7TH GRADE
STEAM LESSON
In this lesson, students will:
- explore the amount of waste, both recyclable and non-recyclable produced by their family and school mates;
- recognize the effect that waste has both locally and globally;
- come up with multiple solutions to either reduce or better manage waste; and
- create a 2D or 3D piece of art from “trash.”

Driving Question:
How does the amount of waste produced locally affect the environment and what are solutions to resolve these affects?

Materials Needed:
- Notebook to record observations, writing utensil, camera to record waste and effects of waste (optional), materials such as cardboard to design product, sketch book, items collected from their families “trash” (explained in lesson), glue, wire, tape or other materials for creating a 3D piece from found objects

National Learning Standards:
Science: MS-PS1-3; MS-LS2-1; MS-ESS3-3; MS-ESS3-4; MS-ETS1-1
Art: Cr2.1.7a; Cr3.1.7a; Re.7.1.7a; Re.7.2.7a; Cn11.1.7a
Prior to beginning this lesson, instruct students to either check their trash cans at home or think about the things they throw away in a day. Make a quick list of items that end up in the trash daily. Ask students if they have recycling bins or other alternate way of disposing of waste. Some students may note that their family throws away a lot of paper plates, others might say their family uses a lot of baby diapers.

At school, begin this lesson by taking your students on a “field trip” around the school to look at waste. Drop by the cafeteria and count the number of trash bins, go outside and look for signs of litter or waste receptacles, and even take a glance in the dumpster. Have students add to the list of items frequently thrown away. Note whether or not your school has a method for recycling and, if so, what items can be recycled. Do a search for the top 10 items found in landfills and the amount of time it will take them to decompose.

Read this page from the National Park Service about plastic straws with your students. Discuss with students the many ways that something as simple as a straw can have a detrimental effect on the environment. Emphasize the human impact on water and the way our input can change how species interact with the environment.

Take another walk around the school to observe species, or brainstorm and discuss species that may be impacted by waste in the immediate area. Students might see or suggest birds, fish, outdoor pets, raccoons, or insects such as honey bees and other pollinators.

Take the waste discussion further by discussing the effects on the environment if our current behavior continues. What might happen to an entire species? What happens if a species or multiple species are lost?

This will act as a segue into discussing species diversity and how waste disrupts food webs. One excellent local example of how a lack of species diversity can lead to catastrophic events is the cotton boll weevil almost eliminating cotton monocultures. Students can use the species list they compiled to create a quick food web and look at how species could be affected by waste. For example, if too many Styrofoam food trays from the cafeteria made it into the local pond, this could block light from getting to the plants, thus reducing the amount of oxygen in the water for the fish and decreasing their population.

One of the most important ways to combat excessive waste is to educate people about its impact on the Earth. As students are answering the questions for their research projects, have them also interview their family members, friends or others in the community and ask them the same questions. The students should record the interviews and present them to the class. Once everyone has played their interviews, form a discussion around the following questions:

- How many people were able to answer the question correctly?
- How might we help to educate the community on the impact of waste?
- What are some alternatives that we can introduce to the community to help make eliminating waste easier?
Students or student groups should choose one of the items they noted in high concentration in either home or school waste receptacles. Make sure that at least one of the groups chooses to focus on plastic straws. For the first part of the project, students will investigate their item further and report on their findings. Student research for their report should be both online and discovered by exploring their neighborhood, waterways such as ponds and drainage, and, if possible, the local landfill. Be sure to discuss safety before students embark on their research. Some questions the students must respond to in their report include:

- Why do we use this particular item?
- What percentage of the total trash does our particular item take up? (For example, Styrofoam trays compose about 80% of our lunchroom trash.)
- How long does the item take to break down in a landfill?
- How often do we see items made of the same material as litter in our town or neighborhood?
- What species might this item have a detrimental effect on?
- How would it affect those species?
- How does that affect the food web the species is a part of?

Students will use this report as a guide on the second portion of the project. In this portion of the project, students will come up with a resolution for the negative effects. Students should understand why we use this item and then propose other tested solutions for the item. For example, students may test alternatives to the Styrofoam trays such as recycled cardboard. Students may also explore solutions that don’t involve waste production such as using stainless steel trays. For each method they come up with, students should also explore the above questions and compare them to the original item. At the conclusion of their research and product testing, students will report their findings and their proposed solution for reducing or eliminating their particular waste item.

**UPCYCLE**

Design it better! Many companies are looking at alternate ways to build their products. For example, many tons of food-grade plastic wrap could be replaced in the landfill by using new Bee’s Wrap, a sustainable food wrap made out of beeswax. Use natural, recycled and/or compostable materials to design your own replacement product for the item you investigated. Test your prototypes and come up with a plan that would allow the best one to be engineered on a scale large enough for it to sustainably serve people with an earth-friendly alternative!
eARTh

Activist art is a type of art that is created to bring awareness to an issue that affects society in some way. Because the environment is a huge concern, many activist artists create pieces that bring awareness and new perspectives to issues plaguing our planet.

Show your students some of the work on this site that deals with environmental issues. There are some amazing examples to pick from. Have an in-depth classroom conversation around three or four of them. Ask the students questions* such as:

- What do you see?
- Do you think this is a successful piece of activist art?
- Why or why not?
- Would you change anything?

*As the students are talking, remind them to use proper vocabulary relating to the elements of art and principles of design.

Now, instruct students to collect items from their trash at home throughout the week that they can bring to school. They should not bring anything that could spoil or rot, or any container or wrapper that has not been thoroughly rinsed.

After they have had time to collect their trash, they should make a sculpture or 2D work of art with it! Have them lay out all of the items that they were able to bring. They should begin to brainstorm their sculpture or 2D work by creating some sketches of their ideas. Invite them to trade items if they want.

Once they have finished, the students will present their projects to the class. If possible, display the pieces for their peers and teachers to view. Have them write an explanation of the piece, what it is comprised of, and what they learned about consumer waste in the process of creating their art.

Note: Earth Day is celebrated each year on April 22nd. This would be a great project to do for Earth Day to raise awareness of the amount of waste that families can produce in as little as a week.

Community Garden

There are a number of alternatives to using plastic straws. Visit this link with your students and discuss all of the options available for ecofriendly straws. Many of these options are very affordable! Work with your class to think of a way to raise money so that you can purchase some of these options, then, set up a booth at a local Earth Day event, or any community gathering, and hand the straws out to visitors. Be sure to include information regarding the level of harm plastic straws bring to the ecosystem and marine life. EarthX has launched a campaign to Strike Out Straws; at earthxfilm.org students can take the pledge to reduce the burden of single use plastic straws on our environment.

KERNEL OF KNOWLEDGE

According to an article in The Global Citizen, the U.S. alone uses over 500 million straws each day.
CAREER CONNECTION

**Recycling Sorter** - Recycling sorters go through the mixed recycling from community or residential bins. They use a conveyor belt to remove, sort and clean materials. This career requires a high school diploma or GED.

**Recycling Coordinator** - Recycling coordinators work with cities and other entities to coordinate recycling programs and manage the employees within that program. They are also responsible for community outreach and education programs. This career requires a bachelor’s degree in a recycling related field.

**Waste Management Driver** - Waste management drivers use large trucks to collect trash and recycling from residences and other sources. They usually also perform general maintenance on their truck. This career requires a high school diploma or GED as well as a Class A or Class B driver’s license.

**Ecologist** - Ecologists are scientists that specialize in studying ecosystems and how the organisms in them interact with each other. They may work to correct damage to an ecosystem or research an area to prevent damage from occurring. This career can range from needing an associate’s degree for general lab work to requiring a master’s degree for more advanced studies in ecosystem management.

**Inventor** - Inventors create new products and build prototypes. They then apply for patents to secure their invention. This career requires a high school diploma or GED.

CAREER HIGHLIGHT

Jackie Nunez was traveling in the Caribbean when she realized just how detrimental the plastic straws in our drinks have been to the ocean. She has since founded The Last Plastic Straw, a movement dedicated to decreasing our plastic consumption, thus reducing the level of plastic pollution in our water.
7TH GRADE
STEAM & SOCIAL STUDIES
CITIES

Driving Question:
How can changes be made in and around town to help control erosion, deposition and watershed contamination?

Materials Needed:
Examples of debris that might be found in watersheds such as plastic straws, Styrofoam, a bag of lawn fertilizer and pet waste, science notebook, sketchbook, writing utensil, ways to test prototypes such as access to a downspout or water pumps, prototyping materials such as filters, device for research

In this lesson, students will:
- recognize the effects of poor erosion control and come up with a comprehensive plan to help prevent erosion, deposition and watershed contamination.

National Learning Standards:
Science: MS-ESS3-3; MS-ESS3-4; MS-ETS1-1
Math: 7.G.6
Social Studies: III,h
Art: Cr2.3.7a

GET YOUR DEPOSIT BACK
Show students examples of debris that might be found in watersheds and ask for ideas of what they may all have in common. Explain that all of these items are things that might eventually end up in local or even global waterways through rain and wind. Define watershed and tell students that items such as plastic bags and Styrofoam that don’t quite make it into trashcans are blown or washed through watersheds until they reach our local waterways. Excess lawn chemicals and pet waste travel in the same way and eventually contaminate our local watersheds.

In most parts of Texas, rapid population growth and development is occurring. Show students images of piles of earth and other materials displaced by construction and ask students what will happen if we get one of the heavy torrential downpours for which we are known. Students should be able to identify that the soil will be quickly washed away because there are no plant roots to hold it down. As a class, discuss where all of this eroded material goes and what effect it has on local waterways. Explain that this is fairly large-scale, and ask for examples of how erosion might be occurring in their own yard at home. Ask students what measures they think should be taken to prevent both small- and large-scale erosion and note their ideas on the board.

Further discuss the effects of watershed contamination, erosion and deposition on not only the local watershed, but also on the rivers and streams that eventually lead into the ocean.

**KERNEL OF KNOWLEDGE**

Land along the Texas coast is sinking and the seas are rising, leading to rapid erosion. Annual erosion rates can run as high as 35 to 40 feet near the Louisiana border and 10 to 15 feet on South Padre Island and Galveston Island.
Students will create and design some mechanism to prevent and control erosion or to capture items and chemicals before they are deposited in the watershed. Students may test different plant and foliage types near downspouts to help maintain soil quality as well as provide a habitat for organisms. They may also choose to create a city plan and budget to install more waste receptacles to prevent more plastics from entering watersheds. Students will create a comprehensive report identifying the problem (erosion, deposition of chemicals, deposition of substances, etc.), how they have chosen to address it, and what their experimentation shows the outcome of their plan will be.

**UPCYCLE**

Discuss the following with students: While humans modify their environment in unnatural ways (e.g., building massive dams, deforestation and infrastructure) some modifications of the environment are natural. For instance, mountains erode over time from wind, water, snow and glaciers. Additionally, rivers can form canyons and deposit sediments downstream called deposition. Why then would a government want to put control measures on erosion and deposition?

Students can research this topic individually and share answers, or students can brainstorm and share out ideas in a group or class discussion. They should understand that erosion and deposition hurts human consumption. It causes damage to land that is privately and government owned as well as buildup in lakes that are created by dams. It also clogs up water filtration systems, causes rocks to slide into roads from mountains, and can result in devastating landslides.

**THROUGH THE LENS**

Share with students the following question: “How does Texas government go about controlling erosion and deposition?” Have students research this and explain in a Flipgrid video how the Texas government addresses erosion and deposition issues.
While erosion can have a negative impact on the earth, the effects from the energy of water can be quite beautiful on objects. Show your students some images of the effects of erosion on rocks. If you google this topic, a number of great images will come up. Have them look closely at the images, using an artist’s eye, and discuss what they see. One of the most stunning features is, often the varying lines that form from the erosion. Also, multiple types of textures might form or strong variations in value. Focus the discussion on the elements of art that are present in the images.

Next, perform an erosion experiment with your students. Give each student, or pair of students, three types of candy. They should be varying degrees of hardness. The students should take a close-up photograph of each. Next, provide the pairs with three small glass jars with lids. Fill them about three-quarters full with water and place one candy in each jar. The students will then take turns shaking the jars to see the effects that the force has on the candy. After a few minutes of shaking, the students should stop, take the candy out and take another close-up photograph. They should have at least four photos of each candy by the end. After some time, the candy may dissolve or completely break up.

Once they have finished, the students will review their photos and pay close attention to how the shape, size and color of the candy changed in each one. The students will now recreate these images in a painting or drawing. Using four small squares of white paper, have them recreate each stage on a separate square and mount them all on one big sheet of paper when they have finished. They should present their work to the class and talk about what they observed in the process, how their candy changed, and how this is reflected in their use of line, color, shape and size.

Community Garden
Take your students on a walk around your school or community. Look for places where erosion might be having a negative effect. Are there areas that seem to have excessive runoff? Is this having an effect on the surrounding soil? Choose some of these locations and work together to solve the problem. You could plant some grass or flowers or create a small cover for the affected area.
**CAREER CONNECTION**

**Civil Engineer** - Civil engineers plan, design, construct and maintain city infrastructure projects. They are responsible for nearly everything you see in the city, from roadways to sewer systems. Civil engineering requires a bachelor’s degree.

**Water Quality Inspector** - Water quality inspectors use their knowledge of water-quality standards and legislation to ensure the safety of our water and compliance with local and federal laws. Water quality inspectors require classes in earth and water science, as well as many certifications and experience in the field.

**CAREER HIGHLIGHT**

Prior to the scientific discoveries made by James Hutton in the mid-1700s, humans erroneously thought the world was much younger. Hutton formulated the theory of uniformitarianism, which said that processes such as erosion create uniform layers of rock and sediment which can give us invaluable information about the past.
Driving Question:
How can we build houses to make them both eco-friendly and tornado safe?

Materials Needed:
Science journal, sketchbook, graph paper, writing utensil, away to simulate natural disasters, prototype building materials such as baling wire, glue, balsa wood or plaster

In this lesson, students will:
• identify the damage caused by catastrophic events and design structures to better withstand the increase in natural disasters.

National Learning Standards:
Science: MS-ESS3-2; MS-ETS1-1; MS-ETS1-3
Social Studies: IX,d
Art: Cr3.1.7a; Re.7.2.7a
Ask students if they have ever been in a natural disaster or seen one in the news. Examples of recent catastrophic events include Hurricane Harvey along the Texas Gulf Coast or the tornadoes that struck Rockwall, TX. Write the list of natural disasters on the board and begin to discuss the effects they have. For each disaster type, ask students what effects it had on abiotic and biotic factors such as the water quality, air quality, biodiversity and food availability. To see to what extent these events affect an ecosystem, look at images or videos such as these satellite images and discuss what the students see.

Next, watch a video about the rebirth of an ecosystem after a disaster such as this one about Mount Saint Helens. After the video, talk with students about how nature has a way of repairing itself, even slowly, and list the steps it takes such as formation of soil, initial producers coming in, followed by primary consumers who eat those producers, and so on.

Talk about how natural disasters are a part of living on this planet, and may even be increasing in frequency. Even though nature has a way of repairing itself, ask students what happens to displaced organisms and what can we do to help organisms such as humans withstand disasters? Is it possible to create homes and business that can withstand things like tornadoes and floods while also making them greener?

Examine building techniques such as partially submerged ferrocement houses and discuss how they save energy, while also acting as a storm shelter from natural disasters such as tornadoes. What other designs could help with other catastrophic events such as flooding, while incorporating green components? Have the class watch this short video on creating a green storm-shelter at a school.

Spinning the Cocoon

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Kernel of Knowledge

The Texas Health and Human Services Commission has spent more than $1.1 billion on Hurricane Harvey relief, most of which came from the United States Department of Agriculture’s (USDA) food assistance program, according to state budget officials.
Student groups will choose a natural disaster that would affect their area such as a hurricane or tornado. With the effects of their chosen event in mind, students will begin to design and then prototype a building or structure meant to withstand the major elements of the disaster. Students may choose to include features such as wind resistant architecture or water storage and elimination systems for their structure. While incorporating these disaster resistant features, students should also keep in mind green components such as the amount of energy saved by using ground temperature or rainwater reclamation tanks during non-disaster periods. For a cool way to test tornado resistance, watch this video on building a tornado simulator. Students will build and test their prototype until they are satisfied with their design, then present the design with its disaster-resistant and green features to the class.

**METAMORPHOSIS**

Explain to students that after natural disasters, the Federal Emergency Management Agency (FEMA), a government agency, works with the Red Cross to assist with clean-up and rebuilding efforts, and works to build a more sustainable area in case of future disasters. Ask, “How can we come up with solutions to deal with the waste that either was created by Hurricane Harvey or brought in by it?” Have students brainstorm as a class possible solutions and encourage them to write their congressman or senator to share their ideas. This can be at the national or state level, depending on teacher discretion.

**UPCYCLE**

Have students answer the question in Upcycle through a Flipgrid video. This can become more than one video, so the class can debate and come up with ideas to help aid the clean-up effort. As part of their research for the video, students could interview representatives of businesses to find out how they would help in a disaster and/or if they are developing products that would reduce waste. For example, Budweiser uses one of its facilities to can drinking water for emergency distribution, Tide employees operate portable laundromats in disaster recovery areas, and Tetra Pak has developed water containers that will reduce waste.
Global and cultural issues are two factors that heavily influence many artists and their work. Often, their pieces are used as a way to communicate about or bring awareness to issues facing society. Natural disasters are part of life on Earth, that doesn’t, however, take away from the effects that these events have on both the land and the people that live there. These disasters can quickly turn into cultural and political issues that leave a lasting impact on society. There are many ways in which artists create works based on natural disasters, from finding the beauty in a storm to focusing on the pain and suffering caused. Richard Parrish is an artist from Montana who chooses to focus on the beauty that he sees from natural phenomenon. Share with your students this [link](#) and discuss the pieces that he has created to reflect various natural occurrences.

Parrish works in an abstract way to communicate what he sees in these disasters. Form a discussion around the way the artist uses color, line and shape to create his work rather than using traditional and representational images. Ask students, “What does it mean to create a piece of nonrepresentational art? How does this change the way that the viewer experiences the piece? Is it important to know what the work is based on when viewing it? Why or why not?”

Next, ask the students if they, or a family member, have ever been directly affected by a natural disaster. Have them write down some of the words that they think of regarding that experience. If they have not had such an experience, then give them an example and have them imagine how the people that lived in the area affected might have felt or feel.

The students should create nonrepresentational art based on the natural disaster about which they have been writing. Instruct them to think about questions such as, “What colors can best represent the feelings that I want to convey? What types of shape, line and value contrast would work to get my point across?” Be sure to review the principles of design – particularly balance and contrast. The medium is up to you. This could work as a 3D piece or a 2D artwork.

When the students have finished, they should present their work to the class. Instruct them to talk about the emotions that they were hoping to convey through the piece, and how they chose to represent those with color, line, texture, etc.

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**Community Garden**
- When disaster strikes, people are amazing about coming together to help their fellow man. When you are miles away from those in need, it can seem difficult to help, but there are many organizations that need assistance.
- With your students, research different organizations that respond to the needs of victims of natural disasters such as the Red Cross, Feeding America and the Salvation Army. Often, they collect care packages to send to victims. Choose an organization to contact, and ask how you and your students can contribute to helping the people in need.
CAREER CONNECTION

**Architect** - Architects design, redesign and repair buildings and structures. Most architects use computer design software to come up with creative building concepts, as well as visualize renovations. They are responsible for ensuring not only a building’s general appearance, but also its safety and longevity. Architects must complete a minimum of a bachelor’s degree.

**Urban Planner** - Urban and regional planners develop land-use plans and programs that help create communities, accommodate population growth, and revitalize physical facilities in towns, cities, counties and metropolitan areas. Most urban planners hold a master’s degree in one of the following fields: urban or regional planning, environmental planning, urban design or geography.

CAREER HIGHLIGHT

Building green is nothing new for Ken Yeang, a Malaysian architect famous for integrating ecology into architecture. His sustainable creations and “subcrapers” have earned him great accolades including being named “One of the 50 People Who Could Save the Planet” by *The Guardian*. 
7TH GRADE
STEAM & SOCIAL STUDIES
Driving Question:
How do different composting methods affect how quickly substances decompose?

Materials Needed:
Example of previously composted materials, science notebook, food scraps, other biodegradable trash (e.g., grass clippings and paper), dirt, earthworms, containers for compost (e.g., large buckets with lids), outdoor areas for compost (if students want to test outdoors), soil test kit, supplemental reading resources such as this blog.

In this lesson, students will:
• recognize that different ratios of organic compounds in soil aid in the breakdown and change of materials in compost.

National Learning Standards:
Science: MS-LS2-3; MS-LS2-5; MS-ESS2-1; MS-ESS3-3
Social Studies: III.h
As a class, create a list of things that are commonly thrown away such as paper, food scraps, plastic bottles and baby diapers. The student list may be quite extensive. As a class, sort all of the items into these three categories: can be easily broken down, can't be easily broken down and unsure.

Look at all of the items that can be broken down and talk about what they have in common. Tell students we label them biodegradable and define biodegradable as the ability to quickly break down into more basic compounds such as carbon, hydrogen (water) and oxygen. Explain that, when thrown away, these items end up in the landfill where they can take even longer to break down and be exposed to volatile chemicals thus contaminating them. A more efficient and sustainable way to aid household waste in breaking down to more basic compounds is composting.

Show students the compost sample and explain that the soil they see was once food scraps, grass clippings and leaves. The breakdown of these materials leads to a soil rich in nutrients that are important for plant growth. In order to create compost, they need equal amounts of nitrogen sources such as veggie and fruit scraps or grass trimmings as well as carbon sources such as dried leaves or straw. Keeping the compost moist and aerating it frequently will allow the substances within to break down fairly rapidly.

KERNEL OF KNOWLEDGE
It takes 500 to 1,000 years to create an inch of soil! Why so long? Soil is generally derived from rock, which has to be broken down by weathering and physical processes over time.
Students will experiment with how quickly they can get waste materials to break down in compost. Students should have at least two compost buckets or piles. They should keep detailed records of how they manipulate the two compost samples that include the mass of carbon and nitrogen sources added, how often they turn the compost, the volume of water added, and whether or not they incorporated organisms such as earthworms. Ideally students should only change one variable such as the amount of water or how often they turn the compost. Students should check regularly to see if their compost is fully broken down. When it is, students can take an additional step and use a soil test kit to test nitrogen, phosphorus, potassium, and the Ph balance of their sample to check how fertile the is, in addition to the speed at which it broke down.

METAMORPHOSIS

UPCYCLE

Most food will ideally rot eventually or be consumed by decomposers. But are all foods created equal? Students will use compost and vermiculture to test how quickly organic versus processed food waste is broken down. Students should use two vermiculture bins with the same amount of soil and worms. In one they will place organic food such as potatoes, fruits, vegetables, and organic pastas and oatmeal. In the other bin, students can put items such as processed chips and other pre-packaged, non-organic foods. Prior to officially beginning the exploration, students should write a hypothesis regarding what will happen to the food products and worms in each bin. Students should weigh all food before adding it and “feed” their worms with regularity. After adequate time has passed, students should use a screen to separate worm castings from leftover food byproducts and weight the mass of the remaining food products as well as count the number of worms in each bin. Students should use this data to determine if worms consume and break down organic foods or processed foods at faster rates and if the different food sources impacted the worms’ health.

THROUGH THE LENS

Have students create a short video using Flipgrid either individually or in a small group that answers the following question: How can composting reduce toxic runoff in waterways and improve life for Texans? The video should incorporate the ideas generated from the science lesson above. Remind them that the video should be clear and concise.
Explain to students that the Texas economy is largely based on agriculture. Have students identify ways Texans have modified the environment, specifically related to the waterways and pollution from farming practices, and have them research and analyze the results using their electronic device. Use the answers students find to promote a discussion. This can be done in partner talks or as a class.
Worms are hard workers when it comes to creating a compost pile, but did you know that they can also be artists? Borrow a few of the worms that were used in creating the compost pile for the science lesson and introduce your students to worm art! Give each student 1-3 worms to work with*, a medium sized sheet of white watercolor or mixed media paper, and some water-based paints. Be sure avoid oil-based or other forms of paint as they may harm the worms.

Once the students have their paper laid out and their paint ready (which should be in small bowls), have the student dip their worm in their chosen paint color and place it on the white paper. The worm will start to wiggle and move around create a beautiful line as it glides across the paper. If the student has multiple worms, have them dip them in different colors and place them on the paper at the same time. When finished, the worms should be rinsed with water and placed back in the dirt or compost pile.

Once all of the worm paintings are dry, hang them up and let the students see all of them. Form a discussion about line and color. Ask students, “Do the lines vary? Are there different thicknesses?” This can be a great kick start project for a more concentrated work based on line, or the students can take their worm’s art and add to it to make it a collaborative effort.

*If any of the students are just too grossed out to paint with the worm, have some gummy worms handy that they can dip in paint and drag across the paper themselves.
CAREER CONNECTION

**Organic Composting Specialist** - Organic composting specialists work for waste departments to discover ways to more effectively break down waste materials into usable products. In addition to hands-on research, they manage other scientists and interns within composting programs. This career requires a bachelor’s degree in science, as well as personnel management skills.

**Soil Scientist** - Soil scientists examine and research the chemical and physical properties of soil from around the world. Not only do they determine soils viability for agricultural purposes, they also provide vital information about soil quality as it pertains to human health and biodiversity. A soil scientist requires a bachelor’s degree, but most have a master’s degree.

CAREER HIGHLIGHT

Joel Salatin, a self-proclaimed “lunatic farmer,” is famous for making nature work for him to create sustainable farms. One of his most intriguing projects uses animal rotation to compost various areas of the farm, thus preventing the need for fertilizer. By rotating different animals from pasture to pasture, manure is spread and composted to fertilize the fields with minimal interference from humans.
7TH GRADE
STEM & SOCIAL STUDIES
ENERGY

In this lesson, students will:
• use knowledge of food webs and the scarcity of food to create nontraditional food sources.

National Learning Standards:
Science: MS-ESS3-3; MS-ESS3-4; MS-ETS1-1
Social Studies: III,h
Art: Pr5.1.7a

ENERGIZING YOUR LAWN

Driving Question:
How can cultivated yards be changed to provide food for a community?

Materials Needed:
Science notebook, sketchbook, writing utensil, a device for research, small planting boxes or herb containers, seeds or seedlings
Begin by asking students what makes life on Earth possible. Student responses will likely include our atmosphere and the sun. Explain that our proximity to the sun allows for the ideal climate for the biodiversity needed for all species to survive. Expand on the initial question by asking students what else the sun provides for us. In addition to energy for electricity, it also provides energy needed for plants to grow. After undergoing photosynthesis, plants use energy from the sun along with water and carbon dioxide to produce glucose, a sugar needed by humans and other organisms for energy. Explain that, because plants produce energy, we call them “producers.” Other organisms that consume plants are called “consumers.”

Show students an example of a food chain and ask them for strengths and weaknesses of the model. Explain that the model is great as a simplified version of how just a few organisms eat, but doesn’t explain the complexity of feeding relationships in an ecosystem. A better model is the food web, which uses arrows pointing toward the consumer to expound on the complexity of feeding relationships. Ask students to describe some of the producers they have actually seen growing such as a local corn field or tomatoes in their parent’s garden. Then, create a food web on the board showing feeding relationships, including humans, insects that also eat the food, and other organisms that might break down what is left of it after we have had our fill.

Tell students that the first grocery store in the United States opened in 1916, more than 100 years ago. Grocery stores didn’t open in other places such as Europe until the 1950s, so how did we get our food? The Farm Bureau estimates that less than 2% of the U.S. population is engaged in agriculture, feeding the other 98% of us. A large amount of our food is even grown in other countries. Regardless of it whether it is grown domestically or internationally, our food must travel many miles before it gets to our plates, but what does that mean?

Shipping food means that it is loaded onto carbon-producing vehicles and trucked long distances. During travel, it is exposed to vehicle exhaust and other contaminants. All of this occurs when we could be growing a significant amount ourselves. But where? In place of cultivated lawns! Discuss how cultivated lawns consume resources such as water, and also contribute to chemical pollution via overuse of fertilizers and other lawn chemicals. All of that, and no food to show for it.

Ask students to estimate the number of American citizens who don’t get enough to eat every day. Tell students that, according to Feeding America, a staggering 41 million people suffer from hunger in our nation. What can we do about this locally?
Students or student groups will begin by researching the [Food Not Lawns Project](#). They will either use their own lawn or a lawn of their choosing as a basis for their project. Students will research and choose food crops such as pole beans, zucchini and tomatoes to grow in their project and note the space and light requirements, crop yields, potential pests and predators. Students will draw their design and create a timeline for food production. Based on estimated yields, students will also prepare a report of how many people one lawn can feed versus the number of people residing in the attached house. Groups can use ratios to create a scale model of their garden to test functionality, uncover problems that may hinder the ease of harvest, and check yields based on one plant versus many. Students will then create a food web of their new lawn including humans, potential pests and predators, and even decomposers such as earthworms in the soil.

**THROUGH THE LENS**

Students can create an explanatory video on Flipgrid of their research on how farmers accidentally aided in the creation of the Dust Bowl, and the safety measures that have since been put into effect to prevent such an event from happening again.

**UPCYCLE**

One of the reasons farming has improved so much is because of what occurred during the Dust Bowl. Explain the Dust Bowl to students and how it affected the plains in the 1930s. It was called this because, due to drought and bad farming practices, there were severe dust storms in the Texas Panhandle, Oklahoma, Kansas, Colorado and New Mexico. Other areas were affected, but these states endured the worst consequences. Conditions were so horrible that people had to plug their windows and doors with rags, wear face masks and stay indoors. Some suffered major health issues, especially those with lung problems like asthma. Many people had to move because there was no food for them or their livestock to eat and therefore they couldn’t survive if they stayed. It would be helpful to show pictures of the Dust Bowl and a map of the affected area to students.

Have students research the Dust Bowl on their electronic devices. Have them determine what farmers were doing that contributed to the event and how the government has since put in place measures to prevent a disaster like this from happening again. You may check for understanding and foster a discussion or have students design an information poster that explains the Dust Bowl and what was learned from it.
eARTh

Food is a source of energy for all living things, but have you ever thought of food as a medium to create art? When artists use food to create their work, it becomes what is known as ephemeral art. This is a type of art that is meant to occur once, and it is temporary. With this type of art, the photograph or documentation of the piece becomes the part of the artwork that lives on. Introduce your students to this term, and show them the work of Nadia Luongo. She is an Italian artist who uses nontraditional mediums to create art. Visit this link to see images of her food art, as well as videos of her creating some of the pieces.

Now, it’s time for your students to make some food art of their own! There are several ways to approach this. You can bring in a specific type of food for them to use or leave it to them to bring in something. Think about taking them to the cafeteria the day of the project to see what food is going to be thrown out that you can repurpose for the art project.

Before the students begin, they need to create some sketches of their ideas. You could give them a theme, or let them choose what they would like to create with their food. It is important that it be something that they can complete in one class period, so they need to create a simple, clean drawing from which to work. Once they have their sketches done and have decided on a final drawing, they can begin creating their food art. As soon as they finish their piece, have them photograph it. They could also record the process of creating it and upload it to Flipgrid or another app of your choice. When everyone has finished, the students should share their work with the class. They need to be able to discuss the principles of design in their piece as well as the elements of art, particularly line and value. If you are able to print out the photos of the final artworks, you could display them in the hall or create an exhibit in the cafeteria.

Community Garden

Ever wonder what happens to all of the food that grocery stores don’t sell? Sadly, a huge percentage of it is thrown out – even when it is still perfectly fine to eat. Show your students this article and discuss how they feel about the information in it. Ask them, “What could be done about all of the food wasted? Where could it go?” With your students, create a proposal for a local grocery store to package the food that they plan to throw out so that you and your class can take it to a local community kitchen. The students can write out the proposal with posters to present, or record a video and send it to the store.

KERNEL OF KNOWLEDGE

In North America, fruits and vegetables travel an average of 1,500 miles before reaching your plate. Buying fresh, local food eliminates long distances traveled and preserves flavor and nutrients.
CAREER CONNECTION

**Farmers Market Vendor Coordinator** - Vendor coordinators work with local farmers and food artisans to create a sensible market map, ensure product variety, check producer credentials, and promote the market to the community. Most market coordinator jobs require some college courses and advanced interpersonal, organizational and marketing skills.

**Homestead Farmer** - Homestead farmers create and implement a farm plan, which will vary greatly depending on region. Some raise meats, some produce, and many raise both. Homestead farmers must be well-versed in agriculture practices as well as animal husbandry. No formal education is required, but most take regular courses or spend a lot of time reading about their chosen specialization. Being willing to wake up early and work long hours is a must!

**Produce Buyer** - Farm-to-table restaurants specialize in preparing and serving food that is sourced locally. A produce buyer for such a restaurant is responsible for knowing what fruits and vegetables are available during each season, where to obtain them locally and then purchasing what the chef needs to create a menu. This career does not require a college degree, but buyers must have extensive knowledge of produce as well as math and negotiation skills.

CAREER HIGHLIGHT

Like many scientists before him, Bill Mollison got his ideas for permaculture from observing nature. He used his observations of marsupials in Australia to develop self-sufficient and sustainable agricultural production practices. The permaculture movement in the United States may be just now gaining steam, but he helped co-found the first ever Permaculture Institute in the 1970s.