



**PROTECTING**

**OUR**

**WATERSHED:**

**AN**

**ACTIVITY**

**BOOK**

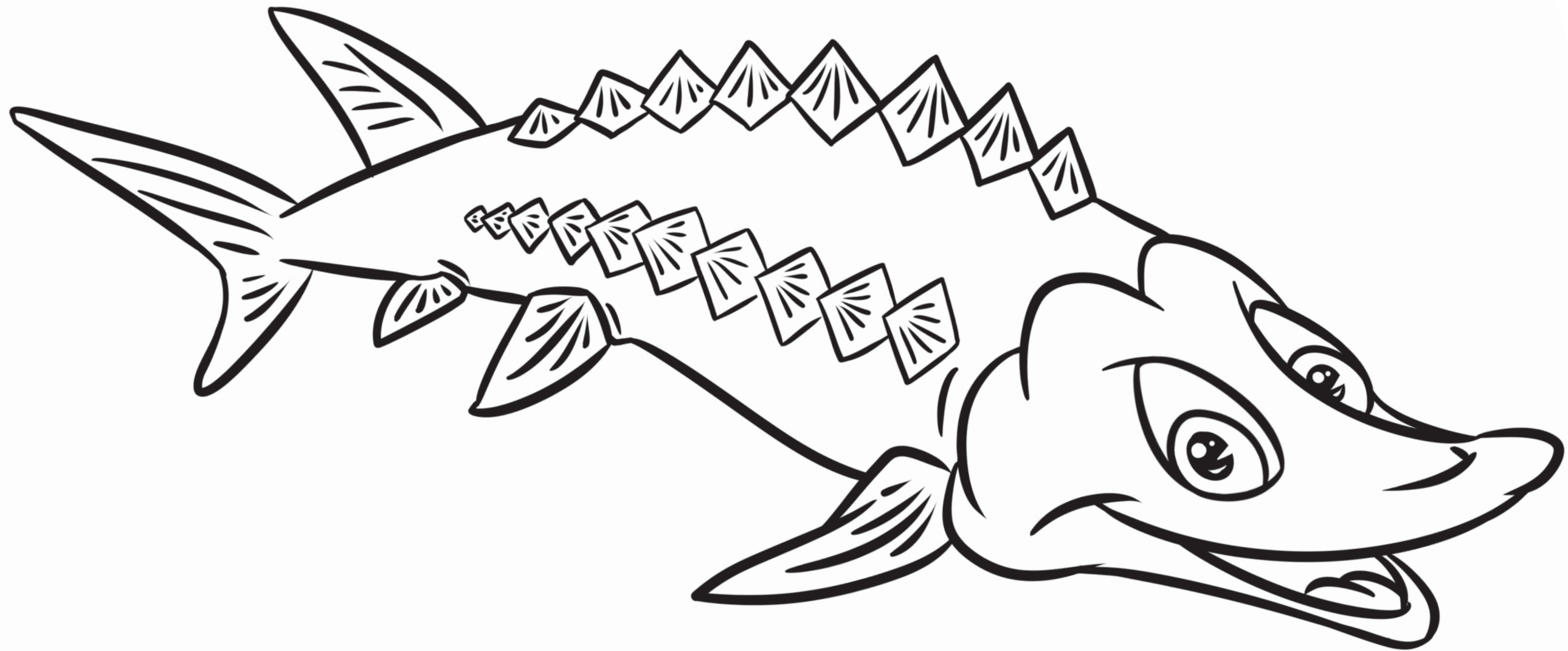
**WMEAC**

  
**GRAND VALLEY  
STATE UNIVERSITY**  
COLLEGE OF EDUCATION

**DEP** 

 **EPA**

**Groundswell**



“I’m Sturgis, a sturgeon, which is the largest fish in the Great Lakes system. Many people think of me as a living fossil because my ancestors have been around for more than 150 million years. Sturgeon can grow to more than 8 feet long and 800 pounds and can live to be 100 years old.

There used to be plenty of us around, but today scientists estimate only around 5000 of us remain in the Great Lakes. We are considered a state **threatened** species, mainly because of over-fishing, pollution, and loss of habitat. It is very unlikely you will catch a glimpse of me these days. However, Michigan does hold one of the last major populations of sturgeon.”

## PART ONE: WATERSHEDS

A watershed is the land area that drains into a stream or other body of water. Gravity pulls water downhill from rainstorms, snow melt, and even groundwater supplies until reaching the lowest point in an area, where bodies of water are found.

### Learning about our watershed...

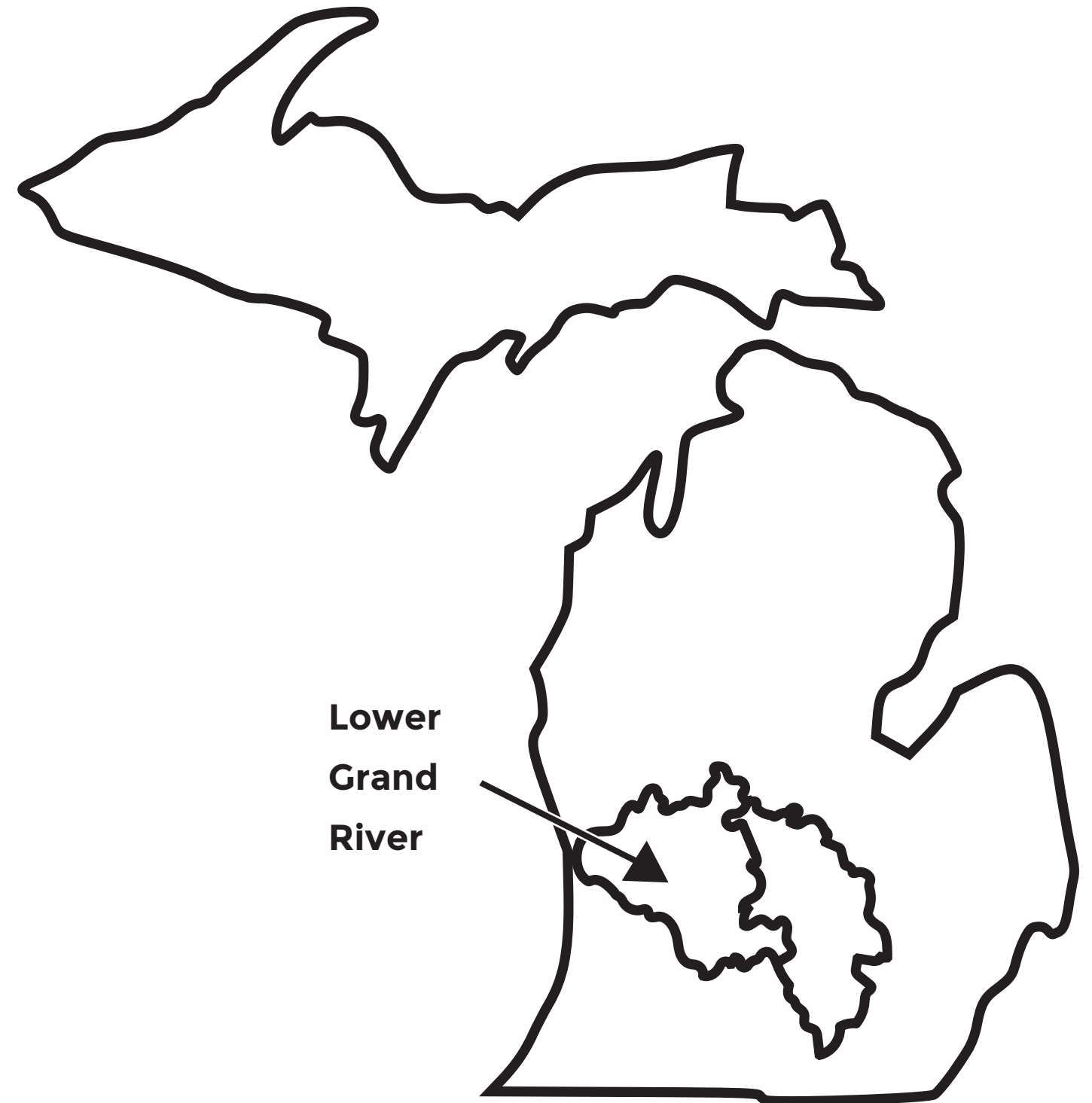
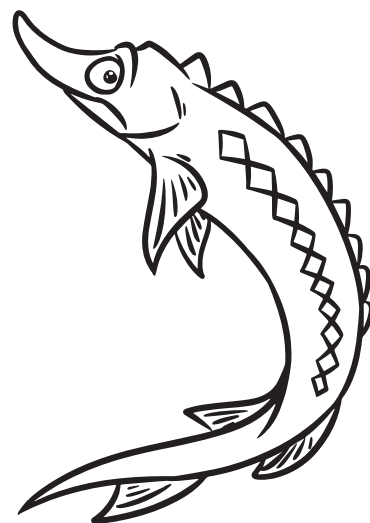
Living in Michigan means you are a part of the Great Lakes Basin! This means you live in a watershed that holds 20% of the entire world's freshwater.

In West Michigan, our water comes from Lake Michigan and the lower Grand River Watershed, which covers over 2,900 square miles and provides water for almost a million people!

only 30% of all Earth's water is accessible fresh water, so it is important to understand the importance of our watershed!

### LOOK AT A MAP

1. Name a stream in your watershed
2. Trace the stream to name the largest river in your watershed
3. Trace that river to where it meets a larger body of water
4. Name where the river meets the Great Lakes



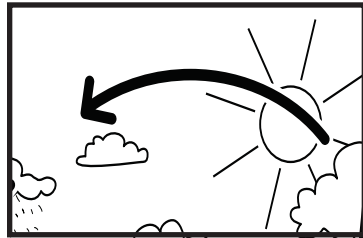
Lower  
Grand  
River

**PART TWO: THE WATER CYCLE**

Earth has a limited amount of water continually going around in the **water cycle**. Water evaporates, travels into the air and becomes part of a cloud, becomes heavy and falls down to earth as precipitation, and then evaporates again. Water changes from a solid to a liquid to a gas over and over again in order to replenish our world with fresh water. This cycle is never-ending and the water on Earth has been here since the beginning of time. Water is pretty amazing stuff.

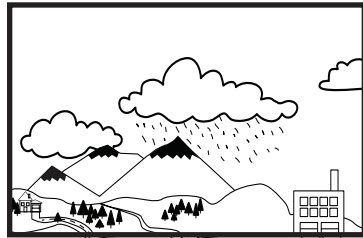
**WATER MOVES FROM ONE PART OF THE WATER CYCLE TO ANOTHER**

**CONDENSATION**



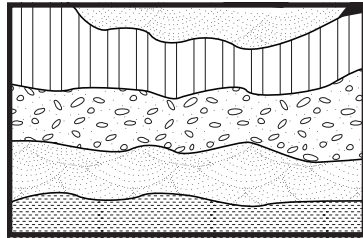
This is the process that changes water vapor in the air into liquid water. Condensation is crucial to the water cycle because it is responsible for the formation of clouds.

**PRECIPITATION**



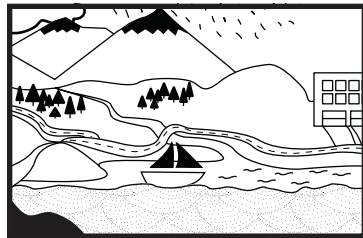
Precipitation is water released from clouds in multiple forms. It is the primary connection in the water cycle that provides for the delivery of atmospheric water to the Earth.

**INFILTRATION**



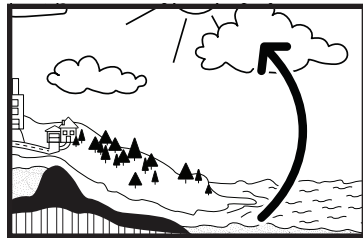
Infiltration is an important process where rainwater soaks into the ground, through the soil and underlying rock layers.

**RUNOFF**



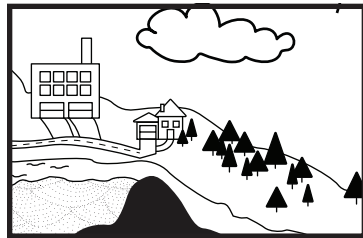
Lots of water that returns to Earth as precipitation runs off the surface of the land, and flows downhill into streams, rivers, ponds and lakes.

**EVAPORATION**



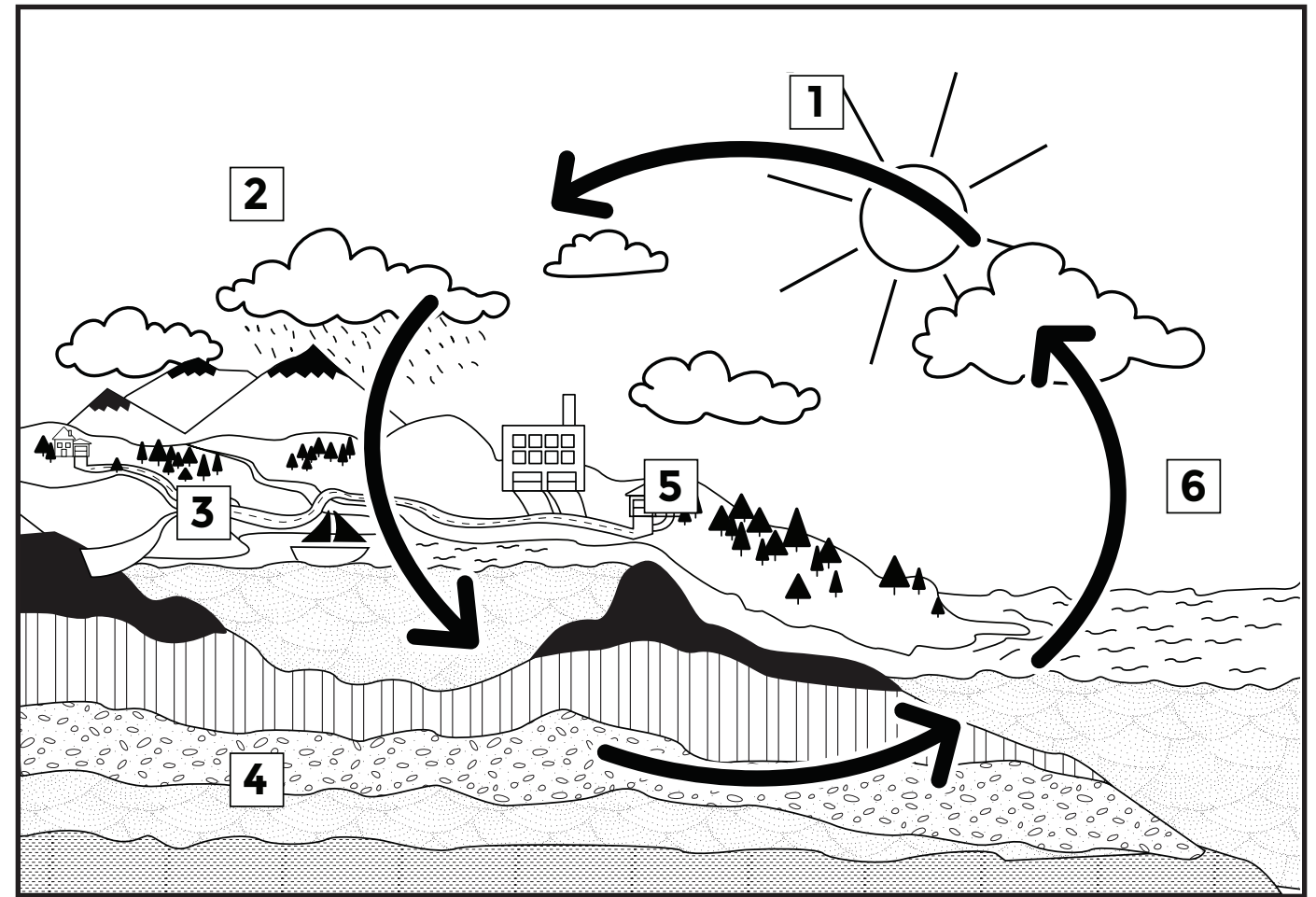
Evaporation is the process where a liquid, in this case water, changes from its liquid state to a gaseous state.

**TRANSPIRATION**



The process of water evaporation through plant leaves is called transpiration.

Review your knowledge of the water cycle processes:



- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

- 4. \_\_\_\_\_
- 5. \_\_\_\_\_
- 6. \_\_\_\_\_



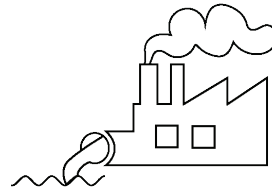
Water Cycles are unbelievable! Would you believe that a dinosaur could have once used your drink of water!



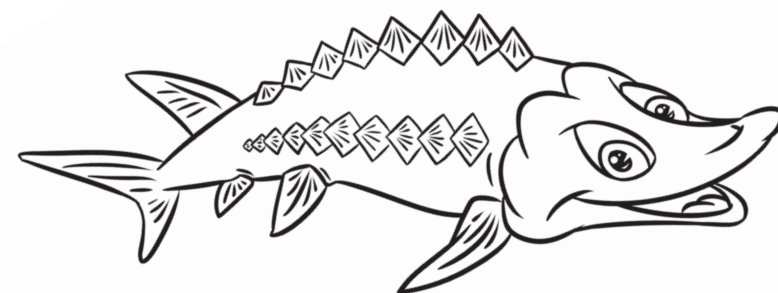
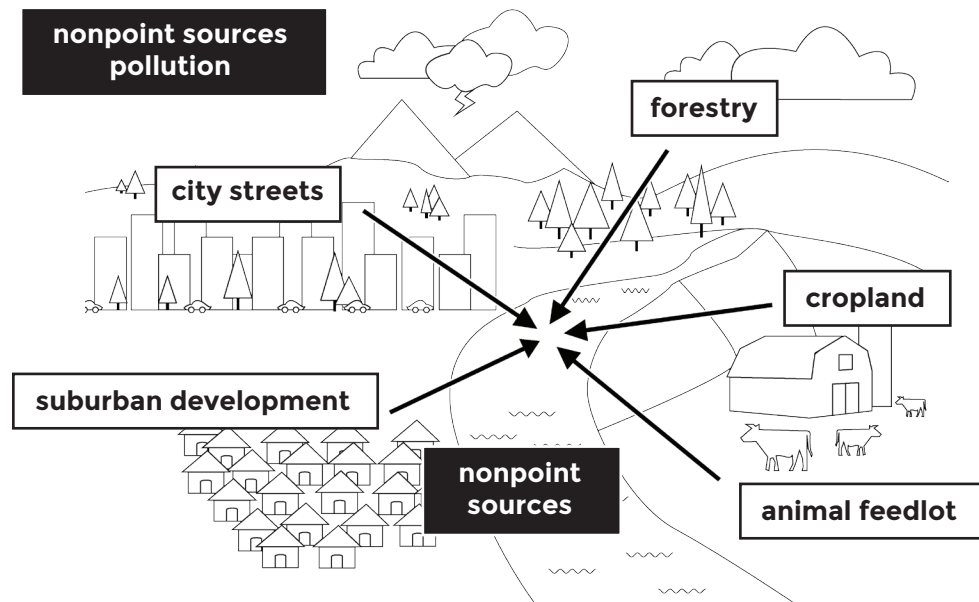
### PART THREE: POLLUTION

There are two main categories of water pollution: **point source** and **nonpoint source**.

**Point source pollution** comes from a specific location that is easy to identify - like a pipe. You can easily point to the spot and know exactly where the pollution is coming from.



**Nonpoint source pollution** comes from all over the watershed. It's spread out over a big area, and you can't point to a specific spot where it is coming from. Rain and snow melt picks up chemicals and other substances as the water flows over the ground. This pollution can make people sick and harm ecosystems.



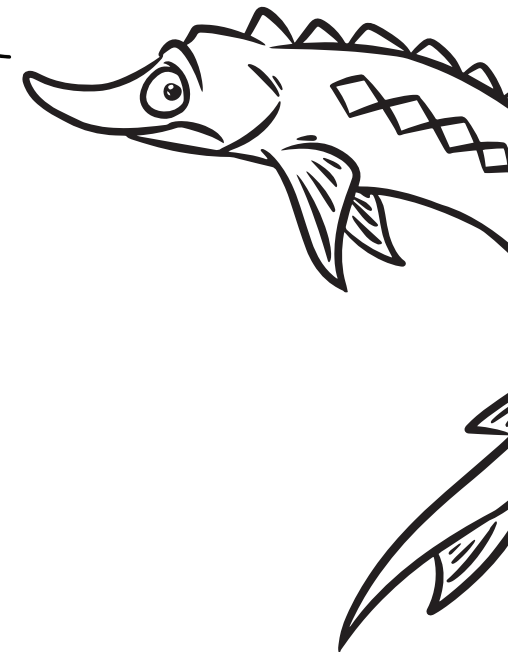
Did you know storm drains go directly to the river - not a water treatment plant? Any pollution that goes down the drain will get into the river!

Join Sturgis as he explores the three main types of nonpoint source pollution in the Grand River Watershed and what we can do to protect the water!

### PATHOGENS AND BACTERIA: NO WASTE IN THE WATER!

Pathogens and bacteria come from the feces of livestock, pets, wild animals, and septic systems that aren't managed properly. Pathogens from the waste are picked up by rainwater as it flows over the ground and down the storm drain to the river (nonpoint source pollution).

Pathogens are organisms that can make people sick. High levels of pathogens in the water leads to beach closures to protect human health!

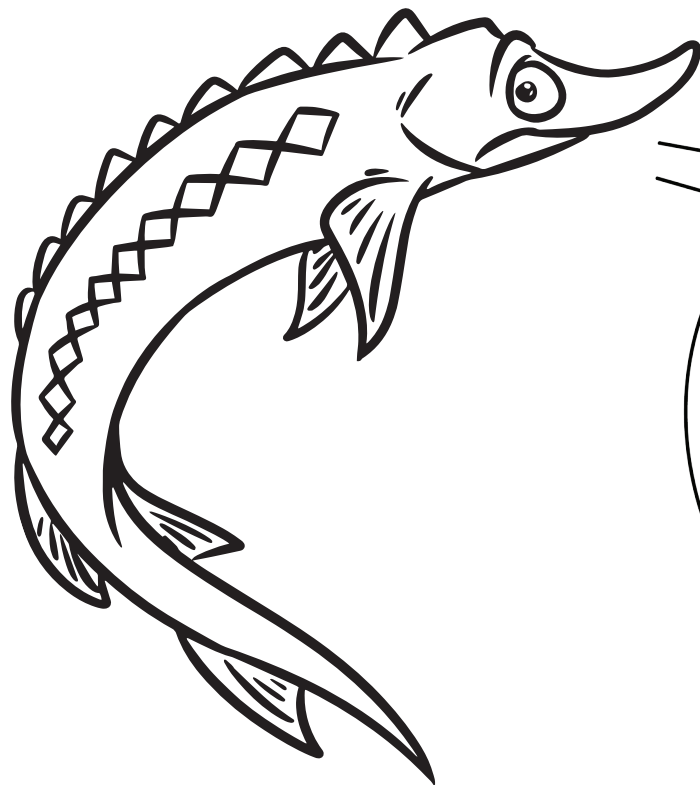


#### Help Sturgis keep pathogens out of the water!

- Pick up after your pets
- Plant native vegetation to soak up rainwater and clean it before it goes down the storm drain

### SEDIMENT: HOLD DOWN THE SOIL!

Sediment pollution comes from soil that is picked up by rainwater as it flows over the ground. Flowing water has a lot of energy. This energy gives water the power to pick up and transport loose soil and other materials. If soil is not held down by vegetation, there is a much higher risk it will erode and be carried away by rainwater (nonpoint source pollution).



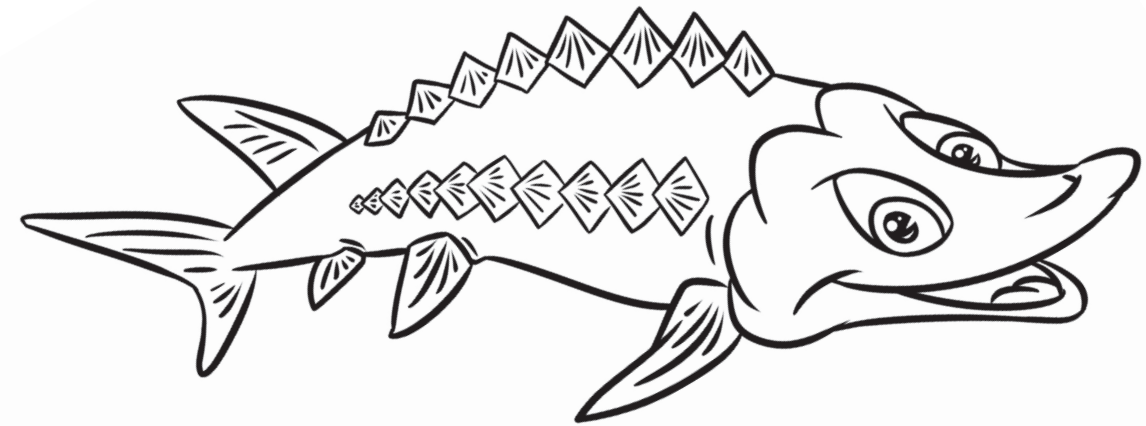
Fish and aquatic insects need gravel beds in streams to lay eggs. Too much soil in streams covers up these gravel beds. Sediment also can hurt fish gills and make it harder for organisms in streams to find food.

### Help Sturgis keep sediment out of the water!

- Plant native vegetation to hold down soil
- Plant a rain garden to soak up rainwater and prevent it from eroding soil
- Install a rain barrel to catch rainwater and prevent it from eroding soil

### NUTRIENTS : DON'T OVERFEED THE LAKE!

Nutrients are chemicals - like fertilizer - that plants use to grow. The most common nutrients that can cause harm in the watershed are nitrogen and phosphorus. These nutrients come from pet waste, manure, poorly maintained septic systems, and fertilizer used on lawns and farm fields. Nutrients are picked up by rainwater as it flows over the ground and are carried to rivers and lakes (nonpoint source pollution).



If too many nutrients are added to a lake, weeds and algae will grow out of control. This makes the lake less healthy for fish like me and other aquatic organisms. It also makes it less fun for people to boat or swim in the lake.

### Help Sturgis keep nutrients out of the water!

- Do a soil test to figure out how much fertilizer to use on your lawn - it will save you money and keep nutrients out of the river
- Pick up after your pet
- Plant native vegetation to soak up rainwater and absorb nutrients

## AQUATIC MACROINVERTEBRATES

What is an aquatic macroinvertebrate?

Let's break it down!

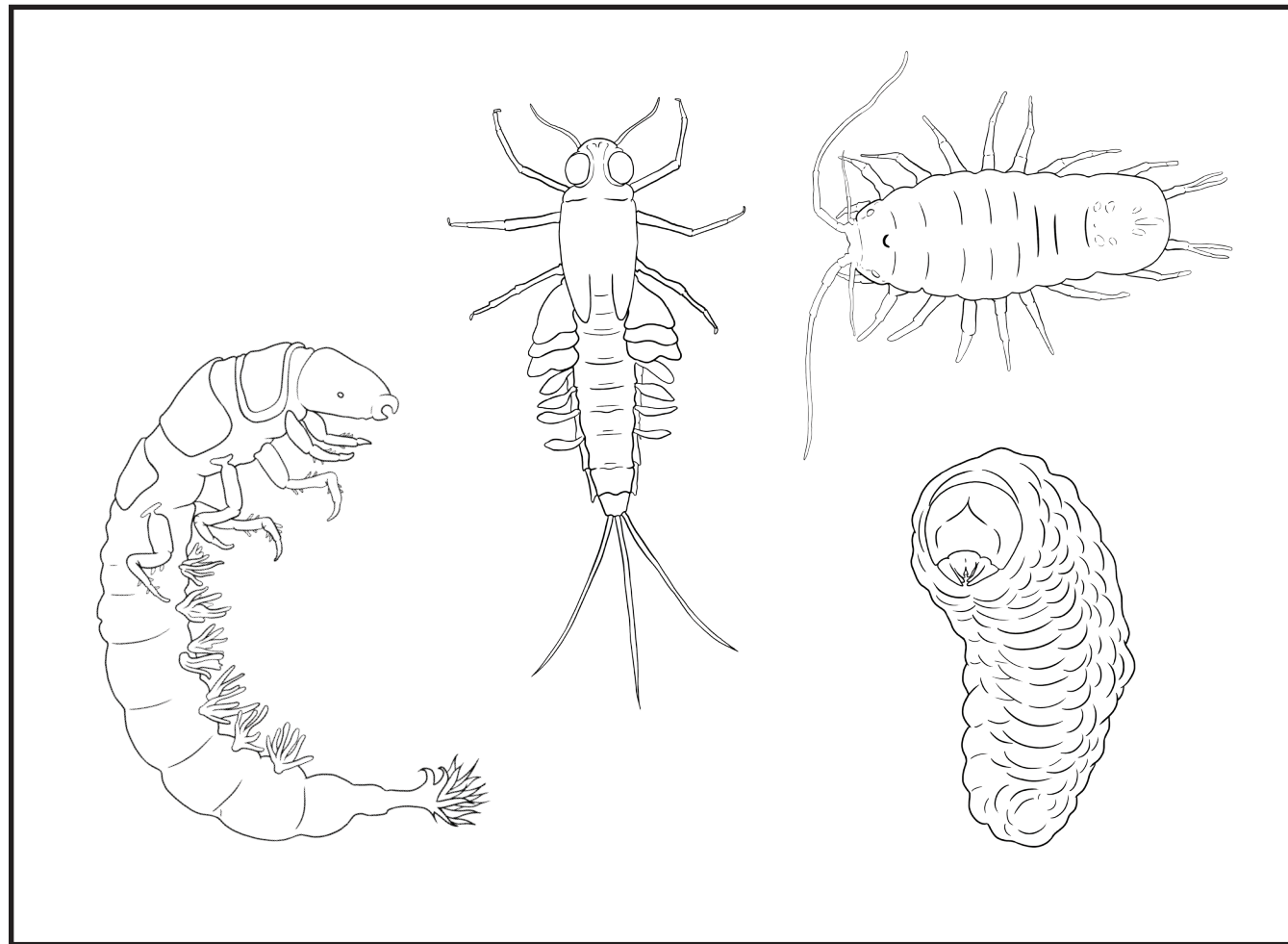
**AQUATIC** means water

**MACRO** means big enough to see without a microscope

**INVERTEBRATE** means without a backbone

Macros make their homes in the sediment of stream beds. Some of these insects and non-insects (like scuds, clams, mussels and snails) spend their entire lives in water. Often, just the insect's larva and nymph stages are spent in water.

Here are some examples:



CADDISFLY, MAYFLY, SOWBUG, GILLED SNAIL

## WHY DO WE CARE ABOUT AQUATIC MACROINVERTEBRATES?

They are an important part of the food chain. Many feed on algae and bacteria and are critical to the flow of energy and nutrients in the food chain. They feed on the algae and shred leaf matter and sticks that fall into the water. They are an important source of food for fish.

### MACROS ARE GOOD INDICATORS OF WATER QUALITY.

Different types of macros tolerate different levels of pollution and stream conditions. When you find a population of certain macros in a stream, you can make predictions about the water quality.

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### WE CAN GROUP MACROS ACCORDING TO THEIR POLLUTION TOLERANCE:

#### GROUP 1

**low pollution tolerance** which means they are highly sensitive to pollution. If these bugs are found in a stream, the water quality there is probably pretty good.

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rifle beetles, dobsonfly larvae, caddisfly larvae, stonefly larvae, caddisflies, mayflies and stoneflies

#### GROUP 2

**medium pollution tolerance** which means they can tolerate some pollution and can be found in a wider range of water quality.

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damselfly nymph, aquatic sowbug, crayfish, scud, crane fly larvae and dragonfly nymphs

#### GROUP 3

**high pollution tolerance** Finding these usually means pollution and poor water quality.

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leeches, aquatic worms, backswimmers, water boatmen pouch snails and water scorpions

Draw arrows showing the flow of energy from one organism to another. Keep in mind the energy starts with the sun and flows from there.

PRIMARY PRODUCER → PRODUCERS → PRIMARY CONSUMERS → SECONDARY CONSUMERS			
sun	algae	macroinvertebrates	fish
	plants	zooplankton	frogs
			insects

Unscramble the letters of these macroinvertebrates

s i c r a h y f

g m y y d r o l n p h f a n

d c l a i s f y d

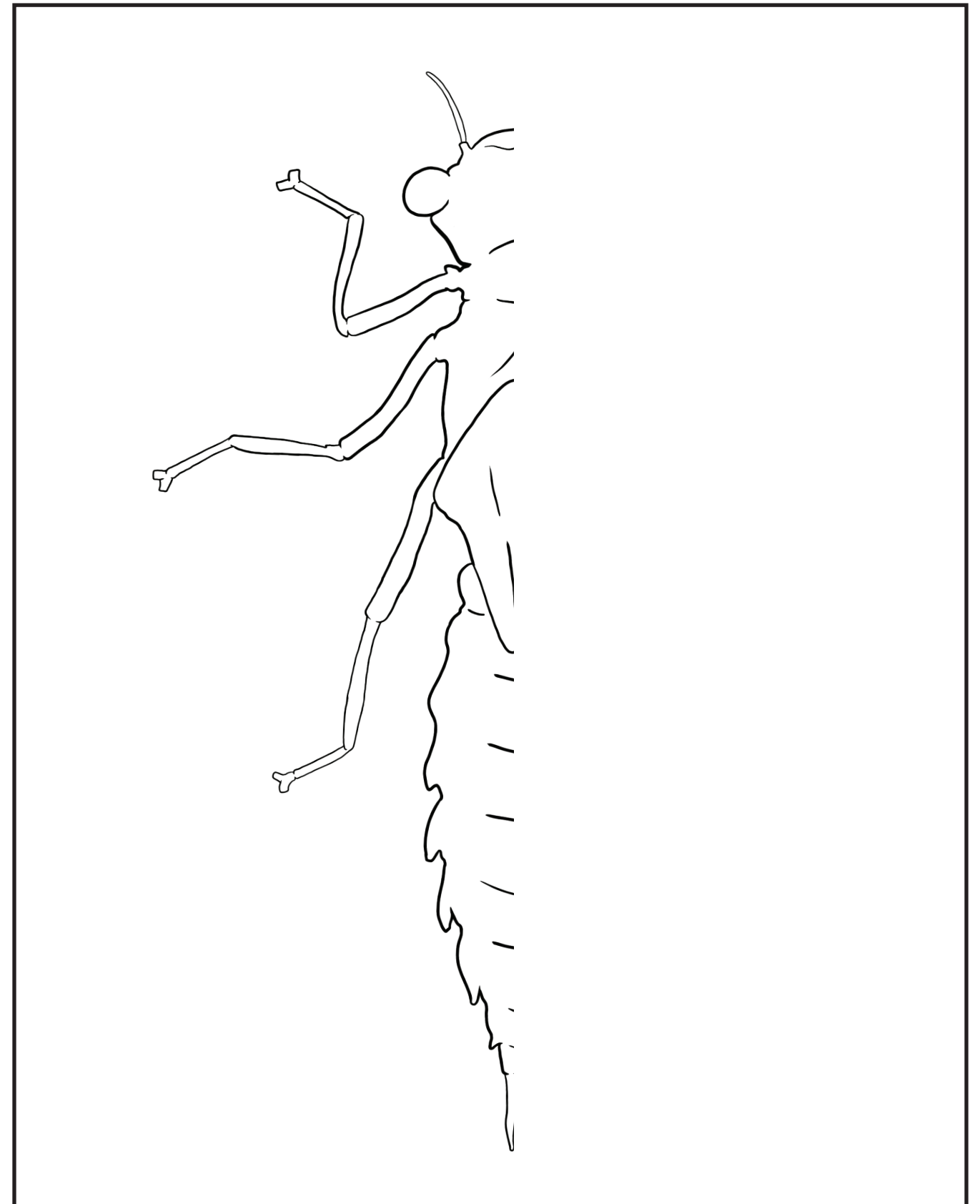
s c h e c e l e

v y r a a e f l l a r n e f c

u c d s

b t b a a c s o u g w i u

Complete the pictures of commonly found macroinvertebrates!



Dragonfly



**DOWN**

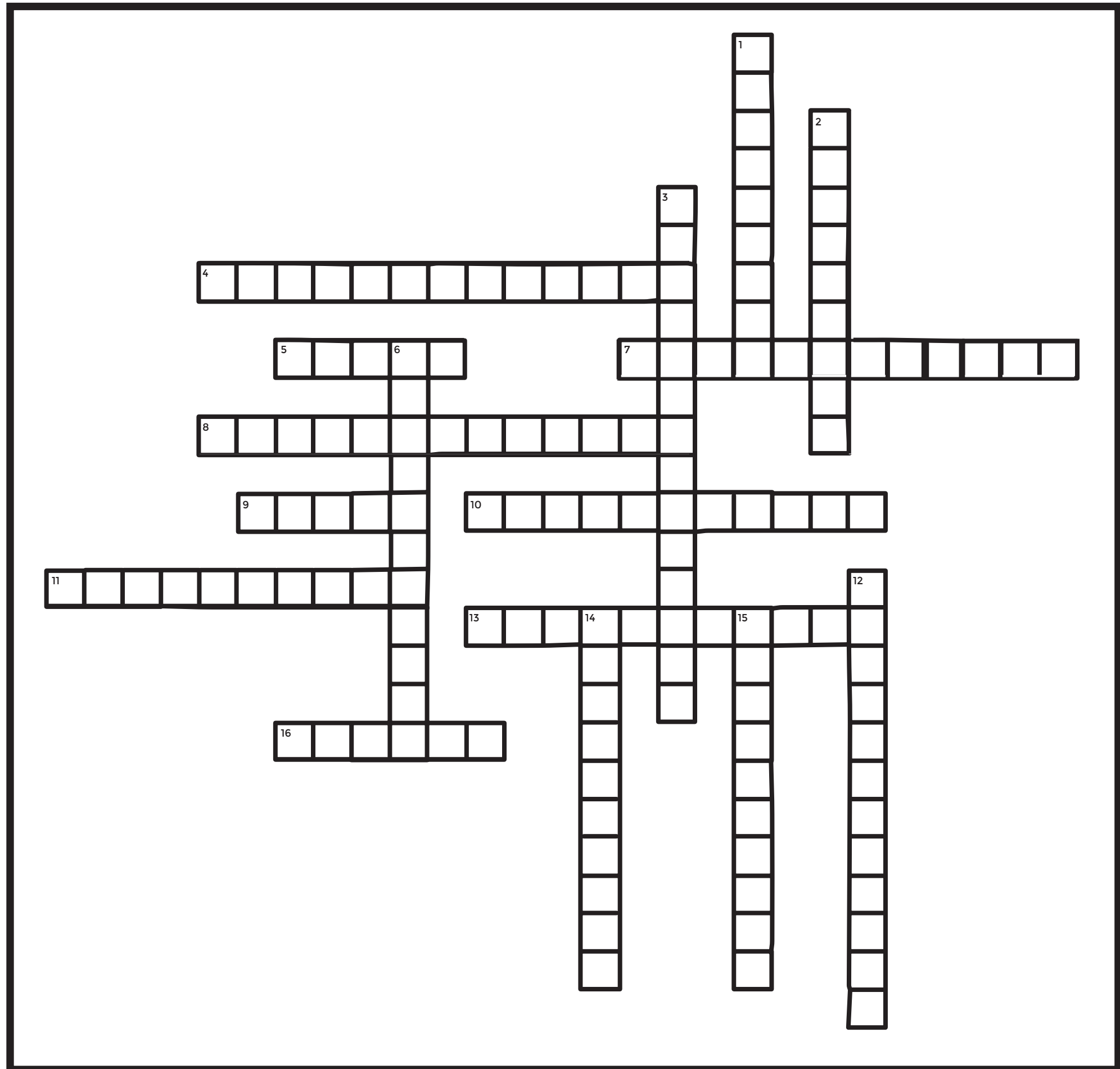
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- 1) The land area that drains into a stream or other body of water
- 2) The range of conditions that an organism can withstand
- 3) Pollution that comes from many different sources
- 6) Not permitting the passage of fluid
- 12) The process of rainwater soaking into the ground, through the soil and underlying rock layers
- 14) A chemical used to destroy plant pests
- 15) The surface features of places or regions on a map that shows landform locations and elevations

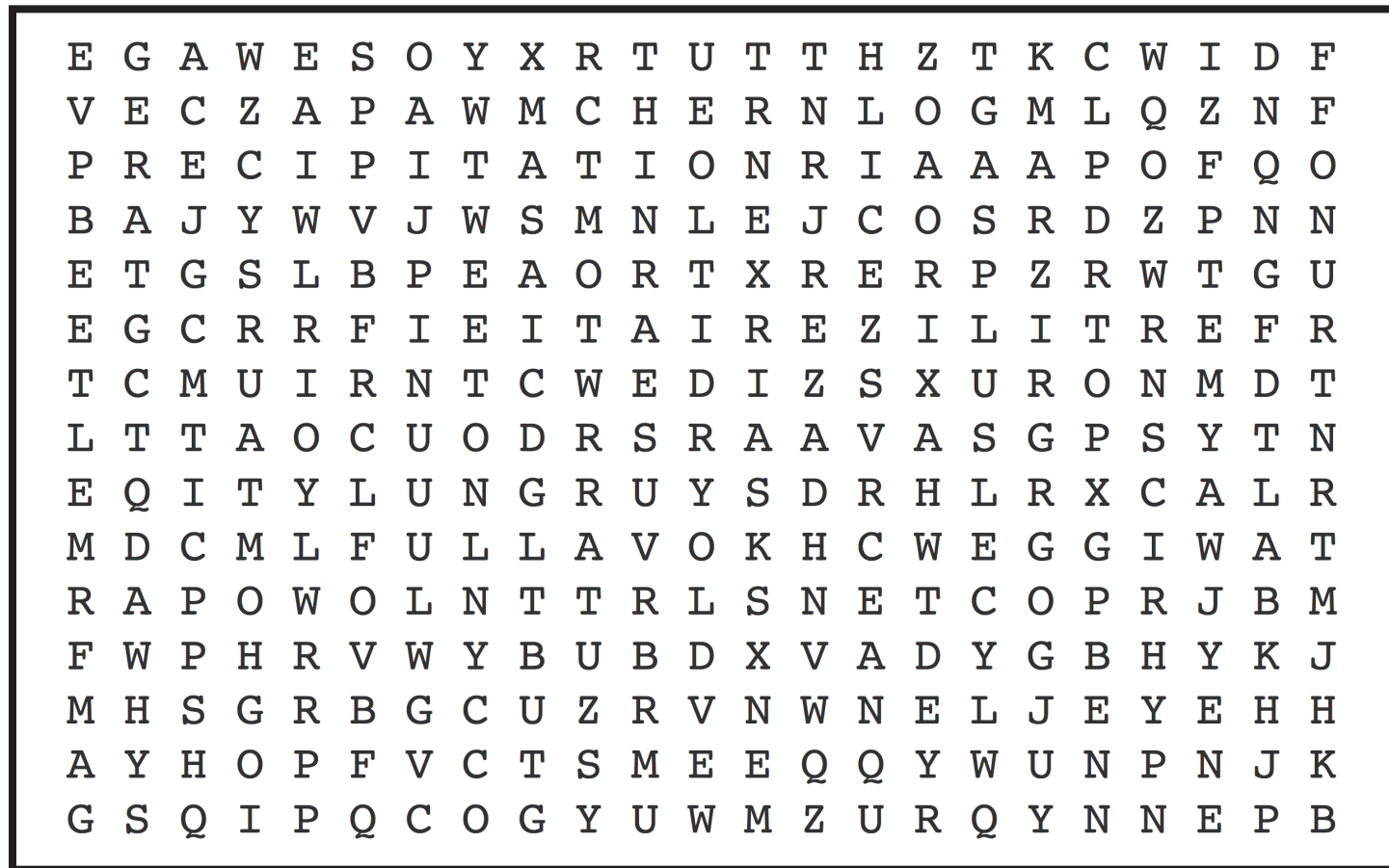
**ACROSS**

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- 4) The process of water evaporation through plant leaves
- 5) An enclosed area that usually holds water
- 7) This is the process that changes water vapor in the air into liquid water
- 8) Water released from cloud in multiple forms
- 9) A large natural flow of water that crosses an area of land and goes from an ocean or lake
- 10) Pollution that enters a waterway through a specific entry point
- 11) The flowing together of two or more streams
- 13) The process of changing from a liquid state to a gaseous state
- 16) A natural flow of water that is smaller than a river



# WATERSHED WORD SEARCH



## FIND THE WATERSHED TERMS

Watershed	Groundwater	Point source	Water Penny
Sewage	Mayfly	pollution	Beetle
Dragonfly	Runoff	Fertilizer	Factories
Pollution	Salt	Precipitation	Agriculture

## HELP PROTECT THE WATERSHED FROM NONPOINT SOURCE POLLUTION!

Nonpoint source pollution is one of the biggest issues impacting the quality of the water in the Grand River Watershed. Since nonpoint source pollution comes from the entire watershed - anywhere rain falls on the land - it is very challenging to manage.



## HERE IS A CHECKLIST TO PREVENT WATER POLLUTION DAILY!

### CAR

- Use caution when changing your motor oil.
- Sprinkle kitty litter over any spills that may occur.
- Go to a car wash instead of washing it yourself.
- Park on grass instead of solid surfaces when washing your car.

### IN YOUR NEIGHBORHOOD

- Pick up after your pets to keep waste out of the river
- Remove trash and debris from storm drains to keep litter out of the river
- Adopt a park and plant trees and native vegetation to soak up rainwater
- Plant tall grasses around ponds and lakes to keep geese waste out of the water
- Plant trees and native vegetation near eroded streambanks to hold the soil in place

### AROUND THE HOUSE

- Use less fertilizer to keep nutrients out of the river
- Install a rain barrel to collect rainwater for watering your lawn and garden - and save money!
- Replace lawn grass with native vegetation to soak up rainwater and filter out pollutants
- Cover exposed soil with vegetation to hold down soil and prevent erosion
- Wash your car at a carwash or on the lawn to keep soap out of the storm drain
- Keep trash cans covered and secure to prevent litter
- Perform regular maintenance on septic systems to keep human waste out of the water
- Do not dispose of waste by dumping it down the storm drain to prevent waste from entering the river
- Securely close your outdoor trash cans.

### YARD

- Sweep your driveway clean instead of rinsing it with a hose.
- Follow fertilizer and pesticide directions correctly and avoid overuse and never apply right before a rain event.
- Implement rain barrels in your backyard and point downspouts away from hard surfaces.
- Take yard waste to green waste facilities.
- Cover exposed soil with mulch or grass.
- Keep all stormdrains clear of debris.

### PETS

- Pick up your pet's poop.



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