WHAT IS SOIL?

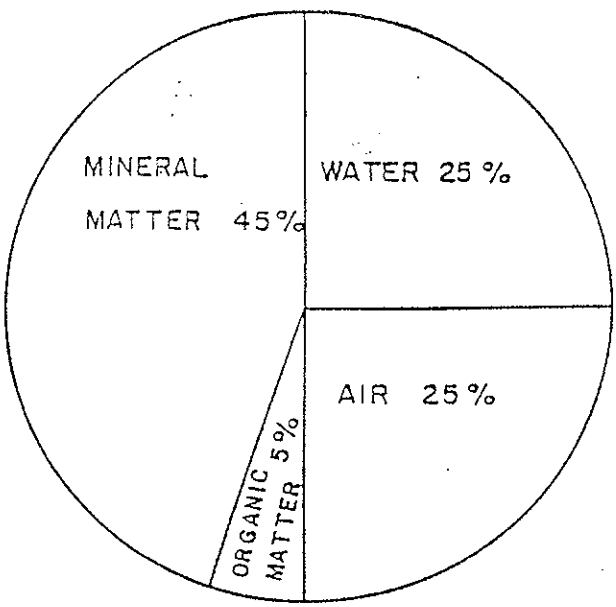
Soil is formed over a very long period of time. It forms as solid rock is weathered (broken down) into tiny pieces. Weathering occurs when rock freezes and thaws, heats and cools, is washed over by rivers and waves, or as glaciers move across the rock. The tiny fragments of rock form the first layer of soil. As the layer becomes thicker and thicker, a soil begins to form.

Soils can take hundreds, thousands or even millions of years to form. The type of soil that forms depends on climate, location, vegetation, time and the parent material (the rock the soil forms from).

Soil is composed of four main things:

1. minerals - tiny fragments of rock
2. air
3. water
4. organic matter - leaves, roots and small living organisms

Soil is one of our most important non-renewable natural resources. We say it is non-renewable because it takes such a long time for a productive soil to be formed.




Soil is made of mineral matter, organic matter, air and water. Minerals are broken down pieces of rock. Organic matter is the main source of food for the plants. Air is found in the spaces between the mineral matter and helps the plant roots to breathe. Water is used by plants and helps to move food to the roots.

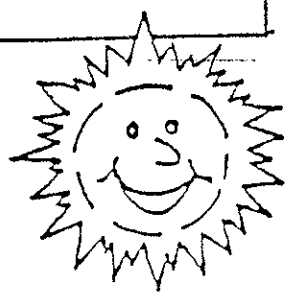
# CLIMATE IS IMPORTANT FOR SOIL FORMATION

## HEAT

THE SUN GIVES HEAT THAT HELPS PLANTS TO GROW AND WARMS UP OUR SOIL

## CLIMATE

OUR CLIMATE HAS MANY PARTS THAT WORK VERY CLOSE TOGETHER. THIS PICTURE SHOWS HOW THESE PARTS WORK.



## WIND

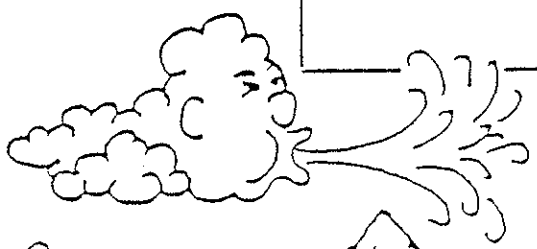
WHEN THE WIND BLOWS IT CAN MAKE SOME BARE SOIL FLY AWAY.

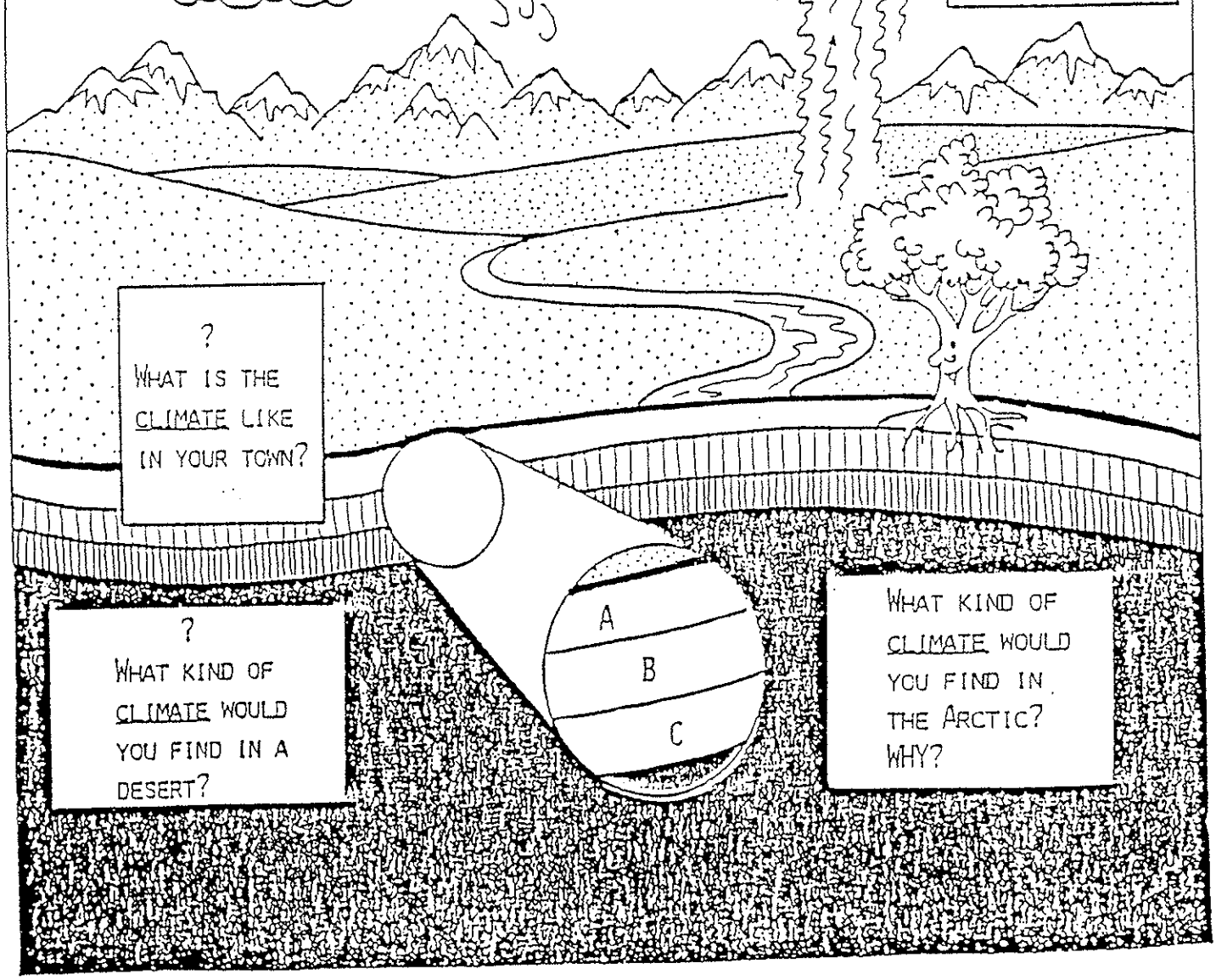
## CLOUDS

CLOUDS ARE MADE WHEN VERY SMALL DROPS OF WATER MOVE UP FROM THE LAND.

## RAIN AND SNOW

PLANTS AND SOIL NEED WATER TO STAY HAPPY AND HEALTHY.






? WHAT IS THE CLIMATE LIKE IN YOUR TOWN?

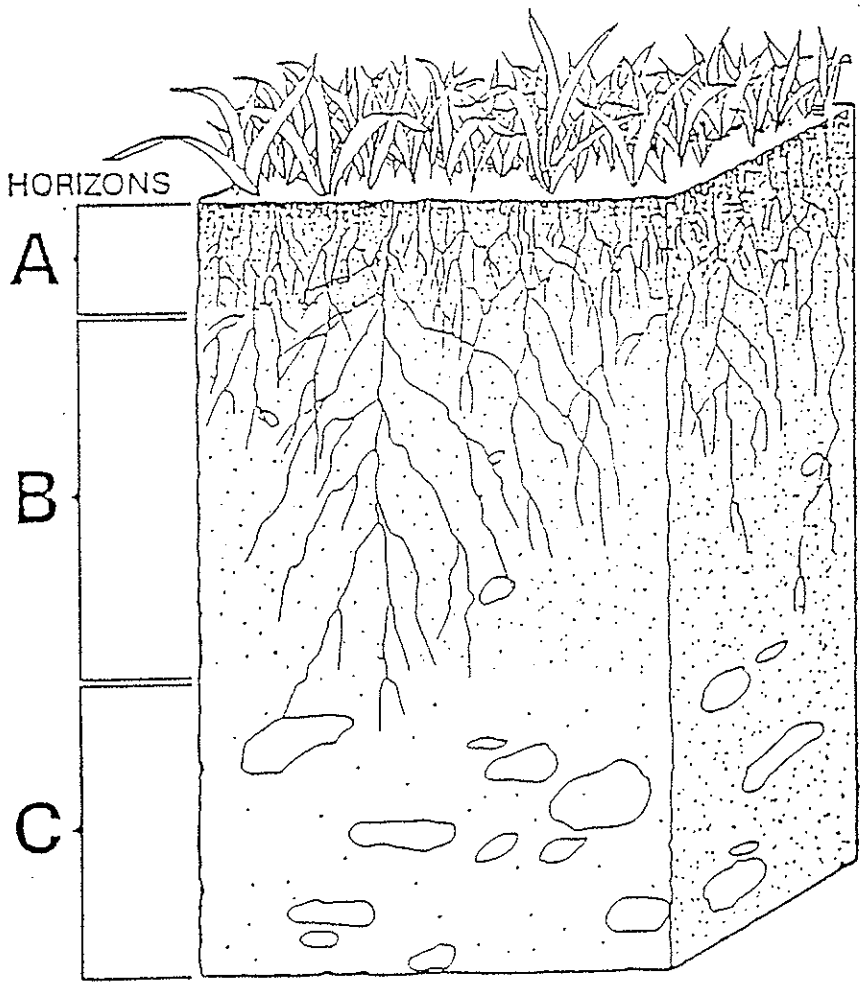
? WHAT KIND OF CLIMATE WOULD YOU FIND IN A DESERT?

WHAT KIND OF CLIMATE WOULD YOU FIND IN THE ARCTIC? WHY?

WE NEED SOIL!

Even though soils can be very deep, the most important part is the surface 15 to 30 centimetres. This portion is called the topsoil. Topsoil is very darkly coloured (almost black). The dark colour shows that there is a lot of organic matter present. Organic matter provides many of the nutrients needed for plant growth. Below the topsoil lies the subsoil and parent material.

# A SOIL PROFILE




topsoil
darkest in color
many living things
much organic matter
much plant food

subsoil
lighter in color
fewer living things
less organic matter
little plant food

parent material
rock dust, gravel
no living things
no organic matter
formed as bedrock breaks

Scientists have compared plants grown on soil rich in organic matter with plants grown on soil poor in organic matter. Only those plants grown on the rich soil grew into large, healthy plants. Even more surprising was that even when fertilizer was added to the poor soil to artificially supply nutrients, plants grown on soil high in organic matter always grew better.

Now, if we keep in mind that most of the things we eat (cornflakes, hamburgers, cheese), and many of the things we need (clothing, medicine, lumber), can be traced back to the soil, we must realize how much we depend on soil in our daily lives.

Finally, let us consider the world in general. We know that our population continues to increase and that we need more and more food to feed our people. Therefore we must conserve (take care of) our soils before this non-renewable natural resource is lost. Once we lose our soil it is gone forever; it will take a lot longer than a lifetime to get it back.

## WHAT IS SOIL DEGRADATION?

Our agricultural soils have been used for hundreds of years. The first farmers thought our soil was in a never-ending supply. When they arrived they cleared land that had been covered by prairie grasses or forests for a very long time. They planted the land to crops such as wheat and oats. The new soil was rich in organic matter and grew plenty of food. As time passed, the farmers noticed that the condition of the soil was becoming poorer; the soil was becoming less fertile (could produce less and less food). Once the soil could no longer provide enough food for them, they simply cleared a new area and started over.

More and more of our land was cleared of grass and forests. Large areas of soil were left uncovered and unprotected. Our soils began to show the first signs of soil degradation.

Soil degradation is the wearing out of the soil. As soil degrades, it loses its ability to grow food and forests and support livestock and wildlife. Soil degradation is a serious problem. It threatens our ability to feed, clothe and house ourselves. It costs our nation billions of dollars every year.

There are several types of soil degradation. The main ones are erosion by wind and water, organic matter loss, and salinity.

Salinity is the build-up of salts in the soil. The salts appear as white patches in the field. Too much salt prevents the plants from growing healthily.

Organic matter loss has been happening ever since farming began. Today our soils contain only half the organic matter they had when they were covered by grass and forests.

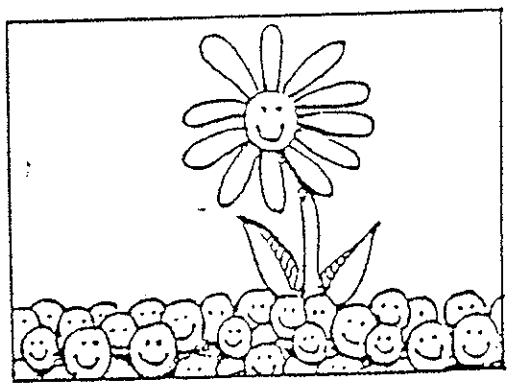
Erosion can occur whenever the soil is left uncovered. Thousands of tonnes of topsoil are eroded from our agricultural soils each year. Erosion occurs by both wind and water. Erosion is not only bad for soil but pollutes the air and clogs our waterways and drainage ditches.

There is usually more than one type of soil degradation happening at the same time. For example, erosion of an unprotected soil surface removes topsoil which is also high in organic matter.

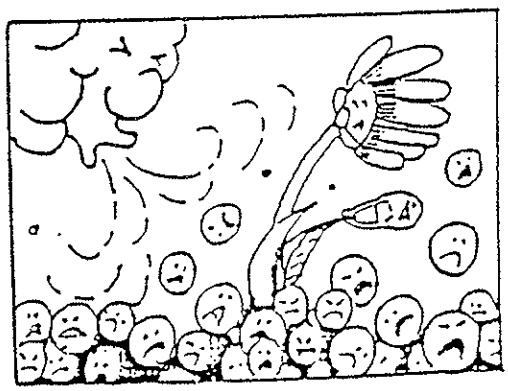
WIND EROSION

The best way to prevent wind erosion is to keep the soil surface covered. Reducing tillage in the fall leaves the soil with more straw on the surface. The straw acts to protect the soil between harvest and the next spring. Some other ways of preventing wind erosion are **continuous cropping** (never summerfallowing) or growing cover crops whenever the soil is left bare for any length of time, planting **shelterbelts** (rows of trees to slow the wind), and **stripcropping** (seeding narrow strips of crops prone to erosion such as sugar beets, alternated with strips of crops seeded to crops resistant to erosion such as wheat).

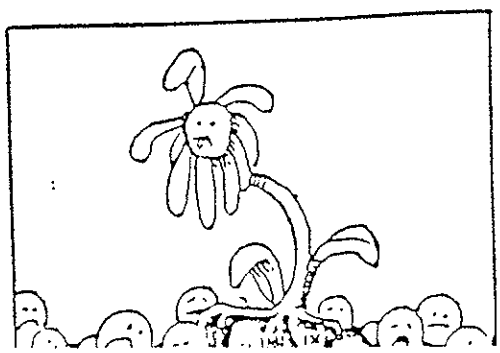
When a strong wind blows on bare soil, loose material is blown away. This is called wind erosion. Most blown material somersaults and bounces along the ground surface. It ends up beside fences and in ditches. Lighter soil material is lost as dust.



Wind erosion can harm growing plants. If a lot of soil is blown away, plants do not grow well because plant nutrients are lost along with the soil.



If we protect soil from the wind, it will still be able to grow plants. Soil can be covered with grass, straw, stubble or a crop to protect it from the wind. We can plant rows of trees to protect soil from the wind.



WATER EROSION

Water erosion occurs whenever water flows across bare soil. The best way to prevent water erosion is the same way to prevent wind erosion - keep the soil surface protected! Some ways to prevent water erosion are building grassed waterways (strips seeded to grasses to help move the water across a field without damaging the surface), and contour farming (working fields sideways across a slope instead of up and down the slope).

Bare soil is easy to wash away, especially when it is on a steep or long hill.

a) When raindrops fall to the earth from clouds, they can explode on the surface just like a small bomb.

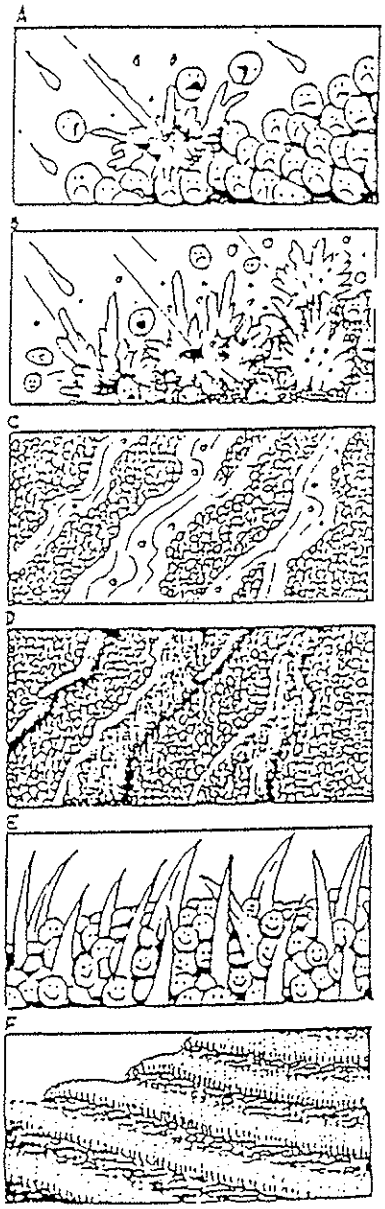
b) This is called splash erosion and is the first stage of water erosion.

c) After it has been raining for awhile, the water begins to run down the hill. Water running down a hill will pick up pieces of soil and wash them away. This thin layer of running water and soil is called sheet erosion.

d) If the water is able to wash down the hill for awhile longer, then it might cut small paths into the soil. These paths are like tiny rivers and are called rills.

e) We can protect soil from the rain if we keep it covered with straw, grass, stubble or a crop.

f) We can also protect soil from running water by planting rows of crops across the slope of a hill.



## ORGANIC MATTER LOSS

Growing annual crops, summerfallowing and too much tillage cause and overall loss in organic matter. Growing forages (grasses and alfalfa) and adding manure increases soil organic matter.

## OTHER TYPES OF SOIL DEGRADATION

There are many other types of soil degradation.

Compaction is the packing down of soil by forces of weight on the surface. It occurs when heavy equipment travels across the soil again and again. Compaction can slow or prevent good root growth.

Soil pollution occurs when unwanted chemicals build up in the soil. The main cause of soil pollution is the overuse of pesticides. Pesticides in the soil can soon pollute our drinking water.

Urbanization happens as towns and cities are built on top of land which should be used for agriculture. More land is used for houses and buildings than for fields to grow the food that feeds the people in the towns and cities.

Desertification occurs when land gets so worn out that it becomes a desert waste land. Desertification often happens in places such as Asia and Africa where long periods of drought have taken place.

WHAT IS SOIL CONSERVATION?

Soil conservation is any action that can be taken to conserve soil. Farmers can directly affect how our soil is conserved by changing some of their farming practices. Perhaps the most important soil conservation practices are those which keep soil organic matter high and protect the soil surface. All of us can take part in soil conservation. The first step is realizing that soil degradation is a problem. Then we must be willing to adjust to changes that we must make so we will know that our soils will continue to feed us.

Soil conservation is important not only to farmers but to townspeople and city dwellers too. Everyone relies on the soil to provide the food and the other things we need to survive. Without conserving, our everyday lives will be threatened. These are the reasons we say " Soil Conservation is Everybody's Business ".