

**Activity Summary:**

**Investigate decomposition and the organisms involved first hand. Youth will discuss decomposition, sing about the types of organisms involved (decomposers), learn about the various types of composting, and observe and explore decomposers in their natural habitats.**

*This lesson plan was adapted by the Keep Austin Beautiful Education team for at-home learning.*

**Introduction (5 min)**

1. Today, we are learning about a special place some of our kitchen waste can go, and how with the help of decomposition, that waste can turn into compost!
2. What is compost? What do you put in a compost bin? What does compost turn into? At its simplest form, compost turns “food into soil.”
  - Allow time for feedback, questions and discussion
3. If you place an apple on a table, will it magically turn into soil? No, you need the help of something special. You need the help of **decomposers!**

**Read “Sarah, Sylvia, Cynthia, Stout” poem (See attached Lesson Resources for poem) (10 min)**

1. What was Sarah not doing? Taking out the trash.
2. What happened because she didn’t take out the trash? It broke her house, the neighbors and friends moved away.
3. What was most of the trash she wasn’t throwing away? Food.
4. How can we dispose of our kitchen scraps and old food? Compost!
5. What are some of the different kinds of compost systems? Large-scale, backyard and vermi-compost (**See attached Lesson Resources for background information**)
6. What organisms break down food scraps in vermi-composting? Worms.
7. Are worms the only thing with the superpower to turn food into soil? No. There are many things that can turn food into soil, and they are called **decomposers.**

**Deeeeeee-composers! (5 min)**

1. Today we will learn about decomposers by first singing a song about them. This song is a “Do as I do, say as I say” song, so be sure to repeat what I say and do. This song is sung to the tune of the popular camp song “The Alligator is My Friend” and is called “*The Decomposers Song*”. (**See attached Lesson Resources for song lyrics**)
2. What did you think of that song? Who are the decomposers? In the song we said, “The decomposers are my friends, they’re called the....” FBI!
3. Review the FBI. Older grades (3<sup>rd</sup>-5<sup>th</sup>) have most likely already learned about these three organisms. (**See attached Lesson Resources for background information**)
4. What does the “F” stand for? **Fungus**. What is a fungus?

**UNIT:** Generation Zero

**GRADES:** K+

**MATERIALS:**

- Access to the outdoors\* (E.g. backyard, patch of grass, green space)
- Picture of decomposing apple (attached)
- Pictures of various compost systems (attached)
- Poem by Shel Silverstein “Sarah Cynthia Sylvia Stout” (attached)
- Background Information (attached)
- Magnifying glasses (optional)
- Popsicle sticks or sticks found outside

**TIME REQUIRED:** 55 min

**OBJECTIVES:**

Students will be able to:

- Describe decomposition and the organisms involved.
- Identify food waste that can be composted.
- Describe the nutrient cycle.
- Investigate and observe the roles of decomposers.

**TEKS CORE CONCEPTS:**

**Science:**

K: 2A-E; 4B; 7C; 9B;

1<sup>st</sup>: 7AC; 9BC; 10A

2<sup>nd</sup>: 2A-F; 9A-C;

3<sup>rd</sup>: 1A-B; 2A; 7A-D; 9A; 10A

4<sup>th</sup>: 7A; 9A

5<sup>th</sup>: 1AB; 9AB

6<sup>th</sup>: 1B; 2A

7<sup>th</sup>: 1B; 2A; 5B; 10A

- Mushrooms – There’s a fungus that we eat. It starts with the letter M and you put it on top of your pizza!
  - Mold – There’s another fungus, that we don’t eat. It also starts with the letter M and it grows on our old food.
  - Mushrooms and mold work together and grow on old things to help break them down.
5. What does the “B” stand for? **Bacteria**. What is a bacterium?
    - Bacteria CAN be germs, which are bad for you, but there are also a lot of good bacteria somewhere in our body. Where would you find the most amount of good bacteria? Stomach.
    - What is the good bacteria doing in our stomach? Helping us break down our food.
  6. What does the “I” stand for? **Invertebrates**! What is an invertebrate? (For younger grades, you can substitute “invertebrate” for “insect”)
    - An invertebrate is an animal without a backbone. What are some examples of invertebrates that are ALSO decomposers?
      - a. Some appropriate answers: worms, flies, pill bugs, sow bugs, daddy long legs, crickets, cockroaches, ants, snails, fly larvae, etc.

## Compost as a Habitat (10 min)

1. Show and discuss the picture of the decomposing apple. (**See attached Lesson Resources for photos**)
  - Would you eat the apple on the left? Yes! On the right? No!
  - What is so good about the apple on the left that makes you want to eat it? Nutrients.
    - a. **Nutrient:** A substance that provides nourishment and is essential for life and growth.
  - Are there any nutrients in the apple on the right?
    - a. There are still nutrients in the decomposing apple. If we throw that apple away, those nutrients will end up in the landfill (nutrient jail) and will be forever lost. But if that apple goes into the compost, the soil will get those nutrients.
2. Expand your discussion of the picture. Would placing a decomposer on the decomposing apple be enough to turn the apple into soil? (No)
3. Review what a **habitat** is.
  - What is a habitat? A place where organisms live.
  - What are the four things that living things need in every habitat to survive? Food, water, shelter, and air.
  - Decomposers need habitats as well. When you build a **compost pile**, you are making the perfect habitat for decomposers. When we explore **natural habitats** where decomposers live such as under rocks, dirt, and in and around rotting logs, we can observe decomposers in nature.
4. Show and discuss pictures of three different compost systems (**See attached Lesson Resources for photos**) Emphasize that each system is a different habitat than the others and thus supports different amounts of decomposers, affecting the ingredients that can go in that type of compost.
  - **Large-scale compost** – *Biggest type of compost. The piles are taller than a person and longer than a school, and it is the perfect habitat for decomposers. Since a lot of decomposers can live here, it’s like a giant decomposer party and it gets really hot. You can compost meat and milk because the heat kills the harmful bacteria. This is the compost system school cafeteria compost goes too.*
  - **Backyard compost** – *Likes leaves, all veggie and fruit scraps, but not meat or milk. You can build this at home. Fewer types of decomposers live here.*
  - **Vermi-compost** – *Does not like citrus or meats. Smallest and coldest compost system. The vermi-compost bin is a habitat for red wiggler worms where they require shelter and space*

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*(newspaper), water (spray bottles), oxygen (air holes in bin), and food (kitchen scraps). We will explore this system more thoroughly today.*

5. Show and discuss pictures of different compost critters. **(See attached Lesson Resources for photos)**
  - Guiding Questions for discussion: Do you recognize any of these critters? What do you know about them? Can you describe their structures and the functions they serve? (E.g. What do they use their antennae for?) Where do you think they might live in nature?

## Habitat Exploration (20+ min)

Let's go on an outdoor hunt for decomposers and their habitats! Remember: Finding living organisms isn't the ultimate goal. Instead, focus on the process, inquiry, and fun in exploring the outdoors. Encourage curiosity and keep in mind, it's okay to not know the answers to every question!

1. **Guidelines:**
  - **Safety:** Do not touch anything you know or suspect to be hazardous or dangerous. Stick to simple patches of grass, rocks, trees and other spaces near and around your home or neighborhood. Review what poison ivy looks like, and wash your hands thoroughly after.
  - **Respect:** Insects and "critters" are living things and if handled safely, must be handled with care. That same respect extends towards their homes and habitats.
2. **Materials:**
  - Insect guide (or other naturalist or common Texas insect guides or apps) – For identification
  - Magnifying glasses (if available) – For observing
  - Sticks – For carefully moving organisms, pushing away dirt, etc.
3. **Exploration:**
  - Take a walk around your home searching for dirt, rocks, trees, crevices, rotting logs and any other place where insects would burrow and live.
  - If you find a large rock or log, carefully and slowly lift up and observe. Notice what's underneath! What kinds of organisms do you see? What evidence of decomposers can you find? What structures do these organisms have and what function might they serve?
  - Use a Critter Guide, insect ID guide or identification app to see if you can find and ID any of those organisms in your exploration spot.
  - Wrap up: Be sure to return any objects you've lifted or overturned!

## Conclusion and Extensions (5 min)

1. Build your own compost station at home or observe decomposition in your green City of Austin compost container (if available).
2. In the "Compost as a Habitat" portion of this lesson, instead of showing pictures of fresh and decomposing apples use real decomposing and fresh fruits to compare and explore.
3. Encourage youth to continue their new recycling and composting practices every day!

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**Sarah Cynthia Sylvia Stout***by Shel Silverstein*

Sarah Cynthia Sylvia Stout  
Would not take the garbage out.  
She'd wash the dishes and scrub the  
pans

Cook the yams and spice the hams,  
And though her parents would scream  
and shout,  
She simply would not take the garbage  
out.

And so it piled up to the ceiling:  
Coffee grounds, potato peelings,  
Brown bananas and rotten peas,  
Chunks of sour cottage cheese.  
It filled the can, it covered the floor,  
It cracked the windows and blocked the  
door,

With bacon rinds and chicken bones,  
Drippy ends of ice cream cones,  
Prune pits, peach pits, orange peels,  
Gloppy glumps of cold oatmeal,  
Pizza crusts and withered greens,  
Soggy beans, and tangerines,  
Crusts of black-burned buttered toast,  
Grisly bits of beefy roast.

The garbage rolled on down the halls,  
It raised the roof, it broke the walls,  
I mean, greasy napkins, cookie crumbs,  
Blobs of gooey bubble gum,  
Cellophane from old bologna,  
Rubbery, blubbery macaroni,  
Peanut butter, caked and dry,  
Curdled milk, and crusts of pie,  
Rotting melons, dried-up mustard,

Eggshells mixed with lemon custard,  
Cold French fries and rancid meat,  
Yellow lumps of Cream of Wheat.  
At last the garbage reached so high  
That finally it touched the sky,  
And none of her friends would come to  
play,

And all of her neighbors moved away;  
And finally, Sarah Cynthia Stout  
Said, "Okay, I'll take the garbage out!"  
But then, of course it was too late,  
The garbage reached across the state,  
From New York to the Golden Gate;  
And there in the garbage she did hate  
Poor Sarah met an awful fate  
That I cannot right now relate  
Because the hour is much too late  
But children, remember Sarah Stout,  
And always take the garbage out.

## **Decomposers Song Lyrics**

(Sung to the tune of the popular camp song “The Alligator is my Friend”)

Chorus:

Decomposers! (Bring your hands out and apart, then clap your hands)

Deee-composers! (Bring your hands farther apart then clap your hands)

Dee-Dee-composers! (Bring your hands even farther apart then clap your hands)

Can be your friends, can be your friends, (point to as many friends as you can)  
can be your friends too! (When you say the word “too” hold up two fingers)

Verse 1:

The decomposers are my friends. (Point to yourself)

They’re called the FBI.

That’s fungus and bacteria...

And insects! My, oh, my!

*Chorus*

Verse 2:

The decomposers are my friends. (Point to yourself)

They keep things in the loop. (Draw a circle in the air with your finger)

Cuz what you grow your veggies in...

Is decomposer poop!

*Chorus*

Cuz they break, break, break it down, they break, break, break it down

(everybody) break, break, break it down, they break, break, break it down

(a little lower) break, break, break it down, they break, break, break it down

(to the floor) break, break, break it down, they break, break, break it down



Which apple would you eat?

Are there still nutrients in the decomposing apple?

What is helping the decomposing apple  
breakdown?

Where can we put the decomposing apple in order  
to help turn “food into soil?”



# Large-scale Composting





# Backyard Composting





## Vermi-composting



**ADDITIONAL INFORMATION**

- City of Austin Commercial Compost Product:  
<http://www.austintexas.gov/dillodirt>
- COA Compost Fact Sheet:  
[http://austintexas.gov/sites/default/files/files/Trash\\_and\\_Recycling/CompostingFactSheet.pdf](http://austintexas.gov/sites/default/files/files/Trash_and_Recycling/CompostingFactSheet.pdf)

**Nutrient Cycling**

Although plants use the sun’s energy to make food during photosynthesis, they also need nutrients from the soil such as iron, calcium, nitrogen, and phosphorus. Nutrients are very basic small elements found in soil. There are many varieties but all soil comes from the breakdown of plant, animal, and rock material. Without a way to replenish soil with essential nutrients, the plants thriving in it will soon run into problems from the depletion of critical nutrients. Compost is rich in these nutrients and an excellent amendment to help hold water, oxygen, and grow healthy plants. It is made with material such as leaves, shredded twigs, and kitchen scraps from

plants. Compost is a great material for garden soil. Adding compost to clay soils makes them easier to work and plant. In sandy soils, the addition of compost improves the water holding capacity of the soil. By adding organic matter to the soil, compost can help improve plant growth and health.

**Types of Decomposers**

<b>Fungi</b>	A fungus can range from single celled organisms like mold to the much larger, multicellular mushrooms that we enjoy eating. Making up an entire kingdom, they are the largest and most important group of decomposers on the planet. Plants, animals, and every other living thing depend on the nutrients this group of decomposers break down and make available to the ecosystems they inhabit.
<b>Bacteria</b>	Bacteria are microorganisms that are incredibly diverse and widespread. Most people know bacteria as the “germs” that make them sick, but there are many, many more kinds of bacteria that play vital roles in ecosystems across the planet. Many bacteria function as decomposers, including the very E. Coli that live in our intestines.
<b>Invertebrates</b>	Invertebrates are organisms that can be found in the animal kingdom. Invertebrates’ notable feature is that they lack a backbone. They are incredibly diverse, and include insects, arachnids, worms, and much more. Some common invertebrates that play a role as decomposers include worms, ants, flies, cockroaches, beetles, millipedes, roly polies, slugs, and much more.

**Waste Reduction through Compost**

Almost half of all waste entering a landfill is compostable organic matter. Unlike a compost pile, landfills do not contain enough oxygen to decompose the waste efficiently. By removing these materials, landfills save space, and reduce odor, toxic liquids, and methane gas. Several landfill and landscape companies use food and yard waste to produce compost. The soils and mulch are sold back to the community at garden centers and farms. All yard waste collected by the City of Austin since 1989 is turned into Dillo Dirt, a trade-marked compost product by the city Water and Wastewater Utility.

**Compost Types**

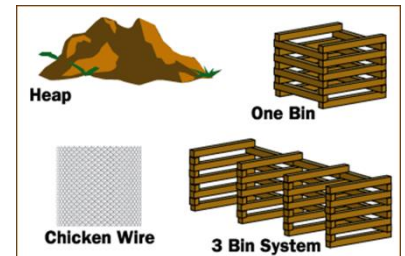
While the end result of a compost system is always healthy soil, there are many different methods to achieve this goal. The most common methods are vermi-compost bins using worms, backyard residential compost piles, and large scale commercial piles built by landscape or waste companies. Each pile can accept different ingredients based on factors such as temperature, decomposers, and location. As a rule of thumb the hotter and larger the pile the wider variety of waste it can accept. Below are descriptions on each and common differences in what they accept.

### Vermi-compost Bin (Cool and Short)

Composting with worms is a great way to divert kitchen scraps while creating organic fertilizer for potted plants and small gardens. While one pound of worms can consume over two pounds of fresh food a day, owners still need to be careful about the types of food added. Rinds and banana peels take much longer for worms to breakdown. Citrus fruits and onions can also be a bit acidic for the worms and create odor in the bin. The temperature stays relatively cool and does not cultivate heat loving bacteria to breakdown and sanitize meat and dairy products. A few grains and breads can be added from time to time but not in large amounts since they increase mold and fungus growth.

### Backyard Compost Pile (Hot and Short)

Using recycled pallets or chicken wire to create a backyard compost pile, or purchasing an enclosed compost tumbler is a great way for families to recycle yard and kitchen waste. The backyard pile attracts many more creatures such as insects, bacteria, fungi, spiders, and pill bugs allowing you to process more organic materials. Composting plain breads and other grains without oils and sauce is acceptable but the temperature still doesn't get hot enough to handle meats, fish and dairy. Another major reason to be selective with the types of organic materials added is to prevent unwanted odors and scavengers (raccoons, possums, and rats) from frequenting your backyard and irritating the neighbors.



### Commercial Compost (Hot and Tall)

Companies in Austin such as Organics by Gosh, Texas Disposal Systems, and Waste Management create compost to sell as a landscape product. Using large equipment to turn, filter, and shred piles, they can accept any type of organic decomposable material including oils, meats, dairy and sugars. Ecologically these piles are very active and contain trillions of heat loving bacteria that quickly munch their way through the food. With so many decomposers, these piles can breakdown large material such as branches, wood chips, and food rinds much faster than a small pile.

### School Compost

In 2011, Austin Independent School District Elementary Schools became the first district in the state to offer single stream recycling and cafeteria composting. In every elementary school there is a collection system maintained by students and staff to receive all organic wastes and transfer to a compost dumpster located in the parking lot. Similar to landfill trash and single stream, Texas Disposal Systems trucks pick up the compost weekly and haul the material to a facility in Buda. Long rows of compost are churned daily and heat up to temperatures over 140 degrees! Organic waste that would otherwise sit in a landfill is helping to create new soil and mulch for farms and gardens all over Austin.

### Vocabulary

<b>Compost</b>	Mixture of decomposed organic material, which include plants, animals, fungi, and microorganisms, which is used as fertilizer.
<b>Habitat</b>	A place where an animal, plant, or person has everything they need to live, eat, drink water, and raise a family.
<b>Decomposers</b>	Organisms such as bacteria and fungi which get nutrients by breaking down organic matter in wastes into simpler chemicals.

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