

The Strength of Water

Background

The hydrogen bond that links water molecules is very strong. This gives water tremendous strength. Water can be stretched and pulled quite a bit before it breaks. In the following activity, you will look at surface tension in order to gain an appreciation of water's strength.

SURFACE TENSION

Purpose

- To show how water 'sticks' to itself.

Material

- Penny
- Eyedropper
- Cup of water

Steps

1. Distribute a penny, an eyedropper and a cup to each student.
2. Demonstrate how to use the eyedroppers. The best method for filling eyedroppers is to first squeeze the bubble end, dip the shaft below the water's surface, then release the bubble. This keeps the droppers from dripping accidentally.
3. Count how many drops of water you can fit on the penny. As soon as the water spills off the edge of the penny, they have reached the penny's capacity to hold water drops. Have the students' record on a chart the number of drops of water fit on their pennies.

Questions

1. What shape does the water form on the penny?
-

2. Why does it do this?
-

Pair up with a partner. Have one person touch their forefingers together while their partners use their hands to "slice" them apart. Next, have one partner lock their forefingers together by linking them together at the knuckles and pulling against each other. Have the other partner try to break this link. You will find it difficult or impossible to break this link. Hydrogen bonds are strong like this. The water molecules hold on so tightly that they don't come apart easily. This allows water to mound up on a penny.

WHAT CAN YOU DO?

Objectives

The student will do the following:

1. Identify ways people can help protect wetlands.
2. Design a wetlands conservation poster.

Background Information

Over the years, many of Canada's wetlands have been destroyed, mostly by draining and/or filling them, and using them for purposes such as agriculture or real estate development. As we learn more and more about the values and benefits wetlands provide to us and our environment, many people are now taking the steps to protect these valuable areas.

Advance Preparation

1. Obtain the book WERE YOU A WILD DUCK WHERE WOULD YOU GO? From your local public or school library.
2. If this award winning book is not available, use the alternative method of reading a short encyclopedia article about a selected species of waterfowl (such as mallards).
 - a. After reading key information to the students, ask them to imagine that their class is a small flock of (your selected) birds on their long migration flight.
 - b. Use a globe or world map to show the students the migratory path of your selected bird.
 - c. Have the students identify when wetlands are important to the bird (such as nesting and raising young, and resting during migration,). Ask the student what things wetlands have that are important to your selected waterfowl (land, water, plenty of food).
 - d. Have the students imagine that they are each waterfowl. Ask them what they would do if more and more of the wetlands along their flight path disappeared (were drained or filled and used for agriculture or real estate development). Have several student share what they think would happen. (What really happens is that fewer birds survive, thrive and reproduce; numbers of the birds decrease over time.)

Subjects:

Science
Art
Language Arts

Time:

1 hour

Materials:

Posterboard or large sheet of paper
Markers or crayons
Globe or world map
Were You A Wild Duck Where Would You Go? By George Mendoza

WHAT CAN YOU DO?

Procedure

1. Setting the Stage

- a. Discuss the book "Were You A Wild Duck Where Would You Go?", making sure the students understand the main character, Mallard, is a wetland bird and his home has been destroyed. (Note: If the book is unavailable, and you use the alternative detailed above, your lesson can still proceed successfully.)
- b. Tell the students that many of our wetlands are being destroyed because pollution is being dumped into the waters that drain into them, they are being drained for agricultural use, or they are being drained and/or filled for housing development, shopping centres, office building, or factories, or other real estate development.
- c. Briefly discuss the reasons for protecting wetlands. (Note: You may use the teacher sheet "10 Reasons Wetlands Are Important).)
- d. Explain to the students that today they are going to learn about some things that other people are doing to protect our valuable wetlands, and they will discover things they can do to help.

2. Activity

- a. Show the students
- b. Share briefly the definitions of the Clean Water Act and the North American Waterfowl Management Plan. Tell the students that these programs are some of the things their government is doing in an attempt to protect wetlands.
- c. Discuss with the students the importance of getting individuals involved in the protection of wetlands. Divide the students into cooperative learning groups. Challenge the groups to brainstorm things they could do to get involved in protecting wetlands. Allow five minutes for the groups to work on this problem.
- d. Call time then have the groups share their ideas with the class.

3. Follow-Up

- a. Tell the students they are going to design and create a "Wetlands Conservation Poster". Briefly review the importance of wetlands and why they should be protected.

WHAT CAN YOU DO?

3. Follow-Up (cont'd)

- b. Distribute the poster-board or large sheets of paper. Have students get out their markers and/or crayons. Before they begin, give them about five minutes to plan their poster. Stress that they should keep in mind the reasons wetlands are important to people and the environment, and remind them their posters should show things individual people can do to help protect wetlands.
- c. When the posters are complete, allow students to present their posters to the class.

4. Extensions

- a. Have the students research their community to locate wetlands near them. If possible, arrange a field trip to visit a wetland area. (For the Niagara Region, please contact The Niagara Peninsula Conservation Authority at (905) 788-3135).
- b. Contact Ducks Unlimited and ask if there is a member who could speak to your class about what is being done to conserve wetlands. After the visit, have the students write a thank you letter to the visitor. You can visit Ducks Unlimited at their website: www.ducks.ca

10 REASONS WETLANDS ARE IMPORTANT

- 1. Fish, wildlife, and plant habitats:**

- 2. Critical habitats for endangered species:**

- 3. Flood control and protection:**

- 4. Water quality improvement:**

- 5. Shoreline erosion control:**

- 6. Reduction of storm drainage:**

- 7. Groundwater recharge:**

- 8. Natural products:**

- 9. Recreation and aesthetics:**

- 10. Education and research:**

Wonderful Wetlands

Find these words in the word search puzzle below. As you find each word, circle it, and mark it off the list. The words may go across, up and down, diagonally, or backwards.

animals
body of water
bogs
clean water
dry land
filters
flooding

freshwater marshes
habitats
important
plants
plants
pollution
saltwater marshes

soil erosion
swamps
transition zone
water soaked soil
wetlands
wildlife

E Z B A W C K S R F L O O D I N G R E T I S S A L
 N T O M I F R M J A S O N M D B J B A L T J U Y M
 O X N H L H A M J L W E E A T O C O S W A M P S E
 Z O E C D H A B I T A T S W F G P D U L A D R A H
 N D S B L I R E I H T E S T S S Q Y A W V P R P W
 O R A G I E S O I L E R O S I O N O F C G O B X E
 I E L U F C E U C O R G D A H P L F D L T C A F T
 T S T A E G N R A C S R A T R E V W A E Y O T V L
 I A W P A V D I D H O Y T A X B L A S A L S Y G A
 S R A N I M A L S T A M A R B Q M T L N M I X S N
 N R T R P E E D O U K S T N A L Y E A W B N I Q D
 A Y E Y P S T B F R E S H W A T E R M A R S H E S
 R U R C O E N M R R D C V A I K S R E T L I F A I
 T G M I L M A A E D S N S C O R S M A E M Q F G K
 U H A U L R T B A S O A A N Q B R W D R Y L A N D
 L N R T U B R P R A I R I E P O T H O L E S B N O
 E L S T T I O S E O L A R N Q X P N V F Q N J G R
 Y U H M I E P N L R D Y A H C F W K W K R X W M G
 S E E E O O M A N G R O V E S W A M P S N I P K H
 B R S R N Y I E R T U R O K C P L A N T S B R X W

Wetlands

Watersheds are landscape-level systems through which water drains and flows. Wetlands are an important part of watersheds, as they naturally filter the water that passes through them.

Sediments and organisms that live in wetlands can trap, breakdown, or absorb these nutrients. In fact, up to 92 percent of phosphorus and 95 per cent of nitrogen draining from the surrounding watershed can be removed from water passing through a wetland. For these reasons, wetlands are known as nature's finest water filters! Wetlands are a key link in the water system chain.

Wetlands are home to a very complex food chain. At the bottom of the food chain are the various microbes and bacteria, which invertebrates, such as insects, feed on. Below is a picture of a wetland. Many different things live and grow in a wetland. Can you find some of them?

Circle the items in the picture



Cattails



Bulrushes



Trees



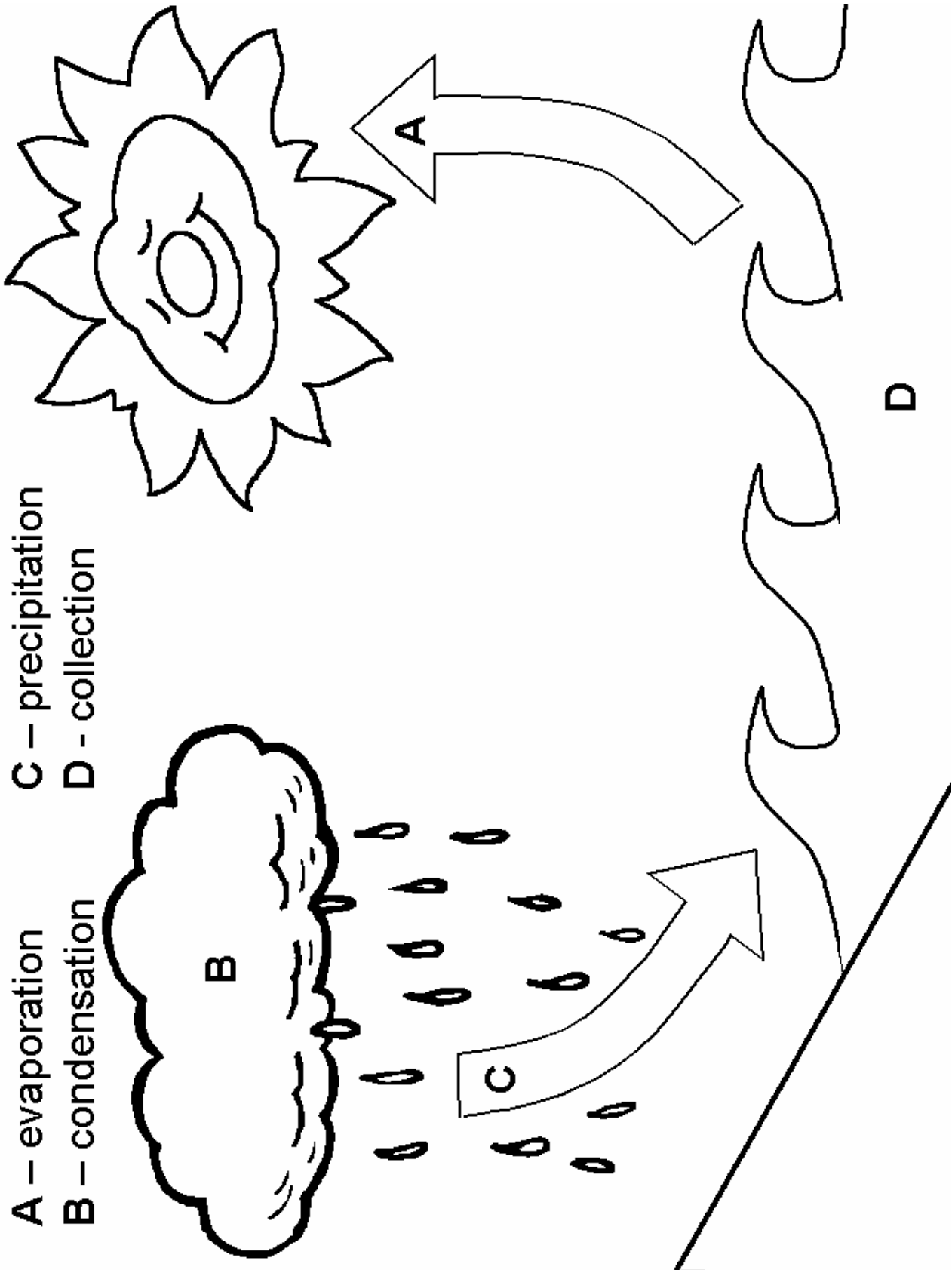
Frog



Muskrat Lodge

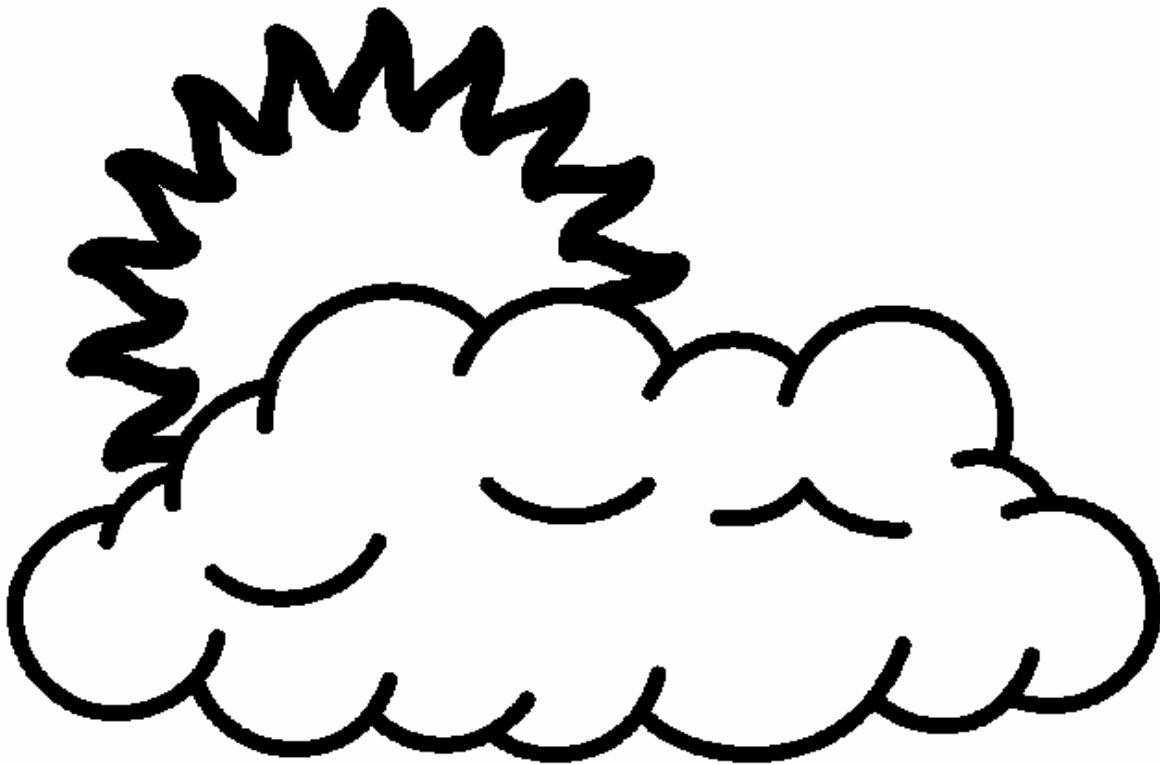


Water Cycle Coloring Book



A – evaporation
B – condensation
C – precipitation
D – collection

Condensation



Water vapor in the air gets cold and changes back into liquid, forming clouds. This is called condensation.

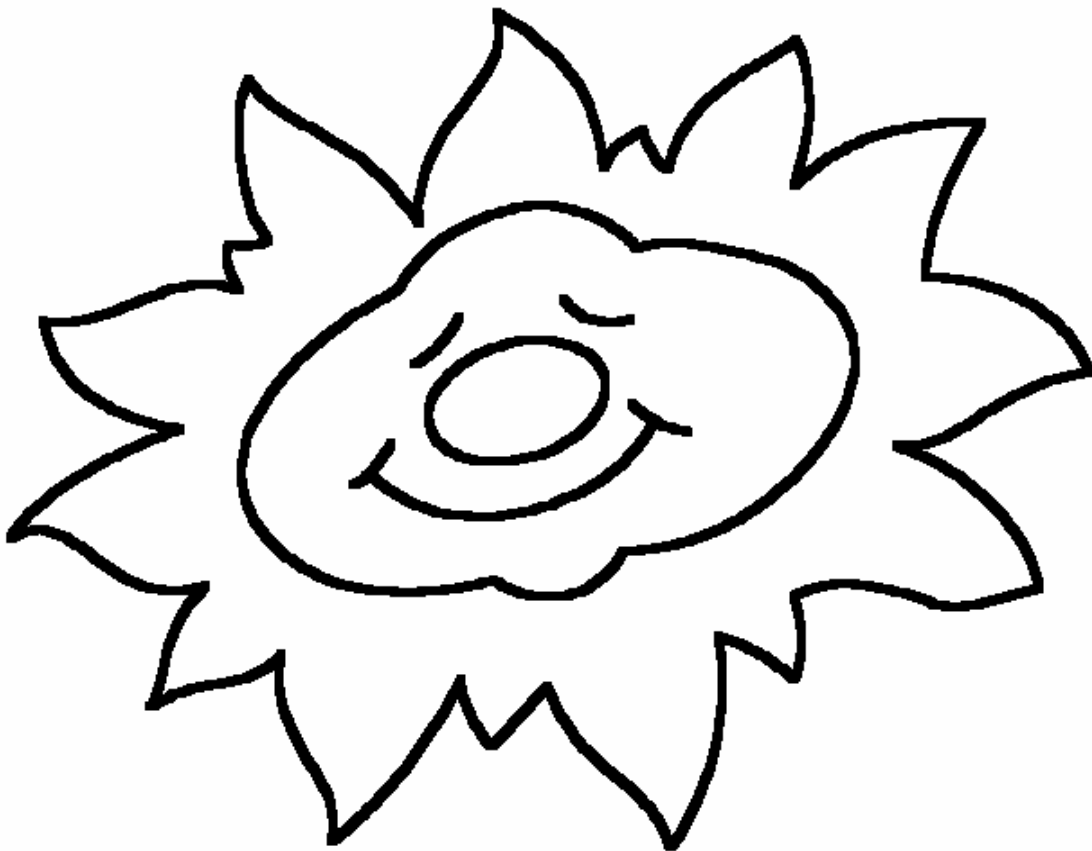
To see condensation in action, put a large (at least 8 ½ x 11) piece of cardboard (a book will work) in the freezer for about an hour. Now, take the boiling kettle of water and hold the cold book about 1 foot over the spout (right in the steam... wear oven mitts). Water droplets will form on the book. That's condensation!

Collection



When water falls back to earth as precipitation, it may fall back in the oceans, lakes or rivers or it may end up on land. When it ends up on land, it will either soak into the earth and become part of the “ground water” that plants and animals use to drink or it may run over the soil and collect in the oceans, lakes or rivers where the cycle starts all over again.

Evaporation



Evaporation is when the sun heats up water in rivers or lakes or the ocean and turns it into vapor or steam. The water vapor or steam leaves the river, lake or ocean and goes into the air. Make your own evaporation. With an adult's help, heat some water in a kettle. Watch closely! Do you see the steam rising? That's evaporation!

Precipitation



Precipitation occurs when so much water has condensed that the air cannot hold it anymore. The clouds get heavy and water falls back to the earth in the form of rain, hail or snow.

If you continue the condensation experiment long enough, so much water will condense on the book that it won't be able to hold it all. At that point, water will start dripping down from the book and you've created precipitation!

Rocks and Minerals Matching Activity

Using science textbooks, encyclopedias, or the Internet, match the definitions in the first columns with the corresponding words in the second column.

- | | | |
|-------|---|-------------------|
| _____ | 1. _____ is the first thing we look for when identifying minerals. | A. Rock |
| _____ | 2. The appearance of a mineral's surface judged by its brilliance and reflective abilities is called its _____. | B. Sedimentary |
| _____ | 3. All rocks fall into three basic groups: metamorphic, igneous, and _____. | C. Lava |
| _____ | 4. Molten rock under the surface is called _____. | D. Metamorphic |
| _____ | 5. _____ are people who study the earth's rocky crust. | E. Geologists |
| _____ | 6. _____ is the fossilized sap of ancient trees. | F. Color |
| _____ | 7. A _____ is usually made up of mixtures of different kinds of minerals. | G. Concrete |
| _____ | 8. Molten rock on the surface is called _____. | H. Luster |
| _____ | 9. _____ is made from three minerals: feldspar, mica, and quartz. | I. Amber |
| _____ | 10. A _____ is a chemical substance found in the earth but not formed by plants or animals. | J. Stratification |
| _____ | 11. The visible shape of a mineral's atom pattern is called a _____. | K. Mineral |
| _____ | 12. Cement, water, sand, and gravel mixed together make _____. | L. Crystal |
| _____ | 13. The layering that occurs in sedimentary rocks is called _____. | M. Granite |
| _____ | 14. _____ rocks are formed by the transformation of pre-existing rocks. | N. Magma |

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Background

The hydrogen bond that links water molecules is very strong. This gives water tremendous strength. Water can be stretched and pulled quite a bit before it breaks. In the following activity, you will look at surface tension in order to gain an appreciation of water's strength.

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Questions

3. What shape does the water form on the penny?

The penny forms a mound.

4. Why does it do this?

The surface tension is the force that holds the water together.

Pair up with a partner. Have one person touch their forefingers together while their partners use their hands to "slice" them apart. Next, have one partner lock their forefingers together by linking them together at the knuckles and pulling against each other. Have the other partner try to break this link. You will find it difficult or impossible to break this link. Hydrogen bonds are strong like this. The water molecules hold on so tightly that they don't come apart easily. This allows water to mound up on a penny.

10 REASONS WETLANDS ARE IMPORTANT

(information)

- 1. Fish, wildlife, and plant habitats:** Wetlands are critical to the survival of a wide variety of organisms. For many, wetlands are the only places they can live. For others, wetlands provide important food, water, or cover.
- 2. Critical habitats for endangered species:** A number of rare and endangered species depend on wetlands for their survival. The destruction of wetlands endanger these species even more.
- 3. Flood control and protection:** Some wetlands store either flood waters or water that collects in isolated depressions. Tree and other wetland plants can help to slow the speed of flood waters. These functions help protect property from flood damage.
- 4. Water quality improvement:** Wetlands are good water filters. They can filter surface water runoff before it reaches an open body of water and help filter nutrients, waste, and sediment from flood waters.
- 5. Shoreline erosion control:** Wetlands located between rivers and high ground can help to buffer shorelines against erosion. Wetland plants strengthen the sediment by binding soil with their roots; they also dampen wave action. Some provinces are recommending the planting of wetland vegetation to control shoreline erosion in coastal areas.
- 6. Reduction of storm drainage:** Wetlands serve as buffers between the winds and waves of storms and the areas beyond. Properties located behind wetlands along the seashore or large lakes often fare much better during storms than those that are not located behind wetlands.
- 7. Groundwater recharge:** Water sits in wetlands and is slowly released into the ground. The released water is filtered as it works its way down through the wetland, thereby improving the quality and quantity of the water which eventually reaches and replenishes our groundwater supplies.
- 8. Natural products:** Wetlands produce a wealth of natural products, including timber, fish and shellfish, wildlife, blueberries, cranberries and wild rice.
- 9. Recreation and aesthetics:** Wetlands provide many opportunities for recreational activities, such as hunting, boating, and fishing. Many artists and photographers seek to capture the beauty of wetlands and wetland plants and animals each year.
- 10. Education and research:** Although much more is know about the functions of wetlands today than in the past, researches are still studying them to determine all the benefits and values they bring to people and the environment.

Wonderful Wetlands Answer Key

Find these words in the word search puzzle below. As you find each word, circle it, and mark it off the list. The words may go across, up and down, diagonally, or backwards.

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water soaked soil
wetlands
wildlife

E	Z	B	A	W	C	K	S	R	F	L	O	O	D	I	N	G	R	E	T	I	S	S	A	L
N	T	O	M	I	F	R	M	J	A	S	O	N	M	D	B	J	B	A	L	T	J	U	Y	M
O	X	N	H	L	H	A	M	J	L	W	E	E	A	T	O	C	O	S	W	A	M	P	S	E
Z	O	E	C	D	H	A	B	I	T	A	T	S	W	F	G	P	D	U	L	A	D	R	A	H
N	D	S	B	L	I	R	E	I	H	T	E	S	T	S	S	Q	Y	A	W	V	P	R	P	W
O	R	A	G	I	E	S	O	I	L	E	R	O	S	I	O	N	O	F	C	G	O	B	X	E
I	E	L	U	F	C	E	U	C	O	R	G	D	A	H	P	L	F	D	L	T	C	A	F	T
T	S	T	A	E	G	N	R	A	C	S	R	A	T	R	E	V	W	A	E	Y	O	T	V	L
I	A	W	P	A	V	D	I	D	H	O	Y	T	A	X	B	L	A	S	A	L	S	Y	G	A
S	R	A	N	I	M	A	L	S	T	A	M	A	R	B	Q	M	T	L	N	M	I	X	S	N
N	R	T	R	P	E	E	D	O	U	K	S	T	N	A	L	Y	E	A	W	B	N	I	Q	D
A	Y	E	Y	P	S	T	B	F	R	E	S	H	W	A	T	E	R	M	A	R	S	H	E	S
R	U	R	C	O	E	N	M	R	R	D	C	V	A	I	K	S	R	E	T	L	I	F	A	I
T	G	M	I	L	M	A	A	E	D	S	N	S	C	O	R	S	M	A	E	M	Q	F	G	K
U	H	A	U	L	R	T	B	A	S	O	A	A	N	Q	B	R	W	D	R	Y	L	A	N	D
L	N	R	T	U	B	R	P	R	A	I	R	I	E	P	O	T	H	O	L	E	S	B	N	O
E	L	S	T	T	I	O	S	E	O	L	A	R	N	Q	X	P	N	V	F	Q	N	J	G	R
Y	U	H	M	I	E	P	N	L	R	D	Y	A	H	C	F	W	K	W	K	R	X	W	M	G
S	E	E	E	O	O	M	A	N	G	R	O	V	E	S	W	A	M	P	S	N	I	P	K	H
B	R	S	R	N	Y	I	E	R	T	U	R	O	K	C	P	L	A	N	T	S	B	R	X	W

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| <u> I </u> | 6. _____ is the fossilized sap of ancient trees. | F. Color |
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