When the Water Makes its Way

Audiance :
7 to 12 years

Duration :
15 to 30 min

Observe the passage of water on the ground

Observe water flowing through microhabitats with vegetated soil, soil with detritus and bare soil.

Abrinord
OBV de la rivière du Nord

Objectives

Understand the flow of water as well as the principles of erosion and retention, according to the different types of soil.

- Observe the water retention and filtration capacity of plants
- Discuss the phenomenon of soil erosion

Required material :

- 3 bins of soil *

*It is possible to borrow these bins from Abrinord.

or

- Watering can
- 3 transparent plastic bottles (2 L or more)
- 3 transparent containers or bottle bottoms (~ 500 ml)
- Soil (3 à 4 L) *
- 3 pieces of string of about 20 cm
- Quick germinating seeds. ex: catnip, alfalfa, clover, grass, chia, etc.
- About 500 ml of leaves and small branches

*do not use potting soil, as it will be too absorbent and not representative of natural soil. Prefer soil taken outside.

Abrinord

Preparing the activity

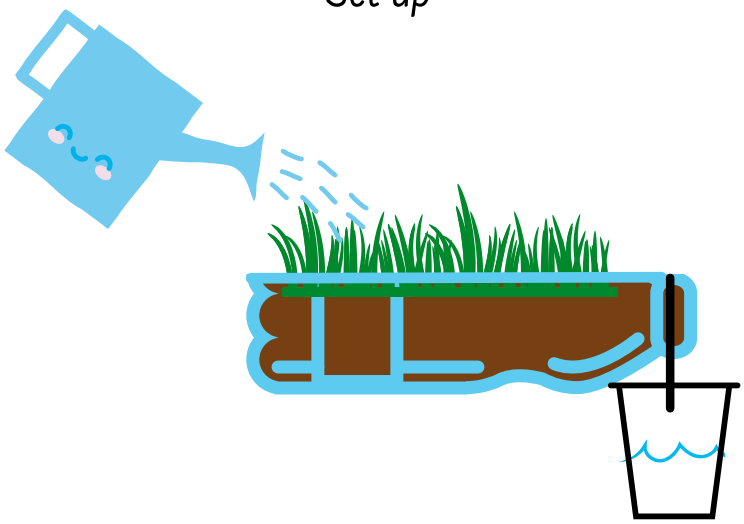
Preparing the model (30 min)

*Without borrowed bins

Step 5 requires 4 to 5 days of waiting to allow the plants to grow.

1. Punch two opposing holes in the top of the clear containers and tie the string to create small buckets.
2. Cut the 2 L bottles lengthwise about 1 cm above the top of the neck to keep the neck on the bottle.
3. Lay the bottles down, cut side up. For each bottle, fill with soil leaving a gap of about 2 cm to the cut edge, compacting slightly. Create a slight slope towards the spout to encourage runoff.
4. In the first bottle, cover the soil with pieces of dry leaves and small branches.
5. In the second bottle, plant the seeds relatively densely, then water. Expose to light and water about once a day, or as needed, to grow the seedlings.
6. The third bottle will contain only soil.
7. When the seedlings of the second bottle have reached 5-10cm, the experiment can be performed.

Set up



1.
2.
3.

Abrinord

Course of the activity

Introduction (10 min)

Introduce the following basic concepts :

What is runoff ?

When it rains or when the snow melts, the water moves from the highest point to the lowest point. As it passes through, it may flow on the surface of the ground (run-off) and continue on its way to a watercourse, or it may enter the ground (infiltrate). The run-off of the water can cause erosion as the water passes over the soil surface. The amount of run-off varies with the nature of the soil and its infiltration rate. For example, there will be more run-off on clay than on sand.

What is erosion ?

Erosion occurs when soil is moved by the forces of nature. Some soils, such as sand or soil without vegetation, are easily washed away by wind or water. When water flows quickly, it can pick up soil particles and carry them with it.

Have you ever observed runoff ? If so, give an example.

Runoff occurs wherever water does not enter the ground, such as in parking lots, on paved streets or on compacted soil.

Have you ever observed erosion ? If so, give an example.

There is a lot of erosion in agricultural fields, on construction sites when the soil is bare. Erosion can also be observed on the beach and shoreline with the passage of waves or current.

1.
2.
3.

Abrinord

Course of the activity

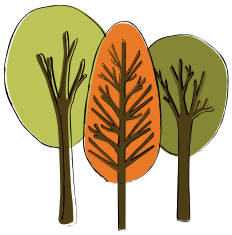
Making it rain (10 min)

1. Place the bottles or containers side by side. Hang the buckets on each of the spouts.
2. Using the watering can, pour water (500 mL for each bottle or 750 mL for each tub) onto each soil. The run-off water will drip into the buckets. If you need, pour more water for there to be run-off, but make sure you pour the same quantity in each.
    - What colour is the water when it comes out of the containers ? Why ?
        - For the bare soil, the water is cloudy and brown because there has been erosion. The water has therefore carried away soil particles which are now found in the bucket.
        - For the leaf-covered soil, the water is clearer because the leaves and branches have slowed the rate of water flow and therefore less erosion.
        - For the planted soil, the water is clear because the plants have slowed the rate of water flow and there has been little or no erosion. In addition, the roots retain soil particles and reduce erosion.
    - How much water came out ?
        - For the bare soil, there should be a lot of water. Most of the water poured ended up in the bucket. The water came out of the bottle so fast that it did not have much time to penetrate the ground.
        - For the leaf-covered soil, there is a little less water because the debris have slowed the path of the water, giving it more time to soak into the soil.
        - For the planted soil, there is almost no water or none at all, because the plants have allowed the passage of water to be slowed down enough for the water to infiltrate and be absorbed by the soil and plants.
3. Now look at the bottles or bins.
    - Is the soil dry or wet ?
    - Do you see the roots of the plants holding the soil ?

1.
2.
3.

Reflection

What would happen to the water if you cut down several trees in one place ?

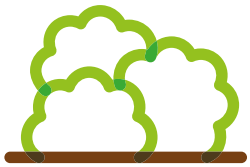


When trees are cut down and natural ground features (roots, branches, leaves, plants, etc.) are removed for a construction site, for example, there is nothing left to slow down the water and allow it to penetrate the ground. It will run-off and drain quickly and infiltrate very little into the soil. As the water passes through, it will likely erode the soil and particles will be carried to the lowest point of the land, sometimes a ditch, lake or river.

What will happen with the colour of the river ?

Since the water flow is carrying soil, the water will become cloudy and its colour will be brown. These particles are called suspended solids (SS). A significant presence of SS can decrease water quality and the biodiversity of the ecosystem.

What can be done to prevent erosion ?



It is important to let the vegetation grow to allow the water to slow down and seep into the soil. It is thus filtered by plants, which is even more important on the banks of rivers and lakes, to maintain healthy water bodies.

When it is not possible to put plants, such as on construction sites, we can put cloths to retain the soil and prevent it from leaving with water.

What can you do ?

- Avoid rain or water from a watering can falling directly on the bare soil.
- Ask your parents to plant vegetation, plant grass or mulch where the soil is exposed.
- Keep the rain on your property by installing rain barrels or rain gardens.

Abrinord

For a demonstration

YouTube : Fun Science Demos

https://youtu.be/im4HVXMGI68

Abrinord