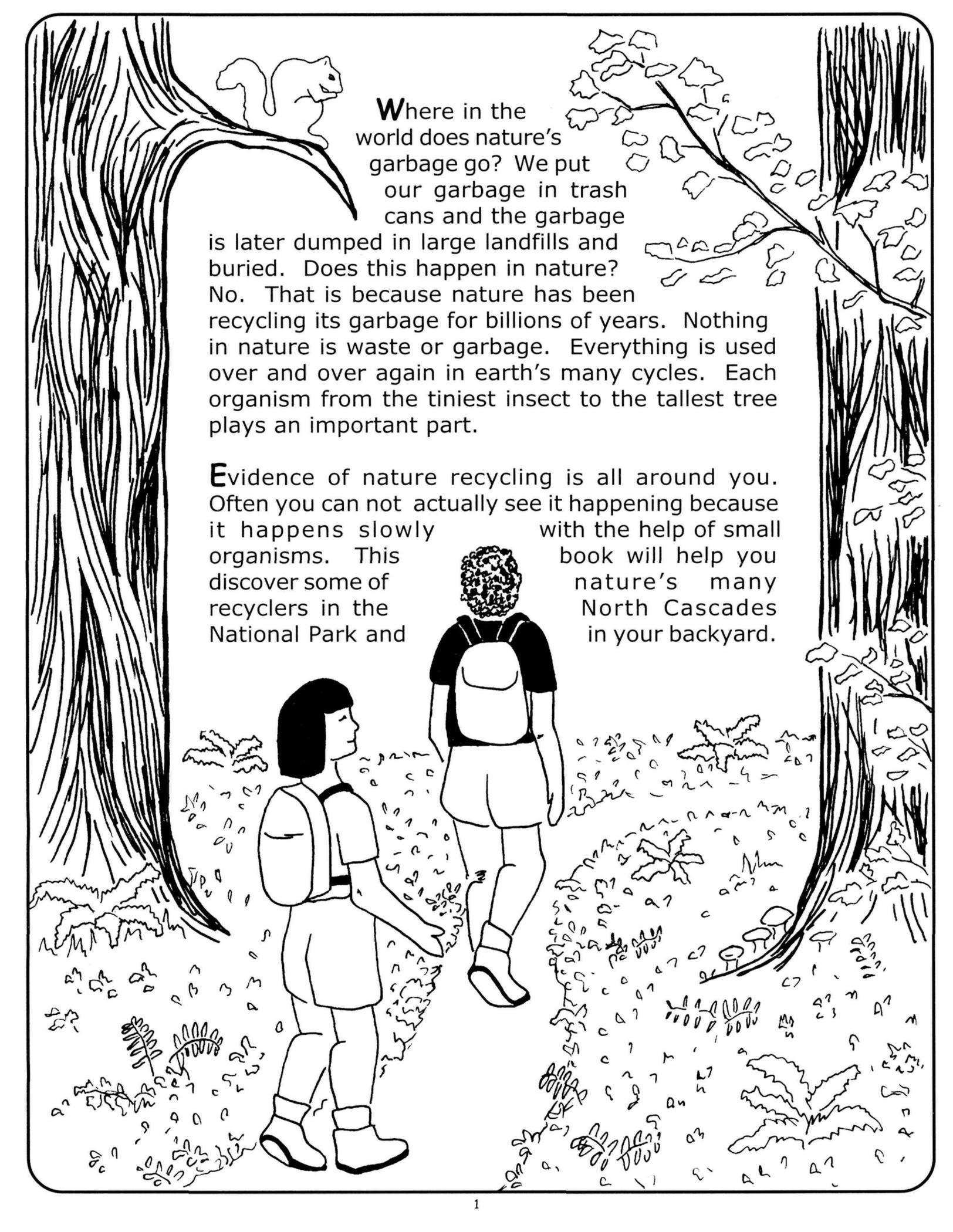


Nature's

Recyclers

Coloring
and
Activity
Book

North Cascades National Park Service Complex



Where in the world does nature's garbage go? We put our garbage in trash cans and the garbage is later dumped in large landfills and buried. Does this happen in nature? No. That is because nature has been recycling its garbage for billions of years. Nothing in nature is waste or garbage. Everything is used over and over again in earth's many cycles. Each organism from the tiniest insect to the tallest tree plays an important part.

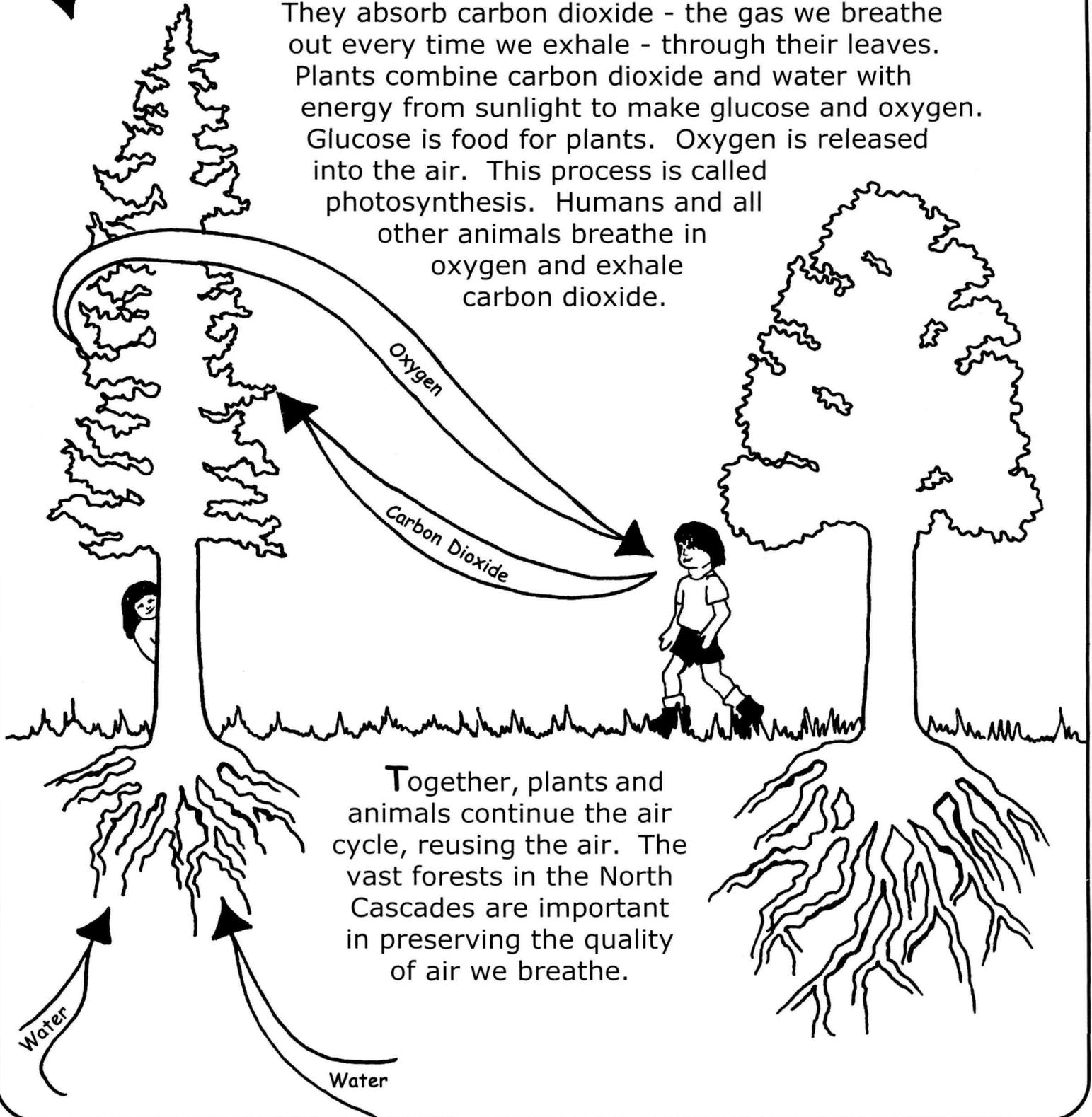
Evidence of nature recycling is all around you. Often you can not actually see it happening because it happens slowly with the help of small organisms. This book will help you discover some of nature's many recyclers in the North Cascades National Park and in your backyard.

Sunlight

Breath of Fresh Air

The Air Cycle

All plants, from microscopic algae to giant Douglas fir trees, perform an important role in the air cycle. They absorb carbon dioxide - the gas we breathe out every time we exhale - through their leaves. Plants combine carbon dioxide and water with energy from sunlight to make glucose and oxygen. Glucose is food for plants. Oxygen is released into the air. This process is called photosynthesis. Humans and all other animals breathe in oxygen and exhale carbon dioxide.

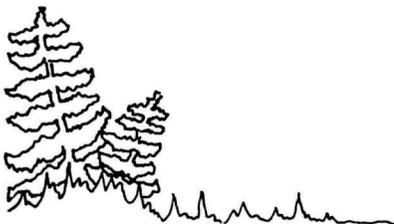


Together, plants and animals continue the air cycle, reusing the air. The vast forests in the North Cascades are important in preserving the quality of air we breathe.

Plants are also important in keeping the air clean. Their leaves help trap dust floating in the air. Dirty air can affect not only our health but the health of other animals and plants. Power plants, factories and cars release gases called sulfur dioxide and nitrogen dioxide into the air when they burn fuel. These gases combine with moisture in the air and fall to the ground when it rains. This is called acid rain. Acid rain burns plants and wears away rocks. Tree roots absorb the acid which can damage and often kill the trees.



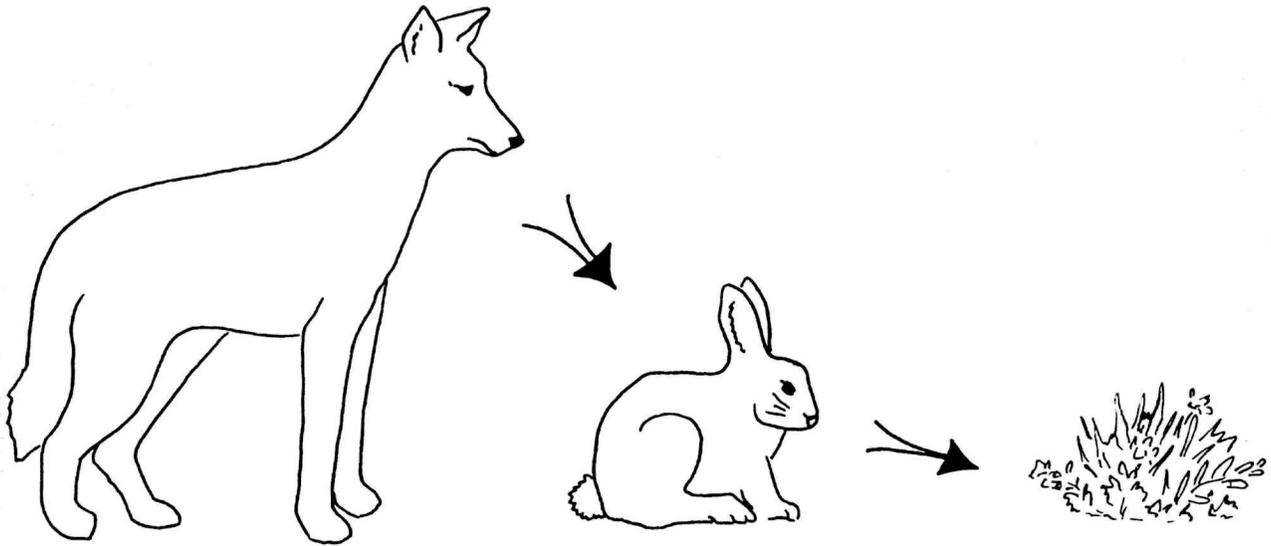
Look closely at the trees
and plants around you. How are they similar?
How are they different?
Draw pictures of the different types of leaves.



What's for Dinner?

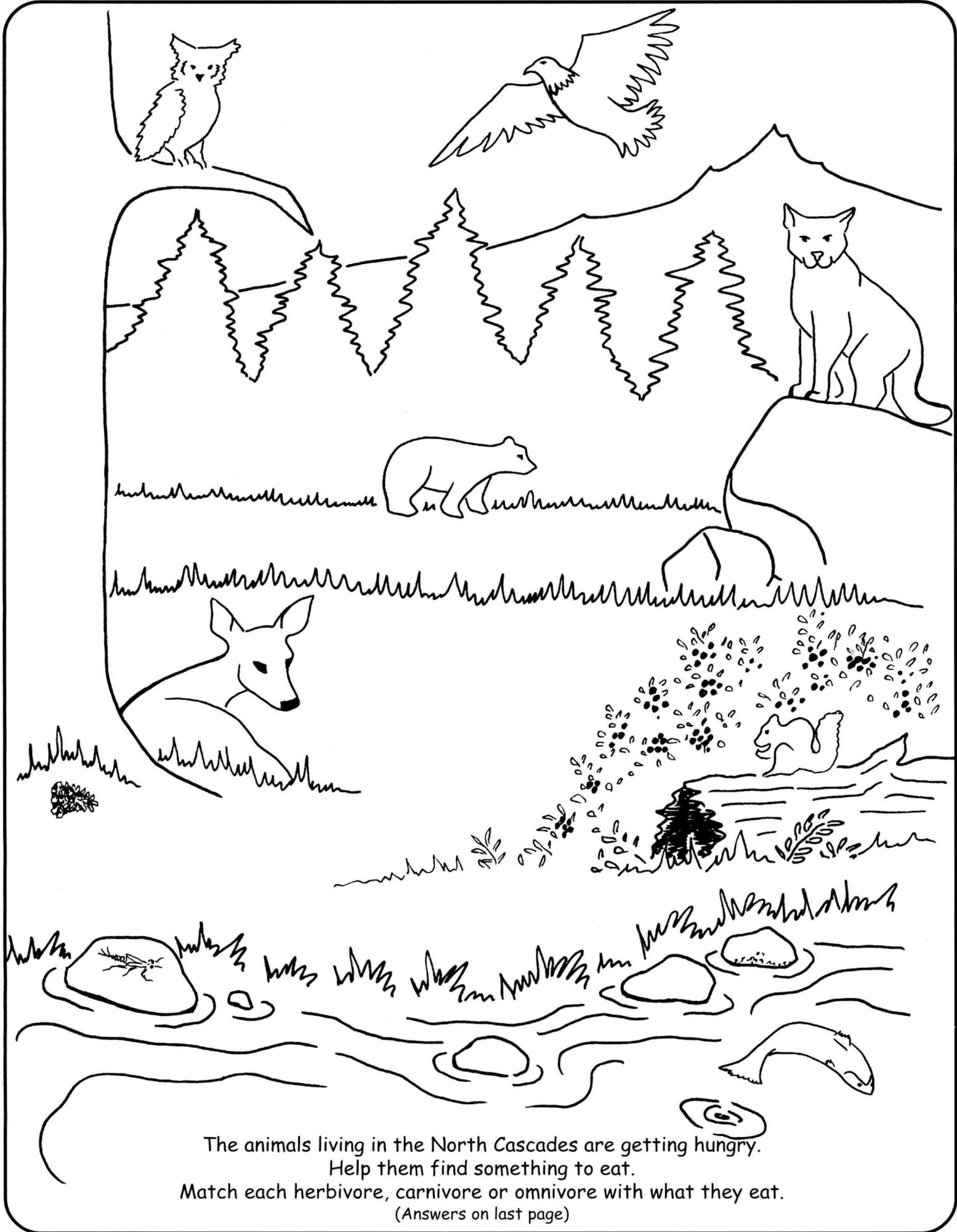
The Life Cycle

Plants are the only organisms besides some bacteria that live in deep, dark caves or at the bottom of the ocean that can make their own food. All other organisms rely on plants for food. Herbivores are animals that eat only plants. Carnivores eat other animals. Omnivores eat both plants and animals.

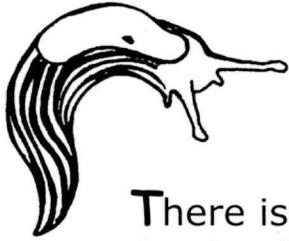


Draw what you like to eat and where it comes from.

A large, empty rounded rectangular box with a black border, intended for a student to draw their own food chain. The box is currently blank.

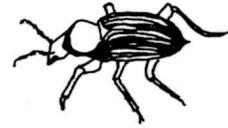


The animals living in the North Cascades are getting hungry.
 Help them find something to eat.
 Match each herbivore, carnivore or omnivore with what they eat.
 (Answers on last page)



Nature's Decomposers

The Life Cycle Never Ends



There is more to the life cycle than plants producing food and animals eating plants or other animals. If the life cycle ended there, things would look different. Piles of fallen leaves, toppled trees and dead animals would be everywhere. What would it be like to hike through a forest with debris everywhere? Organisms called decomposers break down the dead plants and animals. Who are these decomposers?



Wanted: The F.B.I.'S.



Fungus: Growing on rotting plants.

Bacteria: Hiding so well we need a microscope to see them.

Insects: Creeping around everywhere.

Scavengers: Eating the meat of dead animals lying around.

Wanted Alive - and eating dead things!

Reward - clean and healthy ecosystem.

Aliases - Mushrooms, germs, bugs and ravens.



Look closely at a patch of earth. How many creatures do you see crawling around? There are hundreds more organisms that we can not see without a microscope.

Waste that can decompose is biodegradable. Not all waste is biodegradable. Many things made by humans take hundreds of years to decompose. Plastic, glass and some metals are non-biodegradable.

Find out which garbage is biodegradable:

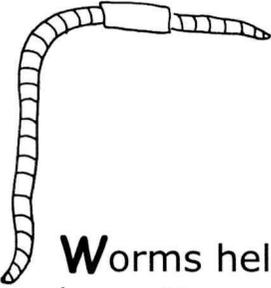
- Put damp soil into two containers.
- In one container, bury pieces of natural garbage like leaves and apple cores. Bury pieces of human made garbage in the other container like glass and plastic.
- Store the containers in a cool damp place for a couple of weeks. Uncover the garbage. What has started to decompose?



Natural forest fires caused by lightning also help nature decompose. Fire burns debris which adds important nutrients like nitrogen to the soil. Trees and plants need nitrogen to grow. Fire keeps forests healthy by reducing the number of diseased and insect infested trees.

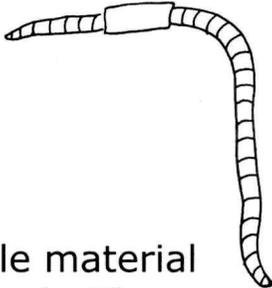


Fire is necessary for some trees to reproduce. Lodgepole pines require the heat from forest fires to open their cones and release their seeds.



Make your own Worm Bin

Recycling Activity I

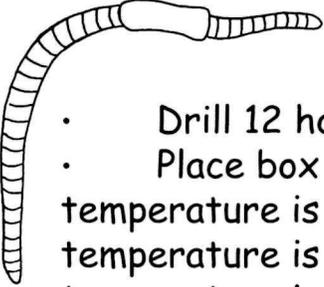


Worms help decompose leaves and other biodegradable material by eating small, moist bits of matter found on the ground. They do not have teeth to grind food down. Instead they have a gizzard that grinds the food with dirt that they also ingest. The food moves on to the intestine where juices are released. The juices, called digestive enzymes, break down the food even more. Nutrients are then small enough for the worm's body to absorb, supplying energy for the worms to move and grow. The worms excrete what they do not digest, leaving nutrients for plants.

Worms will also eat kitchen scraps like potato peels and coffee grounds. They can help decompose what you throw away and make rich soil for your houseplants at the same time. Here is how you can make a worm box:

Materials:

- Box 2 feet by 3 feet with lid made from wood, dark plastic or galvanized metal. The box should be shallow - between 8 and 12 inches deep - so air can move through out the box.
- Tray or something to set the box on to collect any water that drips out of the box.
- Shredded paper
- Handful of dirt
- Water - 6 cups of water per pound of paper
- Bucket
- Black Plastic - same size as box lid.
- Worms - you can buy worms at bait shops or order them from advertisements in fishing or gardening magazines. Redworms, also called red wiggler, work the best. Earthworms found in the garden will die in worm boxes. They need deep soil to burrow down into.



How to Make your Worm Box:

- Drill 12 holes 1/2 inch in size in bottom of box.
- Place box on tray in a cool place. Worms work best when the temperature is between 55 and 77 degrees. They will freeze if the temperature is below 32 degrees and will be too hot if the temperature is over 84 degrees. They also need to be in a place where air can get into the box.
- Mix shredded paper and dirt with water in bucket. Worms need to live in moist places so they can absorb oxygen through their skin. However, they can drown if there is too much moisture.
- Add mixture to the box. This is the bedding.
- Add worms. The worms will burrow down into the bedding.
- Bury some vegetable scraps completely under the bedding.
- Place the plastic over the bedding and cover with the lid.
- Your worms will slowly eat your garbage and produce more worms to help out.

Taking Care of your Worms:

- Your worms need moisture. Make sure the bedding stays damp. Spray water on the bedding.
- Feed your worms a couple of times a week. 2 pounds of worms can eat 1 pound of garbage per week.
- What to feed your worms: Vegetable and fruit peelings, orange rinds, lettuce leaves, coffee grounds, tea leaves, cheese rinds and egg shells (rinse egg shells off first). Don't feed your worms meat or too much fruit. The box will start to smell if you feed them too much. If that happens, don't feed them for awhile.
- Put the food in different places in the box each time you feed your worms.
- Change the bedding in the box after 2 to 4 months. Your worms will also be eating the bedding. One way to change the bedding is to only put the food scraps in one area for a while. The worms will slowly move to where the food is buried. When they do, remove the old bedding and add moist, new bedding. Another way is to remove 1/3 of the bedding (including the worms) and put it in a garden. The old bedding makes good fertilizer for your garden and house plants.

Nature's Paper Makers

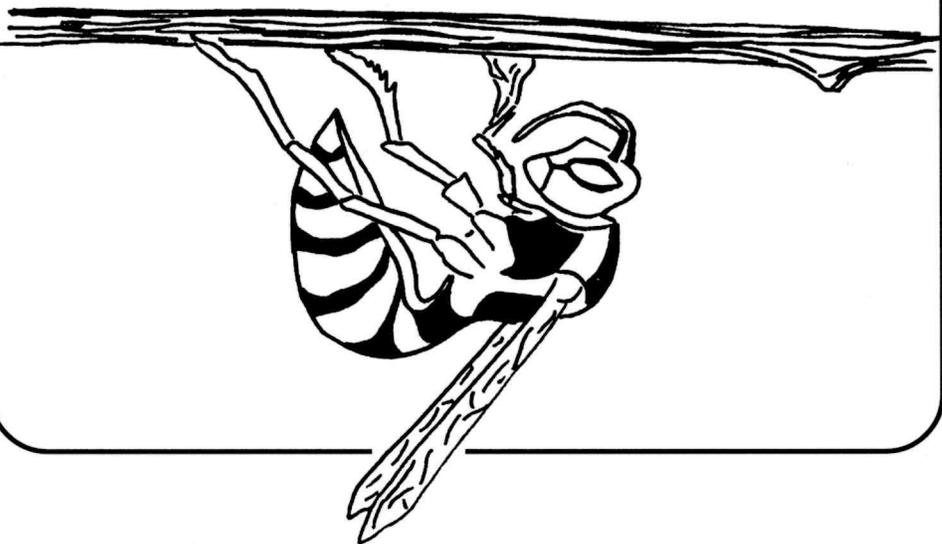
Natural Helpers

Wasps play an important role in reducing waste in the forest. They feed their larvae insects and meat from carrion (dead animals). Some wasps such as paper wasps, hornets and yellow jackets, make their nests from dead and decaying wood. Their nests look like they are made from paper.

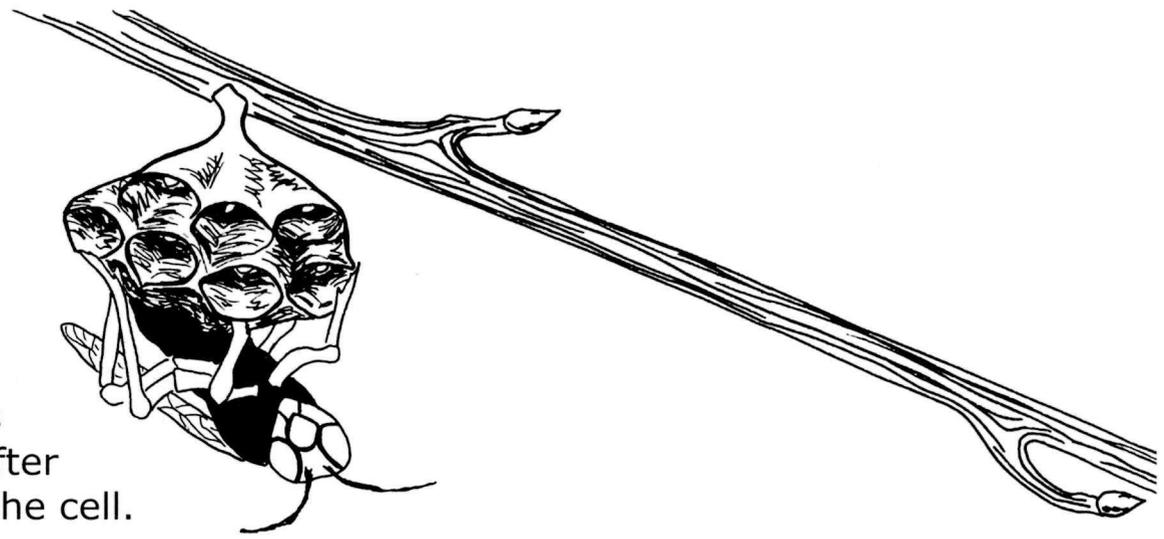


In the spring, the queen wasp starts to build the nest as soon as she wakes from her winter slumber. She chews bits of old wood into a grey paste mixed with her saliva to create pulp.

She first forms the paste into a stalk hanging from a branch. Sometimes she makes her nest in a hole underground.

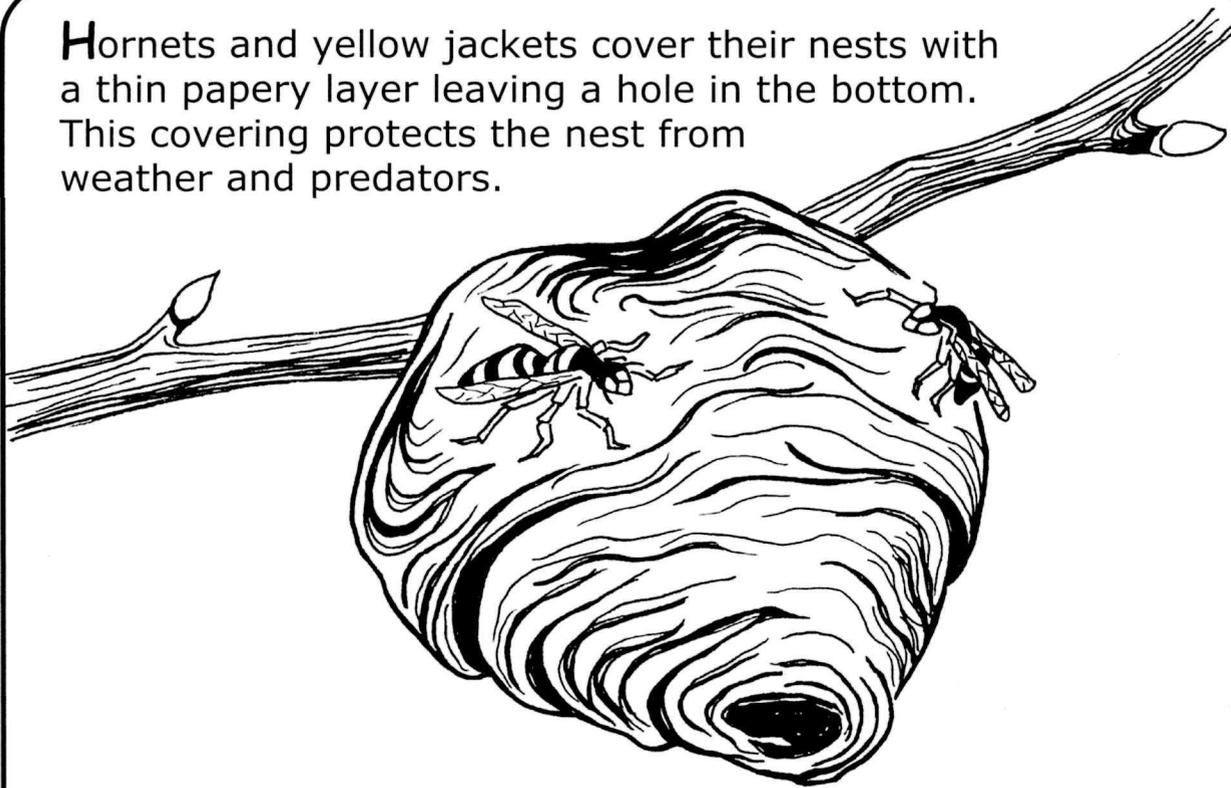


She then spreads more pulp into a hexagonal (six-sided) cell. She lays an egg in it after constructing the cell.



She continues to make more cells and lays more eggs. When the eggs hatch into larvae, the queen brings them food while still building the nest larger and larger. As soon as the larvae develop into worker wasps, they take over building the nest and feeding the larvae insects and carrion. The queen spends all her time filling the new cells with eggs. By the end of the summer, the nest has many tiers of cells. Large nests can have over 10,000 cells.

Hornets and yellow jackets cover their nests with a thin papery layer leaving a hole in the bottom. This covering protects the nest from weather and predators.



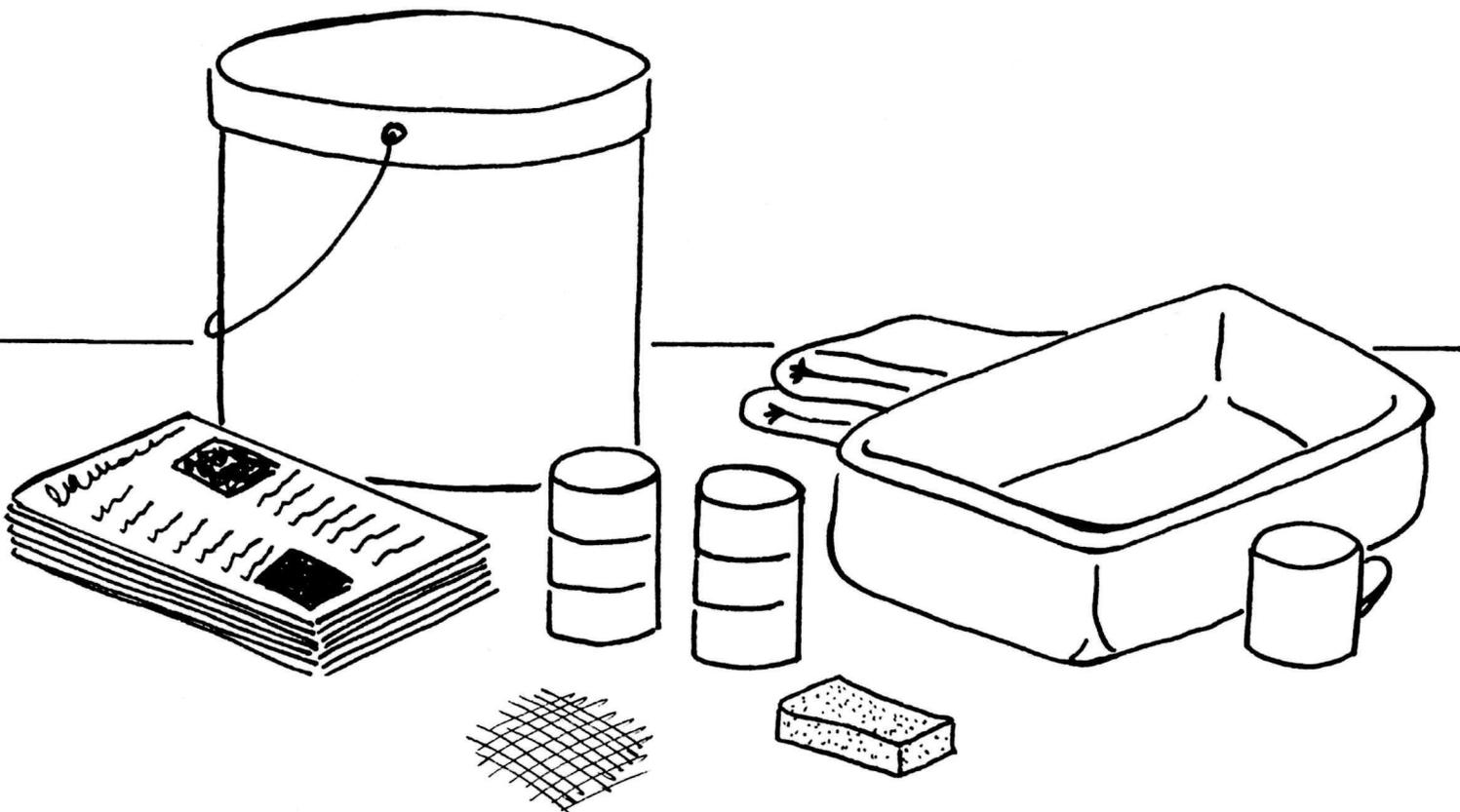
Look for their nests when hiking, but watch from a distance. They will sting when bothered.

You too can make Paper like a Wasp!

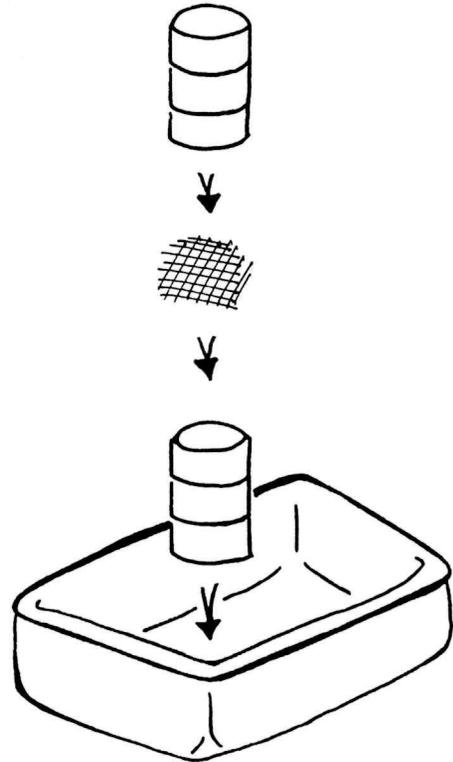
Recycling Activity II

Materials: One inch stack of old newspapers, two tin cans, piece of screen, rubber tub, bucket, cup, sponges, old towels and water.

1. Shred newspapers into bucket. Add enough water so the newspapers are covered by an inch of water.
2. Let the newspapers soak overnight or until the paper has turned into pulp, a grey mush, when stirred.
3. Remove both ends from the cans. *CAUTION:* Watch out for any sharp edges. Smooth down sharp edges with a spoon.



4. Place a tin can in the tub with the screen on top.
5. Next place the other tin can on top of that.
6. Stir up the pulp and water.
7. Pour a cup of pulp from the bucket into the top tin can. The water will slowly pass through the screen. The thickness of the paper depends on how much pulp is in the water. Wait until most of the water has dripped though. Remove the top can.



8. Pat any extra water out of the pulp by using the sponge.
9. Gently turn the screen over onto the towel. Pat the back of the screen.
10. Slowly pull the screen off the pulp. You have just made a piece of paper!
11. Wait until the paper has dried before removing it from the towel.

Other things to try:

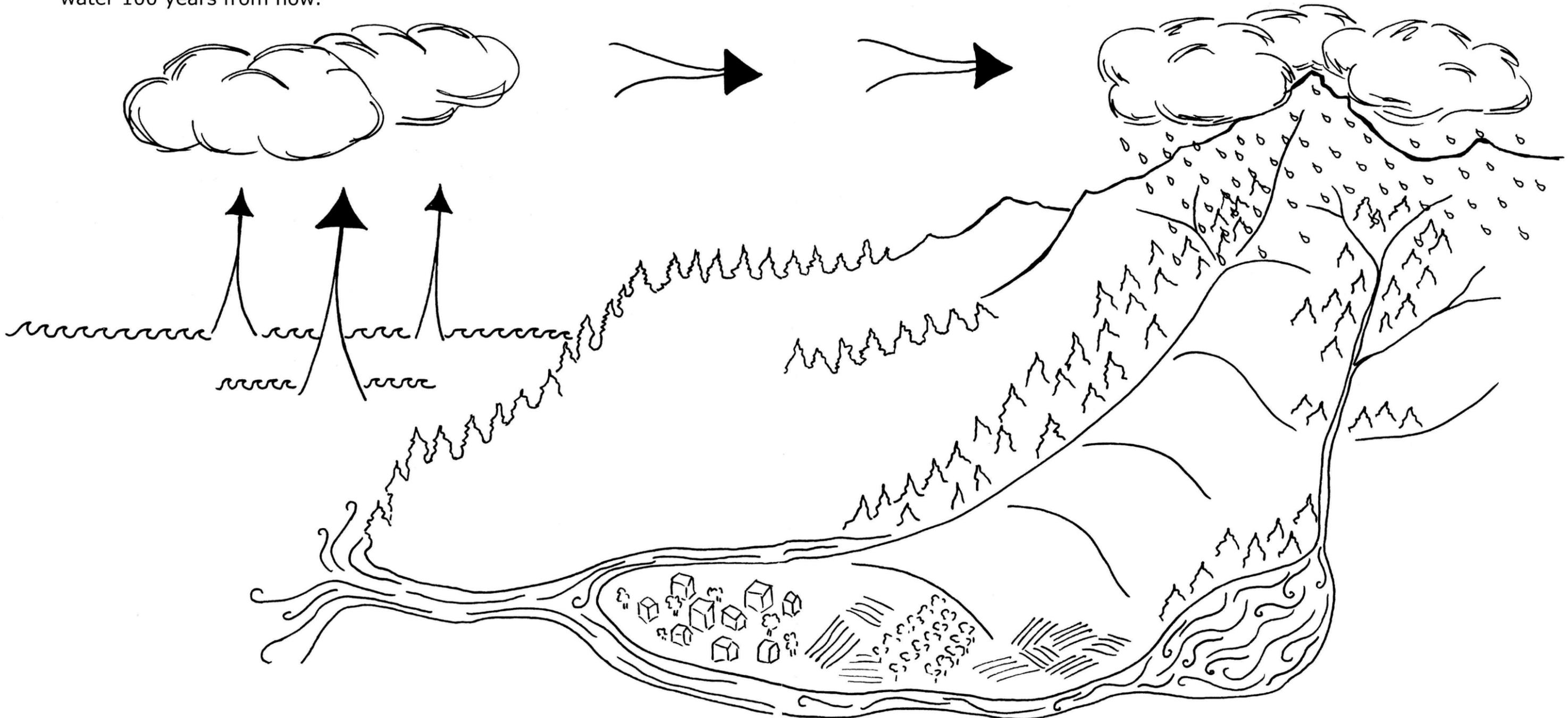
- Add color paper to the pulp. What color does the paper turn?
- Add texture to the paper by including bits of leaves, pine needles and other things found outside.

Rain, Rain, Come Again

The Water Cycle

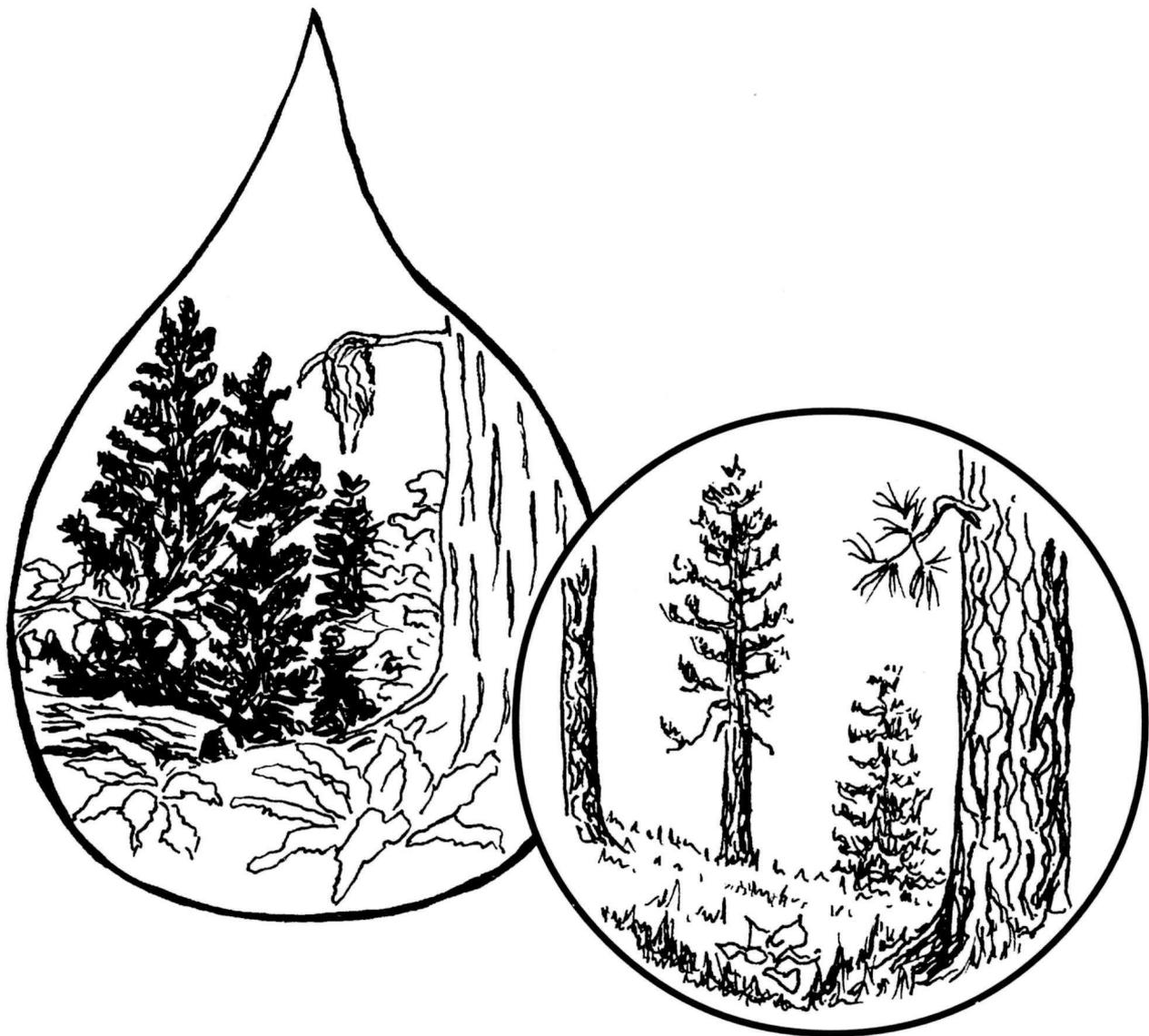
Plants and animals living on land need fresh water to live. Only 3% of all the water on earth is fresh and drinkable. Nature cleans and recycles the water so it can be used over and over again. The water you drink today may have been frozen in a glacier 100 years ago. Your grandchildren may drink the same water 100 years from now.

Water evaporates from oceans and lakes to form clouds. Clouds drift with the wind and are forced upwards by mountains. Colder air up high causes the water in the clouds to form droplets. When the droplets become too heavy, they fall to the ground as rain. Rain flows down hill to streams, streams flow to rivers and rivers flow to oceans - where the cycle begins again.



The amount of precipitation - rain and snow- changes from the west side of the mountains to the east side. At the crest of the Cascade mountains, the total amount of precipitation is close to 100 inches. In Stehekin in Lake Chelan National Recreation Area, it is around 30 to 32 inches. Only 10 to 12 inches fall in Chelan. The amount of precipitation in a place affects the kind of plants that can grow there.

Plants growing in areas of little moisture have adapted to the dryness. Compare plants growing in drier areas to those growing where there is more moisture. In what ways have the plants adapted?

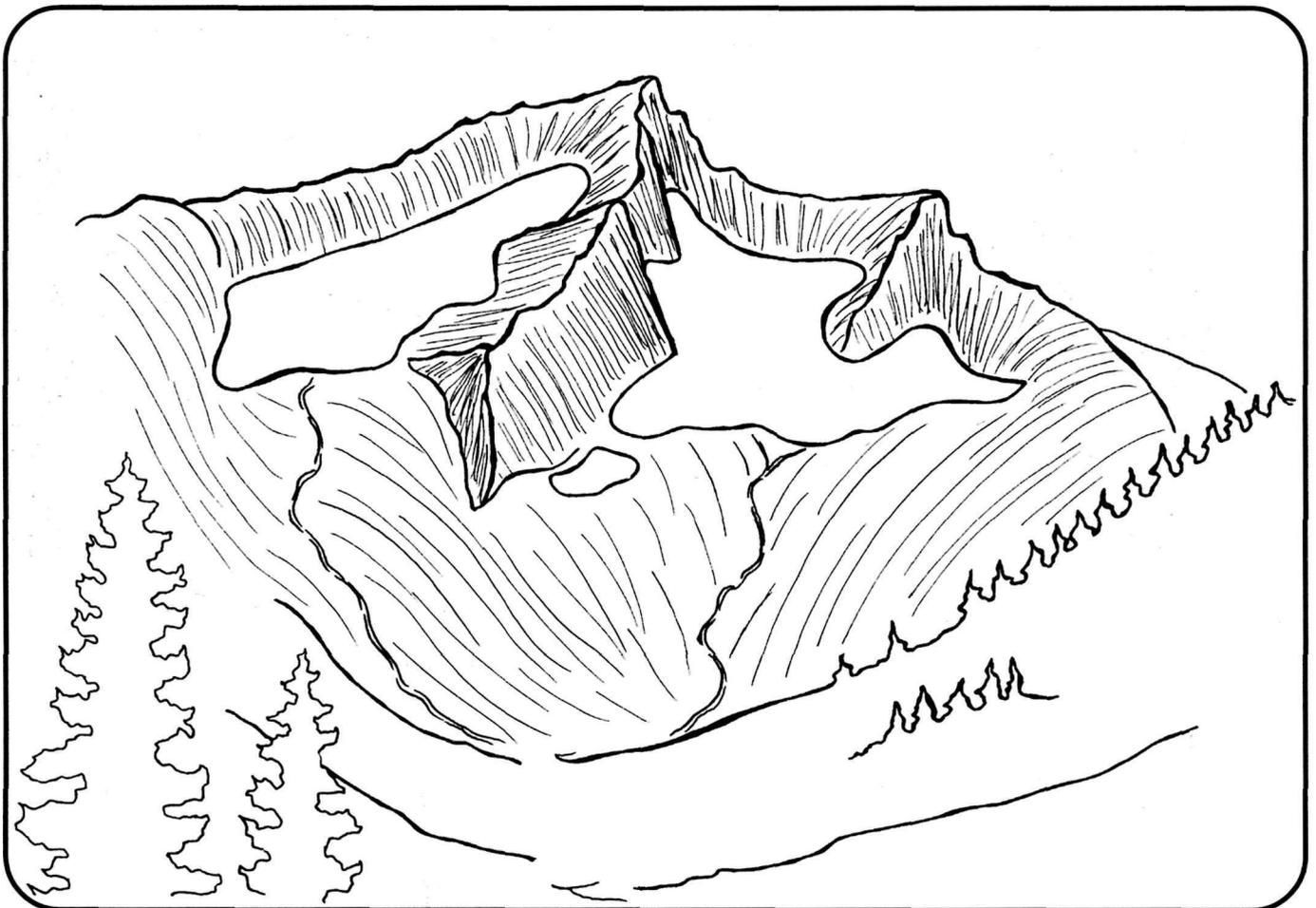


Water, Water Everywhere

How Water is Stored

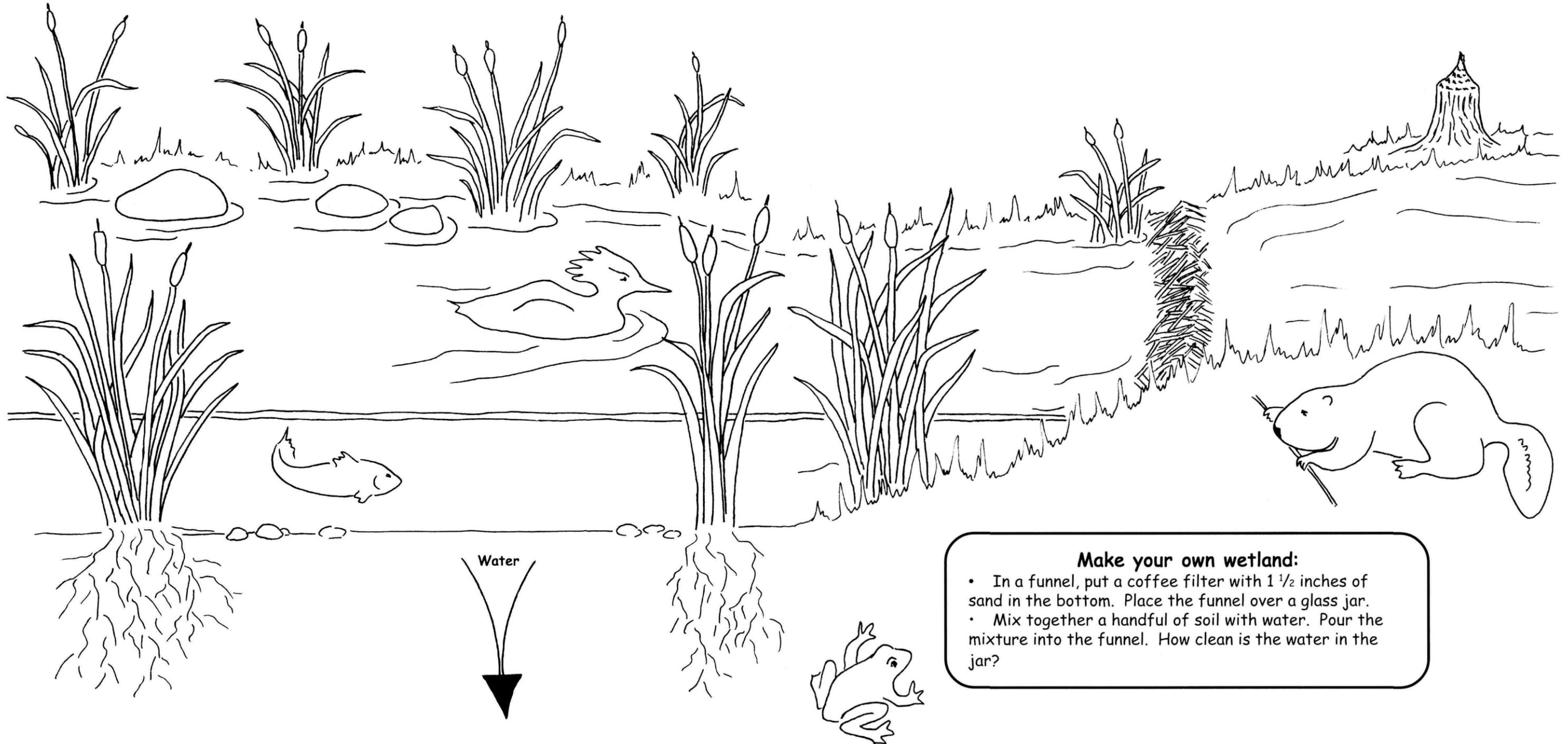
Water is stored in many ways along its journey back to the ocean. Plants and animals depend on stored water for survival during the summer when there is little rain. You can see some of the many ways water is stored throughout the North Cascades.

As moisture travels over the mountains during the winter, cold air turns it into snow. High in the mountains the snow is stored throughout the winter on glaciers and snow fields until it starts to melt in the warm summer sun. Some snow never melts and will be added to one of the more than 300 glaciers in the North Cascades.



Water travels down the mountain slopes through river valleys and lakes, slowing as it passes through wetlands. Wetlands are areas where the soil is saturated with water during most of the year. The soil is like a sponge. It soaks up water and refills underground water tables. Sediment and pollution flowing in the water are trapped by plant roots growing in the wetland — keeping the water clean. The plants also help protect the land from washing away.

The marshy areas along the Stehekin River and at the head of Lake Chelan are all wetlands. Many different types of birds, fish, insects and animals live among the tall grass and depend on wetlands for food and shelter. Some animals, like the beaver, help make more wetlands. The beaver builds a dam in a stream to make a pond for its lodge. The dam traps sediment, creating a new wetland.



Make your own wetland:

- In a funnel, put a coffee filter with 1 1/2 inches of sand in the bottom. Place the funnel over a glass jar.
- Mix together a handful of soil with water. Pour the mixture into the funnel. How clean is the water in the jar?

From the air we breathe to the food we eat, everything is part of a cycle. Many of the things we do affect the earth and even the North Cascades National Park. We use materials from the earth everyday and throw away what we do not use. We have a lot of waste that does not decompose, filling up landfills. Although the park is protected from people taking things out of it or leaving things behind, it is still affected. For example, by driving cars we add more carbon dioxide and other pollutants to the air which then blow into the park.

We can learn how to be better recyclers by studying nature closely. We can start by practicing the three R's:

Reduce the amount of waste:

- Buy items made with recycled materials.
- Buy items wrapped using less or no packaging.
- Walk somewhere instead of driving.
- Turn off the water when brushing your teeth.
- Turn off the lights when leaving the room for more than ten minutes.

Reuse items:

- Write on both sides of paper.
- Reuse plastic bags and glass jars.
- Patch clothes with bright fabric.
- Make art projects using old magazines, buttons, fabric scraps, plastic bottles and items that would otherwise be thrown away.

Recycle items made from plastic, glass, metal and paper.



What other ways can you think of to help?

Word Search

Each sentence is missing a word.
Fill in the blanks with a word that is used
somewhere in this book.

1. Garbage that decomposes is _____. Some garbage like plastic bottles or tin cans are not _____.
2. By _____, plants produce their own food from carbon dioxide, water and energy from the sun.
3. All animals and plants living on land need _____ to live. Only 3% of it is fresh. Some of it is stored as _____ until it melts. _____ slow it down so the ground can absorb it.
4. Mushrooms, slugs, bugs and ravens help dead animals and plants _____ into fertile soil for more plants to grow.
5. When something is used again and again, it is being _____ and the amount of waste is reduced.
6. Wolves, cougars and other _____ eat only animals. Bears will eat other animals too, but they also eat berries and plants. They are _____. Animals that just eat plants like deer are _____.



Answers:

1. Biodegradable, biodegradable

2. Photosynthesis

3. Water, glaciers, wetlands

4. Decompose

5. Recycled

6. Carnivores, omnivores, herbivores.

Food Chain Answers:

Bald eagle - fish - insects - algae

Owl - squirrel - nuts from pine cones

Cougar - deer - plants

Black bear - berries.

In the wild, animals will eat many different things. They would starve if they relied only on one food source and that food source disappeared. For example, black bears also eat plants, bulbs, insects, grubs, small mammals and carrion, depending on the time of year.

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