Record your observations.
2. Look at the picture of a tree being decomposed. Discuss this with your class.
3. Observe the log again. Do you see examples of fungi? Lichen? Sow bugs? Carpenter ants? Burrowers?
4. The picture shows four stages of a tree being decomposed. What stages do you see on the log?
5. Look around at home or at school. Find a real example of each stage.

Part 2: Experiment

1. You observed how nature recycles a tree. Humans recycle, too. List some things we recycle.
2. One of the items we recycle is plastic. Why do humans need to recycle plastic? Work with your class. Find a way to compare how plastic breaks down to how a plant breaks down. Write the steps you will take.
3. Do your experiment. Record your data.
4. Discuss your data with the class. Did the plant decompose? Did the plastic decompose? Does this help you understand why we recycle plastic? How?

Part 3: Engineer

Recycling breaks something down. Then it is used to make something new. Nature recycles trees. Decomposers break the trees down. The nutrients from the trees go into the soil. Those nutrients feed new trees. It takes a long time for plastic to break down in nature. So people recycle plastic in other ways.

1. Design a way to recycle plastic. Use what you know about how trees are recycled in nature.
2. Make a model of your idea (draw how this would work).
3. Watch the video your teacher plays. This video shows how plastic is recycled.
4. How is your idea the same? Different?

5. We recycle plastic. Nature recycles trees. How are these the same? How are they different? Draw or write your ideas.

Reflect and Apply

1. Think about your experiment. Did anything surprise you? What errors might you have made?
2. What happened in your experiment? Did this help you understand why we recycle plastic? How?
3. You learned how nature recycles trees. How did this help you get ideas about how plastic might be recycled?
4. Compare the two systems: how nature recycles a tree and how humans recycles plastic. What are the similarities / differences?

Extension:

1. Listen as your teacher reads "One Plastic Bag."
2. Find something at home that can be reused to make something new.
3. Bring your creation to class. Tell what it is made of.



JOURNAL QUESTION

How can observing nature help us to solve problems?

Student Name:

Period:

Part 1: Observe

Observe the decomposing wood. Write or draw your observations.

Part 2: Experiment

List some things we recycle.

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Describe your experiment

1. What is your question? _____

2. What is your hypothesis? _____

3. How will you test it? List your steps.

Step 1: _____

Step 2: _____

Step 3: _____

Step 4: _____

Step 5: _____

Step 6: _____

Step 7: _____

Step 8: _____

Step 9: _____

Step 10: _____

4. What data will you collect? _____

5. How will you collect data? _____

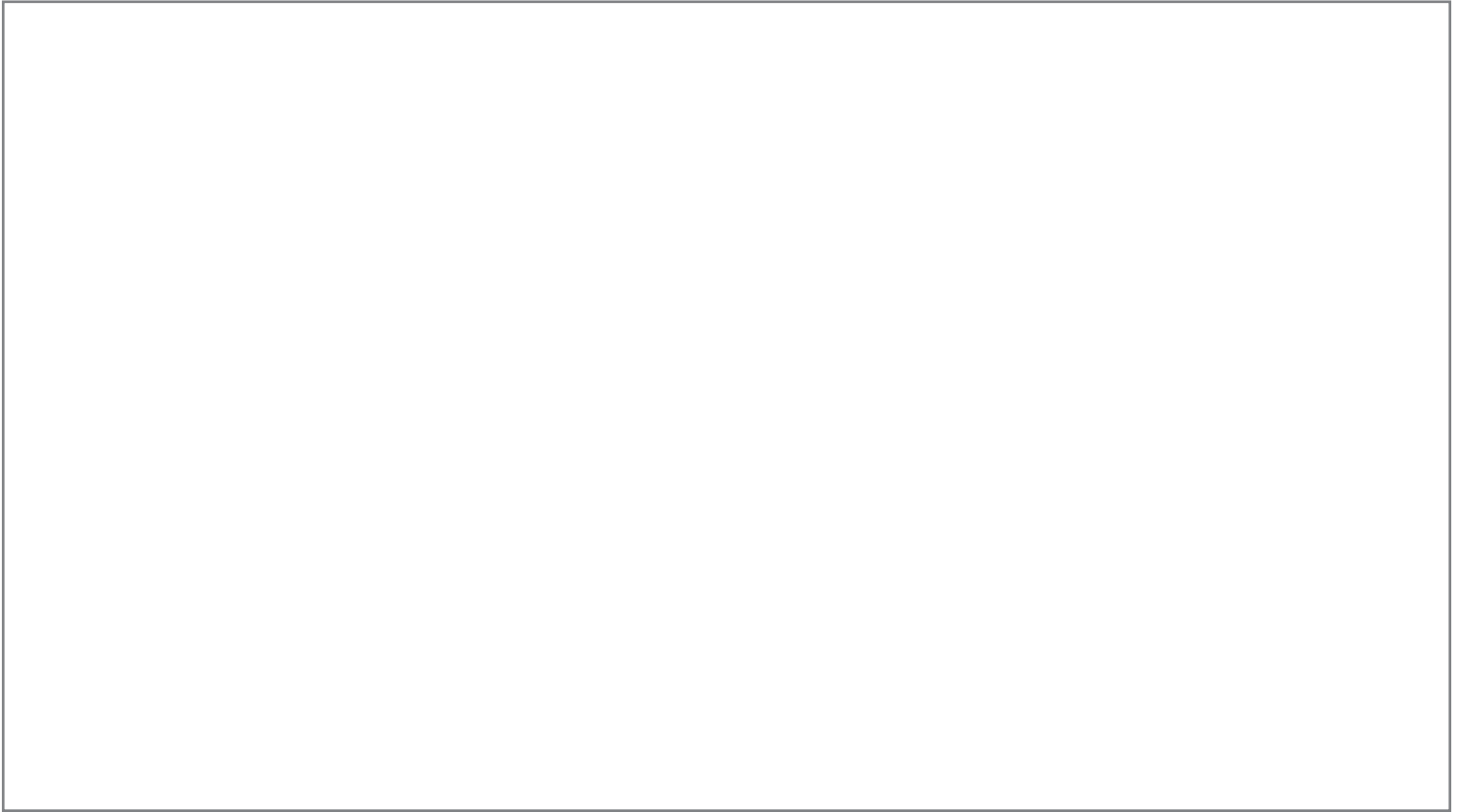
6. How will you record data? _____

Use this to record your data. Add labels to the columns. Add labels to the rows.

What did your data show?

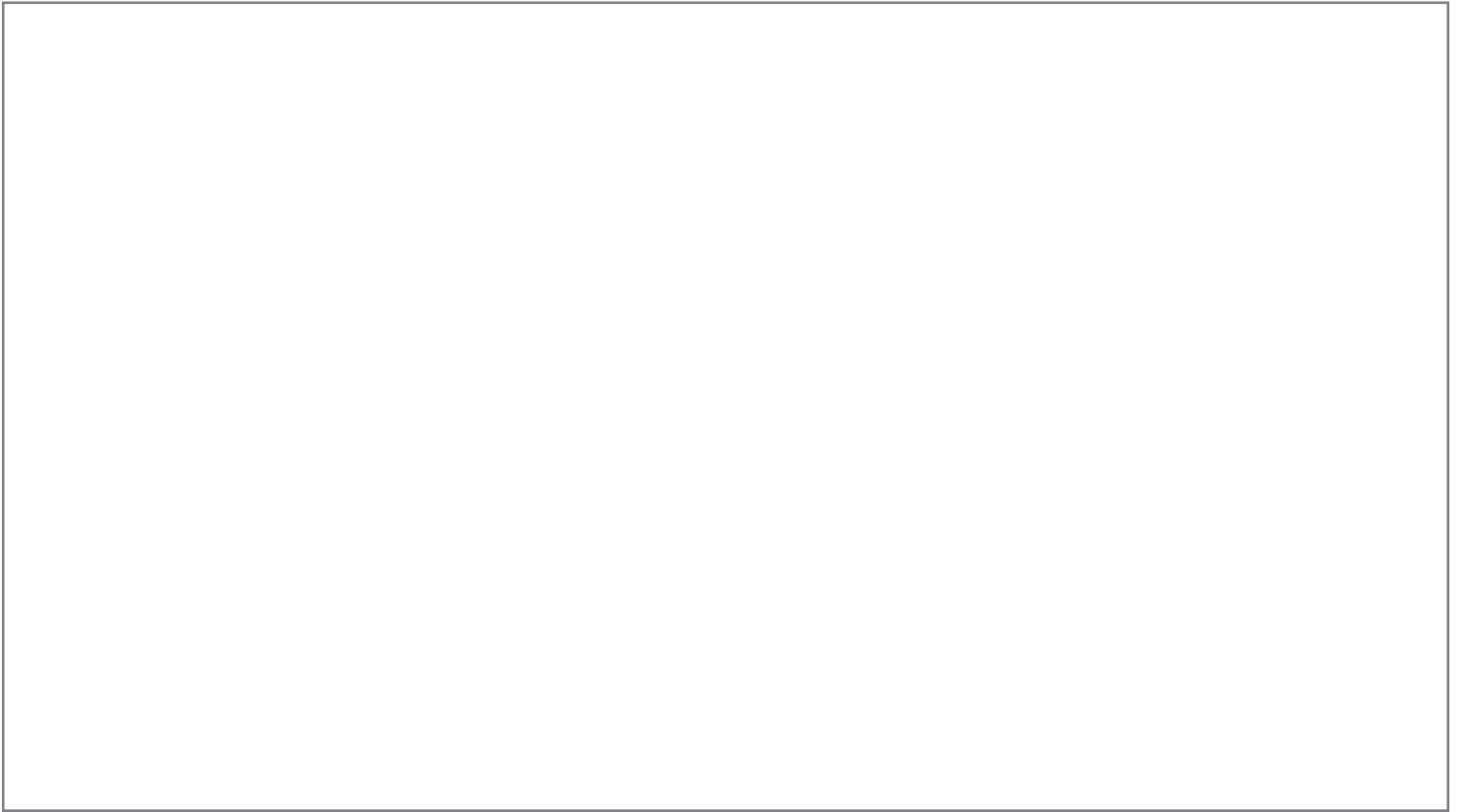
Part 3: Engineer

Design a way to recycle plastic. Draw a diagram (make a model) of how this would work. See if you can get some ideas from how nature recycles a tree!



Explain

We recycle plastic. Nature recycles trees. How are these the same? How are they different? Draw or write your ideas.



Explain



Fungi break down logs to get nutrients.



Lichens have a special acid. It helps break down wood.



Bugs can also be decomposers. Carpenter ants help break down trees. Saw bugs and other bugs do too.



Some animals and bugs burrow in dead trees. This helps break down the tree.

