

# IYS Soils Activity



## Summary

Recycling aluminum cans and plastic bottles allows the materials to be used again. Earthworms, which can be found in soil all over the world, are super recyclers, turning organic materials into compost that can help living plants grow and thrive. Worms recycle by eating the dead organic matter and then turning it into castings—also known as worm poop—that are rich in nutrients. Worms also help aerate and loosen the soil so that plant roots can more easily develop underground. For these reasons, worms are an integral part of a healthy ecosystem. Vermicomposting is a great way for students to observe the effect of worms in a miniature ecosystem.

## Learning Objectives/Outcomes

1. To learn where soil organic matter comes from
2. To learn the important role of earthworms in creating soil organic matter
3. To learn how organic materials can be recycled in nature

## Materials (per student, group etc.)

- a plastic bin with a lid
- newspaper
- water
- soil
- organic waste products, especially food scraps
- one pound of worms—there are many different types of worms, but the best-suited for indoor vermicomposting are red wigglers, which are readily available for mail order from many websites; earthworms can be obtained from a bait shop or your local extension agent

*Celebrating the*



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[soils.org/IYS](http://soils.org/IYS)

# Worms, Nature's Super Recyclers (and exploration in vermicomposting)

## Ages of Audience

Elementary

## Recommended group size?

Unlimited

## Where could you offer this?

Local school

## What type of room do you need?

Lab/work benches

## Type of Lesson (may be more than one)

1. Hands-on (participants touch the stuff)
2. Indoor
3. Experiment (follow procedure, get results, interpret results)

## Time Needed

1. Scientist prep time + clean up time: About 1 hour
2. Participant/class time: Depends on how long observations are made, how many additional activities are linked to the vermicomposting.

## If the activity costs money, how have you funded this in the past/suggestions for others?

Costs to be covered by the school that utilizes the activity

## Methods/Procedures

### Setting up the bin:

1. Drill small holes (about the width of a toothpick) around the base of the container about 2 inches from the bottom. Space the holes at about one per inch. These holes allow air flow to and from the soil.
2. Add bedding to the bottom of the bin. Bedding can be made by shredding newspaper into inch-wide strips. Wet the strips by dipping them in water. Fill about 6 inches of the bottom of the bin with wet newspaper bedding.

3. Sprinkle a 2-inch layer of soil over the bedding and sprinkle it with water to make the soil damp.
4. Bury food scraps under the soil. Burying the scraps prevents bad food odors.
5. Now add your earthworms and put the lid on the bin. They will go to work!

### Caring for your worms:

1. Assign one or two students a week to give food scraps to the worms.
2. Don't use food scraps that are fatty or contain meat. Use newspaper, vegetables, coffee grounds and even eggshells. Although earthworms eat a lot for their size, they need only a couple of small handfuls of food a week.
3. As the worm population grows, they should be able to eat more food. Too much food may make the bin stink as bacteria and other microorganisms break down the food before the worms can. If this becomes a problem, remove some of the excess food and monitor how fast the worms are eating the food that is added.
4. Too much moisture will cause mold and other unwanted pests to grow, which will prevent the worms from doing their job. If condensation forms inside the bin, simply remove the lid to let the bin air out for a couple of hours and then add more holes for drainage and ventilation.
5. Worms have a hard time surviving if the compost is too dry. The bedding material should be moist to the touch without forming droplets when squeezed. If there is not enough moisture, use a spray bottle to add one or two tablespoons of water at a time until the bin is at the right moisture level. If a lack of moisture continues to be a problem, consider closing off some ventilation holes with tape.
6. Typically, room temperature is great for worms, but be cautious that they do not overheat or get too cold because either situation could stunt and possibly kill the worms.

*continued...*

# Worms, Nature's Super Recyclers

## Harvesting the vermicompost:

1. Open the bin and shine a bright light onto the soil. The earthworms will migrate to a deeper level away from the light, and the top layer of humus (the name for composed organic material) can be scraped away for later use.
2. Continue this process until you get close to the bottom of the bin and mostly earthworms remain.
3. Add fresh bedding and soil to the bin to give the worms a new home again.
4. The compost that is scraped away makes a wonderful soil amendment for garden and indoor plants.

## Observing the worms at work:

1. Note how the compost differs from the original materials (newspapers strips, soil, and food scraps) added to the bin. There will be changes in properties like color, texture, and consistency. Be as detailed in your observations as possible. It will help if some newspaper strips, soil, and food scraps are laid out on a table beside some of the vermicompost.
2. Measure the effect of the vermicompost on plant growth. Try growing seeds with different amounts of compost added, or add different amounts of compost to plants growing in the garden. Predict which amounts of compost will produce the best results, then use a tape measure to record the growth and observe changes in the plants.

## Discussion Questions

### Topics to discuss before beginning the vermicomposting

1. Ask students what the word *recycling* means. Have them talk about items they have recycled before. Make a list of those items. Ask them if food can be recycled. Tell them to imagine they are in the cafeteria at their school. Have them try to think of ways they can use the leftover food being thrown away to make something else. (*This question will probably bring interesting responses.*)

2. Show them the earthworms in the bin and allow them to find a worm and look at it closely. Ask the students what they think earthworms eat (*organic materials in soil*). Ask them what kinds of things they typically throw away that they might be able to feed to the earthworms instead (*food scraps, especially fruit and vegetable scraps; meat/fat scraps aren't as good*).
3. Discuss the kinds of conditions earthworms need to be successful (*moist, but not wet, soils; adequate food source; appropriate temperatures; a source of air*).
4. Play the "Soil Management Farming Game" (see Farming Game activity under November's IYS activities). Ask the students how their vermicomposting experiment relates to soils and climate. (*Earthworms and other soil organisms are important in creating soil organic matter. The "Soil Management Farming Game" shows how the choices we make in agricultural management can lead to the release of greenhouse gases from decomposing soil organic matter. It is the balance between newly created soil organic matter and the decomposition rate of soil organic matter that determines whether soils are a sink or source of atmospheric greenhouse gases. Sink means more greenhouse gases are removed from the atmosphere than are added; source means more greenhouse gases are added to the atmosphere than are removed.*)

### Topics to discuss after doing the vermicomposting for a while

1. Ask the group what happens to leaves in the forest in autumn (*they fall to the ground*). Ask them why the leaves that fall from the trees every year don't just pile up higher and higher (*they break down/decompose and become part of the soil through the action of organisms such as earthworms*). Ask the students about other possible sources of organic matter that is found in soil (*pretty much anything organic that might come into contact with soil—roots that die and decompose, branches that fall to the ground, grass clippings that are mulched and returned to the soil surface, animals that die on or in the soil, etc.*).

2. Count how many worms are added to the bin initially. Periodically separate the worms from the compost (either by sifting, or if the material can't be sifted, dump the bin onto a tarp outside and have the students sort through it) and count them again. Are there more or fewer worms now? If the population has grown, it is because the worms have everything they need to reproduce. If the population has shrunk, it is because the worms don't have the right environment. If worm numbers are shrinking, have the students brainstorm ideas to increase the worm numbers (review the information above for help determining what problems the worms might be having).

## References

This activity was created by modifying an activity developed by the Utah State University Agriculture in the Classroom project. [https://extension.usu.edu/files/publications/publication/Sustainability\\_2012-08pr.pdf](https://extension.usu.edu/files/publications/publication/Sustainability_2012-08pr.pdf)