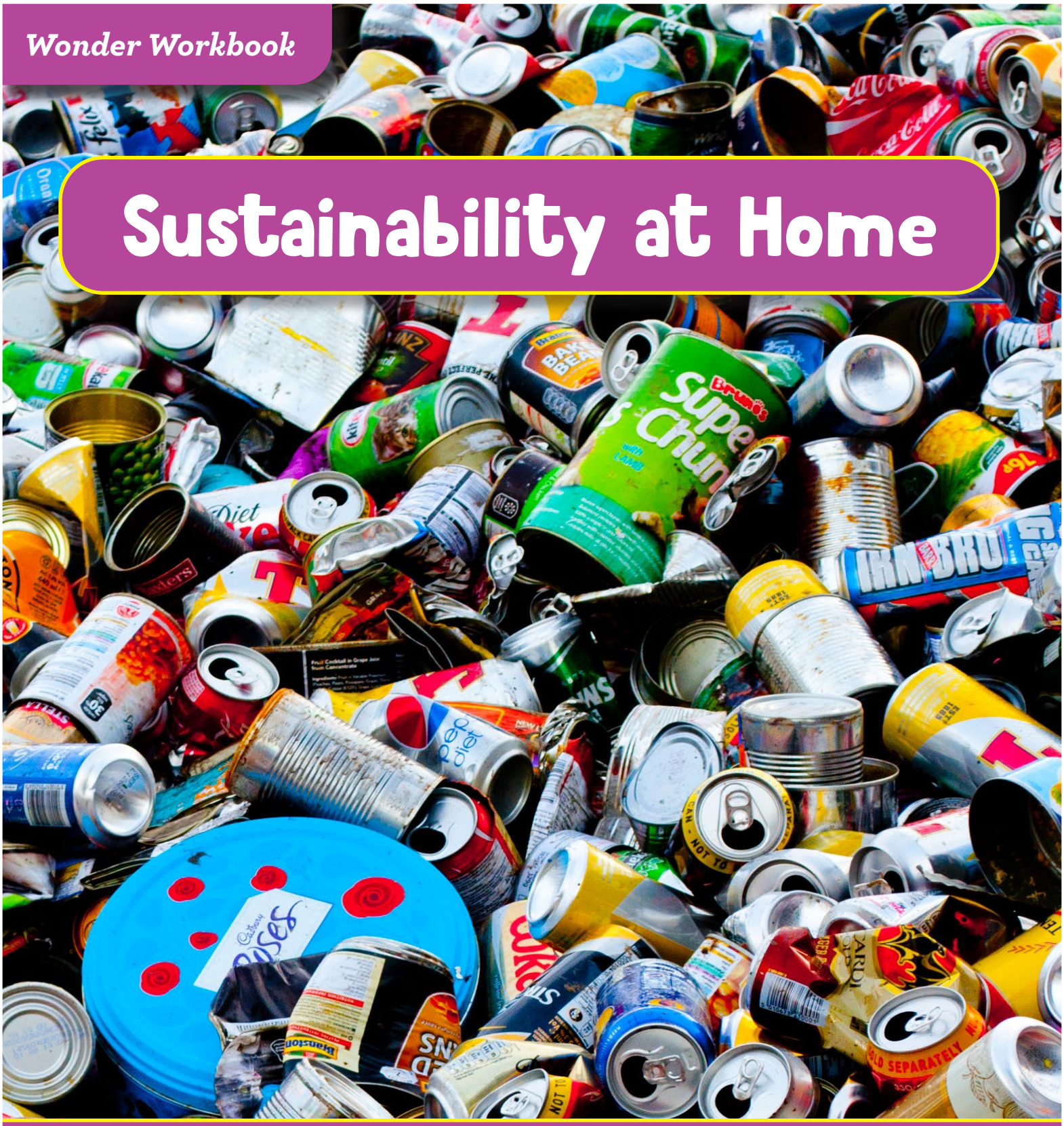
Wonder Workbook

Sustainability at Home



SUSTAINABILITY VOL. 1

CHICAGO ACADEMY OF SCIENCES

PEGGY NOTEBAERT NATURE MUSEUM

Sustainability at Home

Peggy Notebaert Nature Museum Wonder Workbook

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Top 8 Ways to Conserve Water at Home

1. Fix leaky faucets and toilets.
2. Run washing machines and dishwashers only when full.
3. Limit showers to less than five minutes.
4. Toilet installed before 1980? Place a bottle filled with water in the toilet tank.
5. Install a low-flow shower head.
6. Turn off water while either brushing your teeth or shaving.
7. Use leftover drinking water to water houseplants.
8. If possible, use a dishwasher instead of washing by hand. Rinse dishes in a sink full of water rather than by using the tap.

What are some other ways you use water?

Can you think of ways that you can conserve the water you use? Or use it in a more efficient way?

"Save the Source" Water Audit

Did you know that Lake Michigan is the largest public drinking water supply in the state of Illinois? Even though the lake is large, it's not an unlimited supply. Let's learn some simple steps we can all take to help conserve water at home! Use this worksheet to keep track of the number of times you use water and in which way for a full day by filling out the **"number of times"** column. Then, at the end of the day, multiply the number of times by the **"average amount of water for the activity."** Write the answer in the **"total water used"** column, then add that column up to get an estimate of how much water you use in a day.

Please note that this is not comprehensive or the only way; feel free to modify this worksheet to fit your needs. Have fun, be creative and get your family or roommates involved in monitoring.

Activity	# of Times (✓)	Average Amount of Water for this Activity (liters)	Total Water Used (liters)
Washing face or hands (water running)		7.5	
Washing face or hands (water off)		4	
Flushing toilet (standard flow toilet)		20	
Flushing toilet (low-flow toilet)		5.5	
Taking a shower (standard head)	**# of minutes:**	7.5/minute	
Taking a shower (low-flow)	**# of minutes:**	4/minute	
Taking a bath		150	
Shaving (water running)		7.5	
Shaving (water turned off)		4	
Brushing teeth (with water running)		7.5	
Brushing teeth (with water turned off)		1	
Getting a drink (from a fountain)		1	
Getting a drink (in a glass)		0.25	
Cooking a meal		10	
Washing dishes by hand (water running)		110	
Washing dishes by hand (water off)		40	
Washing dishes (with a dishwasher)		55	
Doing a load of laundry		110	
Other:		**Estimate:**	
		TOTAL:	

How many gallons of water did you use on this day? How many gallons would you estimate you use in a week? In a year?

How can you start conserving water today? Long-term?

Let's Explore a Worm Bin

What do we see when we open up the worm bin?

Let's take a closer look...

It's newspaper!

Newspaper (even the ink!) is biodegradable, so it is safe for the worms to eat.

Newspaper isn't just worm food. It also helps absorb any extra liquid from decomposing food, and from the compost itself. This keeps the worm bin not too wet and not too dry—just right!

Let's Explore a Worm Bin

When we move the newspaper, what's underneath?

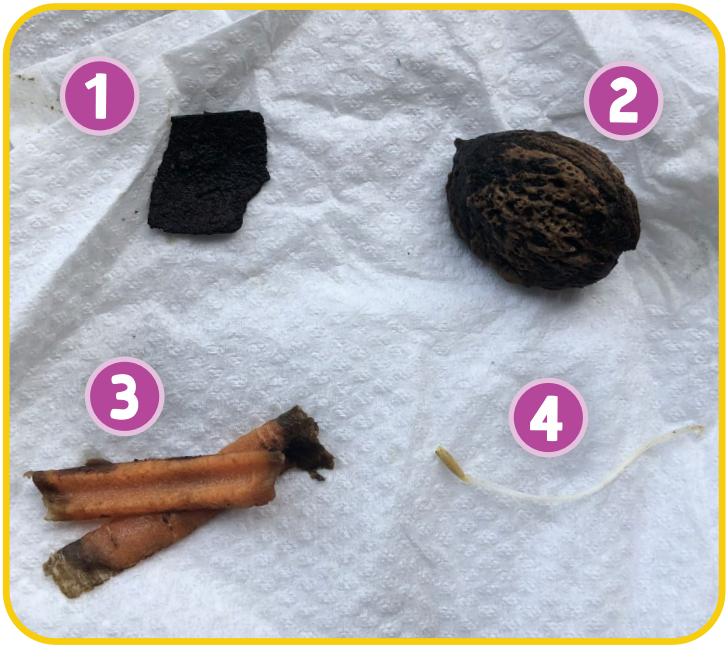
It looks like a whole bunch of dirt! Wait...is it mud? What do you think?

It's actually called compost (also known as "worm poop")!

After worms eat organic material like plants, fruits, and vegetables, the worms poop out a nutrient-rich waste. All of the good nutrients in their poop help more plants grow and keep the soil healthy.

Let's Explore a Worm Bin

What are some foods the worms are snacking on? Let's see what we can find....



1. Avocado peel (they ate the soft green avocado fruit!)
2. Peach pit (they ate all the peach pieces off of it!)
3. Carrot peels!
4. A small sprout that started growing in the compost! (from a zucchini seed)

Compost worms love to eat raw vegetable scraps like carrots, broccoli, zucchini, potatoes, cabbage, and corn. They like some fruit, such as banana peels and apple cores. They also eat beans and grains. They won't like anything that's too sour, such as an orange or a lemon. Additionally, they won't like anything that's greasy or oily, or dairy such as cheese. The worms can eat meat, but they take a long time eating it, which means the meat will go bad in your bin and make it stinky! We feed our worms a vegan diet to keep them (and the bin) happy and healthy.

Let's meet our worm friends!

Compost worms are small, wiggly, and squishy. It is good to be gentle when handling them so they don't accidentally get poked too hard.

Worms love to be underground where it's dark, in damp dirt. Worms don't like to dry out!

They don't have teeth so they can't bite you—this also means they can't chew their food! They grind their food up after they swallow it, in a special organ called a gizzard.

How long do they look? What colors do you see? What shapes do the worms make when they wiggle?

Let's Explore a Worm Bin

Final challenge: how many worms can you find?

What Lunch Scraps Can You Compost?

What is composting? Composting converts food scraps and yard trimmings into a special soil conditioner called humus. This amazing material helps fortify soil, holds water, and helps reduce the need for synthetic fertilizers. Plus, you can do it in your backyard!

Composting with worms—called vermicomposting—is another way to break down your scraps. The worms, like red wigglers, eat the waste and produce nutrient-rich waste. What can you compost? **A good rule of thumb is if it's organic, you can compost it!**

COMPOST SORTING CARD GAME

See if you can figure out what can and can't be composted! Using a pair of scissors, cut out the cards on the following pages. Once you're done cutting, shuffle your cards and sort them based on what you think belongs in a compost bin and what doesn't. Each card is available in English and Spanish!

POST-ACTIVITY GUIDING QUESTIONS

What kinds of things do you think we can compost?

What is special about them? Think about the way they break down or decompose.

What are some other things you can think of that we could add to a compost bin?

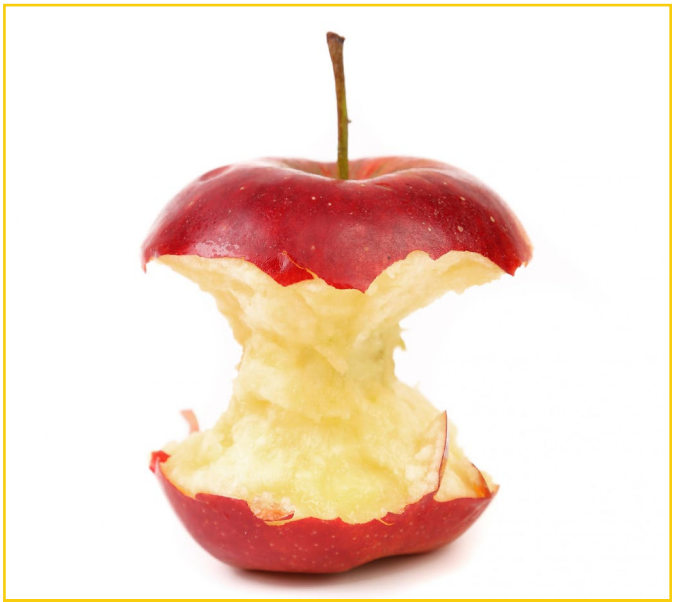
What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Apple Core

Apple Core

Corazón de Manzana



Corazón de Manzana

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Egg Shells

Egg Shells

Cáscara de Huevo

Cáscara de Huevo

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Tea Bag

Tea Bag

Bolsa de Té

Bolsa de Té

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Coffee Ground & Filter

Coffee Ground & Filter

Café Molido y Filtro

Café Molido y Filtro

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Banana Peel

Banana Peel

Cáscara de Plátano

Cáscara de Plátano

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Sandwich Scraps

Sandwich Scraps

Restos de Sandwich

Restos de Sandwich

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Pizza Crust

Pizza Crust

Corteza de Pizza

Corteza de Pizza

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Strawberry Scraps

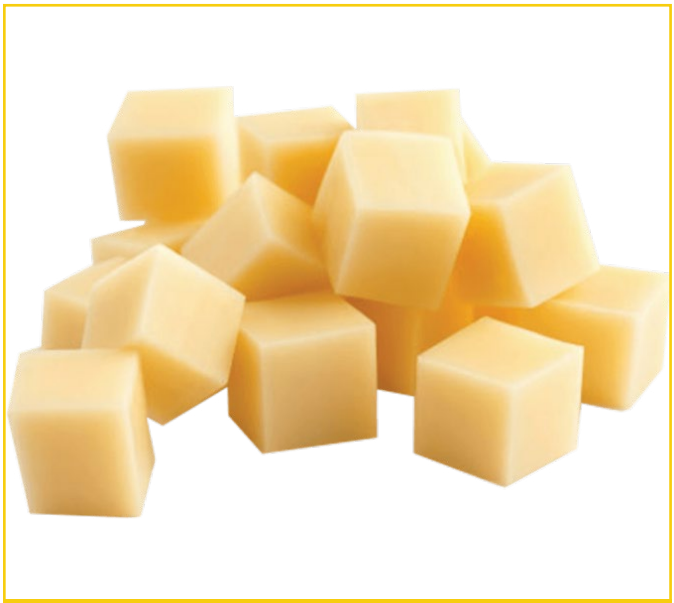
Strawberry Scraps

Hojas de Fresa

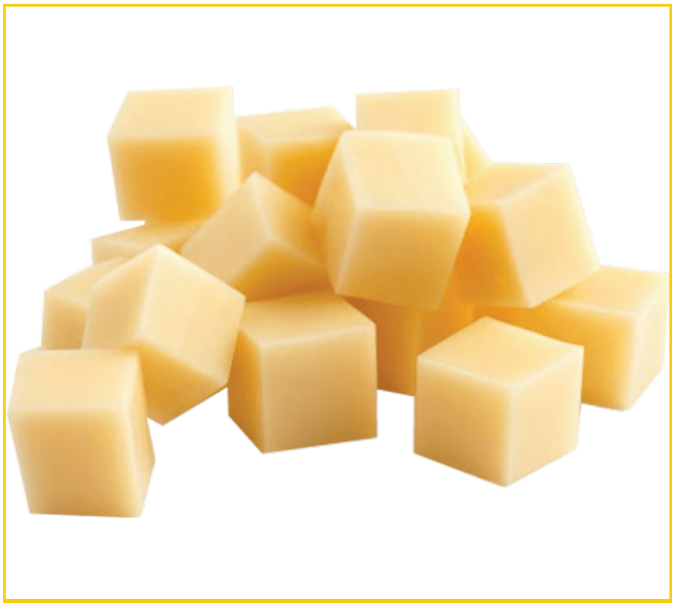
Hojas de Fresa

What Lunch Scraps Can You Compost?

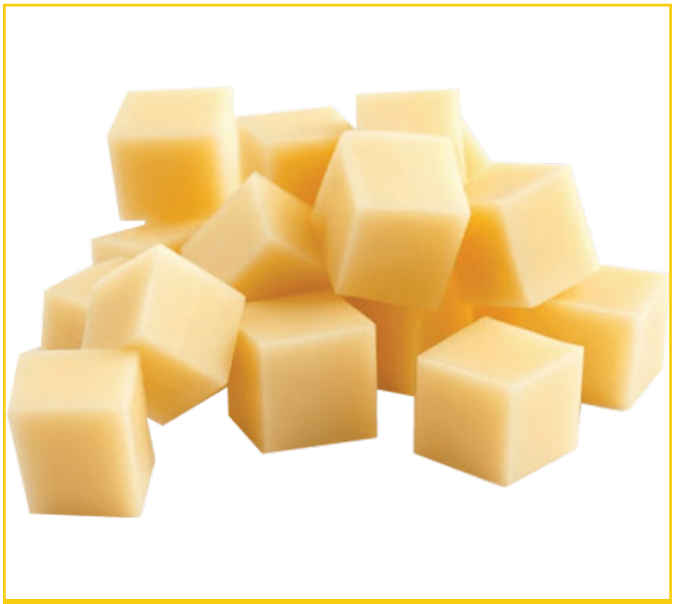
COMPOST SORTING CARD GAME



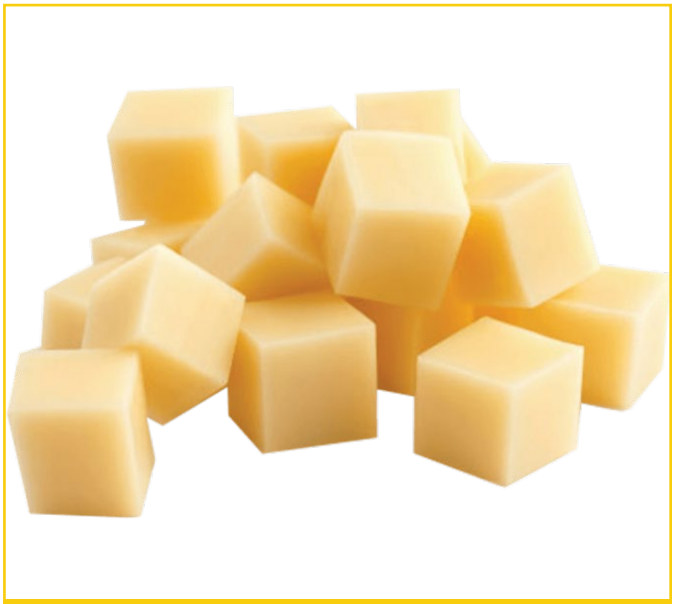
Cheese Cubes



Cheese Cubes



Cubo de Queso



Cubo de Queso

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Chicken Bone

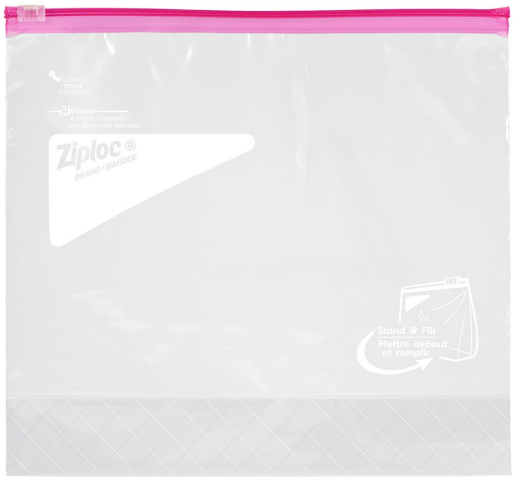
Chicken Bone

Hueso de Pollo

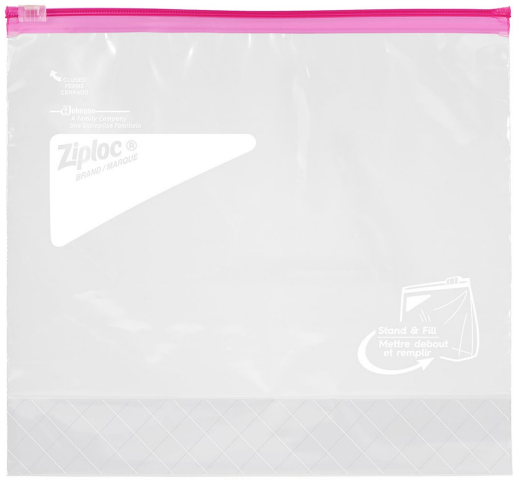
Hueso de Pollo

What Lunch Scraps Can You Compost?

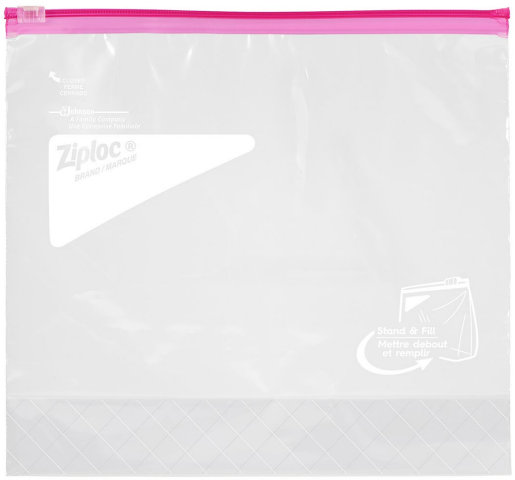
COMPOST SORTING CARD GAME



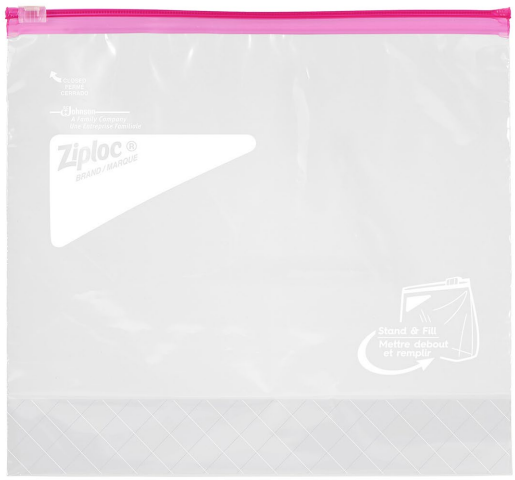
Sandwich Bag



Sandwich Bag



Bolsa de Sandwich



Bolsa de Sandwich

What Lunch Scraps Can You Compost?

COMPOST SORTING CARD GAME

Dry Leaves

Dry Leaves

Hojas Secas

Hojas Secas

Composting with Worms Guide

WHY WORM BINS?

Food scraps make up 12% of the waste that Americans generate every day. That adds up to about 28 million tons of food that gets thrown out over the course of a year! Food scraps that are sealed in airtight landfills can react with other materials and create methane, a greenhouse gas, and acidic leachate. If the food is composted instead, it creates environmentally friendly, nutrient-rich soil.

Vermicomposting (or vermiculture) is the practice of using worms to turn organic food waste into a nutrient-rich fertilizer called vermicompost. Worms eat the decaying food and transform it into castings (i.e., worm poop) that are full of the nutrients and bacteria that gardens and houseplants love. Vermicomposting is a great way to compost in an urban setting where outdoor compost bins may not be practical. You can keep the worm bin inside, and, if you do it right, it won't smell or attract flies.

BUILDING A WORM BIN

What you need:

- ☐ **Rubbermaid bin**
- ☐ **1 pound of red worms**
- ☐ **¼ pound of organic food waste**
- ☐ **Black-and-white newspaper or shredded paper**

Step 1: Use the 1/16 inch bit to drill ventilation holes about 2 inches apart along the side of the bin near the top (to prevent worms escaping). Drill 8-10 holes in the bin's top. Remember to wear safety glasses when you drill.

Step 2: Prepare bedding materials. Bedding provides the medium in which worms live, holds the moisture and provides the air worms need to survive, and covers the garbage you bury. Tear newspaper into long strips about 1 inch wide or shred old office paper. Fill the bin with the strips. *Note: Do not use slick paper (like magazine pages), which can be toxic to the worms. The paper should be well-fluffed – don't pack it in.*
Step 3: Add just enough water to moisten the paper so it is about as damp as a wrung-out sponge.

Step 4: Add about 1 pound of worms.

Step 5: Bury about ¼ lb (about a handful) of food in the bedding. ¼ pound of food equals about ¾ cup of sliced fruit or veggies.

Step 6: Put the lid on it! Worms are sensitive to light, so keep the lid on the bin whenever you're not adding food or working on maintenance.

Composting with Worms Guide

MAKING A HOME FOR YOUR WORMS

Finding a place for your worm bin
Worms prefer moderate temperatures (between 55 and 77 degrees Fahrenheit), so find a place for the bin somewhere where it will not freeze or overheat. The kitchen is a good spot because it is where most of your food waste will occur, but you could also keep them in a garage, utility room, or other out-of-the-way location.

Feeding the worms (ongoing)
In general, earthworms consume about half their weight each day. Since you started with about 1 pound of worms, add no more than 1/2 pound of food per day. The worm population will adjust according to how much food you add, but the bin will probably not be able to handle much more than 1 pound of worms, so don't add too much food. Chopping the food scraps into small pieces with more surface area should help the worms eat it faster and will decrease the chance of rotting or molding.

Begin feeding the worms a little at a time. You can add more food as they multiply.
Bury the waste in pockets, rotating around the bin as you go. Most of the food should have been eaten by the time you return to the first spot. If not, cut back on the amount of waste you add. You may have to do some trial and error to figure out which food scraps work best in your bin, but to start, here are some basic tips on what to feed the worms:

FEED LOTS OF:	FEED SOME OF:	DON'T FEED:
• Fruits, vegetables, & herbs • Newspaper • Used tea & tea bags • Cardboard • Rinsed egg shells • Paper towels	• Coffee grounds/filters • Smelly veggies (e.g. onions and garlic)	• Breads and grains • Bones • Spicy things (e.g. peppers) • Oils, fats, and butter • Cheese and dairy • Meat, poultry, and fish • Glossy paper • Manure

Maintenance (ongoing) – keeping moisture in check
In addition to feeding the worms, you'll want to remove excess liquid to keep the worms from drowning. To keep moisture levels down, you can add dry shredded newspaper to the surface of the worm bin to soak up moisture, use a turkey baster to draw off excess liquid, and/or carefully pour the liquid out of the bin (making sure to keep everything else in). The liquid produced in the bin is known as "worm tea" or "compost tea" and makes a great, potent fertilizer for house or outdoor plants.

Composting with Worms Guide

HARVESTING YOUR COMPOST

After 2 to 6 months (8–16 weeks), you should start to see compost. Once you see that most of the bedding has been eaten and replaced with dark, crumbly fertilizer, it is time to "harvest" the compost and provide new bedding for the worms. Here are a few suggestions:

Scoop Method: If you just need a little compost, leave the top of the bin open for about 10 minutes. After the worms have wriggled to the bottom (to escape the light), scoop out a few handfuls of compost.

Migrating Method: Push the compost to one side of the bin and add fresh bedding to the other side. After a month or so, all the worms will have migrated to the fresh side and you can remove the old compost.

Pile Method: Empty the contents of the bin onto a sheet of plastic and separate into little piles. The worms will wriggle away from the light into the center of each pile and you can brush away the compost on the outside by hand.

TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	SOLUTION
Worms are dying or are trying to escape	• Too hot • Too dry • Too wet • Not getting enough food • Bedding is used up	• Move bin to cooler location • Moisten bedding • Add more bedding • Add more food • Harvest bin and add more bedding
Bin stinks or attracts flies	• Exposed food in bin • Not enough air circulation • Improper items added • Too much food added	• Bury food in bedding • Fluff bedding and add more • Remove meat, dairy, etc. • Turn contents, add bedding; stop feeding until problem goes away

Note: Mold is an active part of the worm bin; the mold helps break down the food that the worms eat. People with extreme mold sensitivities should avoid tending the bin.

Composting with Worms Guide

APPLYING COMPOST

Outdoor plants

- **To mulch (after planting):** Apply one inch to the soil around plants; make sure compost is not piled against plant stems.
- **To amend (before planting):** Mix compost into the top few inches of soil before planting; or mix with potting soil and spread over your planting area; or mix it into the bottom of seeding trenches or transplant holes.

Houseplants

Sprinkle compost around the base of plants.

FAQS

Q **What do I do if the compost is ready to harvest before I'm ready to use it in my garden?**

A Worm castings (i.e., the compost) are toxic to worms, so you should harvest the compost soon after it is ready. You can try storing the compost, but it may dry out or get moldy. We recommend finding a way to use compost soon after it is ready – such as on your houseplants.

Q **Will population control be a problem? Will my worms multiply out of control?**

A Your worms will not take over the house. The availability of food and space limit the population size. Worms reproduce quickly, but if you continue to add the same amount of food you always have, the population size will be kept in check. (Don't worry about finding dead worms in the compost; they decompose very quickly.)

Q **Can I put too much waste in the worm bin?**

A Yes. If you put more food waste in the bin than it is equipped to handle, anaerobic conditions may develop, causing odor. To decrease odor, you can aerate the bin by turning the material and stop adding food until the odor goes away.

ADDITIONAL RESOURCES

Mary Appelhof's *Worms Eat My Garbage* is considered the authoritative source on vermicompositing.

Recycle or Trash – Card Sorting Game

Do you know what you can recycle and what you can't?
Try your hand at this sorting activity. Print out and cut the items on the following pages. Then, sort them into three piles:

Yes
Recycle It

No
Trash It

Different Situations

Once you've sorted them, check out full list at the bottom for the answers. You might be surprised at what you can and can't recycle!

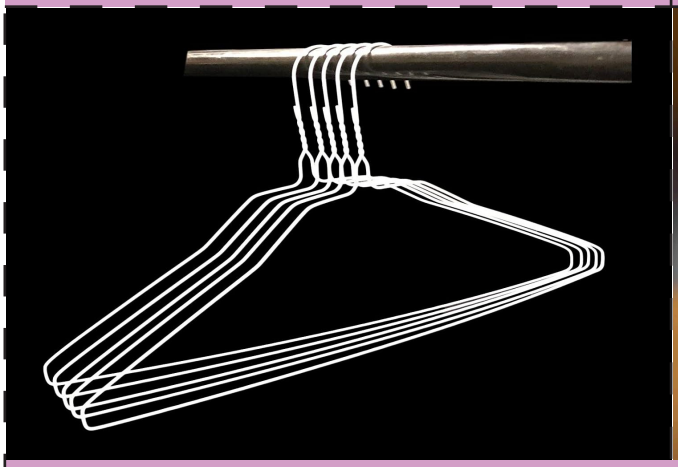
ANSWER KEY

Yes *Recycle It*	No *Trash It*	Different Situations
• Aluminum Foil • Soda Cans • Cardboard Boxes • Metal Caps • Batteries • Envelopes • Soda Bottles • Plastic Bottle Caps • Glossy Magazines • Newspapers • Post-it Notes • Toilet Paper Rolls • Paper Towel Rolls • Juice Boxes • Milk Cartons	• Storage Bins • Glass Bottle Shards (safety reasons) • Reusable Water Bottle • Plastic Straws • Disposable Coffee Cups • Plastic Cutlery • Sandwhich Bags • Pizza Box (top can be reycled if there's no grease)	• Plastic grocery bags (reuse) • Coat Hangers (return them to dry cleaners) • Light Bulbs (take to office supply stores) • Ink Cartridges (take to office supply store)

Recycle or Trash - Card Sorting Game

Glossy Magazines

Newspaper



Coat Hangers

Disposable Coffee Cups

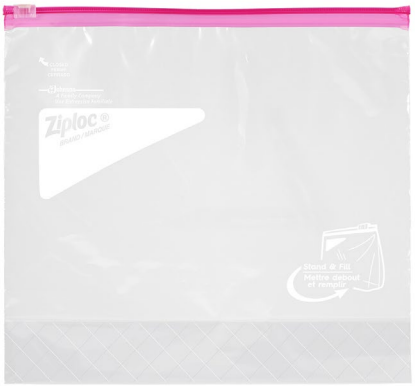
Toilet Paper Tubes

Batteries

Recycle or Trash – Card Sorting Game

Glass Bottle Shards

Grocery Bags



Sandwich Bags

Plastic Cutlery

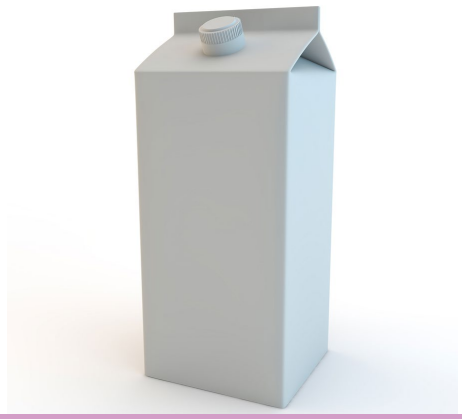
Soda Cans

Metal Caps

Recycle or Trash – Card Sorting Game

Aluminum Foil

Pizza Box



Drink Carton

Soda Bottle

Plastic Bottle Caps

Plastic Straws

Recycle or Trash – Card Sorting Game

Storage Bins

Ink Cartridges

Cardboard Boxes

Reusable Water Bottles

Envelopes

Sticky Notes

Talking to Children About Climate Change

Teaching children about nature and our climate from a young age helps them develop a sense of responsibility and passion for the world around them, and lays the groundwork growing children will need to understand the scientific issues, like climate change, that will affect them throughout their lives.

It's not just possible, it's critical to engage children in thinking about our environment at every age, and that includes the challenges climate change presents our environment today.

It can be overwhelming determining how to talk to children about climate change, which is often a difficult topic of discussion for adults. Climate change is complicated and often extremely abstract, and it can be intimidating or even frightening to think about. What's more, children at different developmental stages engage with these issues in very different ways.

That's why we've developed these age-appropriate guides that provide ways to start simple discussions about environmental impacts with children. Using authentic connections and experiences with nature as a strong foundation, children can gradually build towards more complex ideas about the ways that humans and the environment affect one another.

We have tips and activities to get the conversation started with kids of all ages. Flip through to find the perfect fit for you!

Talking to Children About Climate Change

Beginning the Conversation: Ages 2–5

TIPS FOR ADULTS

Introducing very young children to nature from the start will provide the groundwork for a growing understanding of the environment as they get older. Concrete, familiar ideas such as home provide a starting point for very young children to engage with nature on a personal level.

Help children recognize the ways and places nature is present in their own lives and homes. Talk about nature in and around your home. Look in your backyard, out your windows, or in familiar nearby outdoor areas. Talk about how these spaces that feel like home to you might also feel like home to other animals.

SUGGESTED ACTIVITIES

- Go on a nature walk and search for animal homes in your area.
- Gather natural materials and build your favorite animal home. Use those materials to build a model house that a person might like to live in. How do people and animals use things from their environment to make homes they want to live in?

GUIDING QUESTIONS

Which animals live in our back yard?

Do we share our home with any plants or animals?

What do you think 'home' looks like to them? What makes that place a good home for them?

How does that home help them live and be comfortable? How do our homes help us live and be comfortable?

Talking to Children About Climate Change
Introducing Human Impact: Ages 6–9

TIPS FOR ADULTS

Children of this age level are old enough to start exploring cause and effect: the ways nature affects their daily lives, and the idea that humans can also impact nature. Start with simple causes that have clear effects. For instance, weather events (such as rain, snow, a very cold or hot day) can lead to conversations about how weather, as part of nature, affects your day-to-day lives. Meanwhile, human actions like cutting down trees or picking up litter have obvious and direct impacts on nature.

This is a good time to introduce the idea of climate (what the weather is "always" like, over a long period of time) as an early prelude to discussing how climate can change.

SUGGESTED ACTIVITIES

- Set up a rain catcher or a thermometer at home. Keep a weather journal, or just check to see how the weather changes from day to day. Does weather in Chicago follow any sort of pattern? How can we find out about these patterns?

GUIDING QUESTIONS

Does the weather ever change what you do?

What would you do differently on a sunny day than you would on a rainy day? What about a snowy day?

Are there places you like to go to be in nature? What do you do there?

Does it look the same every time you visit? What is the same and what is different? Do you think nature notices that you were there?

What are ways that you help protect nature when you go to a park?

Talking to Children About Climate Change
Looking to the Future: Ages 10–12

TIPS FOR ADULTS

By this age, children are generally ready for conversations specifically about climate change. Begin with honest, simple facts: human actions over a long period of time have changed the climate around the world, and it will continue to change in the future. Together you can gradually explore more details about which human actions have created what changes and how.

Focus on empowering your child with actions they can take. How can you adapt to live with a changing climate? Talk about specific human actions that can impact the climate, like energy use and transportation, and choices you can make in your own lives so that the climate doesn't change even more.

SUGGESTED ACTIVITIES

- Talk about things that your family does every day that might have an impact on climate change. Decide on a few things that you can do differently together that will help reduce climate change in the future. How do you make a plan that's good for the environment that you can stick with over a long time?

GUIDING QUESTIONS

What would it be like if it rained all the time? What if it never rained at all?

What would happen to your neighborhood and everything that lives there?

What are some good ways to deal with all the problems that arise from too much rain?

What are some things we use electricity for?

Can you think of ways to do those things with less electricity?

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