KEEP AUSTIN BEAUTIFUL

Waste Wise

Activity Summary:
Explore waste solutions while investigating what is being thrown away in landfills in the U.S. Students will learn about Brownfields lands, how recycling and composting cycles work, waste management strategies in Austin, and practice sorting common waste items.

UNIT: Generation Zero

GRADES: 6th – 8th, 9th-12th

MATERIALS:
Pictures of a modern landfill, MRF recycling facility, composting facility, RDOC (access to YouTube for videos), pictures of previous dumps/landfills in Austin converted to recreation areas, various common waste items

TIME REQUIRED: 60 minutes

OBJECTIVES:
Students will be able to:
Understand City of Austin Zero Waste Goal and the importance of diverting trash away from landfills.
Learn about Land Revitalization efforts on previous landfills/dump sites in Austin
Learn about recycling, composting, reuse and creative waste management strategies.

TEKS CORE CONCEPTS:
See Instructor Resources

Set-Up *(Before lesson)*

1. Make sure you have access to a white board and ability to show YouTube video, if the technology is available to access (can adapt if unavailable).

Introduction (5 min)

1. Where our trash goes.
   a. *Where do you put waste in this room? (trash can) Where does that garbage truck take the waste? (landfill) Does anyone know why this is what we do with our waste?*
   b. *People found the most success by simply burying their waste, and by the 1960's and 70's, the Environmental Protection Agency (EPA) began initiating standards for sanitary landfills. The regulations were tightened tremendously, giving birth to the modern day, heavily regulated landfill. Leakage of toxic liquids and methane gases still pose a problem, however. Do we think landfills are a sustainable method for getting rid of our waste? Why or why not?* Allow youth to answer. Possible answers: They take up a lot of space, land use, waste takes thousands of years to break down, causes pollution such as methane gas and other emissions.

<u>Brownfields Reclamations (5 minutes)</u>

a. *One of the biggest issues with landfills is that they take up a lot of space that cannot be used to build any houses, workplaces, stores, or roads. This can also encroach on wildlife habitat. But what if we could reuse that land in a way that everyone could enjoy it? What are some ways you can think of where a patch of land like a landfill could be reused without being built on?* Various youth answers. *These lands are called Brownfields- or the process of taking land that was already used and turning it into an asset for one's community. The EPA even provides grants for this to happen!*
b. *Raise your hand if you've ever been to Zilker Park. Did you know it contains the site of an old landfill? The parking lot underneath MoPac is an old stone quarry that, in the 1960s, was turned into a landfill! After it filled up, the City capped the landfill with soil and a thick layer of rocks, and now, thousands of people park their cars on top of it every year to enjoy the crown jewel of Austin. The site is carefully monitored so leachate (AKA trash juice) does not enter and pollute Ladybird Lake.*

c. *There are places all over Austin with a similar story. Do you know of any other sites in Austin that are examples of Land Revitalization?* Allow students to answer. *If you've ever played soccer or skated at Mabel Davis District Park, or hiked Red Bluff Nature Preserve, you've used the site of an old landfill/dump to make your life in Austin more interesting and fun. And just like Zilker Park, they are carefully monitored to make sure they remain a healthy place we can all enjoy.* Show pictures of these local spots!

Diversion Solutions (15 minutes)

1. *Even with the many ways landfills can be reclaimed and reused, the best way we can mitigate the environmental issues is by not using them at all! Can anyone guess how many pounds of trash each Austinite produces on average every day?* Allow for student answers.
    a. *Every person in Austin makes 4.5lbs of trash every day on average! If all this trash goes to the landfill, how long until they are all full? Then what do we do? Build a new one?* "From 1986 to the mid-1990s, the state's reserve capacity for disposal (the time it would take landfills to fill up if they continued operating normally) was less than 22 years. Thanks to changes in technology, processes, and waste diversion, the current reserve capacity for disposal is about 54 years." (Source).
    b. Discuss problems with building new landfills. Allow students to brainstorm and share out before asking the guiding questions: *Where do we put it? How close will you live to it? Where is there enough space in this area to actually build a new landfill? What if we built it farther away? Transportation of trash? Cost?*
    c. *Are landfills a sustainable option? Where else can we put our trash? What are ways we can reduce our waste?*
2. *This idea of waste reduction is so important that in 2011, the City of Austin made a decades-long commitment to make this happen, called the 2040 Zero Waste Goal. This goal says that by 2040, by the time you guys are around [age], the City of Austin would divert, or find other places for, 90% of our landfill waste. Do you believe this goal is possible to achieve?* Allow for student answers.
3. Using an instructor pie chart, show the following landfill composition. have the class determine which categories can be recycled or composted. Write on pie chart if it is landfill trash, single stream recycling, composting, reusable, can be donated or can be recycled at a special facility.

What's in a Landfill?	***Percentage***
Paper & Cardboard	*23%*
Food Scraps	*22%*
Yard Trimmings	*12%*
Plastics	*13%*
Metals	*9%*
Rubber, Leather, & Textiles	*9%*
Wood	*6%*
Glass	*4%*
Other	*2%*

a. *Do all these items have to go into the landfill? Which categories can we send elsewhere?* Go category by

category and mark each as Compostable, Recyclable, Reusable, or Landfill as follows:

Recyclable Materials:

- Start with Paper and Paperboard: 23%, *Where should paper and cardboard go instead?* Recycling *Which three other categories go into the single stream recycling cart?* Have them answer. Option to teach rhyme: Paper, Plastic, Metal, Glass! These things don't go in the trash.
  Metals 9%- Recyclable
  Glass 4%- Recyclable
  Plastic 12%– Recyclable (With advanced students note 2% of plastics are Landfill trash only)
  Paper – Recyclable and Compostable

- *Does anyone know what "Single Stream Recycling" means? Recycling is very localized meaning it can look very different in other cities and towns even within Texas. In some places, you must separate all your recyclable materials into different places. Here in Austin, we have "Single Stream Recycling" services where you can put all products into one cart, then these are sorted out at recycling facilities.*

Compostable Materials:

- Start with Food Scraps. *What percentage is food scraps?* 22%. *Do food scraps have to go to the landfill? What is a better option for food scraps if available?* Composting. Compostable items turn into healthy soil.
- *Rule of thumb with Composting is "If it grows, it goes!", which other category can be composted*? Yard trimmings 12%
- Food Scraps, Yard trimmings – Compostable. Ask students if they've seen the green composting cart or have one at home. The City of Austin is actively working on making sure everyone has access to the green composting carts/dumpsters including apartment complexes and condos. All food items can be composted with this service including meat leftovers (chicken bones), dairy (cheesy pizza, spoiled yogurt). Can you give an example of yard trimmings? Leaves, sticks, untreated wood. You can even put wet paper like soiled napkins and pizza boxes (cardboard) in the green cart. *Why can we put those items in the cart? Because* if it grows, it goes. It comes from trees.

Why should we compost?

- A recent study showed the almost half of everything residential customers (in Austin, TX) put in the trash cart could have been composted instead. Do you think compostable material can break down in the landfill as it would in nature or in a compost pile? Compostable material cannot break down in a landfill. When compostable materials are put into the landfill, it starts to decompose without oxygen. This releases harmful methane into the atmosphere.
- The food scraps, yard trimmings and paper products turn into healthy humus which can be used to help fertilize lawns and gardens without chemicals. It also helps soil with water retention. (sourced from ARR website)

Special Recycling

- *Which categories do you think can be reused or go somewhere special to be recycled?* Rubber, Leather & Textiles.
- Rubber/Leather/Textiles – Most can be reused or recycled in some way to extend their life. You can upcycle or donate textiles. *Where can I take my clothes, I no longer need/want?* Thrift store, Donation. *Did you know the United States produces 330 million tires a year? Because tires*

cannot safely be reused once they are worn out, Austin shreds them to use in playgrounds, or even melts them down to fill cracks in the highway!

- Batteries can be taken to Austin Public Library or RRDOC (Recycle & Reuse Dropoff Center)

What must stay in the landfill?

- *We're only left with Treated Wood and Other. How much does Treated Wood equal?* 6% *How about Other?* 2% *How much is 6 + 2?* 8. *That's all we should be putting in the landfill. How much should we NOT be putting in the landfill? 100-8=?* 92%
- Wood (Treated), Other – Treated wood is mostly landfill, though some can be repurposed. Other could include things like diapers, dog poop bags, medical waste like bandages, cigarette filters water hoses, etc.

b. *Go back to City of Austin's Zero Waste Goal. Remember, the Zero Waste Goal in Austin is to divert 90% of our waste from the landfills by year 2040. Now that we've analyzed our data, is it possible to meet the Zero Waste Goal over time? Yes, 100-92 = 8*
   a. *Yes! We just need to learn how to compost and recycle as best as possible. And remember, it's not about a few people recycling perfectly. It's about everyone trying their best. For our last activity, we'll cover the basics, but also some of those more challenging or confusing items, so you can be a recycling pro in your community.*

Create a Closed Loop (*20 minutes*)

1. *You have learned about the different options you have to dispose of your waste. We went over what can go in the compost and recycling carts plus options for disposing of special recycling material. Now we are going to do an activity in groups that focusses on the composting and recycling cycles from start to finish.*
   a. Instructor has youth work in groups if they are not already separated into different table groups.
2. *This is a critical thinking activity that will rely on you and your group making hypothesis to sort the steps that a composting item and a recycling item go through during their journey to become something new. Each group will get two bags that have individual cards with descriptions of each step of the composting and recycling cycle. You will work with your groups to put the cards in order from start to finish.*
   a. Hand out the two separate "recycling" and "composting" baggies to each group. (Please see instructor resource on **page 9** to print out the closed loop system card sets)
3. *Your starting card for each cycle is the "Used water bottle" for the recycling and the "eaten apple" for the composting. You have 5 minutes to work with your group and place the steps of each cycle in order.*
   a. Walk around the room and ask thought-provoking questions to the different groups. *"Why do you think _____ is the third step in this cycle?" "Do you think this cycle would work if you just threw the apple onto the ground?"*
4. Gather the students' attention after the allotted time (The students may need an addition 2 minutes to complete their activity). Using the instructor set of cycle steps, project or write on a board that everyone can see the start of the recycling cycle.
5. *Let's start by going over the recycling cycle that you worked on with your group.* Ask individual groups what they put for each step as you add the steps to the cycle. For the instructor cycle, add the steps in two giant circles/loops.
   a. Recycle Cycle in order
      i. "Used water bottle"-You finished drinking all the water in your plastic water bottle.
      ii. "Recycling Cart"-empty recycle items can be placed in the blue single stream recycling cart.
      iii. "Recycling Truck"-Austin Resource Recovery recycling trucks pick up single stream recycling carts to take to the recycling facility

iv. "Recycling Facility"-Recycling is unloaded by the recycling trucks at the recycling facility in large piles.
v. "Sorting"-The recycled items are sorted by machine and by hand to separate into different types of material at the recycling facility.
vi. "Packing and Shipping"-the sorted material is packaged to be sent to a recycling company where the items are transformed into something new.
vii. "New Product"-The recycling has turned into a new usable product to start the cycle over again.

b. Composting Cycle order
   i. "Eaten Apple"-You finished eating your apple at lunch.
   ii. "Composting Cart"-organic food waste can be placed in the green composting cart.
   iii. "Composting Truck"-Composting trucks pick up the green carts to take to the commercial composting facility.
   iv. "Commercial Composting Facility"-Composting is unloaded by the trucks at the composting facility in large piles.
   v. "Decomposing"-The organic items are broken down through decomposition with the help of fungus, bacteria, and invertebrates. These decomposers are the workers that turn food into soil.
   vi. "New Soil"- The compost has been broken down into soil over several weeks and is now ready to be used to grow new organic material!

c. Closed loop systems:
   *i. Notice how I placed these steps in a circle? Why do you think that is? It's a cycle! There is not beginning or end with this cycle/loop because these composting and recycling cycles continuously create new material that we can reuse again. This is what we call a **closed loop system** which is a process that that creates new resources with the same type of material instead of creating additional waste.*
   ii. If I threw the apple on the ground instead of the compost bin, would that be a close loop? No! The ground does not have the environment needed to turn that food into soil like the composting facility has.
   iii. If I threw the water bottle in the trash or on the ground would that be a closed loop? No! The water bottle would end up in the environment or the landfill and not have the chance to be recycled into something new.

6. *We are going to watch a short video that shows how recycling works locally at Balcones Recycling Center. Show recycling video: https://youtu.be/arP4LqqdZ_U and a short video of Commercial Composting at Organics by Gosh video: https://www.youtube.com/watch?v=qct5TZ0PXWE.* Point out the steps in the recycling and composting cycle you just went over with the students

Waste Wise (*15 minutes*)

4. *We are going to test your knowledge on where different types of waste can be disposed of. You have learned about the different materials that go into the compost cart, the recycling cart, and special recycling options. We are going to do a short activity that focuses on properly sorting waste from the trash can. We will be using these 3 buckets to represent Austin Resource Recovery curbside carts and other places for waste diversion:* ***Note:** instructor has various clean sample waste items to represent landfill waste, recycling, composting and special recycling materials. Some examples instructor can collect: Styrofoam, an electronic (such as an old cellphone), battery, paper, hard plastic, metal (aluminum or tin can), glass, fake food and fake leave/stick for compost, a pizza box or napkin, chip bag, tetra pack (such as a milk or juice carton for example), clothing sample, light bulb, etc.

- Place the blue recycling bin (representing blue recycling cart) in front of the class. *Does anyone know what the blue bin represents?* ***Single Stream Recycling***. *Does anyone remember the types of items that can go in the recycling cart? Paper, hard plastic, metal, and glass can go in this cart.* Only clean and dry items can go in the recycling. So, you can rinse out your item and make sure it's dry before putting it in the bin. Tell students the soft plastic rule. Remember, "If it's plastic, and I can easily crumple it up, I cannot put it in the blue cart." Soft plastics such as plastic bags, chip bags, and even Styrofoam cannot go in the Single Stream Recycling Cart.We'll figure out where some of the tricky plastics can go in a moment.
- Place the green compost bucket (represents green composting cart) in front of the class. *Does anyone know what this bucket represents?* **Composting**. *Does anyone remember what categories go in the composting cart? Yard trimmings and food scraps. We also call these things* ***organic materials****. Organic materials are things that come from nature. For example, a leaf is from a tree, which is from nature. So, leaves and other yard trimmings can go in the green compost cart.*
- *Another example is a pizza box and food soiled napkin. Paper and cardboard are made from trees, so it is a natural material that can go in the compost. Remember the rule, "If it grows, it goes!". You can even compost food scraps like stale bread and rotisserie chicken bones! You can always leave your compost in a kitchen collector and/or store the bags in your freezer until it's time to take your carts to the curb.*
- Place the landfill bucket (representing the trash cart) in front of the class. *Does anyone know what this bucket represents? The landfill. Which categories belong in the landfill? Treated wood and other.* Give examples of "other" to refresh idea.

5. Show picture of ARR Curbside Carts (Landfill, Recycling, Composting). Now, place the special recycling bucket in front of the class. *This bucket represents* **Special Recycling**. *This technically isn't a real cart but rather it represents special recycling which is for items that we can recycle, but not in our single-stream recycling bucket. Examples:*

   If I had a disposable battery, should I put that in the landfill or single stream recycling? Why not? They are made up of different metals, some types have acid, and they can cause fires. You can take batteries and lightbulbs to a special place called Austin Recycle & Reuse Drop-off Center. RRDOC takes hard to recycle items like soft plastic bags, old paint, electronics, clothes, Styrofoam and more. RRDOC is in Southeast Austin. There are other places that may be closer to us to take certain items. Batteries are also accepted at Austin Public Libraries. Which library branch is closest to you?

- Hold up a grocery store plastic bag. *Remember how we said most plastic is recyclable? Not all recyclable plastic should go in the blue recycling cart. Only hard plastic should go in the recycling cart.* Re-emphasize the "soft plastic" rule. Explain that plastic film is not suitable for single-stream (show picture of soft plastic getting tangled up in machines at recycling center), but that you can often take it to a grocery store's plastic-bag-recycling bin, or RRDOC. *Do you see how this soft plastic bag says, "in store recycling"? Yes, most soft plastic bags can be recycled at popular grocery stores. Where do you grocery shop?*
- Battery and Light Bulb. *You can take this to RRDOC, but there may be some spots closer to home for you. There are many hardware stores, places where you could buy batteries, lightbulbs, and many other useful tools, that will take these items back from you when they no longer work. Some electronics stores offer this service as well! You can always check the Austin Reuse Directory to double check where to recycle items In this activity, we are going to be working in your table groups. Each group is going to get 2 or 3 items. Once you get your items, you are going to discuss the following questions with your group. Then you will present to the class your items and waste solutions.* Write the questions on the board or projector.

- *What is my item made of?*
- *Which cart does it go in or what place can it go to?* Have students utilize the "Austin Reuse Directory" resource (if access to chrome books) and research a few other options (buy, sell, donate, recycle, refill, rent/share, repair). If the item goes into single stream recycling, have students research what that item can be turned into.
- *How can I reuse or upcycle/repurpose this item? Or how can you reduce your waste of this item?*

6. Give students a few minutes to discuss. Once all groups are done, have each group come up and place their items in the correct bucket which is representative of recycling, composting, landfill waste and beyond. They will explain why they chose that answer.

- Go in depth over these specific items when students with the following items presents:
  i. **Styrofoam**: Here in Austin the city owns a Styrofoam recycling machine. It recycles the Styrofoam by squeezing all of the air out and melting it into sturdy plastic blocks that can be pelletized and used for many purposes, like making picture frames. To recycle it, you must take it to the RRDOC, the Recycle & Reuse Drop-off Center drop- off center. Be sure to wash off the food residue first!
  ii. **Electronics (old cellphone)**: Some stores accept old cell phones, or you can take electronics to RRDOC (Recycle & Reuse Drop Off Center)
  iii. **Clothing**: Emphasize how donating and repurposing items keeps them out of the waste stream, is similar to recycling. Ask how they can upcycle a shirt. Clothing can also be taken to the Recycle and Reuse Drop-off Center. There is also a free, contactless clothing and housewares curbside collection service.
  iv. **Plastic Bags**: *"Soft plastic"* rule, explain that plastic film is not suitable for single-stream, but re-emphasize how
  you can take it to many grocery store's plastic-bag-recycling bin, or Recycle & Reuse Dropoff Center (RRDOC).

7. Wrap up the activity and cleanup the material.

Extension for Highschool Students– Have students look up items on the "What Do I Do With" tool and the Austin Reuse Directory for additional items such as "mattress" and other items students are interested in learning about

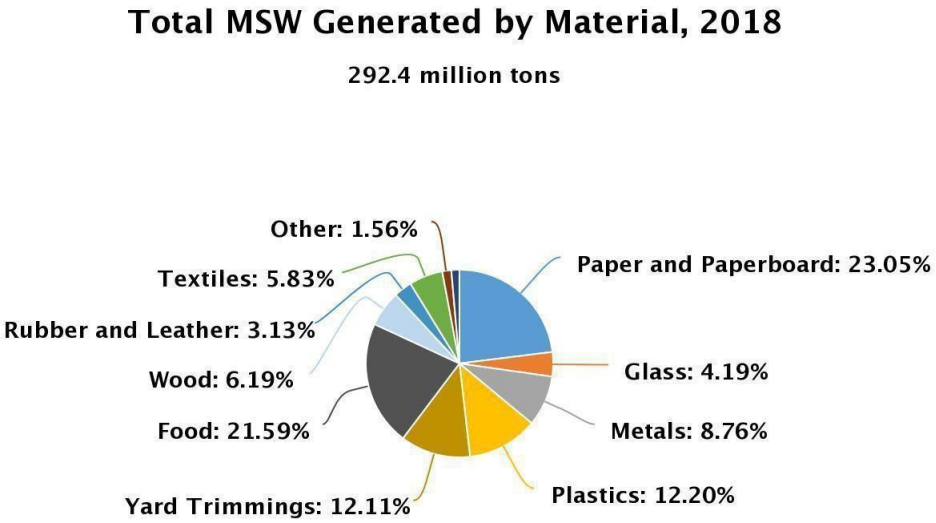

Chart above is most up to date Total MSW (Municipal Solid Waste) Generated by Materials, 2018 (Nationally) data provided by the US EPA on landfill composition.

Source: https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/guide-facts-and-figures-report-about

Waste Wise

Core Activity

Used water bottle You finished drinking all the water in your plastic water bottle.	**Eaten Apple** You finished eating your apple at lunch and the core is left over.
Recycling Cart Empty recycled items can be placed in the blue single stream recycling cart.	**Composting Cart** organic food waste can be placed in the green composting cart.
Recycling Truck Austin Resource Recovery recycling trucks pick up single stream recycling carts to take to the recycling facility	**Composting Truck** Composting trucks pick up the green carts to take to the commercial composting facility.
Recycling Facility Recycling is unloaded by the recycling trucks at the recycling facility in large piles.	**Commercial Composting Facility** Composting is unloaded by the trucks at the composting facility in large piles.
Sorting The recycled items are sorted by machine and by hand to separate into different types of material at the recycling facility.	**Decomposing** The organic items are broken down through decomposition with the help of fungus, bacteria, and invertebrates. These decomposers are the workers that turn food into soil.
Packing and Shipping The sorted material is packaged to be sent to a recycling company where the items are transformed into something new.	**New Soil** The compost has been broken down into soil over several weeks and is now ready to be used to grow new organic material!
New Product The recycling has turned into a new usable product to start the cycle over again.	

Blue= Recycling Closed Loop System **Green=** Composting Closed Loop System

KEEP AUSTIN BEAUTIFUL

AUSTIN RESOURCE RECOVERY

GENERATION ZERO
Leaders of a WASTE-FREE AUSTIN

Waste Wise

Core Activity

TEKS Core Concepts

Middle School:

Science, Grade 6, Adopted 2021— 1A,G; 2A, 5A,B,D,F; 11A,B
Source Note: The provisions of this §112.26 adopted to be effective April 26, 2022, 47 TexReg 2136; amended to be effective March 31, 2024, 49 TexReg 1928

Science, Grade 7, Adopted 2021— 1A,G; 2A, 5A,B,D,F; 11A
Source Note: The provisions of this §112.27 adopted to be effective April 26, 2022, 47 TexReg 2136

Science, Grade 8, Adopted 2021— 1A,G; 2A, 5B,D,F
Source Note: The provisions of this §112.28 adopted to be effective April 26, 2022, 47 TexReg 2136

Highschool

Environmental Systems, Beginning with School Year 2010-2011 (One Credit).— 1B, 2B,E-G, I; 9B,F,I
Source: The provisions of this §112.37 adopted to be effective August 4, 2009, 34 TexReg 5063.

Earth and Space Science, Beginning with School Year 2010-2011 (One Credit). —1B
Source: The provisions of this §112.36 adopted to be effective August 4, 2009, 34 TexReg 5063.

Biology (One Credit) —1A,C-D; 13D
Source Note: The provisions of this §112.42 adopted to be effective April 28, 2021, 46 TexReg 2729

Waste Wise

Core Activity

Photo Reference:

Waste Wise

Core Activity

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Core Activity

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GENERATION ZERO
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