wyre
Forest of discovery

Forces of Nature

School Activities

Forestry Commission

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FORCES OF NATURE - Summary

Science/biology shows how trees have adapted to survive the forces of nature

Downloadable Resource	Worksheet	Activity Worksheet	Curriculum area	Unit	Where	When	Link to Wyre education programme
Forces of Nature	1	How trees stand	KS2 SCIENCE Sc4 Physical processes KS2 SCIENCE Sc2 Life processes and living things	2c-d Forces and motion: Types of force 3c Green plants: Growth and nutrition - roots as anchors	Outdoors	All year	KS2 Plants in the Forest
	2	Why do leaves fall?	KS2 SCIENCE Sc4 Physical processes KS3 SCIENCE Sc4 Physical processes	2b Forces and motion: Types of force 4c The Earth and beyond: The solar system - gravitational forces 2a Forces and motion: Force and linear motion - determining speed	Outdoors	Autumn	KS2 Plants in the Forest KS3 Temperate Woodlands
	3	Windy facts	KS2 SCIENCE Sc4 Physical processes	2e Forces and motion: Types of force	Outdoors	Windy day POST VISIT	KS2 Plants in the Forest
	4	Erosion	KS2 SCIENCE Sc3 Materials and their properties KS2/3 GEOGRAPHY	3a Separating mixtures of materials: Separating solid particles by sieving - erosion 4a-b Knowledge and understanding of patterns and processes: River erosion	Outdoors	All year PRE/POST VISIT	KS2 Stream Study KS3 Streams
	5	Erosion/deposition	KS2 SCIENCE Sc3 Materials and their properties KS2/3 GEOGRAPHY	3a Separating mixtures of materials: Separating solid particles by sieving - erosion 4a-b Knowledge and understanding of patterns and processes: River erosion 5a-b Knowledge and understanding of environmental change and sustainable development:	Outdoors	All year PRE/POST VISIT	KS2 Stream Study KS3 Streams KS2 Forests and Sustainable Development KS3 Sustainability

FORCES OF NATURE - Worksheet 1

Activity - How trees stand

Ask everyone to stand with their feet together, ankles touching and hands over their heads. Try to push them over.

Next, ask them to stand with their legs wide apart and hands outstretched to the sides. Try to push them over.

Lastly, ask them to try standing with their legs wedged between 2 chairs. Try to push them over.

They could do this activity in pairs and take it in turns.

Which position is most stable and why?
Relate this to trees and branches and roots.
What happens to the roots if the ground is very hard?
What happens if it rains heavily?
What happens if the roots hit a barrier?

FORCES OF NATURE - Worksheet 2

Activity - Why do leaves fall?

Gravity holds your feet down to the ground because the mass of the planet exerts a gravitational pull on the mass of your body. In fact, gravity stirs up an attraction between any two objects in the universe: moons, chairs, badgers - you name it. Wherever you find matter, you'll find gravity. You could never travel to a gravity - free planet, only one with greater or lesser mass resulting in greater or lesser gravity.

You will need:
A stopwatch

Falling leaves are an example of gravity in action.
Spend some time watching them fall.
Do different leaves fall at different rates?

Collect some different sized leaves, cones and acorns etc.
Weigh them and then use a stopwatch to time how long it takes them to fall from a set height.
Try to find a fairly high position by standing on a seat or tree stump for instance.
Try lots of different objects including stones.

Bear in mind that gravity is constant for all objects. In an airless environment, basically a vacuum, a piece of paper will fall at the same speed as a metal arrow. That sounds like a lie, but it is completely true.

However, you are not in a vacuum and therefore need to take into consideration wind resistance. Those items that are streamlined more will fall faster, because these things are able to cut through the wind. Those items that are blunt and cannot cut through the wind will fall more slowly.

Can you answer these questions?
Does mass affect the speed of fall in a vacuum?
Does mass affect the speed of fall in air?
What else is affecting the speed that the object is falling?
Explain the difference between density and mass.
In air, do less dense objects fall faster or slower than more dense objects?
What is the fastest an object can fall?
If your object was less dense than air, what would happen to it?
Is gravity effected by the sun and moon?

Explain the theory of gravity. Follow this link to find out more:
http://science.howstuffworks.com/environmental/earth/geophysics/what-is-gravity.htm

FORCES OF NATURE - Worksheet 3

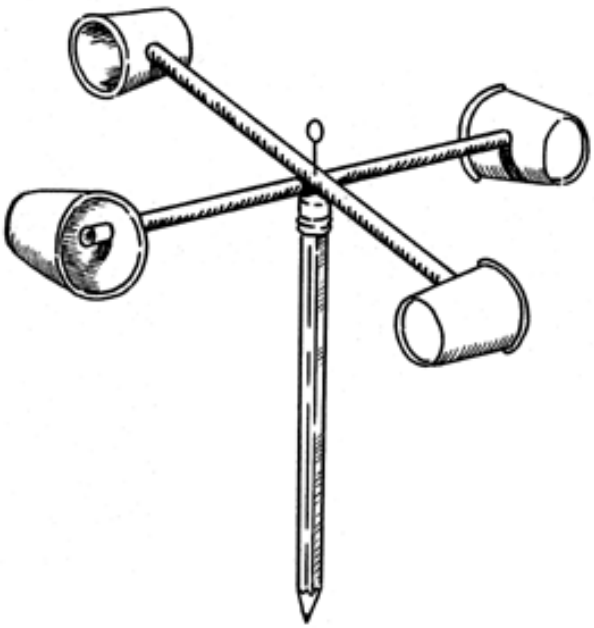
Activity - Windy facts

Wind is the horizontal movement of air. The instrument used to measure wind speed is called an anemometer, which is an indicator that will spin in the wind. The anemometer rotates at the same speed as the wind. It gives a direct measure of the speed of the wind. Wind speed is measured by using the Beaufort Wind Scale which is a scale of 0-12 based on visual clues. Depending on the ability of students, it is probably sufficient that they recognize calm air, and gentle, moderate, and strong breezes. For example, students can use a simplified scale such as the following:

Wind Speed (KmPH)	Term	Description
0-5	Calm	Smoke goes straight up
6-20	Light	Wind is felt on face; weather vanes turn, leaves rustle
21-39	Moderate	Raises dust; flags flap
40-61	Strong	Large branches move; umbrellas turn inside out
62 or more	Gale / Severe Gale	Trees fall over

You will need:
Anemometer - can you make one?

If you already have an anemometer, you can use this to measure Wind Speed



Make an Anemometer
Materials

4 small paper cups
4 plastic drinking straws
tape
scissors
straight pin
pencil with a new eraser
stapler

Method

This anemometer has four cups which catch the wind and cause the anemometer to spin. The inward curve of the cups receives most of the force of the wind. That's what makes the cups move. The more spins per minute, the greater the wind velocity.
Arrange four (4) plastic drinking straws to form a cross and tape them together at the centre.
Staple the top side of one paper cup to the end of each straw, so the open ends of the cups all face the same direction.
Push a straight pin through the centre of the straws into an eraser on the end of a pencil. This provides the axle.
Mark one of the cups; this will be the one they use for counting when the anemometer spins. NOTE: When using this anemometer, 10 turns per minute means the wind speed is about one mile per hour. If possible, it would very useful to use a commercial anemometer to determine an approximate speed. For example, "when our anemometer read 20 spins a minute, the commercial anemometer read 2 miles per hour."

Blow on the anemometer or turn an electric fan on low to make sure that it spins easily. How many times does the anemometer spin in one minute? Can you make a statement connecting the number of spins of your anemometer and the speed of the wind? (you can use the table below to record your practice trials).

	Time Interval	Number of Spins
1.		
2.		
3.		
4.		
5.		

Use an Anemometer to measure wind speed

Try to measure the speed of the wind using your new instrument.

Use the Beaufort scale above: Try to create a woodland version of the beaufort scale. What happens as the wind picks up? Give it a name.

What instrument is used to measure the speed of wind?
What are the strongest winds ever recorded in The Wyre Forest/UK/The world?

Try to find the direction of the wind

Use the 'natural navigation' activities to find the direction of the wind. Firstly you will have to use your senses to feel, see, hear, etc. which way it is blowing.

FORCES OF NATURE - Worksheet 4

Activity - Erosion

This activity demonstrates erosion in rivers. The smaller particles (silts and clay) will be washed downstream leaving the larger particles of sands and gravels higher up the river. You will be able to see this happening in the streams in the Wyre Forest.

You will need:
3 plastic bottles cut in half lengthways, tops and bottoms removed.
Gaffa tape
Sand
Gravels
Bench or rock to prop up one end
Water source (hose or collected in a bucket)
Bucket

Background - erosion

Erosion is the wearing away of the earth's surface by natural forces. The major causes of erosion include running water, wind, glaciers, and waves. Erosion begins with weathering, the weakening and breaking down of rocks and earth on the earth's surface. Some weathering results from air and water combining chemically with rocks; some results from water freezing in rock crevices—as the water freezes it expands, cracking the rock. Living things, including lichens, bacteria, and burrowing animals, also help bring about weathering.

Erosion takes place when particles of earth and broken-down rock are carried away by wind, runoff from rain, or in some other way. The particles themselves contribute to erosion by grinding against exposed rock and earth. In this way, rivers can cut deep channels and even canyons. In the past, as glaciers advanced they caused extreme erosion, scraping away large amounts of rock and earth. The pounding of ocean waves results in the erosion of coastlines.

Erosion is constantly sculpturing the earth's surface into new forms. The general tendency of erosion is to bring all land surfaces down to sea level. However, this tendency is opposed by the formation of volcanoes and by movements in the earth's crust that gradually thrust upward large sections of the earth's surface.

By disturbing the surface of the earth through farming, mining, and construction, humans are a major cause of erosion. Of particular concern is the erosion of soil. In general, forests and natural vegetation help prevent erosion because plant roots form a network that grips the soil and forests absorb some of the water that would otherwise wash away the soil.

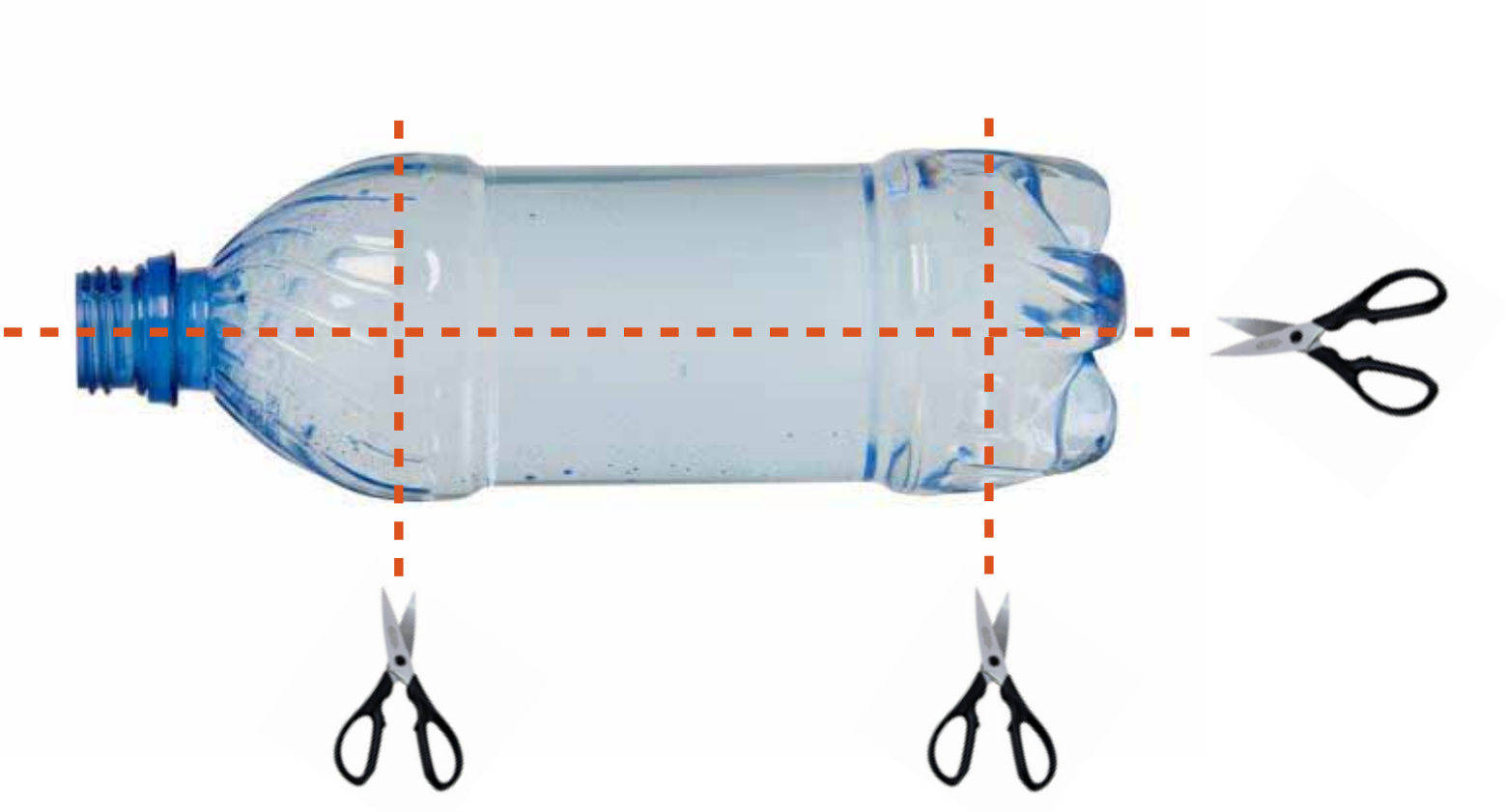
Rivers perform a tremendous amount of erosion. All river water carries dissolved minerals and tiny particles of silt and clay. When the current of the stream is fast enough, it carries sand, gravel, and even boulders by suspension and by rolling them along the river bed. Thus the greater the speed and amount of water, the heavier the load the water can carry.

What to do:

Tape all the plastic bottles together lengthways to create a drainpipe. Make sure that all the gaps are sealed well. (Alternatively use a length of half drainpipe.) Prop one end up to create a slope. Place the bottom end over a bucket to catch the water and eroded materials.

Place the sands and gravels about 1/3 of the way down the pipe then gently pour in the water from the top edge and see what happens.

Sieve the water to retrieve the sands and gravels for another time.



FORCES OF NATURE - Worksheet 5

Activity - Erosion/Deposition

Visit a local stream to look at how deposition occurs.

Find a meander (a naturally occurring bend in the river). Look for signs of deposition on the inside of the bend where the river is normally flowing more slowly. Because the energy of the river is less here, it finds it harder to carry its load and starts to drop material starting with the heaviest bits (stones and gravel) first.
When you have found an area of deposition look carefully at the stone sizes and where they are in relation to the water.
Are they randomly distributed or is there some pattern?
You should find that the largest/heaviest materials are deposited first and are furthest from the edge of the flowing stream.
As you move closer to the edge of the stream the particles become gradually finer/lighter with the finest particles of all – the fine sands and silts being deposited last.
This is because the fine particles are most easily carried by the stream. They are usually transported further down stream and are deposited last.
Flood plains and estuaries are made up of the finest particles of all – the silts and clays.

See Erosion/Deposition at work near you.

Find any running water (best done after heavy rain). It can be on the side of the road, or along a track or path, or even on a gentle slope in the school playground. Look carefully and you will see the processes of erosion, transportation and deposition at work, however small the trickle of water may be.