

KEEP LOUISIANA BEAUTIFUL

ENVIRONMENTAL LESSONS

Grades K – 5

Presented by:



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Lesson Plan 1 - All Litter Harms Animals

Louisiana Student Standards for Science K-ESS3-3 | 3-LS4-4 | 5-ESS3-1

Activity Sheet 1 - The Hazards of Microplastics

Activity Sheet 2 - The Hazards of Entanglement

Lesson Plan 2 - Roadside Litter Survey

Louisiana Student Standards for Math 3.MD.B.3

Louisiana Student Standards for Science 3.MD.B.3 | 5-ESS3-1

Activity Sheet 1 - Visible Litter Simulation Cards

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Activity Sheet 3 - Check for Success

Lesson Plan 3 - Mapping School Litter

Louisiana Student Standards for Math 3.MD.B.3

Louisiana Student Standards for Social Studies 3.19

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Lesson Plan 4 - What Happens to Our Trash and Recyclables?

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Louisiana Student Standards for Science 5-ESS3-1

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Lesson Plan 6 - Microplastics in Our Environment

Louisiana Student Standards for Science 5-ESS3-1

Activity Sheet 1 - Microplastics in Our Oceans

Lesson Plan 7 - Nonpoint Source Pollution

Louisiana Student Standards for Science 5-ESS3-1

Activity Sheet 1 - A Stormwater Drain

Activity Sheet 2 - Water Pollution Water Drops

Activity Sheet 3 - Nonpoint Source Pollution

Lesson Plan 8 - Plastics in Marine Life

Louisiana Student Standards for Science K-ESS3-3 | 3-LS4-4

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Activity Sheet 4 - Fish Activity

Activity Sheet 5 - Classroom Plastic Inventory

Lesson Plan 9 - Recycling At Home

Louisiana Student Standards for Science 3-LS4-4

Activity Sheet 1 - Recycling Data Sheet

Activity Sheet 2 - Where To Put My Waste

Lesson Plan 10 - What is a Watershed?

Louisiana Student Standards for Science 3-LS4-4 | 5-ESS2-1 | 5-ESS3-1

Activity Sheet 1 - Watershed Base

Activity Sheet 2 - Creating a Watershed Model

Activity Sheet 3 - Parts of a Watershed

Activity Sheet 4 - The Mississippi Watershed

Special Thanks

Thank you to educators, Dr. Pam Blanchard and Dr. Mary Legoria for authoring the lesson plans.

The lessons and an activity book is also available for download at KeepLouisianaBeautiful.org.

Lesson 1

ALL LITTER HARMS ANIMALS

Lesson Focus

In this two-part lesson students will learn two ways that plastics are hazardous to animals, especially birds: the harmful effects of microplastic ingestion and entanglement in litter.

Lesson Objective

- Students will be able to explain how wildlife can easily mistake microplastics for food.
- Students will be able to give reasons why all litter is hazardous to wildlife no matter how small it is.
- Students will be able to describe how entanglement can be deadly to animals.

Grade Level	Duration	Subject Area	Vocabulary
K-5	1 Hour	Science	litter, consume, hazard, microplastics, entanglement

Louisiana Student Standards for Science

K-ESS3-3

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

3-LS4-4

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there change as well.

5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environments.

Materials List - Explore - Part 1

Per Student

- 1 small paper bag (send this bag home a week before the lesson for students to collect plastic wrappers from home)
- 1 bowl
- 1 bottle of glue or a glue stick
- 1 rubber band
- 1 copy of **Activity Sheet #1**

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Per Group

- A dinner-size paper plate (pour a cup of the birdseed / microplastics mixture on it)
- 2-3 sets of colored pencils to share
- 2-3 rulers with metric units to share

Per Class

- 2 lb. bag of birdseed (rice may be substituted)
- 1 cup of microplastics (5mm or less cut from students' plastic collection bag)
- Large mixing bowl

Materials List - Explore - Part 2

Per Student

- 1 rubber band
- 1 spoon (preferably reusable)
- 1 copy of **Activity Sheet #2**
- National Geographic Article, **10 Tips to Reduce Your Plastic Use**
<https://kids.nationalgeographic.com/nature/kids-vs-plastic/article/10-tips-to-reduce-your-plastic-use>
(view online or make copies)

Per Group

- Birdseed from **Part 1**
- A dinner-sized paper plate from **Part 1** (pour a cup of the birdseed on it)

Per Class

- Book: **Harry the Snakebird** - A copy is available to borrow from all Louisiana public libraries or can be purchased from <https://keeplouisianabeautiful.org/shop>

Activity Sheets

- The Hazards of Microplastics
- The Hazards of Entanglement

Advance Preparation

1. A week before you teach this lesson, give each student a small paper bag to take home. Ask the students to fill the bag with clean plastic trash items such as wrappers from candy, chips, toys. The bag does not have to be full. They should bring the bag of plastics back to school two days before the lesson is taught.
2. Cut some of the plastic trash items into tiny pieces (5mm or less) to make the microplastics for this lesson. Approximately 1 cup of microplastics will be needed for a class.
3. Mix the microplastics with 2 lbs. of bird seed in a large bowl.
4. Group tray setup:
 - 1 cup of the bird seed and microplastic mixture poured on a paper plate
 - 1 small bowl for each student
 - 2-3 sets of colored pencils for students to share

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- Make copies of **Activity Sheet #1**
- 2-3 rulers with millimeters (these will be used in the **Explain** part of this lesson)

Background Information

In this lesson students learn about two ways that litter is a **hazard** or a danger in the environment that could seriously harm wildlife. **Litter** is defined as any type of waste that is discarded inappropriately. Litter, especially plastic, can harm wildlife in two ways: ingestion and entanglement.

Pieces of plastic that are smaller than 5mm across are called **microplastics**. Because microplastics are tiny and absorb odors, animals often mistake microplastics for food and **consume** or eat them. Microplastics remain in the animal's stomach causing a feeling of fullness. The animal, feeling full, may stop eating and eventually starve to death. Over time harmful chemicals can leach out from microplastics and enter the animals' tissues.

Another way that plastic litter can harm animals is through entanglement. **Entanglement** occurs when litter becomes wrapped around an animal and restricts the animal's ability to move. Once entangled, these animals cannot free themselves. If the litter is entangled around a beak, limb, or their neck, they can grow in deformed ways, have difficulty getting and eating food, escaping from predators, and eventually die. According to National Oceanic and Atmospheric Administration (NOAA) entanglement of marine life is a global problem that results in the death of hundreds of thousands of aquatic birds, marine mammals, and sea turtles worldwide every year.

Even if you don't litter, your trash could still end up causing problems if it falls out of a trash can or blows out of a garbage truck. One excellent way to prevent trash from entering the environment is cutting back on the waste we produce on a daily basis. If you want to take an extra step, consider cleaning up the trash already in our environment (Martin and Silling, 2021).

References

- National Oceanic and Atmospheric Administration (NOAA) Fisheries. (No date). Entanglement of Marine Life: Risks and Response. Available at <https://www.fisheries.noaa.gov/insight/entanglement-marine-life-risks-and-response>
- Silling, C., Martin, K. (November 15, 2021). Plastic Kills Birds: Learn Why and How You Can Help. Available at <https://abcbirds.org/blog21/plastic-kills-birds>

Procedure

Engage – 5 Minutes

1. Distribute the material trays and **Activity Sheet #1**.
2. Explain to your students that they will pretend to be birds today.
 - **What do most birds eat?** *Seeds, berries, worms, and insects*
3. Have students examine the mixture on their plate.
 - **What is in the bowl?** *Birdseed and some tiny pieces of plastic.*
 - **Are the tiny pieces of plastic food?** *No.*

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- **Will they help the bird grow big and strong?** No.
- **Do you think that birds might eat the plastic pieces? Why or why not?** Yes, birds might eat both the birdseed and the plastic pieces because they are both tiny and the birds might not know the difference.

Explore - Part 1 - The Hazards of Microplastics - 20 Minutes

1. Explain to students that they will pretend that they are a flock of birds eating a mixture of birdseed.
2. Ask the questions:
 - **What tools do you use to eat?** We use knives and forks.
 - **What does a bird use to eat?** Birds use their beaks.
3. Demonstrate how to make a bird beak with your fingers (see picture). Explain to students, that they are to eat as much seed from the plate as they can with their bird beak in three seconds. The seed they eat with their beaks should be placed into their bowls. They continue eating until you say, STOP. The bowl represents their stomach. When they put the seed in their bowl, they are consuming or eating the birdseed.
4. When the three seconds are up, instruct your students to examine the contents of their stomachs (the seed in the bowls). Then, on **Activity Sheet #1**, in **Circle 1** draw what they see in their bowls using colored pencils. Students should notice the tiny plastic pieces. Visit groups as they observe and draw. If they don't notice the microplastics, point them out.
5. Next, students will pick out and count the microplastics. Then, they will glue the microplastics in **Circle 2** on **Activity Sheet #1**.
6. Students will record the number of microplastics on **Activity Sheet #1** in the blank.
7. Students will answer the two questions on **Activity Sheet #1**.



Explain - Part 1 - 10 Minutes

1. Begin the discussion by asking the following questions:
 - **What did you see in your bowl?** Birdseed and pieces of plastic.
 - **Do you think that a bird would eat plastic? Why?** Yes. It's hard to separate the plastic pieces from the birdseed when eating. The plastic pieces are tiny and look like birdseed.
 - Explain to students that tiny pieces of plastic that are 5mm or less in size are called microplastics. Show students the length of 5mm on a ruler. Give students two to three minutes to measure a few microplastics with their rulers. After examining and measuring them, students should glue the microplastics in **Circle 2** on **Activity Sheet #1**.
 - Have students save the birdseed for **Part 2**.
2. Ask the questions:
 - **How could eating or consuming these microplastics harm birds?** Accept students' responses and explain the following information: Swallowed plastics often cannot pass through animals' digestive systems and cannot be broken down by their stomach acids. As a result, plastics can accumulate in animals' stomachs, causing them to stop eating and starve (Martin and Silling, 2021). Also, the microplastic pieces do not have the nutrition that animals need to survive.
 - **Could other animals like turtles and fish consume plastics while feeding?** Yes. Any animal could easily mistake microplastics for food because it looks and possibly smells like their food.

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Explore - Part 2 - The Hazards of Entanglement - 20 Minutes

1. For the first feeding:

- Students will make a beak with their fingers and eat birdseed as they did in **Part 1**. Remind students to put the seed that they have eaten in their bowls.
- Students will measure the "eaten" or consumed seed (seed in their bowls) by filling their spoon with seed and counting how many spoonfuls they fill.
- As students count the spoonfuls of seed, they should carefully pour each spoonful in a pile on their desks.
- Students will then record the number of spoonfuls consumed in the **Feeding 1** space on **Activity Sheet #2**.



2. For the second feeding:

- Students will repeat the above eating process, but this time their beaks will be "entangled" by a rubber band (see picture).
- Have students wrap a rubber band around the end of their fingers and thumb twice (about ½" behind the fingernails).
- Be sure to check each rubber band. The rubber band should hold the fingers together snugly but should not be too tight. They should be able to open their fingers at least ½".
- Explain that the rubber band represents litter entangling the bird's beak.
- Students will eat as much birdseed as possible with their "entangled beaks" in 3 seconds. Remind students to put the seed they have eaten in their bowls.
- Students will measure the "eaten" or consumed seed (seed in their bowls) by filling their spoon with seed.
- Students will then count and record the number of spoonfuls in the **Feeding 2** space on **Activity Sheet #2**.
- Show students how to subtract the numbers from their data table.



Number of **Spoonfuls in Feeding 1**

— Number of **Spoonfuls in Feeding 2**

Difference

Explain - Part 2 - 10 Minutes

1. Ask:

- **Describe your experience of "feeding" with your beak entangled by a rubber band.** *In the second feeding I ate fewer spoonfuls of seed. It was hard to pick up the seed when I could barely open my beak.*
- **In which feeding were you able to eat more birdseed?** *Students should report that they could eat more birdseed in Feeding 1 because they could open their beaks more.*
- **Why is entanglement deadly to animals?** *Once entangled, these animals cannot free themselves. If the litter is entangled around a beak, limb, or their neck, they can grow in deformed ways, have difficulty getting and eating food, escaping predators, and may eventually die.*

2. Use the **Harry the Snakebird** book that can be found at all libraries (see materials list), to tell the true story of a bird called an Anhinga. Read this book aloud to your students.

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3. Open **Harry the Snakebird** to the section in the book entitled, Meet the Real Brian and Marie. Show your students the photographs of the real characters, litter in the lake, and other birds entangled in litter. Then, read these pages to your students and discuss how the real Marie and Brian worked to make the lake a safer place for wildlife by removing litter from Capitol Lake. This book should be available for students to read or for the teacher to read aloud later.

Expand – 30 Minutes (Optional)

1. Watch LPB's Critters Don't Litter video to learn that small things like picking up a candy wrapper can help keep wildlife safe. This site also has links to background reading and discussion questions.
 - **PBS Learning Media. Critters Don't Litter**
<https://lpb.pbslearningmedia.org/resource/critters-dont-litter-wildlife-video/untamed-the-wildlife-center-of-virginia> (26:37)
 - Learn about one of the biggest impacts that humans have on their environment—Litter. It isn't just an aesthetic problem; it has serious impacts on habitats, wildlife health, as well as human health and safety. The consequences of even small acts of littering can be far-reaching and long-lasting. Join the Wildlife Center staff and watershed conservation authorities to learn more about the problems litter can pose, as well as a variety of ways that you can help reduce litter. Ages 5 years to Adult.
2. Students should read these two **National Geographic Kids** articles (online or printed copies).
 - **Plastic Pollution** <https://kids.nationalgeographic.com/nature/kids-vs-plastic/article/pollution-1>
 - **10 Tips to Reduce Your Plastic Use** <https://kids.nationalgeographic.com/nature/kids-vs-plastic/article/10-tips-to-reduce-your-plastic-use>
3. Ask the question: **Based on this video and what we have learned from our readings and lessons, how can we reduce litter to help protect wildlife?**
 - *Reduce use of single-use or disposable plastics (refuse straws, use a reusable water bottle, etc.).*
 - *Dispose of plastic and other litter properly and never litter.*
 - *Pick up litter on land before it gets to the waterways.*

Take Action

1. Plan a School Litter Clean Up Day.
 - Explain to students that the best ways to protect wildlife from hazards of litter is to reduce our plastic waste and pick up the litter at home and school.
 - Divide your class into teams of four to five students. Give each team a copy of your school map. Explain that you are taking them on a ten-minute walk around your school campus to locate "litter problem" areas. As you find these areas, each group is to mark the areas on their map.
 - When students return to the classroom each group will choose an area that they marked as a "litter problem" area to clean up. As a class, develop a plan for a "school litter clean up day." The **Mapping School Litter** lesson in this guide can be used for their "school litter clean up day."
 - The litter cleanup could be done at recess. You will need to supervise what students pick up and provide gloves and trash bags.

Evaluate

1. Students' answers on **Activity Sheets #1** and **#2**.

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Online Resources

National Geographic Kids. **Plastic Pollution.**

<https://kids.nationalgeographic.com/nature/kids-vs-plastic/article/pollution-1>

This is a short article that explains that plastics are a useful material that has become a problem due to overuse and improper disposal especially of single-use plastics. The article explains how litter makes its way to the ocean. Ages 8 years to Adult.

National Geographic Kids. **10 Tips to Reduce Your Plastic Use.**

<https://kids.nationalgeographic.com/nature/kids-vs-plastic/article/10-tips-to-reduce-your-plastic-use>

This article lists and explains 10 ways to reduce your plastic use, particularly single-use plastics. Ages 8 years to Adult.

National Oceanic Atmospheric Administration (NOAA) Fisheries. **Entanglement of Marine Life:**

Risks and Response. <https://www.fisheries.noaa.gov/insight/entanglement-marine-life-risks-and-response>

This article explains the risks that marine debris, particularly plastics, pose for wildlife. It explains how wildlife gets entangled in plastic, and what NOAA Fisheries is doing to reduce entanglements.

Ages 10 years to Adult.

Children's Books

Carbo, W. (2022). **Harry the Snakebird.**

Ally-Gator BookBites Publishing House. ISBN 979-8-9860811-1-3

This book is based on a true story of Harry the Anhinga, commonly called a snakebird. Readers learn about the hazards of entanglement through the story and the actions the characters took to make the Baton Rouge Capitol Lake a safer place for wildlife. Ages 5 years to Adult.

Din, R., & Din, C. (2020). **Lily Litter-Picker and The Whale.**

Monkey in a Barrel Publishing. ISBN-13: 978-1838017828

Readers will meet Lily, a determined eco-warrior. She discovers a whale on the beach that is full of rubbish dumped into the sea. Ages 4 - 10 years.

Galat, J.M. (2023). **Too Much Trash: How Litter Is Hurting Animals.**

Orca Book Publishers. ISBN-13: 9781459831827

Readers will discover how garbage ends up everywhere — from city streets and the wilderness to farmland and the ocean. But there's good news: litter is a problem everyone can help prevent. Find out how you can help clean up the planet for all species. Ages 9 - 12 years.

Harrison, J. (2019). **Lol: Leave Zero Litter.**

Janet Harrison Publisher. ISBN-13: 978-1916021778

This story encourages children to get involved in planet Earth's future by making them aware of the distress animals encounter from plastic, glass, and litter, enabling them to make changes — no matter how small. Ages 3 - 10 years.

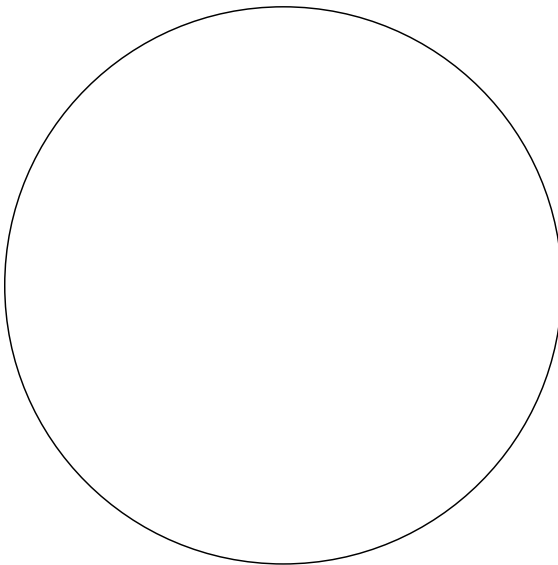
Lesson Plan 1 - All Litter Harms Animals - Activity Sheet 1

THE HAZARDS OF MICROPLASTICS

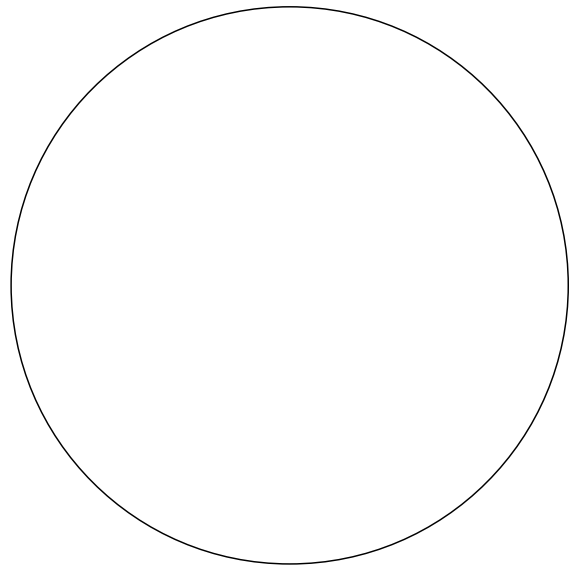
Name: _____ Date: _____

Directions:

1. Pretend you are a bird by making your hand into a beak. With your beak, eat the birdseed on your group's plate until your teacher tells you to stop. As you eat put the seeds into your bowl.
2. Draw what you observed in your bowl (stomach) in **Circle 1**.



Circle 1: This is what I ate today.



Circle 2: These are the microplastics I ate today.

3. Pick the microplastics out of your bowl. Count the number of microplastics that you ate and glue them on **Circle 2**. **Save the seed for Part 2.**

I ate _____ pieces of microplastics today.

1. Why do you think birds eat microplastics (give 2 reasons)?

2. How does eating microplastics harm animals?

Lesson Plan 1 - All Litter Harms Animals - Activity Sheet 2

THE HAZARDS OF ENTANGLEMENT

Name: _____ Date: _____

Directions:

- 1. **Feeding 1:** Pretend you are a bird by making your hand into a beak. With your beak, eat the birdseed on your group’s plate until your teacher tells you to stop. As you eat, put the seeds into your bowl (the bowl represents your stomach.)
- 2. After eating, scoop up the seeds with your spoon, count the number of spoons that you fill, and record this number in the table below.
- 3. **Feeding 2:** Pretend you are a bird by making your hand into a beak again. This time wrap a rubber band around your fingers. The rubber band represents a bird getting its beak entangled in litter. Eat from your group’s plate until your teacher tells you to stop. As you eat, put the seeds into your bowl.
- 4. After eating, scoop up the seeds with your spoon, count the number of spoons that you fill, and record this number in the table below. Subtract the number of spoonfuls in Feeding 2 from Feeding 1.



Seed Eaten by Your Bird Data Table	
	Number of Spoons Filled with Birdseed
Feeding 1	
Feeding 2	
What is the difference between the Feeding 1 and Feeding 2? (Subtract the number of spoonfuls)	

1. How did the rubber band affect how much seed you were able eat?
- _____
- _____
2. What can you do to prevent litter entanglement of wildlife?
- _____
- _____

Lesson 2

ROADSIDE LITTER SURVEY

Lesson Focus

In this lesson, students will become scientists conducting a litter survey on Louisiana's roadways. This activity is a simulation of a roadside litter survey conducted by researchers in 2023.

Lesson Objective

- Students will collect data from the litter cards during the simulation, sort them into categories on the data sheet, and record it on the data sheet with 100% accuracy.
- Students will correctly express data collected from the simulation graphically using a bar graph.
- Students will draw appropriate conclusions based on the data collected by writing at least one or two sentences that correctly summarize the litter data found on Louisiana roads.

Grade Level	Duration	Subject Area	Vocabulary
3	45 Minutes	Math, Science	litter, trash

Louisiana Student Standards for Math

3.MD.B.3

Draw a scaled bar graph to represent a data set with several categories.

Louisiana Student Standards for Science

5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environments.

Materials List

Per Student

- 1 copy of **Activity Sheets #2**
- 1 copy of **Activity Sheets #3** (optional)

Per Group

- 1 copy of **Activity Sheet #1** - see Advance Preparation, Step 1
- Envelopes or paper bags

Lesson 2

ROADSIDE LITTER SURVEY

Activity Sheets

- Visible Litter Simulation Cards
- Simulated Visible Litter Survey
- Check for Success

Advance Preparation

1. Print one set of **Activity Sheet #1** per pair of students. Cut the 20 litter cards apart and place them in an envelope or paper bag.
2. Make a copy of **Activity Sheet #2** for each student.
3. Make sure you can view the Engage video on your classroom projection system.
4. Make a copy of **Activity Sheet #3** for each student. *(optional)*

Background Information

Trash is waste that is disposed of properly. Paper, fast-food wrappers, beverage cans, Styrofoam, cardboard, plastic bottles, cigarette butts, tire and car parts, plastic bags, clothing, plastic wrapping, and even biodegradable items are examples of trash items, but if they are improperly discarded, they become **litter**. Unfortunately, many of these items are common sights along Louisiana roadways.

In 2023, Keep Louisiana Beautiful conducted a comprehensive litter study comprised of a roadside litter survey, a cost of litter survey, and a public attitude survey. The roadway litter survey documented an astounding 143 million pieces of litter on interstates, LA highways, and U.S. highways in Louisiana. The survey team sampled 137 sites that represented rural, suburban, and urban locales. Litter at each site was counted in an area 300 feet long by 15 feet in depth. Litter items found in this rectangular area were classified by category, item, and material type. Below are the descriptors for each of the 11 litter categories. The complete report can be found on the KLB website at <https://keeplouisianabeautiful.org/litter-study>.

Litter Summary Categories, Items, and Packaging Material

(from KLB Roadway Litter Study, Table 2-1, p. 3-4)

Category	Item	Material
Bags	Fast food, retail, trash, leaf bags	paper, plastic, cloth
Beverage Containers	Beer, soda, sports, energy, water, wine/liquor, juice, tea	metal, plastic, glass, composite
Construction Debris	Shingles, lumber/wood, electrical, drywall, foam, insulation, industrial rags, tarps	metal, plastic, polystyrene foam, composite, wood
Cups and Lids	Cups for hot or cold drinks, lids, straws, wrappers	paper, plastic, polystyrene foam
Fast Food	Boxes, clamshells, trays, plates, utensils, napkins	composite, paper, foil, plastic, polystyrene

Lesson 2

ROADSIDE LITTER SURVEY

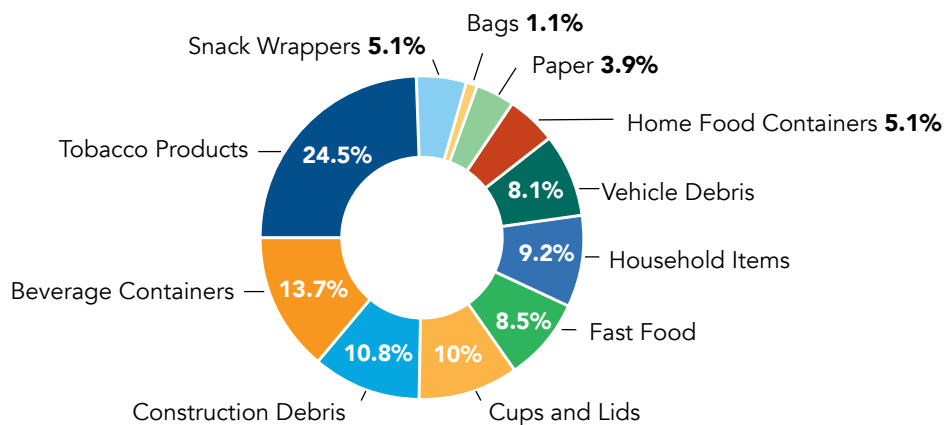
Litter Summary Categories, Items, and Packaging Material Continued

(from KLB Roadway Litter Study, Table 2-1, p. 3-4)

Category	Item	Material
Home Food Containers	Food jars, cans, bottles, lids	composite, glass, metal, plastic, polystyrene foam
Household Items	Clothing, hygiene items, appliances, packaging of items used at home	composite, cloth, metal, plastic, polystyrene foam
Paper	Non-food/beverage paper, e.g., newspapers, magazines, flyers, lottery tickets, business, school, receipts, packaging, paperboard, corrugated boxes	paper
Snack Wrappers	Sweet snacks (candy, cakes), salty snacks (chips, crackers), gum	paper, plastic, composite
Tobacco	Cigarette or cigar butts, lighters, matches, boxes, wrapping, pouches and other packaging. Each was separately classified.	tobacco, plastic, metal, composite
Vehicle Debris	Automobile parts from accidents, car maintenance debris, tires, tire debris	tire, rubber, metal

Aggregate Litter by Category (Figure 2-3)

The graph below shows the percentages of aggregate (visible and micro) litter by category. Tobacco products were the most prevalent type of aggregate litter (24.5%), followed by beverage containers (13.7%), and construction debris (10.8%).



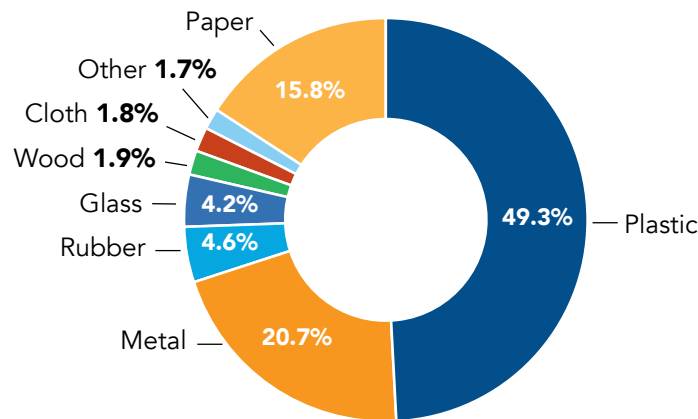
Note: Since this lesson has been created for children, the aggregate category of tobacco has been removed from the activity. The remaining 10 aggregate categories are all used in the simulation.

Lesson 2

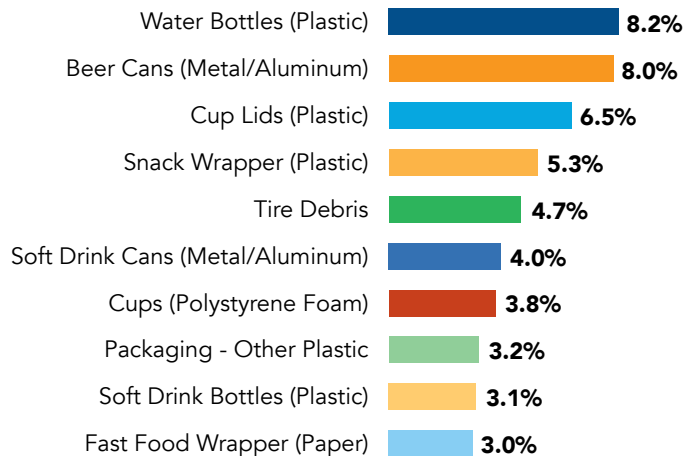
ROADSIDE LITTER SURVEY

Packaging Materials for Visible Litter (Figure 2-11)

Plastic (49.3%) was the most significant and pervasive visible litter packaging material. Metal (20.7%), predominantly aluminum beverage cans, was the second most common packaging material found at the survey sites, followed by paper (15.8%). Figure 2-11 shows the breakdown of visible litter by packaging material type.



Top 10 Visible Litter Items (Figure 2-9)



Litter Source Estimates

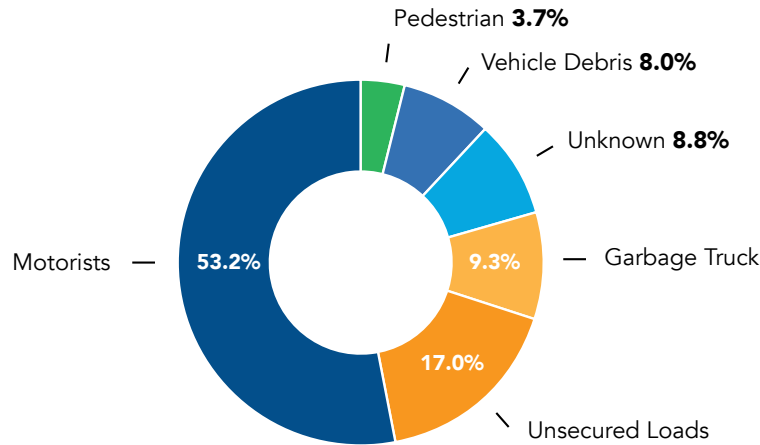
Determining the exact sources of litter without witnessing it, can be difficult. However, based on site conditions and guidelines developed and refined over time, identifying the likely sources of litter is possible. The litter source may be determined based on context clues such as:

- types, amounts, conditions, and locations of littered items
- proximity to specific land uses, e.g., solid waste facilities, convenience stores, construction sites, and fast-food establishments
- roadway type, e.g., accessibility by pedestrians

Lesson 2

ROADSIDE LITTER SURVEY

Top Sources of Litter (figure 2-14)



References

- Carson, C. (2023a). Louisiana Litter Research: Executive Summary. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>

Procedure

Engage – 8 Minutes

- Watch a short video of the introduction to the movie, WALL-E, <https://www.youtube.com/watch?v=QHH3iSeDBLo> (1:18; note: a bra appears as an item of trash at 0:29-0:35)
 - What's going on when we are introduced to WALL-E?** WALL-E, a robot, spends every day doing what he was made for... which is pickup and compacting litter left behind on Earth.
 - What does WALL-E do with the litter he picks up?** WALL-E compacts it and builds structures out of the trash cubes. He also saves some of the trash he finds interesting by keeping it in a red cooler.
 - Where did all this trash come from?** People left it behind. There was so much litter and trash that they had robots like WALL-E picking it up to get it out of the way. There was more trash than there was space in city's landfills, so litter began building up in the cities.
- To introduce the lesson, explain to students that they are going to be science researchers who will be going out to the field to determine what types of litter are found on Louisiana roadways. To prepare for this fieldwork, ask students the following questions:
 - What kind of litter have you noticed on the roads leading to your school? What kind of litter have you noticed around your neighborhood?**
 - How might litter on the sides of our roads in our cities, neighborhoods and rural areas be a problem?** Litter is unsightly, sometimes dangerous to humans, often dangerous to wildlife, etc.

Explore – 30 Minutes

- Distribute the litter card envelopes or bags to each pair of students and one **Activity Sheet #2** to each student. Explain that in this activity students will simulate being scientists investigating the types of litter categories found on Louisiana roadways. To simulate the fieldwork, students draw litter cards from the envelope or bag and record the data on **Activity Sheet #2**.

Lesson 2

ROADSIDE LITTER SURVEY

2. Students record data over five simulated days. Students draw a litter card and record the type of litter on their data table. After recording the data, they return the litter card to the envelope or bag, mix up the litter cards within the envelope or bag and then draw another litter card. They will repeat this process until they have recorded 10 pieces of litter data in the table for each of the five days. Have the students follow the directions on the **Activity Sheet #2**.
3. When students have completed recording their data for the five days, they should begin to graph their data as a bar graph. Students will need to scale and name the vertical axis. The x-axis categories are already provided. Students should provide a title for their graph.
4. Students should write a one or two sentence conclusion based on the data they collected and graphed.

Explain – 15 Minutes

1. Have students share their graphs with the class and orally describe the types and numbers of litter that were found on their five days of litter observations.
2. Some questions you might ask students include:
 - **Show us your graph and tell us what you learned from your data.**
 - **Did anything surprise you about the types of litter that are found on Louisiana roadways?**
Some students might report that they are surprised at how many beverage bottles and cans end up on Louisiana roadways.
 - **What items were most commonly found on Louisiana roadways?** *Beverage containers, drinking cups, and fast-food packaging.*
 - **What items were less common on Louisiana roadways?** *Home food containers, plastic bags and household items.*
 - **How does all this litter end up on Louisiana roadways?** *Motorists are the source of most roadside litter. Littering can be unintentional and intentional. An example of unintentional littering is when plastic covering a box on a truck bed shreds in the wind as the vehicle moves down the roadway and lands on the side of the road. Intentional littering is when people toss their trash out the window of a car or deliberately drop it on the ground without finding a trash can.*
 - **Look at the categories on your graph. What are some unintentional ways that trash can end up as litter on the roadways of Louisiana? Can you think of ways that intentional litter happens for each of your survey categories?**
 - **What do you think is the source of the litter on the roadways?**
 - **How might you be able to prevent or reduce the litter in your graph?**

Expand – 15 Minutes (Optional)

1. Now let's look at a real research study to see what type of visible litter is found on Louisiana's roadsides. Have students look at the graph of the Keep Louisiana Beautiful Roadside Litter Survey of August 2023 (Step 4 of **Activity Sheet #2**). Ask students to look at their graphs and compare their data to the graphed 2023 data.
 - **What are some similarities between your data and the 2023 Roadside Survey data?**
 - **What are some differences?**
 - **Why might your data look different from the 2023 Roadside Survey data?**

Take Action

1. Make litter prevention signs and hang around school.
2. Write and make a pledge not to litter.
3. Identify items being thrown away in the classroom and/or the cafeteria. Identify what is recyclable and what can be reused.

Evaluate

1. Hand out copies of **Activity Sheet #3** (optional).
2. Graphs and completed **Activity Sheets #2** can be graded based on whether the student correctly grouped and counted the different types of litter that were collected during their simulation.

Online Resources

Carson Consulting. (2023). **2023 Keep Louisiana Beautiful Litter Study**.
Available at <https://keeplouisianabeautiful.org/litter-study>

Burns-McConnell Research Team (2021). **2020 National Litter Study: Summary Report, May 2021**.
Keep America Beautiful. 47 p.
Available at https://kab.org/wp-content/uploads/2021/05/Litter-Study-Summary-Report-May-2021_final_05172021.pdf

Karimi, K., & Faghri, A. (2021) **The issues of roadside litter: A Review Paper**.
Current Urban Studies, 9, 779-803.
Available at <https://www.scirp.org/journal/paperinformation.aspx?paperid=113864>

Children's Books

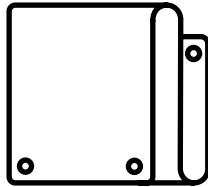
Dejito, R. (2023). **Poly's Woeful Adventures**.
Rachel Dejito Publishing. ISBN-13: 9786210607475
Readers follow the journey of a discarded piece of trash. Ages 9 - 12 years.

Parker, T. (2022). **Talking Trash on the Bayou**.
Amazon Digital Services. ISBN-13: 9798351142371
Readers learn the effects of litter on humans, animals, and the environment. Ages 9 - 12 years.

Lesson Plan 2 - Roadside Litter Survey: A Simulation -
Activity Sheet 1
VISIBLE LITTER SIMULATION CARDS



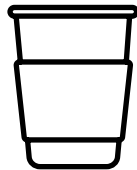
**PLASTIC BOTTLED
ENERGY DRINK**
BEVERAGE CONTAINER



PLASTIC TARP
CONSTRUCTION DEBRIS



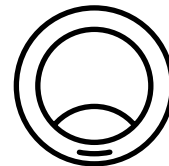
BOTTLED COFFEE DRINK
BEVERAGE CONTAINER



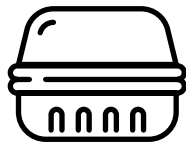
PAPER COFFEE CUP & SLEEVE
DRINKING CUPS



PLASTIC CUP
DRINKING CUPS



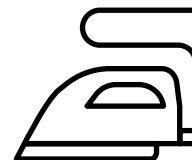
PLASTIC COFFEE CUP LID
DRINKING CUPS



PLASTIC CLAMSHELL
FAST FOOD



GLASS LEMONADE BOTTLE
BEVERAGE CONTAINER



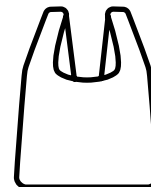
METAL & PLASTIC IRON
HOUSEHOLD ITEMS



PLASTIC KETCHUP BOTTLE
HOME FOOD CONTAINER

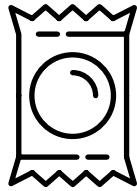


NEWSPAPER
PAPER

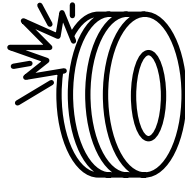


PLASTIC GROCERY BAG
BAGS

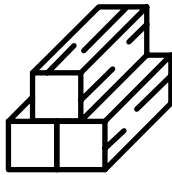
Lesson Plan 2 - Roadside Litter Survey: A Simulation -
Activity Sheet 1
VISIBLE LITTER SIMULATION CARDS



COMPOSITE CHIP BAG
SNACK WRAPPERS



RUBBER TIRE
VEHICLE DEBRIS



WOOD BLOCKS
CONSTRUCTION DEBRIS



ALUMINUM TEA CAN
BEVERAGE CONTAINER



WATER BOTTLE
BEVERAGE CONTAINER



**SPARKLING WATER
PLASTIC BOTTLE**
BEVERAGE CONTAINER



PLASTIC SODA BOTTLE
BEVERAGE CONTAINER



PLASTIC UTENSILS
FAST FOOD

Lesson Plan 2 - Roadside Litter survey: A Simulation - Activity Sheet 2

SIMULATED VISIBLE LITTER SURVEY

Name: _____ Date: _____

Instructions: You are a researcher who has been hired by Keep Louisiana Beautiful to study visible litter left on Louisiana’s roadways. Every time you observe a piece of litter you must record the type of litter in your field notebook data table.

Step 1. To simulate collecting litter survey data, you will draw a litter card out of your envelope. The litter on the card has been left on a Louisiana roadway by a pedestrian or a person in a car or truck. You will begin your observations on “Monday.” Record the category of litter at the top of the column in the chart below and place a tally mark in the correct column and row of your data table. Return the litter card to the envelope. Shake the envelope and draw another litter card. Record your data below. Do this 10 times on each of the five “days” you did your simulated visible litter survey.

Observation Day	Types of Visible Litter (visible litter is larger than 4 inches)									
	Bottles & Cans	Drinking Cups & Lids	Fast-Food	Construction Debris	Vehicle Debris	Paper	Household Items	Snack Wrappers	Plastic Bags	Home Food Containers
Monday										
Tuesday										
Wednesday										
Thursday										
Friday										
Total Over Five Days										

Lesson Plan 2 - Roadside Litter survey: A Simulation - Activity Sheet 2

SIMULATED VISIBLE LITTER SURVEY

Step 2. Create a bar graph below to display your total of each type of visible litter that you found over the course of the five days of your observations. Remember to title your graph and to label both the x and y axes.

Graph Title

[illegible]

X: _____

Y

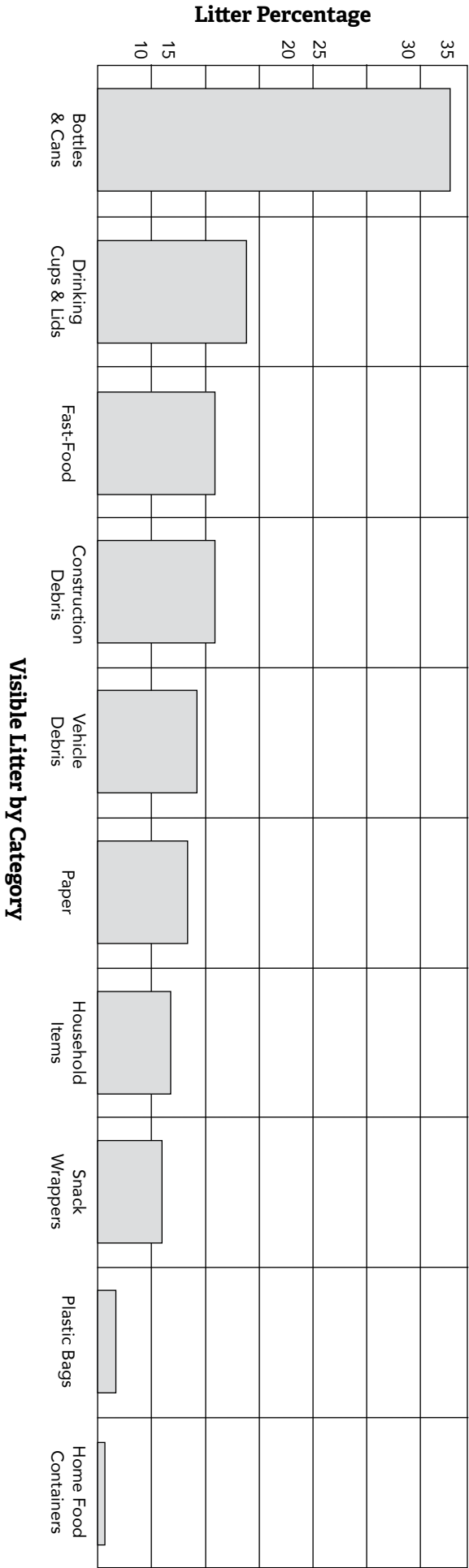
Step 3. Looking back over your table of data and above at your graphed data, describe what the data tells you about your litter survey over the five days of observation.

[illegible]

Lesson Plan 2 - Roadside Litter survey: A Simulation - Activity Sheet 2

SIMULATED VISIBLE LITTER SURVEY

Keep Louisiana Beautiful Litter Research Study Data, August 2023 Research (without tobacco products)



Step 4. How do your simulation results compare with the Keep Louisiana Beautiful Litter Survey Results from August 2023?

Take Action: Many of the litter categories above are the result of careless behavior. What can you do to reduce and prevent litter on our streets and highways?

Lesson Plan 2 - Roadside Litter Survey - Activity Sheet 3

CHECK FOR SUCCESS

Name: _____ Date _____

1. Litter ...

- | | |
|--|------------------------------|
| a. is trash that is thrown on the ground | c. is beautiful to look at |
| b. consists mostly of dead animals | d. is not harmful to animals |

2. The most common visible litter item on Louisiana's roadways is ...

- | | |
|-------------------|--------------------------|
| a. plastic bags | c. plastic water bottles |
| b. snack wrappers | d. fast food containers |

3. One way I can help keep litter off Louisiana roadways is to ...

My Grade: _____ correct out of 3

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Lesson Plan 2 - Roadside Litter Survey - Activity Sheet 3

CHECK FOR SUCCESS

Name: _____ Date _____

1. Litter ...

- | | |
|--|------------------------------|
| a. is trash that is thrown on the ground | c. is beautiful to look at |
| b. consists mostly of dead animals | d. is not harmful to animals |

2. The most common visible litter item on Louisiana's roadways is ...

- | | |
|-------------------|--------------------------|
| a. plastic bags | c. plastic water bottles |
| b. snack wrappers | d. fast food containers |

3. One way I can help keep litter off Louisiana roadways is to ...

My Grade: _____ correct out of 3

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Lesson 3

MAPPING SCHOOL LITTER

Lesson Focus

In this lesson, students will collect litter from the grounds of their school and learn to accurately record and graph it. As the litter is collected, students will identify each piece as one of four material types (paper, plastic, metal & aluminum, and other), record and graph the data.

Lesson Objective

Students will accurately map the litter material they pick up on a map of their school property.

Grade Level	Duration	Subject Area	Vocabulary
3	45 Minutes	Math, Social Studies	litter, trash

Louisiana Student Standards for Math

LSSS (2017) | 3.MD.B.3

Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.

Louisiana Student Standards for Social Studies

LSSS (2023) | 3.19

Create and use maps and models with a key, scale, and compass with intermediate directions.

Materials List

Per Student

- Rubber Gloves
- Copies of **Activity Sheet #1**, **Activity Sheet #2** and **Activity Sheet #3** (optional)

Per Group

- Clip board
- Pencils
- Garbage bags or bucket
- Red, blue, green and black pens

Per Class

- Luggage scale (optional)
- Safety cones (optional)

Lesson 3

MAPPING SCHOOL LITTER

Activity Sheets

- Map, Data Sheet and Analysis Sheet
- Litter Materials by Weight
- Check for Success

Advance Preparation

1. Prepare a map of your school grounds.
 - Scout the area you want to use for your mapping. Decide where you want students to map the litter on your campus. For instance, you may prefer to map the playground, school hallways or the cafeteria.
 - If you don't already have a map of your school grounds, go to Google Maps and enter the name and address of your school. Click the "layers" box to view a satellite image of the school. Enlarge the image so that the area you are interested in is as large as possible. Take a screenshot of it or print and save the image. Put your image into a PowerPoint slide. Be sure your image/map shows all areas where your students will be picking up litter. You can create an outline map of the image (see below) if you think it will be easier for students to locate themselves on a simple map rather than an aerial view of your school.
 - Label the map and include a compass rose. Put the map scale on the outline map (located in the lower right corner of the Google map). See Figure 1 as an example.
 - Another option is to use the map of the school grounds that most schools use to show fire escape routes or room assignments.

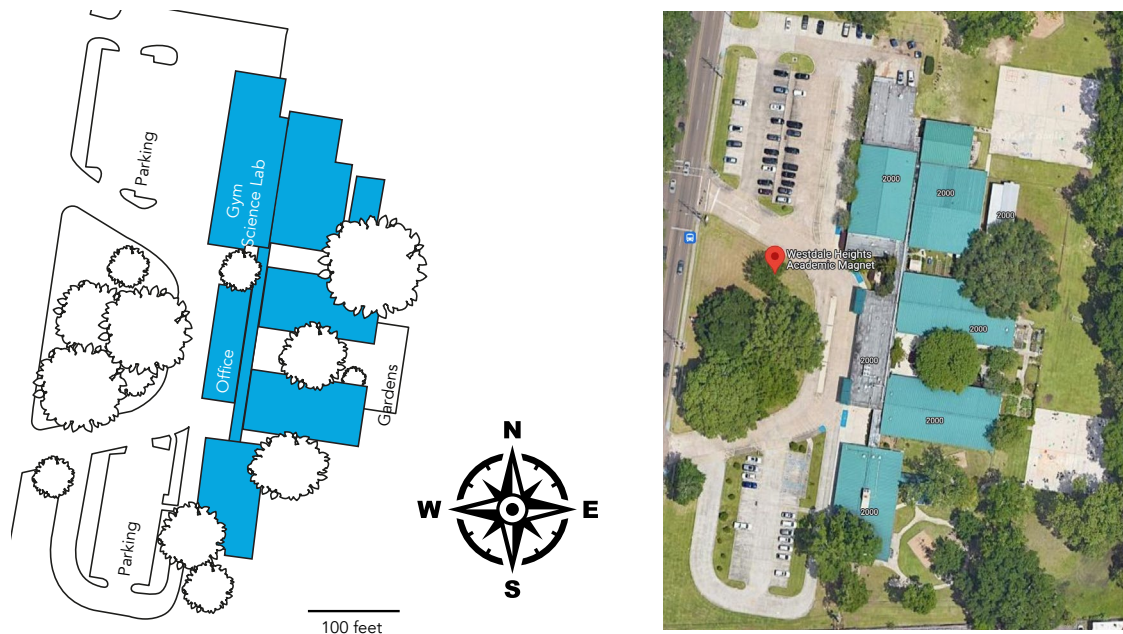


Figure 1. Line map (left) drawn from the image on Google Maps.

Lesson 3

MAPPING SCHOOL LITTER

2. Identify the litter pickup areas that are safe for students to access. Mark the boundaries for litter pickup on the map and at the school using safety cones if necessary.
3. Gather supplies listed in the Materials List.
 - Depending on where you live, you might be able to borrow cleanup supplies by utilizing Keep Louisiana Beautiful's Get Down and Clean Up library program. The program allows library patrons to check out litter removal supplies (vests, litter grabbers and bags) using their library card. To find participating libraries go to - <https://keeplouisianabeautiful.org/library-clean-up-kit-program>
4. Purchase rubber gloves or ask the students to bring garden gloves from home.
5. Consider taking "before & after" pictures so students can see how their actions have made a difference.



Background Information

Items that are no longer useful or wanted that have been properly disposed of are considered **trash**. When trash is not disposed of properly, whether intentionally or unintentionally, it becomes **litter**.

In Louisiana, litter is a big problem. According to a roadside litter survey conducted by Keep Louisiana Beautiful, there are approximately 143.8 million pieces of litter on Louisiana roadways. There are approximately 10,178 pieces of litter per mile on Louisiana interstate roadways alone. That is a lot of litter. Of the litter found along the roadways, the most common packaging material is plastic (43.1%), followed by tobacco-related materials (24.5%), metal (10.0%), paper (9.3%), glass (4.5%), rubber (2.2%) and other (6.4%).

The study also documented that litter is a very costly problem. Over \$91.4 million a year is spent in Louisiana on litter cleanup, prevention, and remediation efforts. If litter was not such a huge costly problem, perhaps that money could be used for our schools, and to benefit our communities. All the litter on our roadsides is the result of carelessness of Louisiana motorists and pedestrians. Over 92% of respondents of the Public Attitude Survey indicated that litter is a very serious problem in Louisiana. These respondents recognized that litter is harmful to humans and animals, affects environmental quality, contributes to flooding by clogging drainage systems, negatively impacts tourism, reduces property values, and decreases business revenues.

References

- Louisiana Litter Research: Executive Summary. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>
- Louisiana Litter Research: Public Attitude Survey. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>
- Louisiana Litter Research: Roadway Litter Survey. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>
- Louisiana Litter Research: Cost of Litter Survey. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>
- Louisiana Public Broadcasting's Louisiana Public Square: Litter in Louisiana <https://www.pbs.org/video/litter-in-louisiana-louisiana-public-square-dpynxf>, 57:41

Procedure

Engage – 5 Minutes

1. To introduce today's activity, view the first 43 seconds of **Tracking Trash to Teach Students about Environmental Impact** (4:32) by Google Earth, <https://www.youtube.com/watch?v=WUuoopvmzxw>

Questions to ask students:

- **What are the students doing in this video?** *They are picking up trash in a park near their school.*
- **Where did the students find the most litter?** *In the bushes near the walking paths in the park.*
- **How would you define litter?** *Litter is when used items are discarded improperly, like on the ground or in the water. Littering can happen intentionally or unintentionally.*
- **If litter is an item that is not properly thrown away, what is trash?** *Trash is when we discard used items properly, like in a trash receptacle.*

Explore – 20 Minutes

1. Orient your students to where things are on their campus map. Ask students where they have noticed litter on campus. As students give you answers, ask if others have noticed litter at those locations as well.
2. Outline the boundaries of the area the students will map. Mark the area with safety cones or other indicators. Emphasize that students are to stay within the boundaries.
3. Divide students into litter pickup groups. Groups of four are recommended: a tally recorder, a map recorder, a litter picker and a bag handler. Hand out the materials needed to do the activity: maps and data sheets on clipboards, trash bags, pencils, colored pens, and safety gloves.
4. Give directions on the litter pickup process.
 - Students are to pick up all the litter that they can in a 10-minute time frame. Emphasize that even microlitter (tiny pieces less than 4" in length) should be picked up and recorded. Students should never pick up sharp or hazardous items.
 - For each piece of litter, the recorder will mark its location with a colored dot on the map (see note below) and then the trash bag handler can accept the piece of litter into their bag. After the litter piece is added to the bag, the recorder places a tally mark on the data sheet in the correct category based on the material type of the litter. Students should add their piece of litter to the trash bag only after it has been marked on the map and after the tally mark has been added to their data sheet.
NOTE: The dots made on the school map should be color coded using different colored pens. This will allow students to determine if there is a pattern to where different litter types are found on their campus.
 - Litter material types and color coding:

PL – Plastics: This includes hard and soft plastics such as bottle caps, utensils, Styrofoam pieces, cups, beverage bottles, straws, food and candy wrappers and film, and bags.

P – Paper: This includes newspaper, boxes, fliers, magazines, school paper, bags, and napkins.

M – Metals and Aluminum: This includes food or snack cans, drink cans, and metal fragments.

O – Other: This includes rubber, cloth, glass, cigarette butts and packaging, and items made with mixed materials such as foil and paper.

Lesson 3

MAPPING SCHOOL LITTER

5. Discuss safety measures for picking up litter. Students should:
 - not touch unsafe, sharp, heavy, or hazardous items such as dead animals, glass, medical waste, and litter that is out of reach or in tall weeds.
 - be supervised by an adult during the litter collection.
 - wear gloves always.

Explain – 20 Minutes

1. Have students return to their classroom once the allotted time has elapsed. Sitting in groups, have the students transfer the data from the collector's map and data sheet to their own Activity Sheets so that each student has their own copy of the location and data information. Each student will then have the necessary information to construct a graph based on their group data as well as a location map so that they can complete the analysis questions below the data table and the graph.
2. Discuss the questions that students answered in the analysis of their data.
 - **What material type of litter represented the largest number of items?**
 - **What material type of litter represented the smallest number of items?**
 - **What is the most littered item that you collected?**
 - **What is the total number of pieces of plastic you found in your area?**
 - **How might you reduce or prevent the littering of the most littered item?**
 - **Look at the data tables and maps from another group. Is their data the same as yours? Is their map the same? How are they similar and different?**
 - **Looking back over your data table and at your graphed data, describe what your data tells you about the number of items and litter material type discarded on the ground in your area.**
 - **Was the litter evenly distributed across your whole area or was it located in a particular area? Why do you think the litter was distributed like it was?**
 - **Given what you learned about litter in your area, what can you do to prevent litter?**
 - **Looking at your data, what pieces did you collect today that could be recycled and diverted away from a landfill?**
 - **How does your campus data compare to the Louisiana Roadway Litter Study data? Why do you think your data is similar or different from the Louisiana Roadway Litter Study (Carson, 2023) data?** The link to this study is <https://keeplouisianabeautiful.org/wp-content/uploads/2023/10/LA-Roadway-Litter-Survey-AUG2123.pdf>

Expand – 20 Minutes (Optional)

1. Students have analyzed their data based on the number of pieces of litter material and location. The litter can also be analyzed by the weight of each litter material. To do this, have the students wear gloves and sort the litter into the same major categories used to map and graph their original data. They can then graph the new data based on the weights (**Activity Sheet #3**). This can be done as individual groups or as a collective class.
 - **What is the total weight of the plastic litter?**
 - **What litter material is the heaviest?**
 - **What litter material is the lightest?**
 - **Looking back over your new data table and graph based on weight. What do you learn about the weight and type of litter discarded on the ground in your area?**

Take Action

1. Now that students have a better understanding of the types of litter on campus and the possible reasons it accumulated based on the behaviors of students, staff, and parents around their school, have them brainstorm ideas to prevent litter on campus. Examples include:
 - Place more trash receptacles at locations that had the most litter indicated by their mapping activity.
 - Place student-made litter prevention signs at highly visible locations like the cafeteria or playgrounds.
2. Have a group of students representing their class present School Litter Prevention recommendations to the principal and vice-principal.
3. As a class, students can write a pledge not to litter. They can take the pledge at the end of the class.
4. The class or school can register to participate in Love the Boot Week by doing a cleanup or beautification project at their school. To find out more, go to <https://keeplouisianabeautiful.org/love-the-boot>.

Evaluate

1. **Activity Sheet #1** and **Activity Sheet #2** can be graded.
2. **Activity Sheet #3** (optional)

Online Resources

Louisiana Litter Research: Executive Summary. Keep Louisiana Beautiful.

Available at <https://keeplouisianabeautiful.org/litter-study>

Louisiana Litter Research: Public Attitude Study. Keep Louisiana Beautiful.

Available at <https://keeplouisianabeautiful.org/litter-study>

Louisiana Litter Research: Roadway Litter Study. Keep Louisiana Beautiful.

Available at <https://keeplouisianabeautiful.org/litter-study>

Vista Lens. (n.d.). **Clean Pelican.**

<https://youtu.be/AlTYTggfjEg>

This video explains how the Clean Pelican volunteer group formed in Baton Rouge.

Google Earth. (n.d.). **Tracking Trash to Teach Students about Environmental Impact.**

<https://www.youtube.com/watch?v=WUuopvmzxw> (4:32).

This video follows Peg Keiner, Director of Innovation at GEMS World Academy in Chicago, as she engages students in mapping litter that they picked up near their school.

Keep Louisiana Beautiful. **Library Clean Up Kit.**

<https://keeplouisianabeautiful.org/library-clean-up-kit-program>

Keep Louisiana Beautiful has distributed litter pick up kits at local libraries (see participating libraries at above link) that are free to check out to library patrons. Each kit comes with safety vests, litter grabbers and trash bags.

Keep Louisiana Beautiful. (n.d.). **What is litter?**

<https://keeplouisianabeautiful.org/tools-resources/litter>

Overview of litter and the costs associated with keeping our environment clean.

Kirschner, J. (Mar 22, 2017). **TedTalk: This app makes it fun to pick up litter. [Litterati].**

<https://www.youtube.com/watch?v=es4w3WUcrNQ> (6:10)

Litterati is an app to help make litter pick up fun and at the same time gather important data. The app connects who picks up litter, what the litter is, what time it was picked up and where the litter is located.

Note: A school example is from 5:10-5:50.

Louisiana Public Broadcasting. (February 2021). **Louisiana Public Square: Litter in Louisiana.**

<https://www.pbs.org/video/litter-in-louisiana-louisiana-public-square-dpynxf>

An excellent, detailed look at the problem of litter in Louisiana.

Children's Books

Bartlett, D. (2020). **Just One Child: Starting a Plastic-Free and Litter-Free Journey.**

Debbie Bartlett Publisher. BN ID: 2940163470525 [Barnes and Noble's ebook].

Readers learn that small actions can make a big difference. Ages 9 - 12 years.

Flynn, S.W. (2017). **This Book Stinks! Gross Garbage, Rotten Rubbish, and the Science of Trash.**

Disney Publishing Group. ISBN-13: 978-1426327308.

This book is filled with infographics, photos, stats, and facts. There are also quizzes and activities to inspire kids to take action. Ages 8 - 12 years.

Martina, S. (2022). **Hannah and Dexter: The Litter Busters.**

Martina Publishing. ISBN-13: 978-1957645995.

Hannah and Dexter research how litter hurts the environment, makes communities unsafe and cities look bad. This book encourages people to pick up trash and promotes Earth Day. Read along at https://www.youtube.com/watch?v=sNJ_xB9PKdg (10:16). Ages 3 - 10 years.

Lesson Plan 3 - Mapping School Litter - Activity Sheet 1

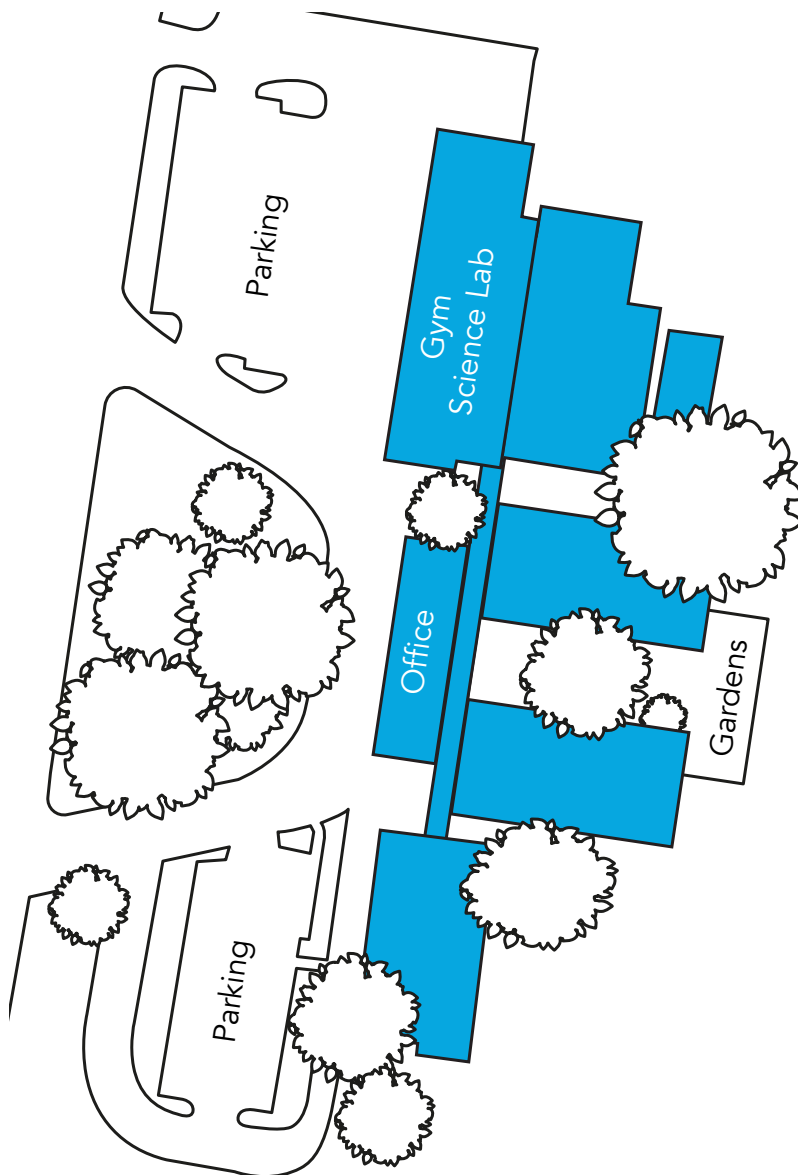
MAP

Pickup Team: _____

Area of Pickup: _____

Directions: On the school map below, use the key to mark the locations of the types of litter you find in your assigned area of litter pickup.

SAMPLE MAP



Map Key:

PL – Plastics: Drink bottles, bottle caps, straws, utensils, cups, lids, pens, fragments, food wrappers, bags, Styrofoam, etc.

P – Paper: Newspaper, boxes, fliers, magazines, school paper, bags, napkins, etc.

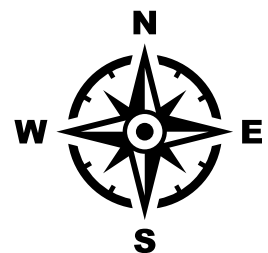
M – Metals and Aluminum: Metal caps, foil, drink cans

O – Other: cigarette butts, rubber, candy wrappers made of more than 1 type of material

Safety Tips:

Do not touch items that could be harmful such as glass, dead animals, medical or hazardous waste, or large items.

Ask an adult before touching anything you are not sure of.



100 feet

Lesson Plan 3 - Mapping School Litter - Activity Sheet 1

MAP

Pickup Team: _____

Area of Pickup: _____

Directions: On the school map below, use the key to mark the locations of the types of litter you find in your assigned area of litter pickup.

Map Key:

PL – Plastics: Drink bottles, bottle caps, straws, utensils, cups, lids, pens, fragments, food wrappers, bags, Styrofoam, etc.

P – Paper: Newspaper, boxes, fliers, magazines, school paper, bags, napkins, etc.

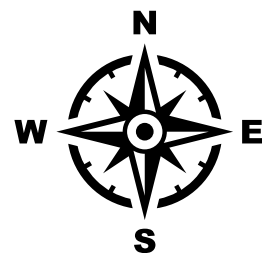
M – Metals and Aluminum:
Metal caps, foil, drink cans

O – Other: cigarette butts, rubber, candy wrappers made of more than 1 type of material

Safety Tips:

Do not touch items that could be harmful such as glass, dead animals, medical or hazardous waste, or large items.

Ask an adult before touching anything you are not sure of.



100 feet

Lesson Plan 3 - Mapping School Litter - Activity Sheet 1

DATA SHEET

Name: _____ Date _____

Pickup Team: _____

Area of Pickup: _____

Litter Material	Tally Marks	Total Tally Marks
PL – Plastics: drink bottles, bottle caps, straws, utensils, cups, lids, pens, fragments, soft plastic food wrappers, bags, zip lock bags, Styrofoam, plates and containers		
P – Paper: newspaper, boxes, fliers, magazines, school paper, bags, and napkins		
M – Metals and Aluminum: food or snack cans, drink cans, and metal fragments		
O – Other: rubber, cloth, glass, cigarette butts and packaging, and items made with mixed materials such as foil and paper		
	Total Tallies =	

What litter material represented the largest number of pieces of litter? _____

What fraction of litter did this largest material type represent? _____

What litter material represented the smallest number of litter? _____

What fraction of litter did this smallest material type represent? _____

What is the number of total pieces of plastic you found in your area? _____

What fraction of your total litter is represented by plastics represent? _____

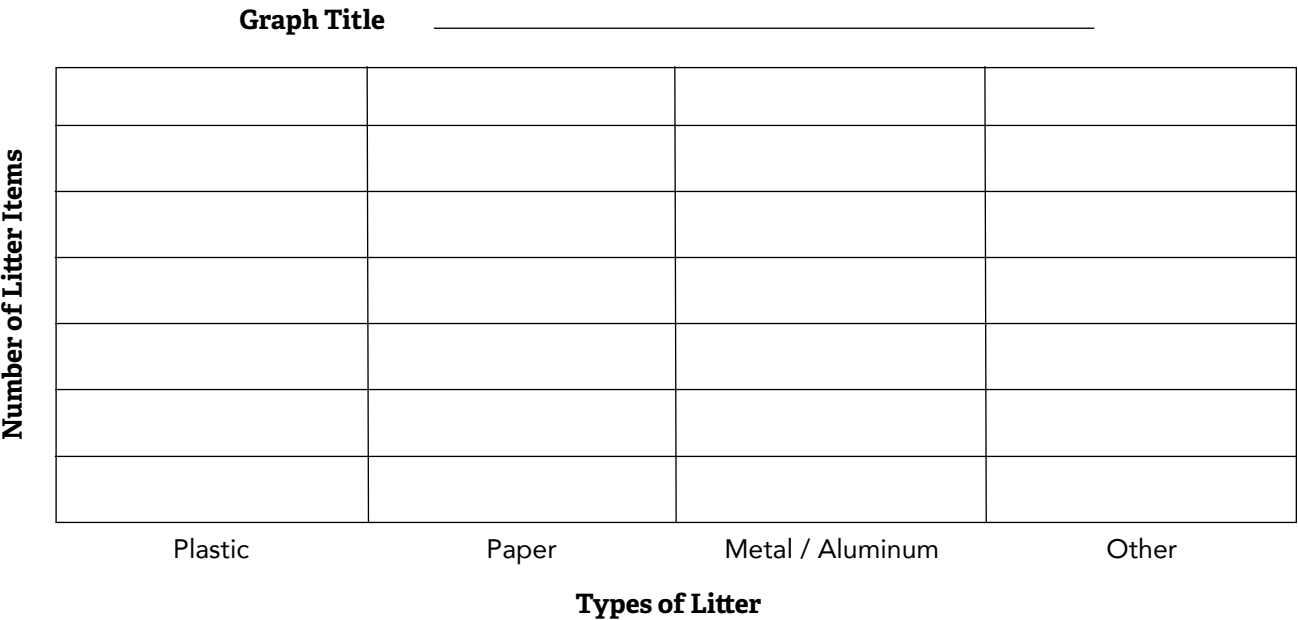
What fraction of your total litter is represented by paper pieces? _____

What fraction of your total litter is represented by other litter materials? _____

Lesson Plan 3 - Mapping School Litter - Activity Sheet 1

ANALYSIS SHEET

Directions: Graph your litter data as a BAR GRAPH on the graph below.



Thinking About Your Data: Looking back over your data sheet and above at your graphed data, describe what your data tells you about the amount and type of litter in your area.

Was the litter evenly distributed across the whole area or was it located in a particular area? Why do you think the litter was distributed like it was?

Taking Action: Given what you learned about litter, what can you do to prevent it?

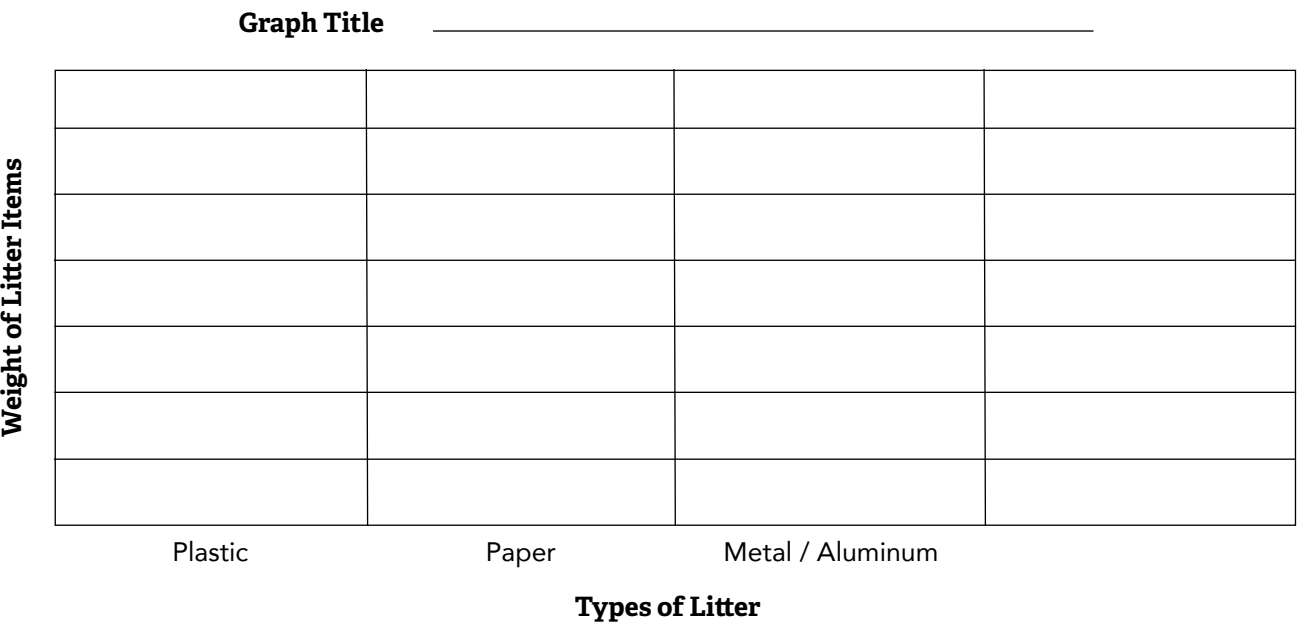
Lesson Plan 3 - Mapping School Litter - Activity Sheet 2

LITTER MATERIAL BY WEIGHT

Name: _____ Date: _____

Litter Material	Weight
PL – Plastics: drink bottles, bottle caps, straws, utensils, cups, lids, pens, fragments, soft plastic food wrappers, bags, zip lock bags, Styrofoam, plates and containers	
P – Paper: newspaper, boxes, fliers, magazines, school paper, bags, and napkins	
M – Metals and Aluminum: food or snack cans, drink cans, and metal fragments	
O – Other: rubber, cloth, glass, cigarette butts and packaging, and items made with mixed materials such as foil and paper	

Graph your litter weights as a **BAR GRAPH** on the graph below.



Which material represented the heaviest litter? _____

Which material represented the lightest litter? _____

How is this information similar or different from your data counts? _____

Lesson Plan 3 - Mapping School Litter - Activity Sheet 3

CHECK FOR SUCCESS

Name: _____ Date: _____

1. What is the definition of litter?

2. In this lesson, what did you learn about litter on our school campus?

3. What is one way you can prevent the amount of litter on our school campus?

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Lesson Plan 3 - Mapping School Litter - Activity Sheet 3

CHECK FOR SUCCESS

Name: _____ Date: _____

1. What is the definition of litter?

2. In this lesson, what did you learn about litter on our school campus?

3. What is one way you can prevent the amount of litter on our school campus?

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Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

Lesson Focus

In this lesson students will learn which solid waste items can be recycled and which ones should be disposed of in the trash.

Lesson Objective

- Students will be able to correctly define single stream recycling.
- Students will learn how to correctly sort trash into landfill and recycle categories.

Grade Level	Duration	Subject Area	Vocabulary
3	45 Minutes	Science	material recovery facility, transfer station, curbside recycling programs, single-stream recycling program, drop off recycling programs

Louisiana Student Standards for Science

LSSS (2017) | K-ESS3-2

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Louisiana Student Standards for Science

LSSS (2017) | 5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environments.

Materials List

Per Student

- 1 copy of **Activity Sheet #4**

Per Group

- 1 copy of **Activity Sheet #1** and **Activity Sheet #3**
- 1 set of waste cards - **Activity Sheet #2**, cut into individual cards and placed in an envelope
- 1 envelope

Activity Sheets

- Proper Waste Disposal Placemat
- Waste Cards
- Data Sheet: Can It Be Recycled?
- Check for Success

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

Advance Preparation

1. Make a copy of **Activity Sheet #1** for each group of students.
2. Make copies of **Activity Sheet #2** and cut them into individual cards. Place each set of cards into an envelope.
3. Make a copy of **Activity Sheet #3** and **Activity Sheet #4**.

Background Information

According to the United States Environmental Protection Agency (EPA), the average American generates 4.9 pounds of trash every day or 1,788 pounds per year. That is almost a ton of trash per person, per year! Louisiana has a population of 4.574 million people (US Census Bureau, 2023). If each person in Louisiana generates 4.9 pounds of trash per day that totals 22.413 million pounds per day or 8.18 billion pounds per year! That is a lot of trash! Managing our trash with the goal of diverting as much as possible from the landfill is particularly important.

"Trash, or municipal solid waste (MSW), ...[is] various items consumers throw away after they are used" (EPA, 2023b). EPA reported that in 2018 (the most recent data available) "94 million tons of MSW were recycled and composted, equivalent to a 32.1% recycling and composting rate" (2023b). Other various waste management pathways accounted for 17.9% of the MSW, leaving "more than 146 million tons of MSW (50%)" to be landfilled (2023b).

EPA defines a landfill as a "discrete area of land or excavation that receives household waste" (2023a). When a landfill reaches capacity, the environmental engineers cap the landfill. All the trash that is collected must then be taken to a new landfill site. It is often difficult to find space for new landfill sites. We can extend the life of a landfill by reducing the amount of trash we produce and increasing recycling.

Recycling percentage rates since 2005 have hovered in the low- to mid-30's range (Figure 1). By percentage, paper and paperboard are recycled the most (66.54%), with metal recycling running at 12.62% (Figure 2). With only 32.1% of recyclable and compostable MSW diverted from landfills, there is much room for improvement in increasing the amount of recycling we do. Given that landfills are finite in size and that over 50% of MSW is still destined for landfills, we need more communities to offer curbside and drop off recycling programs.

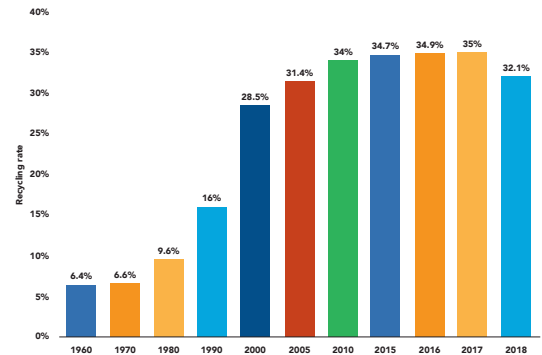


Figure 1. Municipal solid waste (MSW) recycling rate in the United States from 1960 to 2018. <https://www.statista.com/statistics/193928/percentage-of-us-municipal-solid-waste-recycled-since-1960/>

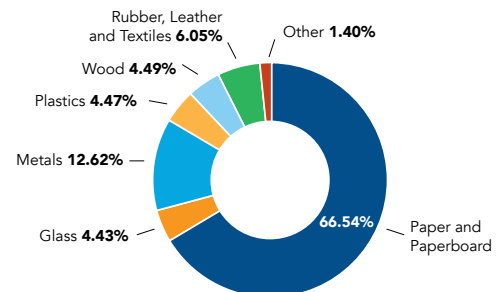


Figure 2. Municipal solid waste (MSW) recycling by material, 2018. 69.1 million tons. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

Recycling programs for MSW divert recyclable materials away from landfills. Some communities offer curbside recycling programs and community drop off programs. **Curbside recycling programs** pick up recyclable materials that are placed in designated bins at the curb of households in a neighborhood. Many communities offer curbside recycling as a **single-stream recycling program**. This type of recycling program allows residents to put all recyclable items into a single recycling bin. The contents of the recycling bins are transported to a recycling sorting facility, called a **Materials Recovery Facility (MRF)**, where items are sorted, baled, and sent to the proper handling facility. Another recycling management strategy is to have **drop off recycling programs** set up at sites around the city requiring residents to bring their recyclable materials to that central location. This recycling program also may be single-stream recycling.

The trash we throw away into our garbage cans is picked up by a garbage truck. When the garbage truck is full it needs to be emptied to make room for more trash. Instead of the garbage truck traveling long distances to the landfill to empty their load, they will instead drive to a nearby **transfer station**. At the transfer station, they empty their load of trash and can quickly return to their route to finish picking up trash. Larger trucks come to the transfer station to pick up loads of trash to take to the landfill. Only 32% of MSW is recycled, which means the loads of trash contain large quantities of materials that could have been recycled and kept out of the landfill.

Knowing what can be recycled and what needs to be thrown away is an important step in how to manage our waste properly. Below is a table of what can be recycled and what should be tossed into the trash. Note that some items can be recycled (electronics, batteries, etc.) through specific recycling efforts of retailers. This is called Specialty Recycling.

What can be Recycled and What Goes in the Trash Can

Check your local listing to see what can be recycled in your area.

Paper		
Recycle		Trash / Landfill
Junk mail	Paperboard boxes - cereal, tissue, frozen food boxes	Photos
White or colored paper	Gift catalogs, magazines	Hardcover books
Gift wrap	Newspaper	Cardboard greasy pizza boxes
Paper bags	Cartons - milk, juice, broth, soup and others	Paper plates with food remnants
Flattened cardboard boxes		Paper towels
Paperback books		Tissue paper
File folders, office paper, envelopes		Waxed paper

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

Plastic			
Recycle		Trash / Landfill	
Plastics #1-5 & #7	Tops and lids from plastic containers	Plastics #6	Plastic wrap and film
Plastic bottles	Water bottles	Plastic coat hangers	Clamshell take out packaging
Rinsed out plastic food containers	Milk jugs	Plastic toys	Hard plastics like chairs and toys
Detergent bottles	Soda bottles	Plastic grocery bags**	Plastic solo cups
Shampoo bottles		Six-pack rings	Plastic silverware
Rinsed household cleaner bottles		Packing bubble wrap	Large yard/garbage bags
Rinsed bleach bottles		Styrofoam	Snack bags and packaging
			Straws

** Plastic grocery bags can be recycled at some Albertsons, Hi-Nabor, Matherne's, and Walmart stores. Ask your local grocery store if they accept recycled plastic bags. You can always request paper bags for your groceries!

Metal / Aluminum	
Recycle	Trash / Landfill
Aluminum cans	Aerosol cans
Tin cans	Wire Hangers
Rinsed food and pet cans	Non-food metal items
Metal Cans	

Specialty Recycling - Glass	
Recycle	Trash / Landfill
Glass food jars (remove lids)	Light bulbs
Glass containers	Mirrors
Glass beverage bottles	Window glass
	Drinking glasses
	Dishes

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

Specialty Recycling	
Recycle	Trash / Landfill
Printer ink and toner cartridges	
Electronics and computer hardware	
DVDs	
Mobile phones	
Telephone and computer cables	
Computer monitors	
Laptops	
Computers	
Xboxes and PlayStations	
Printers	
Batteries	
Paint	
Plastic shopping bags in some areas**	

References

- Baton Rouge Parish of Department of Environmental Services Recycling Division. (2018). The Red Stick Green Guide. Available at <https://www.brla.gov/DocumentCenter/View/4621/2018-Green-Guide-first-edits-made>
- Louisiana Department of Environmental Quality. (no date). Recycling Resources and Recyclers. <https://deq.louisiana.gov/page/recycling-resources-and-recyclers>
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- US Census Bureau (2023). QuickFacts. Louisiana. <https://www.census.gov/quickfacts/fact/table/LA/PST045222>

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

- US EPA. (2023a). Municipal Solid Waste Landfills.
Available at <https://www.epa.gov/landfills/municipal-solid-waste-landfills>
- US EPA. (2023b). National Overview: Facts and figures about materials, waste, and recycling.
Available at <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>
- US EPA. (2023c). Reduce, Reuse, Recycle Resources for Students and Educators.
Available at <https://www.epa.gov/recycle/reduce-reuse-recycle-resources-students-and-educators>

Procedure

Engage – 8 Minutes

1. Watch: Homewood Disposal. **Sorting and Recycling Facility – Follow the Process.**
Accessed at <https://www.youtube.com/watch?v=3Lzsu8SXaWY> (4:01)
 - **What is a MRF (pronounced 'merf')?** *It is an acronym for Materials Recycling Facility, a place where recyclables are brought and sorted.*
 - **What materials are sorted on the conveyor belt?** *Items that cannot be recycled are removed first. Then items that can be recycled such as cardboard, paper, plastic containers, tin cans, and aluminum cans are separated.*
 - **The last stop at the recycling center is a baler. What does this machine do?** *It puts each type of recyclable material into large bunches called bales. It prepares it to be transported to a processor.*
 - **Why is it important to recycle as much material as possible?** *Recycling diverts trash from the landfill, which extends the life of the landfill. Recycling also conserves natural resources when virgin materials are not required to make new products.*
 - **What happens when items that cannot be recycled are put in the recycle bin?** *Items that are placed in the recycling bin that cannot be recycled contaminate the entire load. This sometimes can result in the load going to the landfill instead of being recycled as it is often too hard to separate the trash items from the recyclables.*

Explore – 30 Minutes

1. In this activity students will learn what should be disposed of in the trash, destined for the landfill, and what can be recycled. Students will work with a partner to do this activity. Each student pair should be given a data sheet (**Activity Sheet #3**), a proper waste disposal placemat page (**Activity Sheet #1**) and an envelope filled with cards. Students are to decide whether the item on the card is something that can be recycled or if it should be put in the trash can destined for a landfill.
2. Allocate 20 minutes for students to pull the cards, place each card in the appropriate waste disposal section on **Activity Sheet #1** and complete the data sheet.
3. Students should discuss each item with their partners when deciding if the item can be recycled or if it should go in the trash.

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

Explain – 10 Minutes

During this section, discuss which items should be thrown away and which items can be recycled.

1. **What are some plastic items that can be recycled?** plastic water bottles, rinsed out plastic food containers (no clamshells), detergent bottles, shampoo bottles, rinsed household cleaner bottles, rinsed bleach bottles, tops and lids from plastic containers
2. **What are some plastic items that cannot be recycled?** plastic bags, plastic coat hangers, plastic toys, six-pack rings, packing bubble wrap, Styrofoam, dirty plastic items, plastic furniture
3. **What are some glass items that can be recycled?** clear glass, green glass, brown glass, glass bottles and jars
4. **What are some glass items that cannot be recycled?** light bulbs, mirrors, window glass, drinking glasses, dishes
5. **What are some electronic items that can be recycled at special locations?** printer ink and toner cartridges, electronics and computer hardware, cell phones, telephone and computer cables, computer monitors, laptops, computers, Xboxes and PlayStations, printers
6. **What are some metal items that can be recycled?** aluminum cans, rinsed food cans, metal lids, tin cans, metal cans
7. **What are some metal items that cannot be recycled?** aerosol cans, wire hangers, non-food metal items
8. **What are some paper items that can be recycled?** junk mail, newspaper, white or colored paper, paper gift wrap (no foil), paper bags, cardboard, paperback books, gift boxes, cereal boxes, gift catalogs, magazines
9. **What are some paper items that cannot be recycled?** photos, hardcover books, greasy pizza boxes, dirty paper items
10. **Why is recycling materials so important?** It diverts materials from the landfill, extending the life of the landfill. It reduces the use of natural resources needed to create new items.

Expand – 10 Minutes (Optional)

1. Watch: **Where Does My Trash Go After It Is Picked Up?** Homewood Disposal Systems. Accessed at <https://www.youtube.com/watch?v=jQCBvG7s58c>. (2:26)
 - **When the garbage truck picks up your trash at your curb, where does it go?** A garbage truck picks up household trash in neighborhoods usually on a weekly basis. When the garbage truck fills up it needs to be emptied to make room for more trash. Instead of the garbage truck traveling, sometimes long distances to the landfill to empty the load, they will drive to a transfer station. At the transfer station, they empty their load of trash and can quickly return to their route to finish picking up trash.
 - **What happens at the transfer station?** At the transfer station, all the trash is loaded onto much larger trucks and taken to the landfill.
 - **Can landfills be hazardous to the environment?** Modern landfills are designed to keep toxic trash contained but unfortunately leaks do happen. Landfills can also emit harmful gases like methane and carbon dioxide, which contribute to climate warming. However, monitoring, regulations, and

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

technology to capture gas and leachate (contaminated liquid at the bottom of the landfill) have improved the environmental impacts.

- **Why can't we just let the CO₂ and CH₄ (methane) gas escape into the atmosphere?** Methane is a potent greenhouse gas that traps heat and contributes to global climate warming.
- **How does recycling help landfills?** Recycling extends the life of a landfill because it reduces the amount of waste taking up space in a landfill.
- **What do you think happens when a landfill is full?** When a landfill is full, the environmental engineers cap the landfill. All the trash that is collected must be taken to a new site. It is often difficult to find space for new landfill sites. We can extend the life of a landfill by reducing the amount of trash we produce and increasing recycling.

Take Action

1. Students can make posters to demonstrate how they can reduce the trash that goes to the landfill. *Using reusable water bottles instead of single-use ones, packing their lunch in reusable containers instead of disposable plastic baggies, refusing plastic straws and extra napkins are a few ways to reduce trash.*
2. Students can take a tour of a Material Recovery Facility (MRF) or landfill. After the tour, they can write a letter to the mayor or community leaders explaining what they learned and the importance of recycling.

Evaluate

1. Hand out copies of **Activity Sheet #4**.

Online Resources

GreenWaste Material Recovery Facility (MRF Tour)

<https://www.youtube.com/watch?v=zmMAIYMfw9k> (4:57)

Shows what goes on at the GreenWaste Material Recovery Facility.

Homewood Disposal. **Sorting and Recycling Facility - Follow the Process.**

Accessed at <https://www.youtube.com/watch?v=3Lzsu8SxaWY> (4:01)

Follows the recycling and sorting process from curbside to finished sorted materials ready to be reused.

KCAL (2020). **What happens to the trash when it is taken away? The Landfill Supervisor Knows.**

Accessed at <https://www.youtube.com/watch?v=vQZorKBOCsg> (3:01)

Meet Amanda, an environmental geologist, who manages a landfill. Learn more about landfills in her talk about methane collection and leachate (trash juice).

Mystery Science. (2020). **What do garbage trucks do with garbage?**

https://www.youtube.com/watch?v=1ZtlC_pog-E (7:27)

A comprehensive look at landfills and how they are created. The video covers composting, incinerators, and recycling.

Lesson 4

WHAT HAPPENS TO OUR TRASH & RECYCLABLES?

NowThis Originals. (2018). **What happens to your recycling after it is collected?**

Accessed at <https://www.youtube.com/watch?v=s4LZwCDaoQM> (5:46)

An excellent video that tells the story of how recyclables are moved through a material recovery facility. The video explains the value of recyclable materials.

Republic Services. **Welcome to Recycling 101.**

<https://www.republicservices.com/residents/recycling-and-solid-waste/recycling-education>

This website provides a variety of information including virtual field trips to a landfill and a recycling facility, information on improving how you recycle, and a variety of activity sheets.

Children's Books

Disney, R.H. (2014). **Smash Trash!** (Disney/Pixar WALL-E).

Random House Children's Books. ISBN-13: 9780385389792 [e-book]

Readers are introduced to WALL-E, a trash-compacting robot. Ages 5 - 8 years.

Flynn, S.W. (2017). **This Book Stinks! Gross Garbage, Rotten Rubbish, and the Science of Trash.**

Disney Publishing Group. ISBN-13: 9781426327308.

This book is filled with infographics, photos, statistics, facts, quizzes and activities to inspire kids to act. Ages 8 - 12 years.

Showers, P. (2015). **Where Does the Garbage Go?**

HarperCollins Children's Books. ISBN-13: 978-0062382009

This book explains how people create too much waste, how waste can be recycled and what happens to waste in a landfill. Ages 4 - 8 years. Read aloud at <https://www.youtube.com/watch?v=1lbM727ISQA>

Lesson Plan 4 - What Happens to our Trash and Recyclables? - Activity Sheet 1

PROPER WASTE DISPOSAL PLACEMAT

Instructions: Decide how the item on your card would be disposed of properly by placing it in one of the four categories below.

Single Stream Recycling Material Recovery Facility

Paper and Cardboard

Plastic

Metal

Specialty Recycle

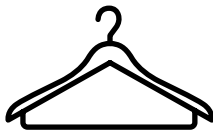
Landfill

Lesson Plan 4 - What Happens to our Trash and Recyclables - Activity Sheet 2

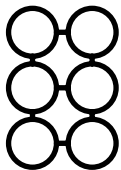
WASTE CARDS



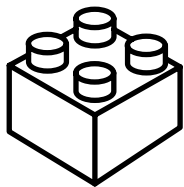
PLASTIC BAGS



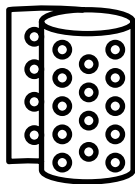
PLASTIC COAT
HANGERS



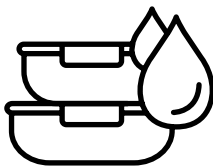
SIX-PACK
RINGS



HARD
PLASTIC TOYS



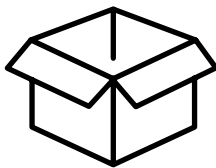
BUBBLE WRAP



RINSED PLASTIC
FOOD CONTAINER



DETERGENT &
SHAMPOO BOTTLES



CARDBOARD BOXES



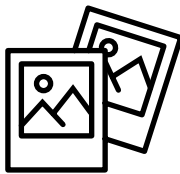
RINSED BLEACH
& SOAP BOTTLES



CEREAL BOXES



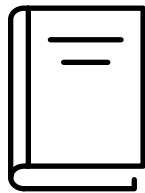
JUNK MAIL



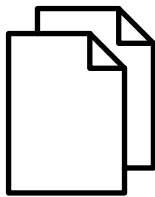
PHOTOS

Lesson Plan 4 - What Happens to our Trash and Recyclables - Activity Sheet 2

WASTE CARDS



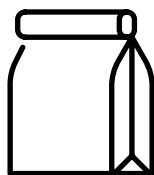
HARD COVER BOOKS



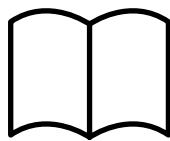
**WHITE OR
COLORED PAPER**



GIFT WRAP



PAPER BAGS



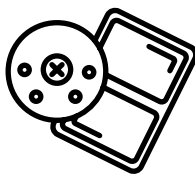
**CATALOGS
& MAGAZINES**



CELL PHONES



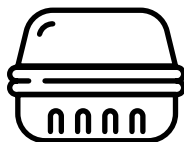
PAPERBACK BOOKS



**LIDS & TOPS FROM
PLASTIC CONTAINERS**



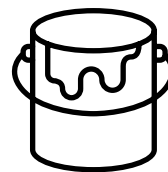
**GREEN, BROWN OR
CLEAR GLASS BOTTLES**



CLAMSHELLS



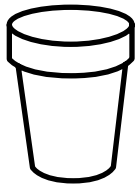
**PLASTIC WATER &
SOFT DRINK BOTTLES**



PAINT CANS

Lesson Plan 4 - What Happens to our Trash and
Recyclables - Activity Sheet 2

WASTE CARDS



STYROFOAM



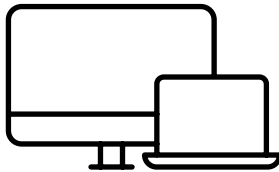
**ALUMINUM
DRINK CANS**



**RINSED FOOD
& PET FOOD CANS**



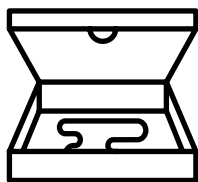
PLASTIC WRAP



**COMPUTERS, LAPTOPS
& MONITORS**



**PAPER PLATE WITH
FOOD SCRAPS**



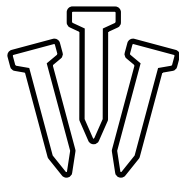
**GREASY
PIZZA BOX**



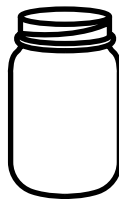
AERSOL CANS



WIRE HANGERS



**NON-FOOD
METAL ITEMS**



CLEAR GLASS JARS



NEWSPAPER

Lesson Plan 4 - What Happens to our Trash and Recyclables - Activity Sheet 2

WASTE CARDS



PRINTER₂



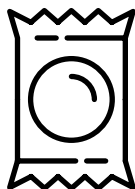
GLASS DRINK BOTTLES



LIGHT BULBS



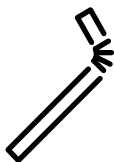
MIRRORS



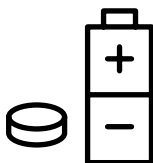
SNACK BAG



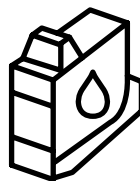
LOOSE LEAF PAPER



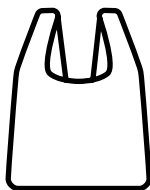
PLASTIC STRAW



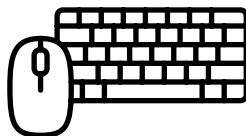
SMALL BATTERIES



PRINTER INK & TONER CARTRIDGES



PLASTIC GROCERY BAG



ELECTRONICS & COMPUTER HARDWARE



PLASTIC BOTTLES THAT ARE NOT EMPTY

Lesson Plan 4 - What Happens to our Trash and Recyclables - Activity Sheet 3

DATA SHEET: CAN IT BE RECYCLED?

Name: _____ Date: _____

Glass, electronics, and batteries are not recyclable in a curbside recycling bin but may be recycled by specialty recyclers.

Paper			
Recycle		Trash / Landfill	

Plastic			
Recycle		Trash / Landfill	

*** Plastic grocery bags can be recycled at some Albertsons, Hi-Nabor, Matherne's, and Walmart stores. Ask your local grocery store if they accept recycled plastic bags. You can always request paper bags for your groceries!*

Metal / Aluminum	
Recycle	Trash / Landfill

Lesson Plan 4 - What Happens to our Trash and Recyclables - Activity Sheet 3

DATA SHEET: CAN IT BE RECYCLED?

Specialty Recycling - Glass	
Recycle	Trash / Landfill

Specialty Recycling	
Recycle	Trash / Landfill

Lesson Plan 4 - What Happens to Recyclables - Activity Sheet 4

CHECK FOR SUCCESS

Name: _____ Date: _____

1. What does MRF (merf) stand for?

2. What happens at a MRF?

3. What is one way you can increase the amount of recycling that occurs on our campus?

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Lesson Plan 4 - What Happens to Recyclables - Activity Sheet 4

CHECK FOR SUCCESS

Name: _____ Date: _____

1. What does MRF (merf) stand for?

2. What happens at a MRF?

3. What is one way you can increase the amount of recycling that occurs on our campus?

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Lesson 5

MANAGING WASTE THROUGH PERSONAL CHOICES

Lesson Focus

In this lesson, students will be given various scenarios and asked to identify the problem and produce two solutions.

Lesson Objective

The student will be able to clearly communicate at least one workable positive solution for each scenario in which there are multiple avenues of personal behavior.

Grade Level	Duration	Subject Area	Vocabulary
4	50 Minutes	Science	reduce, recycle, refuse, reuse

Louisiana Student Standards for Science

LSSS (2017) | 5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environments.

Materials List

Per Student

- 1 copy of **Activity Sheet #1**
- 1 copy of **Activity Sheet #2**

Activity Sheets

- Scenarios
- Check for Success

Advance Preparation

- Run off copies of the desired scenarios for each of the five groups (**Activity Sheet #1**).
- Make copies of **Activity Sheet #2**.

Lesson 5

MANAGING WASTE THROUGH PERSONAL CHOICES

Background Information

Things and items that are no longer useful or wanted, and that have been thrown away are considered trash. When unwanted waste is not disposed of properly, whether intentionally or unintentionally, it becomes litter. Littering is often the result of careless behavior.

A 2023 study of litter in Louisiana found that there are approximately 143,800,000 pieces of litter on Louisiana's roadways. Interstate highways are the most littered roadways, with an average of 10,178 pieces of litter per mile. The highest percentage of aggregate litter (visible + micro litter) by packaging material is plastic (43.1%), followed by tobacco-related products (24.5%) and metal (10%). The most common aggregate litter items are cigarette butts (21%), plastic beverage containers and cup pieces (13.8%) and plastic fast-food pieces (7.2%) (Carson, 2023c).

Most Louisiana citizens (92%) believe that litter is a problem (Carson, 2023b). The top reasons people litter are convenience and laziness. Furthermore, 88% of Louisiana citizens agreed that litter harms humans and animals, affects environmental quality, contributes to flooding, reduces property values, negatively impacts tourism and decreases business revenues (Carson, 2023a).

There are many important ways we can take care of the environment – especially when it comes to keeping our spaces litter-free. An important way to keep the environment clean is to make every effort to reduce the amount of waste we produce. Reducing the amount of waste we consume reduces the potential that it will become litter as well as reduces the amount of waste that goes into the landfill. By making environmentally responsible personal choices and adopting positive behaviors, everyone can become a good steward of the environment.

The most effective way to be an environmental steward is to adopt the waste reduction and management best practices of Refuse, Reduce, Reuse and Recycle.

- **Refuse** – This practice focuses on minimizing wasteful consumption by not accepting items that aren't essential. Refusing a plastic drinking straw, condiment packets that you won't use or a plastic shopping bag when you only have one or two items are just a few examples of how you can reduce waste.
- **Reduce** – This practice focuses on minimizing wasteful consumption by purchasing and using less. Examples of reducing strategies include using just one napkin instead of two or three with your lunch, using both sides of a piece of paper at school, bring a reusable water bottle instead of a single-use plastic bottle and using reusable containers for your snacks and lunch instead of plastic zip bags. This concept encourages reducing what we buy and trying to focus on purchasing essential materials with as little waste at the end as possible.
- **Reuse** – This practice focuses on considering what we can reuse after the original use of an item is complete. Instead of putting something in the trash headed to the landfill, consider how it can be used for another useful purpose. Examples of reusing strategies include using an empty jar as a pencil holder, making a bird feeder from a milk jug or donating unwanted clothes to charity.

Lesson 5

MANAGING WASTE THROUGH PERSONAL CHOICES

- **Recycle** – This practice focuses on the process of collecting and processing materials that would otherwise be thrown away as trash and remanufacturing them into new products. Recycling reduces the amount of waste sent to landfills and incinerators, conserves natural resources such as timber, water and minerals, and prevents pollution and reduces greenhouse gas emissions. Used paper can be recycled to make new paper plates or toilet paper, aluminum cans can become new aluminum cans, plastic bottles can be recycled to make carpet or clothing, and glass can be recycled to make other glass items.

By choosing behaviors aligned with the 4 R's, we'll reduce waste and redirect materials bound for our landfills into other purposeful uses. Our personal choices and positive behaviors can make a big difference in keeping our environment clean and healthy.

References

- Carson, C. (2023a). Louisiana Litter Research: Executive Summary. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>
- Carson, C. (2023b). Louisiana Litter Research: Public Attitude Study. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>
- Carson, C. (2023c). Louisiana Litter Research: Roadway Litter Study. Keep Louisiana Beautiful. Available at <https://keeplouisianabeautiful.org/litter-study>
- TRVST. (2023). The importance of 4Rs – Refuse, reduce, reuse, recycle. TRVST. <https://www.trvst.world/sustainable-living/importance-of-4rs-refuse-reduce-reuse-recycle>

Procedure

Engage – 5 Minutes

1. Watch Yogotar's - Educational Video. **A lesson on littering to inspire environmental stewardship for children – SmartKids** (1:54) <https://www.youtube.com/watch?v=4pbXLw6NDBM>
 - **What was the main point of this video?** *It matters where we put our trash.*
 - **What are some of the problems that occur when we litter?** *It's messy and smelly. Animals can be harmed by litter. Litter can end up in the water and lakes.*
 - **What do you do if you don't see a trash can?** *Hold your trash until you find one.*

Explore – 15 Minutes

1. **Activity Sheet #1** has 12 scenarios from which you can choose to give your students. Divide students into five groups. Distribute a Scenario page from **Activity Sheet #1** to each member of the group. Each member of the group should have the same scenarios.
2. Have the groups read through the scenarios, identify the problem and write out the problem.
3. Next, have students brainstorm two solutions for each scenario. At the end of 15 minutes, they should be prepared to present their scenarios to the rest of the class.

Lesson 5

MANAGING WASTE THROUGH PERSONAL CHOICES

Explain – 25 Minutes

1. Have students take turns reading the scenarios, the problem they identified in each scenario, and the two solutions that they came up with for each scenario. Discuss their solutions with the class.
2. Questions you might use to guide the discussions:
 - **Do you think this scenario is something that might happen in real life? Why?**
 - **Which of the two solutions is the best one and why?**
 - **Can you think of other solutions that might be tried to deal with the scenario?**
 - **Will the solution be easy to do?**
 - **Will the solution have a cost?**
 - **Will the solution permanently solve the problem?**
 - **Why is it important for us to prevent our trash from becoming litter?**

Expand – 10 Minutes (Optional)

Have students come up with a scenario of their own. Then share the scenarios with the class. Identify the problem and two possible solutions.

Take Action

1. Close the lesson by asking the students what they learned about finding solutions to common trash situations.
 - **What can students do to reduce the amount of trash and litter in their surroundings?**
2. Have students create a pledge to follow the 4 R practices.
3. Have students create posters to support the 4 R practices at their school.

Evaluate

1. The scenario activity sheets can be graded.
2. A short, three-question quiz - **Activity Sheet #2**.

Online Resources

Louisiana Sugarcane. **Don't Litter Louisiana.**

https://www.youtube.com/watch?v=QX9nmVkl_M (0:30).

A public service announcement about the problems of littering.

PBS LearningMedia. **Kids Go Green: Waste less.**

<https://lpb.pbslearningmedia.org/resource/ee18-sci-greentm/kids-go-green-waste-less> (3:46).

This video shows how students at a school in Brooklyn, NY, worked to reduce the amount of waste in their school and to better help students recycle waste.

PBS Terra. **How FIVE BILLION Pounds of Las Vegas Garbage Powers a City.**

<https://www.youtube.com/watch?v=aHzltu6Tvl8> (9:14).

This video shows how Las Vegas manages with five billion pounds of waste a year. This video explores how the city deals with solid waste, recyclables, and food waste.

Lesson 5

MANAGING WASTE THROUGH PERSONAL CHOICES

Vista Lens. **Clean Pelican.**

<https://youtu.be/AlTYTggfjEg> (1:38).

The creation of Clean Pelicans, a group of citizens committed to picking up litter in Baton Rouge, LA.

Children's Books

IglooBooks. (2020). **The Life of a Little Cardboard Box: Discover an Amazing Story About Reusing and Recycling.** Igloo Books. ISBN-13: 978-1839032448

This book follows what happens to a cardboard box. Ages Preschool -5 years.

Read aloud at <https://www.youtube.com/watch?v=xWA3cL1STQE> (2:23)

IglooBooks. (2020). **The Life of a Little Plastic Bottle.**

Igloo Books. ISBN-13: 978-1839032455

This book introduces the concepts of reusing and recycling. Ages 4 - 8 years.

Read aloud at <https://www.youtube.com/watch?v=fclaNkzrRQU> (4:06)

Inches, A. (2009). **The Adventures of an Aluminum Can: A Story About Recycling.**

Little Simon, Simon & Schuster Publishing. ISBN-13: 978-1416972211

This tells the story of an aluminum can from the manufacturing line to the store shelf to returning to the recycling plant. Read aloud at <https://www.youtube.com/watch?v=WZbMVfmvNyE> (7:55)

Javernick, E. (2012). **What If Everybody Did That?**

Two Lions Publishing. ISBN: 0761456864

This book shows the consequences of thoughtless behavior in a child-friendly way. Ages 3 - 7 years.


Read aloud at <https://www.youtube.com/watch?v=lxKZHdJ4d24> (6:14)

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 1

Samantha went to the store to get a pack of chewing gum. The clerk put the single pack of chewing gum in a plastic bag and handed it to her.

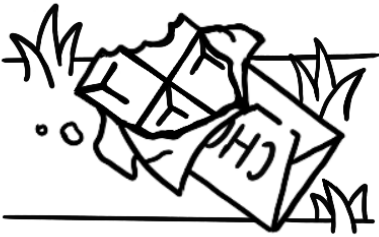
	<p>What's The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 2

Grace is enjoying a chocolate caramel candy bar. The wrapper is very sticky, and she doesn't want to hold it any longer. Grace drops the wrapper on the ground.

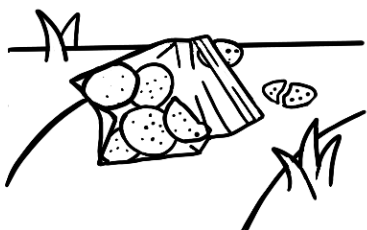
	<p>What's The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 3

Fredrico was eating his snack on the playground. A gust of wind blew the bag holding his snack on the ground. Unable to eat his snack any longer, he ran off to play with his friends.



What's The Problem?

Solution 1

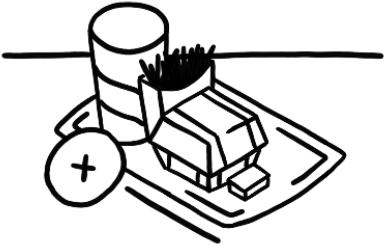
Solution 2

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 4

Janelle ordered a drink at a fast-food restaurant. The employee gives her a lid and a straw with her drink that she doesn't really need.

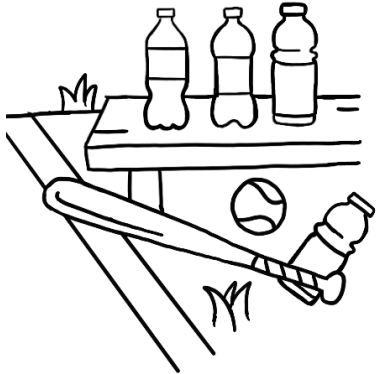
	<p>What's The Problem?</p>	
<p>Solution 1</p>		<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 5

Sam is practicing softball with this team at the ballpark. After practice everyone gets up and leaves behind their sports drink and water bottles on the practice bench.


	<p>What's The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 6

Frankie goes to throw away his trash at lunch, but the trash can is already full.

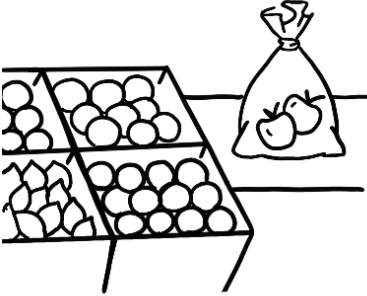
	<p>What's The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 7

Sandra wants to purchase some apples at the grocery store. She chooses two apples. Her mom wants her to put them in a plastic bag.

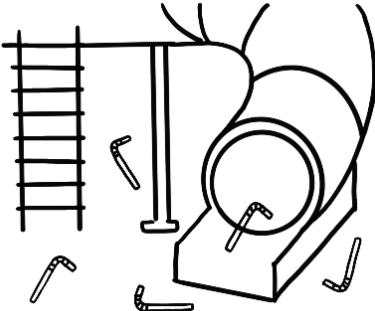
	<p>What's The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 8

At the end of recess, Gabriella notices that there are a bunch of plastic straws littering the playground.


	<p>What's The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 9

At soccer practice, Ricky’s mom brings his teammates juice in small plastic containers. All the plastic juice containers are thrown into the trash can.

	<p>What’s The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 10

Blaze notices that a lot of paper is thrown away in his classroom.



What's The Problem?

Solution 1

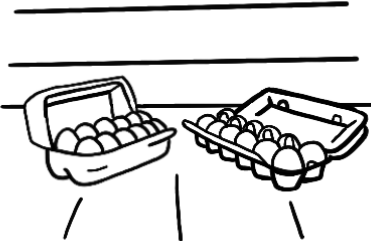
Solution 2

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 11

Mary is at the store and needs eggs. She has a choice between eggs in a cardboard carton or eggs in a foam carton.

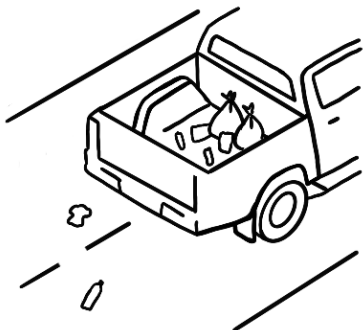
	<p>What's The Problem?</p>
<p>Solution 1</p>	<p>Solution 2</p>

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 1

SCENARIOS

Scenario 12

Brandon saw his father put loose items such as fast-food bags and empty water bottles in the back of his truck. Some of the items blow out of the truck bed on their way home.



What's The Problem?

Solution 1

Solution 2

Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 2

CHECK FOR SUCCESS

Name: _____ **Date:** _____

Judy takes the plastic wrapper off her juice box straw. When she tries to throw it away, the plastic wrapper accidentally falls to the ground next to the trash can. Judy walks away leaving the wrapper on the ground.

1. What is the problem here?

2. What would be a solution to this problem?

3. Why is it important for everyone to prevent their trash from becoming litter?

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Lesson Plan 5 - Managing Waste Through Personal Choices - Activity Sheet 2

CHECK FOR SUCCESS

Name: _____ **Date:** _____

Judy takes the plastic wrapper off her juice box straw. When she tries to throw it away, the plastic wrapper accidentally falls to the ground next to the trash can. Judy walks away leaving the wrapper on the ground.

1. What is the problem here?

2. What would be a solution to this problem?

3. Why is it important for everyone to prevent their trash from becoming litter?

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Lesson 6

MICROPLASTICS IN OUR ENVIRONMENT

Lesson Focus

In this lesson, students will create a model "ocean gyre" and observe the behavior of microplastics in the water.

Lesson Objective

- Students will be able to correctly define microplastic and gyre.
- Students will be able to describe the pathways that plastics take to the ocean.
- Students will be able to list the three things that work together to break down large plastic pieces into microplastics.

Grade Level	Duration	Subject Area	Vocabulary
5	45 Minutes	Science	microplastic, microfiber, gyre

Louisiana Student Standards for Science

5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environments.

Materials List

Per Student

- 1 copy of **Activity Sheet #1**

Per Group

- 1 straight-sided clear, wide-mouth glass jar filled 2/3 full of water (a mason jar or a large glass bowl will work as well)
- 1 cupcake liner paper
- Small plastic products - they should all be the same size (sequins, glitter, cut-up candy wrappers, Mardi Gras bead, styrofoam, small lengths of fishing line, or bristles cut off an old toothbrush)
- 1 spoon (preferably reusable)

Materials Tray Set Up Per Group:

- 1 clear, wide-mouth glass jar filled 2/3 full of water
- Fill the cupcake liner with the small plastic products from the materials list
- 1 spoon

Activity Sheets

- Microplastics in Our Oceans

Lesson 6

MICROPLASTICS IN OUR ENVIRONMENT

Advance Preparation

- Make copies of **Activity Sheet #1**

Background Information

Humans live in a natural world made up of water, air, plants, and trees as well as in a manmade world of cities, homes, schools, and cars. We live among things built by man of various materials such as wood, metal, and plastic. The increased use of plastics in our daily existence in the last several decades has become especially concerning.

The first synthetic plastic was produced in 1907, marking the beginning of the global plastics industry. However, rapid growth in global plastic production did not happen until the 1950s. Plastics are a very affordable, versatile, lightweight, durable, and corrode resistant material making it a popular manufacturing choice. We encounter hundreds of items made of plastic in our everyday home and school life. Computer keys, phones, some clothing, bags, and water bottles are all made of plastic. Plastic production has more than doubled in the last two decades.

Unfortunately, there are disadvantages of plastics including its environmental impact, health risks and toxicity. Some scientists estimate that plastic will last at least 500 years or more before completely breaking down (United Nations, 2021). In recent years, scientists, environmentalists, and citizens have become increasingly aware of the dangers of plastic pollution to animals, humans, land, waterways, and the atmosphere.

Especially problematic are **microplastics**, pieces of plastic that are 5mm in diameter or less. Some microplastics are created when larger plastic pieces begin to decompose, becoming smaller pieces of plastics. Other types of microplastics enter our environment already less than 5mm in size.

Three main sources of microplastics:

Source: Microfibers

One source of microplastics is microfibers. These are tiny bits of fibers that come loose from synthetic clothing when we wash them. Examples of synthetic fabrics that shed microfibers are polyester, nylon, and rayon. Most washing machines do not have filters to prevent plastic microfibers from washing down the drain.

Source: Nurdles

Another source of microplastics are resin pellets used in plastic production called nurdles. These small pieces of plastic are made into all sorts of plastic objects like bottles, toys, car parts, furniture, and computers. Researcher Jace Tunnell estimates (2020) that it takes the following numbers of nurdles to make these common items:

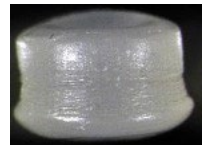
- Soda bottle: 1,005 nurdles
- Toothbrush: 665 nurdles
- Quart size Ziploc bag: 314 nurdles
- Yogurt cup: 357 nurdles

Lesson 6

MICROPLASTICS IN OUR ENVIRONMENT

Nurdles are a big problem for our environment when they are spilled during handling and shipping. It is estimated that 230,000 metric tons (1 metric ton is equal to 2,203 pounds) of nurdles are accidentally released into the environment each year. That is enough nurdles to make 15 billion plastic bottles! (Fidra, 2023).

Nurdle spills can occur accidentally during transportation and production. On August 2, 2020, a container ship docked in the port of New Orleans, the CMA CGM Bianca, came loose from its moorings during a storm and multiple 55-pound bags of nurdles fell into the Mississippi River. After the storm, nurdles could be found in great drifts along the river's edge and on beaches at the mouth of the Mississippi River. Dr. Mark Benfield, a researcher at Louisiana State University who studies microplastics, observed that the water's edge along the Mississippi River and the Gulf of Mexico beaches were covered in white pellets that looked like snow (Hawkins, 2022). Dr. Benfield explained that nurdles produced at a particular plant all look similar in shape, size, and color. In the case of the Bianca nurdle release, they were all the same small white cylindrical pellet, with one end slightly concave and the other end slightly convex and wider. The picture to the right shows a Bianca nurdle from the side.



Nurdle spills are commonplace. If you go to the beach, you will see nurdles at the high tide line that are in many shapes, colors, and sizes. Each distinct nurdle is evidence of an accidental nurdle spill. Currently, there is no law in place that requires the company that spills nurdles to clean up their spilled microplastics.

Source: Land-based Litter and Debris.

Another source of microplastics is created when pieces of plastic litter, carried by wind and rain from roadsides and land, end up in ditches, streams, bayous, rivers, and eventually makes their way into the oceans. Once plastic enters the waterways, it begins to degrade from the water currents and waves, saltwater, and UV light from the sun. Plastic becomes brittle, breaking down into smaller and smaller pieces, eventually becoming microplastics. As they break down, some plastic pieces sink while other pieces float.

Where Do the Plastics Go?

Plastic pollution, trash and marine debris carried by water currents will travel hundreds of miles eventually ending up in an ocean. Locally, the Mississippi River Basin, which covers 1,245,000 miles and drains 31 states and two provinces in Canada, carries not only water but litter, debris, and microplastics from all these areas through Louisiana and down to the mouth of the Gulf of Mexico and into the ocean.

Once in an ocean, the debris gets caught up in large systems of circulating currents, called **gyres**, which essentially guide debris to predictable final destinations, like giant whirlpools moving in slow motion. There are five large garbage gyres that are located in the North Pacific, Indian, North Atlantic, South Pacific, and South Atlantic oceans. The Great Pacific Garbage Patch, located between California and Hawaii, is the most notable of the floating ocean trash vortexes (see the Gyre Resource Map at the end of this lesson).

According to Population Education, every minute we dump two garbage trucks of plastic into the ocean. That is roughly 5.25 trillion bits of plastic trash entering the oceans today. That is enough trash to cover every

Lesson 6

MICROPLASTICS IN OUR ENVIRONMENT

foot of coastline worldwide with five full trash bags of plastic, and, unfortunately, that number is expected to grow. By 2040, the amount of plastic trash flowing into the ocean is expected to triple to 29 million metric tons. Most of the debris in the ocean does not float, it sinks. Only 1% of plastics in the ocean float on the ocean's surface. The plastic in these gyres range from large pieces to microscopic pieces. Multiple factors make it challenging to eliminate plastic floating in the ocean gyres. The gyres are thousands of miles away from the mainland. Also, most of the debris in the gyres is not on the surface. And, lastly, much of the debris is not large, easy-to-clean pieces of plastic. Instead, there are millions of tiny microplastic particles too small to be caught in nets.

Ways to Reduce Plastics Pollution.

What can you do? Never litter, and when you do see litter make sure to pick it up before it enters the waterways. Practice good litter prevention habits like using a trash bag when boating to prevent trash from flying out of the boat and use a car litter bag too. Reduce your use of single-use plastics, like water bottles and plastic grocery bags. Avoid products that come in plastic packaging. Reduce synthetic microfiber pollution by buying more cotton and fewer synthetic clothes, reduce washing or make larger loads. Use products, like Cora Microfiber Laundry Ball (<https://coraball.com>), to reduce the number of microfibers released with our washing machine water.

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Lesson 6

MICROPLASTICS IN OUR ENVIRONMENT

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- United Nations. (June 2021). In Images: Plastic is Forever.
<https://www.un.org/en/exhibits/exhibit/in-images-plastic-forever>

Procedure

Engage – 5 Minutes

1. Watch **The Great Pacific Garbage Patch**, <https://www.youtube.com/watch?v=MnCbTTTi7ic> (4:03)
2. Ask students:
 - **How many garbage patches are there in the Earth's oceans?** *Five.*
 - **Where did the plastic come from that is now in the Great Pacific Garbage Patch?** *It is plastic waste carried to the ocean by lakes, rivers, and streams.*
 - **What does the "garbage patch" look like?** *It is a soupy mix of all sizes of plastic and trash from microscopic fragments to larger pieces.*
 - **What types of plastics are found in the garbage patch?** *Fishing nets, ropes, water bottles, fishing line, foam buoys, etc.*
 - **What does it mean to biodegrade? Can microplastics biodegrade?** *Biodegrade means that bacteria and fungi will decompose an organic substance into other compounds. Microplastics are not organic and cannot biodegrade. They can, however, through the actions of wind, UV light, and saltwater, break down into tinier and tinier plastic particles until they are so small, they are called microplastics.*

Explore – 20 Minutes

1. Pass out the prepared equipment trays and **Activity Sheet #1**. Students will make observations in teams of three or four students.
2. Ask students to:
 - **Observe the materials in the cupcake liner paper. What do these items represent?** *Microplastics*
 - **Define microplastics.** *It is a small piece of plastic less than 5mm in length.*
 - **Demonstrate with their fingers the length of 5mm.** Have students compare their estimate of 5mm to a metric ruler and then draw the length on **Activity Sheet #1**.
3. Next, have students slowly sprinkle the mix of microplastics into the center of the jar of water. Students need to carefully observe what happens and write down their observations on **Activity Sheet #1**.
 - **What happened when you dropped the plastic pieces into the container?** *Some of them stayed floating at the top of the water. Some of them immediately sank.*
4. Gently stir the water with the spoon. Observe what happens.
 - **What is the name of the current you are creating when you gently stir the water?** *A gyre*
 - **What happens to the plastic pieces when you stir the water?** *They swirl around. Some sink to the bottom of the jar and other pieces float near the middle of the container.*

Lesson 6

MICROPLASTICS IN OUR ENVIRONMENT

Explain – 20 Minutes

1. Watch, **What are Microplastics and Gyres?** <https://www.youtube.com/watch?v=tfHfoafRxtY> (2:26)
2. Ask students:
 - **What are gyres?** *Large circular currents.*
 - **When things from land wash into the ocean, where do they end up in the gyre?** *They move to the center of the gyre.*
 - **Where do the small plastic pieces come from?** *They are broken down from larger pieces of plastic. Some enter the water already as microplastics such as from a nurdle spill or microfibers from a washing machine.*
 - **What three things work together to make microplastics in ocean gyres?** *Wind, sunlight and saltwater.*
 - **What does the surface of a piece of microplastic look like?** *It is filled with tiny pits and is very rough.*
 - **What sticks to microplastics?** *Water-borne chemicals from industry and agriculture stick to the tiny plastic pieces, making them poisonous which is extremely harmful when eaten by marine life.*
 - **What does this film recommend doing to make a difference?** *Stop putting plastics in the ocean. Reduce, reuse, and refuse single-use plastics.*

Expand – 15 Minutes (Optional)

1. Jones, C. (n.d.). **Plastic Pollution in the World's Oceans.** [5 Gyres.org video] <https://player.vimeo.com/video/113359330> (3:00)
2. Ask students:
 - **What was the big question that this group of scientists set out to answer? How much plastic is in the world's oceans? Why was this difficult to answer?** *Because plastics are spread across all five of the subtropical gyres and no one had been able to devise a way to estimate it.*
 - **How did scientists collect samples of plastics in the ocean? They used a manta trawl. What does a manta trawl do?** *It collects particles, in this case plastics, floating on the ocean's surface.*
 - **What did the scientists discover about plastics in the ocean?** *Plastics start out in all shapes and sizes. Wind, water and sunlight break the plastics up just like a blender or shredder would, making much smaller pieces of plastic.*
 - **How much plastic did the scientists estimate is in our oceans?** *270,000 tons of plastic or 5.25 trillion pieces.*
 - **What three solutions are recommended to reduce plastic pollution?** *1) Education 2) Improve waste management systems 3) Ensure corporate responsibility*

Take Action

1. Take students on a marine debris pickup along the coast or along a nearby waterbody or stream.
2. Have students write a pledge to reduce their use of plastics by using reusable beverage bottles and refusing unnecessary single-use plastics like straws.

Lesson 6

MICROPLASTICS IN OUR ENVIRONMENT

Evaluate

1. **Activity Sheet #1** can be graded.

Online Resources

CBS Evening News. (December 25, 2023). **Researchers strive to understand the impact of microplastics on the oceans.** <https://www.youtube.com/watch?v=XyASybDO-RM> (3:04)

A video about the problem of microplastics in the oceans and how they move from the surface of the ocean to the seafloor.

Fidra. (2023). **A Fidra Project: Nurdles.** Fidra Website.

<https://www.fidra.org.uk/showcasing-solutions-to-nurdle-pollution>

Describes the nurdle problem and how nurdles get into the environment. Also discusses the effort to get nurdles listed as hazardous waste so that legislation can be proposed to clean up nurdle spills.

Five Gyres Institute. (March 24, 2016). **What is a Gyre?**

<https://www.youtube.com/watch?v=PH06oJl5n90>

A video that explains what a gyre is and where they are located.

Five Gyres Institute. (January 12, 2012). **Ocean Heroes: What is a Gyre?**

<https://www.youtube.com/watch?v=h6i16CrI8ss> (2:21)

A video that explains what a gyre is and where they are located. Plastic particles are found in all subtropical oceans.

FuseSchool. (Mar 12, 2019). **Plastics.**

<https://www.youtube.com/watch?v=54IQNDtF0NA> (3:23)

Plastic is indestructible – which is both good and bad. Every piece of plastic that has been made is still with us in the environment. Floating plastics in our ocean are a particular problem.

GreenPeace. (August 24, 2017). **How Does Plastic End Up in Our Oceans?**

<https://www.youtube.com/watch?v=Our5CZz5qoU> (1:20)

This video describes three ways that plastic ends up in our oceans.

Jones, C. (n.d.). **Plastic Pollution in the World's Oceans.** [5 Gyres.org video]

<https://player.vimeo.com/video/113359330> (3:00)

This video explains how scientists determined the estimation of 270,000 metric tons of plastic in the oceans.

National Geographic. (Oct 27, 2015). **Are Microplastics in Our Water Becoming a Macroproblem?**

<https://www.youtube.com/watch?v=ZHCgA-n5wRw> (2:52)

This video is about the problem of microplastics in the oceans and its presence in the food chain.

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MICROPLASTICS IN OUR ENVIRONMENT

National Ocean Service. (no date). **What are Microplastics?**

<https://oceanservice.noaa.gov/facts/microplastics.html> (0:58)

This video explains what microplastics are and how they harm ocean life.

Ocean Wise. (December 13, 2022). **What happens to microplastics in the ocean?**

<https://www.youtube.com/watch?v=0jOx0dGUklg> (2:55)

This video explains how microplastics are causing problems in the ocean.

United Nations. (May 24, 2017). **Plastic Ocean.**

https://www.youtube.com/watch?v=ju_2NuK5O-E (7:28)

This video explains the dangers of microplastics to marine birds and ocean life. The film follows Dr. Jennifer Lavers and the plight of seabirds. She shows how birds have died with stomachs full of plastic pieces. Shows several necropsies.

PBS Newshour. (November 27, 2019). **The Plastic Problem.**

<https://www.youtube.com/watch?v=1RDc2opwg0I>

Children's Books

Bartlett, D. (2020). **Just One Child: Starting a Plastic-Free and Litter-Free Journey.**

Debbie Bartlett Publisher. BN ID: 2940163470525 [Barnes and Noble's ebook].

Readers learn that small actions can make a big difference. Ages 9 - 12 years.

Lepetit, A. (2013). **Trash Magic: A Book about Recycling a Plastic Bottle.**

Capstone Publishing. ISBN-13: 9781620657430

Readers learn how a plastic bottle is recycled. Ages 4 - 8 years.

Paul, M. (2015). **One Plastic Bag: Isatou Ceesay and the Recycling Women of Gambia.**

Millbrook Picture Books. ISBN-13: 978-1467716086

The true story about a woman who started a plastic bag recycling movement in her community.

Ages 5 - 9 years.

Thomas, I. (2018). **This Book is Not Rubbish.**

Hachette Children's Group. ISBN-13: 978-1250203557

Ways to reduce pollution. Non-fiction. Ages 9 - 11 years.

Lesson Plan 6 - Microplastics in Our Environment
Activity Sheet 1

MICROPLASTICS IN OUR OCEANS

Name: _____ Date: _____

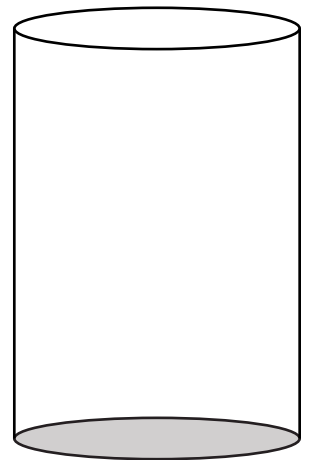
1. What are microplastics?

2. How big are microplastics? Using a ruler draw the length of a piece of microplastic.

3. List 3 sources of microplastics:

4. Draw and describe what happened when you dropped the microplastics into the jar.

5. Describe what happened when you gently stirred the water.



Jar

6. What are three things in the ocean that cause larger plastic items to break down into microplastics?

Lesson Plan 6 - Microplastics in Our Environment
Activity Sheet 1

MICROPLASTICS IN OUR OCEANS

7. What are circular currents in oceans called?

8. How many gyres exist in our oceans?

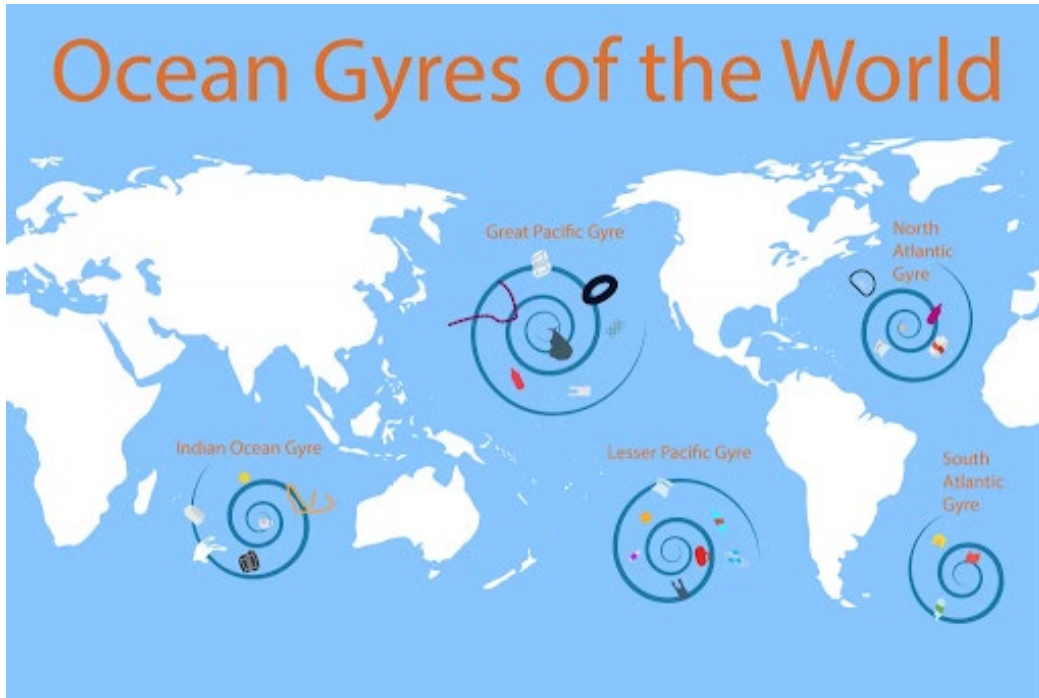
9. Why is it so challenging to eliminate plastic floating in the ocean gyres?

10. What is one thing you can do to reduce the plastic pollution problem?

Lesson Plan 6 - Microplastics in Our Environment
Activity Sheet 1

MICROPLASTICS IN OUR OCEANS

Gyres Resource Map



Plastics in our oceans



Lesson 7

NONPOINT SOURCE POLLUTION

Lesson Focus

In this lesson, students will learn the difference between nonpoint source pollution and point source pollution.

Lesson Objective

- Students will be able to correctly define nonpoint source pollution.
- Students will be able to correctly distinguish nonpoint source pollution from point source pollution.
- Students will be able to correctly list examples and causes of nonpoint source pollution.
- Students will be able to explain the function of a storm drain.

Grade Level	Duration	Subject Area	Vocabulary
5	50 Minutes	Science	runoff, nonpoint source pollution, point source pollution, stormwater drain

Louisiana Student Standards for Science

5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environments.

Materials List

Per Class

- Clear plastic tub with lid about 5-7" tall x 7" wide x 10-12" long. A plastic shoe box will work.
- Water
- Food coloring
- Spray bottle
- ¼ cup soil, sand, gravel (mix is fine)
- ¼ cup vegetable oil
- Grass clippings or leaves (small handful)
- Shredded paper (small handful)
- Small wads of paper
- A few small sticks

Lesson 7

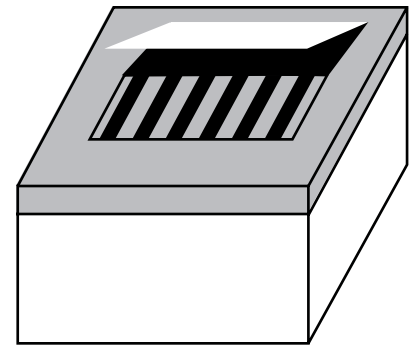
NONPOINT SOURCE POLLUTION

Activity Sheets

- A Storm Water Drain
- Water Pollution Water Drops
- Nonpoint Source Pollution

Advance Preparation

1. Cut the lid of the clear plastic container so that it resembles a storm drain. This can be as simple as cutting a slot in one end to as elaborate as cutting a grill in front of the "drain slot" (see diagram).
2. Make copies of **Activity Sheet #2** and cut out the water droplets for the Explore Activity.
3. Make copies of **Activity Sheet #3**



Background Information

There are many forms of water pollution, from sediment to chemical discharges to litter. In understanding these many forms of water pollution, environmental scientists distinguish two groups, point source and nonpoint source pollution, based on how the pollution enters a water body.

Point source pollution is any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship, or factory smokestack. Examples of point sources can include industrial plants, oil refineries, pulp and paper mills, chemical manufacturers, sewage treatment plants, food processors, and livestock operations. Pollutants from these sources can include oil, thermal pollution, toxic chemicals, heavy metal, nutrients, and bacteria. Point source pollution is subject to environmental regulations and remediation efforts.

Nonpoint source pollution results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. Nonpoint source pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources which makes it challenging to regulate. Nonpoint source pollution is caused when stormwater **runoff** is generated from rain and snowmelt that flows over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into bayous, streams, rivers, wetlands, coastal waters, and ground waters. (United States Environmental Protection Agency - EPA, 2023)

Nonpoint source pollution is the opposite of point source pollution, with pollutants released in a wide area. As an example, picture a city street during a thunderstorm. As rainwater flows over asphalt, it washes away drops of oil that leaked from car engines, particles of tire rubber, dog waste, and trash. The runoff goes into a **stormwater drain** and ends up in a nearby river. Runoff is a major cause of nonpoint source pollution. It is a big problem in cities because of all the hard surfaces, including streets and roofs. The amount of pollutants

Lesson 7

NONPOINT SOURCE POLLUTION

washed from a single city block might be small, but when you add up the miles and miles of pavement in a big city, you get a big problem.

In rural areas, runoff can wash sediment from the roads in a logged-over forest tract. It can also carry acid from abandoned mines and flush pesticides and fertilizer from farm fields. All this pollution is likely to wind up in streams, rivers, and lakes.

In the United States, the Clean Air Act and the Clean Water Act have helped to limit both point-source and nonpoint source pollution. Thanks to these two legislative initiatives, in effect for some 50 years now, America's air and water are cleaner today than they were for most of the 20th century. (National Geographic, 2023)

Examples Nonpoint Source Pollution

Litter

Roadside trash, overflowing garbage cans and dumpsters, unkempt parking lots and alleys, illegally dumped tires, and "junk" as well as piles of leaves, sticks, and grass clippings piled along curbs or dumped into ditches, are all forms of litter. Time, wind, rain, and melting snow aid in "breaking down" or decomposing some of these materials and carrying the lighter ones into nearby ditches, storm drains, streams, and rivers. Trash and debris on our highways and streets can travel by wind or rain into ditches, storm drains, bayou, streams, and rivers.

Sediment

Sediment is tiny soil and rock particles carried by rain and snowmelt into streams, lakes, and estuaries. It can carry chemical pollutants with it into the water. Sedimentation can result from soil erosion, construction, and other types of land disturbances in rural, urban, and suburban areas.

Excessive Nutrients

All plants require nutrients to survive and reproduce. Two naturally occurring nutrients, nitrogen and phosphorus, are important components in fertilizers. When too much fertilizer is used, excess nutrients are picked up by stormwater runoff and washed into nearby waterways. This excess causes increased algae and aquatic plant growth, resulting in lower amount of dissolved oxygen in the water, which can result in fish kills. Excessive amounts of nitrogen and phosphorus in stormwater runoff comes from fertilizers, manure from farms, industrial waste, sewage, detergents, and grass clippings.

Animal and Human Waste

Pathogens are disease-causing microorganisms present in human and animal waste, also known as fecal matter. Diseases that can result from exposure to fecal matter include dysentery, hepatitis, food poisoning and parasitic infections. Bacterial contamination is caused when untreated waste of humans, pets, livestock, and animals are washed from the ground by stormwater runoff into local waterways. Contamination also occurs at marinas and by boaters discharging raw sewage overboard with poorly operated septic systems.

Lesson 7

NONPOINT SOURCE POLLUTION

Pesticides

Pesticides, which include insecticides and herbicides, contain chemicals harmful to humans and animals. Improper application and usage lead to pesticide-laden runoff and ground water that can possibly kill aquatic vegetation, insects, and fish.

Toxic Metals

Metals are considered toxic to humans because they can accumulate in our body and can impact our health over time. Toxic metals include copper, mercury, nickel, chromium, zinc, and lead. Metals originate from cars, industrial waste, and misused pesticides that are transported by rain and highway runoff.

Motor Oil

Motor oil contains toxic substances, including lead and chemical additives, which seriously contaminate ground water and inland and coastal waterways. It stunts or kills algae and other vegetation, smothers aquatic animals, and contaminates shellfish beds and drinking water supplies. The presence of oil in groundwater is usually the result of used motor oil poured directly onto the ground or into storm drains and leakage from improperly maintained vehicles and equipment.

Household Hazardous Waste

Household hazardous waste includes poisonous substances found in our homes and can include household cleaners, nail polish removers, antifreeze, paint, and gasoline. Improper disposal of these substances onto the ground or a storm drain means they can enter our bayous and streams without any treatment at a wastewater treatment plant. When dumped into a sink, toilet, or household drain, they can harm the bacteria used to treat the water, either in the septic system or at the wastewater treatment facility.

Road Salts

Salt is used to de-ice highways every winter. Used in this way, however, it can contaminate ground water supplies and affect the lives of fish.

Acidic Deposition

Acid rain is the most common form of acidic deposition and is caused primarily by car emissions. It is also associated with the burning of coal, wood, and other industrial emissions. It is defined as the settling of the aerial acid particles by means of precipitation. Acid rain not only removes certain nutrients from the soil and affects tree growth, but it also washes toxic metals from the soil into the waterways.

References

- New Jersey Department of Environmental Protection. (1991). Beneath the Shell: A teacher's guide to nonpoint source pollution and its potential impact on New Jersey shellfish. <https://www.nj.gov/dep/seeds/docs/bts.pdf>
Lesson 7 has been modified from The Beneath the Shell, Storm drain watch lesson.

Lesson 7

NONPOINT SOURCE POLLUTION

Procedure

Engage – 5 Minutes

1. Watch, **The Drainage System in Front of the School is Clogged Due to Debris.**
<https://www.youtube.com/watch?v=PB7KyBLnEBk> (12:46)
2. Ask students:
 - **What is going on in this video?** *There has been a rainstorm, and the street is flooded because the drain is clogged.*
 - **What is the person doing?** *They are removing debris, leaves, sticks, and litter from the drain opening.*
 - **Is the water on the flooded road causing problems?** *Yes. At the beginning of the video, the cars and motorcycles were driving in the center of the road to stay out of the water.*
 - **Were leaves the only thing the person pulled out of the storm drain?** *No. There was also litter (a plastic cup and bottles, about 5:40 in the video).*
 - **Did the person remove the leaves on the sidewalk?** *Yes. They put the leaves and trash into a trash bin.*

NOTE You can stop watching at around 6:00 if time is short.

Explore – 20 Minutes

1. Show a picture of a stormwater drain (**Activity Sheet #1**).
2. Ask students:
 - **Does anyone know what this is called?** *It is a stormwater drain.*
 - **Where are these found?** *Along our streets.*
 - **What does a storm drain do?** *It prevents flooding by diverting rainwater and melted snow off the streets and other paved surfaces and into a natural body of water.*
 - **What might enter a storm drain?** *Write the student's answers on the board. The answers are all the things listed in the Background section. Explain that the items listed are nonpoint source pollutants.*
 - **Where does the water go after it enters a storm drain?** *It usually is piped directly to the nearest stream, canal, or river.*
3. Bring the pre-made storm drain model and set it down on the front table where students can observe it. Explain that this is a model of a storm drain.
4. Fill the plastic container about ½ full of water. Explain that the water represents a stream in which the drain empties into.
5. Students will pretend there is a rainstorm. Students will read each water drop card (**Activity Sheet #2**), discuss the situation, and fill the storm drain model with the items indicated on the card.
6. For each water drop card scenario discuss:
 - **Does the action described on the water drop card harm the environment? If so, how?**
 - **Do you think the people in the story wanted to harm the environment?**
 - **What could they have done differently to not harm the environment?**

Lesson 7

NONPOINT SOURCE POLLUTION

Explain – 25 Minutes

1. Observe the storm drain model and discuss:
 - **How did the water change from the beginning of the activity?** *The water changed color and became full of debris.*
 - **How did this make you feel?** *Angry and sad. Concerned for the environment.*
 - **Where will the water and pollutants travel?** *They will travel to larger water bodies like streams, canals, and rivers.*
 - **Students should work in groups to invent a method or mechanism to remove the pollutants from the stormwater.**
 - **Have the class create a list of ways to prevent people from littering and dumping into the storm drain.**
 - **Review examples of nonpoint source pollution.**

Expand – 15 Minutes (Optional)

1. Watch, SciShow Kids (May 3, 2021). **Keeping Our Water Clean!**
<https://www.youtube.com/watch?v=Npv47F3GK2w>
2. Ask students:
 - **What are two examples of impermeable surfaces?** *Roadways, parking lots, and buildings.*
 - **Why is rainwater pooling on roadways dangerous?** *Excessive rainwater on roadways is dangerous because it creates puddles of water. It could also cause street flooding which is a driving hazard.*
 - **What is runoff water?** *Runoff occurs when there is more water than land can absorb. The excess water flows across the land and into nearby creeks, streams, or ponds.*
 - **How is water going down a sink drain similar and different from water going down a storm drain?** *Water going down a sink and a storm drain are both being carried away from a particular spot. Water going down a sink is destined for a water treatment facility where it is cleaned of any harmful substances. Water going down a storm drain is carried off to a nearby stream or bayou. Storm drain water is not treated at a water treatment facility.*
 - **Why are storm drains important on roadways?** *Storm drains move water off the roads and keep them clear of flooding.*
 - **Why are clogged storm drains a problem?** *Clogged storm drains can no longer function as they were designed, causing water to accumulate on the street. Flooded streets are dangerous and can cause flooding of cars, homes, and businesses.*

Take Action

1. **Adopt a Storm Drain.** <https://la.adopt-a-drain.org/suggested-drains/create?zoom=17&lat=30.43062842197942&lng=-91.1357727462799>
Your class can help by adopting a storm drain and keeping it clean. Take a walk around your school campus to look for the storm drains. Then, go to the link listed above. When you enter your address, a map will pop up. Drag a red pin to mark the location to adopt a storm drain.
 - Sign up online to Adopt a Drain in your neighborhood or school.
 - Keep the drain clear of debris especially before rainfall. Rake leaves, trash, and other debris off the drain surface throughout the year.

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- Track your impact. Keep a log of what you collect and enter it into your online account to gauge the cumulative results of your work.
- Lead by example. Tell friends and neighbors about your commitment to keeping a storm drain clean and ask them to do the same. Share with them some easy things they can do at home to prevent water pollution.

Evaluate

1. Have students complete **Activity Sheet #3** and discuss their answers.

Online Resources

City of Garland Texas. (November 22, 2016). **Only Rain in the Storm Drain.**

<https://www.youtube.com/watch?v=LsBKpArM-v0>

Did you know that only rain goes in the storm drains? This video discusses ways that you can limit water pollution.

Contra Costa County Clean Water Program. (March 25, 2021). **How Does the Storm Drain System Work?**

(0:44) <https://www.youtube.com/watch?v=YJ5DOo3sAh4>

Learn about the difference between the storm drain system and the sanitary sewer system.

EPCOR. (October 8, 2019). **What is a catch basin?**

<https://www.youtube.com/watch?v=QB0vGXF70Jk> (1:00)

A catch basin is often referred to as a storm drain, storm sewer, surface water drain or storm water drain. This video explains how important storm drains are in moving storm water into the drainage system. It also shares that only rain and melting snow should enter a catch basin.

Louisiana Department of Environmental Quality (DEQ). **Nonpoint Source Pollution (NPS) Video Featuring Enviroscope.** <https://www.youtube.com/watch?v=2WHW3F5qG18> (4:41)

The Enviroscope Model effectively communicates our shared responsibility for the environment, specifically water quality, to people of all ages. By being able to see "pollution" move around in real-time and discuss solutions, these complex issues seem simple to anyone who will listen. You can also contact a DEQ scientist and request an Enviroscope model demonstration for your classes.

Contact India Ambeau at india.ambeau@la.gov

Enviroscope Exam

<https://www.deq.louisiana.gov/assets/docs/LDEQEnviroscopeVideoTest.pdf>

Enviroscope Exam Answer Key

<https://www.deq.louisiana.gov/assets/docs/LDEQEnviroscopeVideoTestKey.pdf>

The Watershed Institute. (June 18, 2018). **Explaining Stormwater Runoff.**

<https://www.youtube.com/watch?v=fn736F34QyQ> (1:35)

Learn about stormwater runoff and how to reduce it.

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NONPOINT SOURCE POLLUTION

Children's Books

Beck, G. (2022). **Watersheds: A practical handbook for healthy water.**

Firefly Books. ISBN 0228103231.

The book explains ecological principles and environmental challenges, introduces North America's major biological regions, outlines the complexities of water and nutrient cycles, and explains the ecology of wetlands and waterways. This book also explains some of the major environmental issues facing North America, including air pollution, water pollution, invasive exotic species, and habitat loss and destruction. Ages 8 years to Adult.

Canavan, R. (2014). **You Wouldn't Want to Live Without Clean Water!**

Franklin Watts Publishing. ISBN-13: 978-0531213100

This book familiarizes the readers with fascinating facts about water. Ages 8 - 12 years.

Fossey, S. (2020). **The Life of a Little Plastic Bottle.**

Autumn Publishing, Igloo Books. ISBN-13: 978-1839032455

Children are introduced to reusing and recycling through this story about the journey of a little water bottle. Ages 1 - 5 years. Read aloud at <https://www.youtube.com/watch?v=fclaNkzrRQU>

Lindstrom, C. (2020). **We are Water Protectors.**

Roaring Brook Press. ISBN-13: 978-1250203557

This book issues an urgent call to protect the Earth's waters. Winner of the 2021 Caldecott Medal. Read aloud at <https://www.youtube.com/watch?v=FLZVQFhFeqE>. Ages 3 - 7 years.

Lesson Plan 7 - Nonpoint Source Pollution - Activity Sheet 1

A STORM WATER DRAIN

Name: _____ Date _____



By Panek - Own work, CC BY 3.0

https://en.wikipedia.org/wiki/Storm_drain#/media/File:Rynsztok.jpg

Lesson Plan 7 - Nonpoint Source Pollution - Activity Sheet 2

WATER POLLUTION WATER DROPS

Name: _____ Date _____

Instructions: Cut out the cards. Read the scenario on the card. Follow the directions on the card using the storm drain model you made.

Mr. Boudreaux has two large lemon trees near his porch that attract a lot of undesirable insects like aphids. He sprayed his trees thoroughly with an insecticide and shortly afterward a storm occurred. Much of the chemical was washed into the soil and then into the nearby storm drain.

Drop two green drops of food color onto the plastic lid of the model and spray it with water into the storm drain.

There is a small stream behind Sally's school. She notices that the edges of the stream are eroding into the stream after every storm. The land near the stream banks is slowly collapsing into the stream.

Add soil, sand, and pebbles along with two drops of brown food coloring and spray it with water into the storm drain.

Jackson is happy to help his dad change the oil in his truck. He takes the used oil to the storm drain where he dumps it.

Pour $\frac{1}{4}$ cup of vegetable oil into the storm drain. Add two drops of blue food coloring and spray it with water into the storm drain.

After recess, Gracie noticed a lot of clear plastic straw covers all over the playground along with some litter from lunch.

Add small pieces of torn paper to the storm drain. Add two drops of red food coloring and spray it with water into the storm drain.

Lesson Plan 7 - Nonpoint Source Pollution - Activity Sheet 2

WATER POLLUTION WATER DROPS

Jarvis helps his dad by cutting the grass in his yard. When he gets close to the street, he blows the grass clippings into the street.

Place the grass clippings into the storm drain. Add two drops of orange food coloring and spray it with water into the storm drain.

Jolie is walking her dog. The dog "does his business" near the street curb. The dog didn't mess on the neighbor's lawn, but it will still make its way to the drain.

Place two twigs into the storm drain. Add two drops of blue food coloring and spray it with water into the storm drain.

The Crestor family likes to eat fast food on their way to the ball park. When they are through eating, they toss their trash out the window of the car.

Place a few small pieces of wadded paper into the storm drain. Add two drops of purple food coloring and spray it with water into the storm drain.

Juanita is very careful about being in the sun. She always wears sunscreen when she plays on the Slip 'n Slide in her backyard. After an hour she has to reapply it since it tends to wash off in the water.

Add two drops of red food coloring and spray it with water into the storm drain.

Lesson Plan 7 - Nonpoint Source Pollution - Activity Sheet 3

NONPOINT SOURCE POLLUTION

Name: _____ Date: _____

Identify whether the items below are nonpoint source pollution or point source pollution. Put a N by the items that are nonpoint source pollutants and a P by the items that are point source pollutants.

_____ leaves and clippings

_____ discharge pipe from a chemical plant

_____ pet waste

_____ litter

_____ pesticides and herbicides

_____ eroded sediments

_____ food waste from a food processing facility

_____ fertilizers applied to our yards

_____ motor oil on a driveway

_____ sunscreen

In your own words, what is the definition of nonpoint source pollution?

What is the purpose of a storm drain?

What is the difference between water going down a sink inside your house and water flowing into a storm drain?

How is nonpoint source pollution different from point source pollution?

Lesson Plan 7 - Nonpoint Source Pollution - Activity Sheet 3

NONPOINT SOURCE POLLUTION - KEY

Name: _____ Date: _____

Identify whether the items below are nonpoint source pollution or point source pollution. Put a N by the items that are nonpoint source pollutants and a P by the items that are point source pollutants.

<u> N </u> leaves and clippings	<u> P </u> discharge pipe from a chemical plant
<u> N </u> pet waste	<u> N </u> litter
<u> N </u> pesticides and herbicides	<u> N </u> eroded sediments
<u> P </u> food waste from a food processing facility	<u> N </u> fertilizers applied to our yards
<u> N </u> motor oil on a driveway	<u> N </u> sunscreen

In your own words, what is the definition of nonpoint source pollution?

Nonpoint source pollution is pollution that comes from water runoff carrying pollutants into the waterways. Examples might be litter, sediment, fertilizers, pesticides, and motor oil.

What is the purpose of a storm drain?

The purpose of a storm drain is to carry rainfall and runoff away from streets and properties and into creeks, bayous, and streams.

What is the difference between water going down a sink inside your house and water flowing into a storm drain?

Water that goes down a sink is carried to a wastewater facility where it is cleaned and then released into streams, creeks, and bayous. Water flowing into a storm drain is carried directly into streams, creeks, and bayous. It is not treated or cleaned in any way.

How is nonpoint source pollution different from point source pollution?

Nonpoint source pollution is pollution carried by runoff after a precipitation event. The sources of nonpoint source pollution are diverse and come from many different pollution sources. Point source pollution comes directly from a known manufacturing facility or refinery. It is easier to regulate since it can be traced back to the source.

Lesson 8

PLASTICS IN MARINE LIFE

Lesson Focus

In this lesson students will learn how microplastics transfer from smaller animals to larger animals through their food chain, resulting in a higher concentration of microplastics and the chemicals they emit in the apex (top) predator.

Lesson Objective

Students will be able to correctly describe how microplastics are moved up a food chain by bigger fish consuming smaller fish that have eaten microplastics.

Grade Level	Duration	Subject Area	Vocabulary
K-3	1 Hour	Science	food chain, plankton, marine debris, microplastics, biodegrade, bioaccumulation, biomagnification

Louisiana Student Standards for Science

K-ESS3-3

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

3-LS4-4

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there change as well.

Materials List

For Teacher Demonstrations

- 1 pint-sized jar (preferably a Mason jar) filled $\frac{3}{4}$ with water and with torn strips of newspaper - the weekly ad papers from the grocery store are free, colorful, and work well
- 1 plastic grocery bag
- 1 piece of broccoli or onion sealed in a plastic bag or plastic container for a demonstration of how plastics absorb odors

For Grades K-1

Per Student

- 1 copy of **Activity Sheet #4**

Per Group

- 1 copy of **Activity Sheet #1**
- Prepared fish (see advanced preparation)
- 1 envelope with 30 lentils (25 green and 5 red)

Lesson 8

PLASTICS IN MARINE LIFE

For Grades 2-3

Per Student

- 1 scissors
- 1 copy of **Activity Sheet #2** and **Activity Sheet #4**

Per Group

- 1 side of a clear plastic sheet protector
- 4 different colored permanent markers
- 1 envelope with 30 lentils (25 green and 5 red)
- 1 copy of **Activity Sheet #1** and **Activity Sheet #3**

Activity Sheets

- The Great Pacific Garbage Patch
- Plastics In Marine Life Worksheet
- Fish Template
- Fish Activity
- Classroom Plastic Inventory

Advance Preparation

1. **How Large Plastic Objects Breakdown into Microplastics Demonstration:** Before class begins fill a pint-sized jar $\frac{3}{4}$ full of water. If possible, put the jar with water in the microwave for 1 minute to heat the water. Tear five strips of the newspaper (approximately 3" x 5"), place in jar, put on jar lid, and let sit for at least five minutes. This will give the paper time to absorb the water and help it break down quicker.
2. **How Plastics Absorb Odors Demonstration:** The night before the lesson put a piece of broccoli or onion in a small plastic container or sealed bag. Leave it overnight at room temperature.
3. Prepare 1 envelope filled with 30 lentils (25 green and 5 red) for each group.
4. Cut the sheet protector into 2 pieces and make copies of the activity sheets.
5. **For Grades K – 1:** Trace and cut the 4 fish from the sheet protectors (each fish should be traced in a different colored pen – see **Activity Sheet #2**).

Background Information

Globally, our waterways and marine environments are contaminated by plastic debris. Eighty percent of **marine debris** or litter in the oceans originates on land and is carried into our waterways by stormwater runoff, rain, wind, and other actions that move litter. Plastic marine debris is of considerable concern because of its harmful effects on water quality and marine life and because it does not fully decompose. Plastics enter the waterways as large plastic items such as beverage bottles and bags or as small pieces 5mm in size and smaller known as **microplastics**. Small pieces of laundry fibers from synthetic textiles enter the waterways from washing machines and are one of the greatest sources of microplastics. Large plastic items enter waterways in a variety of ways: improper disposal of trash, littering, and stormwater runoff. Once in the waterways, plastics begin biodegrading. Plastics do not completely **biodegrade** or break down like natural materials do. Instead, as plastics are exposed to the sun, water, and movement from waves, they fragment and break up into smaller and smaller pieces. Plastic pieces 5mm or less are known as microplastics.

Lesson 8

PLASTICS IN MARINE LIFE

Microplastics' small size and ability to float make them resemble fish eggs and **plankton** (microscopic plants and animals) that fish and other aquatic animals eat. However, the ingestion of microplastics may not only be driven by a chance encounter with microplastics. Scientists believe that fish and other animals are attracted to the smell of microplastics. Microplastics absorb odors much like plastic food containers or bags. Many **phytoplankton** (microscopic plants known as algae) create a chemical called dimethyl sulfide. Dimethyl sulfide is one of the main components responsible for the characteristic odor of the ocean (St. Laurent, 2019). Dimethyl sulfide is also found in vegetables like cabbage, broccoli and onions. It is responsible for their characteristic odor. Scientists believe that zooplankton (microscopic aquatic animals) and larger animals may be tempted to eat microplastics because they are infused with the 'dinner scent' of dimethyl sulfide (St. Laurent, 2019).

Once microplastics are swallowed by an animal the plastic pieces cannot be broken down by digestion. These plastics remain in the animal's stomach and take up space, giving the animal a feeling of fullness. This means they are less likely to want to eat and, even if they do eat, there is less room for nutritious food in their stomach. In addition, plastics often attract toxic substances to their surfaces, so these toxins end up remaining in the animal as well. Some of these toxins can even be permanently stored in their tissues. These toxic substances behave like ink in a skin tattoo. A tattoo stays on a person's skin their whole life because their body cannot break down the tattoo ink. This phenomenon of plastics and toxins building up in an animal is called **bioaccumulation**.

Now, imagine the concept of bioaccumulation happening in a **food chain**. A food chain shows the order in which plants and animals get their food and energy. If a small fish mistakes microplastics for algae and eats them, the chemicals in and on the plastics cannot be broken down by the fish's body and are stored in its tissues. Next, a medium-sized fish eats the small fish, now the medium-sized fish has these chemicals stored in its tissues. This is in addition to the microplastics and chemicals that medium fish had already eaten along the way. Then, a large fish eats the medium-sized fish. That large fish gets all the microplastics and all the chemicals eaten by the small and medium fish. This is in addition to all the microplastics that large fish ate on its own. This increasing concentration or buildup of microplastics and chemicals in the medium and large fish is called **biomagnification**. Sadly, biomagnification is not limited to ocean life, it can happen in all wildlife and in humans.

References

- Boucher, J., & Friot, D. (2007). Primary Microplastics in the Oceans: A global evaluation of sources. <https://portals.iucn.org/library/sites/library/files/documents/2017-002-En.pdf>
- NOAA Marine Debris Program. (Jan 1, 2024). Plastic. <https://marinedebris.noaa.gov/what-marine-debris/plastic>
- St. Laurent, K. (May 27, 2019). Microplastics: Smells like Dinner. <https://envirobites.org/2019/05/27/microplastics-smells-like-dinner>

Lesson 8

PLASTICS IN MARINE LIFE

Procedure

Engage – 15 Minutes

1. Project the image of the The Great Pacific Garbage Patch (Korotkin Associates website) and distribute **Activity Sheet #1**.
2. Ask students the following questions which are intended to get students thinking about the problems that improperly discarded plastic items are causing. Acknowledge all answers without correcting the students. This is also a way to learn their prior knowledge on this topic.
 - **What do you see in this picture of the Great Pacific Garbage Patch?** *A variety of plastic items of various sizes. Many items are hard to identify.*
 - **What do you think will eventually happen to all the plastic trash in the water?** *It will breakdown into the small pieces that we see in the picture and eventually into microscopic pieces called microplastics.*
3. **Demonstration: Large Plastic Objects Breakdown into Microplastics.**
 - Explain that when litter, like a plastic bag (hold up a plastic bag), enters the ocean, the sun and waves will break it into small pieces like we saw in the picture. These pieces of plastic will eventually break down into tiny pieces called microplastics. These tiny pieces look and smell like food to animals, and they eat them.
 - Hold up the jar filled with water and newspaper strips.
 - Explain that you are going to show them how this could happen with this jar of water.
 - Explain that you are using paper in this demonstration instead of plastic because paper breaks down quickly. Plastic is tough and breaks down much more slowly.
 - Shake the jar vigorously until the paper breaks up into small pieces.
 - Hold the jar up to the light. Then walk around and show how the paper has broken up into small pieces floating in the water like microplastics.
4. **How Plastics Absorb Odors Demonstration.**
 - Hold up the broccoli or onion sealed in a plastic bag or plastic container.
 - Ask students if they have smelled broccoli or onion. Explain that a chemical in broccoli and onions causes them to smell.
 - Open the container or bag and discard the broccoli or onion.
 - Walk around and let students smell the empty container or let them pass it around.
 - Explain that the plastic still smells like broccoli or onions because the plastic has absorbed the odor.
 - Some plankton, phytoplankton (microscopic plants), have a strong smell because it has this same chemical.
 - Explain that plastics floating in the ocean absorb the odor of this plankton. Animals are attracted to this plastic because it looks and smells like food and will eat it thinking the tiny plastic pieces are food.
 - Show this video of zooplankton eating microplastics.
<https://www.youtube.com/watch?v=beUhzQAnM>
5. Ask, **What are the two ways marine animals might confuse microplastics for food?** *Microplastics can look like food because of their small size and smell like the plankton animals like to eat.*
6. Ask, **What do you think will eventually happen to all the plastic trash in the water?** *It will break down into small pieces called microplastics just like the paper in the jar.*

Lesson 8

PLASTICS IN MARINE LIFE

Explore – 30 Minutes

1. Divide students up into groups of four. Distribute the materials.
 - **For Grades K-1:** Distribute prepared fish and **Activity Sheet #4** only.
 - **For Grades 2-3:** Distribute **Activity Sheets #2, #3** and **#4**. Each student should trace one of the four fish on the group's plastic sheet in a different colored marker than their teammates. Students should cut out their plastic fish creating a set of four different colored and sized fish.
2. **For All Grades:** Distribute the prepared envelopes with 30 lentils. Explain that the green lentils will represent nutritious food (plankton) consumed or eaten by the fish and the red lentils will represent the microplastics consumed by the fish.
3. One student will pull 10 lentils out of their group envelope without looking and set them on their desk. The student will then count the number of microplastics (red lentils) their fish has eaten and draw a dot on their fish for each microplastic their fish consumed. Then, the student will return all the lentils to the envelope and hand the envelope to the next student. Students will repeat this for each one of the plastic fish.
4. Starting with the smallest fish on the bottom, students will make a stack of their fish from smallest to largest. The easiest way to stack the fish is to align the fish's tails. Students should see the dots, representing the microplastics that have been eaten and passed up the food chain, when they stack their fish.
 - **For Grades K-1:** Demonstrate how to draw microplastics in the table on **Activity Sheet #4**. Students draw microplastics and record the number of microplastics as each larger fish is added to the stack.
 - **For Grades 2-3:** Students should record the number of microplastics on their data table on **Activity Sheet #2** as each larger fish is added to the stack. When the activity is finished, the largest fish should be on top of the stack. Students should complete the remainder of **Activity Sheet #2** and **Activity Sheet #4**.

Explain – 10 Minutes

1. Ask, **What do the green lentils represent?** *Food consumed or eaten by the fish. What do the red lentils represent?* *Microplastics consumed or eaten by the fish.*
2. Ask, **How many microplastics do you see in the largest fish?** *Students should count the number of dots they see in the stack of fish.*
3. Ask, **When you stacked a bigger fish on top of a smaller fish what did it represent or show in the food chain?** *When the bigger fish was stacked on a smaller fish, this represented the bigger fish eating the smaller fish.*
4. Ask, **What is happening to the number of microplastics as you move up the food chain?** *The number of microplastics is increasing very quickly. This is called biomagnification.*
5. Ask, **Which fish has the largest number of microplastics?** *The biggest fish (Fish 4). Which has the smallest number of microplastics?* *The smallest fish (Fish 1).*
6. Ask, **What are two harmful effects that microplastics have on fish that mistakenly eat them?** *Microplastics take up room in the fish's stomach, which can lead to starvation. Microplastics have toxins or chemicals on the surface of the plastic, and these toxins can cause the fish to become ill.*

Lesson 8

PLASTICS IN MARINE LIFE

Expand – 25 Minutes (Optional)

1. Students will listen to the book **A Planet Full of Plastic: and how you can help** by Neal Layton. Read aloud by Mrs. Smalley: <https://www.youtube.com/watch?v=mFJ8beW9ZCI> (6:38)
2. Ask students to answer these questions based on the book:
 - **What are some examples of plastic things found in the oceans?** *Answers will vary but should include plastic items listed in the book.*
 - **What does biodegrade mean?** *Biodegrade means to break down into small pieces.*
 - **What makes plastic super useful?** *It lasts an exceptionally long time.*
 - **How are microplastics formed?** *When larger plastics break down after a long time in the ocean and sun.*
 - **How do microplastics affect animals that eat them?** *They fill their stomachs until they are not hungry, and they have toxins that can cause problems for the animals that eat them.*
 - **What can you do to help?** *Answers may vary but should include examples of developing good habits of using less plastic, using reusable water bottles instead of single-use bottles, saying no to straws when they are offered to you, and picking up litter that they see on land before it gets to our waterways and oceans.*
3. Watch and discuss the National Ocean and Atmospheric Administration (NOAA) videos.
 - **TRASH TALK: What is Marine Debris?** Accessed at https://oceanscience.noaa.gov/trashtalk_whatismarinedebris/welcome.html, (2:06) *This video explains what marine debris is and how it gets into the oceans.*
 - National Ocean and Atmospheric Administration (NOAA). **TRASH TALK: What is the Great Pacific Garbage Patch?** Accessed at https://oceanscience.noaa.gov/trashtalk_garbagepatch/ (2:08) *This video discusses what the Great Pacific Garbage Patch is and how it was formed.*
 - National Ocean and Atmospheric Administration (NOAA). **TRASH TALK: What Can We Do?** Accessed at https://oceanscience.noaa.gov/trashtalk_plastics/welcome.html (2:22) *This video discusses how people produce too much waste. That waste ends up in the ocean when we litter or don't recycle. Plastic is an important part of our modern lives - we use it for a lot of good things! But we need to take responsibility for how much we use every day and where it goes when we're done with it.*
4. Then, revisit and discuss the above questions.
 - Ask your students if they would like to revise their answers to the above questions after watching the videos.

Take Action

One way to keep plastic out of our oceans is to reduce our use of disposable or single-use plastics. Students should complete **Activity Sheet #5** by conducting a survey of the plastic items in their classroom and analyze the data. They should answer the following questions: How many of the plastic items identified in the classroom are not recyclable? How could the disposable items be reused? To reduce plastic waste, what could be used instead of the plastic item?

Evaluate

1. **For Grades K-1: Activity Sheet #4**
2. **For Grades 2-3: Activity Sheets #2 and #4** ask students to explain their exploration.

Online Resources

SciShow Kids. (2018). **How Plastic Hurts the World.**

Accessed at <https://www.youtube.com/watch?v=VUUUxOI715s> (4:21)

This video discusses why recycling trash is one really important way that we can help the Earth stay clean! It's much better to recycle things than throw them away, but it's super important to recycle plastic! Jessi is here to tell you why!

Lessplastic Thailand. (2020). **What is a Microplastic?**

Accessed at https://www.youtube.com/watch?v=gTr_rxnMP-o (3:20)

Learn about microplastics and the dangers they pose to the environment and our own health.

Children's Books

Burns, L.G. (2010). **Tracking Trash: Flotsam, Jetsam, and the Science of Ocean Motion.**

HarperCollins Publishers. ISBN-13: 9780547328607

Readers learn how a scientist tracks trash using his knowledge of ocean currents. A Boston Globe–Horn Book Award Honor Book for Nonfiction. Ages 10 - 12 years.

Du, A. (2019). **Microplastics and Me.**

Tumblehome Learning, Inc., Tumblehome, Inc. ISBN-13 978-1-943431-50-2

Readers are engaged in an inspiring first account of a contemporary middle school girl tackling a global environmental problem through engineering. Ages 10 - 12 years.

Layton, N. (2019). **A Planet Full of Plastic And how You Can Help.**

Martina Publishing. ISBN-13: 978-1526361769

How plastic came to be, and how plastic affects the environment. Ages 9 - 12 years.

Read aloud by Mrs. Smalley: <https://www.youtube.com/watch?v=mFJ8beW9ZCI> (6:38)

Read aloud by Mr. Layton: https://www.youtube.com/watch?v=-zfKrgS_H1Y (8:50)

Pincus, Meeg. (2021). **Ocean Soup: A Recipe for You, Me, and a Cleaner Sea.**

Sleeping Bear Press. ISBN-13: 978-1534111189

Readers learn how our oceans are filled with plastics from water bottles to take-out containers to the teeny tiny particles you need a microscope to see. Ages 6 - 9 years.

Smith-Llera, D. (2018). **Trash Vortex: How Plastic Pollution Is Choking The World's Oceans.**

Capstone Publishing. ISBN-13: 9780756557492

Readers learn how plastics accumulate in the ocean and threaten organisms in the ocean. It also discusses microplastics. Ages 10 - 12 years.

Vowell, C. (2021). **Nurdle and the Microplastics.**

Peaen Publishing. ISBN-13: 978-1838109950

Nurdle, a lentil-sized piece of microplastic, meets other microplastics when he is washed into the ocean. Ages 10 - 12 years.

Lesson Plan 8 - Plastics in Marine Life - Activity Sheet 1

THE GREAT PACIFIC GARBAGE PATCH

Name: _____ Date _____



Great Pacific Garbage Patch (Korotkin Associates website),

The Great Pacific Garbage Patch

<https://korotkinassociates.com/great-pacific-garbage-patch/>

Lesson Plan 8 - Plastics in Marine Life - Activity Sheet 2

PLASTICS IN MARINE LIFE WORKSHEET

Name: _____ Date _____

Engage:

1. What did you see in the Great Pacific Garbage Patch?

2. What did the green and red lentils represent?

3. When you stacked a bigger fish on top of a smaller fish what did it represent or show in a food chain?

4. Describe what is happening to the number of microplastics as you move up the food chain.

Data Table

Fish #	# of Microplastics Eaten	Total # Microplastics
Fish 1		
Fish 2		
Fish 3		
Fish 4		

5. What are two harmful things that microplastics do to fish that mistakenly eat them?

6. What can you do to keep microplastics and larger plastics out of the waterways and oceans?

Lesson Plan 8 - Plastics in Marine Life - Activity Sheet 2

PLASTICS IN MARINE LIFE WORKSHEET - KEY

Name: _____ Date _____

Engage:

1. What did you see in the Great Pacific Garbage Patch?

I saw plastic bottles, lots of tiny white pieces of plastic, sticks, and broken things.

2. What did the green and red lentils represent?

The green lentils represented food, like plankton. The red lentils represented microplastics eaten by the fish.

3. When you stacked a bigger fish on top of a smaller fish what did it represent or show in a food chain?

When we stacked the larger fish on top of the smaller fish it showed that the larger fish ate them.

4. Describe what is happening to the number of microplastics as you move up the food chain.

As the larger fish ate the smaller fish, they also ate the microplastics inside it. Each time a fish was eaten, the number of microplastics in the larger fish increased. Fish 4 had the most microplastics.

Data Table

Fish #	# of Microplastics Eaten	Total # Microplastics
Fish 1		
Fish 2		
Fish 3		
Fish 4		

5. What are two harmful things that microplastics do to fish that mistakenly eat them?

Microplastics remain in the fish's stomach making them feel full. Microplastics have chemicals that are passed on from smaller fish to larger fish.

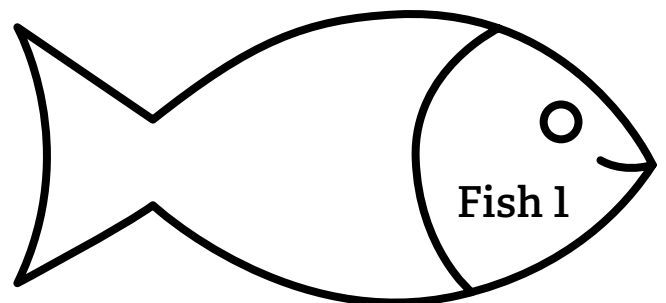
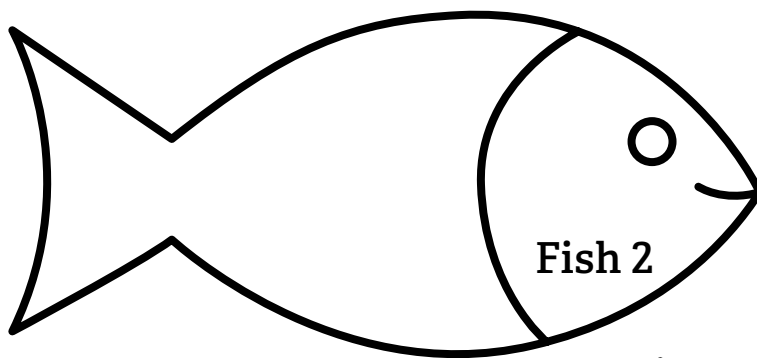
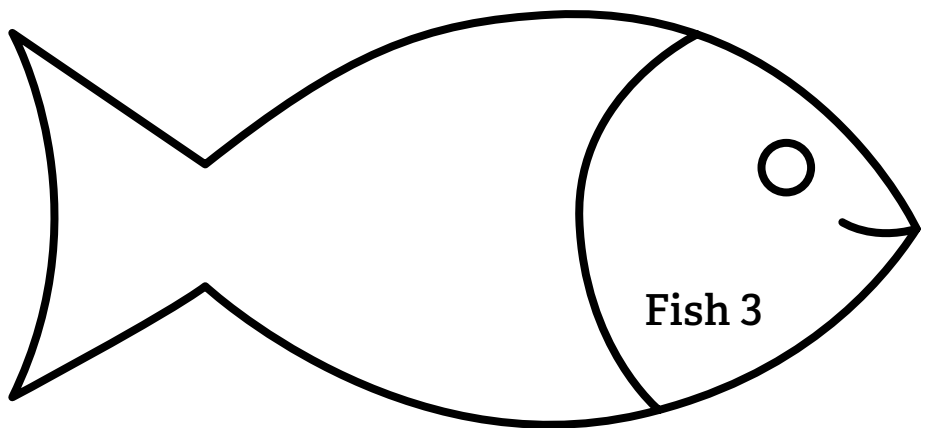
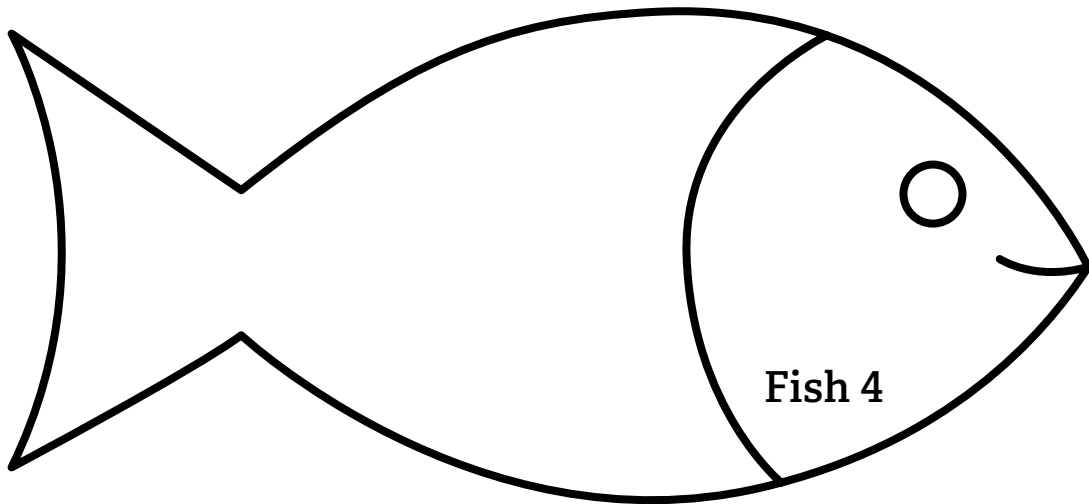
6. What can you do to keep microplastics and larger plastics out of the waterways and oceans?

We can keep plastics out of the ocean by not littering and picking up litter that we see on the ground, especially plastics. We can reduce our use of single-use or disposable plastics.

Lesson Plan 8 - Plastics in Marine Life - Activity Sheet 3

FISH TEMPLATE

Trace each fish in a different color onto your plastic sheet.



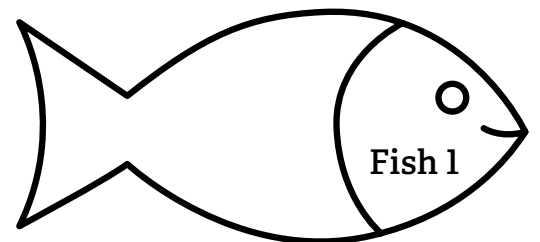
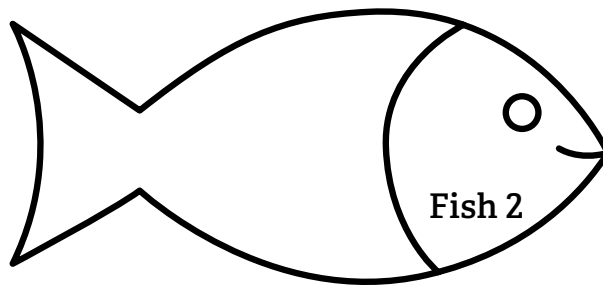
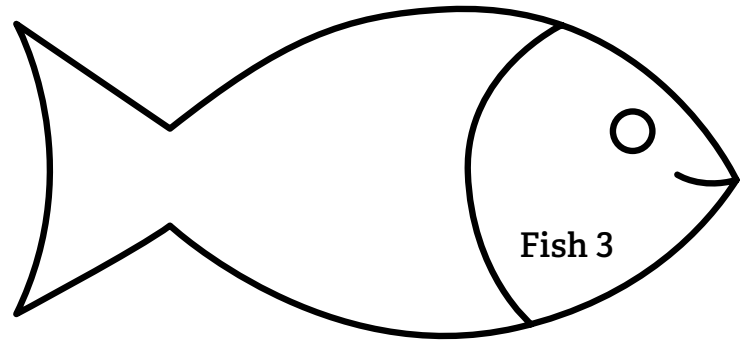
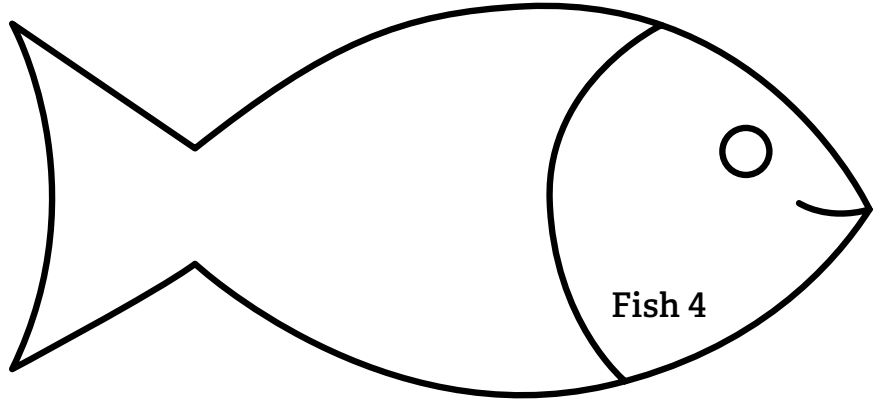
Lesson Plan 8 - Plastics in Marine Life - Activity Sheet 4

FISH ACTIVITY

Name: _____ Date: _____

Instructions: Draw and then write the number of microplastics for each fish in the boxes.

Fish 4 _____ microplastics
Fish 3 _____ microplastics
Fish 2 _____ microplastics
Fish 1 _____ microplastics




Which fish has the highest number of microplastics? _____

Lesson Plan 8 - Plastics in Marine Life - Activity Sheet 5

CLASSROOM PLASTIC INVENTORY

Name: _____ Date: _____

#	Plastic Item Count	 #RIC	Can the item be recycled?		Is it a single-use item?	What item can you replace the non-recyclable item with?	How can you reuse the item?
			Yes	No			
1	Plastic Spoon	No		X	Yes	A Metal Spoon	Make a marshmallow catapult, measure dry materials in a lab
2							
3							
4							
5							
6							
7							
8							
9							

Look at our **Classroom Plastic Inventory** data. How many plastic items are not recyclable? _____

How can we reduce our use of single-use or disposable plastic? Write your answer below.

Lesson 9

RECYCLING AT HOME

Lesson Focus

In this lesson, students will sort trash they have brought from home into recyclable, specialty business recycling, or trash for the landfill.

Lesson Objective

- Students will be able to define trash and recycling.
- Students will be able to give two reasons why recycling is important.
- Students will be able to distinguish whether a household waste item is recyclable or trash for the landfill.

Grade Level	Duration	Subject Area	Vocabulary
3	50 Minutes	Science	recycle, trash

Louisiana Student Standards for Science

3-LS4-4

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Materials List

Per Student

- 1 bag with 5 clean household trash items
- 1 copy of **Activity Sheet #1**

Per Pair of Students

- A bag with 6 trash items that the teacher makes (*see advance preparation*)

Per Class

- 3 empty cardboard boxes labeled: recyclable, specialty business recycling, and trash for the landfill
- 1 large box to hold all the collected trash items that the students bring from home
- 1 copy of **Activity Sheet #2** for reference

Activity Sheets

- Recycling Data Sheet
- Where To Put My Waste

Advance Preparation

1. A few days before this lesson is to be taught, ask students to bring to school five clean, household trash items that they think can be recycled and a few that they think cannot be recycled.

Lesson 9

RECYCLING AT HOME

2. Collect the items they bring and put all the items into one large box. The box should be filled with an assortment of recyclable items, trash that cannot be recycled, as well as items that can be recycled at certain businesses, which we are calling "specialty business recycling." You should add specialty recycling items such as empty printer cartridges, charging cables, batteries, etc. to the box. See **Activity Sheet #2** for a detailed listing of recyclable items, trash, and specialty recyclables.
3. Gather individual bags so that each student in your class will have one bag.
4. From the large box of items that you collected from the students, fill a bag for each student with three items. Be sure that each bag has at least one item that cannot be recycled such a glass light bulb, Styrofoam, photographs, or a straw.
5. Prepare three cardboard boxes with labels: recyclable, specialty business recycling, and trash for the landfill.

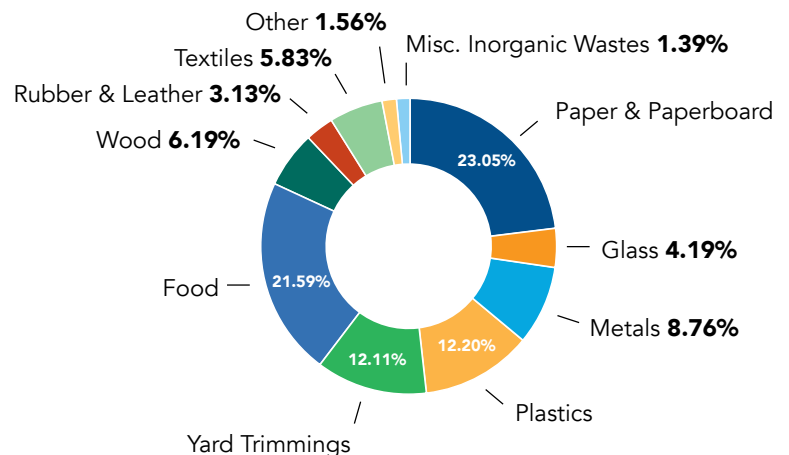
Background Information

Most of us don't spend a great deal of time thinking about how much trash we generate. In 2018, Environmental Protection Agency estimated that each person in the United States generated 4.9 pounds of trash per person per day (EPA, 2022). This totals 292.4 million [U.S. short] tons of trash. Of this amount, nearly 69 million tons, or roughly a quarter, of the trash was recycled. About half of the 292.4 million pounds of trash was landfilled.

Much of the **trash**, or the items consumers throw away after they are used, can be **recycled** or used to produce materials that can be used again. In Figure 1, the graph shows the proportions of the various types of municipal solid waste (household trash). As can be seen, many of these materials can be recycled. Recycling is very important because it keeps unnecessary materials out of the landfills and leaves more room for materials that cannot be recycled.

Knowing what can be recycled and what needs to be thrown away is an important step in how to manage our waste properly. Many household items can be recycled but are not. At the end of this lesson is a listing of what can be recycled and what should be tossed into the trash. Some items can be recycled (electronics, batteries, plastic grocery bags, etc.) through specific recycling efforts of retailers. We are referring to this as Specialty Business Recycling.

Total MSW Generated by Material, 2018
292.4 million tons



Total municipal solid waste generated by material, 2018. (EPA 2022)

References

- US Environmental Protection Agency. (2022). National Overview: Facts and Figures on Materials, Wastes, and Recycling. Available at <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>
- This lesson has been modified from Vermont Department of Environmental Conservation. <https://dec.vermont.gov/sites/dec/files/wmp/SolidWaste/Documents/Don't%20Throw%20Away%20Our%20Future.pdf>

Procedure

Engage – 10 Minutes

1. Watch Learn Bright, Clarendon Learning. (2021) **Recycling for Kids** <https://www.youtube.com/watch?v=Fex-wvrOZf4> (6:38) This video covers the basics of recycling for children.
2. Ask students:
 - **What is recycling?** It is taking used materials and turning them into new products that we can use again.
 - **Why is recycling important?** It helps to protect our natural resources like energy and water, and it reduces waste.
 - **What are the three steps to successful recycling?** 1) Collecting recyclable materials. 2) Sorting the recyclable materials by categories. 3) Processing the materials at a facility to prepare them to be made into another product.
 - **What are the three Rs?** Reduce, Reuse, and Recycle.

Explore - 15 Minutes

1. Distribute **Activity Sheet #1** and one bag containing three household trash items to each student. Have students work together in pairs for this activity.
2. Ask students:
 - **What is trash?** It is something that is used and then discarded.
 - **Where does trash go?** Garbage trucks collect trash from the receptacles placed on the curb at our home or from a dumpster at a business. The trash is taken to a landfill.
 - **What does it mean to recycle?** Recycling is when certain items are collected, sorted and processed into new or different items. Recycling keeps trash out of the landfill.
3. Working together, the pair of students should examine the items in their bags. Using **Activity Sheet #1**, they will write a description of the items, determine if the item is recyclable (i.e. newspaper, plastic bottle, aluminum can), a specialty business recycling (i.e. ink cartridge, plastic grocery bag, battery), or trash for the landfill (i.e. Styrofoam egg carton, plastic film, plastic straws) and put a tally mark in the appropriate column. If the item is made of plastic, they should look for the plastic recycling number on the item and enter the number in center of the recycling icon ♻️.
4. Students should add the tally marks in each column and complete the sentences at the bottom of **Activity Sheet #1**.

Lesson 9

RECYCLING AT HOME

Explain - 25 Minutes

1. Place the three labeled boxes: recyclable, specialty business recycling, and trash for the landfill in front of the classroom.
2. Have each pair of students choose one or two items from their bag. Taking turns, they will describe the items to their classmates. They will then decide if the item can be recycled or not and place it in the correct labeled box. The students should explain how they made their decision.

Expand – 15 Minutes (Optional)

1. Watch, **Why Is Recycling Important for Kids**, https://www.youtube.com/watch?v=l8Kny-t_nps (11:16)
2. Ask students:
 - **How many pounds of trash does a single person throw away?** *Over four pounds.*
 - **What is a landfill?** *A landfill is a place where trash is buried.*
 - **What are some items that can be made from recycled paper?** *Toilet paper, tissue paper, newsprint, school paper, and paper plates can all be made from recycled paper.*
 - **How many trees can 1 ton of recycled paper save?** *One tree.*
 - **How many times can plastic be recycled?** *Multiple times.*
 - **How long does aluminum last on the Earth's surface?** *Over 500 years.*
 - **Are old computers recyclable?** *Yes, you should check with your local recycling providers to find a business in your area that accepts them.*

Take Action

1. Students should share what they learned with their parents. Together they can identify all the household items that can be recycled and make a list of them. Post the list on the refrigerator door as a reminder to not throw those items in the trash can.
2. Have students write a letter to the principal explaining why recycling is important and giving two examples of items that can be recycled at school and at home.

Evaluate - 5 Minutes

1. **Activity Sheets #1** can be assigned a grade.

Online Resources

Generation Genius. (n.d.). **Reducing Our Impact on the Earth.**

<https://www.generationgenius.com/videolessons/reducing-our-impact-on-earth-video-for-kids/>

This website includes 5E lesson plans, reading material, quiz games, DIY activities and more. Requires creating a free account.

Homewood Disposal Service. (n.d.). **Planet Protectors: Teaching kids how to recycle and save the environment.** <https://mydisposal.com/kids>

This website has videos, stories, activities, and recycling education kits.

Learn Bright, Clarendon Learning. (2021). **Recycling for Kids.**

<https://www.youtube.com/watch?v=Fex-wvrOZf4> (6:38)

This video covers the basics of recycling for children.

Lesson 9

RECYCLING AT HOME

SciShow Kids. (2016). **How Recycling Works.**

<https://www.youtube.com/watch?v=VIRVPum9cp4> (4:09)

Humans make a lot of trash every day. The video discusses what happens to our waste and how it is recycled.

Children's Books

Estrada, E. (2021). **I Choose to Reduce, Reuse and Recycle.**

Independently Published. ISBN-13: 989-8513457299

Written in poetic verse, this book teaches green practices and how taking small steps will positively impact the earth. Ages 4 - 10 years.

Read aloud at <https://www.youtube.com/watch?v=5zu5jQspcT8> (4:18)

Green, J. (2005). **Why Should I Recycle? Helping Kids Take Care of Planet Earth.**

Sourcebooks Explore. ISBN-13: 978-0764131554

This book shows children the importance of recycling things we might normally throw away.

Ages 3 - 6 years. Read aloud at https://www.youtube.com/watch?v=vaHmtCA_BjM (3:15)

Tornio, S. (2021). **This Class Can Save The Planet. Be a Good Human Company.**

ISBN-13: non – a Kindle edition book

This book shows children they can have an incredible impact on the Earth if they work together. It shows students what they can do to make a difference. Ages 4 - 12 years. Read aloud at

<https://www.youtube.com/watch?v=2iB23uVKHVw> (2:46)

Weitzman, E. (2016). **10 Things You Can Do to Reduce, Reuse, and Recycle.**

Children's Press. ISBN-13: 989-0531227602

This book shows children it is easy to recycle and reduce the amount of trash we produce. Ages 7 - 8 years.





Lesson Plan 9 - Recycling at Home - Activity Sheet 1

RECYCLING DATA SHEET

Name: _____ Date: _____

Directions: For each item in your bag decide whether it can be recycled or not.

- 1. Write a brief description of the item.
- 2. Make a tally mark in the column in which you think the item belongs.
- 3. If you have a plastic item, look for the plastic recycling number and write it inside the recycling symbol.
- 4. Remember some items can be recycled by businesses. Those should go in the Specialty Business Recycling column.

	Brief Description	Can the item be recycled?			Specialty Business Recycling	Trash for the Landfill
		Paper Cardboard	Plastic	Tin or Aluminum		
1						
2						
3						
4						
5						
6						
7						

In our bags, we had _____ items that could be recycled out of our 10 items.

We had _____ paper or cardboard items.

We had _____ plastic items.

We had _____ aluminum or tin cans.

We had _____ special business recycling items.

We had _____ items that are trash for the landfill.

Lesson Plan 9 - Recycling at Home - Activity Sheet 2

WHERE TO PUT MY WASTE?

Name: _____ Date: _____

WHAT CAN BE RECYCLED AND WHAT GOES IN THE TRASH CAN

Check your local listing to see what can be recycled in your area.

Paper		
Recycle		Trash / Landfill
Junk mail	Paperboard boxes - cereal, tissue, frozen food boxes	Photos
White or colored paper	Gift catalogs, magazines	Hardcover books
Gift wrap	Newspaper	Cardboard greasy pizza boxes
Paper bags	Cartons - milk, juice, broth, soup, and others	Paper plates with food remnants
Flattened cardboard boxes		Paper towels
Paperback books		Tissue paper
File folders, office paper, envelopes		Waxed paper

Plastic			
Recycle		Trash / Landfill	
Plastics #1-5 & #7	Tops and lids from plastic containers	Plastics #6	Plastic wrap and film
Plastic bottles	Water bottles	Plastic coat hangers	Clamshell take out packaging
Rinsed out plastic food containers	Milk jugs	Plastic toys	Hard plastics like chairs and toys
Detergent bottles	Soda bottles	Plastic grocery bags	Plastic solo cups
Shampoo bottles		Six-pack rings	Plastic silverware
Rinsed household cleaner bottles		Packing bubble wrap	Large yard/garbage bags
Rinsed bleach bottles		Styrofoam	Snack bags and packaging
			Straws

Metal / Aluminum	
Recycle	Trash / Landfill
Aluminum cans	Aerosol cans
Tin cans	Wire Hangers
Rinsed food and pet cans	Non-food metal items
Metal Cans	

Lesson Plan 9 - Recycling at Home - Activity Sheet 2

WHERE TO PUT MY WASTE?

Specialty Recycling - Glass	
Recycle	Trash / Landfill
Glass food jars (remove lids)	Light bulbs
Glass containers	Mirrors
Glass beverage bottles	Window glass
	Drinking glasses
	Dishes

Specialty Recycling	
Recycle	Trash / Landfill
Printer ink and toner cartridges	
Electronics and computer hardware	
DVDs	
Mobile phones	
Telephone and computer cables	
Computer monitors	
Laptops	
Computers	
Xboxes and PlayStations	
Printers	
Batteries	
Paint	
Plastic shopping bags in some areas	

Lesson 10

WHAT IS A WATERSHED?

Lesson Focus

Students will learn how rain and runoff water moves through a watershed, picking up natural and human-caused pollutants and carrying them to larger bodies of water. This lesson should be taught after the biosphere, geosphere, hydrosphere, and atmosphere have been introduced to students.

Lesson Objective

- Students will be able to define the term watershed.
- Students will be able to explain how water moves through a watershed.
- Students will be able to explain how litter moves with rainwater and runoff water through a watershed.
- Students will be able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in their watershed model.

Grade Level	Duration	Subject Area	Vocabulary
3-5	1 Hour, plus independent practice for the next day	Science	watershed, ridgeline, tributary, runoff, basin, geosphere, biosphere, hydrosphere, atmosphere

Louisiana Student Standards for Science

3-LS4-4

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

5-ESS2-1

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environment.

Materials List

Per Pair of Students

- 2 pieces of copy paper (8.5" x 11")
- 1 copy of **Activity Sheet #1**
- 1 copy of **Activity Sheet #2**
- 1 blue washable marker
- 1 teaspoon of "litter glitter"

Lesson 10

WHAT IS A WATERSHED?

Per Class

- 2-3 staplers
- 1 bottle of glitter (preferably biodegradable, available at Amazon)
- 1 spray bottle filled with water

Activity Sheets

- Watershed Base
- Creating a Watershed Model
- Parts of a Watershed
- The Mississippi Watershed

Advance Preparation

1. Make copies of **Activity Sheet #1** (1 for every 2 students).
2. Make copies of **Activity Sheet #2** (1 for every 2 students).
3. Make copies of **Activity Sheet #3** (1 for every student for the following day or assessment).
4. Make copies of **Activity Sheet #4** (1 for every student for the following day or assessment).
5. Gather materials.

Background Information

No matter where you live, your home is situated in a watershed. A **watershed** is an area of land that drains rainfall and snowmelt from tributaries to lakes, rivers, and eventually outflow points like reservoirs, lakes, and oceans. All watersheds have a large river or main stem with smaller rivers or streams branching off from it. These smaller rivers or streams are called **tributaries**. A watershed includes all the land, mountains, groundwater, plants and animals, cities, farms, and people in its boundaries. **Ridgelines** are high areas of land that form the boundaries of watersheds. When precipitation falls in a watershed, it flows down from the ridgelines to lower bodies of water such as bayous, streams, and rivers and eventually to a drainage **basin**. A drainage basin is an area of land where all flowing surface water converges to a single point, such as a river mouth, or flows into another body of water, such as a lake or ocean. A watershed is an excellent example of how the atmosphere and hydrosphere (precipitation) interacts with the geosphere (the land) and biosphere (living things such as plants and animals).

The **biosphere** includes all living things on Earth. The **atmosphere** is the mixtures of gases, including water vapor surrounding the Earth. **Hydrosphere** is the total amount of water on our Earth. It includes water that is on the surface, underground, and in the air. The **geosphere** includes the rocks and minerals on Earth - from the molten rocks and heavy metals in the deep interior of the planet to the sand on beaches and peaks of mountains (Center for Science Education, 2024).

The hydrosphere interacts with the atmosphere through processes like evaporation and precipitation. Water evaporates from bodies of water and enters the atmosphere as water vapor. This water vapor can then condense to form clouds and eventually fall back to the watershed as precipitation and flows down the slope of the ridgelines (geosphere) into bodies of water such as a lake. Water in the lake (hydrosphere) seeps into

Lesson 10

WHAT IS A WATERSHED?

the ground, becoming groundwater (geosphere), or evaporates into the air (atmosphere). Animals, including humans (biosphere) live, play, drink, and sometimes contaminate the water (hydrosphere) in a watershed.

The fourth-largest watershed in the world, the Mississippi River watershed, reaches from the Allegheny Mountains in the eastern United States all the way to the Rocky Mountains in the West, encompassing regions from 31 states and two Canadian provinces in its drainage area. The Mississippi River Watershed has many tributaries, each of which has its own watershed. The Mississippi River Watershed empties into the Gulf of Mexico, which flows to the Atlantic Ocean.

Even the water that you see dripping down a car window shield, pooling in a street, or in a litter-filled ditch flows to a wetland, a river, or an ocean. When rainwater hits impervious surfaces (surfaces that do not allow water to go through them) such as pavement, roofs, or vehicles, it can't soak into the ground, and instead must flow across the hard surface. This water is known as **runoff**. In the process, this runoff water picks up litter, soil, debris, or chemical contaminants carrying them to storm drains. Heavy precipitation events can lead to a decrease in water quality by washing litter and other pollutants into local waterways. Because of the interconnectivity of watersheds, what may seem like a small action in one area of the watershed can have a big impact on natural systems further down in the watershed, including the plants, animals, and people (NOAA, 2019). This is why it is important that we dispose of household chemicals properly and that we clean up litter on our streets and highways. "As water runs over and through the watershed, it picks up and carries contaminants, litter, and soil. (NOAA, 2019)." Learning about watersheds can help students develop understanding and appreciation for the relationship that we have with our environment and a desire to take care of it.

References

- Keep Louisiana Beautiful. (2019). Rocksey's Toolbox, Lesson 4.
- National Ocean and Atmospheric Administration (NOAA). (2019). Watersheds, flooding, and pollution. Accessed at <https://www.noaa.gov/education/resource-collections/freshwater/watersheds-flooding-and-pollution>
- National Environmental Education Foundation (NEEF). (2024). Lesson 1: Watershed Basics. Accessed at <https://www.neefusa.org/water/lesson-1-watershed-basics>
- The Center for Science Education. (2024). How Climate Works. <https://scied.ucar.edu/learning-zone/how-climate-works/biosphere>

Procedure

Engage – 5 Minutes

1. Watch, **A Plastic Ocean** trailer (2:03), <https://www.aplasticocean.movie>
2. Ask students: **Where did all this litter come from?** Acknowledge all answers. This movie and question aim to start your students thinking about Louisiana's litter problem and help them realize that much of the marine debris comes from litter thrown on the streets. As students learn about watersheds, they will understand how litter can be carried to the oceans by rainwater and wind. This question also gives you an idea of their prior knowledge about the litter problem in waterways and the oceans.

Lesson 10

WHAT IS A WATERSHED?

Explore - 30 Minutes

1. Distribute materials and explain to your students how they will work with a partner to create a watershed model by completing the steps on **Activity Sheet #2**. To make the watershed model students should use both sheets of paper to make the model sturdy enough to hold up, especially once water is sprayed on it.
2. Once students have completed their watershed models and have labeled their basins, they should raise their hands.
3. Sprinkle a teaspoon of "litter glitter" on their models and explain that it represents all the litter in a watershed.
4. Ask students:
 - **What do you think will happen to the water when it rains on your model?** *The rainwater will travel from the high ridgelines to the low places like lakes and oceans through a river and its tributaries.*
 - Have your students trace the paths that they think the water will travel. Explain that there may be multiple paths and watersheds in their model. The paths they trace should begin at ridgelines and end at their basins. The basins should be labeled with X's.
 - **What do you think will happen to the litter glitter when it rains?** *The water will carry the litter glitter to the lowest point.*
5. Spray their model with the water bottle five times, stopping after each spray for students to observe. The water sprayed on the model represents rainfall. Students should observe the water traveling from high points to low points carrying the litter glitter with it. They should also notice that the water, along with the litter, accumulates in the lowest spots or basins such as lakes and oceans.
6. Ask students: **What happened to the litter glitter when it rained?** *It was carried by the water to the lowest point.*
7. Ask students: **Can you give me examples from your watershed model that demonstrated interactions between the geosphere, atmosphere, hydrosphere, and biosphere?** *The hydrosphere interacts with the atmosphere through processes like evaporation and precipitation. In our model the rainwater coming from the atmosphere rained down on our mountain and its ridgelines (geosphere) and formed rivers and streams that flowed to the ocean (hydrosphere). Living things (biosphere) live in the rivers, lakes, and oceans and drink the water. The litter glitter represented the litter that people (biosphere) dropped on the land (geosphere) in the watershed. The rainwater (hydrosphere) carried it through the watershed and deposited it in the ocean (hydrosphere) and on the land (geosphere). The litter in the water and on the land is a hazard for all wildlife (biosphere).*

Explain - 25 Minutes

1. Place students' watershed models on desks or on a table. Have students stand around the table or desks and observe the models.
2. Review water flow in watersheds by pointing to the blue path created by the rainwater. Point to the ridgelines and explain that they are the boundaries of a watershed.
3. Ask students: **What do we call this area?** *It is a watershed.* **What is a watershed?** *It is the area where all water drains from the highest point to the lowest point, which eventually is a lake or ocean.*
4. Have students use the ridgelines to find the watersheds in their models.
5. Have students point out where the water has been contaminated with the litter glitter.

Lesson 10

WHAT IS A WATERSHED?

6. Ask students: **Where do you see the litter glitter in the water's path or oceans?** Students should point to the various places the litter glitter has settled.
7. **Remember the video? Where did all the litter in that ocean come from?** Students should explain that litter is carried to the oceans by rainwater traveling through a watershed. They should give examples from their models.
8. **Independent Practice for the next day.** Students can practice labeling the parts of a watershed with **Activity Sheet #3**. They should have access to a computer to look up answers. This activity sheet could also be used as an assessment after they have learned the parts of a watershed.
9. **Independent Practice for the next day.** Students can learn about the Mississippi Watershed with **Activity Sheet #4**. This activity sheet could also be used as an assessment after they have learned the parts of a watershed. **The Rivers of the Mississippi Watershed** animation can be accessed at <https://svs.gsfc.nasa.gov/4493>. This animation starts with the points furthest from the Gulf and reveals the streams and rivers as a steady progression towards the mouth of the Mississippi until all the major rivers are revealed.

Expand (Independent Practice for the next day) – 20 Minutes (Optional)

1. Have your students visit the **Central Sierra Environmental Resource Center** site at the link listed below. At this site students will learn ways that the geosphere, biosphere, hydrosphere, and/or atmosphere interact in a watershed. They can reinforce their knowledge of watersheds with the watershed diagram, learn the steps and sequence of the water cycle, and learn how to keep a watershed clean by playing the Watershed Game. In the Watershed Game, many different people and corporations are polluting a watershed. Their task is to complete each scenario to clean up and protect the watershed.
Central Sierra Environmental Resource Center. Accessed at <https://www.cserc.org/sierra-fun/games/watershed-game>.
2. Project a picture from one of the **Watershed Game** scenarios on a wall or board. If you can't project a picture, you could print a picture for each pair of students.
3. Ask students to give you examples of the geosphere, hydrosphere, atmosphere, and biosphere interacting in the scenario.
4. Have students use the **USGS Streamer Tool** to trace the Mississippi River from the Gulf of Mexico (its basin to its source) and to explore where different rivers start and end. Accessed at <https://water.usgs.gov/streamer/web>
5. Directions:
 - Read the directions and click on **Go to Map**
 - **Map tools** are in the upper-right corner
 - Move the **Zoom Slider** below the second line
 - Click on **Trace Upstream or Trace Downstream**
 - Click on a **river on the map**
 - The tracer will start tracing the river downstream or upstream
 - **Hover your cursor over the red dot** and details about the river will pop up, including the river name and its outlet waterbody

Lesson 10

WHAT IS A WATERSHED?

Take Action

1. Host a screening of the movie, **A Plastic Ocean**, one evening at your school or during school to educate your school community about the litter problem in the ocean. This would be a good school activity to do during Earth Day week. Invite parents and neighborhood members. Ask your school or parent teacher organization to pay for the screening of the movie as there is a fee associated with the screening. The application can be found on this site: <https://www.aplasticocean.movie>.
2. Discuss ways that we can keep litter out of bodies of water, including the oceans. Contact a local organization or neighborhood and ask them if you could have a Saturday Litter Pick up Day in the park, walking path, or natural area away from traffic in their neighborhood. Plan a Saturday Litter Pick up Day with parents and students.

Evaluate

1. Completed Watershed Model, **Activity Sheets #3** and **#4**.
2. **Go to Quizlet** <https://quizlet.com>. There are prepared watershed study sets that your students can study. You can create a quizlet test from the study sets.
3. **Activity Sheets #3** and **#4** could also be used as an assessment after students have learned the parts of a watershed.

Online Resources

Jacobs, F. (February 3, 2019). **The World's Watersheds Mapped in Gorgeous Detail. Strange Maps.**

<https://bigthink.com/strange-maps/gorgeous-river-watershed-maps>

This article features colorful watershed maps of all the world's watersheds. Each shows the flow of tributary streams into main rivers and water courses into the sea or final destinations inland. The streams are shown in the Strahler Stream Order Classification, which uses width to indicate the hierarchy of streams. Watersheds (a.k.a. drainage basins or catchment areas) are grouped by color. Ages 8 years to Adult.

North Texas Municipal Water District. **What is a Watershed?**

<https://www.youtube.com/watch?v=QoqgzJAF6LQ>

Do you know what a watershed is? By protecting your watershed and the environment around it, you can help improve the quality of the water you drink. (1:09)

SCVWD Valley Water. (2020). **Watershed Maps: A Hands-On Map-making Activity.**

Accessed at Watershed Maps: A Hands-On Map-making Activity ([youtube.com](https://www.youtube.com)).

This Watershed Maps activity is similar to the one in this lesson. This video also gives information on taking care of watersheds and has good pictures of litter in waterways and clogged storm drains. Participants will learn about watersheds and see how taking care of our environment has an impact on the quantity and quality of our local water supply! (12:59).

One Cool Earth. (no date). **Marine Debris Prevention Best Practices Manual. NOAA.**

https://marinedebris.noaa.gov/sites/default/files/publications-files/OCE_Marine_Debris_Prevention_Best_Practices_Manual_2022.pdf

This is an informational resource to assist schools in preventing marine debris. Includes lessons and resources. Ages 5 years to Adult.

Lesson 10

WHAT IS A WATERSHED?

Project WET Water Education Today. (no date). <https://www.projectwet.org/>

Project WET: Water Education Today is dedicated to solving critical environmental challenges by teaching the world about water. They do this by providing hands-on, science-based water education resources to formal and non-formal educators around the world. This link will take you to their publications page where you can purchase and download their educational resources and books.

Niagara Peninsula Conservation Authority. (2018). **What is a Watershed?**

Accessed at <https://www.youtube.com/watch?v=9isAx64liSc>

This video asks you to think of a watershed as a bathtub. The video explains the parts and function of a watershed. (2.08).

Geography Realm. (2018). **Geography Facts: Mississippi Watershed.**

Accessed at <https://www.youtube.com/watch?v=tuxQ7Ghdmgg>

This video shows all the tributaries of the Mississippi River Watershed (MRW) and gives facts about the MRW. (2.80).

Children's Books

Beck, G. (2022). **Watersheds: A Practical Handbook for Healthy Water.**

Firefly Books. ISBN 0228103231.

The book explains ecological principles and environmental challenges, introduces North America's major biological regions, outlines the complexities of water and nutrient cycles, and explains the ecology of wetlands and waterways. This book also explains some of the major environmental issues facing North America, including air pollution, water pollution, invasive exotic species, and habitat loss and destruction. Ages 8 years to Adult

Crowley, J. (2019). **Song of the River.**

Gecko Press. ISBN 177657253X

Cam, a mountain boy, follows the river from its trickling source in the mountain snow all the way to the coast. The river leads him through forests, farms, and towns to the salty wind of the sea. Dramatic landscape illustrations evoke a North American landscape and are packed with details to explore the world of the river. Ages 5 - 8 years.

Project WET Foundation. (1999). **Big Rivers.**

Project WET Foundation. ISBN 1-8886314-44-9

Available at <https://store.projectwet.org/products/big-rivers-download>

Readers explore big rivers and watersheds in North America. They will meet famous river explorers, calculate a river's rate of flow, discover how unique the river environment is, and recognize the role of water managers. Ages 8 - 14 years.

Project WET Foundation. (2008). **Watershed Protection.**

Project WET Foundation. ISBN 978-1-888631-29-6.

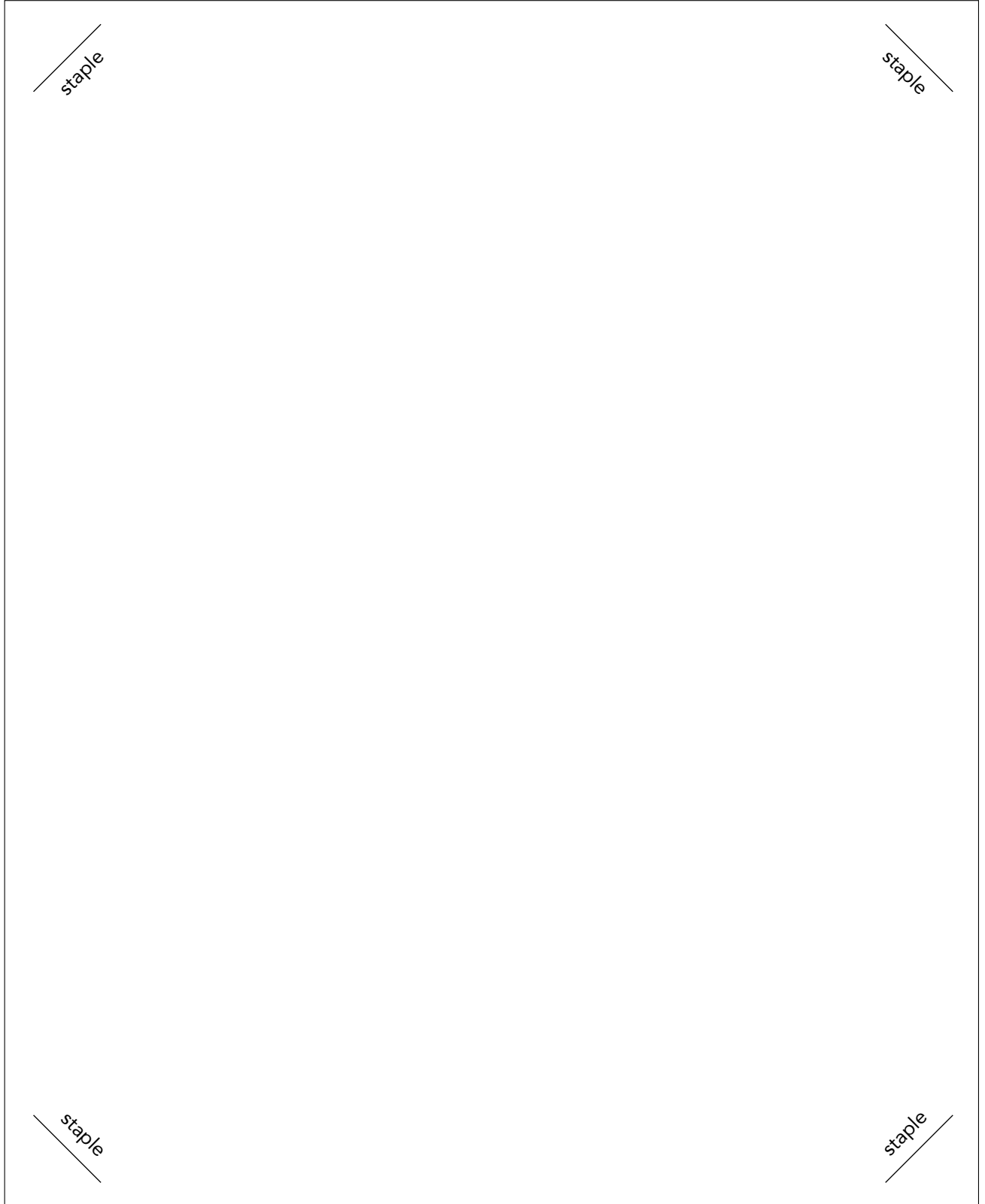
Available at <https://store.projectwet.org/products/watershed-protection-kids-activity-booklet>

Through this colorful activity booklet, watersheds not only come to life, but kids will discover how to help protect the many types of life that live in each unique habitat. Filled with engaging activities, students will soak in every drop of information. Ages 8 - 14 years.

Lesson Plan 10 - What is a Watershed? - Activity Sheet 1

WATERSHED BASE

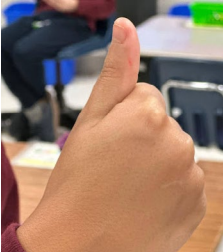


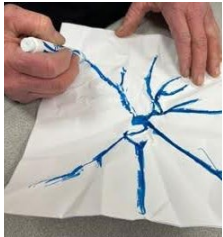
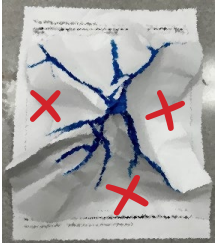
Name: _____ **Date:** _____



Lesson Plan 10 - What is a Watershed? - Activity Sheet 2

CREATING A WATERSHED MODEL

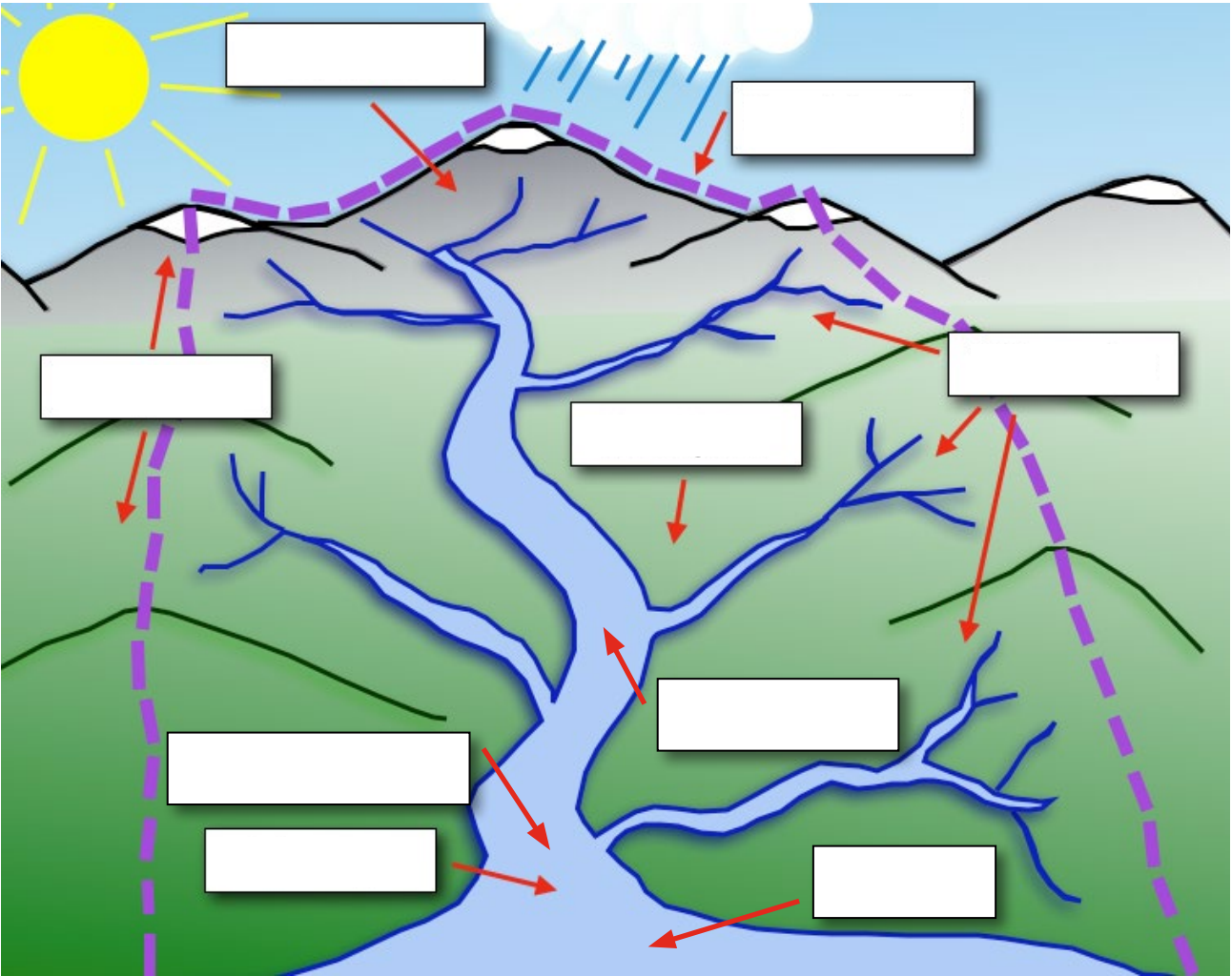
Name: _____ Date: _____

Step 1	Partner 1 <ul style="list-style-type: none">Make a fist with your thumb extended higher than the rest of your fist.	
Step 2	Partner 2 <ul style="list-style-type: none">Place 2 pieces of paper over Partner 1's fist.Crumple the papers around Partner 1's fist.This will create a "mountain" in the middle of your land.	
Step 3	Partner 2 <ul style="list-style-type: none">Uncrumple your paper "land".What does it look like?Find the ridgelines. They are the highest lines on your land and divide the watersheds.	
Step 4	Partner 1 & 2 <ul style="list-style-type: none">Use a blue washable marker to color your ridgelines. Make thick lines (1/4 inch).	
Step 5	Partner 1 & 2 <ul style="list-style-type: none">Line up the top and bottom of your land with the top and bottom lines on Activity Sheet #1.Staple the top and bottom of your land to Activity Sheet #1.Put X's where you think the rainwater will travel.With your finger trace the ridgelines surrounding your basins. These ridgelines divide your watersheds. How many watersheds do you have in your model?	

Lesson Plan 10 - What is a Watershed? - Activity Sheet 3

PARTS OF A WATERSHED

Name: _____ Date: _____



Central Sierra Environmental Resource Center. (no date). Accessed at <https://www.cserc.org/sierra-fun/games/watershed-game/>

Use these words to label the parts of your watershed.

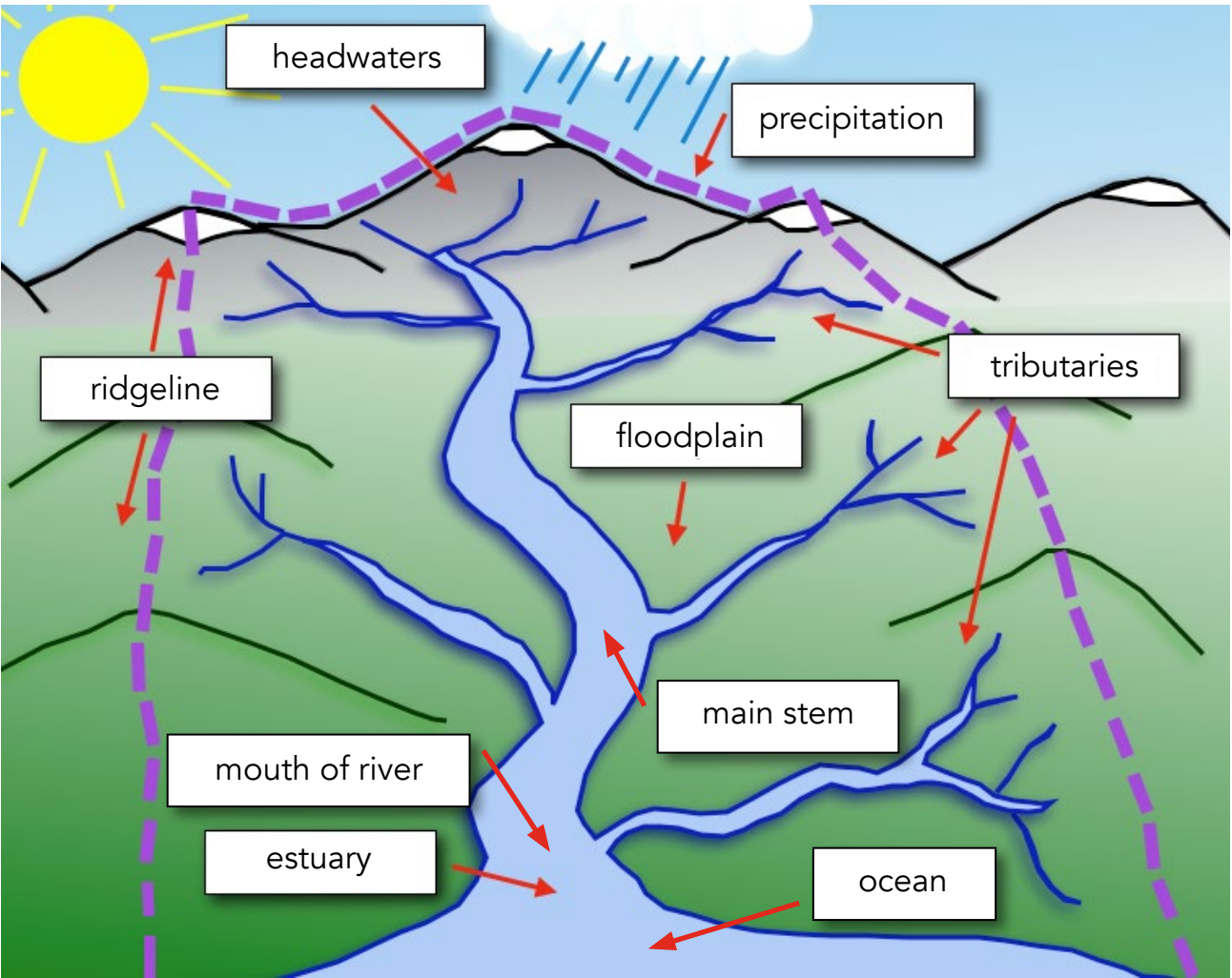
headwaters	ridgeline	estuary
floodplain	main stem	tributaries
precipitation	mouth of river	ocean

What is a watershed?

Lesson Plan 10 - What is a Watershed? - Activity Sheet 3

PARTS OF A WATERSHED - KEY

Name: _____ Date: _____



Central Sierra Environmental Resource Center. (no date). Accessed at <https://www.cserc.org/sierra-fun/games/watershed-game/>

Use these words to label the parts of your watershed.

headwaters	ridgeline	estuary
floodplain	main stem	tributaries
precipitation	mouth of river	ocean

What is a watershed?

A watershed is an area where rain and other water flows from the land into a common waterway.

Lesson Plan 10 - What is a Watershed? - Activity Sheet 4

THE MISSISSIPPI RIVER WATERSHED

Name: _____ Date: _____



1. What are the 6 tributaries of the Mississippi River Watershed?

2. Draw a circle at the spot where the Mississippi River flows into an ocean.

3. The Mississippi Watershed flows into the _____ .

4. The Gulf of Mexico is part of the _____ Ocean.

5. Draw a star to show where your city or town is located in the Mississippi River Watershed.

Lesson Plan 10 - What is a Watershed? - Activity Sheet 4

THE MISSISSIPPI RIVER WATERSHED - KEY



1. What are the 6 tributaries of the Mississippi River Watershed?

Red River, Arkansas River, Missouri River, Ohio River, Tennessee River, Platte River

2. Draw a circle at the spot where the Mississippi River flows into an ocean.

3. The Mississippi Watershed flows into the Gulf of Mexico.

4. The Gulf of Mexico is part of the Atlantic Ocean.

5. Draw a star to show where your city or town is located in the Mississippi River Watershed.



LIEUTENANT GOVERNOR
BILLY NUNGESSER