

askHRgreen.org

GREEN LEARNING GUIDE

TABLE OF CONTENTS

Where We Live	2	Rainy City	12
Water All Around Us	3	Down and Dirty Farm	13
Water Cycle	4	Heroes for the Environment	14
Water Systems Marathon	5	Answer Key	15
Where Does It Go?	6		
Machine Scavenger Hunt	7		
Litter-Free Waterways	8		
Litter Solutions	9		
Stormwater Pollution	10		

WHERE WE LIVE IN HAMPTON ROADS

Welcome to Hampton Roads! Hampton Roads is home to 1.7 million people. It is a region known for its rich history, military presence, and miles of beaches. In this Green Learning Guide, we'll explore the region and learn all about the different ways our actions have an effect on this place we all call home. Protecting the environment is everyone's responsibility. Every decision you make and every action you take make a difference. Let's get started by taking a tour of the region from this bird's-eye view!



GETTING TO KNOW HAMPTON ROADS

USE THE MAP AND KEY TO ANSWER THE QUESTIONS

- 1 In which square is the King Neptune landmark located?
- 2 What river is located in D2?
- 3 In which square is the Coliseum located?
- 4 What river is located in C5?
- 5 What is the largest river on the map?
- 6 How many squares on the map contain land only, no water?



CHALLENGE QUESTIONS

Where is your school located on the map?

Name the waterway closest to your school.

Calculate the area of one square on the grid.



0 5 10
Distance in miles

WATER IS ALL AROUND US IN HAMPTON ROADS

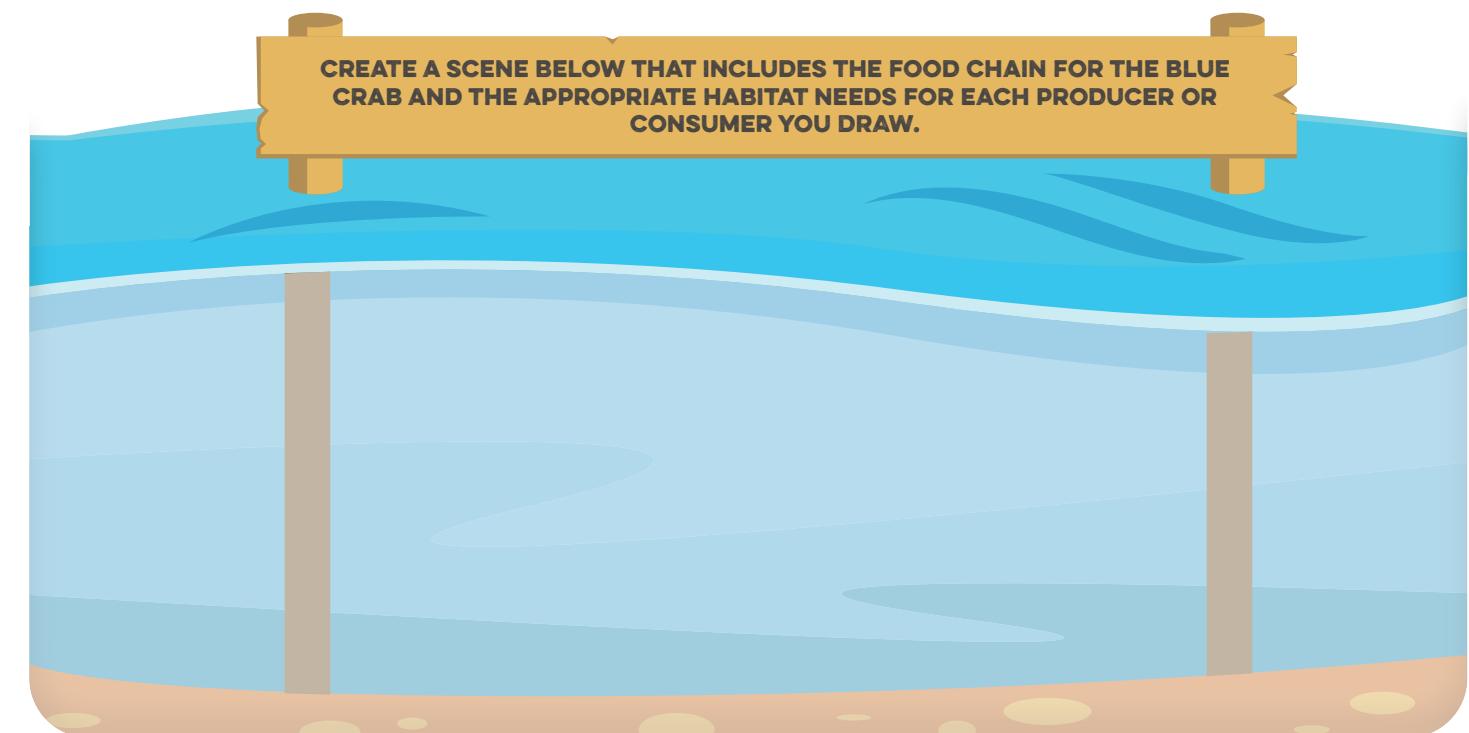
From small creeks and streams to rivers, Hampton Roads is surrounded by water, including the largest **estuary** in the United States and the third largest in the world, the Chesapeake Bay. An **estuary** is a body of water where freshwater and saltwater mix. The Chesapeake Bay supports more than 3,600 species of plants and animals, and produces about 500 million pounds of seafood per year.

THE CHESAPEAKE BLUE CRAB BLUES

One of the most popular species in the Chesapeake Bay is the blue crab, but the blue crab **population** has fallen to near-record lows. Scientists say there are two main causes for the decline: **pollution from human activity** and **overfishing** (catching crabs faster than they can reproduce). **Polluted stormwater runoff** from human activity prevents sunlight from reaching underwater grasses and makes algae grow quickly. Once the algae decays, it robs the waterway of the oxygen needed to sustain life. This hurts blue crabs in two ways: by killing the food they eat, such as oysters and worms, and by destroying the underwater grasses they use to hide from predators such as fish, birds, and turtles. Clean water is essential for healthy populations of blue crabs and other species native to Hampton Roads.

Stormwater runoff is water from rain or melting snow that "runs off" across the land instead of seeping into the ground.

CREATE A SCENE BELOW THAT INCLUDES THE FOOD CHAIN FOR THE BLUE CRAB AND THE APPROPRIATE HABITAT NEEDS FOR EACH PRODUCER OR CONSUMER YOU DRAW.



NOW CHALLENGE YOURSELF WITH THESE QUESTIONS!

How does pollution harm the habitat of the blue crab?

What are some ways you can think of to help the blue crab population?

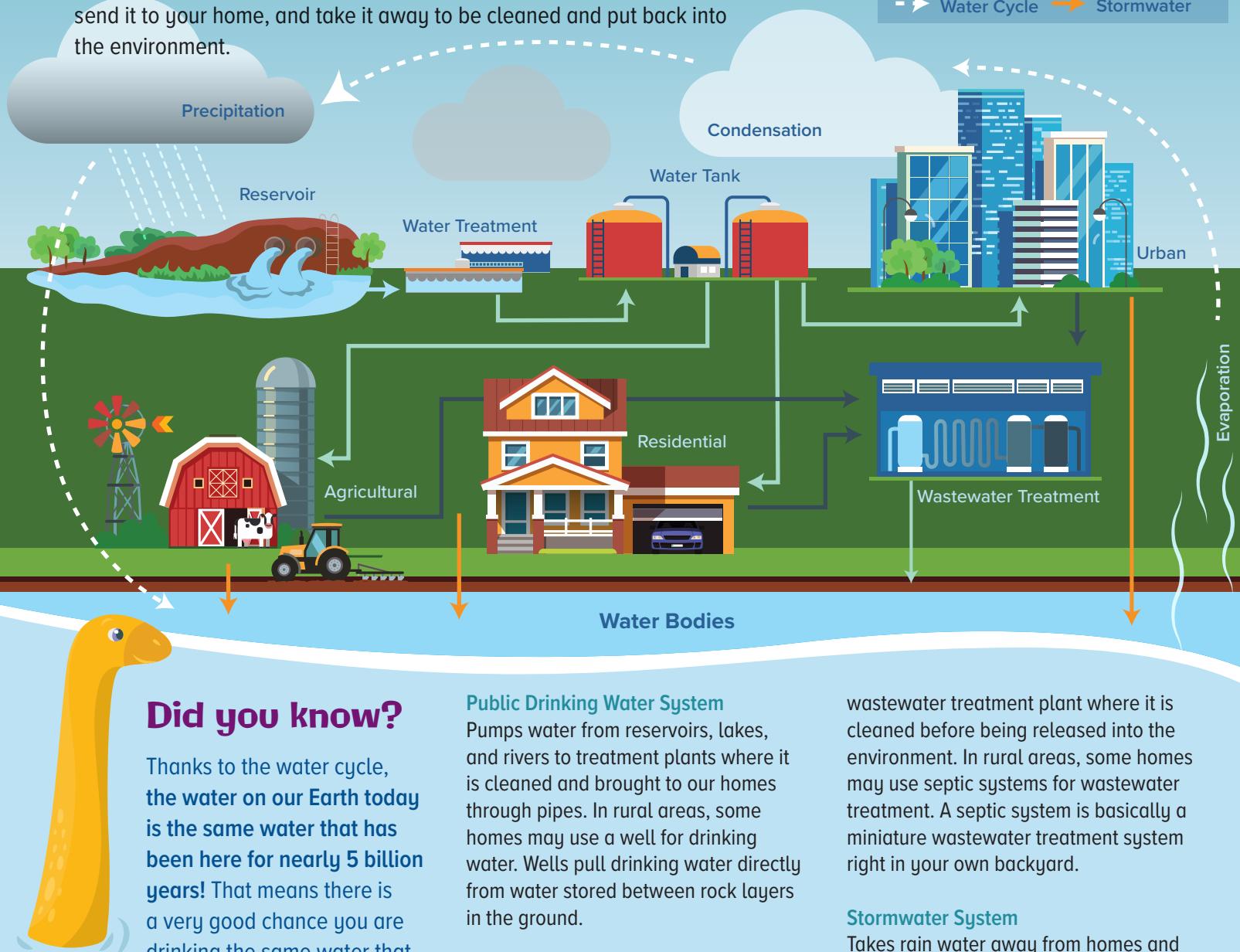
If the blue crab population were to continue to decline, what impact would it have on other consumers and producers in the Chesapeake Bay?

Water Cycle

The water from your faucet goes through quite an amazing journey before it ever makes its way to your glass. This journey is called the natural water cycle. Through this continuing process of **evaporation**, **condensation**, and **precipitation**, Earth's water is recycled over and over again.

Treatment Systems and Processes

Increased population and development have changed the natural water cycle. The new water cycle is called an urban water cycle and includes things people do. It's the process by which our local water and wastewater utilities collect water from lakes and rivers in reservoirs, clean up the water, send it to your home, and take it away to be cleaned and put back into the environment.



Key Vocabulary Words



Evaporation occurs when water in rivers, lakes, oceans, and other waterways is heated by the sun and changes from a liquid to a gas called water vapor as it rises through the air.



Condensation occurs when water vapor gathers in clouds and forms liquid water.



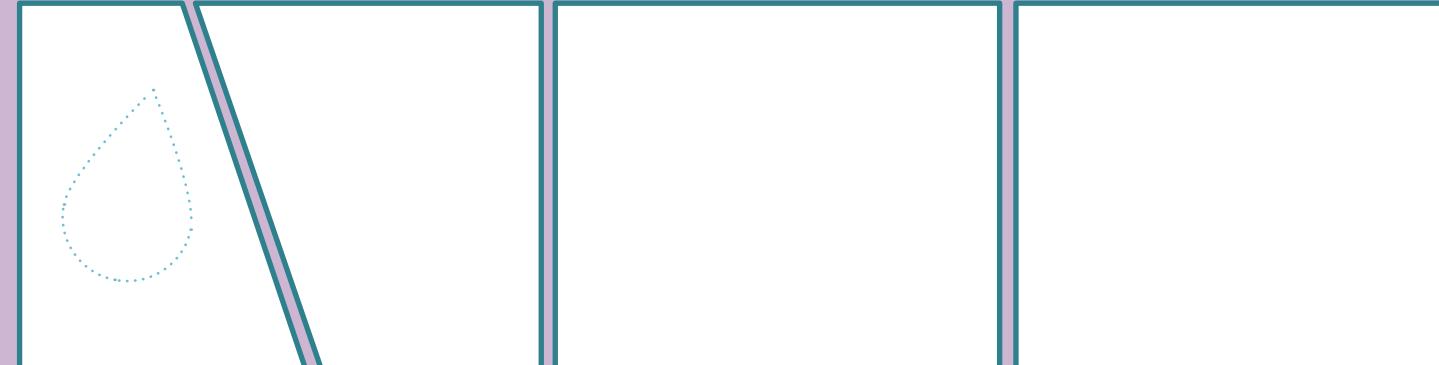
Precipitation occurs when water falls to earth. Gravity causes the water to fall to earth as rain, snow, hail or sleet.

KEY

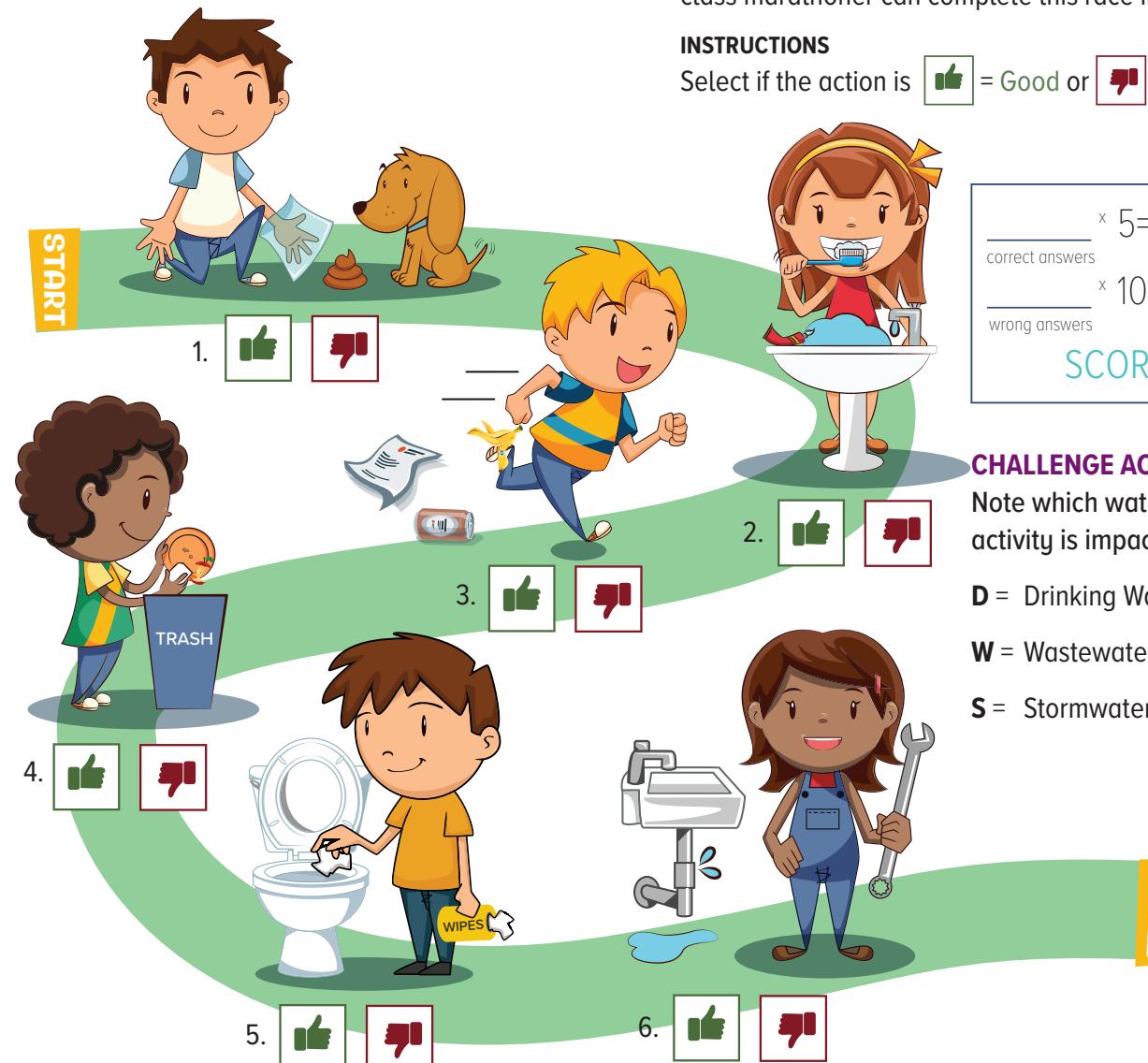
→ Wastewater → Treated Water
- - - Water Cycle → Stormwater

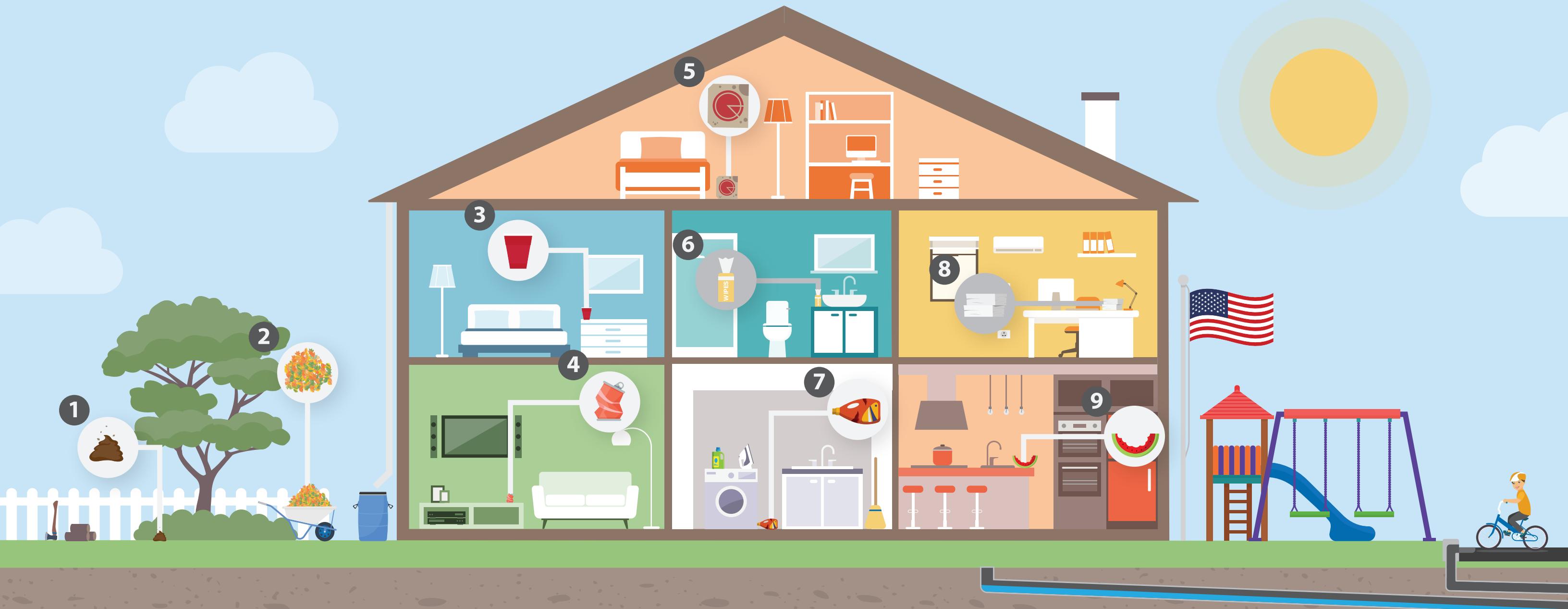
Pretend you are a water drop traveling through the water cycle.

Create a comic strip about your journey starting in a cloud. Where will you fall? What will happen next?



Water Systems Marathon





WHERE DOES IT GO?

Find the eight items with numbers next to them on these two pages. Write the number of each item next to where they go: the compost bin, recycling bin, or trash bin.

COMPOST BIN



Biodegradable, organic waste (meaning it can be broken down) goes here. Compost decomposes into nutrient-rich soil that can be used to fertilize plants. Nothing gets wasted!

RECYCLING BIN



This is for waste that can be turned into a totally new product. It might look like trash, but it can be broken down and given a new life instead of going to the landfill.

TRASH BIN



This is for waste that can't be recycled or composted. These items are taken to a landfill and can stay there for thousands of years. This should be your smallest bin.

MACHINE SCAVENGER HUNT

You don't see them, but there are pipes in your walls and floors that are connected to every drain in your home. Sometimes water moves through pipes with the help of gravity, and other times pumps are used to push the water through the pipes. Moving clean water into your home and taking dirty water away to be treated are just two examples of "work" that happens every day with the help of machines.

Simple machines are simple tools used to make work easier. Compound machines have two or more simple machines working together to make work easier.

Name six simple machines on these pages.

- 1 Lever:
- 2 Inclined Plane:
- 3 Wedge:
- 4 Screw:
- 5 Wheel and Axle:
- 6 Pulley:

Find a compound machine. What simple machines work together to make this compound machine?

A _____ is a compound machine made up of these simple machines:

GET HOOKED ON LITTER-FREE WATERWAYS!



Activity

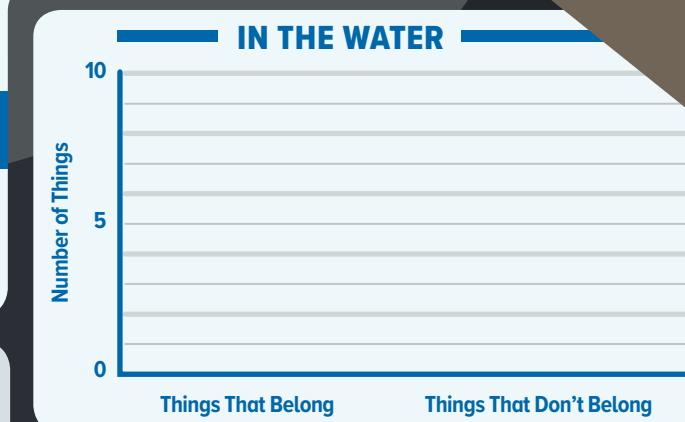
You are fishing in the river in your neighborhood park. Unfortunately, it looks like litter from the park has ended up in the river! Can you “catch” everything in the water?

Circle the things that belong in the water. Draw an “X” on the things that DO NOT belong in the water.

How many things belong in the water?	How many things do not belong in the water?

Bonus Activity

Now, make a bar graph to chart the number of items in each category: things that belong in the water and things that do not belong in the water.



Did you know **litter** hurts our **ecosystem**? An ecosystem includes all the living and nonliving parts of an environment that interact together. Ecosystems support many plants and animals that share limited **resources**. There are two types of ecosystems: **aquatic** and **terrestrial**. Aquatic ecosystems are identified by a large body of water surrounded by land. In an aquatic ecosystem, there are two types of water: **freshwater** and **saltwater**. Water from the rivers and streams are freshwater. Water from oceans are saltwater. In Virginia, there are several rivers that flow into the **Chesapeake Bay** and eventually into the Atlantic Ocean.

Some of the animals found in aquatic ecosystems include birds, insects, fish, turtles, crabs, and even ducks. Plants in an aquatic ecosystem help make oxygen and provide food for the animals. People are responsible for conserving resources to protect our ecosystem. When people throw trash on the ground, overuse chemicals, or destroy habitats, it creates **pollution**. When pollutants get into our water, they harm the plants and animals that depend on it to survive.

Litter starts and stops with us! Litter is 100% preventable. The actions we take every day affect the air, land, water, and the living creatures who make those areas their home.

The list on the left contains a “problem” that leads to pollution. The list on the right contains a “solution” that prevents pollution.

CAN YOU MATCH THE PROBLEM WITH THE SOLUTION?

PROBLEM		SOLUTION
Katie's plastic bag flew out of her hand when she was leaving the grocery store.	1	A Keep a litter bag in the car to collect vehicle trash.
Jake threw his soda bottle on the ground after he finished drinking.	2	B Pick up litter on the ground so animals do not think it is food.
Sam threw her chip bag out of the car window.	3	C Throw bottle you're finished with in the recycling bin.
A bird has a bellyache from eating a piece of plastic it thought was food.	4	D Put a lid on any uncovered trash cans.
Trash has fallen out of a trash can without a lid.	5	E Use a reusable bag for groceries.

BONUS ACTIVITY

Can you think of other solutions to these problems? Write a different solution below each problem.

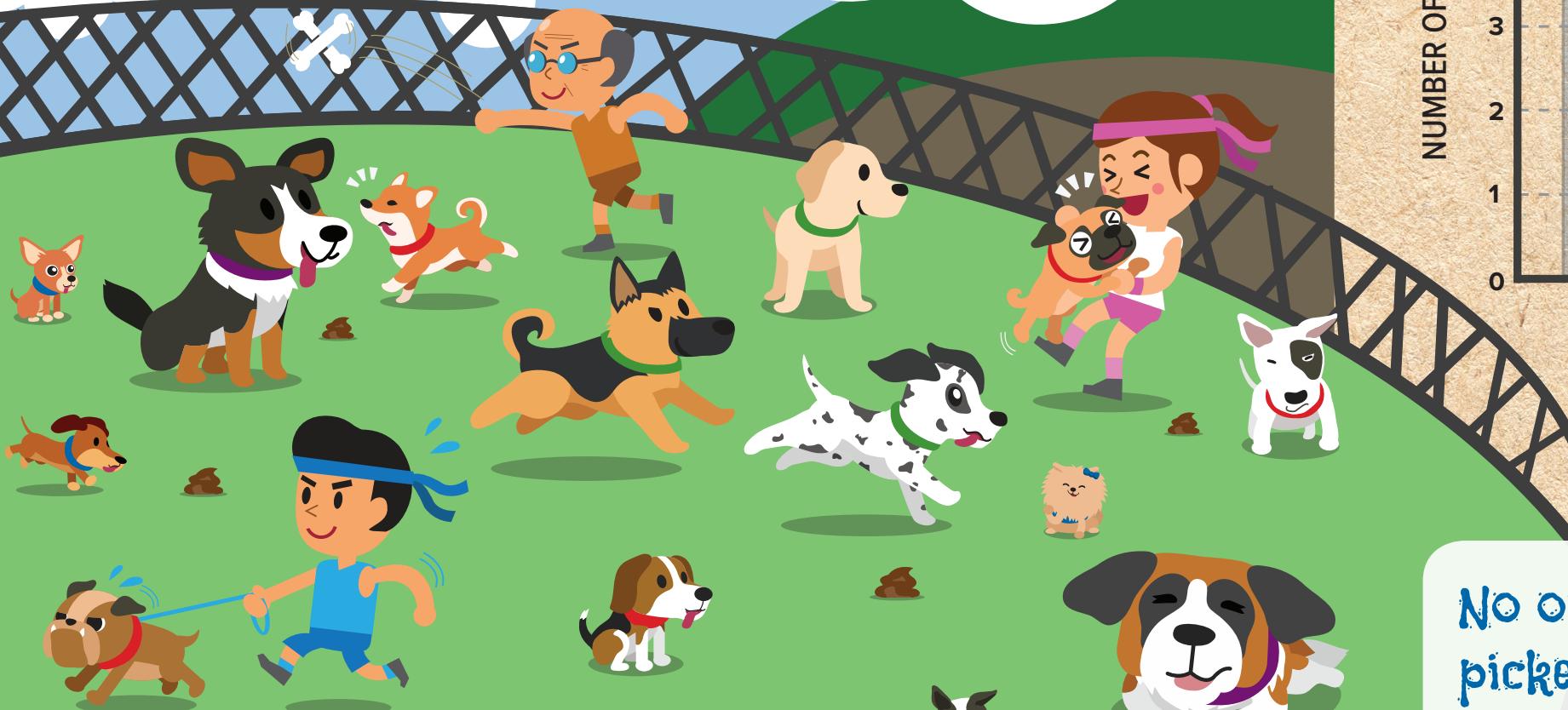
Test Your Knowledge

- 1 **Litter** is waste out of place. How did the litter get into the river?
 - A The fish put it there
 - B Humans put it there
 - C The crabs put it there
- 2 **Habitats** can continue to support the fish, birds, and other animals that live there if people:
 - A Keep littering
 - B Add more water to the river
 - C Leave the natural habitat alone
- 3 Which of these can affect the quality of water in our local rivers?
- 4 People can help keep rivers a good place for aquatic wildlife by:
 - A Preventing litter and chemicals from flowing into the water
 - B Draining the river and starting over
 - C Leaving dog waste on the ground to flow into the water

Stormwater Pollution

Oh, POOP!

Picking up dog waste is more important than just keeping your yard (and shoes) clean! It is important to the environment.



Dog poop is a major contributor to stormwater pollution. It doesn't just decompose. Dog poop contains harmful bacteria and parasites that can contaminate our water and spread disease to humans. It is also high in nutrients that will cause algae to grow in our waterways.

What is the correct way to dispose of your dog's poop? Bag it and throw it in the trash.

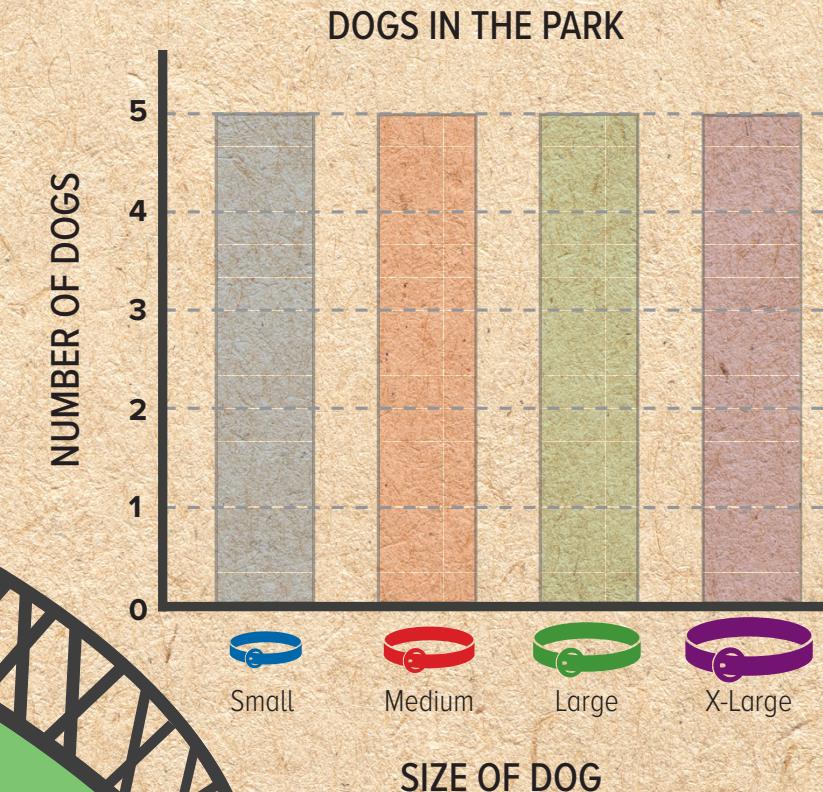
FUN FACT

The City of Norfolk has the **second highest number** of dog parks per person in the United States.



How many dogs are in the dog park (by size)?

Using the image on the left, graph how many of each size dog are in the park. Then, answer the questions.



1 How many medium -sized dogs are in the park?

2 How many more large dogs are there in the park than extra-large dogs?

3 If two more small dogs came to play in the park, how many small dogs would there be in all?

4 Using the graph, order the groups of dogs from **least to greatest**.

5 If there were **seven** frisbees in the park, would there be enough for the medium and large dogs to each have one?

**NO ONE
PICKED UP
THE DOG
POOP IN
THE PARK
TODAY!**

How many ounces of dog poop in all was left to run off and pollute the river?

$$\text{_____} \times 5 \text{ oz.} = \text{_____ oz. of poop per day}$$

small dogs

$$\text{_____} \times 20 \text{ oz.} = \text{_____ oz. of poop per day}$$

large dogs

$$\text{_____} \times 11 \text{ oz.} = \text{_____ oz. of poop per day}$$

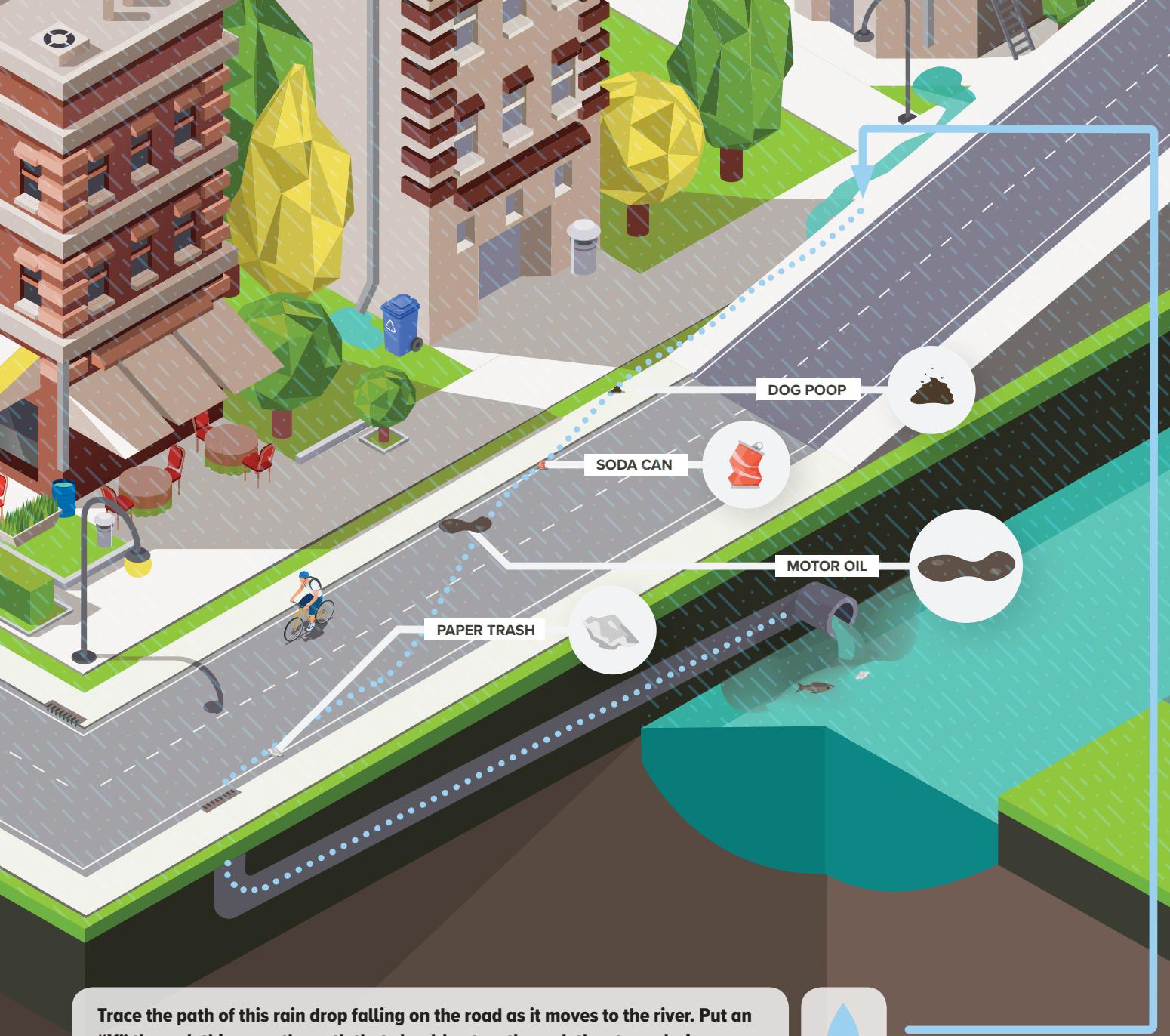
medium dogs

$$\text{_____} \times 37 \text{ oz.} = \text{_____ oz. of poop per day}$$

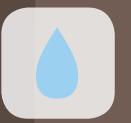
x-large dogs

$$\text{_____ oz. + } \text{_____ oz. + } \text{_____ oz. + } \text{_____ oz. = } \text{_____ oz.}$$

small dogs medium dogs large dogs x-large dogs



Trace the path of this rain drop falling on the road as it moves to the river. Put an "X" through things on the path that should not go through the storm drain.



A QUIET, RAINY DAY

It's raining in the city. Everyone takes out their umbrellas and jumps over puddles. Rain that falls on grass and trees soaks into the ground. The plants use the water to help them grow, but there aren't a lot of plants in the city. Most of the rain falls on buildings or the hard ground. Then it goes into the street and moves downhill. Rain that runs off of buildings and the street is called **stormwater**.

The water picks up trash and oil from the road as it flows. It goes into an opening in the road called a **storm drain**. The storm drain connects to a big pipe under the road. This pipe carries water to nearby waterways, such as streams and rivers. The trash and oil in the water also go to these places.

Animals and plants depend on clean water. What are some ways you can make sure only clean rain water goes down the storm drain?

HELP KEEP THE WATER CLEAN

Farmer Jane needs some help protecting water quality. Her field is bare and there are no trees or shrubs surrounding it. When it rains, the soil runs off into the nearby stream. This is called **erosion**. She also needs help containing her cows. Her pasture is open and she has no way to keep them (and their manure) out of the water.



DOWN AND DIRTY

What is the difference between soil and dirt? **Soil** is a mixture of inorganic particles weathered from bedrock and organic material, both alive and dead. And dirt, well, that's what gets under our fingernails or tracked across the carpet when we don't clean our shoes. (Sorry, Mom!)

Without proper soil, a farmer cannot grow food. Soil stabilizes crops so they can grow tall and plants stabilize soil to prevent erosion. Soil is also important for filtering stormwater, but when soil becomes compacted or hard, it cannot filter rain down to the roots of a farmer's crops. Healthy soil is an important part of our human food chain. Soil is important off the farm, too. It provides a foundation for building roads, houses, schools, and businesses.

CHALLENGE YOURSELF

In this picture, draw some solutions to help Farmer Jane keep the river clean.

- 1 What can you add to protect the shoreline?
- 2 How can you reduce erosion from bare fields?
- 3 How can Farmer Jane keep her cows from going into the water?

CAN YOU IDENTIFY EACH LAYER OF SOIL?

— This layer is made mostly of minerals and most plant roots live here. This layer is also dark in color due to the amount of decaying plant and animal matter.

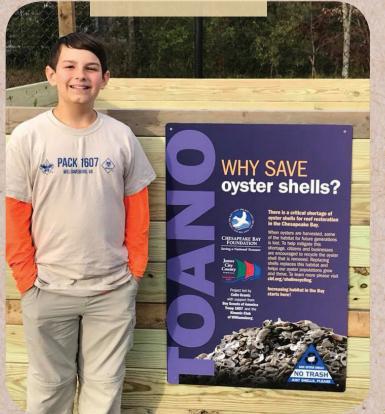
— This layer is made of sand, silt and clay that have not been broken down all the way, so it usually has less organic material and is lighter in color.

— The lowest layer of soil. It is a solid rock layer.



HEROES FOR THE ENVIRONMENT

Sometimes it's easy to say "**I'm just a kid. What can I do to help the environment?**" Take a look around at AMAZING kids here in Hampton Roads and what they are doing!



JAMES CITY COUNTY HERO

Boy Scout Troop 1607 cares about the environment — and boy, do they love oysters! The scouts built an oyster collection bin at the Toano Convenience Center and have bagged 18,000 oyster shells. They use these shells to help baby oysters who need the shells to grow on. They are also working with their Soil and Water Conservation District to learn about topography and soil conservation.

WHAT CAN YOU DO WITH ALL THOSE BOTTLE CAPS?

Keep **Suffolk Beautiful** collected over 20,000 bottle caps of various sizes and colors and turned them into a beautiful mural. **Suffolk Art League** assisted in the masterpiece. This fantastic project drew community-wide attention to the problem of plastics in the environment.



NEWPORT NEWS GETS A MEDAL!

Eagle Scout Conner McKeown placed more than 100 medallions on Newport News storm drains to call public attention to what goes down the drains. **Sedgefield Elementary School** also took positive steps to address stormwater on school grounds by planting over 100 trees and plants.

NORFOLK'S ENVIRONMENTAL HEROES

Norfolk Collegiate "Oak Ambassadors"

They participate in the annual Great American Cleanup around Earth Day.

Maury High School Recycling Club

They partnered with Keep Norfolk Beautiful to expand recycling at their high school. They also purchased recycling bins with askHRgreen grant to supplement bins given by KNB and planned a Go Green Fair.

Norfolk Collegiate 7th Graders

They cleaned up Lafayette Park and boat ramp for International Coastal Cleanup. They also collected 18 bags of trash (270 pounds) and categorized 4,037 pieces of litter.

Oceanair Elementary School Community

They joined the Adopt-A-Spot program and cleaned along Dudley Avenue in Norfolk. In one school year, they have collected 405 pounds of litter.

The message is clear. **People working together can make a BIG difference in our communities!**

ANSWER GUIDE

Page 2

1. H5
2. York River
3. F4
4. Blackwater River
5. James River
6. 0

Challenge Answer:
The area of one square is 100 miles.

Page 5

1. Good, S
2. Bad, D
3. Bad, S
4. Good, W
5. Bad, W
6. Good, D

Page 6

Compost Bin: 2, 9
Recycling Bin: 4, 7, 8
Trash Bin: 1, 3, 5, 6

Page 7

1. Broom, Swing, Office Lamp, Axe, Toilet Handle
2. Pipe, Slide, Ladder, Downspout, Roof
3. Axe
4. Light Bulbs
5. Bicycle, Wheelbarrow
6. Flag Pole

Compound Machine:
A **wheelbarrow** is made of a wheel and axle and lever.

A **bicycle** is made up of wheels, axles and levers

Page 8

Eight things belong in the water.
Ten things do not belong in the water.

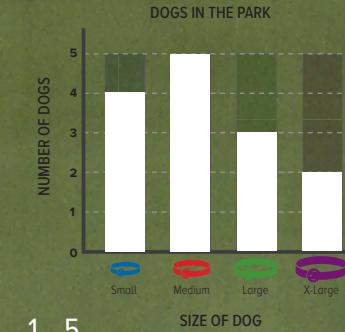
Page 9

Problem and Solution

1. E
2. C
3. A
4. B
5. D

1. B
2. C
3. B
4. A

Page 11



1. 5
2. 1
3. 6
4. X-Large, Large, Small, Medium
5. No

Small dogs = 20 oz.
Medium Dogs = 55 oz.
Large Dogs = 60 oz.
X-Large Dogs = 74 oz.

$$20 \text{ oz.} + 55 \text{ oz.} + 60 \text{ oz.} + 74 \text{ oz.} = 209 \text{ oz.}$$

Page 12

Draw a X on dog poop, motor oil, and litter.

Page 13

Topsoil
Subsoil
Bedrock



YOU CAN MAKE A DIFFERENCE!

Pledge to do these five things and be a Hampton Roads hero!



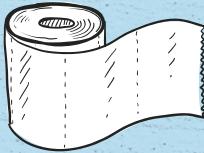
Recycle paper, aluminum cans, and plastic bottles.



If you see trash, pick it up! Don't leave trash in your yard, playground, or school.



Carry a reusable bottle to fill with tap water to quench your thirst.



Adopt the storm drain or ditch in your neighborhood. Make sure your neighbors know only rain goes down the drain (or ditch).

Only flush the three Ps – pee, poo, and (toilet) paper.



Want to take your commitment to the next level?

CHECK OUT THE ASKHRGREEN.ORG MINI GRANT PROGRAM

askHRgreen.org offers environmental education mini grants of up to \$500. The mini grants are intended to provide funding for environmentally-themed projects and may be used to fund a portion of or an entire project. **All Hampton Roads school teachers (K-12), youth leaders, or organizations working with youth are eligible to apply.** Some project ideas include school recycling or composting programs, learning gardens, choose-tap-water campaigns, and wastewater-treatment tours.

askHRgreen.org

FOLLOW US twitter.com/HRgreen

LIKE US facebook.com/askHRgreen

FOLLOW US instagram.com/askhrgreen

TUNE IN TO youtube.com/user/HRGreenVA

READ askhrgreen.org/blog

askHRgreen.org is your go-to resource for all things green in Hampton Roads — from recycling tips and pointers for keeping local waterways clean to water-saving ideas and simple steps to make local living easy on the environment.

askHRgreen.org is administered through the Hampton Roads Planning District Commission (HRPDC) and powered by the following members: the cities of Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg; the counties of Gloucester, Isle of Wight, James City, Southampton, Surry and York; the Town of Smithfield; and HRSD.

Development of this publication was paid for, in part, by funds generated from the sale of Chesapeake Bay license plates.