4. Alpine plants in trouble

Learning Intentions

For students to:

- Work effectively in a group
- Use new vocabulary such as: alpine plants, competition, migration
- Describe and explain environmental change
- Recognise the implications of climate change on mountain flora

Context:

- Environmental activity
- Information sheet on alpine plants and mountains

Resources

Provided

- Pictures of Alpine plants and alpine environments
- Information sheet on alpine plants and mountains

Needed

- A long rope
- Chalk signs on floor to mark the various vegetation zones
- Cards with names of plants and zones
- Space in the playground or garden, preferably with a slope

Links to National Curriculum subjects

Geography KS2

Enquiry and skills (1a, 1c, 1e, 2a, 2c)
Knowledge and understanding of places (3c, 3d, 3e)
Patterns and processes (4b)
Environmental change and sustainable development (5a, 5b)
Breadth of study (6b, 6e)

Geography KS3

Enquiry and skills (1a, 2a, 2c)
Knowledge and understanding of places (3a, 3c, 3d,)
Patterns and processes (4b)
Environmental change and sustainable development (5a, 5b)
Breadth of study (6d, 6e, 6j, 6k)

Overview

'Alpine plants in trouble' demonstrates the impact of climate change on alpine plants. Following a discussion about alpine plants, students participate in an activity in which they represent different plants living on Mount Kenya. As the climate warms students decide where to move to. Discussion and further reading helps students consider the wider implications of climate change on alpine plants.

Teaching activity

1 Run the alpine plant activity. Ideally this should be played out on a slope, with a rope stretched across an open area. Mark the area with the various heights (see below). Explain to the students that the rope represents the slope of Mount Kenya (5,200 metres high).

- Divide the students into six teams. Each team represents the plants from a different vegetation zone.
  1 **Lowland** – 1,000 metres – grassland and thorny scrub
  2 **Cultivated zone** – up to 1,800 metres – tea, coffee, beans, bananas, potatoes
  3 **Montane forest** – 2,000-2,500 metres – juniper trees, African olive trees, elderberry shrubs, herbs such as mint and clover
  4 **Timberline forest** – 3,000-3,500 metres – small trees such as African rosewood, Giant St. John's Wort and flowers such as lobelia and violets
  5 **Heath land** – 3,500-3,800 metres – shrubs such as heathers and sage
  6 **Alpine zone** – 3,800-4,500 metres. The vegetation is sparse at this altitude as plants are exposed to ice which can uproot and damage seedlings. Plants include tussock grass, giant lobelias, gladiola, lichens and moss.
  7 **Nival zone** – 4,500 metres – this is the area above the vegetation line
- Ask one student from each team to line up along the rope to represent a plant from their vegetation zone.
- Each plant produces seeds and a new plant is created. Ask the students (plants) to invite another member of their team to join them in their vegetation zone.
- Explain that the climate is warming. Discuss with the students what they think will happen to the plants.
- The plants again produce seeds and two new plants are created. This time the new plants are able to survive further up the mountain because of the warmer climate. Two members of their team join them on the mountain.
- Continue with the plants producing seeds and their offspring moving further up the mountain.
- Finish the activity with a discussion about the implications of climate change on alpine plants.

2 Provide the students with the information on alpines and ask them to complete the worksheet.

This activity could be linked to activities 2 and 3 where issues of out-competing species are discussed.

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Follow up activities for pupils

Students could read and discuss the two case studies 'Trees with nowhere to go' (page 44) and 'Climate change impacts on boreal forests' (page 52) from Plants and climate change: which future? (www.bgci.org/climate/whichfuture/).

Assessment

Pupil worksheets assessed for levels of response

- No recognition of role of climate change on plant zones on a mountain.
- Some recognition of role of climate change on plant zones on a mountain.
- Notice made of small details and an awareness of the role of climate change in the movement of plant zones on a mountain.
- Awareness of the role of a responsible citizen to alter the factors which are causing the change on mountain slopes.

Visits to botanic gardens

This activity is suited to either a school grounds or a botanic garden as it relies on knowledge of alpine plants, trees and space to play the game. Visiting during spring or summer, when alpine plants are in flower, would be an ideal time as students can engage with the beauty of alpines.

4. Alpine plants in trouble

Alpine plants and mountains

The alpine zone is at the very top of mountains, it is the limited area between the ending of the treeline and the summit of the mountain. Alpine environments are harsh and plants must adapt if they are to survive. Alpine plants are often small and have wonderful flowers. The word alpine comes from the Latin alpes which means 'high mountain' – places which are cold, windy and snowy.

A common feature of alpine plants is to have deep roots. This helps keep them upright in an area where gravity is constantly pulling soil down from the sides and tops of mountains. It also helps them reach water and nutrients.

Alpine plants are generally low in height. The reason for this is two-fold. Wind is always present in arctic-alpine environments and smaller plants are not as exposed to wind as taller plants are. Low growth also means a better chance of staying covered by snow which is one of the best insulators against extreme cold. Temperatures in arctic-alpine regions are generally low but the air temperature at the soil surface is always warmer than just above, so low plants keep themselves warmer simply by their short height.

Many alpines have evergreen leaves. This feature allows them to start photosynthesizing as soon as the air temperatures rise above freezing. Fuzzy leaves are also common and this helps protect alpines against drought conditions. Most alpines bloom and set seed within weeks of the melting snow. Flower colour is important. White flowers can trap some heat and is attractive to general pollinators. This is important in a region where pollinator activity is low. Blue and purple flowers trap more heat than white and this colour is also more attractive to bumblebees which are relatively common in alpine regions. Bumblebees can be active at temperatures much lower than other insects can tolerate. The more flowers produced, at the same time, the better the chances of being seen and visited by pollinators. This is why alpine plants often have spectacular floral displays.

As temperatures increase, there is only so far upwards these alpine plants can move before they are literally pushed off the top of the mountain. Plant species from lower slopes, like grasses and shrubs, will be creeping up the mountainsides at the same time, further threatening the little alpine plants.

Some alpine plants need snow to act as a protective cover. In some alpine regions there is less snow cover because of climate change. This means these plants are unlikely to be able to survive.

Questions

- How are alpine plants adapted to wind and cold temperatures on mountains?
- Why are the flowers of alpine plants often very bright colours?
- Why are alpine trees and plants vulnerable?
- Where is Mount Kenya? Use an atlas to find the mountain and draw a map to show its location.