



Activity Book

For grades 5-8



SPLASH

STOPPING PLASTICS AND
LITTER ALONG SHORELINES

by Celeste Silling

SPLASH

Stopping Plastics and Litter Along Shorelines (SPLASH), is a nonprofit conservation program focused on addressing trash pollution and wildlife conservation in the greater Houston-Galveston region. We do this by creating a cleaner environment for people, birds, and other wildlife through community science, education, and outreach.

In this activity book we cover the issue of marine debris, how it travels, the effects it has on wildlife, and how we can study and solve this problem.

SPLASH was founded by American Bird Conservancy, Gulf Coast Bird Observatory, and Black CAT GIS. To learn more about SPLASH, our research, our education work, and our cleanups, visit us at www.splashtx.org



SPLASH

STOPPING PLASTICS AND
LITTER ALONG SHORELINES



Part 1: Defining Marine Debris

On the beaches of Texas and within the Gulf of Mexico, there is a growing problem. The problem is that of **marine debris**, trash that has been abandoned in the ocean. This is a human-made problem and requires human-made solutions.

TALKING TRASH

The problem of marine debris might seem simple on the surface, but as we dive down deeper, we can see the complexities of this issue. In this chapter, you will learn the precise definition of marine debris and what types of trash can be found on our beaches.

What is Marine Debris?

In simple terms, marine debris is trash found in our oceans. In more specific terms, marine debris is anything that is **long lasting, solid, man-made, and abandoned** in the **marine environment**. Using this description, decide whether or not these items found in the ocean qualify as marine debris.

Plastic Bottle



Marine debris?

Yes No

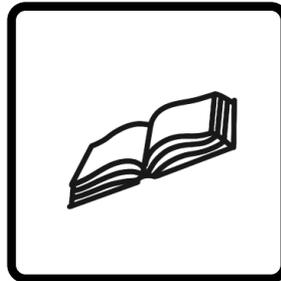
Carrot



Marine debris?

Yes No

Book



Marine debris?

Yes No

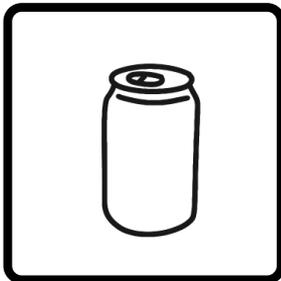
Boat with passengers



Marine debris?

Yes No

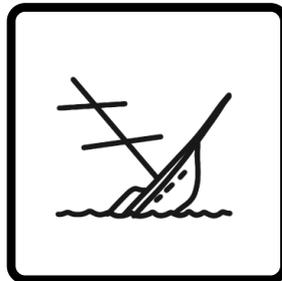
Aluminum Can



Marine debris?

Yes No

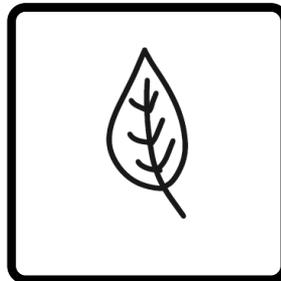
Ship Wreck



Marine debris?

Yes No

Leaf



Marine debris?

Yes No

Glass Jar



Marine debris?

Yes No

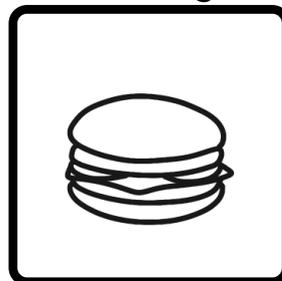
Wrench



Marine debris?

Yes No

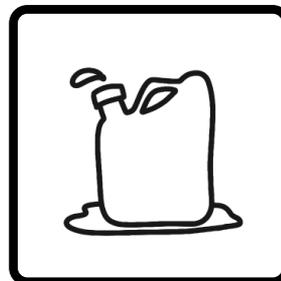
Hamburger



Marine debris?

Yes No

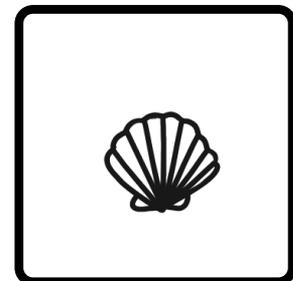
Gasoline



Marine debris?

Yes No

Seashell



Marine debris?

Yes No

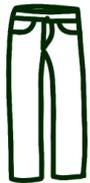
Across

2. Fishing 



4. Milk _____

5. Cell _____



7. _____ jeans

10. Abandoned _____



13. Bottle _____



14. Plastic _____



15. _____ jar



Down

1. Styrofoam _____



3. _____ box



5. _____ bottle



6. _____ can



8. Fishing _____



9. Car _____

11. _____ line



12. _____ flop



16. Drinking _____



Marine Debris Crossword



Part 2: How Trash Travels

We tend to think of marine debris as litter that has been dumped into the ocean or on the beach. But in actuality, most marine debris is **trash that has come from farther inland**. In fact, an estimated 60-80% of marine debris comes from land. So how does trash travel all that way? Find out in this chapter.

TRASH IN TEXAS

Recent research tells us that Texas faces a serious trash pollution problem. Trash accumulates on the Texas coast **ten times faster** than it does on the coasts of other Gulf states. Texas also has the **highest average weight of trash** debris per mile surveyed of any state in the nation, according to a report from the National Oceanic and Atmospheric Administration (NOAA) and Ocean Conservancy. In this chapter, find out why trash accumulates so quickly on our shores.

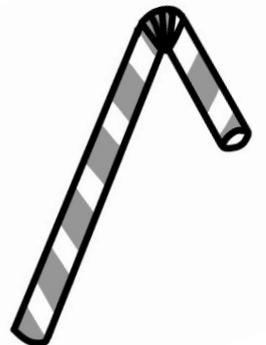
Story of a Straw

Most of us try to avoid littering, which is great! But unfortunately, even when we properly dispose our trash, it can still sometimes make it into the ocean.

In this activity, determine the order of events that lead to a plastic straw becoming marine debris.

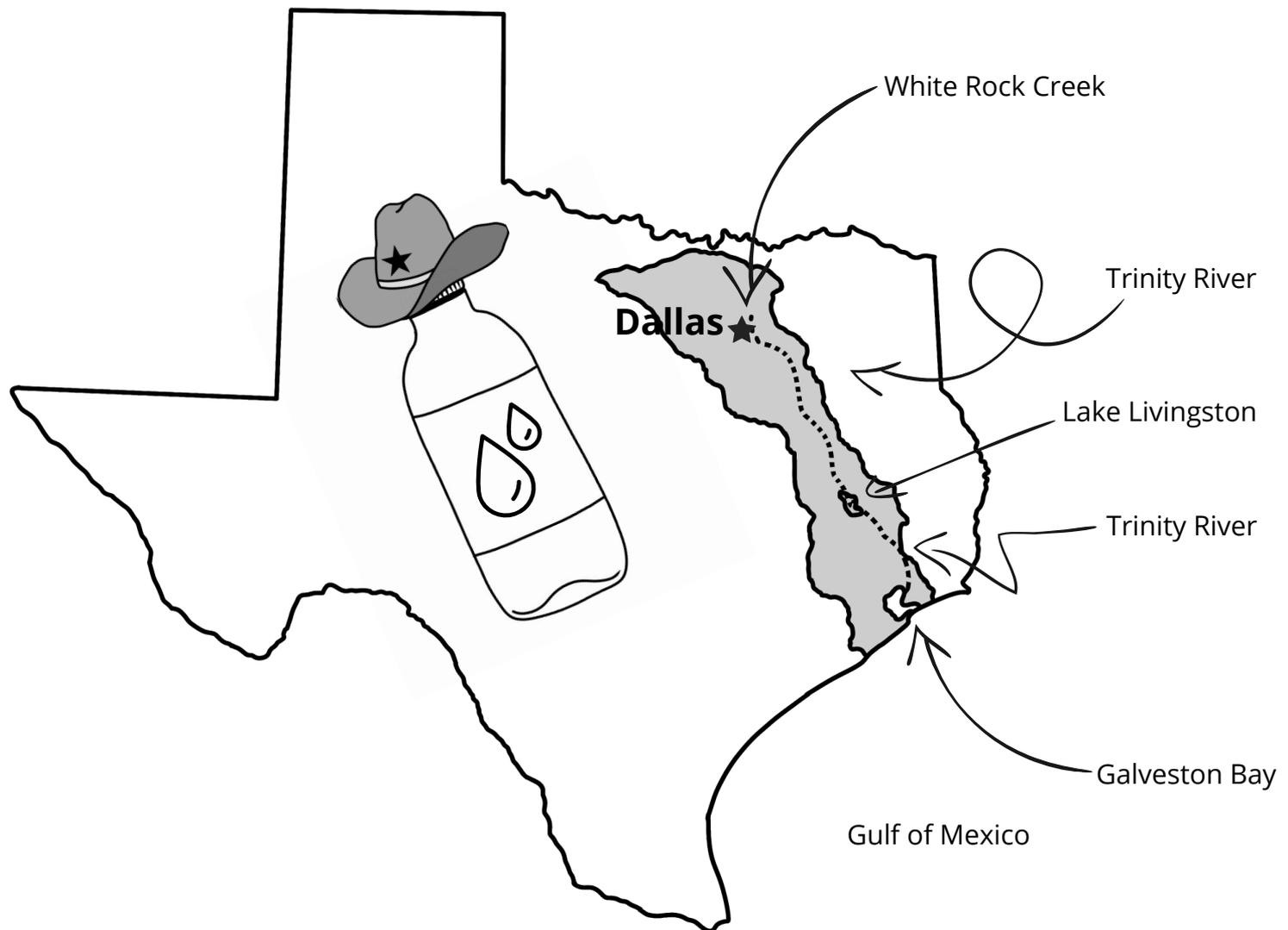
Number the events in order of occurrence.

- A. The bayou flows into the Galveston Bay
- B. The garbage bag falls off the trash truck onto the road
- C. Rain washes the straw into a small stream
- D. Someone puts the garbage bag outside in a dumpster
- E. Lisa buys a cup of soda at a restaurant
- F. The currents take the straw out into the ocean
- G. Raccoons open the bag and the straw out
- H. Lisa finishes her drink and throws away the straw
- I. The stream flows into a large bayou
- J. The dumpster is emptied into a trash truck
- K. Lisa puts a straw in her cup and drinks



Watershed Wanderer

A **watershed** is an area of land where all the water drains to one location. We live in the Galveston Bay watershed (drawn in gray), so our water drains to the Galveston Bay. Even when litter is released far from the ocean, it can travel downstream through the watershed down to the bay. Any litter in our watershed could potentially become marine debris. In this activity, track a piece of litter on its journey down the dotted line.

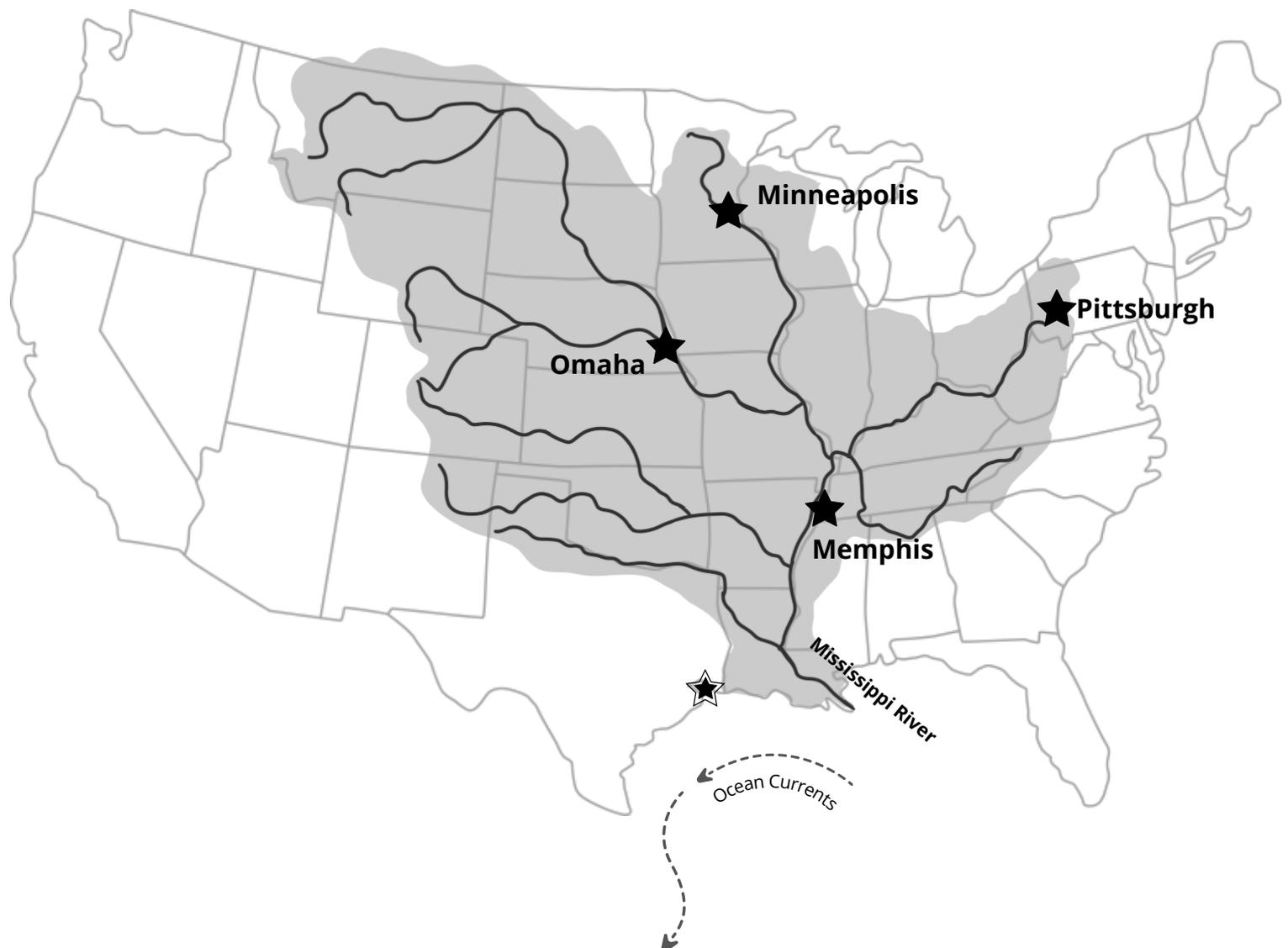


In Dallas, the wind blows a bottle into _____ creek. The bottle travels downstream, into the _____. The river flows down into a larger body of water, _____. Then it continues South on the _____. Finally, it flows into _____ and the currents take the bottle out to the _____

Rolling Down the River!

Through drainage ditches, rivers, creeks, and other waterways, trash can travel enormous distances! The Mississippi River, for example, has **tributaries** (rivers that feed into it) from all across the central United States. When the Mississippi River water reaches the Gulf, it brings a lot of trash with it!

From there, once trash reaches the sea, **ocean currents** can take it even farther. On the map below, use different colors to draw the paths that take trash to the coast of Texas. Start different paths from Minneapolis, Minnesota; Pittsburgh, Pennsylvania; Omaha, Nebraska; and Memphis, Tennessee.

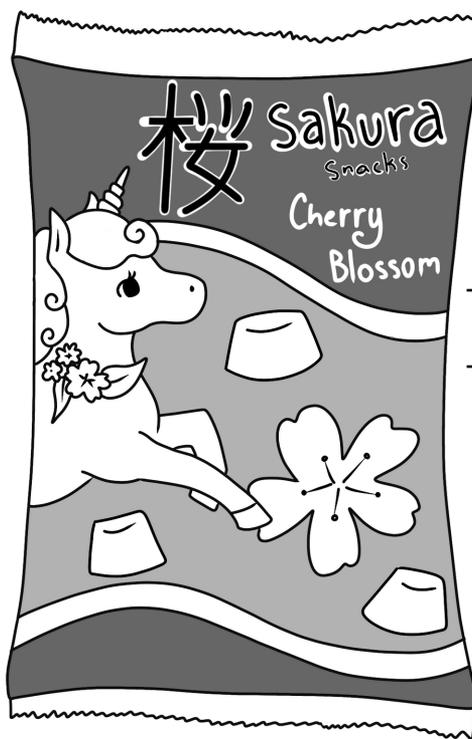


Well Traveled

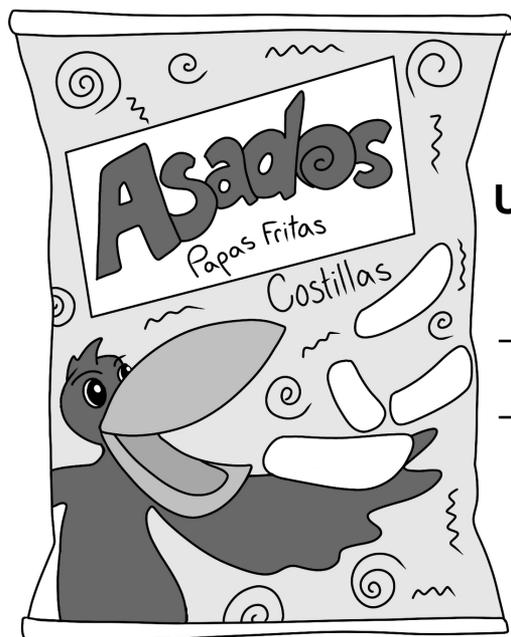
Ocean currents can bring trash to our shores from across the sea. We can sometimes find items from distant places on our beaches! To see where these snack wrappers came from, unscramble the letters to reveal the names of cities and countries.



DRIMAD,
ASNIP



YTOKO,
PAANJ



UENOSB REIAS,
ARGNTEIAN



EWN DEHIL,
ANDII

New Delhi, India

Buenos Aires, Argentina

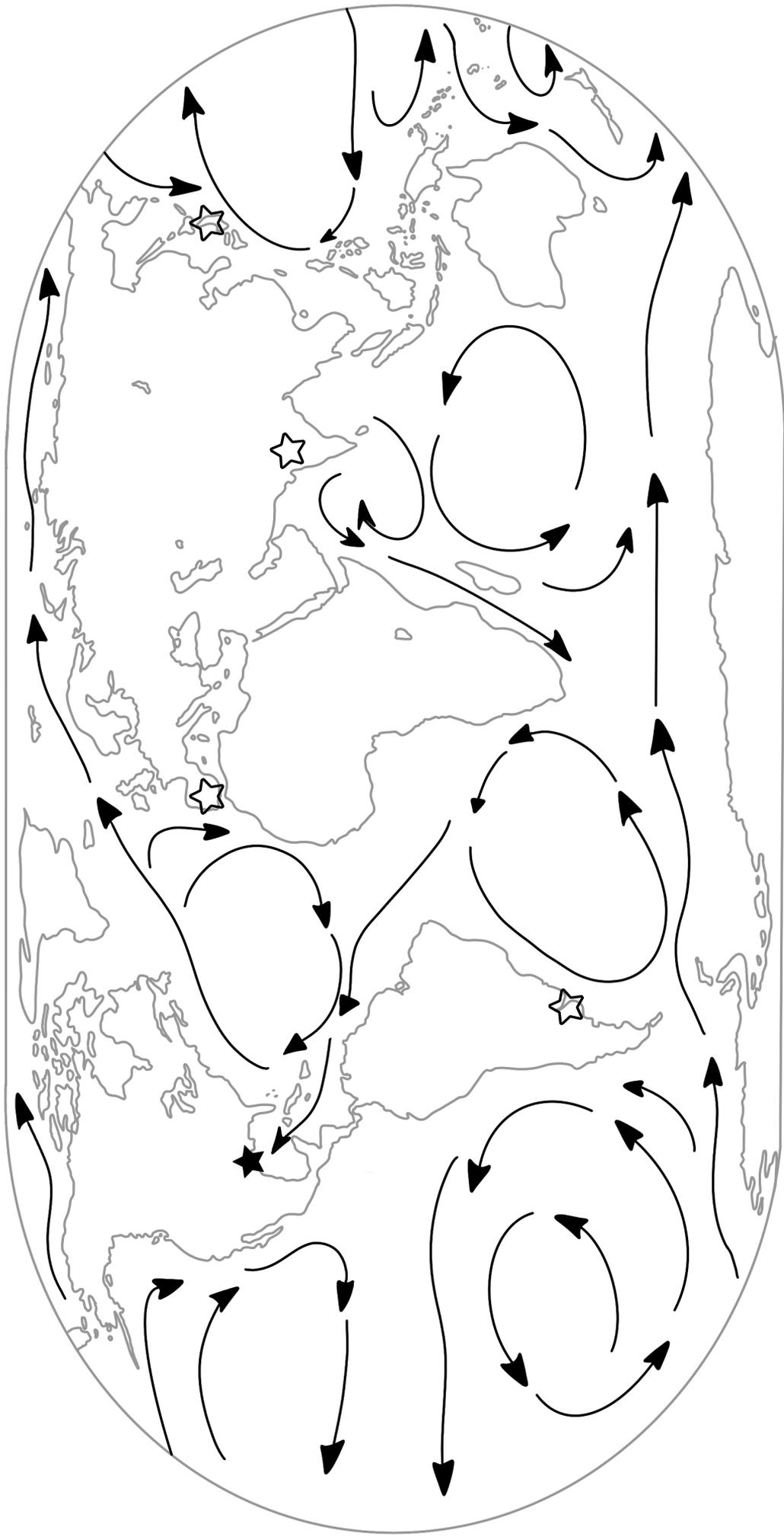
Tokyo, Japan

Madrid, Spain

Answers:

Swept Away

On the previous page, we discovered trash items from India, Argentina, Japan, and Spain that had traveled on ocean currents all the way to Texas. In this exercise, we will track the currents that brought these items here. For each item, start at the country of origin, then follow the ocean currents (the arrows) to see how it could travel to Texas. If possible, use a different color to mark every path.



Part 3: How Marine Debris Affects Wildlife

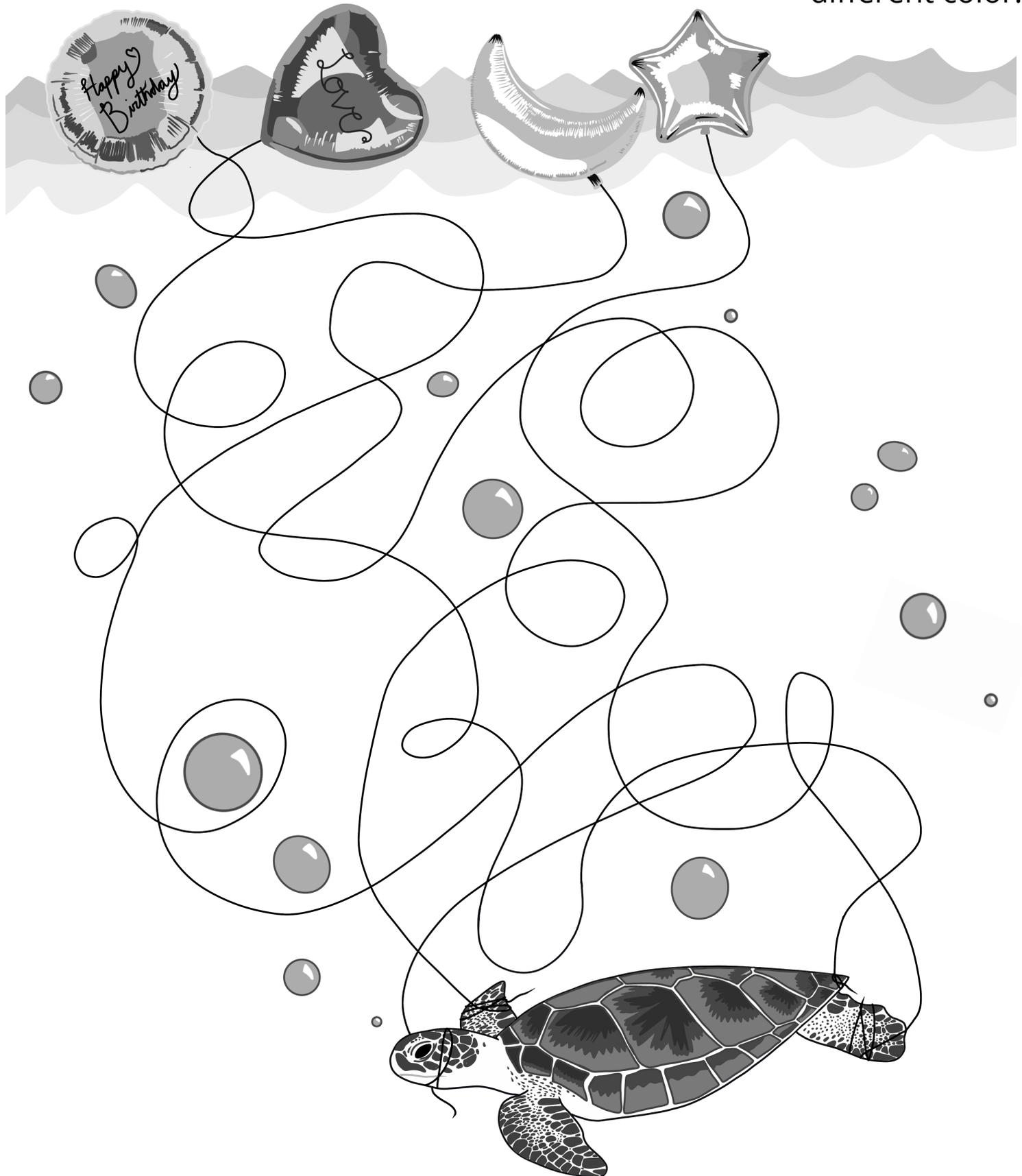
Marine Debris isn't just ugly and obtrusive; it has had a very harmful effect on wildlife in the oceans and rivers and on the shores, leading to even more problems up the food chain.

WHALE OF A PROBLEM

Marine debris affects animals from the smallest shrimp to the biggest whale. It does this in three main ways: **Ingestion** (when the animal eats the trash), **Entanglement** (when the animal is tangled or trapped by the trash), and **Habitat Degradation** (when the animal's habitat becomes less usable because of the trash). In this chapter, learn more about these three threats.

Tangled Turtle

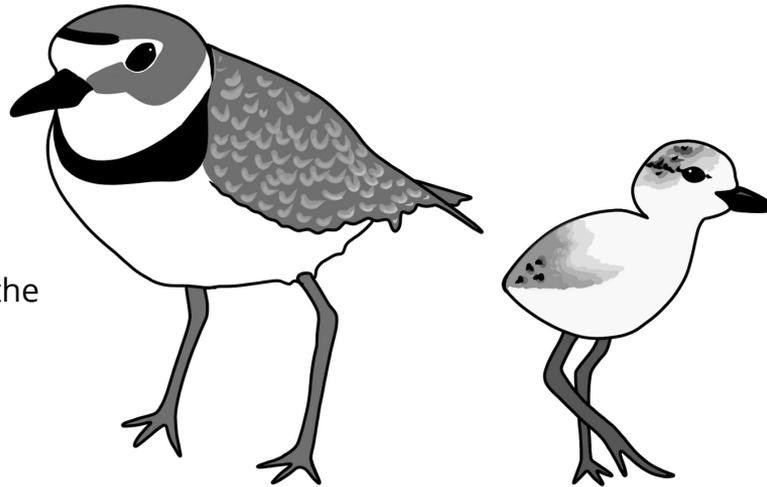
Fly-away balloons often drift down into the ocean, where they can **entangle** wildlife. This Green Sea Turtle has become tangled in four different balloon strings. To help untangle it, color each string a different color.



Precocial Chicks

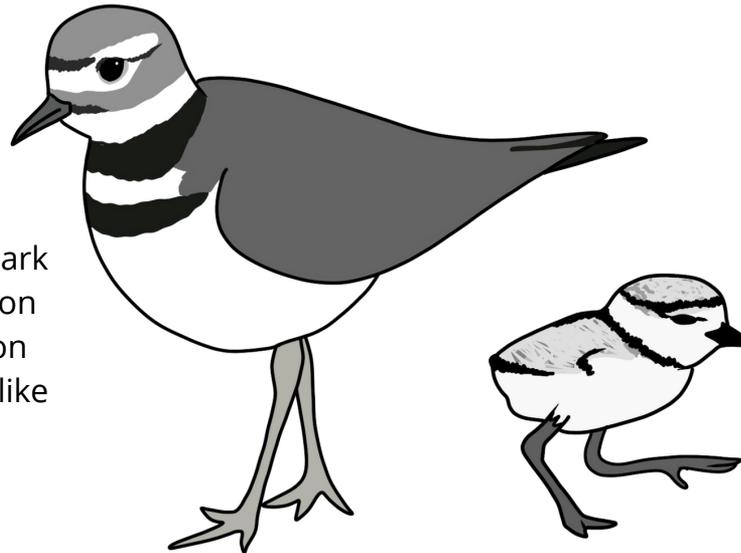
Did you know that some birds nest on the ground? On our beaches we have several shorebird species that nest on sand, oyster shells, and even parking lots. Many of these shorebirds have chicks that are precocial. **Precocial** means that the chicks hatch with downy feathers, and can walk, run and swim within a day or two after hatching. These chicks can hunt for their own food, but their parents still keep close for protection.

Wilson's Plover: the adult Wilson's Plover is brown above, and white below, with a dark band across its chest and a thick beak. It nests on the sand on the beach above the high tide line and within the dunes.



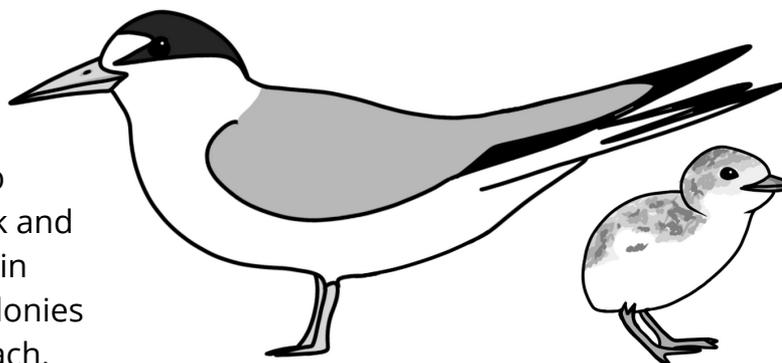
Wilson's Plover Chick: The chick is small and fluffy with long legs for running. It is light colored with a brown speckling above.

Killdeer: the adult Killdeer is brown on top and white below. Unlike the Wilson's plover, it has two dark bands on its chest. It nests on beaches, but can also nest on the ground in other places, like parking lots and driveways



Killdeer Chick: the Killdeer chick is similar to the Wilson's Plover chick, but with dark lines on its forehead, cheeks, and neck.

Least Tern: the adult Least tern is gray above and white below with a black cap and bright yellow beak and feet. These terns nest in large groups called colonies on the sand of the beach.



Least Tern Chick: the Least Tern chick is similar to the Wilson's Plover chick, but with shorter, orange legs.

Plastic Chain

Microplastics are pieces of plastic that are very small (less than 0.2 inches). These tiny pieces of plastic are often **ingested** by animals who mistake them for food. In this activity, we will track some microplastic fibers up the food chain to see where they end up.

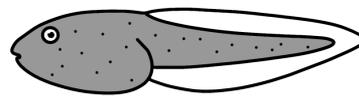
Nylon Fiber

This microplastic is a tiny piece of nylon fiber. It entered the ecosystem when someone washed their nylon shirt.



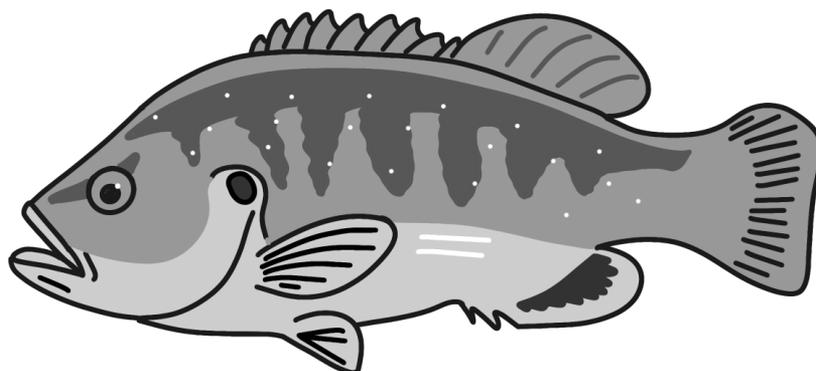
Bullfrog Tadpole

A Bullfrog tadpole eats the microplastic accidentally, mistaking it for algae. Tadpoles cannot digest plastic, so the nylon remains in its digestive tract.



Green Sunfish

A Green Sunfish eats the tadpole. The sunfish can digest the tadpole, but not the plastic, so the nylon remains in the fish's digestive tract. The sunfish eats 3 tadpoles per day for 31 days. If each tadpole has eaten one piece of nylon, how many microplastics are inside the sunfish by the end of the month?

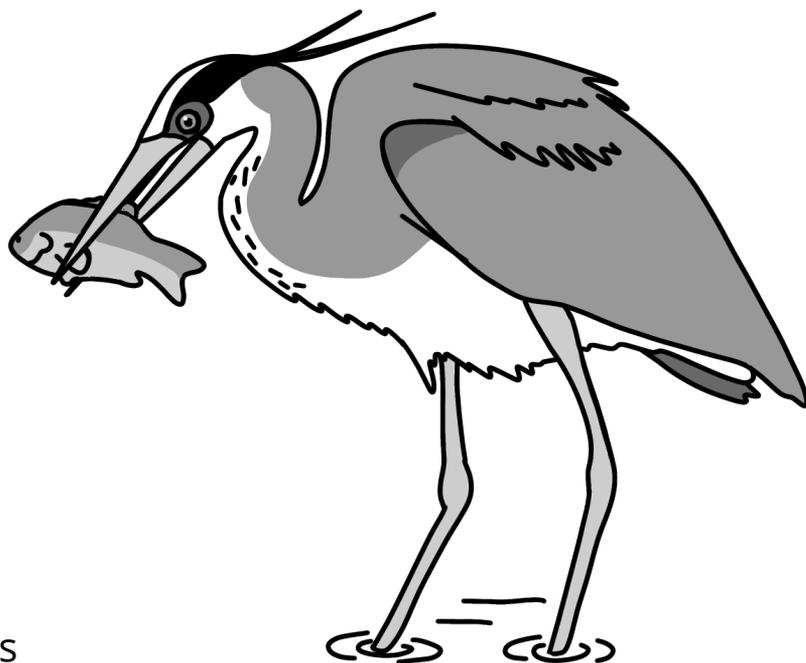


_____ microplastics



Great Blue Heron

At the end of the month, a Great Blue Heron eats the Green Sunfish. Again, the heron cannot digest plastic, so the nylon fibers remain in the bird's digestive tract. If this bird eats one sunfish per day, each containing the same amount of plastic, how many microplastics will be inside the bird after one year? After five years?



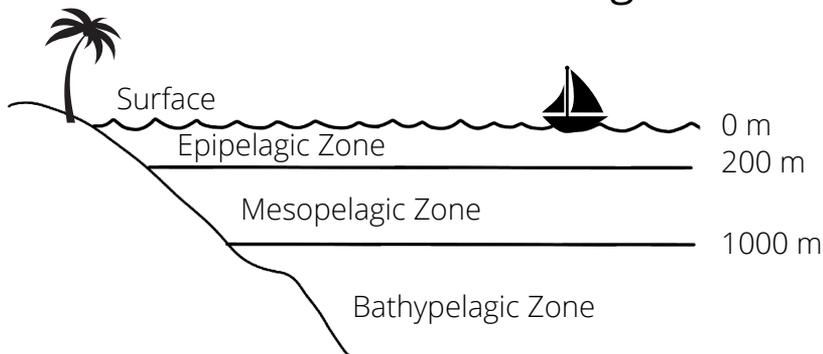
_____ microplastics after 1 year

_____ microplastics after 5 years

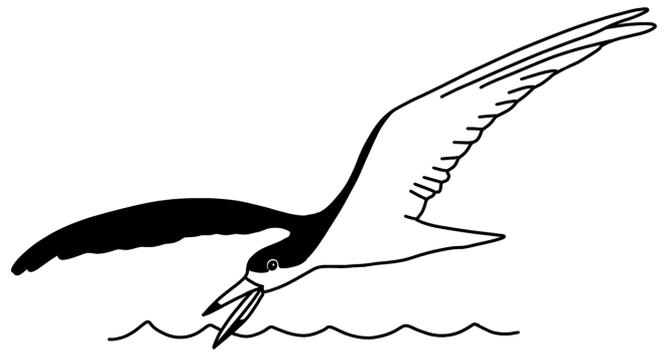
Deep Dive

Different materials have different weights and buoyancy, so some trash is more likely to sink or float than others. As well, different animals live and hunt at different depths. Animals like mahimahi and red drum live closer to the surface, while animals like anglerfish and giant squid live deep down in the

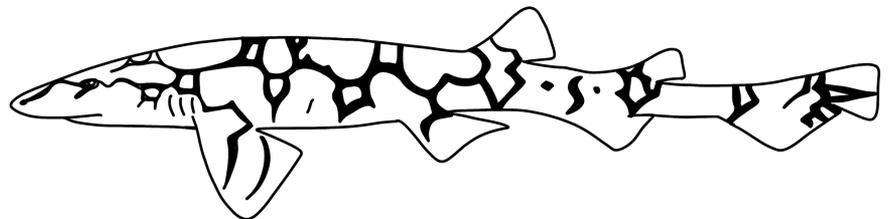
Bathypelagic Zone. In this activity, use the depth chart to see what zone each animal lives or hunts in and what trash they have to contend with.



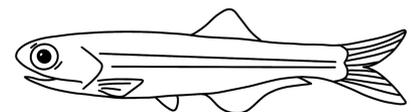
The Black Skimmer is a seabird that skims its bill along the top of the water at a depth of **0 meters** looking for fish. This animal can be found on the _____. At this depth, we find light, floating items such as empty water bottles.



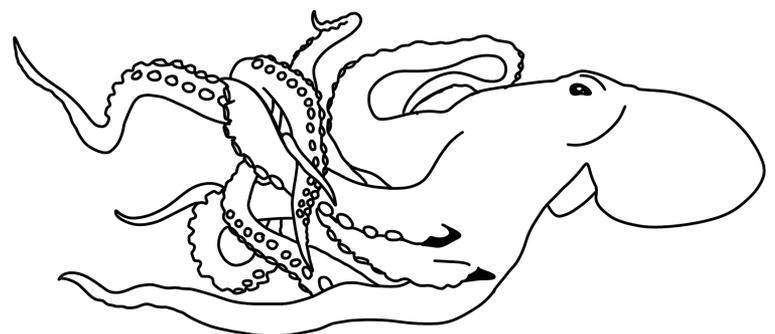
The Chain Catshark is a small biofluorescent shark found under **260 meters**, in the _____ zone. At this depth, we find heavier objects, such as glass or heavy metal objects.



The Bay Anchovy is a small fish that feeds on plankton at a depth of **1 meter**, in the _____ zone. At this depth, we find many floating microplastics.



The Benthoctopus is an octopus found about **1200 meters** deep in the _____ zone eating crustaceans and molluscs. At this depth, we might find heavier objects from far out to sea, such as a sunken ship.



Part 4: Learning More

Before we can solve a problem, we have to understand it. This means that in order to properly address the issue of marine debris, we have to study it and gather information.

Become a Scientist

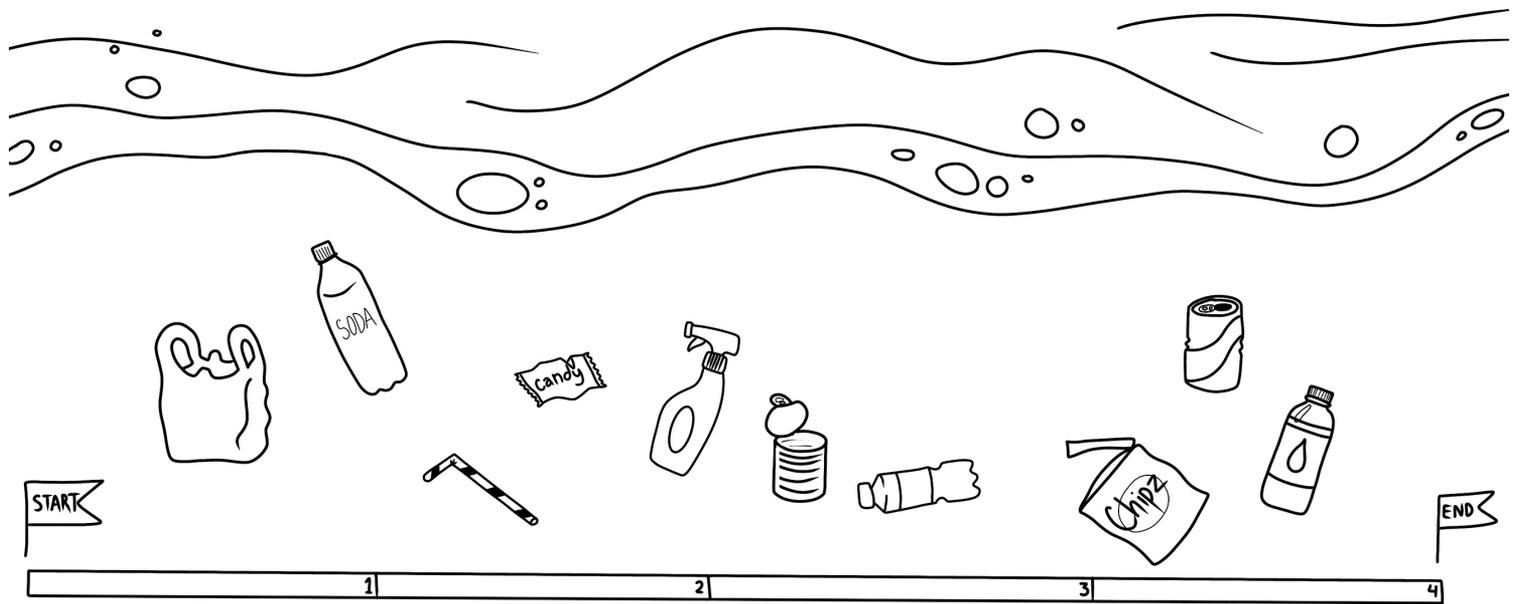
We know a lot about marine debris, like how it travels, how quickly it accumulates, and how it affects wildlife. But how did we learn all of this? And how do we learn more?

Well, most of this knowledge was gathered by scientists who studied marine debris and animals for years. They observed what was happening in the wild and investigated in the lab. These scientists do **research projects**, in which they use science to answer a question, such as "why is there so much trash here?" In this chapter, take a look and participate in some of our research projects, then design a study of your own.

Transect

In order to find out what types of trash are washing up on the beach, we will perform a transect survey to collect data. A **transect** is a

line across the beach in which we will count the items of trash. For this transect, we will be counting the types of trash across four feet of beach. Count the pieces of trash that are made out of three different materials: metal, hard plastic (like plastic bottles and straws), and plastic film (plastic bags and wrappers). Then, use those numbers to figure out what percentage of the total trash is made up of the different materials.



Number of trash items made of:

Metal:

Plastic Film:

Hard Plastic:

Total number of trash items:

Pie Chart

We just performed a transect on the beach. Use the numbers that you counted on the previous page to fill in the fractions and figure out the percentages. Then, use the percentages to fill out the pie chart. Use this formula: $(\text{value}/\text{total value}) \times 100\%$.

Number of metal items:

$$\frac{\quad}{\quad} \times 100\% = \boxed{\quad} \% \text{ Metal}$$

Total number of trash items:

Number of plastic film items:

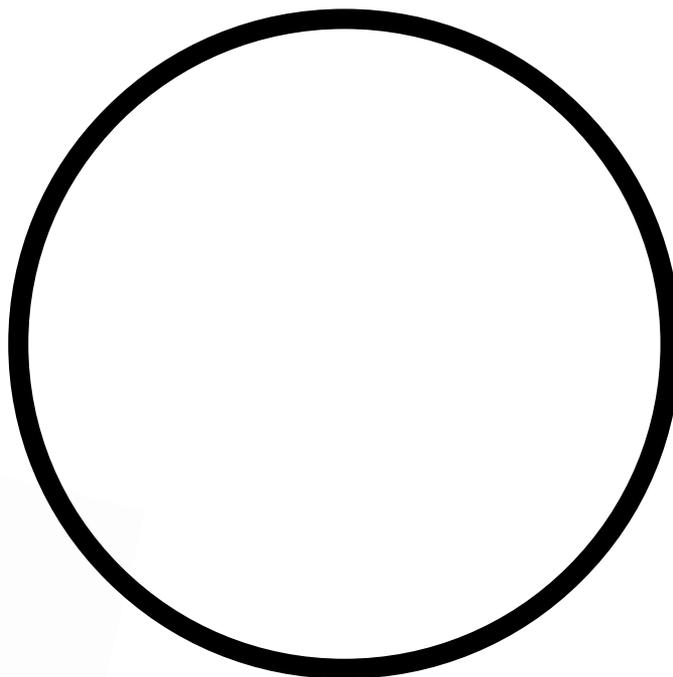
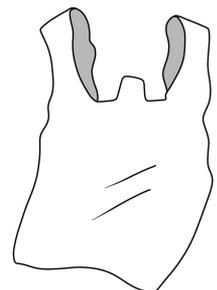
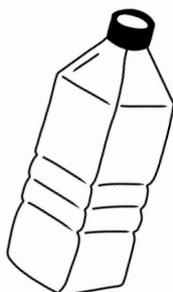
$$\frac{\quad}{\quad} \times 100\% = \boxed{\quad} \% \text{ Plastic Film}$$

Total number of trash items:

Number of hard plastic items:

$$\frac{\quad}{\quad} \times 100\% = \boxed{\quad} \% \text{ Hard Plastic}$$

Total number of trash items:



Answers: Metal-20% Plastic Film-30% Hard Plastic-50%

The Big Picture

Now that we've done our **4 foot long** transect, we can estimate how much trash is on the whole beach. Use your numbers from the previous two pages to figure out how much trash is on a **200 foot long** beach.

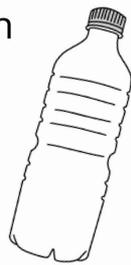


Total number of trash items on transect

Transect length **4ft**

Total number of trash items on the beach

Beach length **200ft**



$$\frac{\text{Total number of trash items on transect}}{4\text{ft}} = \frac{\text{Total number of trash items on the beach}}{200\text{ft}}$$

These two fractions are equal. To figure out how much trash is on the beach, the fraction on the left has to have the same denominator as the one on the right. $4 \times 50 = 200$, so we have to multiply both sides of the left fraction by 50.

(Total number of trash items on transect) x 50

(Transect length) x 50 **200ft**

Total number of trash items on the beach

Beach length **200ft**

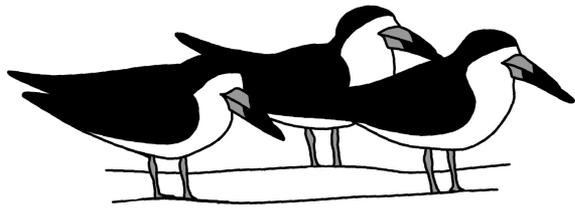
$$\frac{(\text{Total number of trash items on transect}) \times 50}{(\text{Transect length}) \times 50} = \frac{\text{Total number of trash items on the beach}}{\text{Beach length}}$$

So, the 200 foot-long beach has about _____ items of trash! Now, you can use the percentages from the previous page to figure out approximately how many items on the whole beach are metal, plastic film, and hard plastic.

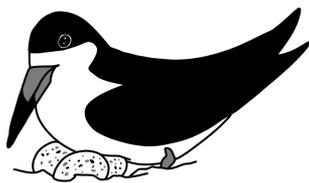
% Metal	<input type="text"/>	X	<input type="text"/>	Trash on Beach	=	<input type="text"/>	Pieces of metal
% Plastic Film	<input type="text"/>	X	<input type="text"/>	Trash on Beach	=	<input type="text"/>	Pieces of plastic film
% Hard Plastic	<input type="text"/>	X	<input type="text"/>	Trash on Beach	=	<input type="text"/>	Pieces of hard plastic

Bird Study

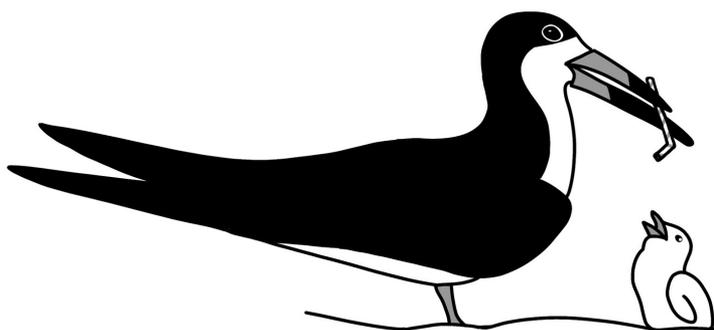
We know that marine debris affects animals, but how did we learn this? And how will we gain more information? One way is by studying the animal **population** (a group that lives in the same area). Biologists at American Bird Conservancy and Gulf Coast Bird Observatory **monitor** populations of birds to determine how they are doing, what threats they face, and how we can help. In this activity, think like a **biologist** and decide how to research and help the birds.



This colony of Black Skimmers has always had a population of 60-100 birds. But this year, there are only 30. For the future, think of a way to tell if birds perish or simply move to a different colony nearby.



You find that half of the Black Skimmers moved to a different island, and are nesting on the oyster shells there. Think of a way to find out why they moved.



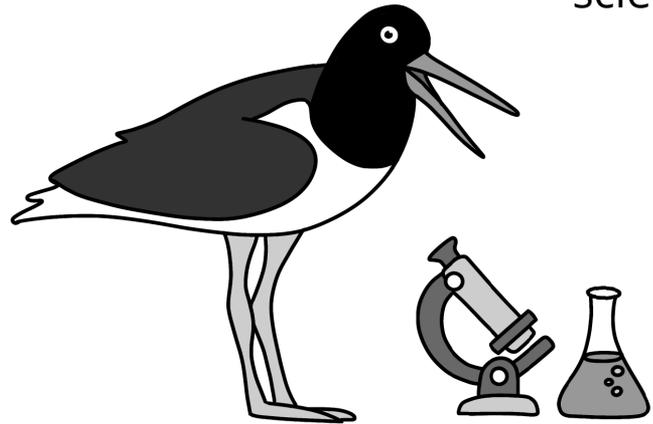
You find that much of the old habitat is now unusable, as the birds can't nest on the debris that covers it. Think of a way to help preserve the habitat for future nesting.

Scientific Exploration

Now that you understand our research projects, you can think about doing your own! In this activity, design a research project using the **scientific method**. You can design an experiment that you can do in school, or you can dream big and plan something for your future career as a scientist!

Step 1: Question

What question or subject would you like to investigate? Example: "How fast does different trash travel down river?"



Step 2: Hypothesis

Predict the answer to your question. Research online or in the library to make an educated hypothesis.

Step 3: Study

Now you can plan out your experiment or study. Explain the methods that you will use to collect data. Then think about how you will analyze your data.

Part 5: Summary and Solutions!

Before you get too stressed out about the huge problem of marine debris, know this: there are **solutions!** Now that we understand more about the issue, we can find ways to solve it.

No Quick Fix

Because this is a large problem that has accumulated over years and is still growing, there is no quick fix. Instead of one solution there are many! No one person can fix this problem, and everyone needs to do their part to eliminate marine debris. If we all wait for someone else to solve it, no one will. In this chapter, review what we've learned so far, then discover some of the solutions to the problem of plastic and marine debris.

Plastic Problems

While all marine debris is problematic, **plastic** is particularly dangerous for a variety of reasons. Using your reasoning skills, as well as what we have learned so far in this workbook, explain why plastic is so problematic.

1 Plastic cannot be digested by animals. Why might that be problematic in the ocean?

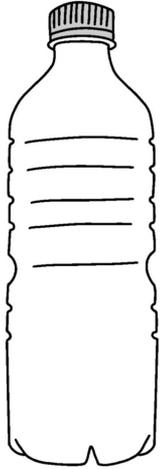
2 Unlike metal or glass, plastic is relatively lightweight and floats. Why might that be problematic in the ocean and waterways?

3 Unlike most other products, plastic is brightly colored and can resemble algae, jellyfish, or other living things. Why might that be problematic in the ocean?

4 Plastic does not decompose, it just breaks down into smaller and smaller microplastics. Why might that be problematic in the ocean?

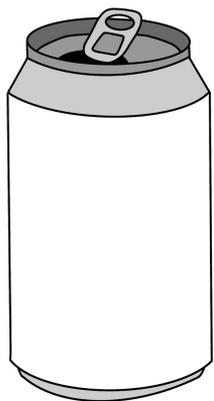
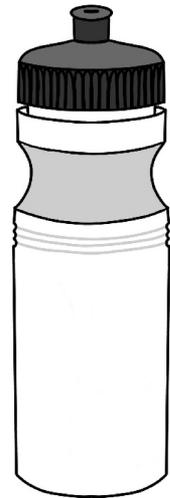
Plastic Prevention

The best way to keep plastic out of our oceans is to not use it in the first place. But totally eliminating plastic from our lives would be impossible! So let's focus on **mitigating**, or lessening the amount of plastic that we use.



Single-use plastics are plastic products designed to only be used once, like a soda bottle. Name one single-use plastic product that you used today or recently and threw away after using.

Some single-use plastic items can be replaced with **reusable** items. Is there an alternative to your plastic item that is reusable? If so, what is it?



Some single-use plastic items can be replaced by items made of metal, paper, or glass. Is there a alternative to your item that is made out of a non-plastic material?

Trash-free Pledge

Unfortunately, even when we're careful about properly disposing of our waste in garbage or recycling bins, these items can sometimes still make it into our waterways. So an important part of reducing the amount of plastic and litter on our beaches is reducing the amount of waste we produce in the first place. If you want to, fill out our Trash-Free Pledge to commit to reducing what you throw out!

Which of these actions do you commit to? It can be just one or all of them, and you can add more actions as you make your way through your trash-free journey - everything makes a difference!

- Stop using plastic bags by bringing reusable grocery bags and produce bags to the store
- Buy items (like grains, cereals, granolas, spices, snacks, etc.) in bulk to avoid disposable packaging
- Avoid single-use beverage bottles and cans by using a reusable water bottle, thermos, or other beverage container
- Dispose of fishing line by placing it either in a designated fishing line receptacle or by taking it home for disposal
- Pack your own meals and/or bring your own utensils to avoid single-use containers (styrofoam, plastic, cardboard, etc.) and utensils from takeout
- Throw cigarette butts in the trash to ensure they make it to the landfill instead of on our coasts or in our waterways
- Avoid purchasing balloons for special occasions or holidays, and especially don't release balloons on purpose into the environment.
- Tell a friend or family member about how they can reduce their plastic waste and trash production
- Save plastic food containers and glass jars. They make great storage for leftovers, flower vases, and more
- Remember all the "Rs" of waste - Rethink (rethink what you really need before buying it), Refuse (refuse unnecessary plastic), Reduce (reduce the amount of single-use items you use), Reuse (reuse any items you can), and finally Recycle (if all else fails, recycle whenever you can)!
- Ask for your beverage without a straw, and bring your own reusable straw
- Other: _____
- Sustainable self-care: use personal-care products that are package- or plastic-free like bamboo toothbrushes, shampoo/conditioner bars, safety razors, etc.
- Reduce or eliminate the use of paper napkins, towels, and other products by using cloth napkins, rags, and other reusable cleaning tools

Signed: _____

Date: _____



We'd love to see your pledge! Send us a picture of your trash-free pledge by emailing splashtx@abcbirds.org

Recycling Rules

Every state, town and even neighborhood has different **recycling** policies. Do you know yours? In this activity, you will need to do some research online, in the library, or with local experts to find out what you can and can't recycle in your area.

Recycling Rules for my town, _____

Plastics that can be recycled:

Colors of plastic that can be recycled:

Metals that can be recycled:

Paper or wood products that can be recycled:

Can glass be recycled?

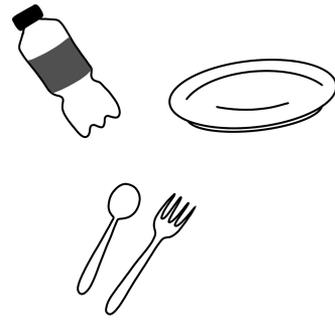
When recycling, should you put your items in a bin or bag?

What items need to be rinsed before being recycled?

Are there specific items, like yogurt containers or plastic bags, that cannot be recycled?

Are there any other important recycling rules?

Reusing Project



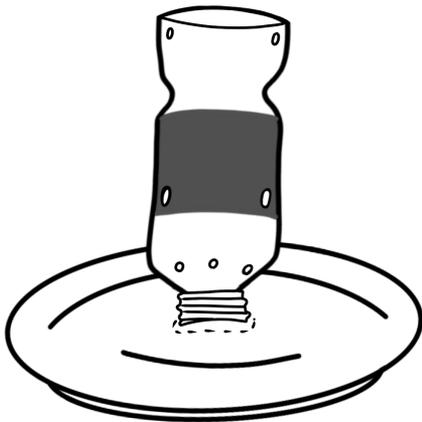
This is a project that you can make in real life! Make a bird feeder out of a plastic bottle, plastic plate or bowl, and plastic utensils! **Reusing** and recycling our plastic waste can give it a new life and keep it out of the ocean.



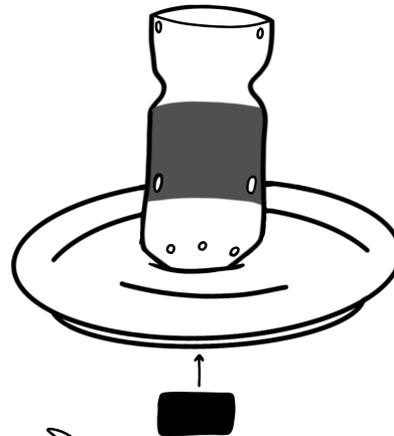
STEP 1:
Take the cap off the plastic bottle and have an adult cut the bottom of the bottle off.



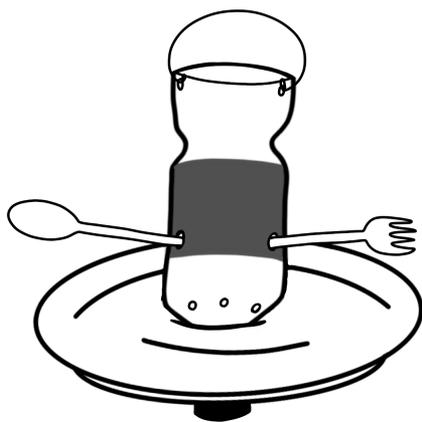
STEP 2:
Using the scissors, have an adult poke 6 holes, about the size of a pinto bean, around the top of the bottle, 2 at the bottom, and two in the middle



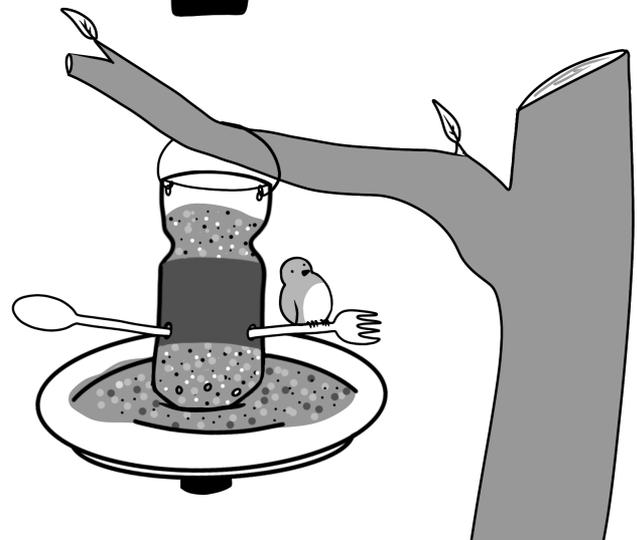
STEP 3:
Use the lip of the bottle to trace a circle in the middle of the plate. Then cut out the circle.



STEP 4:
Stick the bottle neck through the plate and twist the cap on.

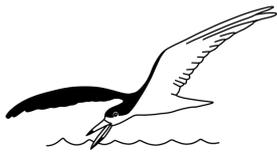


STEP 5:
Stick the utensils into the hole on the sides. Tie a string to the holes on top, leaving some room to hang it up



STEP 6: Fill the feeder with seeds and hang it outside!

See you out there!



One more solution to our marine debris problem is to pick up litter. You can do this on the beach or even in your neighborhood, because as we have learned, the trash on the ground outside can easily become marine debris. You can use this page to keep track of the litter you pick up.

Cleanup Journal

When doing a trash cleanup, always go with an adult, use safety gloves, and wear protective clothing. Avoid dangerous materials like sharp objects, hygienic products, and biohazards.

Date of cleanup: _____

Time spent: _____

Location: _____

Trash weight: _____

Date of cleanup: _____

Time spent: _____

Location: _____

Trash weight: _____

Date of cleanup: _____

Time spent: _____

Location: _____

Trash weight: _____

Date of cleanup: _____

Time spent: _____

Location: _____

Trash weight: _____

Date of cleanup: _____

Time spent: _____

Location: _____

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Date of cleanup: _____

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Location: _____

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Date of cleanup: _____

Time spent: _____

Location: _____

Trash weight: _____

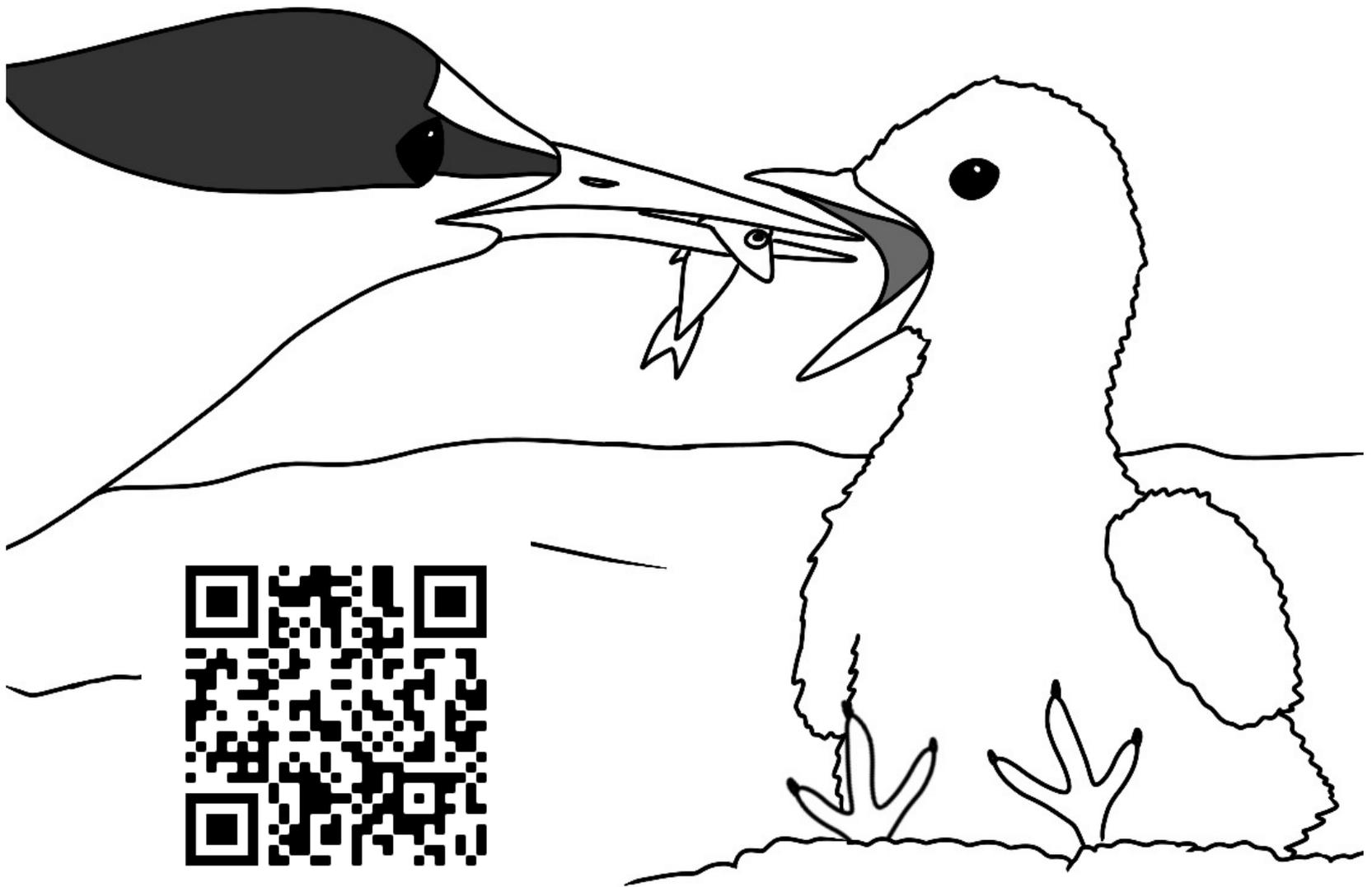
Date of cleanup: _____

Time spent: _____

Location: _____

Trash weight: _____

We hope that you have enjoyed this SPLASH Activity Book! If you would like to **learn more** about SPLASH, **volunteer at one of our beach or bayou cleanups**, or have a SPLASH **education** program at your school, visit **www.splashtx.org**. See you out there!





SPLASH is creating a cleaner environment for people, birds, and other wildlife in the greater Houston-Galveston region through community science, education, and outreach.

To learn more, visit us at
www.splashtx.org

and follow us on all social media
@SPLASHTrashTX