

WORM COMPOSTING IN YOUR CLASSROOM

A CURRICULUM GUIDE FROM THE KITCHEN COMMUNITY

CURRICULUM RECOMMENDATIONS

Vermicomposting Classroom Activities | Cal Recycles

<http://www.calrecycle.ca.gov/Education/curriculum/worms/98activities.pdf>

This guide explores vermicomposting--the practice of using worms to transform food waste into a nutrient rich finished product called vermicompost. In a school setting, vermicomposting can set the stage for a variety of fun, interdisciplinary activities.

Vermicomposting can utilize school cafeteria waste for the worm bin, provide a variety of interesting experiments while maintaining the bin in the classroom, and can culminate in a school or classroom garden using the finished product.

Do the Rot Thing | Central Vermont Solid Waste Management District

http://www.cvsmd.org/uploads/6/1/2/6/6126179/do_the_rot_thing_cvsmd1.pdf

By using the activities in this guide, you will be joining thousands of teachers across the country in bringing compost into the classroom as a valuable teaching tool. The activities you'll find in Do the Rot Thing are hands-on and encourage student exploration and learning.

Composting is a wonderful teaching tool because you can use it to introduce and explain concepts as far reaching as the life cycle, the importance of death and decomposition, soil, recycling, resource management, garbage and landfills, and biodegradable and non-biodegradable items.

"Composting" is simply a way people use the natural process of decomposition to produce a rich, fertile soil amendment. With materials, such as plant trimmings and kitchen scraps and a few basic techniques, anyone with basic mobility can compost.

Set Up Record Sheet

Date set up _____

Initial weight of worms _____

Type of bedding _____

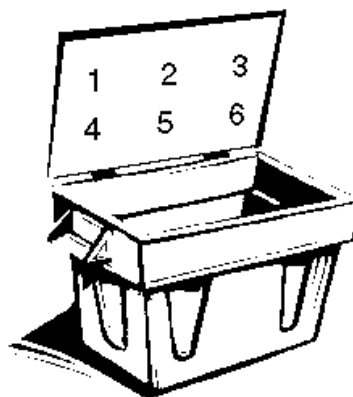
Size of bin _____

Classroom size _____

Garbage burying locations:

Label the worm bin so you can keep track of where and when you are feeding the worms.

1	2	3
6	5	4



Harvest Results

Date harvested _____ No. of days total _____

Worm weight _____

Calculate the following from the Feeding Record Sheet:

Total weight buried garbage _____

Weight uneaten garbage _____

Average oz. buried per day _____

Average temp. _____ Temp. range _____

Feeding Record Sheet

[illegible]

Worm Population Count

We started on _____ with approximately _____ worms.
(date)

On _____ there were _____ worms.
(date)

1. Are there more or less? _____

2. Why do you think the number of worms changed?

3. What did you observe about the contents of the worm bin?

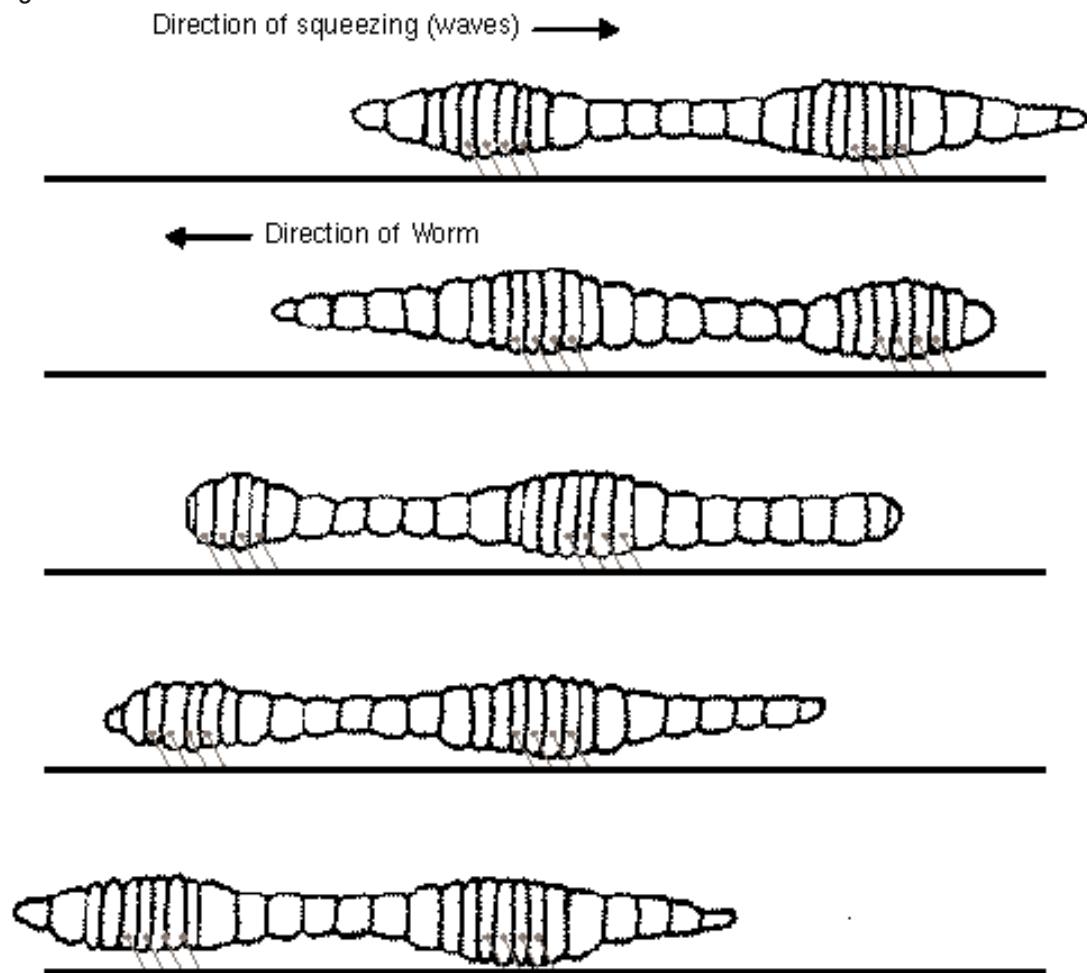
4. What do you think the worms like to eat? Why?



Worm Walk

When a worm wants to move forward, its powerful muscles contract and it squeezes itself around the middle (sort of like when you squeeze a tube of toothpaste). The worm's front gets long and thin and burrows ahead. Then another set of muscles squeezes and makes the worm fat. It pushes its setae (bristles) down and grips the burrow while the rear section catches up with the front section.

Worms can force their way through soft earth; they must eat their way through harder soil. Eaten earth passes through their intestines and is deposited on the ground's surface as castings.



Adapted from *The Reasons for Seasons*, by Linda Allison. Yolla Bolly Press/Little, Brown, and Co. Boston, 1975.



Name _____

Red Worm Observation

Draw a picture of a red worm. Can you label the parts?
(head, tail, mouth, segments, band)

Draw lines pointing to the parts and write the names on the lines.

Write three observations about the worm.

1. _____

2. _____

3. _____



Collector Name _____

Recorder Name _____

Reporter Name _____

What Does Your Worm Prefer?

1. Light or dark? _____

2. Wet or dry? _____

3. On top of soil or underground? _____

Developed by Betsy Weiss



Lab Activities

The following lab activities provide an engaging opportunity for students to learn about the important role worms play in nature. The primary goal of the activities is for students to perform the experiments and draw their own conclusions. As an extension, you may want to have students design their own experiments using the scientific method—posing an idea, forming a hypothesis, constructing an experiment, analyzing results, and presenting conclusions.

To address the negative attitudes towards worms, present the lab activities as an opportunity to learn more about a creature that is vital to recycling nutrients in the soil and helping us to grow nutritious food. You may want to pair squeamish students with others who are less concerned about working with the worms.

Tell students that while working with the worms they should keep them moist by placing them on a moist paper towel or in a petri dish with water. Explain to students that the worms breathe through their wet skin, and therefore must be kept moist.

Following the lab descriptions are sample station cards. You might want to set these labs up at stations and have students rotate through. Allow students ample time to observe and record their findings for each lab activity.

1. Tell the students they are going to observe the red worms living in the compost bin. Ask, “What do you know about redworms?” “What do they do?” “Where do they live?” “What do they eat?”

While many students are familiar with worms, most have not taken the opportunity to observe them closely. List students’ responses and refer back to them as they learn more about the worms. Redworms (*Eisenia foetida*), also called manure worms or red wigglers, are the type of worm used in worm composting systems because they are litter dwellers requiring organic material to live, they tolerate a wide range of temperatures, and they do not require large amounts of soil for burrowing.

Have students use a hand lens to observe the worms. To find out which is the front end, students should observe how the worm moves and which end leads the body. When the worm moves the front (head) end usually goes first. Another distinguishing feature is the clitellum, the swelling or band which is usually distinguished by its lighter color, is nearer to the front end.

2. Are worms sensitive to light? Do worms have eyes?

Darken the room and ask a student to shine a beam from a flashlight covered with red cellophane on a worm. Since worms, like many nocturnal animals, are not sensitive to light from the red end of the spectrum, the worm will probably not react to the light. When the cellophane is removed, the worm will react to the light by turning away. Have students



repeat the experiment with a number of worms and record their findings in their Learning Journals. As a variation, set up the experiment with the worm in a dish that is partially covered so the worm has a dark place to retreat to.

3. Do worms have favorite colors?

To test a worm's response to lights of various colors, shine a flashlight through a prism so it casts a spectrum on a white sheet. Place a worm in the spectrum. The worm should crawl away from the blue light and through the red. Remind students about the red cellophane on the flashlight. Are the two responses consistent with each other? How do they fit in with the environment in which worms live?

4. Do worms like water?

On a piece of paper place a drop of water. Place a worm near the water drop. The worm should crawl to the water. Students could also do the experiment in a box to block out the light.

5. When two worms are placed in the same area, will they move together or stay apart?

Place two worms in a container with a cover to block out the light. The worms should move towards each other. Have students discuss reasons the worms might move towards each other. Possible ideas might include that the worms are seeking moisture or they are looking for companionship, etc.

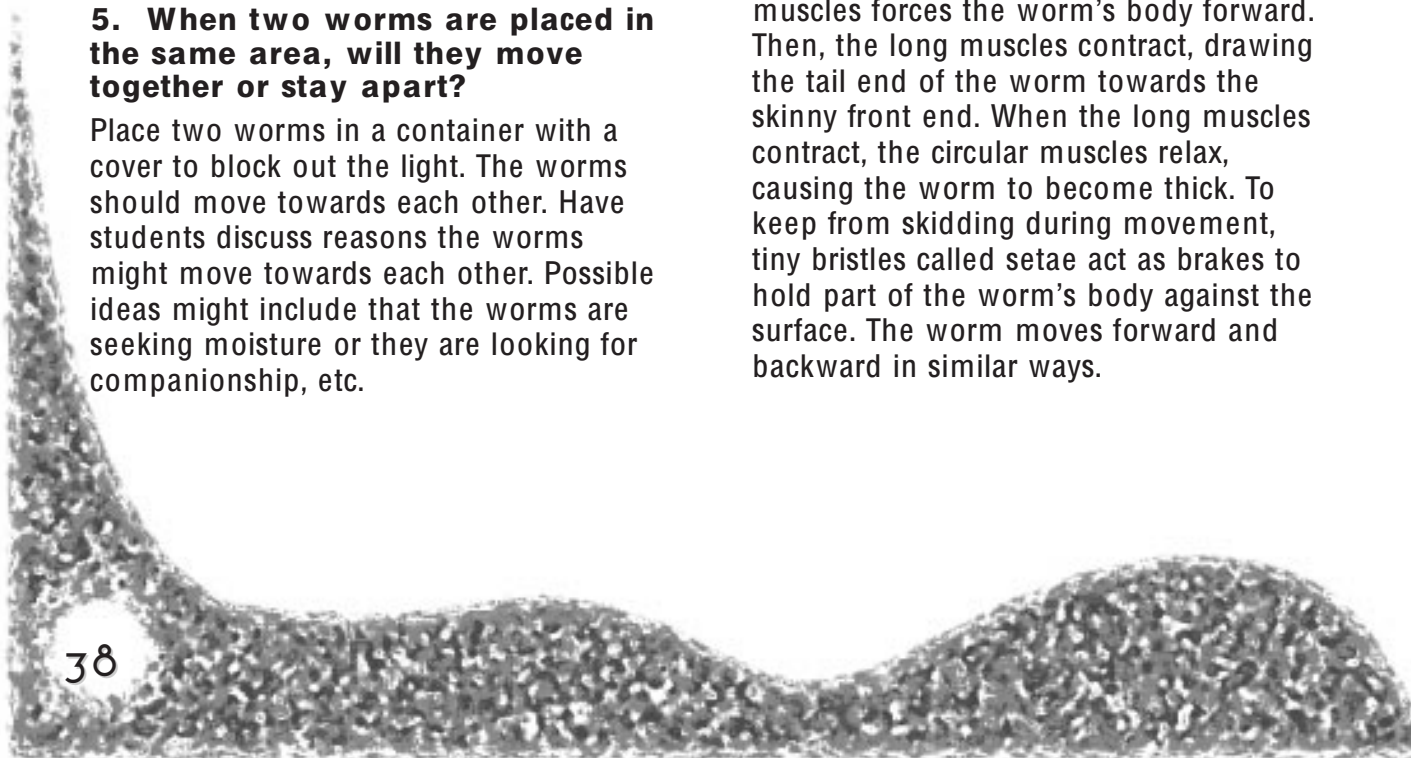
6. What is the average length of a worm?

Place a worm on a damp paper towel, straighten out the worm, and measure it with a ruler. Have students measure a number of worms and calculate the average length. Students should note the accuracy of measurement should increase by measuring a larger number of worms versus only a few.

For younger students, have them measure "gummy" worms to gain experience with measuring and recording data. Variables affecting the length of a worm include how old it is, how well fed it is and if its body has enough moisture.

7. Does a worm move forwards or backwards or both?

Place a worm on a moist paper towel. Using something soft such as a paint brush or leaf touch the end of the worm. The worm will move both forwards and backwards. Worms move through contracting and relaxing their muscles in waves, alternating between circular and long muscles. Contraction of the circular muscles forces the worm's body forward. Then, the long muscles contract, drawing the tail end of the worm towards the skinny front end. When the long muscles contract, the circular muscles relax, causing the worm to become thick. To keep from skidding during movement, tiny bristles called setae act as brakes to hold part of the worm's body against the surface. The worm moves forward and backward in similar ways.

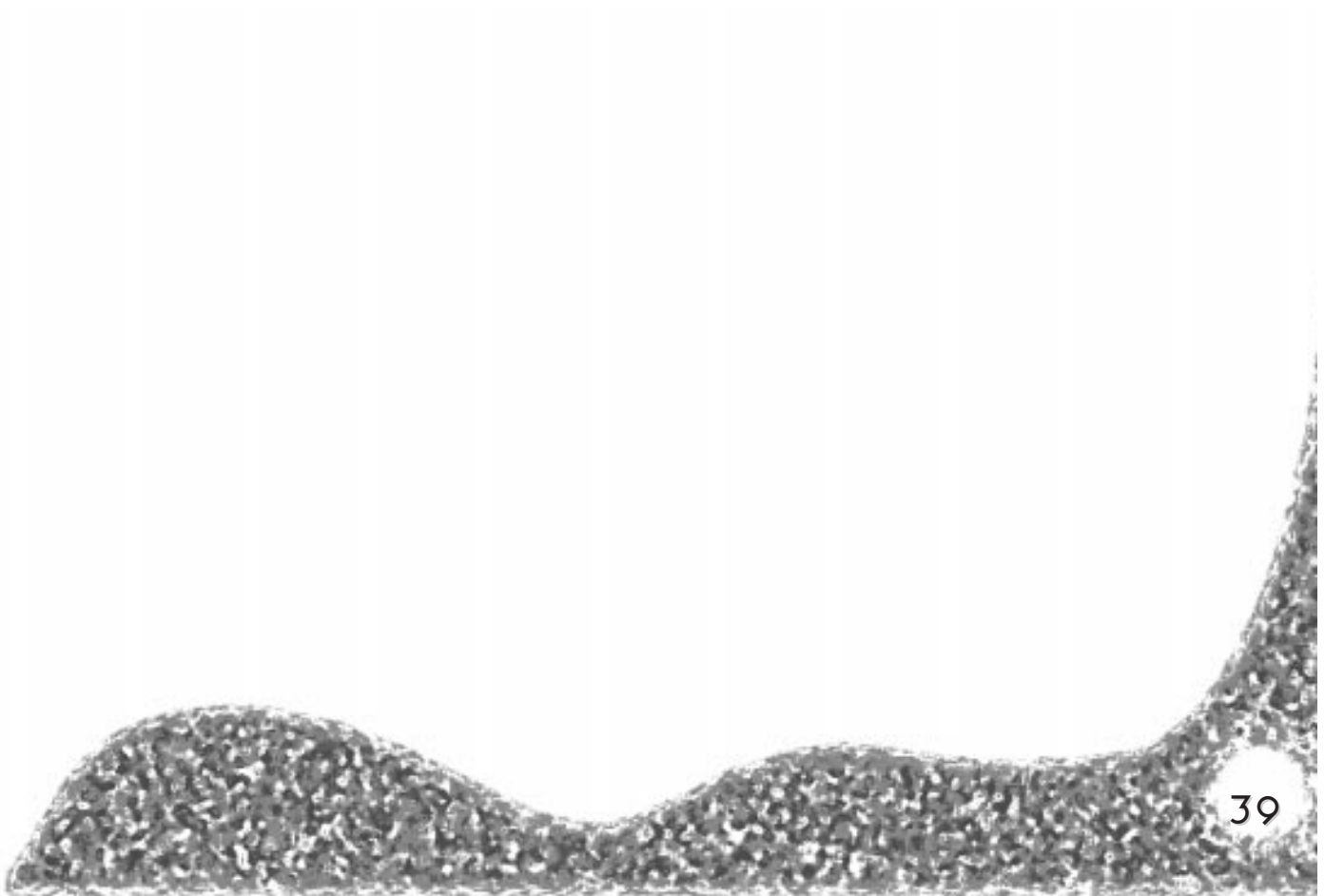


8. Can a worm feel?

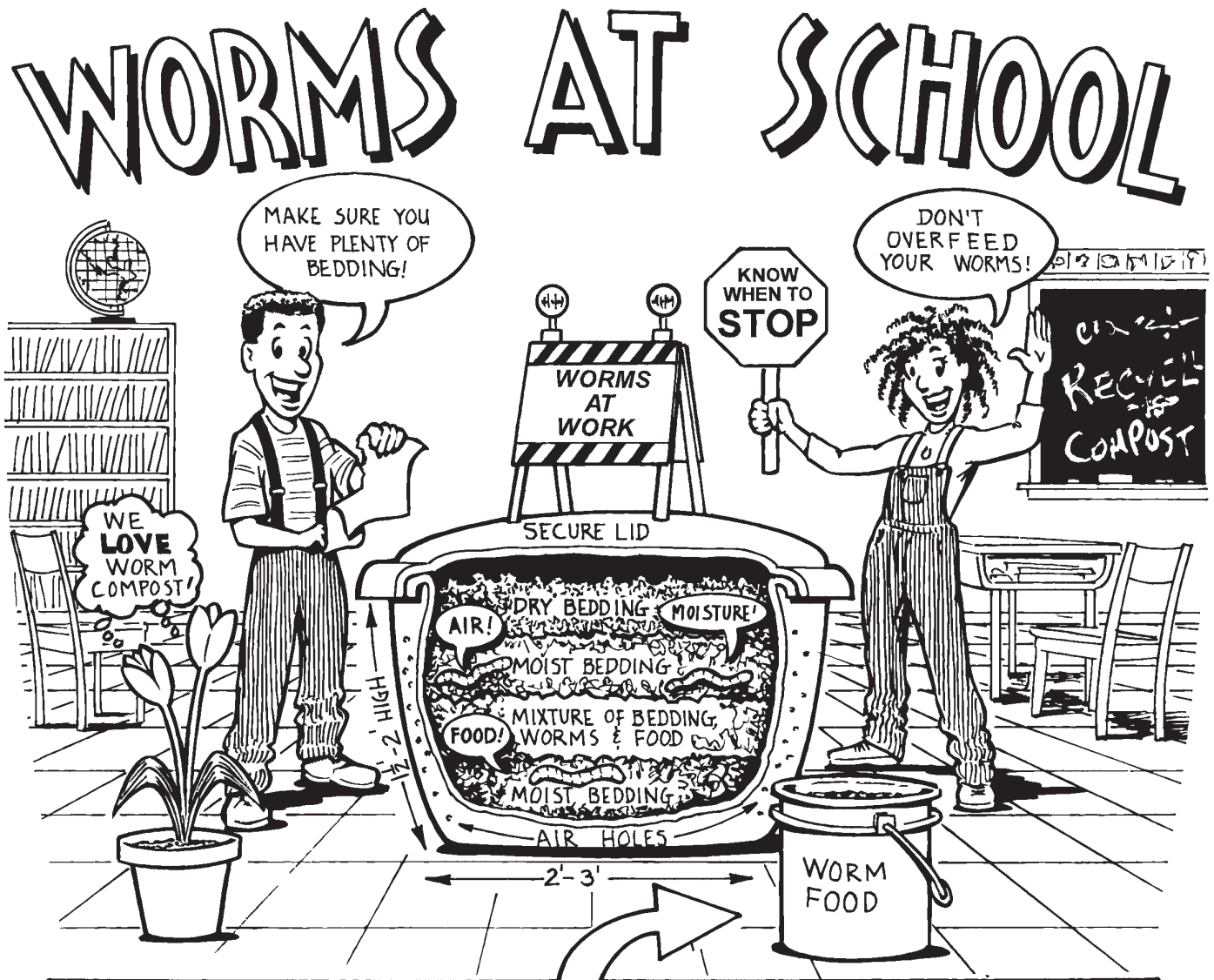
Place a worm on a moist paper towel. Using a feather and then a leaf, touch the worm and observe its reaction. The worm will respond to touch. This experiment demonstrates that worms have senses. Students may garner respect for these creatures rather than squishing them on the playground or tossing them in the air.

9. How do worms find food?

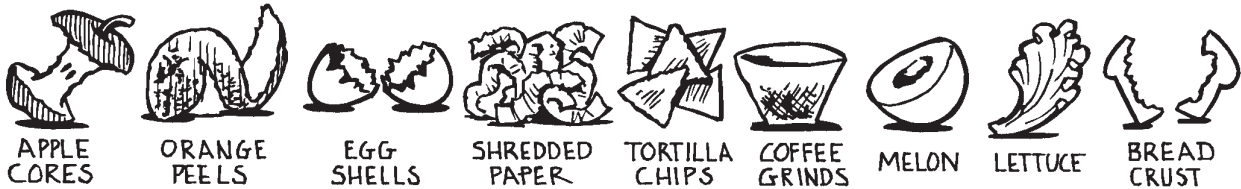
This is a physical education activity. In a large area set up a maze or obstacle track. Explain to students they are now redworms, therefore they have no eyes, legs or arms. They must make their way through the maze to get to their destination or food source. At the conclusion of the activity have students discuss their observations.



Worms at School



HERE ARE JUST A FEW "KITCHEN SCRAP" TYPE THINGS WORMS LOVE TO EAT!



- LIKE HUMANS, WORMS NEED _____, _____ & _____ TO LIVE.
- SHREDDED PAPER PROVIDES THE _____ FOR WORMS TO LIVE IN.
- WORMS MAKE _____ THAT CAN BE USED ON PLANTS.

Name: _____ Date: _____

ACTIVITY

12

**Worm
Composting**
 Grades 2-12

Objective

Participants will:

- learn why worm composting is important to humans;
- record observations of the worm bin environment;
- describe the elements redworms require to live a productive life; and
- get hands-on experience with a worm bin environment.

Time

20-40 minutes

* Look in the back of this booklet for how this activity applies to the Vermont Framework of Standards and Learning Opportunities.

Worm Bin Exploration

Materials Needed

- An active worm box that has been going for at least 3 months
- Newspaper or paper plates
- Damp paper towels
- Magnifying boxes/glasses
- Toothpicks or Q-tips
- Paper and pen for each group
- Worms Inside and Out Information Sheet (p.35)

**Background
Information**

The worm bin environment includes worms, bedding, food, worm box animals, moisture, and more. Through exploration, participants can learn what worms need to live and how to go about setting up a worm bin. Worms, like humans, need air, water, and food to live. A worm box should be cool and moist for the worms.

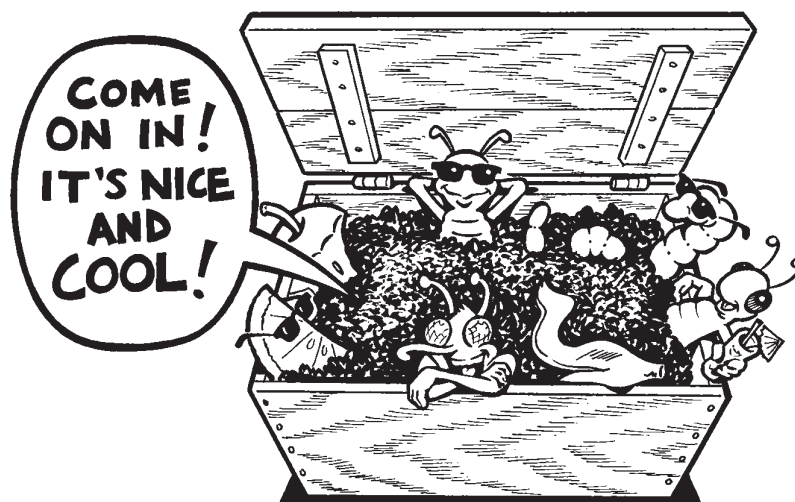
Worms are amazing animals.

Worms breathe through their skin. If their skin dries out, they will die. Worms can eat more than half their weight in food every day. They have no teeth but grind the food in their gizzard. Did you know that they don't have eyes? Worms sense light without seeing it.

A worm box is an ecosystem all in itself. There are many other animals that live in the bin besides the red wigglers. You may see mites, beetles, ants, or sowbugs, to name just a few. All of these animals are important and play a vital role in your worm box.

Management Skills

This is a group activity that involves working together. Children will be in groups of four to six. Kids tend to get very excited with worms. Make sure the groups are organized before handing out compost.

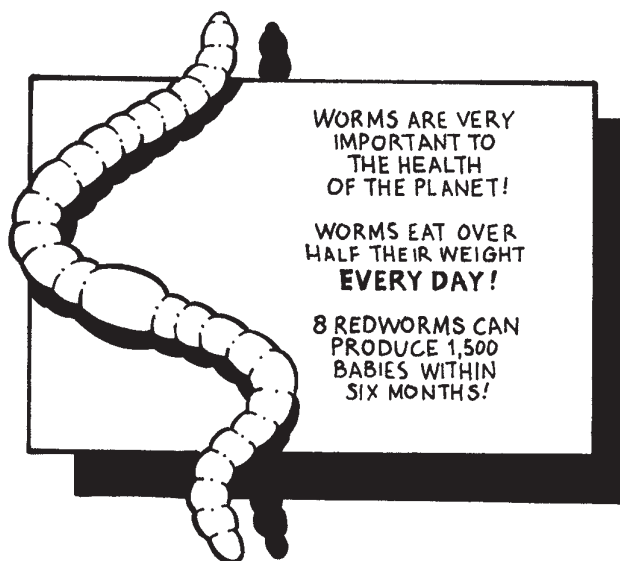
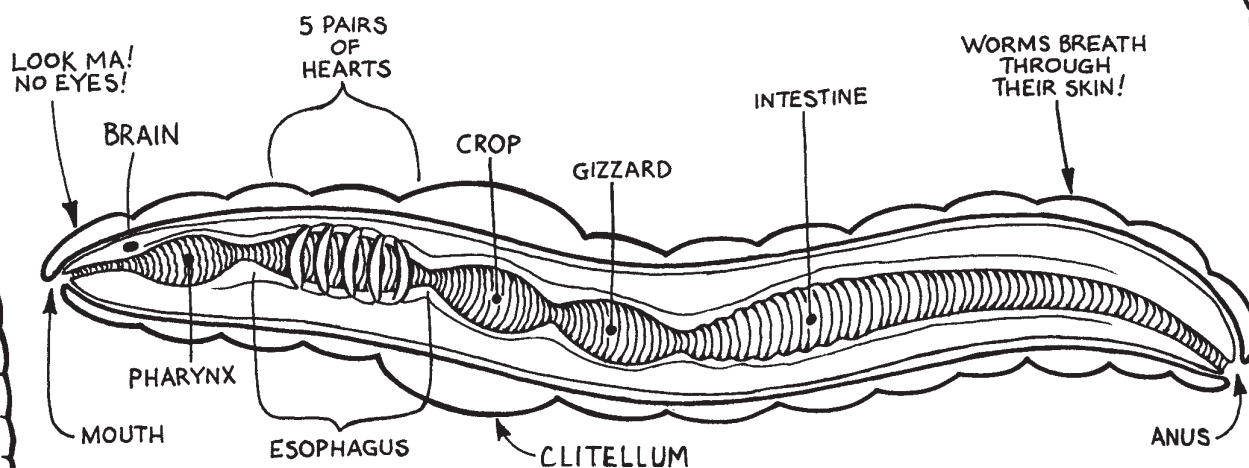


Procedure

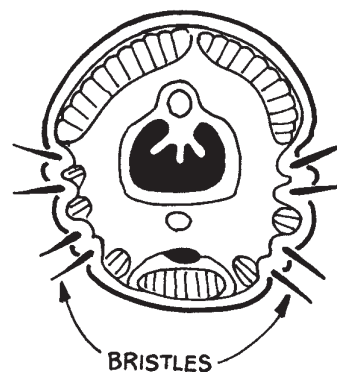
1. Introduce activity by soliciting questions about worms from the group.
2. Discuss the role of worms in the soil and how they help to recycle.
3. Divide participants into groups of four or six.
4. Designate one participant in each group to be the reporter. The responsibility of the reporter is to write down observations and to report to the whole group at the end of the activity.
5. Hand out piles from the inside of a worm box (on newspaper or a paper plate), and toothpicks or Q-tips.
6. Have the participants list all of the things they see in the pile. Can they see pieces of food? What kinds? What kind of bugs are there?
7. Ask reporters to read off their list.
8. Talk about what worms can and can't eat.
9. Ask students to discuss and record what they think worms need to live, based on their observations.
10. Use the Worms Inside and Out information sheet (p. 35) to teach worm anatomy.
11. Finally, ask students how they might create a home for worms in their classroom based on their observations.
12. Summarize by discussing what worms need to live in a classroom, what role they play in nature, how they can help us by composting our garbage, and how much plants love their castings. Also, review student questions to make sure they were answered.



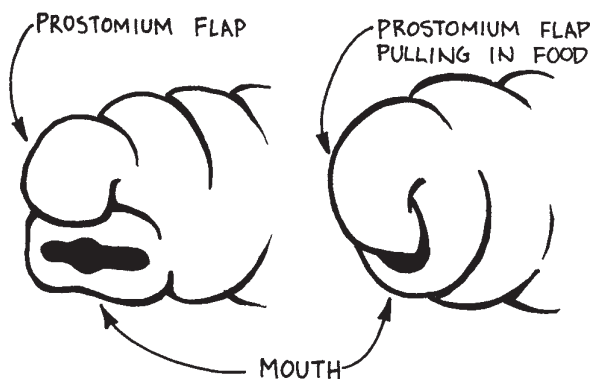
WORMS INSIDE & OUT



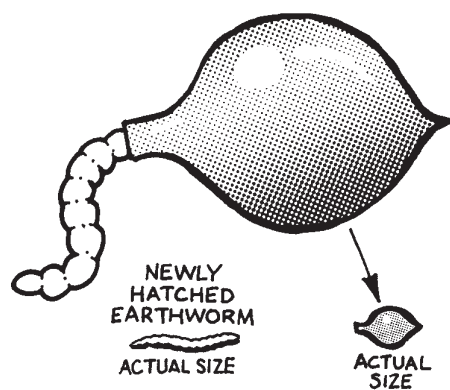
CROSS-SECTION



THE MOUTH



EGG SAC (COCOON)



ACTIVITY

13

Worm Composting

Grades 3-6

Objective

Participants will:

- harvest a worm bin and learn about the uses and benefits of worm castings, and
- learn about the role of earthworms in nature and composting.

Time

30-60 minutes

* Look in the back of this booklet for how this activity applies to the Vermont Framework of Standards and Learning Opportunities.

Harvesting a Worm Bin

Materials Needed

- Active worm bin
- Two tarps
- Two five-gallon buckets
- Colander
- Water
- Paper bags or re-used plastic bags to fill with worm castings for students
- Empty plastic beverage bottles
- 3 to 6 hand-held garden forks or trowels
- Extra worm castings

Background Information

Harvesting a worm bin allows participants to see the magic of the life cycle. By remembering the kinds of foods or other materials that were placed in the bin, participants can marvel at the compost (or castings) worms have made. Worm castings are very high in available nitrogen, so they are a high-quality organic fertilizer for plants. There are several methods for harvesting and everyone seems to have a favorite.

Management Skills

Since this activity involves harvesting worm castings, it is important to have access to a worm bin which has been fed for at least three months. It is assumed that participants have had an introduction to worm composting.

Participants will harvest worm castings from a bin using three different techniques. One five-gallon bucket will be used for the bucket method, and the other bucket will be used for both the sunlight and hand-picking methods. The finished compost can be used around school or taken home.

Procedure

1. Before participants arrive, set up three harvesting stations, or choose just one method to demonstrate:

- Bucket method (requires a tarp, bucket, and water)
- Sunlight method (requires a tarp, bucket, and a sunny day or bright light)
- Hand-picking (requires a tarp and bucket)

2. Review worm composting with students: What do worms eat? How do they help us? How do they help nature? Why is worm composting important?

3. If it is a classroom worm bin, ask participants what they have been putting in the bin. Ask them what they think has happened to the items they named.

4. Remind participants that worm composting is a way of recycling food scraps. Red worms eat food that we would otherwise throw away. The worm castings that are left behind can be used as fertilizer to enrich the soil and feed

plants. Explain that the worm bin is ready to be harvested. They will be taking out the worm castings to use as plant food.

5. Brainstorm uses for the compost that they will harvest today. Answers might include putting it on the lawn, around trees, or on classroom plants.

6. Introduce the three techniques of harvesting: the bucket method, the sunlight method, and hand-picking

- **Bucket Method:** Participants place all contents of the worm bin in a bucket. Gently pour cool water in the bucket. The worms will be okay for a minute or two. Pour the contents of the bucket through the colander. Retrieve the worms and uneaten food and bedding from the colander and return them to the bin. The brown liquid is compost tea that can be used to water plants.

- **Sunlight Method:** Participants mound compost in small piles on the tarp and let them sit in the sun or under a bright light for a few minutes. The worms will move to the center of the pile to avoid the light. The outer part of each pile, now without worms, can be removed and put in the five-gallon bucket. As the castings are removed, the newly exposed worms will head to the middle out of the light and the process can be repeated until you are left with a ball of worms. This ball of worms can be returned to the worm bin.

- **Hand-Picking:** The participants will sort through one big pile of

compost on the tarp, picking out any worms they come across and returning them to the bin. Continue until the pile seems to be relatively worm free.

7. A fourth, slower technique can also be used, although it takes several months to complete.

- **Migration Method:** Push all the bedding, worms, castings, and food in the bin over to one side. Stop adding new food to that side. Make sure $\frac{1}{2}$ of the worm box is empty. Set up the empty side like a new worm box with moist bedding and dry bedding. Put some food in the new side and keep feeding that side (about $\frac{1}{2}$ the amount you usually do). After the worms have eaten the food on the old side they will begin to migrate. You may have to wait several months for this to happen. Eventually, you will be able to harvest the old side.

8. Divide participants into three groups and begin harvesting. You may wish to rotate the groups so that all methods are sampled.

9. When the harvesting is complete, ask participants to compare the various methods. What was hard about the bucket method, the sunlight method, and hand-picking? What was easy? Which one seemed to be fastest? Which one would they like the best and why? Which one did they like the least and why?

10. Divide up the harvested worm castings so that each participant has a bag to use at school or home. The castings will need to sit for two or three days before they are ready, then they can be applied directly to plants. The compost tea may be put into empty beverage bottles and used right away.

