Curriculum Visions

Living Things Teacher's Guide

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Atlantic Europe Publishing

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Designed and produced by
EARTHSCAPE EDITIONS

Contents

Section 1: Practical work

Safety first!

Before any kind of class or fieldwork, please make sure you have thought through the appropriate safety precautions, especially safety with any sharp objects.

There are 27 practical activities. Most involve the minimum of specialist equipment and all can be carried out in a classroom without the need for laboratory facilities. This makes the book a suitable course for both upper primary and lower secondary schools where there is insufficient laboratory provision.

Before you begin, consult your school's policies on practical work with materials and the participation of children in experiments. Also consider the abilities and attitudes of the students in your class, and then select activities for which you are confident to take responsibility.

The resources needed for each of the practicals, set out by experiment, are:

1. Atlas, computer for sending and receiving e-mails.

2A. Supervised access outside, magnifying glass (optional).

2B. Plastic container, such as large sweet jar or aquarium, a polythene sheet with small holes in it for the jar, a sheet of clear plastic with Plasticine supports for the aquarium tank. Soil, grass tussocks, stones, plant pots broken in half, selection of food (see page 47).

3A. Dry broad bean (pesticide free), beakers of water, large plant pots, compost, trowels, or spoons, a place in the light, digital camera (optional).

3B. Plasticine.

3C. Frog spawn, tank with pond water and pond weed, magnifying glass.

4A. Trays of sand, compost, sand and gravel, gravel, stones, wood chips, cress seeds or mustard seeds.

4B. Dandelion with tap root, knife (used by teacher) plant pot, compost, warm and light place to store plant pot.

5A. Plasticine, plain flour, pot or cup, ruler.

5B. Pointed forceps, blunt forceps, two dishes, cress seeds, stop clock.

5C. A tray, cotton wool, a black card to cover the tray, 30 woodlice, a container to hold the woodlice (keep them in moss), a clock.

6A. Clear plastic container (tank or bottle) with loose fitting lid, washed gravel, water plants (Canadian pond weed or hornwort), water snails, pond water, windowsill out of direct sunlight, magnifying glass (optional).

6B. –.

7A. Clear plastic container (tank or bottle) with loose fitting lid, common stick insects and privet leaves in small water jar, or caterpillars and leaves of the appropriate food plant, weighing machine (optional).

7B. Supervised access to hedges and trees.

8A. Supervised access to trees and bushes, white sheet, collecting bottles.

9A. Plastic jars, wood squares, pebbles, steep-sided dish or bowl.

10A. Supervised access to a few square

metres of ground in which trees and bushes grow. Digital camera, computer.

11A. Plasticine, long clear plastic tube with stopper, non-allergenic wallpaper paste, stop clock.

12A. Liverworts from river bank or damp wall or pavement, Petri dish, felt-tip pen or crayon, gravel.

13A. Selection of dishes and bowls – some small and some very large, thermometer, cress seedlings, measuring cylinder, salt.

14A. Soil made by mixing small gravel, coarse and fine sand and a little humus, a local compost or local loam, filter funnel, stop clock, pot with drainage holes.

15A. Wooden rods of different thicknesses. A half kilogram mass or similar, sand.

16A. Shoe box with hole in one end, cardboard, sticky tape, black paint, brush, pea or bean seedling in a pot.

17A. Access to woodland soil and leaf litter, access to soil and leaf litter from a flower bed. White tray or newspapers, collecting jars, paint brush, pooter (optional), magnifying glass.

19A. Supervised access to school grounds or supervised walk around a park.

21A. Depending on resources and the ability and attitude of the children use one of the following: (1) Access to soil in the school grounds or an area partially covered with stones. (2) If working in the classroom – bags of soil including some turf, white tray or newspapers, collecting jars, paint brush, pooter (optional), magnifying glass.

Note: Please read section 3, pages 10 to 33 of this *Teacher's Guide*, along with the introductions to the spreads and practicals as they may contain suggestions for using various pieces of equipment and materials to help set the scene for the work.

Developing investigative skills

Whilst all the practical activities provide opportunities for observations, some provide opportunities for completing tables, drawing graphs and scientific modelling. Those practicals marked with a * provide an opportunity for the students to demonstrate their full range of investigative skills. Each practical has a list of suggested outcomes which you may use or modify to meet your needs.

1A: Major environments
2A: Looking at living things
2B: Observing snails
3A: How a broad bean changes *
3B: Making model insects
3C: Studying tadpoles
4A: Sowing seeds in different places *
4B: Can a dandelion survive?
5A: Testing stabbing teeth *
5B: Testing model beaks *
5C: Investigating woodlice *
6A: A miniature pond
6B: Identifying pond life
7A: How much food do animals eat?
7B: Looking at leaves
8A: What is on the branches? *
9A: How to use a pitfall trap*
10A: How plants change with the seasons
11A: Testing model algae *
12A: How do liverworts grow? *
13A: Rock pools and salt water
14A: Comparing soils
15A: Desert feet *
16A: Growing towards the light
17A: How do habitats compare?
19A: Using a plant key
21A: Identifying soil life

Section 2: Living Things in Their Environment explained

Although the student book – *Living Things in their Environment* – is clear and simple, a great deal of care and thought has been given to the structure and the content of each double-page spread. The worksheets in section 5 of this *Teacher's Guide* also directly link to the pages in *Living Things in their Environment.*

It is possible to use *Living Things in their Environment* and section 5 of the *Teacher's Guide* without reading this section, but we would strongly recommend that you take a short time to familiarise yourself with the construction of the student book.

Living Things in their Environment begins with an answer to the question of what living things are and how to form a simple classification. Living things are then shown to change through their lives, and also to be adapted to their surroundings, both in spatial and temporal senses. The book then goes on to consider the nature of communities and food chains. Finally, it brings all of these ideas together in the form of a thorough investigation of a wide range of habitats, both those close to home, and more extreme habitats such as mountains and deserts. The book then changes direction to look at stewardship and sustainable development for local habitats, and simple ways in which environments can be improved. Finally, the book shows how some habitats can be investigated.

Be considerate!

If you handle any living thing during your studies, remember it IS a living thing and should be treated with consideration and returned to its environment as soon as possible.

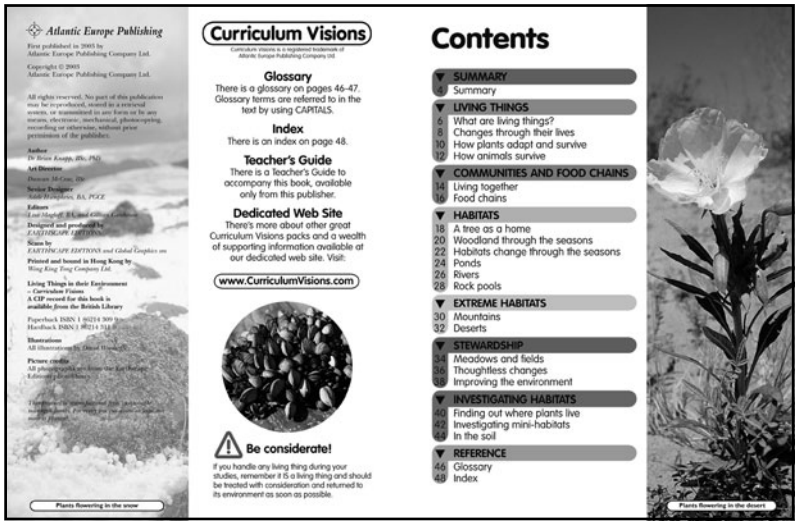
Safety

Please note that there are minor safety issues when dealing with this topic. Children should never handle water that may be contaminated with microbes or animals that may cause them harm. Similarly, they should be aware that they need to handle all living things with respect and return them to their environment as soon as they have been examined.

Finally, children should be taught the rules of safety when going near rivers, ponds, rock pools and other potentially hazardous locations as specified by your Local Education Authority or other authorised body.

Contents

The book is organised into chapters and



straightforward, easy-to-follow, double column format.

Words highlighted in **BOLD CAPITALS** in the student book are defined in the glossary on pages 46–47. The majority are technical words important to the subject, but some are simply difficult words.

The glossary definitions help to reinforce the meaning of a word that may be slightly ambiguous if taken out of context. Many technical words used by scientists are also used in everyday situations where they may have a different meaning.

The glossary words are highlighted on the first page where they are encountered. They may be highlighted again on subsequent pages if they are regarded as particularly important to that page or spread.

It may also be helpful to remind students to look carefully at the way the pictures and their captions are related to, and often extend, the theme of the spread.

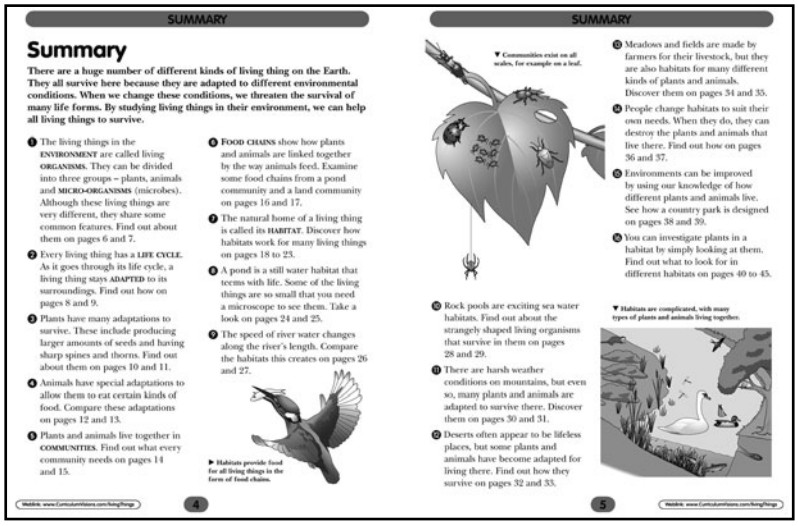
subdivided into double-page spreads. Chapters are shown on the contents page and are colour-coded. Matching, coloured headers run across each spread. The concept is paralleled by the pages on the web site.

Each spread has a heading, below which is a sentence that sets the scene and draws out the most important theme of the spread. The main text of the page then follows in

Summary

Spread 1 (pages 4–5)

Summary



This spread provides a summary of many environmental topics. It can be read by students to give them a feel for the breadth of the study they are about to undertake, and gives an indication of the technical words they will have to learn. It can also be used as a summary or for revision after the course is complete.

Points 1 to 16 discuss the main features of food chains, habitats and ecosystems.

Some of the words shown on pages 4 and 5 are highlighted as glossary entries. (The meaning of each word will become more apparent when it is encountered on the relevant page later, in the context of the supporting explanation and information.)

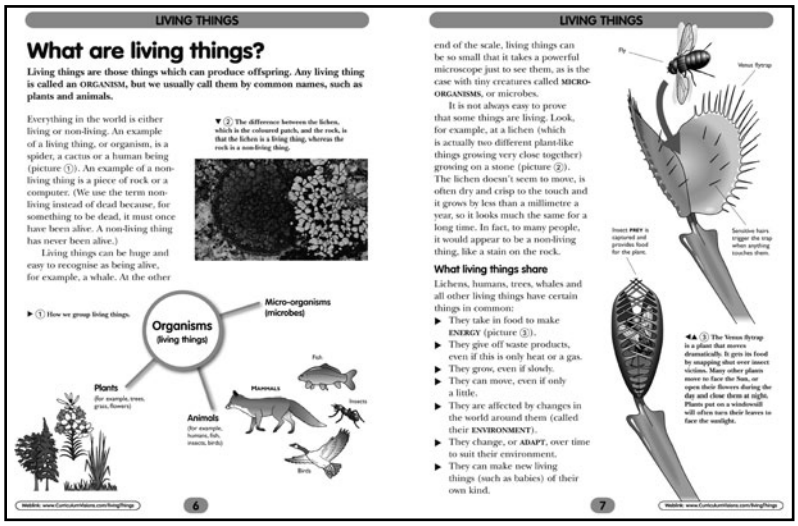
There are two worksheets to help develop ideas. The first is a comprehension sheet and the second is a practical, both dealing with major environments (ecosystems).

Chapter 1: Living things

This chapter begins to raise student's awareness of the environment around them by looking at the nature of living things, life cycles and adaptations.

Spread 2 (pages 6–7)

What are living things?



LIVING THINGS

What are living things?

Living things are those things which can produce offspring. Any living thing is called an ORGANISM, but we usually call them by common names, such as plants and animals.

Everything in the world is either living or non-living. An example of a living thing, or organism, is a spider, a cactus or a human being (picture ①). An example of a non-living thing is a piece of rock or a computer. (We use the term non-living instead of dead because, for something to be dead, it must once have been alive. A non-living thing has never been alive.)

Living things can be huge and easy to recognise as being alive, for example, a whale. At the other end of the scale, living things can be so small that it takes a powerful microscope just to see them, as is the case with tiny creatures called **MICRO-ORGANISMS**, or microbes.

▼ ② The difference between the lichen, which is the coloured patch, and the rock, is that the lichen is a living thing, whereas the rock is a non-living thing.

▶ ① How we group living things.

Organisms (living things)

Micro-organisms (microbes)

Plants (for example, trees, grass, flowers)

Animals (for example, humans, fish, insects, birds)

Fish

Mammals

Insects

Birds

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LIVING THINGS

It is not always easy to prove that some things are living. Look, for example, at a lichen (which is actually two different plant-like things growing very close together) growing on a stone (picture ②). The lichen doesn't seem to move, is often dry and crisp to the touch and it grows by less than a millimetre a year, so it looks much the same for a long time. In fact, to many people, it would appear to be a non-living thing, like a stain on the rock.

What living things share

Lichens, humans, trees, whales and all other living things have certain things in common:

- They take in food to make **ENERGY** (picture ③).
- They give off waste products, even if this is only heat or a gas.
- They grow, even if slowly.
- They can move, even if only a little.
- They are affected by changes in the world around them (called their **ENVIRONMENT**).
- They change, or **ADAPT**, over time to suit their environment.
- They can make new living things (such as babies) of their own kind.

Fly

Venus flytrap

Insect **PREY** is captured and provides food for the plant.

Sensitive hairs trigger the trap when anything touches them.

◀▲ ③ The Venus flytrap is a plant that moves dramatically. It gets its food by snapping shut over insect victims. Many other plants move to face the Sun, or open their flowers during the day and close them at night. Plants put on a windowsill will often turn their leaves to face the sunlight.

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The unit begins by dividing everything into living things or non-living things, and gives examples of each. A non-living thing is also distinguished from something which is dead. The term organism is introduced.

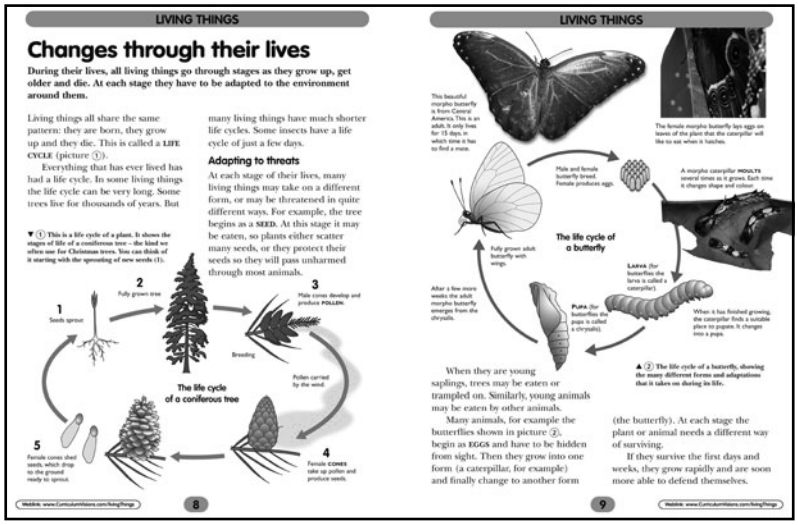
A fascinating close-up photograph of lichens challenges the readers to consider that some living things may not look alive. This is followed by listing seven features of living things – to make the concept of life extremely clear.

The whole unit provides foundation work, not only for the other units in this book but also for other books in the series.

You may like to begin by giving each group of children a dry broad bean seed and a similar-sized pebble. Ask them if the two things appear to be living, then ask them how they may test them to see if they are alive. Look for answers about putting them in moist soil, then let the children plant the objects in plant pots. Ask the children to make predictions about what may happen, then allow them to check the pots regularly over the following few days.

Along with the comprehension worksheet, there are two practicals with this unit. In Practical 2A, the children make a survey of living things around the school. In Practical 2B, the children set up a home for snails and make observations on the way they move, eat and even breed.

Spread 3 (pages 8–9)
Changes through their lives


LIVING THINGS

Changes through their lives

During their lives, all living things go through stages as they grow up, get older and die. At each stage they have to be adapted to the environment around them.

Living things all share the same pattern: they are born, they grow up and they die. This is called a LIFE CYCLE (picture ①).

Everything that has ever lived has had a life cycle. In some living things the life cycle can be very long. Some trees live for thousands of years. But many living things have much shorter life cycles. Some insects have a life cycle of just a few days.

▼ ① This is a life cycle of a plant. It shows the stages of life of a coniferous tree – the kind we often use for Christmas trees. You can think of it starting with the sprouting of new seeds (1).

1 Seeds sprout
2 Fully grown tree
3 Male cones develop and produce POLLEN
4 Female CONES take up pollen and produce seeds.
5 Female cones shed seeds, which drop to the ground ready to sprout.
Breeding
Pollen carried by the wind.
The life cycle of a coniferous tree

Adapting to threats

At each stage of their lives, many living things may take on a different form, or may be threatened in quite different ways. For example, the tree begins as a SEED. At this stage it may be eaten, so plants either scatter many seeds, or they protect their seeds so they will pass unharmed through most animals.

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LIVING THINGS

This beautiful morpho butterfly is from Central America. This is an adult. It only lives for 15 days in which time it has to find a mate.

The female morpho butterfly lays eggs on leaves of the plant that the caterpillar will like to eat when it hatches.

Male and female butterfly breed. Female produces eggs.

A morpho caterpillar MOULTS several times as it grows. Each time it changes shape and colour.

The life cycle of a butterfly

Fully grown adult butterfly with wings.

LARVA (for butterflies the larva is called a caterpillar).

After a few more weeks the adult morpho butterfly emerges from the chrysalis.

PUPA (for butterflies the pupa is called a chrysalis).

When it has finished growing, the caterpillar finds a suitable place to pupate. It changes into a pupa.

▲ ② The life cycle of a butterfly, showing the many different forms and adaptations that it takes on during its life.

When they are young saplings, trees may be eaten or trampled on. Similarly, young animals may be eaten by other animals.

Many animals, for example the butterflies shown in picture ②, begin as EGGS and have to be hidden from sight. Then they grow into one form (a caterpillar, for example) and finally change to another form (the butterfly). At each stage the plant or animal needs a different way of surviving.

If they survive the first days and weeks, they grow rapidly and are soon more able to defend themselves.

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The unit begins by explaining the concept of a life cycle. A clear diagram of the life cycle of a coniferous tree is shown.

The text deals with the various threats to survival to which living things must adapt. The stages of the life cycle of a butterfly are then illustrated with a large, clear diagram and intriguing colour photographs of the life cycle of the morpho butterfly from Central America. Pupation and the emergence of the short-lived adult is described.

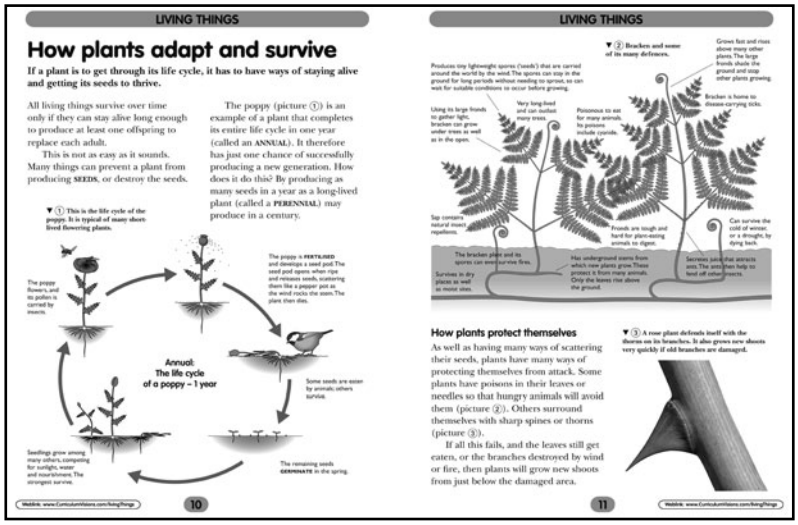
You may like to begin by asking the children "What is an insect?" Look for answers about having six legs and wings and make sure the children can distinguish insects from spiders.

Ask for a volunteer to be fitted with insect arms. Produce some card and make it into cylinders which fit over the upper and lower arms. Join the cylinders loosely so that the volunteer can move their arms. Tell the children that insects have their skeletons on the outside of their body, and if they were an insect their arms would look much like the cylinders. Tell the children that this presents a problem with growth because the hard, firm skeleton will not let the body grow. The insect solves the problem by moulting. In most insects this occurs when they are larva.

In addition to the comprehension worksheet, this unit has three practicals. In Practical 3A, the children examine the changes in a broad bean after it has been planted for several days. In Practical 3B, they can make a maggot and fly from Plasticine and compare their body structures. Lastly, in Practical 3C, an extensive study of the development of the tadpole can be carried out.

Spread 4 (pages 10–11)

How plants adapt and survive


LIVING THINGS

How plants adapt and survive

If a plant is to get through its life cycle, it has to have ways of staying alive and getting its seeds to thrive.

All living things survive over time only if they can stay alive long enough to produce at least one offspring to replace each adult.

This is not as easy as it sounds. Many things can prevent a plant from producing SEEDS, or destroy the seeds.

The poppy (picture ①) is an example of a plant that completes its entire life cycle in one year (called an ANNUAL). It therefore has just one chance of successfully producing a new generation. How does it do this? By producing as many seeds in a year as a long-lived plant (called a PERENNIAL) may produce in a century.

▼ ① This is the life cycle of the poppy. It is typical of many short-lived flowering plants.

Annual: The life cycle of a poppy – 1 year

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LIVING THINGS

▼ ② Bracken and some of its many defences.

How plants protect themselves

As well as having many ways of scattering their seeds, plants have many ways of protecting themselves from attack. Some plants have poisons in their leaves or needles so that hungry animals will avoid them (picture ②). Others surround themselves with sharp spines or thorns (picture ③).

If all this fails, and the leaves still get eaten, or the branches destroyed by wind or fire, then plants will grow new shoots from just below the damaged area.

▼ ③ A rose plant defends itself with the thorns on its branches. It also grows new shoots very quickly if old branches are damaged.

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This unit looks at the two main plant life cycles: those of annuals and perennials. You can also refer back to page 8 for an example of a perennial (the coniferous tree).

The other main theme is to show a number of easily-understood strategies that plants have for ensuring their survival – from the production of many seeds to the use of thorns and poisons for defence.

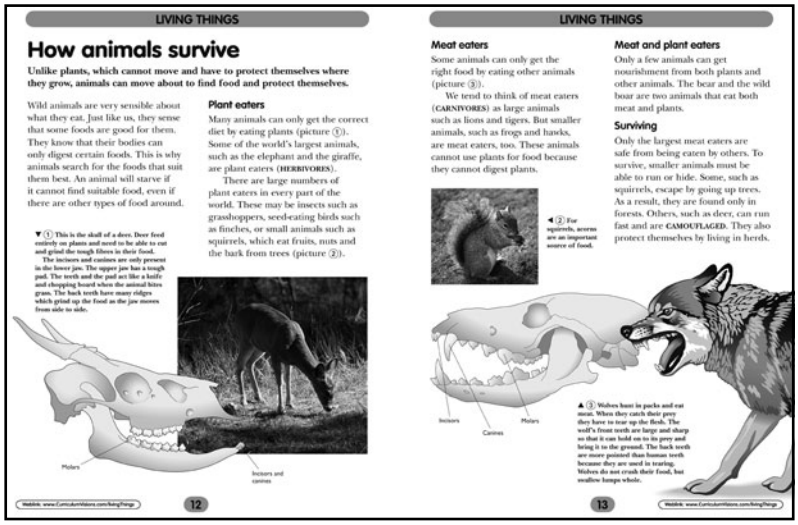
The unit begins by focusing on annuals, and stating that such plants produce large numbers of seeds to ensure survival. Reasons are also given why plants fail to survive. The life cycle of the poppy is described and illustrated as an example of an annual plant.

You could begin by giving each child in the class a number. Take them into the school hall and gather them round you. Tell them that they are seeds and in a moment they will be dispersed. Tell the children to spread out round the hall and sit down. Call out the numbers of half the class and tell them that they have landed where they cannot grow, so they die. Those children can lie down. Call out the numbers of a quarter of the class. Tell them that they are seeds that are eaten and let them lie down too. Tell the remaining children to stand up. They have germinated and grown into seedlings. Call out the numbers of half of these 'seedlings'. They are eaten by animals and die. Call out the numbers of all but one of the others and say they are attacked by disease or shaded by other plants and die. Tell the children that this is what happens to every group of seeds which leaves a plant.

There is a comprehension worksheet to accompany this unit, and two practicals. In Practical 4A, the children experiment with sowing seeds in various different materials such as sand and gravel and record signs of germination and growth. In Practical 4B, children investigate what happens to a dandelion root when it is cut up and placed back in the soil.

Spread 5 (pages 12–13)

How animals survive



This unit is concerned with how animals survive, in part by finding the food they need, and also by being able to move about in order to protect themselves from animals further up the food chain (predators).

The unit begins by stating that animals have particular diets. The text moves on to describe a wide range of plant-eating animals, and is supported by a photo of a deer, and an illustration of a deer skull, to show the special arrangement of the teeth.

In the section on meat eaters, the point is made that not only large animals like lions and tigers are meat eaters, but smaller ones, like the frog, are meat eaters, too. This section is supported by illustrations of the wolf showing its skull, and with its jaws ready for action. The unit ends by mentioning that a few animals eat both plants and animals.

To begin this unit, you might ask the children for the name of an animal that lives in a tree in this country. Look for an answer such as squirrel, but birds may also be mentioned. Move on to ask about animals that live in the grass and in a pond. It is important for the children to realise that wild animals are not just large animals, but small ones too, and include mini-beasts. Move on to ask about the food of some of the animals, and ask the children about their observations of seeing wild animals feeding.

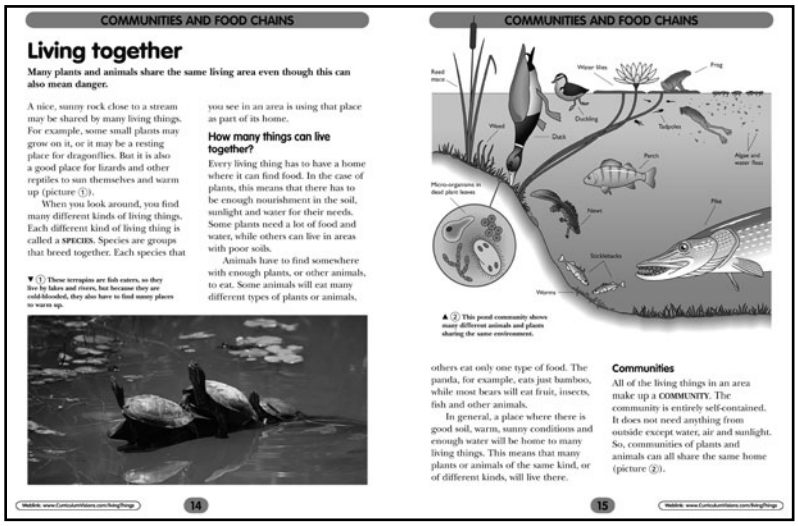
In addition to a comprehension worksheet, there are three practicals. In Practical 5A, the children make Plasticine teeth and find out how deep they can stab into flour. In Practical 5B, they can study the feeding capabilities of birds discussed in the text by scientifically modelling the actions of a seed-eating bird and an insect-eating bird to see how their beaks are adapted to their food. Lastly, in Practical 5C, the children can investigate how woodlice respond to damp conditions.

Chapter 2: Communities and food chains

This chapter focuses on the communities of living things and the food chains and food webs which develop in a particular ecosystem.

Spread 6 (pages 14–15)

Living together



COMMUNITIES AND FOOD CHAINS

Living together

Many plants and animals share the same living area even though this can also mean danger.

A nice, sunny rock close to a stream may be shared by many living things. For example, some small plants may grow on it, or it may be a resting place for dragonflies. But it is also a good place for lizards and other reptiles to sun themselves and warm up (picture ①).

When you look around, you find many different kinds of living things. Each different kind of living thing is called a **SPECIES**. Species are groups that breed together. Each species that you see in an area is using that place as part of its home.

How many things can live together?

Every living thing has to have a home where it can find food. In the case of plants, this means that there has to be enough nourishment in the soil, sunlight and water for their needs. Some plants need a lot of food and water, while others can live in areas with poor soils.

Animals have to find somewhere with enough plants, or other animals, to eat. Some animals will eat many different types of plants or animals, others eat only one type of food. The panda, for example, eats just bamboo, while most bears will eat fruit, insects, fish and other animals.

In general, a place where there is good soil, warm, sunny conditions and enough water will be home to many living things. This means that many plants or animals of the same kind, or of different kinds, will live there.

▼ ① These terrapins are fish eaters, so they live by lakes and rivers, but because they are cold-blooded, they also have to find sunny places to warm up.

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COMMUNITIES AND FOOD CHAINS

▲ ② This pond community shows many different animals and plants sharing the same environment.

Communities

All of the living things in an area make up a **COMMUNITY**. The community is entirely self-contained. It does not need anything from outside except water, air and sunlight. So, communities of plants and animals can all share the same home (picture ②).

15

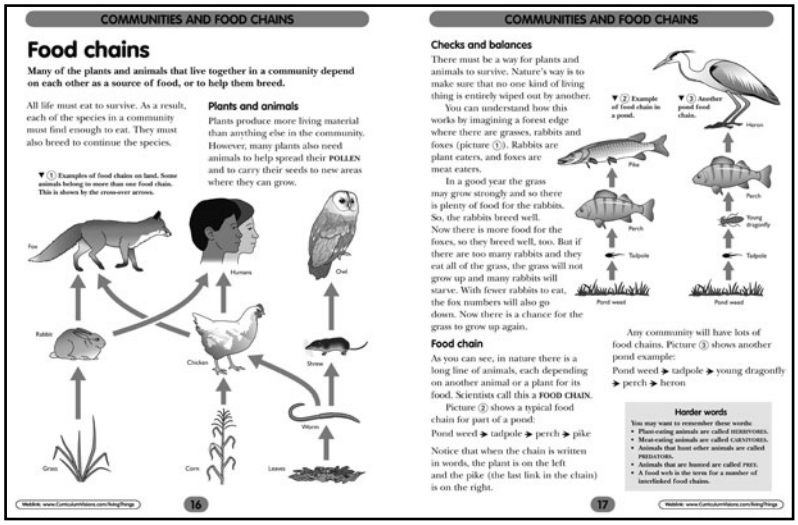
This unit begins to develop the concept of habitat and food webs by talking about the many creatures that share the same environment.

The unit begins by showing how a simple feature in a habitat, such as a rock, can be used by several different kinds of living thing. The text moves on to define the word 'species' and establishes that a habitat may be home to many different species. The needs of plant and animal species are compared, and the unit ends by showing how plant and animal species live together and form a community. The concept of the community is illustrated by a large, colourful picture of life in a pond.

You could begin by asking the children what living things may be found in a pond. Write the names on the board. If they do not mention water plants you should add them to the board as you go along. Ask the children which of the animals are large and which are small. Challenge them to think about why a large animal like a pike does not eat all the other animals in the pond. They should answer that some animals are camouflaged to blend in with the plants or to hide away in them. Suggest to the children that living things survive together in a habitat because they help each other in different ways.

After the comprehension worksheet, there are two practicals. In Practical 6A, the children make a simple pond community and keep records in a notebook over a period of several weeks. Practical 6B gives the children a chance to identify a selection of pond animals using an identification key.

foods have in common and look for an answer about them being all plants. Now trace a path from one of the plant foods



COMMUNITIES AND FOOD CHAINS

Food chains

Many of the plants and animals that live together in a community depend on each other as a source of food, or to help them breed.

All life must eat to survive. As a result, each of the species in a community must find enough to eat. They must also breed to continue the species.

Plants and animals

Plants produce more living material than anything else in the community. However, many plants also need animals to help spread their **POLLEN** and to carry their seeds to new areas where they can grow.

▼ ① Examples of food chains on land. Some animals belong in more than one food chain. This is shown by the cross-over arrows.

Fox, Humans, Owl, Rabbit, Chicken, Shrew, Worm, Grass, Corn, Leaves

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COMMUNITIES AND FOOD CHAINS

Checks and balances

There must be a way for plants and animals to survive. Nature's way is to make sure that no one kind of living thing is entirely wiped out by another.

You can understand how this works by imagining a forest edge where there are grasses, rabbits and foxes (picture ①). Rabbits are plant eaters, and foxes are meat eaters.

In a good year the grass may grow strongly and so there is plenty of food for the rabbits. So, the rabbits breed well. Now there is more food for the foxes, so they breed well, too. But if there are too many rabbits and they eat all of the grass, the grass will not grow up and many rabbits will starve. With fewer rabbits to eat, the fox numbers will also go down. Now there is a chance for the grass to grow up again.

Food chain

As you can see, in nature there is a long line of animals, each depending on another animal or a plant for its food. Scientists call this a **FOOD CHAIN**.

Picture ② shows a typical food chain for part of a pond:

Pond weed ➔ tadpole ➔ perch ➔ pike

Notice that when the chain is written in words, the plant is on the left and the pike (the last link in the chain) is on the right.

▼ ② Example of food chain in a pond.

Pike, Perch, Tadpole, Pond weed

▼ ③ Another pond food chain.

Heron, Perch, Young dragonfly, Tadpole, Pond weed

Any community will have lots of food chains. Picture ③ shows another pond example:

Pond weed ➔ tadpole ➔ young dragonfly ➔ perch ➔ heron

Harder words

You may want to remember these words:

- Plant-eating animals are called HERBIVORES.
- Meat-eating animals are called CARNIVORES.
- Animals that hunt other animals are called PREDATORS.
- Animals that are hunted are called PREY.
- A food web is the term for a number of interlinked food chains.

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Spread 7 (pages 16–17)

Food chains

This unit is designed to get students thinking about food chains and how there can be many food chains in an ecosystem because animals are selective feeders.

The unit opens by explaining that all forms of life need food. It goes on to explore the idea of a food chain and the checks and balances involved. A detailed description of how rabbits and foxes live together is given. When grass grows well, rabbits, and therefore foxes, thrive but when there are too many rabbits there is not enough grass to eat so the rabbit population shrinks along with the fox population. This is exemplified by showing three simple food chains and how they can be linked together in a food web. The unit ends by showing two further food chains from a pond.

You may like to begin by asking the children what they ate in their last meal. Suggest a selection of plant-based foods, such as crisps and bread, and ask the children where these foods came from (for example, potatoes and wheat). Write the sources on the board. Ask about meat and milk and trace them back to grass. Ask the children what all the sources of the to one of the children. Write the path on the board. Challenge the children to write some food paths leading to themselves.

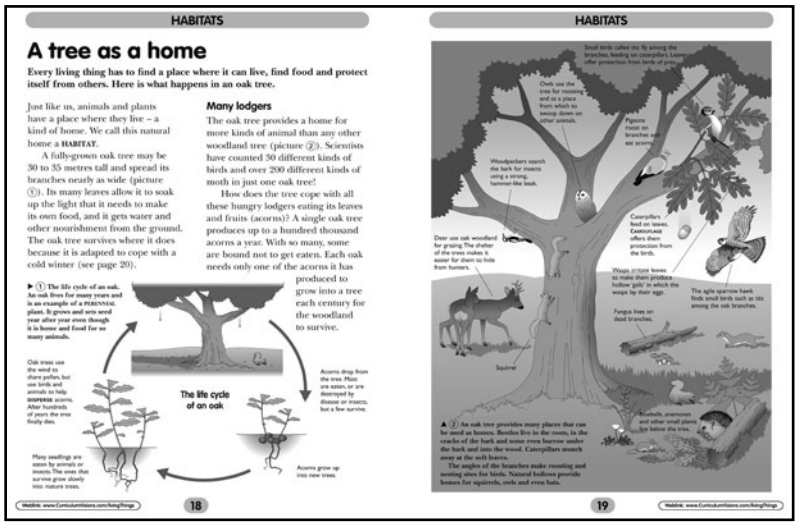
Three worksheets help develop these ideas. The first is a comprehension worksheet and it is followed by two practicals. In Practical 7A, the children find out how much food a group of animals consumes in a few days, and make calculations to find out how much a single animal consumes. In Practical 7B, the children examine leaves on bushes and trees to find out about the animals that feed on them.

Chapter 3: Habitats

This chapter is concerned to show students a wide variety of habitats so that they can have numerous examples of the species involved. It provides the opportunity to think about many food chains.

Spread 8 (pages 18–19)

A tree as a home



HABITATS

A tree as a home

Every living thing has to find a place where it can live, find food and protect itself from others. Here is what happens in an oak tree.

Just like us, animals and plants have a place where they live – a kind of home. We call this natural home a **HABITAT**.

A fully-grown oak tree may be 30 to 35 metres tall and spread its branches nearly as wide (picture ①). Its many leaves allow it to soak up the light that it needs to make its own food, and it gets water and other nourishment from the ground. The oak tree survives where it does because it is adapted to cope with a cold winter (see page 20).

Many lodgers

The oak tree provides a home for more kinds of animal than any other woodland tree (picture ②). Scientists have counted 50 different kinds of birds and over 200 different kinds of moth in just one oak tree!

How does the tree cope with all these hungry lodgers eating its leaves and fruits (acorns)? A single oak tree produces up to a hundred thousand acorns a year. With so many, some are bound not to get eaten. Each oak needs only one of the acorns it has produced to grow into a tree each century for the woodland to survive.

▶ ① The life cycle of an oak. An oak lives for many years and is an example of a PERENNIAL plant. It grows and sets seed year after year even though it is home and food for so many animals.

The life cycle of an oak

Oak trees use the wind to share pollen, but use birds and animals to help DISPERSE acorns. After hundreds of years the tree finally dies.

Acorns drop from the tree. Most are eaten, or are destroyed by disease or insects, but a few survive.

Many seedlings are eaten by animals or insects. The ones that survive grow slowly into mature trees.

Acorns grow up into new trees.

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HABITATS

Small birds called tits fly among the branches, feeding on caterpillars. Leaves offer protection from birds of prey.

Owls use the tree for roosting and as a place from which to swoop down on other animals.

Pigeons roost on branches and eat acorns.

Woodpeckers search the bark for insects using a strong, hammer-like beak.

Caterpillars feed on leaves. CAMOUFLAGE offers them protection from the birds.

Deer use oak woodland for grazing. The shelter of the trees makes it easier for them to hide from hunters.

Wasps initiate leaves to make them produce hollow 'galls' in which the wasps lay their eggs.

The agile sparrow hawk finds small birds such as tits among the oak branches.

Fungus lives on dead branches.

Squirrel

Bluebells, anemones and other small plants live below the trees.

▲ ② An oak tree provides many places that can be used as homes. Beetles live in the roots, in the cracks of the bark and some even burrow under the bark and into the wood. Caterpillars munch away at the soft leaves.

The angles of the branches make roosting and nesting sites for birds. Natural hollows provide homes for squirrels, owls and even bats.

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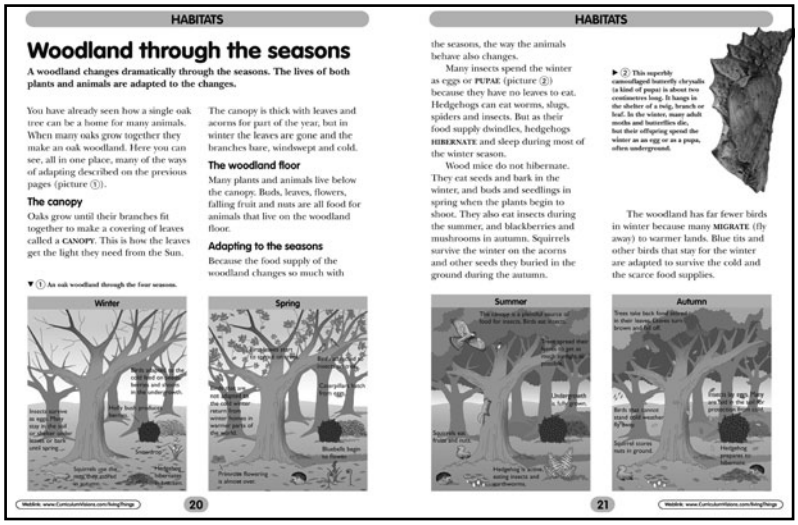
In this unit the concept of a habitat is tackled from the point of view of a single tree. This provides a more controlled and accessible habitat than delving directly into a woodland.

This unit looks at the oak tree as a habitat where many different kinds of animals and plants live, find food and protect themselves from others. The oak can provide such a varied habitat because it is a long-lived tree. The life of the oak as a perennial plant is also illustrated.

Before you begin this unit you may like to discuss with the children their ideas about habitats, and the examples they have studied previously. You may then move the discussion on to why an animal can survive in one habitat and not in another.

There is one comprehension worksheet and one practical to complement this topic. In Practical 8A, children examine the animals which fall from a shaken branch. These are compared with animals from different types of trees and bushes, and detailed results are recorded.

Spread 9 (pages 20–21)
Woodland through the seasons


HABITATS

Woodland through the seasons

A woodland changes dramatically through the seasons. The lives of both plants and animals are adapted to the changes.

You have already seen how a single oak tree can be a home for many animals. When many oaks grow together they make an oak woodland. Here you can see, all in one place, many of the ways of adapting described on the previous pages (picture ③).

The canopy

Oaks grow until their branches fit together to make a covering of leaves called a CANOPY. This is how the leaves get the light they need from the Sun.

The canopy is thick with leaves and acorns for part of the year, but in winter the leaves are gone and the branches bare, windswept and cold.

The woodland floor

Many plants and animals live below the canopy. Buds, leaves, flowers, falling fruit and nuts are all food for animals that live on the woodland floor.

Adapting to the seasons

Because the food supply of the woodland changes so much with the seasons, the way the animals behave also changes.

Many insects spend the winter as eggs or PUPAE (picture ②) because they have no leaves to eat. Hedgehogs can eat worms, slugs, spiders and insects. But as their food supply dwindles, hedgehogs HIBERNATE and sleep during most of the winter season.

Wood mice do not hibernate. They eat seeds and bark in the winter, and buds and seedlings in spring when the plants begin to shoot. They also eat insects during the summer, and blackberries and mushrooms in autumn. Squirrels survive the winter on the acorns and other seeds they buried in the ground during the autumn.

▼ ① An oak woodland through the four seasons.

Winter

Spring

Summer

Autumn

▶ ② This superbly camouflaged butterfly chrysalis (a kind of pupa) is about two centimetres long. It hangs in the shelter of a twig, branch or leaf. In the winter, many adult moths and butterflies die, but their offspring spend the winter as an egg or as a pupa, often underground.

The woodland has far fewer birds in winter because many MIGRATE (fly away) to warmer lands. Blue tits and other birds that stay for the winter are adapted to survive the cold and the scarce food supplies.

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Having looked at the habitat that a single oak provides, we now turn to the habitat that involves the tree and its surroundings in a woodland. To add variety, the changes in a woodland are considered on a seasonal basis. You can also consider the species on a spatial basis for each season.

The unit begins by reminding the children of the single oak tree in Unit 8, and describing how oak trees form a woodland with its characteristic features of a canopy and a woodland floor.

Four pictures illustrate the changes in a wood over the year, and how these changes affect some of the plants and animals that live there. The text compares animals that hibernate, migrate or are otherwise adapted to stay active in the woodland through the harshest weather.

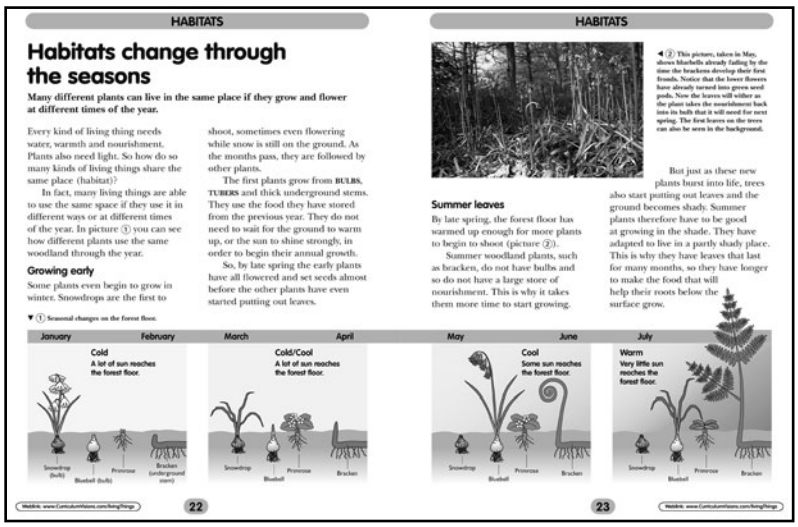
You may want to begin this topic by reminding the children of how the Earth moves around the Sun. You could enlist one child to be the Sun, while another holds the Earth at the correct tilt and moves round the Sun. The other members of the class can then describe the change in seasons. You can now tie these cosmic events to the seasonal changes in the woodland habitat and their effect on the organisms that live there.

There is a comprehension worksheet and a practical for this unit. In the practical (9A), the children find out about the animal life living in an area of ground by using pitfall traps.

Spread 10 (pages 22–23)

Habitats change through the seasons

This unit gives the chance to consider the


HABITATS

Habitats change through the seasons

Many different plants can live in the same place if they grow and flower at different times of the year.

Every kind of living thing needs water, warmth and nourishment. Plants also need light. So how do so many kinds of living things share the same place (habitat)?

In fact, many living things are able to use the same space if they use it in different ways or at different times of the year. In picture ① you can see how different plants use the same woodland through the year.

Growing early

Some plants even begin to grow in winter. Snowdrops are the first to shoot, sometimes even flowering while snow is still on the ground. As the months pass, they are followed by other plants.

The first plants grow from BULBS, TUBERS and thick underground stems. They use the food they have stored from the previous year. They do not need to wait for the ground to warm up, or the sun to shine strongly, in order to begin their annual growth.

So, by late spring the early plants have all flowered and set seeds almost before the other plants have even started putting out leaves.

▼ ① Seasonal changes on the forest floor.

January February March April May June July

Cold
A lot of sun reaches the forest floor.

Cold/Cool
A lot of sun reaches the forest floor.

Cool
Some sun reaches the forest floor.

Warm
Very little sun reaches the forest floor.

Snowdrop (bulb) Bluebell (bulb) Primrose Bracken (underground stem)

Snowdrop Bluebell Primrose Bracken

Snowdrop Bluebell Primrose Bracken

Snowdrop Bluebell Primrose Bracken

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HABITATS

◀ ② This picture, taken in May, shows bluebells already fading by the time the brackens develop their first fronds. Notice that the lower flowers have already turned into green seed pods. Now the leaves will wither as the plant takes the nourishment back into its bulb that it will need for next spring. The first leaves on the trees can also be seen in the background.

Summer leaves

By late spring, the forest floor has warmed up enough for more plants to begin to shoot (picture ②).

Summer woodland plants, such as bracken, do not have bulbs and so do not have a large store of nourishment. This is why it takes them more time to start growing.

But just as these new plants burst into life, trees also start putting out leaves and the ground becomes shady. Summer plants therefore have to be good at growing in the shade. They have adapted to live in a partly shady place. This is why they have leaves that last for many months, so they have longer to make the food that will help their roots below the surface grow.

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way that many plants are adapted to use a single habitat by occupying it actively for specific parts of the year. This is especially obvious in spring, but can be traced throughout the year.

You may introduce the unit by showing the children some plant bulbs. Describe them as stores of energy which allow plants to grow without strong light shining on them. These adaptations allow some plants to live in the same habitat as other plants by growing earlier in the year than those plants that grow from seeds or have woody stems.

If you are studying the unit in the autumn, you may like the children to plant some bulbs for flowering early in the following year. If you are studying the unit in the spring, you may show them some bulbs in leaf and flower.

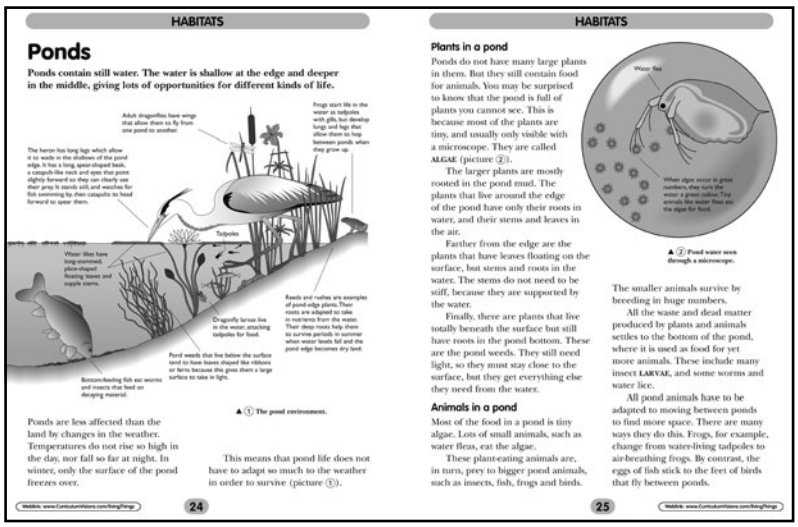
In addition to bulbs, the unit also features root tubers and underground stems as stores of energy for plant growth. The sequence of plant growth in a wood is described by reference to the snowdrop, primrose, bluebell, bracken and trees. The advantages of early growth are discussed. By coming into leaf at different times of year, a large number of plants can survive in the same area without competing with each other.

Two worksheets accompany this unit – a comprehension worksheet and Practical 10A, in which children map out a particular area and add details of plants growing there. This exercise can be repeated in different seasons to explore in-depth how plants change over time.

Spread 11 (pages 24–25)

Ponds

This unit moves away from the woodland



to consider a habitat based on a closed water system – the pond. Ponds give immense pleasure and are relatively easy to visit. Small aquaria can also be used to replicate some features of ponds and their life.

Ponds are exciting places and you may want the children to visit a pond before they begin a formal study. The children could collect some pond life, such as water weed and snails, for the classroom aquarium tank. They could study the pond life while they are working through the unit, then return them to the pond on a second visit, when the children look at the pond again in the light of what they have learned.

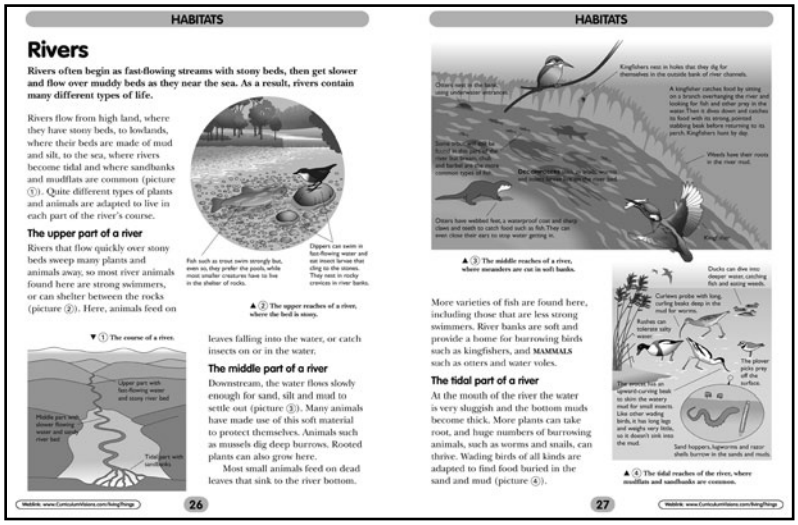
The unit begins by comparing the pond habitat with a habitat on land, then moves on to describe the arrangement of plants in a pond and the presence of microscopic algae. A detailed illustration shows how some plants and animals are adapted for life in the pond, and the unit ends by describing how some pond animals move from one pond to the next.

There is a comprehension worksheet and one practical for this unit. Practical 11A studies the adaptation of algae to an aquatic life. The children make Plasticine models of algae and test their sinking speed. They can relate the numbers of spines on an algae to its ability to stay in sunlit water.

Spread 12 (pages 26–27)

Rivers

This is a unit with specific cross-curricular



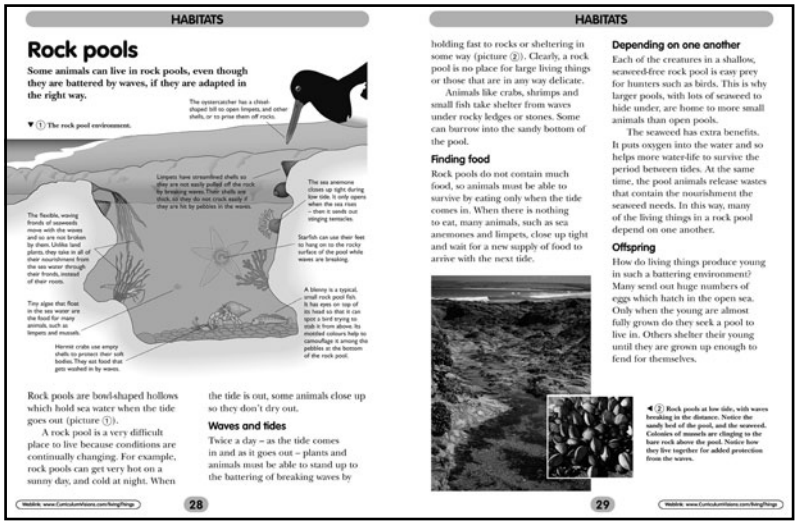
links with the geography curriculum. In the geography curriculum, students learn about the main physical features of the river, how meanders form, the reason for channel shapes and the different types of sediment that can be found from source to mouth. This provides the foundation for looking at river life, and both kinds of investigation can be combined into a single field trip.

The river is a long, narrow habitat, and children can have difficulty appreciating it in its entirety. To address this problem, the unit begins by showing a diagram of a complete river, then addresses the three major habitats within the river system.

You may like to help the children visualise these regions by building a model river. First mix some sand, gravel and clay in a jar and pour this down a gently sloping gutter. Let the children see how the particles separate out, with the larger ones at the top and the smaller ones at the bottom. Develop this observation further by preparing a short, steep piece of gutter with gravel in it (the upper reach), emptying into a longer, more gently sloping piece of gutter with a mixture of sand and small gravel in it (the middle reach), and this in turn emptying into a very slightly sloping tray of clay and fine sand. Allow some water to trickle through the system and let the children see how its speed changes in each part of the river. Refer back to the different parts of your model as you work through each part of the river in the unit.

There is a comprehension worksheet and a practical for this unit. In the practical (12A), the children investigate the conditions for growth of a riverside plant – the liverwort – and plan an investigation into how much water a liverwort needs to stay healthy.

Spread 13 (pages 28–29)
Rock pools


HABITATS

Rock pools

Some animals can live in rock pools, even though they are battered by waves, if they are adapted in the right way.

The oystercatcher has a chisel-shaped bill to open limpets, and other shells, or to prise them off rocks.

▼ ① The rock pool environment.

Limpets have streamlined shells so they are not easily pulled off the rock by breaking waves. Their shells are thick, so they do not crack easily if they are hit by pebbles in the waves.

The sea anemone closes up tight during low tide. It only opens when the sea rises – then it sends out stinging tentacles.

The flexible, waving fronds of seaweeds move with the waves and so are not broken by them. Unlike land plants, they take in all of their nourishment from the sea water through their fronds, instead of their roots.

Starfish can use their feet to hang on to the rocky surface of the pool while waves are breaking.

Tiny algae that float in the sea water are the food for many animals, such as limpets and mussels.

A blenny is a typical, small rock pool fish. It has eyes on top of its head so that it can spot a bird trying to stab it from above. Its mottled colours help to camouflage it among the pebbles at the bottom of the rock pool.

Harvest crabs use empty shells to protect their soft bodies. They eat food that gets washed in by waves.

Rock pools are bowl-shaped hollows which hold sea water when the tide goes out (picture ①).

A rock pool is a very difficult place to live because conditions are continually changing. For example, rock pools can get very hot on a sunny day, and cold at night. When the tide is out, some animals close up so they don't dry out.

Waves and tides

Twice a day – as the tide comes in and as it goes out – plants and animals must be able to stand up to the battering of breaking waves by

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HABITATS

holding fast to rocks or sheltering in some way (picture ②). Clearly, a rock pool is no place for large living things or those that are in any way delicate.

Animals like crabs, shrimps and small fish take shelter from waves under rocky ledges or stones. Some can burrow into the sandy bottom of the pool.

Finding food

Rock pools do not contain much food, so animals must be able to survive by eating only when the tide comes in. When there is nothing to eat, many animals, such as sea anemones and limpets, close up tight and wait for a new supply of food to arrive with the next tide.

Depending on one another

Each of the creatures in a shallow, seaweed-free rock pool is easy prey for hunters such as birds. This is why larger pools, with lots of seaweed to hide under, are home to more small animals than open pools.

The seaweed has extra benefits. It puts oxygen into the water and so helps more water-life to survive the period between tides. At the same time, the pool animals release wastes that contain the nourishment the seaweed needs. In this way, many of the living things in a rock pool depend on one another.

Offspring

How do living things produce young in such a battering environment? Many send out huge numbers of eggs which hatch in the open sea. Only when the young are almost fully grown do they seek a pool to live in. Others shelter their young until they are grown up enough to fend for themselves.

◀ ② Rock pools at low tide, with waves breaking in the distance. Notice the sandy bed of the pool, and the seaweed. Colonies of mussels are clinging to the bare rock above the pool. Notice how they live together for added protection from the waves.

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Rock pools still provide a great deal of interest on family holidays and also they are a convenient place to look at sea life during a field trip. They can be compared to ponds, noting the fact that in a rock pool the water level, temperature and many other aspects change twice a day, whereas everything in a pond remains constant through the day.

The unit looks at the problems sea creatures face as they try to survive on a rocky shore. The problems of drying out, rising temperatures and the battering of breaking waves are described, along with the wait for food on the incoming tide, and the close relationship between the seaweed and animals that live in the pools.

You may like to begin this work by looking at ocean life and by showing the children a video of life on a coral reef, or of exploration of the sea floor. If possible, follow this by looking at specimens from the sea. You may be able to borrow some from a local museum or secondary school. Some children may have collected shells and dried starfish on a trip to the seaside, which could also form part of a display. The children could look at how the animal's features (such as the shell) help them adapt to sea life.

There is a comprehension worksheet and one practical to help develop ideas. Practical 13A features two investigations about the conditions organisms face when they try to cross habitat boundaries. In the first part, the children set up their own rock pools and study how water temperatures change. In the second part, they study how salt water affects the growth of land plants.

Chapter 4: Extreme habitats

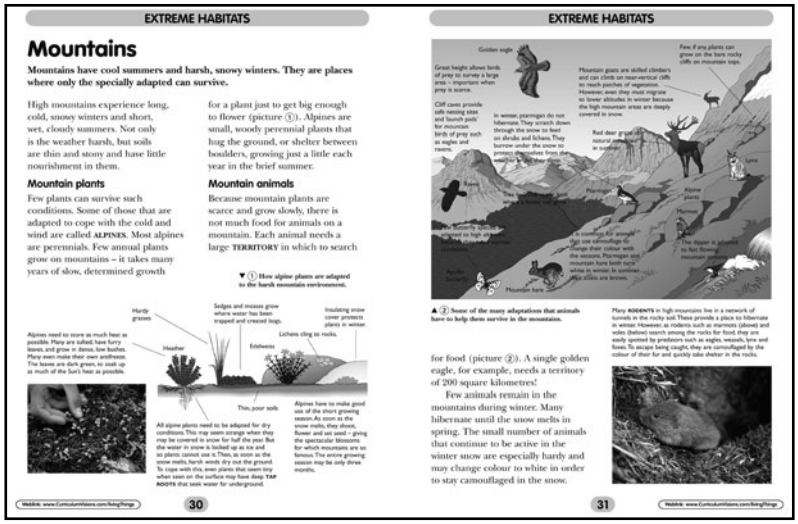
adaptations are more extreme here than in other habitats, so this may well be a point where it is possible to help those less able to see more clearly how concepts of adaptation work.

This chapter concentrates on some environments where the climate is so extreme that it places severe limitations on the number and variety of the species that can thrive. Very often

Spread 14 (pages 30-31)

Mountains

This habitat has specific cross-



EXTREME HABITATS

Mountains

Mountains have cool summers and harsh, snowy winters. They are places where only the specially adapted can survive.

High mountains experience long, cold, snowy winters and short, wet, cloudy summers. Not only is the weather harsh, but soils are thin and stony and have little nourishment in them.

Mountain plants

Few plants can survive such conditions. Some of those that are adapted to cope with the cold and wind are called **ALPINES**. Most alpines are perennials. Few annual plants grow on mountains – it takes many years of slow, determined growth for a plant just to get big enough to flower (picture ①). Alpines are small, woody perennial plants that hug the ground, or shelter between boulders, growing just a little each year in the brief summer.

Mountain animals

Because mountain plants are scarce and grow slowly, there is not much food for animals on a mountain. Each animal needs a large **TERRITORY** in which to search for food (picture ②). A single golden eagle, for example, needs a territory of 200 square kilometres!

Few animals remain in the mountains during winter. Many hibernate until the snow melts in spring. The small number of animals that continue to be active in the winter snow are especially hardy and may change colour to white in order to stay camouflaged in the snow.

▼ ① How alpine plants are adapted to the harsh mountain environment.

Hardy grasses
Sedges and mosses grow where water has been trapped and created bogs.
Insulating snow cover protects plants in winter
Lichens cling to rocks.
Heather
Edelweiss
Thin, poor soils

Alpines need to store as much heat as possible. Many are tufted, have furry leaves, and grow in dense, low bushes. Many even make their own antifreeze. The leaves are dark green, to soak up as much of the Sun's heat as possible.

All alpine plants need to be adapted for dry conditions. This may seem strange when they may be covered in snow for half the year. But the water in snow is locked up as ice and so plants cannot use it. Then, as soon as the snow melts, harsh winds dry out the ground. To cope with this, even plants that seem tiny when seen on the surface may have deep **TAP ROOTS** that seek water for underground.

Alpines have to make good use of the short growing season. As soon as the snow melts, they shoot, flower and set seed – giving the spectacular blossoms for which mountains are so famous. The entire growing season may be only three months.

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EXTREME HABITATS

Golden eagle

Great height allows birds of prey to survey a large area – important when prey is scarce.

Few if any plants can grow on the bare rocky cliffs on mountain tops.

Mountain goats are skilled climbers and can climb on near-vertical cliffs to reach patches of vegetation. However, even they must migrate to lower altitudes in winter because the high mountain areas are deeply covered in snow.

Cliff caves provide safe nesting sites and 'launch pads' for mountain birds of prey such as eagles and ravens.

In winter, ptarmigan do not hibernate. They scratch down through the snow to feed on shrubs and lichens. They borrow under the snow to protect themselves from the weather.

Red deer graze on natural vegetation in summer.

Lynx

Alpine plants

Ptarmigan

Mountain hare

▲ ② Some of the many adaptations that animals have to help them survive in the mountains.

Many **RODENTS** in high mountains live in a network of tunnels in the rocky soil. These provide a place to hibernate in winter. However, as rodents such as marmots (above) and voles (below) search among the rocks for food, they are easily spotted by predators such as eagles, weasels, lynx and foxes. To escape being caught, they are camouflaged by the colour of their fur and quickly take shelter in the rocks.

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curricular connections with geography because geography looks at mountain environments as a major theme. As a result, students can be expected to understand the nature of a mountain climate and be able to use this knowledge to develop ideas of the pattern of adaptation of the various living things in the mountain zones.

The concept of altitudinal zoning could be further developed as an extension to this spread, for example, by choosing a place which has a tropical rainforest in low lying areas, but which rises to arid mountains. Such habitats occur in Africa, South East Asia and South America.

You may want to begin by reviewing what the children know about mountains and mountain life. You may find that it is useful to develop the discussion by showing a video about mountaineering which illustrates the cold, windy and inhospitable conditions. In contrast, you could also show a video of people who live in the mountains, and compare how their lives are different from people who live at lower altitudes. This should set the scene for looking at how plants and animals survive in mountain conditions.

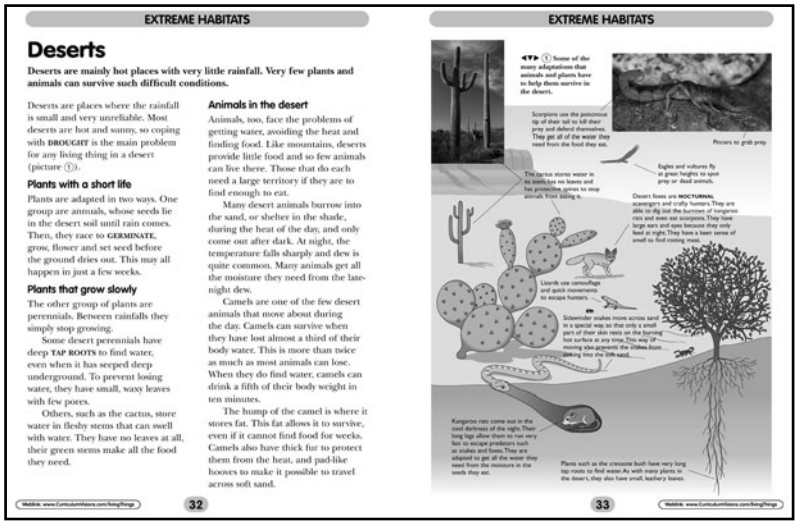
The unit addresses the survival of plants and animals in some detail. For example, some plants can survive the cold, dry conditions by making their own antifreeze and having deep tap roots.

Animals need to have large territories in which to find the sparse food. The lives of prey animals such as mountain hares are contrasted with predators such as the golden eagle and the lynx.

The adaptations of both plants and animals to the harsh conditions in the habitat are clearly presented in words and pictures.

After the comprehension worksheet, Practical 14A gives the opportunity for children to compare mountain soil with soil from the lowlands.

Spread 15 (pages 32–33)
Deserts



EXTREME HABITATS

Deserts

Deserts are mainly hot places with very little rainfall. Very few plants and animals can survive such difficult conditions.

Deserts are places where the rainfall is small and very unreliable. Most deserts are hot and sunny, so coping with **DROUGHT** is the main problem for any living thing in a desert (picture ①).

Plants with a short life

Plants are adapted in two ways. One group are annuals, whose seeds lie in the desert soil until rain comes. Then, they race to **GERMINATE**, grow, flower and set seed before the ground dries out. This may all happen in just a few weeks.

Plants that grow slowly

The other group of plants are perennials. Between rainfalls they simply stop growing.

Some desert perennials have deep **TAP ROOTS** to find water, even when it has seeped deep underground. To prevent losing water, they have small, waxy leaves with few pores.

Others, such as the cactus, store water in fleshy stems that can swell with water. They have no leaves at all, their green stems make all the food they need.

Animals in the desert

Animals, too, face the problems of getting water, avoiding the heat and finding food. Like mountains, deserts provide little food and so few animals can live there. Those that do each need a large territory if they are to find enough to eat.

Many desert animals burrow into the sand, or shelter in the shade, during the heat of the day, and only come out after dark. At night, the temperature falls sharply and dew is quite common. Many animals get all the moisture they need from the late-night dew.

Camels are one of the few desert animals that move about during the day. Camels can survive when they have lost almost a third of their body water. This is more than twice as much as most animals can lose. When they do find water, camels can drink a fifth of their body weight in ten minutes.

The hump of the camel is where it stores fat. This fat allows it to survive, even if it cannot find food for weeks. Camels also have thick fur to protect them from the heat, and pad-like hooves to make it possible to travel across soft sand.

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EXTREME HABITATS

◀ ▼ ▶ ① Some of the many adaptations that animals and plants have to help them survive in the desert.

Scorpions use the poisonous tip of their tail to kill their prey and defend themselves. They get all of the water they need from the food they eat.

Pincers to grab prey

Eagles and vultures fly at great heights to spot prey or dead animals.

The cactus stores water in its stem. It has no leaves and has protective spines to stop animals from eating it.

Desert foxes are **NOCTURNAL** scavengers and crafty hunters. They are able to dig out the burrows of kangaroo rats and even eat scorpions. They have large ears and eyes because they only feed at night. They have a keen sense of smell to find resting mice.

Lizards use camouflage and quick movements to escape hunters.

Sidewinder snakes move across sand in a special way so that only a small part of their skin rests on the burning hot surface at any time. This way of moving also prevents the snakes from sinking into the soft sand.

Kangaroo rats come out in the cool darkness of the night. Their long legs allow them to run very fast to escape predators such as snakes and foxes. They are adapted to get all the water they need from the moisture in the seeds they eat.

Plants such as the creosote bush have very long tap roots to find water. As with many plants in the desert, they also have small, leathery leaves.

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Again, this unit has strong cross-curricular links with geography, especially if children are studying weather at home and abroad.

Children have a good idea about what a desert is, so build on this by comparing the local climate with that of a desert. Show the children the annual change in temperature and rainfall for your locality, and compare this to the annual change in temperature and rainfall for a desert such as the Sahara. (On our web site www.CurriculumVisions.com, click on weather, then world weather, then weather stations, then make a choice.)

You could also compare how the conditions would be different in the desert at different times of year. It is important to remind the children that deserts may be very hot during the day, but they are also cold at night, so the daily range of temperature is also greater than here.

The unit begins by comparing two strategies that plants use for survival – a short life cycle of rapid growth over a few weeks, or a long life cycle in which plants simply stop growing when the desert is dry. Many desert animals are nocturnal, which helps them to get water from the dew that forms as the air temperature falls.

The large illustration features a creosote bush and a cactus. In the same illustration, reptiles and mammals seek food and protection under the eye of a bird of prey.

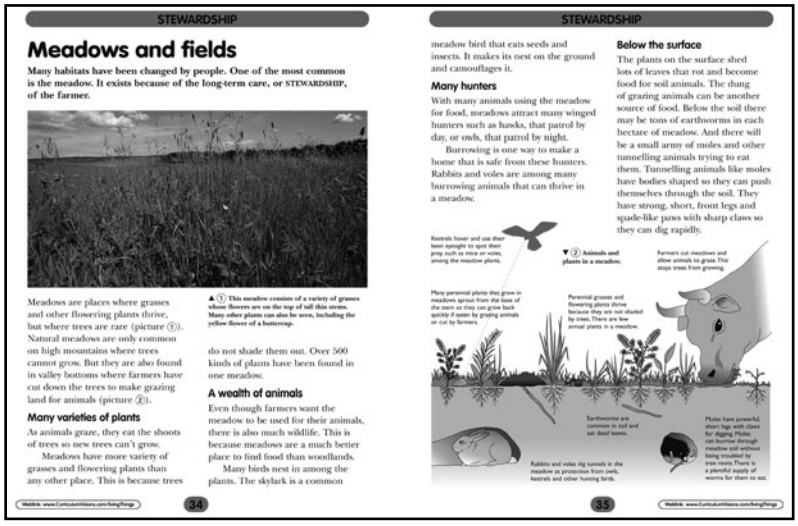
There is one comprehension worksheet and one practical for this topic. The practical (15A) develops the text in the unit relating to the camel and provides the chance for the children to design and carry out an investigation showing how feet are adapted for walking across sand.

Chapter 5: Stewardship

development. This chapter begins to look at how there is another successful way to have development, while at the same time encompassing respect for all living things.

Now that students understand the ideas of habitat, they can appreciate how habitats can be disturbed, and in particular how they can be threatened if one species – man – becomes dominant and embarks on a self-centred destructive path of

Spread 16 (pages 34–35)
Meadows and fields


STEWARDSHIP

Meadows and fields

Many habitats have been changed by people. One of the most common is the meadow. It exists because of the long-term care, or STEWARDSHIP, of the farmer.

▲ ① This meadow consists of a variety of grasses whose flowers are on the top of tall thin stems. Many other plants can also be seen, including the yellow flower of a buttercup.

Meadows are places where grasses and other flowering plants thrive, but where trees are rare (picture ①). Natural meadows are only common on high mountains where trees cannot grow. But they are also found in valley bottoms where farmers have cut down the trees to make grazing land for animals (picture ②).

Many varieties of plants

As animals graze, they eat the shoots of trees so new trees can't grow.

Meadows have more variety of grasses and flowering plants than any other place. This is because trees do not shade them out. Over 500 kinds of plants have been found in one meadow.

A wealth of animals

Even though farmers want the meadow to be used for their animals, there is also much wildlife. This is because meadows are a much better place to find food than woodlands.

Many birds nest in among the plants. The skylark is a common meadow bird that eats seeds and insects. It makes its nest on the ground and camouflages it.

Many hunters

With many animals using the meadow for food, meadows attract many winged hunters such as hawks, that patrol by day, or owls, that patrol by night.

Burrowing is one way to make a home that is safe from these hunters. Rabbits and voles are among many burrowing animals that can thrive in a meadow.

Below the surface

The plants on the surface shed lots of leaves that rot and become food for soil animals. The dung of grazing animals can be another source of food. Below the soil there may be tons of earthworms in each hectare of meadow. And there will be a small army of moles and other tunnelling animals trying to eat them. Tunnelling animals like moles have bodies shaped so they can push themselves through the soil. They have strong, short, front legs and spade-like paws with sharp claws so they can dig rapidly.

▼ ② Animals and plants in a meadow.

Kestrels hover and use their keen eyesight to spot their prey, such as mice or voles, among the meadow plants.

Farmers cut meadows and allow animals to graze. This stops trees from growing.

Many perennial plants that grow in meadows sprout from the base of the stem so they can grow back quickly if eaten by grazing animals or cut by farmers.

Perennial grasses and flowering plants thrive because they are not shaded by trees. There are few annual plants in a meadow.

Earthworms are common in soil and eat dead leaves.

Moles have powerful, short legs with claws for digging. Moles can burrow through meadow soil without being troubled by tree roots. There is a plentiful supply of worms for them to eat.

Rabbits and voles dig tunnels in the meadow as protection from owls, kestrels and other hunting birds.

Weblink: www.CurriculumVisions.com/livingthings

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Weblink: www.CurriculumVisions.com/livingthings

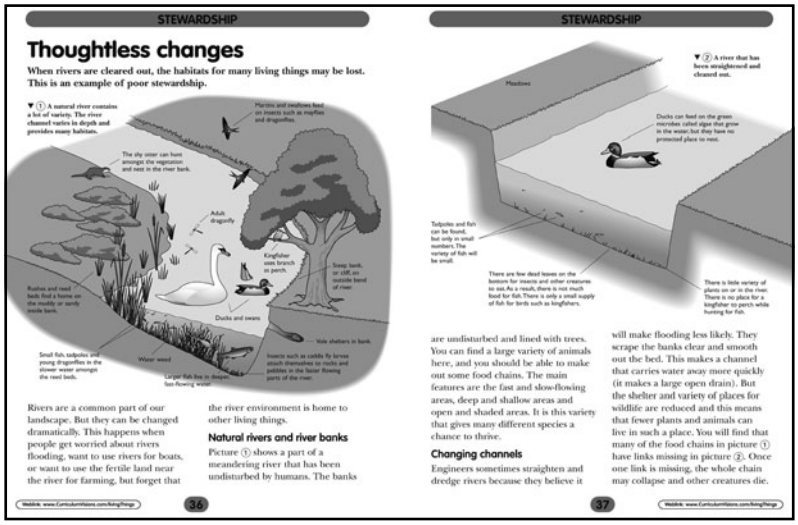
This unit begins by pointing out that most meadows have been produced by human activity, and natural meadows are only common on mountain sides. It continues by discussing the variety of plants and animals that are adapted to the conditions in the meadow, from kestrels hovering above the grass, to rabbits and moles burrowing through the soil.

The major feature of a meadow is its range of grasses, so you may like to begin by showing the children a clump of grass (complete with its soil). Let them see that it is a tangle of grass roots and stems with leaves and flower stalks growing upwards. You may develop the idea of the meadow as food for farm animals by cutting your grass with a pair of scissors, until it is close cropped, and letting the children weigh the cuttings. Now water the grass and leave it in a sunny place. Let the children look for signs of re-growth, then cut and weigh the grass again to find out how productive it is.

The grass is also a habitat for tiny animals, and you may like to break up another piece of it over a white tray and let the children observe the animals that fall out.

One comprehension worksheet and one practical accompany this unit. In Practical 16A, the children investigate how plant shoots can find light even if it is shaded out by other plants.

Spread 17 (pages 36–37)
Thoughtless changes


STEWARDSHIP

Thoughtless changes

When rivers are cleared out, the habitats for many living things may be lost. This is an example of poor stewardship.

▼ ① A natural river contains a lot of variety. The river channel varies in depth and provides many habitats.

Rivers are a common part of our landscape. But they can be changed dramatically. This happens when people get worried about rivers flooding, want to use rivers for boats, or want to use the fertile land near the river for farming, but forget that the river environment is home to other living things.

Natural rivers and river banks

Picture ① shows a part of a meandering river that has been undisturbed by humans. The banks

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STEWARDSHIP

▼ ② A river that has been straightened and cleaned out.

Meadows

Ducks can feed on the green microbes called algae that grow in the water, but they have no protected place to nest.

Tadpoles and fish can be found, but only in small numbers. The variety of fish will be small.

There are few dead leaves on the bottom for insects and other creatures to eat. As a result, there is not much food for fish. There is only a small supply of fish for birds such as kingfishers.

There is little variety of plants on or in the river. There is no place for a kingfisher to perch while hunting for fish.

are undisturbed and lined with trees. You can find a large variety of animals here, and you should be able to make out some food chains. The main features are the fast and slow-flowing areas, deep and shallow areas and open and shaded areas. It is this variety that gives many different species a chance to thrive.

Changing channels

Engineers sometimes straighten and dredge rivers because they believe it will make flooding less likely. They scrape the banks clear and smooth out the bed. This makes a channel that carries water away more quickly (it makes a large open drain). But the shelter and variety of places for wildlife are reduced and this means that fewer plants and animals can live in such a place. You will find that many of the food chains in picture ① have links missing in picture ②. Once one link is missing, the whole chain may collapse and other creatures die.

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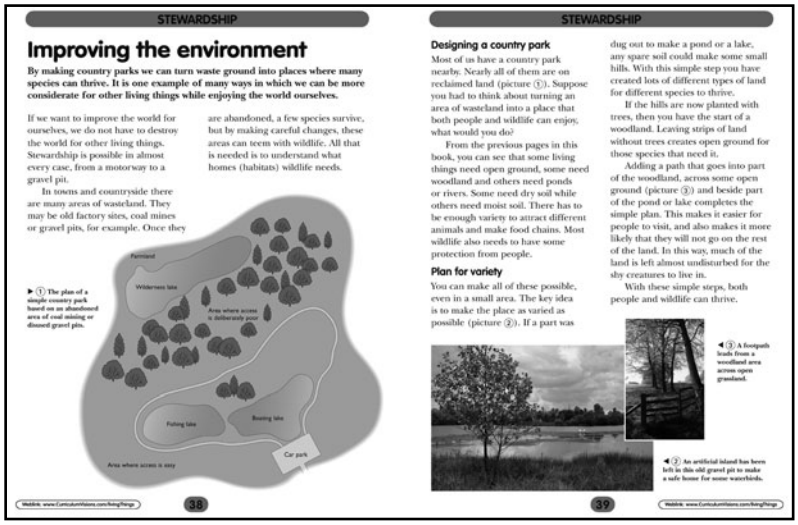
This unit builds on the previous one by showing how food chains can be damaged or destroyed when humans change a natural habitat. A large, detailed picture of a natural river habitat shows the variety of wildlife that can live there. This is then contrasted starkly with a river that has been straightened and dredged for human use.

Begin by asking one child to stand up and be an oak tree. Ask another child to stand up and be a squirrel. Say that the squirrel eats acorns and put a length of yarn between them to represent a food chain. Using just one 'oak tree' child, set up the following two food chains in a similar manner: oak tree, bark beetle, woodpecker; and oak tree, wood mouse, owl. Tell the class that you are chopping down the oak tree and ask the 'oak tree' child to sit down. Ask the class what will happen to the squirrel, bark beetle and wood mouse and look for answers that they would die because they would have no food. Let each child sit down as its animal is pronounced dead. Follow this with asking about the woodpecker and owl. When all the children have sat down, let them think about how destroying one living thing can affect others.

There are two worksheets to develop these ideas – one comprehension and one practical. In Practical 17A, the children compare the soil and leaf litter of a wood with that in a flower bed, and think about ways in which humans have changed the woodland habitat.

Spread 18 (pages 38–39)
Improving the environment


STEWARDSHIP

Improving the environment

By making country parks we can turn waste ground into places where many species can thrive. It is one example of many ways in which we can be more considerate for other living things while enjoying the world ourselves.

If we want to improve the world for ourselves, we do not have to destroy the world for other living things. Stewardship is possible in almost every case, from a motorway to a gravel pit.

In towns and countryside there are many areas of wasteland. They may be old factory sites, coal mines or gravel pits, for example. Once they are abandoned, a few species survive, but by making careful changes, these areas can teem with wildlife. All that is needed is to understand what homes (habitats) wildlife needs.

▶ ① The plan of a simple country park based on an abandoned area of coal mining or disused gravel pits.

Farmland
Wilderness lake
Area where access is deliberately poor
Fishing lake
Boating lake
Car park
Area where access is easy

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STEWARDSHIP

Designing a country park

Most of us have a country park nearby. Nearly all of them are on reclaimed land (picture ①). Suppose you had to think about turning an area of wasteland into a place that both people and wildlife can enjoy, what would you do?

From the previous pages in this book, you can see that some living things need open ground, some need woodland and others need ponds or rivers. Some need dry soil while others need moist soil. There has to be enough variety to attract different animals and make food chains. Most wildlife also needs to have some protection from people.

Plan for variety

You can make all of these possible, even in a small area. The key idea is to make the place as varied as possible (picture ②). If a part was dug out to make a pond or a lake, any spare soil could make some small hills. With this simple step you have created lots of different types of land for different species to thrive.

If the hills are now planted with trees, then you have the start of a woodland. Leaving strips of land without trees creates open ground for those species that need it.

Adding a path that goes into part of the woodland, across some open ground (picture ③) and beside part of the pond or lake completes the simple plan. This makes it easier for people to visit, and also makes it more likely that they will not go on the rest of the land. In this way, much of the land is left almost undisturbed for the shy creatures to live in.

With these simple steps, both people and wildlife can thrive.

◀ ③ A footpath leads from a woodland area across open grassland.

◀ ② An artificial island has been left in this old gravel pit to make a safe home for some waterbirds.

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Following on from the previous unit, it is important to show that there is a way forward on a wide variety of scales.

The unit begins by identifying areas in towns and countryside which could be improved for living things. The text explains that improvements can be made by using our knowledge of how living things survive together in their habitats. Suggestions are made for planning a country park, which call for the establishment of ponds, woods and dry areas. A design for a simple country park is illustrated and discussed, and the use of the footpath to reduce disturbance to the habitats is described.

You may like to begin by telling the children that you are thinking of turning into a frog. When they have recovered from their speculations ask them if the classroom will need changing to accommodate you. If the children need help, tell them that you will lose water through your skin and eat earthworms and slugs. The children may respond by suggesting damp surroundings, soil for the earthworms, and plants for the slugs to eat. They may suggest that you need somewhere to hide away from predators such as foxes, or a pond to swim in. Now tell the children they have worked in the same way as a country park manager when he or she is trying to attract wildlife.

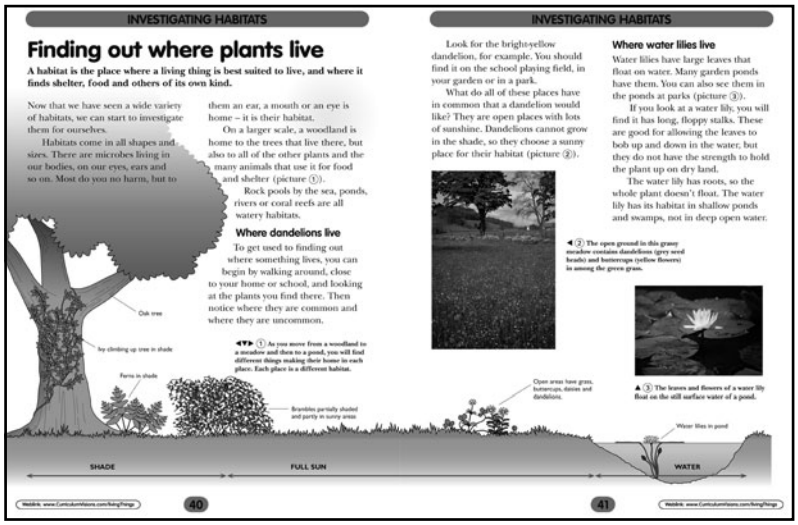
There is no supporting practical for this unit. Instead, suggestions are made in the teacher's comprehension sheet for children to set up their own wildlife area in the school grounds.

Chapter 6: Investigating habitats

have already explained to children the need for respect of all living things, both large and small, and the need to return living things to their environment in a sensitive way and without causing harm.

As a conclusion to this book, we present a section on scientific investigation in the field, limiting ourselves to places where most school children can get to in school time or on a short field trip. Throughout this section it is assumed that teaches will

Spread 19 (pages 40–41)
Finding out where plants live


INVESTIGATING HABITATS

Finding out where plants live

A habitat is the place where a living thing is best suited to live, and where it finds shelter, food and others of its own kind.

Now that we have seen a wide variety of habitats, we can start to investigate them for ourselves.

Habitats come in all shapes and sizes. There are microbes living in our bodies, on our eyes, ears and so on. Most do you no harm, but to them an ear, a mouth or an eye is home – it is their habitat.

On a larger scale, a woodland is home to the trees that live there, but also to all of the other plants and the many animals that use it for food and shelter (picture ①).

Rock pools by the sea, ponds, rivers or coral reefs are all watery habitats.

Where dandelions live

To get used to finding out where something lives, you can begin by walking around, close to your home or school, and looking at the plants you find there. Then notice where they are common and where they are uncommon.

◀▶ ① As you move from a woodland to a meadow and then to a pond, you will find different things making their home in each place. Each place is a different habitat.

Oak tree

Ivy climbing up tree in shade

Ferns in shade

Brambles partially shaded and partly in sunny areas

Open areas have grass, buttercups, daisies and dandelions.

Water lilies in pond

SHADE

FULL SUN

WATER

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INVESTIGATING HABITATS

Look for the bright-yellow dandelion, for example. You should find it on the school playing field, in your garden or in a park.

What do all of these places have in common that a dandelion would like? They are open places with lots of sunshine. Dandelions cannot grow in the shade, so they choose a sunny place for their habitat (picture ②).

◀ ② The open ground in this grassy meadow contains dandelions (grey seed heads) and buttercups (yellow flowers) in among the green grass.

Where water lilies live

Water lilies have large leaves that float on water. Many garden ponds have them. You can also see them in the ponds at parks (picture ③).

If you look at a water lily, you will find it has long, floppy stalks. These are good for allowing the leaves to bob up and down in the water, but they do not have the strength to hold the plant up on dry land.

The water lily has roots, so the whole plant doesn't float. The water lily has its habitat in shallow ponds and swamps, not in deep open water.

▲ ③ The leaves and flowers of a water lily float on the still surface water of a pond.

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This unit reintroduces and reinforces the term 'habitat' as the home of a living thing.

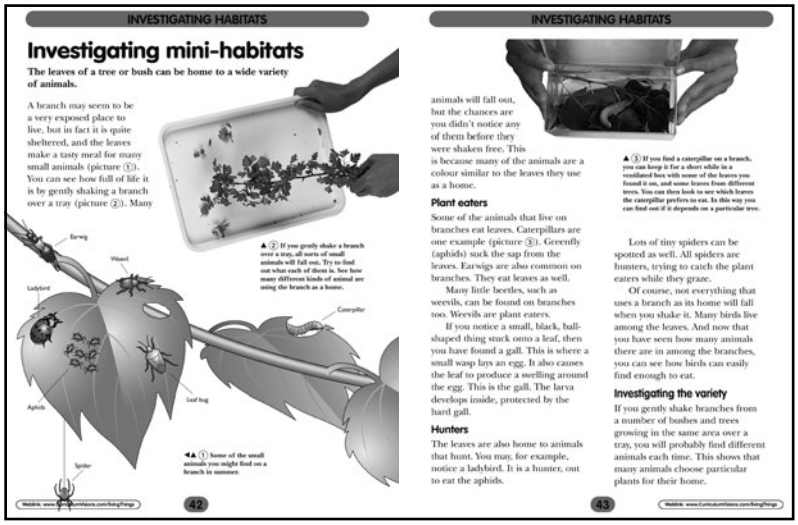
The unit begins by considering the different sizes of habitats. The small habitat of a microbe living on a human body is compared to the large woodland habitat of a tree. Instructions are given on how to find the habitat of a dandelion. After comparing land habitats in shade and in full sunlight, the unit ends by considering the habitat of the water lily and how the water lily is adapted to live there.

You may like to remind the children that living things have certain characteristics, such as feeding and moving, and a habitat provides everything a living thing needs to survive. You could suggest to the children that humans are very complicated living things, and human young also need places to sleep, get food, play and learn.

If the children live locally, you could suggest that the neighbourhood is their habitat, and produce a large, simple map showing homes, shops, play areas and the school. Some children could show the paths they make through the habitat as they go out to play, go to the shop or go home from school. Remind the children that plants are different. They cannot move from place to place, so when you see a plant growing, you are also seeing it in its habitat.

Two worksheets complement this topic – one comprehension and one practical. In Practical 19A, the children learn how to use an identification key to identify six common plants and discover their habitats.

Spread 20 (pages 42–43)
Investigating mini-habitats


INVESTIGATING HABITATS

Investigating mini-habitats

The leaves of a tree or bush can be home to a wide variety of animals.

A branch may seem to be a very exposed place to live, but in fact it is quite sheltered, and the leaves make a tasty meal for many small animals (picture ①). You can see how full of life it is by gently shaking a branch over a tray (picture ②). Many

▲ ② If you gently shake a branch over a tray, all sorts of small animals will fall out. Try to find out what each of them is. See how many different kinds of animal are using the branch as a home.

Earwig
Whitefly
Ladybird
Caterpillar
Aphids
Leaf bug
Spider

◀▲ ① Some of the small animals you might find on a branch in summer.

Weblink: www.CurriculumVisions.com/RangThings

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INVESTIGATING HABITATS

animals will fall out, but the chances are you didn't notice any of them before they were shaken free. This is because many of the animals are a colour similar to the leaves they use as a home.

Plant eaters

Some of the animals that live on branches eat leaves. Caterpillars are one example (picture ③). Greenfly (aphids) suck the sap from the leaves. Earwigs are also common on branches. They eat leaves as well.

Many little beetles, such as weevils, can be found on branches too. Weevils are plant eaters.

If you notice a small, black, ball-shaped thing stuck onto a leaf, then you have found a gall. This is where a small wasp lays an egg. It also causes the leaf to produce a swelling around the egg. This is the gall. The larva develops inside, protected by the hard gall.

Hunters

The leaves are also home to animals that hunt. You may, for example, notice a ladybird. It is a hunter, out to eat the aphids.

▲ ③ If you find a caterpillar on a branch, you can keep it for a short while in a ventilated box with some of the leaves you found it on, and some leaves from different trees. You can then look to see which leaves the caterpillar prefers to eat. In this way you can find out if it depends on a particular tree.

Lots of tiny spiders can be spotted as well. All spiders are hunters, trying to catch the plant eaters while they graze.

Of course, not everything that uses a branch as its home will fall when you shake it. Many birds live among the leaves. And now that you have seen how many animals there are in among the branches, you can see how birds can easily find enough to eat.

Investigating the variety

If you gently shake branches from a number of bushes and trees growing in the same area over a tray, you will probably find different animals each time. This shows that many animals choose particular plants for their home.

Weblink: www.CurriculumVisions.com/RangThings

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It is surprising not just that life exists on the Earth, but that there is such a great diversity of life on the planet. This unit makes this point by considering the variety of life just among the leaves of a single bush or tree.

The unit begins by showing that a branch is both a shelter and a feeding place for a wide variety of animals. A large, clear diagram illustrates some common animals that may be found on a branch. The supporting text explains how the animals can be divided into plant eaters and hunters. The important point is made that each type of animal only eats leaves from specific plants, and this must be remembered when rearing caterpillars.

You could begin by brainstorming with the class about the living things in a park or around the school. Write their answers on the board. Start by asking for the names of plants, then for the names of insects, then birds and finally mammals. By the end you may have a board full of names. Tell the children that even more living things can be found if they look even closer at their surroundings, then let them open their books at page 42 and begin.

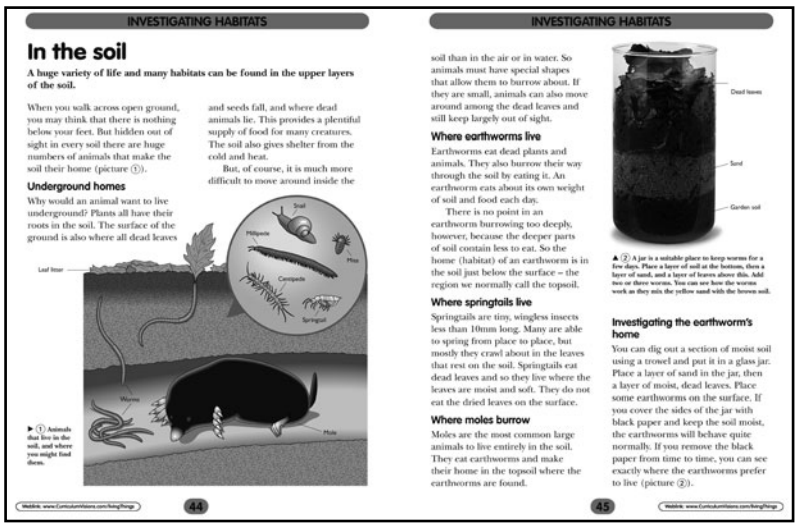
The unit ends by inviting the reader to shake branches from a number of bushes and trees and see what falls out.

There is one comprehension worksheet for this topic. For a supporting practical, use Practical 8A which examines the living things which fall from a shaken branch.

Spread 21 (pages 44–45)

In the soil

Most of the habitats considered in this



INVESTIGATING HABITATS

In the soil

A huge variety of life and many habitats can be found in the upper layers of the soil.

When you walk across open ground, you may think that there is nothing below your feet. But hidden out of sight in every soil there are huge numbers of animals that make the soil their home (picture ①).

Underground homes

Why would an animal want to live underground? Plants all have their roots in the soil. The surface of the ground is also where all dead leaves and seeds fall, and where dead animals lie. This provides a plentiful supply of food for many creatures. The soil also gives shelter from the cold and heat.

But, of course, it is much more difficult to move around inside the soil than in the air or in water. So animals must have special shapes that allow them to borrow about. If they are small, animals can also move around among the dead leaves and still keep largely out of sight.

Snail
Millipede
Mite
Centipede
Springtail
Leaf litter
Worms
Mole

▶ ① Animals that live in the soil, and where you might find them.

Where earthworms live

Earthworms eat dead plants and animals. They also burrow their way through the soil by eating it. An earthworm eats about its own weight of soil and food each day.

There is no point in an earthworm burrowing too deeply, however, because the deeper parts of soil contain less to eat. So the home (habitat) of an earthworm is in the soil just below the surface – the region we normally call the topsoil.

Where springtails live

Springtails are tiny, wingless insects less than 10mm long. Many are able to spring from place to place, but mostly they crawl about in the leaves that rest on the soil. Springtails eat dead leaves and so they live where the leaves are moist and soft. They do not eat the dried leaves on the surface.

Where moles burrow

Moles are the most common large animals to live entirely in the soil. They eat earthworms and make their home in the topsoil where the earthworms are found.

Webl ink: www.CurriculumVisions.com/RivingThings

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INVESTIGATING HABITATS

Dead leaves
Sand
Garden soil

▲ ② A jar is a suitable place to keep worms for a few days. Place a layer of soil at the bottom, then a layer of sand, and a layer of leaves above this. Add two or three worms. You can see how the worms work as they mix the yellow sand with the brown soil.

Investigating the earthworm's home

You can dig out a section of moist soil using a trowel and put it in a glass jar. Place a layer of sand in the jar, then a layer of moist, dead leaves. Place some earthworms on the surface. If you cover the sides of the jar with black paper and keep the soil moist, the earthworms will behave quite normally. If you remove the black paper from time to time, you can see exactly where the earthworms prefer to live (picture ②).

Webl ink: www.CurriculumVisions.com/RivingThings

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book have been those which are easily seen above ground level. But, just as it is possible to investigate living things on a small scale on a tree or in a meadow, it is also possible to investigate what lives in the soil.

The unit begins by suggesting that as we walk over open ground, we are not aware of the huge number of animals present beneath our feet. The text then goes on to pose the question "Why would anything want to live underground?" The question is answered by a description of how the ground provides food and shelter. A beautiful illustration about soil life is supported by text explaining how earthworms move through the soil and why springtails and moles are found near the soil surface. The unit ends by suggesting practical work to investigate earthworm behaviour.

Whether or not you introduced the previous unit as suggested, you might like to begin by holding up a clear polythene bag of soil. Ask the children what animals they might expect to see when you tip the soil onto a white tray. When you have written the names of the animals on the board, tip out the bag and check them off your list as the class identifies them. Let the children compare their predictions with the animals they found.

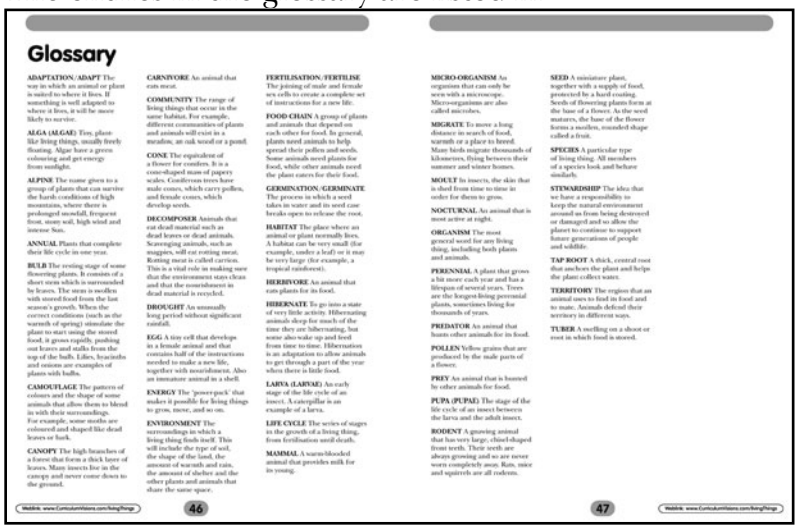
A comprehension worksheet and a practical are included for this unit. In the practical (21A), the children use a key to help them identify some of the animals they find while investigating the habitat of the soil.

Reference

The last three pages of the book contain the glossary and the index.

Glossary (pages 46–47)

The entries in the glossary are listed in



Glossary

ADAPTATION/ADAPT The way in which an animal or plant is suited to where it lives. If something is well adapted to where it lives, it will be more likely to survive.

ALGA (ALGAE) Tiny, plant-like living things, usually freely floating. Algae have a green colouring and get energy from sunlight.

ALPINE The name given to a group of plants that can survive the harsh conditions of high mountains, where there is prolonged snowfall, frequent frost, stony soil, high wind and intense Sun.

ANNUAL Plants that complete their life cycle in one year.

BULB The resting stage of some flowering plants. It consists of a short stem which is surrounded by leaves. The stem is swollen with stored food from the last season's growth. When the correct conditions (such as the warmth of spring) stimulate the plant to start using the stored food, it grows rapidly, pushing out leaves and stalks from the top of the bulb. Lilies, bracinths and onions are examples of plants with bulbs.

CAMOUFLAGE The pattern of colours and the shape of some animals that allow them to blend in with their surroundings. For example, some moths are coloured and shaped like dead leaves or bark.

CANOPY The high branches of a forest that form a thick layer of leaves. Many insects live in the canopy and never come down to the ground.

CARNIVORE An animal that eats meat.

COMMUNITY The range of living things that occur in the same habitat. For example, different communities of plants and animals will exist in a meadow, an oak wood or a pond.

CONE The equivalent of a flower for conifers. It is a cone-shaped mass of papery scales. Coniferous trees have male cones, which carry pollen, and female cones, which develop seeds.

DECOMPOSER Animals that eat dead material such as dead leaves or dead animals. Scavenging animals, such as magpies, will eat rotting meat. Rotting meat is called carrion. This is a vital role in making sure that the environment stays clean and that the nourishment in dead material is recycled.

DROUGHT An unusually long period without significant rainfall.

EGG A tiny cell that develops in a female animal and that contains half of the instructions needed to make a new life, together with nourishment. Also an immature animal in a shell.

ENERGY The 'power-pack' that makes it possible for living things to grow, move, and so on.

ENVIRONMENT The surroundings in which a living thing finds itself. This will include the type of soil, the shape of the land, the amount of warmth and rain, the amount of shelter and the other plants and animals that share the same space.

FERTILISATION/FERTILISE The joining of male and female sex cells to create a complete set of instructions for a new life.

FOOD CHAIN A group of plants and animals that depend on each other for food. In general, plants need animals to help spread their pollen and seeds. Some animals need plants for food, while other animals need the plant-eaters for their food.

GERMINATION/GERMINATE The process in which a seed takes in water and its seed case breaks open to release the root.

HABITAT The place where an animal or plant normally lives. A habitat can be very small (for example, under a leaf) or it may be very large (for example, a tropical rainforest).

HERBIVORE An animal that eats plants for its food.

HIBERNATE To go into a state of very little activity. Hibernating animals sleep for much of the time they are hibernating, but some also wake up and feed from time to time. Hibernation is an adaptation to allow animals to get through a part of the year when there is little food.

LARVA (LARVAE) An early stage of the life cycle of an insect. A caterpillar is an example of a larva.

LIFE CYCLE The series of stages in the growth of a living thing, from fertilisation until death.

MAMMAL A warm-blooded animal that provides milk for its young.

MICRO-ORGANISM An organism that can only be seen with a microscope. Micro-organisms are also called microbes.

MIGRATE To move a long distance in search of food, warmth or a place to breed. Many birds migrate thousands of kilometres, flying between their summer and winter homes.

MOULT In insects, the skin that is shed from time to time in order for them to grow.

NOCTURNAL An animal that is most active at night.

ORGANISM The most general word for any living thing, including both plants and animals.

PERENNIAL A plant that grows a bit more each year and has a lifespan of several years. Trees are the longest-living perennial plants, sometimes living for thousands of years.

PREDATOR An animal that hunts other animals for its food.

POLLEN Yellow grains that are produced by the male parts of a flower.

PREY An animal that is hunted by other animals for food.

PUPA (PUPAE) The stage of the life cycle of an insect between the larva and the adult insect.

RODENT A gnawing animal that has very large, chisel-shaped front teeth. Their teeth are always growing and so are never worn completely away. Rats, mice and squirrels are all rodents.

SEED A miniature plant, together with a supply of food, protected by a hard coating. Seeds of flowering plants form at the base of a flower. As the seed matures, the base of the flower forms a swollen, rounded shape called a fruit.

SPECIES A particular type of living thing. All members of a species look and behave similarly.

STEWARDSHIP The idea that we have a responsibility to keep the natural environment around us from being destroyed or damaged and so allow the planet to continue to support future generations of people and wildlife.

TAP ROOT A thick, central root that anchors the plant and helps the plant collect water.

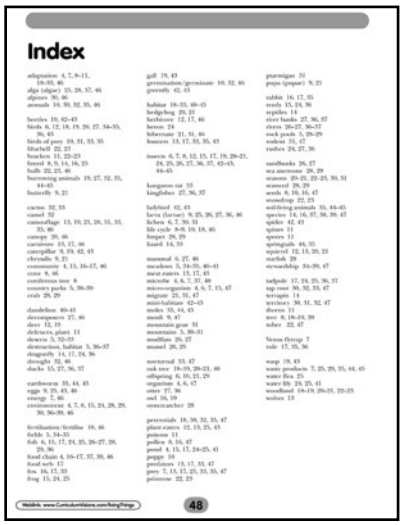
TERRITORY The region that an animal uses to find its food and to mate. Animals defend their territory in different ways.

TUBER A swelling on a shoot or root in which food is stored.

alphabetical order. The short definitions are given in simple language for the context in which they are used. They are, therefore, not necessarily the same as definitions given in an encyclopedia or dictionary.

Where necessary, more breadth is given to a definition (to make it encompass other meanings, or make the definition more general).

Index (page 48)



Index

A comprehensive index allows specific subjects to be found.

The index can be used to encourage research skills.

Section 3: Considering the curriculum

The core parts of the two syllabuses this material addresses are as follows, but the materials can also be used for other syllabuses, and with a broad range of abilities in many types of school.

National curriculum Science: Life processes and living things

Life processes

1. (c) Make links between life processes in familiar plants and animals and the environments in which they are found.

Green plants

3. (a) The effect of light, air, water and temperature on plant growth.

(b) The role of the leaf in producing new material for growth.

(c) The root anchors the plant, and water and minerals are taken in through the root and transported through the stem to other parts of the plant.

(d) The role of the flower in the life cycle of flowering plants.

Variation and classification

4. (a) Using keys.

(b) How locally occurring plants can be identified and assigned to groups.

(c) The variety of plants and animals makes it important to identify them and assign them to groups.

Living things and their environment

5. (a) Ways in which living things and the environment need protection.

Adaptation

(b) Different plants and animals are found in different habitats.

(c) Animals and plants in two different habitats are suited to their environment.

Feeding relationships

(d) Food chains are used to show feeding relationships in a habitat.

(e) Nearly all food chains start with a green plant.

Micro-organisms

(f) Micro-organisms are living things that are often too small to see and may be beneficial or harmful.

National Guidelines for Scotland Environmental Studies 5–14:

Living things and the processes of life

Variety and characteristic features

C Name some of the common animals and plants using simple keys.

E Use keys to identify living things.

Interaction of living things with their environment

C Explain how living things and the environment can be protected.

D Describe examples of human impact on the environment that have brought about beneficial change, and examples that have detrimental effects.

Give examples of how plants and animals are suited to their environment.

E Describe examples of competition between plants and between animals.

Give examples of physical factors that affect the distribution of living things.

Developing informed attitudes

Respect and care for self and others

Participate in the safe and responsible care of living things and the environment.

Social and environmental responsibility

Think through the various consequences for living things and for the environment of different choices, decisions and courses of action.

Realise the importance of the interrelationships between living things and their environment.

Section 4: Photocopiable worksheets

Introduction

The photocopiable worksheets in this *Teacher's Guide* have been designed to be a fast and efficient way of working through the study of living things in their environment.

It is intended that you photocopy each worksheet and distribute the photocopies for students to complete. The questions are on all worksheets.

At the head of each worksheet is given the relevant pages of *Living Things in their Environment*. So, 'See pages 8 and 9 of *Living Things in their Environment*', means that the answers to all of the questions can be found by using pages 8 and 9 of the student book, unless stated on the worksheet. Many of the practical worksheets also require the use of practical materials. This is stated where appropriate, and a full list can be found on pages 8 and 9 of this *Teacher's Guide*.

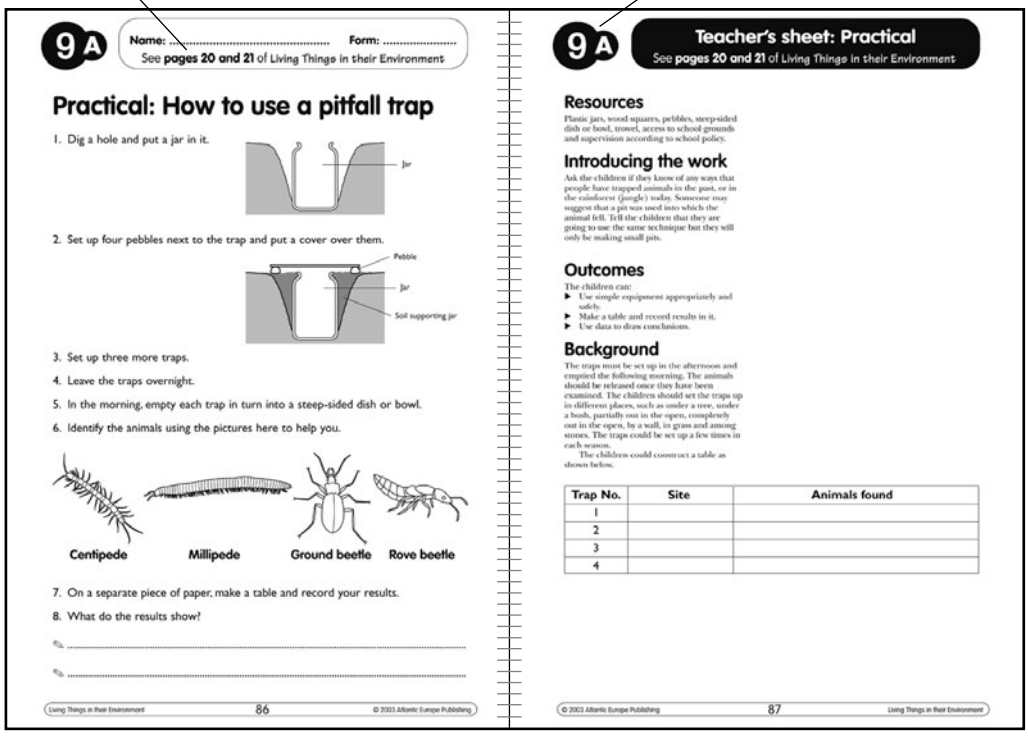
Each comprehension worksheet has been given a unique number, which is in a circle at the top of the page. Practical worksheets also have this number, but in addition are labelled **A**, **B**, etc.

The answers face each worksheet. Here you will also find background information, notes on the practicals, outcomes, resources, links, etc.

Further extension worksheets can be found on the Curriculum Visions web site (see page 132 of this *Teacher's Guide* for details).

Refers to the page numbers in the student book to which the worksheet relates.

Worksheet number – practical worksheets are also labelled A, B, etc.



9A

Name: ..... Form: .....

See **pages 20 and 21** of Living Things in their Environment

Practical: How to use a pitfall trap

1. Dig a hole and put a jar in it.

Jar

2. Set up four pebbles next to the trap and put a cover over them.

Pebble

Jar

Soil supporting jar

3. Set up three more traps.
4. Leave the traps overnight.
5. In the morning, empty each trap in turn into a steep-sided dish or bowl.
6. Identify the animals using the pictures here to help you.

Centipede Millipede Ground beetle Rove beetle

7. On a separate piece of paper, make a table and record your results.
8. What do the results show?

86

9A

Teacher's sheet: Practical

See **pages 20 and 21** of Living Things in their Environment

Resources

Plastic jars, wood squares, pebbles, steep-sided dish or bowl, trowel, access to school grounds and supervision according to school policy.

Introducing the work

Ask the children if they know of any ways that people have trapped animals in the past, or in the rainforest (jungle) today. Someone may suggest that a pit was used into which the animal fell. Tell the children that they are going to use the same technique but they will only be making small pits.

Outcomes

The children can:

- Use simple equipment appropriately and safely.
- Make a table and record results in it.
- Use data to draw conclusions.

Background

The traps must be set up in the afternoon and emptied the following morning. The animals should be released once they have been examined. The children should set the traps up in different places, such as under a tree, under a bush, partially out in the open, completely out in the open, by a wall, in grass and among stones. The traps could be set up a few times in each season.

The children could construct a table as shown below.

Trap No.	Site	Animals found
1		
2		
3		
4		

87

The left-hand page is to photocopy and hand out to students.

The right-hand page provides the answers and teacher's notes.

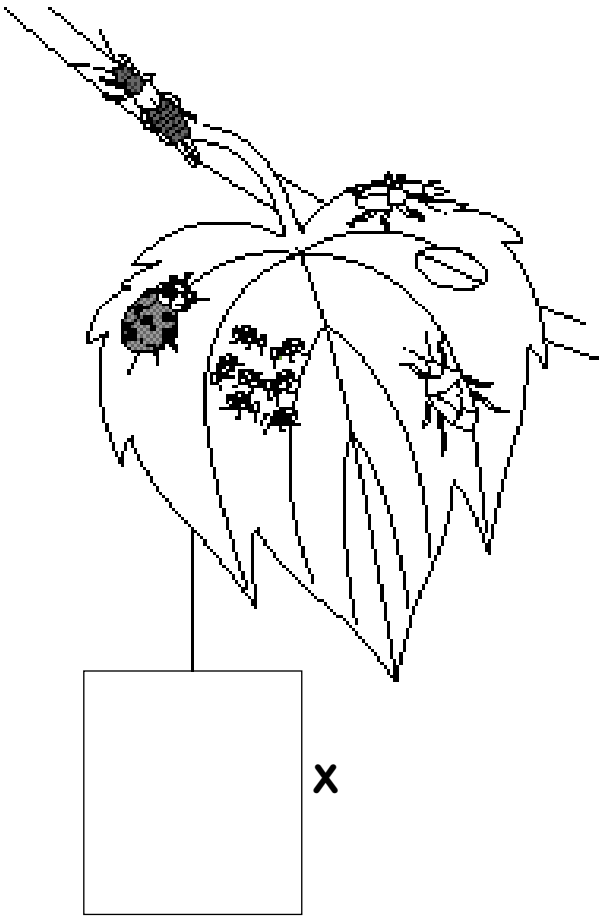
1

Name: ..... **Form:** .....

See **pages 4 and 5** of Living Things in their Environment

Summary

There are a huge number of different kinds of living things on the Earth. They all survive here because they are adapted to different environmental conditions. When we change these conditions, we threaten the survival of many life forms. By studying living things in their environment, we can help all living things to survive.



Q1. An animal is missing from point X. Draw it in the box.

X

Q2. What do food chains show?

✎ .....

Q3. What is the natural home of a living thing?

✎ .....

Q4. (i) Who makes most meadows and fields? ✎ .....

(ii) What are meadows and fields used for? ✎ .....

Q5. When can plants and animals be destroyed?

✎ .....

✎ .....

Q6. How can environments be improved?

✎ .....

✎ .....

1 Teacher's sheet: Comprehension

See **pages 4 and 5** of Living Things in their Environment

Answers

Q1. A spider should be drawn in the box.

Q2. How plants and animals are linked together by the way animals feed.

Q3. A habitat.

Q4. (i) Farmers; (ii) livestock.

Q5. When people change the habitat to suit their own needs.

Q6. By using our knowledge of how plants and animals live.

Introduction

You may wish to begin by reviewing the children's knowledge of living things. Ask them to name as many living things as they can in five minutes. You could do this exercise by either letting the children write down the names, or by letting them call out while you write the names of the living things on the board. At the end of five minutes, remind the children that the major groups of living things are plants and animals, and ask them to count up the number of plants and animals that have been recorded. It is more than likely that the animal list is much longer than the plant list. Draw this to the children's attention.

Look out of the classroom window and ask the children what living things they see. They may notice people, dogs and pigeons but also point out the plants. Follow this by showing the children that plants grow widely in the environment and outnumber the animals. Remind the children that when they study living things in their environment they will be studying both plants and animals.

You may then like to introduce the summary spread and read it with the children. If interest is expressed in a certain topic let the children turn to that topic to look briefly at it. You may look at several topics in this way to let the children get a feel for the course of work to come.

At the end of your work with the book you can return to this spread and go through it again with the class to check the knowledge and understanding they have acquired.

Practical work

1A: Major environments

Integrating the practical work

Show the children a large photograph of a rocky, mountain scene with a lake in it. Ask them how it is similar and different from the environment around their school. Tell the children that just as there are different kinds of plants and animals, there are different kinds of environments around the world, then follow the introduction to Practical 1A.

Extension work

See page 132 of this Teacher's Guide.

Links

This spread links to all the other pages in the book. You may wish to start with the sequence on 'Living things' beginning on page 6, 'Communities and food chains' on page 14, 'Habitats' on page 20, 'Stewardship'on page 34 or 'Investigating habitats' on page 40.

Background

You may like to introduce the work by giving a cosmic perspective. Start by reminding the children of times when they have looked into a clear night sky and seen stars. The following information may be useful for your introduction.

The universe began with a huge explosion called the Big Bang. From this, stars formed. Stars do not last forever, but end by burning out or exploding. They form when particles of gas and dust form swirling clouds. Around a star, planets may form. The Earth formed about 4.6 billion years ago from the rocky debris around the Sun – our star. At first the planet was too hot to be hospitable to life, but eventually it cooled down and living things developed on it about 3.5 billion years ago. One theory to explain how life formed states that chemicals combined together to form simple cells which could divide and replicate themselves. All further life forms developed from these. Life will only survive if certain conditions are met. A major one is that the Earth is just the correct distance from the Sun to receive the correct amount of heat and light. However, there are a number of environments, from mountain tops to ocean trenches, which have their own environmental conditions and life forms have developed to live in them. Each is adapted to certain environmental conditions and will not survive without them.

Practical: Major environments

1. Use an atlas to find the locations of the following towns and cities and mark them on this map of the world.

(a) London, England ✎ ..... (b) Dallas, Texas, USA ✎ ..... c) Manaus, Brazil ✎ .....

(d) Alice Springs, Australia ✎ ..... (e) Yellowknife, Canada ✎ ..... (f) Hyderabad, India ✎ .....

(g) Nairobi, Kenya ✎ ..... (h) Athens, Greece ✎ .....

.....

2. Look at a world map showing the major environments and compare it with this map. For each of the towns or cities marked on the map, write down the environment in which they are

1A

Name: ..... **Form:** .....

See **pages 4 and 5** of Living Things in their Environment

1A Teacher's sheet: Practical

See **pages 4 and 5** of Living Things in their Environment

Resources

- An atlas.
- Computer for sending and receiving e-mails (optional).

Introducing the work

Remind the children that there are many different environmental conditions on the planet and ask them to suggest some different environments. Look for deserts, rainforests, mountains and others. Tell the children that in the UK they live in a deciduous forest environment, but it also features ponds and lakes and some parts have been changed to make fields. However, if a field was left alone for a hundred or more years, it would begin to turn back into deciduous forest. The plants that live in a deciduous forest are those best able to live in the prevailing climate.

If the children have friends around the world you may like them to use e-mail to find out about environmental conditions where their friends live.

Outcomes

The children can:

- Understand that there are different environments on the Earth.
- Use maps to find the environments of different places around the world.
- Use maps to identify the kind of environment in which they live.

Background

The use of the word environment here refers to major vegetation zones. The community of plants that live in a particular area depends upon the climate and the type of soil. For example, in dry areas, the lack of water limits the plants that can grow. This is where we find desert plants. When vegetation is destroyed, such as in the clearing of a forest, the vegetation will grow back again to its natural state. In rainforests this may not happen because the excessive rain washes away the soil. In other forests, such as 'old growth' forests, it may take thousands of years for the forest to return to its natural state. Each community of plants has a characteristic community of animals that live with them.

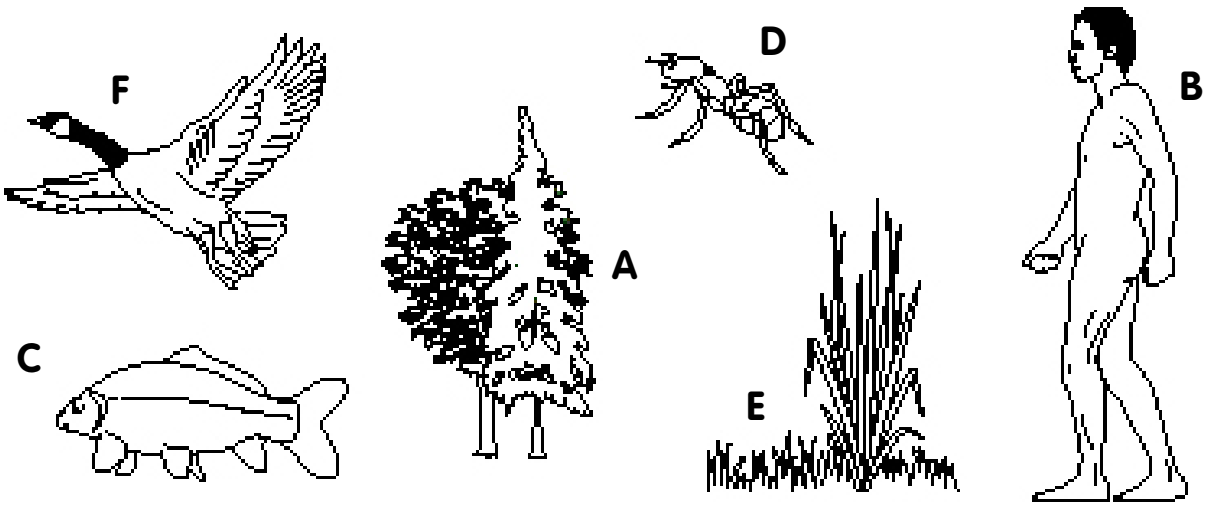
2

Name: ..... **Form:** .....

See **pages 6 and 7** of Living Things in their Environment

What are living things?

Living things are those things which can produce offspring. Any living thing is called an organism, but we usually call them by common names.



Q1. These living things can be divided into two groups. What are the groups called?

✎ ..... ✎ .....

Q2. Divide the living things into the two groups. Write down the name of the group, then next to each name write the letter of the living thing you wish to put in that group.

✎ ..... ✎ .....

Q3. Give two examples of non-living things.

✎ ..... ✎ .....

Q4. Some living things grow on rocks and look as if they are stains on the rock. What are they? ✎ .....

Q5. State three things that all living things have in common.

✎ .....

✎ .....

✎ .....

Q6. What are very small living things called? ✎ .....

2 Teacher's sheet: Comprehension

See **pages 6 and 7** of *Living Things in their Environment*

Answers

Q1. Plants and animals.

Q2. Plants – A, E. Animals – B, C, D, F.

Q3. Rock, computer, etc.

Q4. Lichens.

Q5. Feed, grow, move, give off waste, affected by changes in the environment, adapted to the environment, make new living things of their own kind.

Q6. Micro-organisms or microbes.

Introduction

Ask the children to imagine that they were astronauts and had landed on another planet. Ask them how they would be able to identify living things on the new planet. Look for answers about feeding and moving. Show the children two objects – a pea (but don't tell the children it is a pea) and a small pebble. Ask the children if they think these objects are alive. Ask the children how they could test to see if they were alive, and look for an answer about planting them in soil and watering them. Let the children try this and let them check regularly for signs of life. They should find that the pea sprouts a root and shoot.

Practical work

2A: Looking at living things
2B: Observing snails

Integrating the practical work

You may like the children to try Practical 2A after reading the first three paragraphs.

Practical 2B may be tried when the children have studied the section about what living things share.

Extension work

See page 132 of this Teacher's Guide.

Links

This spread can be linked with many of the other spreads depending on how you wish to develop the topic. It provides a firm foundation for linking with 'Changes in their lives' on pages 8–9, which deals with life cycles.

Background

The seven characteristics of life are: feeding, moving, respiring, excreting, growing, reproducing and sensing changes in the surroundings.

Many plants are distinguished from animals in the following ways: plants move as they grow while animals can move the whole of their bodies from place to place. Plants make their own food from air (the carbon dioxide in it), sunlight and water. Animals have to feed on plants or other animals. Plants have a green substance called chlorophyll which traps some of the energy in sunlight and makes it available for food production. Animals do not have chlorophyll. Plants have a substance called cellulose to give them support (think of crunchy celery). Animals such as slugs and worms trap water in their bodies for support, vertebrates such as fish and mammals have bones and insects and crustaceans (crabs and lobsters) have hard outer skeletons called exoskeletons.

Plants also need minerals from the soil for full health. Some plants, which live in marshy ground, cannot get the minerals they need, so they resort to catching insects and obtaining the minerals from their bodies. The Venus Fly Trap is a well known example but there are other carnivorous plants such as the pitcher plant and the sundew.

Lichens are formed from an association of a fungus with a kind of algae.

The major groups of living things are called kingdoms. Plants, animals and fungi are separate kingdoms. Algae are sometimes grouped with plants, or with other small living things in a group called the Protoctista.

2A

Name: ..... **Form:** .....

See **pages 6 and 7** of Living Things in their Environment

Practical: Looking at living things

1. Have a look around the outside of your school for the living things listed below. Take this sheet and fill in the table as you walk around. Put a dash if you cannot find them in any place.

2. If you find living things in places not given on the table, then add them to the table. There are three blank rows that you can use.

3. If you find some other living thing you would like to record, write their names in a blank box in column 1, then put a tick in the appropriate location.

Living thing	**Place found**							
	Wall	Path	Edge of path	Lawn	Flower bed			
Lichen								
Moss								
Fern								
Grass								
Snail								
Slug								
Earthworm								
Woodlouse								
Spider								
Beetle								
Butterfly								
Fly								
Bee								

4. In which place did you find the most living things? ✎ .....

5. Which living thing was found in the largest number of places?

✎ .....

2A Teacher's sheet: Practical

See **pages 6 and 7** of Living Things in their Environment

Resources

Each group will need:

- Supervised access to the school grounds or supervised walk around a park.
- Magnifying glasses (optional).

Introducing the work

Ask the children if they have seen any living things on their way to school today. Write their answers on the board. You may find that they include answers such as cat, dog, pigeon. Tell them that they are going to look for other kinds of life and that they are going to examine different features in the environment to see if different kinds of life are found there.

Outcomes

Most children can:

- Identify some common living things in their surroundings.
- Fill in a table.
- Extract data from a table.

Background

Mosses and ferns belong to the plant kingdom but they are not flowering plants. They reproduce by means of spores. You may see that some mosses have whiskers above them with swollen tips. The tips contain spores. These are microscopic capsules which contain a small piece of the parent plant. Ferns make spores in structures on the undersides of their fronds. These structures may look like brown buttons. Grass is a flowering plant, but it produces flowers that are pollinated by the wind. These are small, green and without smell.

Slugs, snails and woodlice need damp surroundings because they lose moisture through their skins. Insects and spiders can be found in drier surroundings because water cannot escape through their skins.

2B

Name: ..... **Form:** .....

See **pages 6 and 7** of Living Things in their Environment

Practical: Observing snails

1. Set up a habitat for snails using a tank or a large jar. Put moist soil in the bottom of the container to a depth of seven centimetres.

2. Add some tussocks of grass to cover the soil.

3. Make a shelter from half a plant pot or a few stones.

4. Put in the snails and cover the container with a plastic sheet.

5. Make sure there are some holes or gaps in the plastic sheet through which air can pass to the snails.

6. Make a drawing of your snail container and label all the things in it.

7. Give the snails different foods and find out which ones they eat. Write down here what you find out.

✎ .....

✎ .....

8. Write down any other discoveries you make about the snails.

✎ .....

✎ .....

Teacher's sheet: Practical

See **pages 6 and 7** of Living Things in their Environment

Resources

Each group will need:

- A plastic container such as a large sweet jar or an aquarium tank. The jar will need a polythene sheet with some small holes in it and an elastic band to seal the top. The aquarium tank will need a sheet of clear plastic and some Plasticine supports. There only needs to be a small gap between the top of the tank and the plastic sheet.
- Each container will need moist soil, grass tussocks, stones or plant pots broken in half.
- A few snails for the container.
- Food – cabbage, lettuce, mashed potato, flour paste and rolled oats crushed with chalk.
- Carrots and leaves of garden plants could be offered as food.

Introducing the work

You could show the children some snails and ask how they could be cared for. You could steer the children's answers towards the setting up of a snail container, or 'snailery'.

Outcomes

Most children can:

- Make accurate observations.
- Complete an extensive investigation.

Background

Snails lose water through their skins, and in dry conditions seal themselves inside their shells by making a parchment-like sheet (called an epiphragm) across the entrance to the shell. To prevent this happening, spray the inside of the container with water periodically. The food should be changed before it decays, and snail droppings will also need removing. Snail eggs may be found in the soil. They are white and about 4mm long. If the eggs are put in a moist container they may hatch in 20 to 30 days. The children could try and rear the snails. They could then measure the young snails and produce graphs showing their growth.

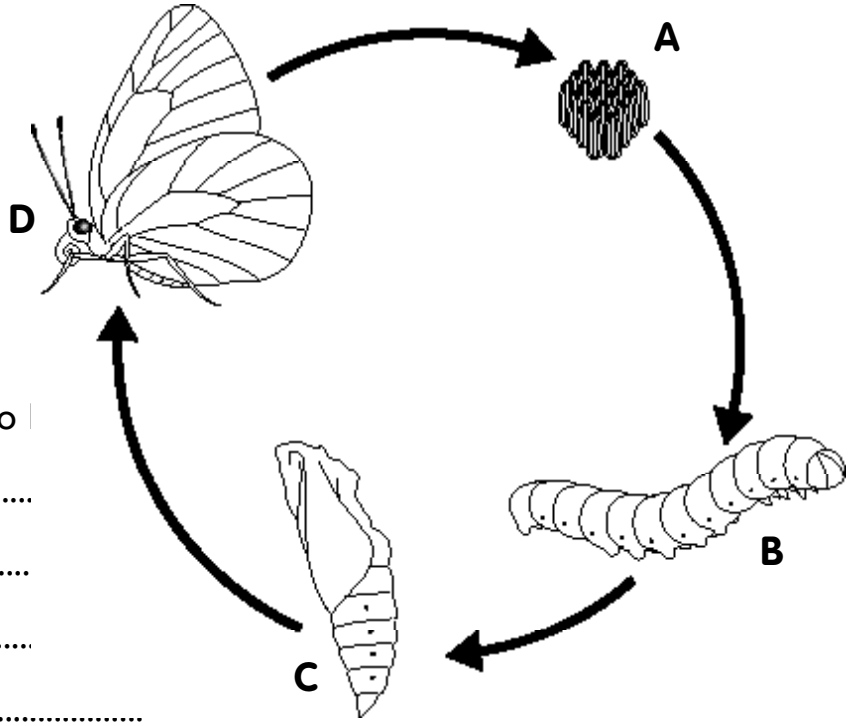
3

Name: ..... **Form:** .....

See **pages 8 and 9** of Living Things in their Environment

Changes through their lives

During their lives, all living things go through stages as they grow up, get older and die.
At each stage they have to be adapted to the environment around them.



Q1. Name the stages of the butterfly life cycle labelled A to D

A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

Q2. What are the three features of every life cycle? (Fill in the gaps below to answer).

Living things are ..... , they ..... and then they .....

Q3. What kind of living thing may live for thousands of years?

✎ .....

Q4. What kind of living thing may have a life cycle of just a few days?

✎ .....

Q5. What may happen to young saplings?

✎ .....

Q6. What happens once young living things survive their first few days?

✎ .....

✎ .....

3 Teacher's sheet: Comprehension

See **pages 8 and 9** of Living Things in their Environment

Answers

Q1. A = egg, B = caterpillar, C = pupa, D = adult.

Q2. Born, grow, die.

Q3. Some trees.

Q4. Some insects.

Q5. They may be eaten or trampled on.

Q6. They grow rapidly and are soon more able to defend themselves.

Introduction

You may like to begin by holding up a packet of seeds and telling the children that it is full of living things waiting to start their life cycles. Open the packet and show the children the seeds. Ask them how the life cycles of the seeds could be started. Look for answers about planting them in the soil and watering them. Set up some pots with the seeds in and let the children watch the plants grow and complete their life cycles.

Practical work

3A: How a broad bean changes
3B: Making model insects
3C: Studying tadpoles

Integrating the practical work

You may wish to introduce the work on the broad bean after the children have looked at the life cycle of the plant on page 8.

The children can make models of the maggot and fly after they have studied the life cycle of the butterfly.

If the time of the year is appropriate, the children could study tadpoles.

Extension

See page 132 of this Teacher's Guide.

Links

This spread is linked to 'How plants adapt and survive' on pages 10–11, 'A tree as a home' on pages 18–19, and 'Habitats change through the seasons' on pages 22–23.

Background

The simplest life cycle is where a living thing simply grows, reproduces once and dies. Annual and biennial plants and insects have this type of simple life cycle, but many other living things have a more extended life cycle in that they survive as adults for a few years, or for many years, and reproduce regularly during that time. Perennial plants such as trees, and many vertebrates such as birds and mammals, have a life cycle of this kind.

Many living things have young forms which are simply miniature versions of the adult. However, they may lack adult strength. For example, a sapling is much weaker than an adult tree and more easily destroyed. Young mammals such as deer lack strength and must hide away until they grow strong enough to move with the herd. Young animals like this may be camouflaged as an adaptation for survival.

Not all insects have the same type of life cycle as shown by the butterfly. The cockroach and locust hatch out as nymphs, which are miniature versions of the adult but without wings and sex organs. The nymph grows by moulting its old, hard skin, taking in air to pump up its soft new skin then feeding to put on body mass to fill the spaces inside the new skin. Insects which grow as miniature adults feed on the same food as the adults and compete with them. The butterfly has solved this problem by having its young feed on different food from the adults. The egg, caterpillar and pupa of an insect or moth are camouflaged to give protection, the adult may also have large spots which look like eyes to deter a predator from attacking.

3A

Name: ..... **Form:** .....

See **pages 8 and 9** of Living Things in their Environment

Practical: How a broad bean changes

1. Take a dry broad bean and examine it. Make a drawing on a sheet of paper.
2. Put the broad bean in water and leave it overnight.
3. Take the broad bean out of the water, examine it and draw it.
4. Put some compost in a plant pot.
5. Make a hole about five centimetres deep in the compost.
6. Put the broad bean in the compost and cover it up with compost.
7. Keep the compost watered and leave it for a week.
8. Carefully dig up the broad bean and examine it. Make a drawing.
9. Repeat step 8 every few days, then leave the plant to grow.
10. When the shoot of the plant grows above the compost, make drawings of its growth or take photographs with a digital camera.
11. At the end of your observations, write about how the broad bean changed.

3A Teacher's sheet: Practical

See **pages 8 and 9** of Living Things in their Environment

Resources

Each group will need:
A dry broad bean (pesticide free), a beaker of water, a large plant pot, compost, a small trowel or spoon, a place in the light to store the pot, digital camera (optional).

Introducing the work

Ask the children about any seeds that they have grown in the past. Tell them that they are going to make a careful record of the changes that take place when a seed sprouts and grows into a plant.

Outcomes

The children can:

- Follow instructions to carry out an investigation.
- Make careful observations.
- Treat a plant with care so that it thrives.
- Record results over a period of a few weeks.
- Use their data, drawings or photographs to summarise the changes that take place as a plant grows.

Background

The broad bean is a seed of the broad bean plant. It contains a tiny plant, surrounded by two large food stores. The interior of the seed is almost dry. This prevents a fungal attack which would destroy the food and plant. The dryness of the seed makes the seed coat wrinkled. When the seed is placed in water, some water enters by a tiny hole called the micropyle. The water greatly increases the weight and bulk of the seed and smooths out the wrinkles in its skin. If a newly soaked seed is gently squeezed, with the V-shaped mark towards you, water may ooze from the micropyle.

The water allows the food in the food stores to be transported to the plant and allows the plant to use the food to grow. The root grows out first, to secure the plant in the soil and to search for more water. The shoot grows out later. Whatever position the seed is planted in, the root will always grow down and the shoot will grow upwards. When the shoot grows above the ground it begins to make food by photosynthesis. As the plant grows it will need a cane for support.

Name: ..... Form: .....

See **pages 8 and 9** of *Living Things in their Environment*

Practical: Making model insects

1. Diagram 1 shows the larva of a fly. It is called a maggot.

Use Plasticine to make a model maggot. To do this, make up 11 discs of Plasticine and then stick them together.

Diagram 1

2. Diagrams 2 and 3 show you how to make a fly from Plasticine. First make up three oval pieces and stick them end to end. Then roll out some long rods and use them to make the six legs. Lastly, flatten two pieces and stick them to the top to make wings. Use a picture of a fly to help you see what it looks like.

Diagram 2

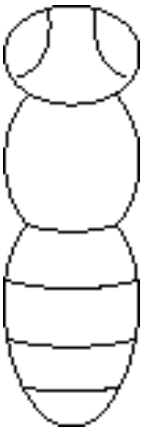
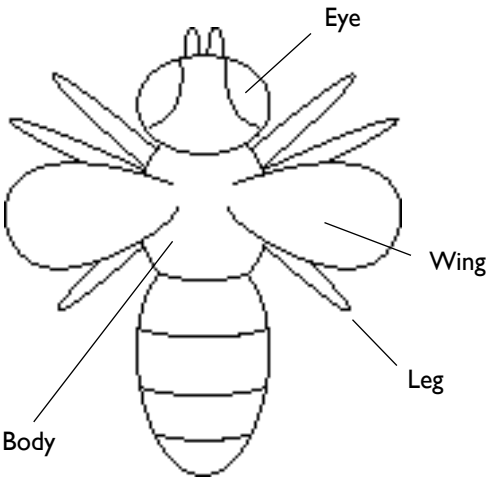


Diagram 3



3. Look at the two models and write down how the insect body changes as it grows from a larva to an adult.

✎ .....

✎ .....

✎ .....

✎ .....

Teacher's sheet: Practical

See **pages 8 and 9** of Living Things in their Environment

Resources

Each group will need:

- Plasticine.

Introducing the work

Remind the children about the life cycle of the butterfly and ask them if they know anything about the life cycle of the fly. Children who have been fishing or have someone in their family who goes fishing may be able to provide some anecdotes about maggots. Other children may know about maggots on rotting food. Tell the children that sometimes, when scientists want to study something but there are difficulties, they use a model. Tell the children that it would be difficult to study the real stages in the life cycle of a fly because of the unhygienic conditions of the maggots, and the speed with which flies move, so they are going to make models using Plasticine.

Outcomes

The children can:

- Use materials safely.
- Follow instructions in written and diagrammatic form.
- Make observations and comparisons.

Background

The first insects had a simpler life cycle than that of the butterfly or the fly. When their eggs hatched, a miniature version of the adult climbed out. Some insects, such as the cockroach and locust, still have this life cycle today. The stage after the egg is called the nymph. It lacks the reproductive organs and wings of the adult. The nymph grows by moulting, and in the last moult it achieves adult size and all the adult features. This type of growth is called incomplete metamorphosis. Dragonflies and mayflies are aquatic insects which have this form of life cycle.

The stick insect also grows by incomplete metamorphosis. The common stick insect that may be kept in class is a kind which is made up of females that lay fertile eggs. Males are rare.

The greenfly or aphid also grows by incomplete metamorphosis. The eggs hatch inside the mother's body and the nymphs are born.

The growth pattern shown by the butterfly and fly is called complete metamorphosis, as there is a complete change of form during the life cycle. This growth pattern is shared by beetles, bees, wasps and moths.

Name: ..... **Form:** .....

See **pages 8 and 9** of Living Things in their Environment

Practical: Studying tadpoles

1. Your teacher will provide you with some frog spawn. Look at the frog spawn and draw one of the eggs here.

2. After a few days, look at the frog spawn again and draw an egg again.

3. Draw a tadpole when it has newly hatched.

4. Draw a tadpole when it is one week old.

5. Draw a tadpole when it is three weeks old.

6. Make a chart to record how quickly the tadpole grows and begins to form legs. Examine the tadpoles frequently and make a record in your chart each time you make an observation. Try to measure the tadpole's length, but be careful that you do not touch them (you could hold a ruler above the tadpole).

7. Use your chart to describe how a tadpole changes into a frog.

✎ .....

✎ .....

✎ .....

3C

Teacher's sheet: Practical

See **pages 8 and 9** of Living Things in their Environment

Resources

Frog spawn, tank with pond water and pond weed, magnifying glass.

Introducing the work

After reading about the butterfly and making models of stages in the life cycle of the fly, you could ask the children if they know of any other animal that changes its form as it grows. The children may mention the frog, and if they do, challenge them describe the life cycle. Look for details in their explanation about tadpoles and ask them how these observations may be checked. Tell the children that scientists check observations by repeating them, and say that the children are going to check the observations by making some of their own.

Tell the children that after they have made their observations the tadpoles will be released in a place where they have a good chance of survival. You may like to link this practical with the topic 'Thoughtless changes' on page 36 of the student book.

Outcomes

The children can:

- Make careful observations.
- Record observations as diagrams.
- Make an extended investigation.

Background

The frog is a vertebrate. It belongs to the vertebrate group called Amphibia. Other members of this group are toads, newts, salamanders and some snake-like creatures, called caecilians, which live in the soil on the floors of tropical rainforests.

Frogs hibernate during the winter but return to ponds in early spring to mate. The male attracts a female by croaking. At this time of year, the females are swollen with eggs. The jelly around the eggs inside the female is thin. It swells up after the eggs have entered the water.

The male frog holds onto the female and is carried on her back until the eggs are released. The eggs are fertilised externally by the male shedding his sperm into the water. The sperm join with the eggs before the jelly swells up.

Frogs lay their spawn in clumps, toads lay their spawn in threads and newts lay single eggs on leaves, and wrap the leaves around them for protection.

As the eggs develop they should change from black dots to comma shapes – the shape of the forming tadpole.

The jelly of frog spawn protects the eggs from predators. It becomes thinner as the eggs begin to hatch and the tadpoles eat their way out.

At first the tadpoles feed on algae which coats water plants. When their legs begin to develop they need to be offered a small piece of meat, as they are turning carnivorous. The meat should be removed when the tadpoles are not feeding and should be replaced with a fresh piece.

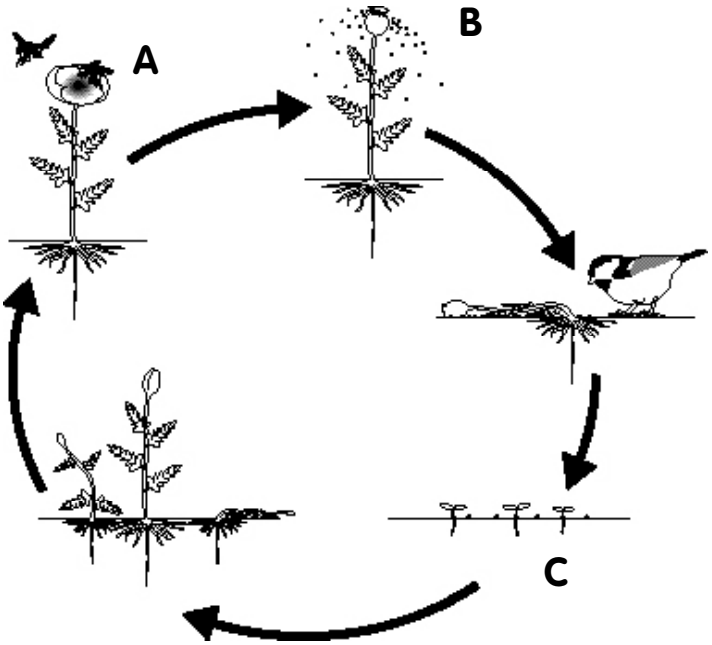
4

Name: ..... **Form:** .....

See **pages 10 and 11** of Living Things in their Environment

How plants adapt and survive

If a plant is to get through its life cycle, it has to have ways of staying alive and getting its seeds to thrive.



Q1. What processes take place at A?

✎ .....

✎ .....

✎ .....

Q2. What processes take place at B?

✎ .....

✎ .....

✎ .....

Q3. What processes take place at C?

✎ .....

Q4. Why do plants need to protect themselves?

✎ .....

Q5. How does a rose plant defend its branches?

✎ .....

Q6. Why do some animals avoid bracken?

✎ .....

✎ .....

4 Teacher's sheet: Comprehension

See **pages 10 and 11** of *Living Things in their Environment*

Answers

Q1. The plant flowers and pollen is transferred by insects.

Q2. The poppy is fertilised, the seed pod grows and the seeds are dispersed by the wind.

Q3. Germination.

Q4. To avoid being eaten by hungry animals.

Q5. With thorns.

Q6. The fronds are tough and hard to digest, they are poisonous, they have disease carrying ticks, they contain insect repellents, and they have ants to defend them.

Introduction

Show the children some photographs of habitats and point out how plants form a major part of the habitat. Suggest that this might mean it is easy for plants to grow and survive. Remind the children of the large numbers of seeds and berries that can be seen in late summer and autumn. If it was easy for a plant to grow, why do they make so many seeds? Answer this question with the following practical.

Give each child in the class a number. Take the class in the hall. Tell the children that they are seeds and they must spread out around the hall just as seeds disperse from their parent plant. When the children are spread out, ask them to sit down. Call out the numbers of half the class and tell them that they have landed where they cannot grow, so they die. Those children can lie down. Call out the numbers of a quarter of the class. Tell them that they are seeds that are eaten and let them lie down too. Tell the remaining children to stand up. They have germinated and grown into seedlings. Call out the numbers of half of these 'seedlings'. They are eaten by animals and die. These children can now lie down. Call out the numbers of all but one of the others and say they are seedlings which are attacked by disease or shaded by other plants and die. These children can also lie down. Tell the children that this is what happens to every group of seeds which leaves a plant so survival is not as easy as it may look.

Practical work

4A: Sowing seeds in different places
4B: Can a dandelion survive?

Integrating the practical work

Practical 4A can be used after the children have studied the life cycle of the poppy on page 10 of the student book. Alternatively, if you have used the introduction above you may like to try the practical first before you start the spread in the student book.

Practical 4B can be used when the children have finished the spread. It could be introduced after considering that the rose plant grows back quickly if it is damaged. The question could be set "Can a dandelion grow back from a piece of root"?

Extension

See page 132 of this Teacher's Guide.

Links

This spread is linked to 'How animals survive' on pages 12–13, 'Food chains' on pages 16–17 and 'A tree as a home' on pages 18–19.

Background

Some plants, such as the weed plant shepherd's purse, have a life cycle which only lasts a few weeks. These plants are called ephemerals.

Many plants are annuals. They complete their life cycle in one year, leaving the seed behind to begin its life cycle in the following year.

A few plants are biennials. They take two years to complete their life cycle. In the first year the plant produces leaves and stores its food in a part of its body such as the root. This body part then survives through the winter. In the following year the food is used to produce leaves and flowers. When the flowers have set their seeds, the plant dies. The carrot, parsnip and beet are examples of biennials.

Many plants are perennials. They have a life cycle which lasts for many years but each year, when they are fully grown, they produce seed. Herbaceous perennials are plants which die back, leaving only a food store such as a bulb, corm or tuber. Trees are woody perennials.

4A

Name: ..... **Form:** .....

See **pages 10 and 11** of *Living Things in their Environment*

Practical: Sowing seeds in different places

1. Select different places to sow seeds. These could be a tray of sand, a tray of sand and gravel, a tray of gravel, a tray of compost, a tray of wood chips and a tray of stones.

2. Select a number of seeds to be sown in each place.

3. Sow the seeds by spreading them evenly over the different places. You should just allow them to fall onto the different surfaces.

4. Each place should receive the same amount of water.

5. Look for signs of germination and growth over the following days and record your results on a separate sheet of paper or on a computer.

6. What do your results show?

✎ .....

✎ .....

✎ .....

4A Teacher's sheet: Practical

See **pages 10 and 11** of Living Things in their Environment

Resources

Cress seeds, mustard seeds. Trays of the following materials – sand, compost, sand and gravel, gravel, stones, wood chips. Alternatively, the children could sow seeds outside in places where these materials form a surface.

Introducing the work

If you took the children in the hall to simulate seed dispersal and survival in the introduction to this topic on page 55, remind them of it now. Tell the children that they are going to perform an investigation on seeds that are dispersed, and they will have to make part of the plan, record observations and draw conclusions.

Outcomes

The children will:

- Set up a fair test.
- Record their observations systematically.
- Draw conclusions from their data.

Background

Plants produce large numbers of seeds because of the uncertainty of their survival. A seed can land on many surfaces. If it cannot draw water from that surface it will not germinate. If it manages to germinate, the material on which it has settled may not be able to supply it with enough water as it grows. Soil (compost) is needed for the best growth because it contains minerals which the plant needs.

Seeds which land on rocks may be washed into spaces full of water. Seeds also need oxygen in order to germinate, so if they are immersed in water they may not receive enough oxygen for their needs. In very damp surroundings the germinating seeds may be attacked by fungus.

4B

Name: ..... **Form:** .....

See **pages 10 and 11** of Living Things in their Environment

Practical: Can a dandelion survive?

1. Collect a dandelion and its long tap root. In the space below draw what you see.

2. Draw lines across your drawing to divide the root into four pieces.

3. Ask your teacher to cut up your dandelion root using the lines on your drawing as a guide.

4. Plant the four pieces of dandelion root in a pot of soil. Next to each piece place a stick to mark its position.

5. Make a prediction about what will happen to the pieces of dandelion root.

✎ .....

6. Give a reason for your prediction.

✎ .....

7. Add water regularly over the next few weeks to make sure the soil does not dry out.

8. Check the plant pot regularly and record any changes that you see on the surface of the soil.

9. What conclusions can you draw from your investigations?

✎ .....

✎ .....

4B Teacher's sheet: Practical

See **pages 10 and 11** of Living Things in their Environment

Resources

Dandelion with tap root, knife (used by the teacher), plant pot, compost, warm and light place to store the plant pot.

Introducing the work

Remind the children that when some plants, such as the rose, are damaged they do not die but instead grow back. Tell the children that gardeners often have difficulty with dandelions. When they try to pull the plants out of the ground, the root snaps and part of it is left in the ground to grow again. Suggest to the children that the dandelion may be able to recover when only a piece of root is left but ask them how they could find out.

Outcomes

The children can:

- Use equipment and materials safely.
- Make a prediction and match it with results.
- Carry out an extensive investigation.

Background

When plants make food in their leaves they often transport some of it to other parts of the plant in order to store it. The dandelion stores some of its food in its tap root. If the root is cut, it can use the energy and materials in the stored food to produce new growth. This is why a dandelion root which is not pulled up may produce a new plant, which annoys gardeners.

5

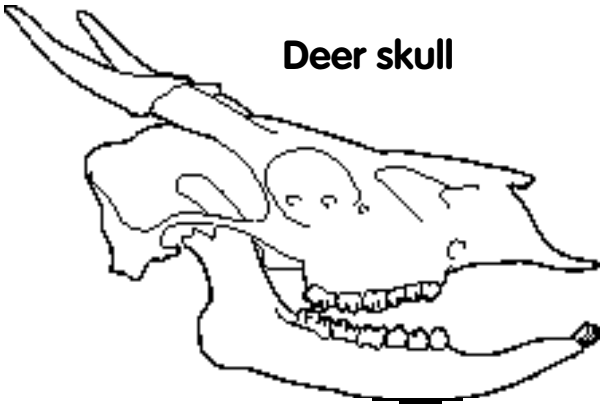
Name: ..... **Form:** .....

See **pages 12 and 13** of Living Things in their Environment

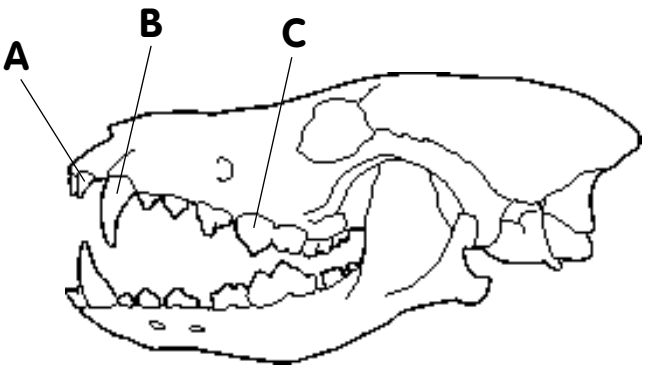
How animals survive

Unlike plants, which cannot move and have to protect themselves where they grow, animals can move about to find food and protect themselves.

Deer skull



Wolf skull



Q1. On the deer skull, label the place where the incisors and canines are found.

Q2. Which part of the deer's mouth acts like a chopping board?

✎ .....

Q3. Name a large, plant eating animal.

✎ .....

Q4. On the wolf skull, name the teeth labelled A, B and C.

A ✎ ..... B ✎ ..... C ✎ .....

Q5. Name two animals that eat both plants and animals

✎ ..... ✎ .....

Q6. State three ways in which an animal can avoid being eaten.

✎ .....

✎ .....

✎ .....

5 Teacher's sheet: Comprehension

See **pages 12 and 13** of Living Things in their Environment

Answers

Q1. The teeth at the front of the lower jaw should be labelled.

Q2. The tough pad in the upper jaw.

Q3. Elephant, giraffe.

Q4. A = incisor, B = canine, C = molar.

Q5. Bear and wild boar.

Q6. Run, hide, have camouflage, live in herds.

Introduction

Ask the children to make a list of 15 or 20 foods that they eat. Draw a table on the board with two columns – headed food from plants and food from animals. Ask one of the children to read out their list and group the foods into the appropriate columns. Where a food such as a pie or a cake is featured say that part of it comes from animal (fat, milk) and part from plant (flour – wheat). Let the children group the food in their own lists. They should find that possibly more food comes from plants than animals, but the main point is that they have a lot of different foods to choose from to survive. Ask the children what their food list might be like if they were a deer, cow, lion or wolf. Look for answers: deer = grass, leaves; cow = grass; lion = zebra, gnu, gazelle; wolf = deer, rabbits. Emphasise that most animals are not capable of eating a wide range of foods like we can, so this can immediately affect their survival.

Practical work

5A: Testing stabbing teeth
5B: Testing model beaks
5C: Investigating woodlice

Integrating the practical work

Practical 5A can be used after the children have studied the skull and teeth of the wolf on page 13. You may use Practical 5B to extend the concept of adaptation of feeding mechanisms in mammals to the adaptation of birds' beaks to their food.

Practical 5C addresses the concept of how animals survive in a different way by focusing on their ability to move to find environmental conditions they require. This also helps the children realise that an animal's requirements from an environment can be quite different from the requirements needed by humans.

Extension

See page 132 of this Teacher's Guide.

Links

'How plants adapt and survive' on pages 10–11 and 'Food chains' on pages 16–17.

Background

Humans are unusual animals in the way that they feed. They can feed on a very wide variety of food which can be either plant or animal in origin. A type of animal which feeds on both plants and animals is called an omnivore. Not many animals are classed as omnivores and two well known examples are the bear (fish, deer, honey and berries) and the wild boar (eggs, insects, mice, roots and acorns). The children must realise that most animals have very specialised diets and will starve if they cannot find the foods they need, even though similar organisms that could be eaten are present in the habitat. This is particularly important if caterpillars are brought into the class for a brief inspection. They must be brought in on the plant they are feeding on and they must be placed on a similar food plant when they are released. Just putting them on any plant may mean they die of starvation before they find the food they need.

5A

Name: ..... **Form:** .....

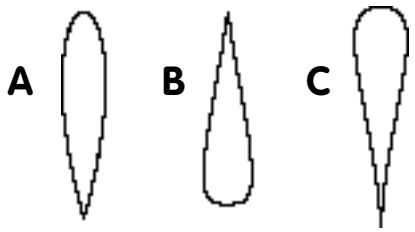
See **pages 12 and 13** of *Living Things in their Environment*

Practical: Testing stabbing teeth

1. Many animals, such as lions and wolves, have teeth for stabbing their food.

The best stabbing shape can be found by making model teeth out of Plasticine and dropping them into flour.

2. Make the three shapes of teeth shown in the diagram. Each tooth should be about 4 centimetres long.



3. Roll each model tooth in a little plain flour (to stop the models getting sticky).

4. Fill a plastic cup with plain flour. Shake the cup to make a loose, flat surface.

5. Predict which tooth will stab the deepest, and which will make the shallowest hole.

The tooth which will stab the deepest will be ✎ .....

The tooth which will make the shallowest hole will be ✎ .....

6. Drop tooth A from a height of 2 centimetres above the surface of the flour.

7. Repeat step 6 four more times.

8. Examine the holes made by the tooth.

9. Repeat steps 6 to 8 with tooth B.

10. Repeat steps 6 to 8 with tooth C.

11. On a separate sheet of paper, write a report of your investigation.

12. How do your results compare with your predictions?

✎ .....

13. Which shape of tooth do you think is best for an animal like a lion or wolf?

Explain your answer.

✎ .....

✎ .....

5A Teacher's sheet: Practical

See **pages 12 and 13** of Living Things in their Environment

Resources

Plasticine, plain flour, pot or cup, ruler.

Introducing the work

Ask the children about any wildlife films that they have seen on television. Focus on the eating habits of animals and ask the children how an animal like a lion or a wolf gets its prey. Look for an answer about these animals stabbing the prey with their sharp teeth.

You may wish to reassure the more sensitive children that the stabbing teeth are intended to bring a quick death to the prey so that the suffering is not prolonged. A quick death is really in the predator's interest, as it prevents undue loss of energy dealing with a struggling prey.

Remind the children that scientists sometimes make models to use in investigations where studying the real thing could be dangerous or impractical.

Outcomes

The children can:

- Perform a fair test.
- Compare a prediction with a result.
- Make an explanation based on data.

Background

Mammals have teeth which are especially adapted to their diet. Shrews are insectivores and have rows of sharp pointed teeth for biting into the tough skin (exoskeleton) of insects. Rodents such as mice have incisor teeth which are continually growing. They do not fill the mouth because they are constantly being worn down by the hard food (nuts) which they eat. If the teeth did not keep growing in this way they would be soon worn away and the animal would starve. The deer has the typical dentition of a herbivore and a similar arrangement is found in sheep and cattle. Horses have incisor and canine teeth in their upper jaws. The wolf has the dentition of a typical carnivore. This arrangement is shared with the lion, cat and dog.

5B

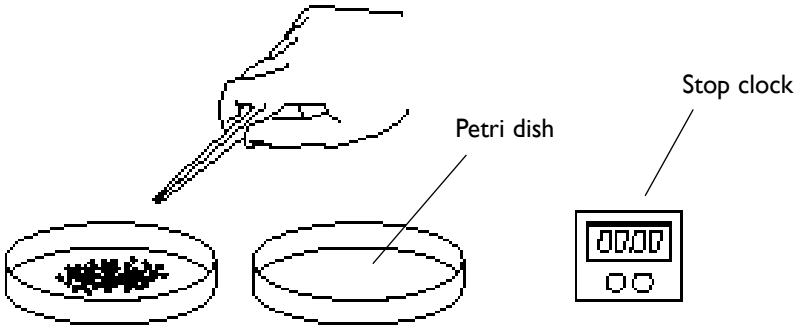
Name: ..... **Form:** .....

See **pages 12 and 13** of Living Things in their Environment

Practical: Testing model beaks

1. Cover the bottom of a dish with cress seeds and place an empty dish close by.

2. Set the stop clock running and, in one minute, try and move as many seeds as you can to the second dish, using a fine pair of forceps or tweezers.



3. Enter the number of seeds you moved in the top box of the Trial 1 column of the table.

	Number of seeds transferred				
	Trial 1	Trial 2	Trial 3	Total	Average
Pointed forceps					
Blunt forceps					

4. Repeat steps 1 and 2 twice more. Each time record the result in the appropriate box.

5. Repeat steps 1 to 4 with a pair of blunt forceps.

6. Add up the totals of both sets of three trials and enter them in the table.

7. Calculate the average number of seeds moved with each pair of forceps and enter it in the table.

8. What do the results show?

✎ .....

✎ .....

5B Teacher's sheet: Practical

See **pages 12 and 13** of Living Things in their Environment

Resources

Pointed forceps, blunt forceps, two dishes, cress seeds, stop clock.

Introducing the work

Some children may need reminding that birds are animals, as sometimes in general reading they are differentiated wrongly, as in the phrase "animals and birds". In studying pages 12 and 13 in the student book, and conducting Practical 5A, the children should appreciate that mammals are adapted to feeding on certain kinds of food. Tell the children that although birds do not have teeth which show adaptations to food, their beaks may show an adaptation and they will be testing this with an exercise in scientific modelling. Explain that instead of using real birds and real beaks they will be the birds and pairs of forceps will be their beaks.

Outcomes

The children can:

- Design a fair test.
- Record data in a prepared table.
- Perform simple calculations.
- Use measurements to draw conclusions.

Background

A bird's beak is highly adapted to its food supply. Small birds which feed on insects and spiders have thin, pointed beaks which can probe into gaps in the soil and in bark to find their food. The treecreeper, which feeds exclusively on the invertebrates living in bark, has a beak which is hooked, to prise out its prey. Seed eaters such as finches have broader beaks because they do not need to probe. They pull seeds from flower heads or pick them up from the ground. A broad beak helps them pick up seeds quickly so they can move from an exposed feeding area to the safety of trees and avoid the predation of birds such as the sparrow hawk. There are many other examples of beaks adapted to food. The woodpecker has a chisel shaped beak to bore into wood to find insects. The flamingo has a sieve in its beak to release water while holding onto the small aquatic crustaceans on which it feeds. Birds of prey such as hawks and owls have hooked beaks for tearing flesh.

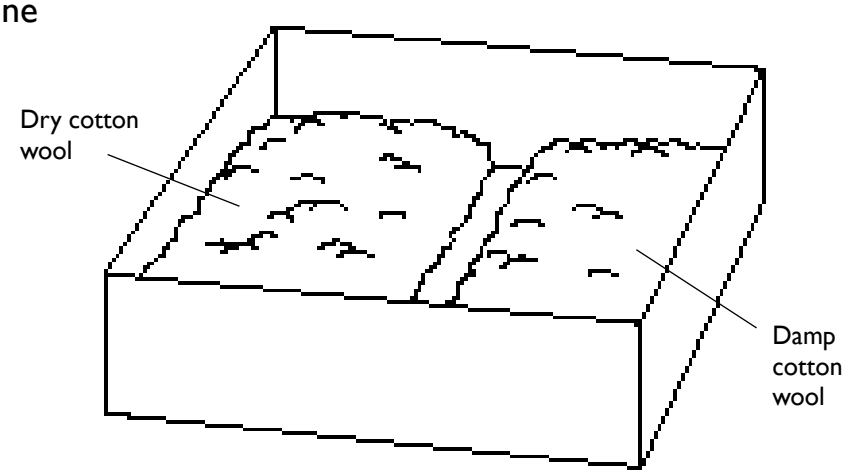
5C

Name: ..... **Form:** .....

See **pages 12 and 13** of Living Things in their Environment

Practical: Investigating woodlice

1. Set up a tray like the one shown in the diagram.



2. Predict where the woodlice will gather after they have been put in the centre of the tray.

✎ .....

3. Put ten woodlice in the centre of the tray.

4. Cover the tray with a piece of dark paper for ten minutes.

5. Remove the cover and count the number of woodlice under the damp cotton wool and under the dry cotton wool. Make a note of the results on a separate piece of paper.

6. Remove the woodlice and repeat steps 3 to 5 with fresh woodlice.

7. Repeat step 6.

8. Draw a table on a separate sheet and put all of your results in it.

9. What do the results show?

✎ .....

✎ .....

✎ .....

10. How do the results match your prediction?

✎ .....

5C

Teacher's sheet: Practical

See **pages 12 and 13** of Living Things in their Environment

Resources

A tray, cotton wool, a black card to cover the tray, 30 woodlice, a container to hold the woodlice (keep them in moss), a clock.

Introducing the work

You may want to start by saying that an animal's survival needs are often different to our own. Remind the children that on pages 12 and 13 of the student book they learned how animals could starve even though we might think that there was plenty of food around for them to eat. This is due to the special diets that animals have. Animals also have other needs which may be different from our own. Ask the children to imagine that they have frog skin. This skin does not hold in water like ours, so warm and dry conditions which may be comfortable to us would be uncomfortable if we had frog skin. Tell the children that some other animals have problems with keeping in their body moisture, and there is one which they can even perform a harmless experiment on – the woodlouse.

Outcomes

The children can:

- Make a prediction and compare it with data.
- Handle living things with care.
- Draw a conclusion from data.

Background

Woodlice are crustaceans. They are related to crabs, lobsters and shrimps. Crustaceans are aquatic animals. Crabs and lobsters are marine animals, while crayfish and Daphnia (water fleas) are freshwater crustaceans. Woodlice are unusual crustaceans in that they are land animals. Woodlice have a hard outer skeleton (exoskeleton) like insects but the surface is not waterproof. This means that if the woodlouse is in dry surroundings water vapour evaporates quickly from its surface and is replaced by water from deeper in its body. If the animal stays in dry conditions it soon dries out and dies. To avoid this happening the woodlouse seeks out places with a damp atmosphere. This slows down the rate of evaporation so much less water is lost.

During the day woodlice hide away under stones. They do this as a defence mechanism and as a way of losing less moisture, as daytime air is drier than night time air. After dark, when the dew has fallen, the air becomes damper and the woodlouse can venture out to feed.

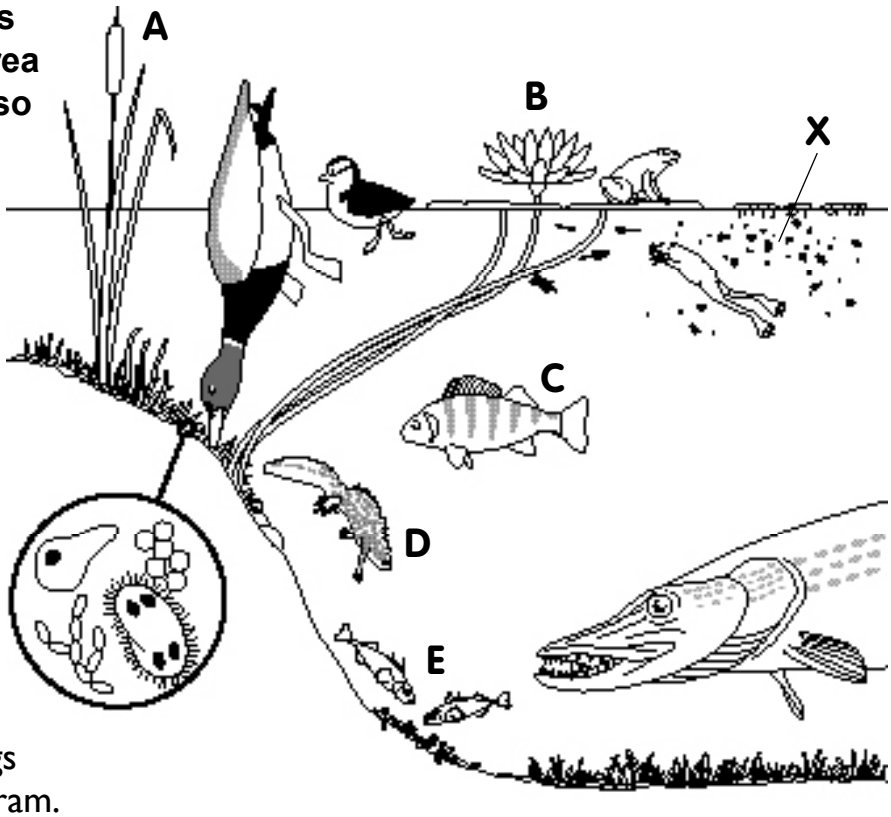
6

Name: ..... **Form:** .....

See **pages 14 and 15** of Living Things in their Environment

Living together

Many plants and animals share the same living area even though this can also mean danger.



Q1. Name the living things labelled A to E in the diagram.

A ✎ ..... B ✎ .....

C ✎ ..... D ✎ .....

E ✎ .....

Q2. What are the two living things in the water at X?

✎ ..... ✎ .....

Q3. What is each different kind of living thing called? ✎ .....

Q4. Name three things that plants need.

✎ ..... ✎ ..... ✎ .....

Q5. What type of community is shown in the picture? ✎ .....

Q6. How is the diet of a bear different from that of a panda?

✎ .....

✎ .....

6 Teacher's sheet: Comprehension

See **pages 14 and 15** of Living Things in their Environment

Answers

Q1. A = reed mace, B = water lily, C = perch, D = newt, E = sticklebacks.

Q2. Algae and water fleas.

Q3. A species.

Q4. Enough nourishment in the soil, sunlight and water.

Q5. Pond.

Q6. Bears eat fruits, insects, fish and other animals. Pandas eat bamboo.

Introduction

Take the children into the school grounds or a local park and ask them to look for living things and make a note of what they find. They do not need to collect any plants or animals, just simply note down what they see. Back in the classroom ask them what they found and write their answers in the board in a two column table headed 'Plants' and 'Animals'. Ask the children if they found each plant or animal living on its own or did they find some organisms living together in the same place. Look for an answer about plants and animals living together and tell the children that they are going to look more closely at how living things live together.

Practical work

6A: A miniature pond
6B: Identifying pond life

Integrating the practical work

When the children have completed the spread, emphasise the idea that a community is a self-contained unit and tell them they can make a small community of water life in a jar. Let the children try Practical 6A.

After the jars have been set up and studied for a short while, arrange a trip to a pond following all the school policies on excursions outside school and let the children try Practical 6B.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Ponds' on pages 24–25 and 'Rock pools' on pages 28–29.

Background

A habitat is a place where a plant or animal lives. A community is a group of plants and animals which can live together, provided that there is a supply of sunlight and oxygen. If plants and animals live in the same place, they share the same habitat, such as a wood, pond or field.

A pond is good example of a community because it has clearly defined boundaries – the sides of the pond and the water surface. The sunlight provides energy which the plants use to make food. Some of this food is eaten by some of the animals. Other animals obtain their food from the plant-eating animals. The dead bodies of plants, animal wastes and dead bodies of animals provide nutrients for plant growth, so the nutrients are recycled. This recycling occurs in all communities. Oxygen from the air can dissolve in water, and aquatic animals have gills to take it in or absorb it through their skin.

6A

Name: ..... **Form:** .....

See **pages 14 and 15** of Living Things in their Environment

Practical: A miniature pond

1. Take a clear, plastic container and put a layer of gravel in the bottom. The layer should be two centimetres deep.

2. Take some water weed and push the cut ends into the gravel.

3. Pour the water in carefully so as not to wash the weeds out of the gravel.

4. Put up to six pond snails in the water.

5. Put a cover, or lid, on the container, but make sure that it does not fit tightly, so air can still pass in and out.

6. Draw your container and label the gravel, weeds and snails.

7. Put the pond on a windowsill but do not let the sun shine directly on it.

8. Keep a notebook of information about your miniature pond. Write the date each time you look at the pond and, on a separate piece of paper, make notes and drawings about what you see.

9. Pick three pieces of information from your notes and write about them here.

✎ .....

✎ .....

✎ .....

6A Teacher's sheet: Practical

See **pages 14 and 15** of Living Things in their Environment

Resources

A clear plastic container (tank or bottle) with loose fitting lid, washed gravel, water plants (Canadian pond weed or hornwort), water snails, pond water, windowsill out of direct sunlight, magnifying glass (optional).

Introducing the work

Tell the children that they are going to set up a simple community of plants and animals and that all the community will need to survive is some energy from sunlight.

Outcomes

The children can:

- Make accurate observations.
- Complete an extensive investigation.
- Compare data and identify the most significant components.

Background

The requirements for the community are: nutrients in the form of minerals for the plants, energy in the form of sunlight which the plants can trap to make food by photosynthesis, oxygen which dissolves in the water from the water surface but is also produced by the plants.

Minerals are released in animal wastes and when the plants and animals die. They are recycled and used by the plants.

Plants also need carbon dioxide to make food. They produce some of this themselves as they respire, but they also obtain carbon dioxide from the animals when they respire. You may wish to mention to the children how the animals and plants are linked by the gases they produce and need.

Over time you may find that algae grows on the sides of the jar as a green slime. The plants and snails can be bought from an aquarist shop. If collected from a pond, other small creatures may appear in the water. This is because they were resting on the plants and snails when they were collected.

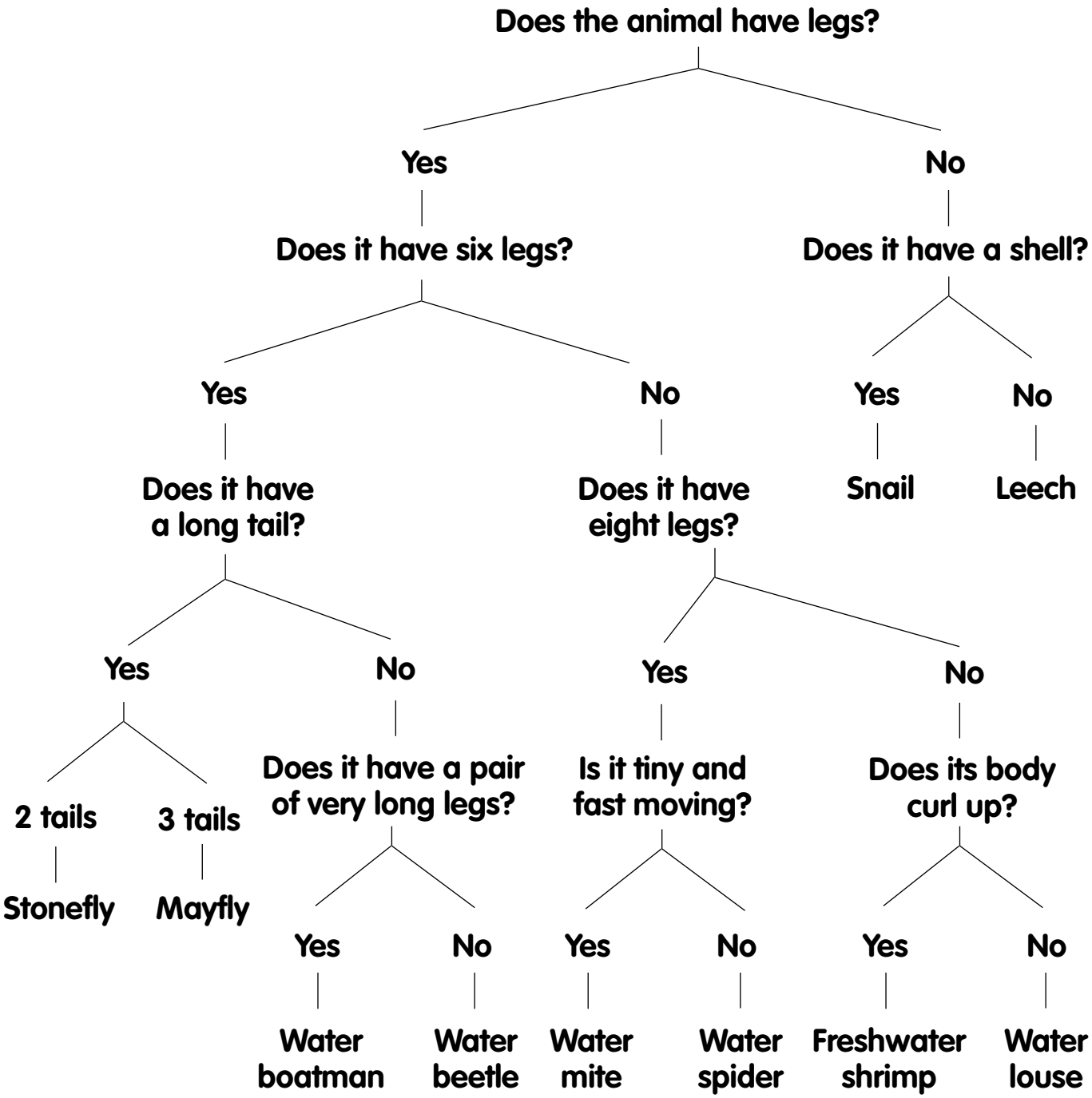
6B

Name: ..... Form: .....

See **pages 14 and 15** of Living Things in their Environment

Practical: Identifying pond life

1. Examine the animals in a sample of pond water and try to identify them from this key.



Also look out for:

Caddis fly cases made out of small stones, shells or pieces of reed; small black flatworms on stones and water surface; long-legged pond skaters on the surface of the pond; whirlygig beetles spinning round on the pond surface.

Teacher's sheet: Practical

See **pages 14 and 15** of Living Things in their Environment

Resources

A pond which you consider safe to visit in accordance with school policies. White trays in which to put samples, nets, magnifying glasses.

Alternatively, you may collect the specimens yourself and let the children use the trays and magnifying glasses in the classroom.

Introducing the work

Ask the children what animals they may expect to see if they visited a real pond. They may mention the animals featured on page 15, but ask them about smaller animal life and they may have fewer ideas. Tell them they are going to investigate pond life by studying samples taken from a pond.

Outcomes

Children can:

- Use a key to identify some pond animals.
- Treat living things with care.
- Make careful observations.

Background

Any key to living things can only cover a few types. Remind the children of this because they may find some animals, such as caddis flies, which cannot be identified using the key.

Some of the animals are used as biological indicators of pollution. Stonefly and mayfly nymphs only live in clean water. Caddis flies and freshwater shrimps can tolerate water which has a low pollution level. Water lice can tolerate water which is highly polluted. Make sure the pond you visit is not polluted.

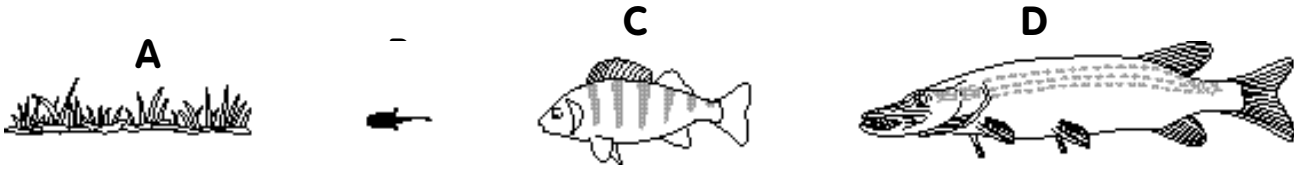
7

Name: ..... **Form:** .....

See **pages 16 and 17** of Living Things in their Environment

Food chains

Many of the plants and animals that live together in a community depend on each other as a source of food or to help them breed.



Q1. The diagram above shows the living things in a food chain in a pond.

(i) Name the living things labelled A to D in the diagram.

A ✎ ..... B ✎ .....

C ✎ ..... D ✎ .....

(ii) Draw in arrows to show how food passes along the food chain.

Q2. What living things in a community produce the most living material?

✎ .....

Q3. Give two reasons why plants need animals.

✎ .....

✎ .....

Q4. (i) What does a shrew eat? ✎ .....

(ii) What feeds on a shrew? ✎.....

Q5. Why do foxes breed well when there is plenty of grass?

✎ .....

✎ .....

Q6. Why doesn't the number of rabbits just get larger and larger?

✎ .....

✎ .....

7 Teacher's sheet: Comprehension

See **pages 16 and 17** of Living Things in their Environment

Answers

Q1. A = pond weed, B = tadpole, C = perch, D = pike; (ii) The arrows point towards the right – from the food to the feeder.

Q2. Plants.

Q3. To carry pollen and to carry seed.

Q4. (i) Worms; (ii) Owl.

Q5. Rabbits breed well and provide a large amount of food for foxes.

Q6. When there is a large number of rabbits they eat all the grass and starve.

Introduction

Ask the children if they like milk. Tell them that milk contains a great deal of nourishment and is the food of young mammals. Ask the children where the milk they drink comes from, then ask them where the cow gets its food from. When the children tell you that the answer is grass, write it on the left hand side of the board, write the word cow in the middle of the board and write the name of a child who likes milk on the right hand side of the board. Tell the children that these three living things are linked by the way the animals feed, and draw in an arrow from the grass to the cow and from the cow to the child. Tell the children that this is a food chain and food chains are used by scientists to find out how animals live together in a community.

Practical work

7A: How much do animals eat?
7B: Looking at leaves

Integrating the practical work

When the children have studied pages 16 and 17 tell them that they are going to make further investigations on the first link in the food chain between plants and animals. Tell them that in the first Practical (7A), they are going to look at the amount of food animals eat and in Practical 7B they are going to look at the small animals that attack leaves in a community.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links to 'Ponds' on pages 24–25, 'Rivers' on pages 26–27, and can be used with other spreads under 'Habitats' and 'Extreme habitats' later in the book.

Background

The food chain is a useful concept to see how plants and animals are related in a community. Almost all food chains start with plants. Plants are called producers because they produce the food. Animals are called consumers because they eat the food. There are different levels of consumer. A primary consumer is one that eats plants. It is a herbivore. A secondary consumer is an animal that eats a primary consumer. It is a carnivore. A tertiary consumer eats a secondary consumer and is also a carnivore.

The mass of living material in each part of the chain is larger than the one above it. For example, the mass of grass is much greater than the mass of rabbits, and the mass of rabbits is much greater than the mass of foxes. When the mass of material at one link in the chain falls, the survival of the living things further up the chain is threatened.

Some food chains on the ocean floor begin with bacteria which feed on chemicals released from hot water springs called black smokers.

7A

Name: ..... **Form:** .....

See **pages 16 and 17** of Living Things in their Environment

Practical: How much food do animals eat?

1. Set up a container in which to keep some animals for a while.
2. Draw and label your container, animals and food.

3. How many animals are kept in the container? ✎ .....
4. How much food is added to the container at the start of your investigation?

✎ .....

5. How much food is taken away from the container at the end of your investigation?

✎ .....

6. How much food has been eaten by the animals?

✎ .....

7. How much food do you think was eaten by one animal?

✎ .....

7A Teacher's sheet: Practical

See **pages 16 and 17** of Living Things in their Environment

Resources

Clear plastic container (tank or bottle) with loose fitting lid, common stick insects and privet leaves in water jar, or caterpillars (do not use hairy caterpillars – some are poisonous) and leaves of the appropriate food plant, weighing machine (optional).

Introducing the work

Tell the children that the amount of food eaten by a group of animals can be measured and present them with the stick insects or caterpillars and their food. Show the children the container for the animals, issue the sheet and let the children complete the first three steps. When they reach step four, discuss with the children how they should find out how much food is eaten. Depending on the ability of the children and the availability of resources, you may ask the children to count the number of leaves that you are giving to the animals, then examine them a day or two later to see how many have been eaten.

Alternatively, if you are using large quantities of plant material, you may like to weigh it before and after the animals have fed on it. Once this has been decided the children can continue with the investigation.

Outcomes

The children can:

- Handle living things with care.
- Make quantitative measurements.
- Perform simple calculations on data.

Background

The common stick insect lives in warm forests in Asia and cannot survive outside in the UK. Males are very rare so all the stick insects you have will most probably be females. They do not need fertilising in order to produce eggs and if you keep stick insects for a while you may see small, glossy, barrel-shaped eggs with a white spot on them. These can be kept in a warm dark place and in time will hatch. The baby stick insect is a tiny version of the adult. It does not have a caterpillar stage. The young stick insects also feed on privet and moult as they grow. You may find skins shed among the leaves. Caterpillars also moult as they grow.

If you have used caterpillars in this investigation make sure that they are soon released back into their habitat and placed on the same kind of plant food as they have been feeding on in the investigation.

7B

Name: ..... **Form:** .....

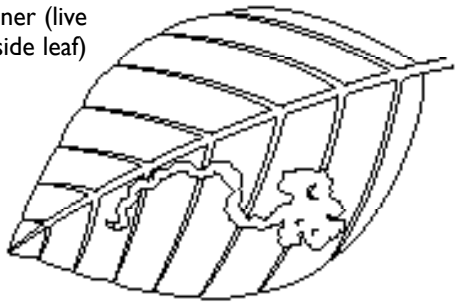
See **pages 16 and 17** of Living Things in their Environment

Practical: Looking at leaves

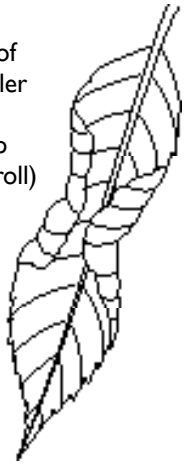
1. Here are some things to look out for on leaves. Try to learn how they look.

Aphid (green, black, white)

Paths of leaf miner (live inside leaf)



Work of leaf roller (young develop inside roll)



2. Look at some leaves. Each time you find a leaf with one or more of the animals above record it in the table. Call the first leaf you find with an animal on it 'Leaf 1', then enter the number and colour of the aphids on the leaf (if any), the number of caterpillars (if any) and tick the box if leaf miners or leaf rollers are present.

Leaf	Aphids	Colour of aphids	Caterpillars	Leaf miners	Leaf rollers
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

3. Which animal was most frequently found? ✎ .....

4. Which leaves had more than one animal? ✎ .....

5. Which leaf had the highest number of aphids? ✎ .....

6. What colour were the aphids found in the survey? ✎ .....

7B Teacher's sheet: Practical

See **pages 16 and 17** of Living Things in their Environment

Resources

Access to a hedge or trees. Visits must be planned in accordance with school policies.

Introducing the work

You may introduce this practical by asking the children about parts of the plant. Look for answers about root, stem, leaves and flowers. Show the children some large photographs of woodland and countryside habitats and ask them which parts of the plants make up most of the pictures. Look for an answer about leaves. Remind the children that these are the food-making organs of the plant, and so they are often the parts of a plant attacked by animals in need of a meal. Tell the children that they are going to look at leaves to see what feeds on them.

Outcomes

The children can:

- Make accurate observations.
- Fill in a table.
- Draw conclusions from data.

Background

Green aphids are also known as greenfly. Aphids have a needle-like mouth which they stick into the leaf to draw out juice. Most of this passes through the aphid's body and forms a sticky substance on the leaf. Some flies, weevils (beetles with a long 'nose') and moths are leaf miners. Some mites, aphids and weevils are leaf rollers.

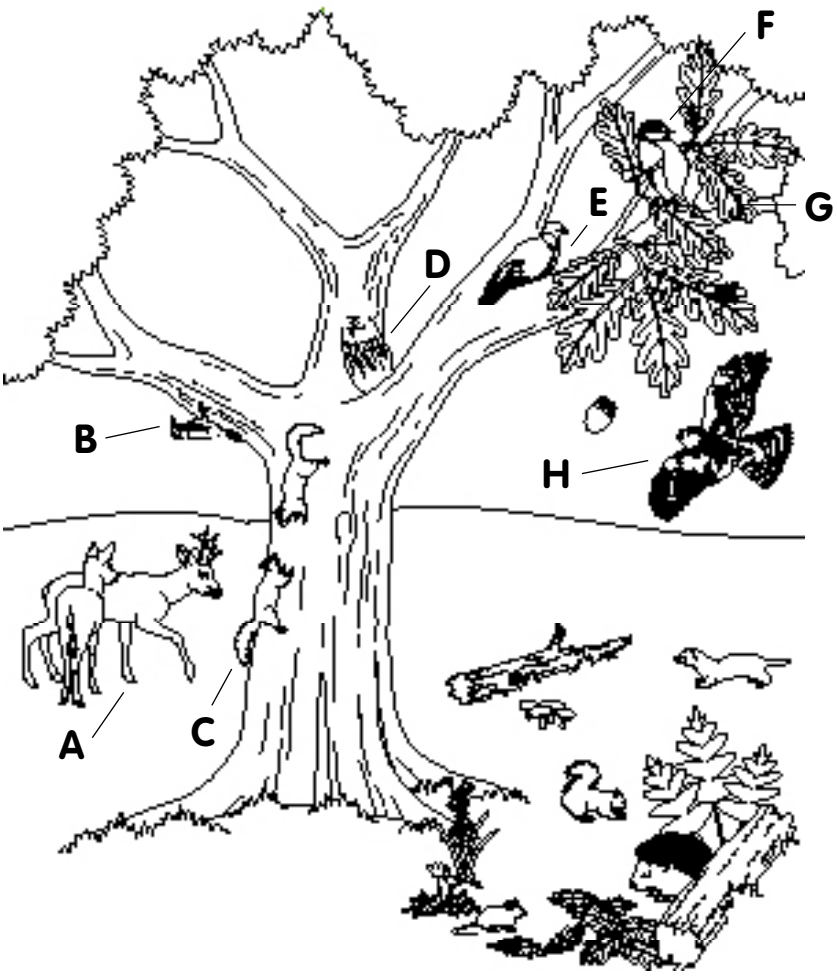
8

Name: ..... **Form:** .....

See **pages 18 and 19** of Living Things in their Environment

A tree as a home

Every living thing has to find a place where it can live, find food and protect itself from others. Here is what happens in an oak tree.



Q1. Name the living things labelled A to H in the diagram.

A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

E ✎ .....

F ✎ .....

G ✎ .....

H ✎ .....

Q2. What is the natural home of a living thing? ✎ .....

Q3. What is the fruit of the oak tree? ✎ .....

Q4. How tall is a fully grown oak tree? ✎ .....

Q5. (i) What is the food of animal C? (ii) Write a food chain of the animal and its food.

(i) ✎ ..... (ii) ✎ .....

Q6. Write a food chain linking the oak tree to animals F, G and H.

✎ .....

8 Teacher's sheet: Comprehension

See **pages 18 and 19** of Living Things in their Environment

Answers

Q1. A = deer, B = woodpecker, C = squirrel, D = owl, E = pigeon, F = blue tit, G = caterpillar, H = sparrow hawk.

Q2. Habitat.

Q3. Acorn.

Q4. 30 to 35 metres.

Q5. (i) Acorns; (ii) Oak (or acorn) ➔ squirrel.

Q6. Oak (or leaves) ➔ caterpillar ➔ blue tit ➔ sparrow hawk.

Introduction

Remind the children that in their previous work they have seen that pond weed and grass are important food sources for animals. Ask the children if anything eats trees. From general knowledge the children may know about squirrels and acorns. Say that sometimes people shelter under trees in the rain and ask if the children think that animals use trees for shelter. Tell the children they are going to find out what a tree provides for other living things.

Practical work

8A: What is on the branches?

Integrating the practical work

When the children have completed the spread ask them how they could find out what was living on the twigs and branches. The children may suggest simply taking a magnifying glass and having a look, but tell them that they need to examine quite a few branches. If nobody suggests shaking the branches, issue the sheet and let the children discover the procedure as they read.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Woodland through the seasons' on pages 20–21 and 'Finding out where plants live' on pages 40–41. Practical 8A can also be used with 'Investigating mini-habitats' on pages 42–43.

Background

Most plants which are perennial and survive from year to year have shoots which die back in the autumn and grow again in the following year. Trees and bushes are unusual in that they keep their shoot above ground all year and protect it with a layer of bark. Each year the shoot grows a little more until a huge living structure is produced which may live for hundreds of years. Trees and bushes provide food for animals mainly through their leaves and fruits, but squirrels can also strip off the bark of some trees. The leaves also provide shelter in rain and wind, and the branches provide locations for nests. As a tree grows it shades the ground below it and this in turn affects the plants that can survive there. Algae and lichens can grow on the bark of the trunk and branches.

8A

Name: ..... **Form:** .....

See **pages 18 and 19** of Living Things in their Environment

Practical: What is on the branches?

1. Find a tree or bush with low branches.
2. Spread a white sheet out under some of the branches.
3. Gently shake the branches a number of times.
4. Look for animals that have fallen onto the sheet.
5. Count the number of spiders, beetles and caterpillars that you find.
6. Make a table in the space below and record your result.

7. Repeat steps 1 to 6 on a different kind of tree or bush and record your result here.

8. What do your results show?

✎ .....

✎ .....

8A Teacher's sheet: Practical

See **pages 18 and 19** of Living Things in their Environment

Resources

Access to trees and bushes. Outside visits to be carried out according to school policies. White sheet, collecting bottles (just to hold quick-moving animals so they can be identified).

Introducing the work

Introduce as suggested in the section on integrating the practical work on page 81, or ask the children who have done Practical 7B if they saw any other animals on the twigs and branches. The chances are that they may have seen a spider so ask how they could remove all the spiders from a branch without touching them. Look for an answer about shaking the branches.

Outcomes

The children can:

- Follow instructions to carry out an investigation.
- Construct tables and record data in them.
- Compare data.
- Make a fair test.

Background

The branches and twigs of trees and bushes are home to animals that are feeding on the leaves and animals that are feeding on the feeders. Caterpillars and aphids feed on the leaves. Spiders are carnivores and feed on any suitable animals they find. Different trees may have different numbers of animals and different types of animals. Different sides of a tree or a bush may have different numbers of animals on them due to one side receiving more light, warmth, wind or rain than the other sides.

When the children have examined the animals they should be placed close to the tree or bush so they can return to their habitat.

9

Name: ..... **Form:** .....

See **pages 20 and 21** of Living Things in their Environment

Woodland through the seasons

A woodland changes dramatically through the seasons. The lives of both plants and animals are adapted to the changes.

Q1. (i) Which season in the wood does the diagram show? (ii) How can you tell?

(i) ✎ .....

(ii) ✎ .....

✎ .....

Q2. (i) What is animal X?
(ii) What does it eat?

(i) ✎ .....

(ii) ✎ .....

Q3. (i) What will animal X do in the next season? (ii) Why will it do this?

(i) ✎ .....

(ii) ✎ .....

Q4. Some woodland birds are not adapted to winter conditions here. What do they do?

✎ .....

Q5. How do many insects survive the winter?

✎ .....

Q6. A woodmouse eats a blackberry and then is eaten by an owl. Write a food chain using this information.

✎ .....

9 Teacher's sheet: Comprehension

See **pages 20 and 21** of Living Things in their Environment

Answers

Q1. (i) Summer; (ii) Trees and undergrowth are in full leaf.

Q2. (i) Hedgehog; (ii) Insects, earthworms, spiders and slugs.

Q3. (i) Prepare to hibernate; (ii) Because there is not enough food to eat.

Q4. Migrate.

Q5. As eggs or pupae.

Q6. Blackberry ➔ Woodmouse ➔ Owl.

Introduction

You may want to begin this topic by reminding the children of how the Earth moves around the Sun. You could enlist one child to be the Sun while another holds the Earth at the correct tilt and moves round the Sun as the other members of the class describe the changes in the seasons. You can now tie these cosmic events to the seasonal changes in the woodland habitat and their effect on the organisms that live there.

Practical work

9A: How to use a pitfall trap

Integrating the practical work

Ask the children to look at the pictures on pages 20 and 21 and point out the squirrel and hedgehog living on the woodland floor. Ask how the children could find out if other small animals lived there and look for an answer about setting a trap.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'How habitats change through the seasons' on pages 22–23.

Background

The Earth does not spin on a vertical axis like a top. Its axis is 23 degrees from the vertical. As the Earth moves round the Sun it keeps its axis pointing the same way. This means that some of the time the Earth's axis points towards the Sun. When this happens, the Northern Hemisphere is bathed in more sunlight and it is summer there. The Earth moves anticlockwise round the Sun as it makes its orbit. After summer there is a time when the Earth's axis points in the direction it is moving. When this happens it is autumn. The Earth then reaches a position where its axis is pointing away from the Sun. When this happens the Northern Hemisphere receives much less sunlight and it is winter there. As the Earth moves, there comes a time when the Earth's axis points away from the direction it is moving. At this time it is spring in the Northern Hemisphere.

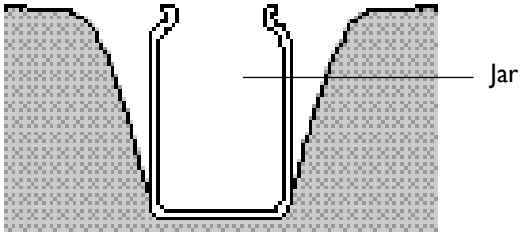
9A

Name: ..... **Form:** .....

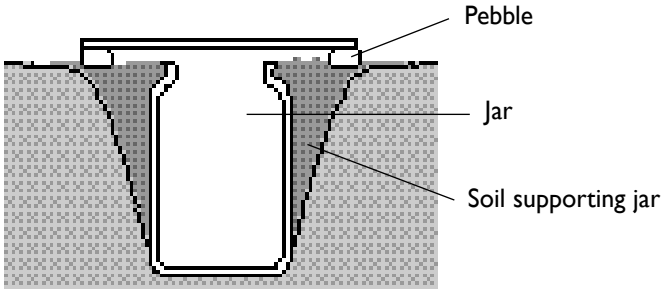
See **pages 20 and 21** of Living Things in their Environment

Practical: How to use a pitfall trap

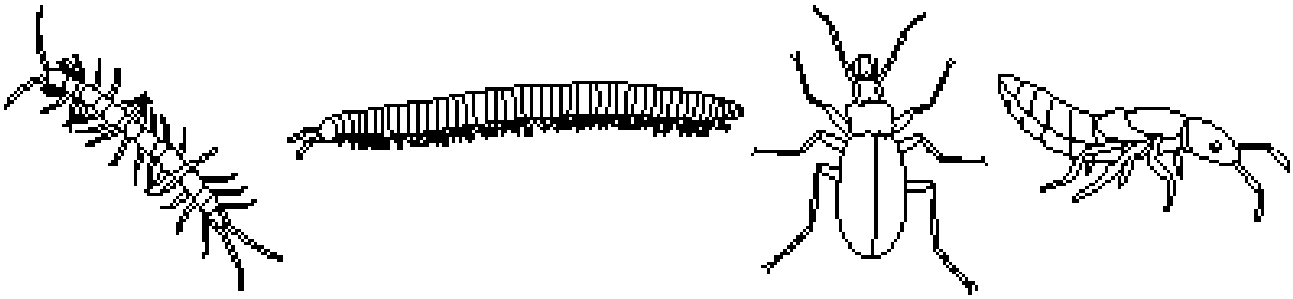
1. Dig a hole and put a jar in it.



2. Set up four pebbles next to the trap and put a cover over them.



3. Set up three more traps.
4. Leave the traps overnight.
5. In the morning, empty each trap in turn into a steep-sided dish or bowl.
6. Identify the animals using the pictures here to help you.



Centipede **Millipede** **Ground beetle** **Rove beetle**

7. On a separate piece of paper, make a table and record your results.
8. What do the results show?

✎ .....

✎ .....

9A Teacher's sheet: Practical

See **pages 20 and 21** of Living Things in their Environment

Resources

Plastic jars, wood squares, pebbles, steep-sided dish or bowl, trowel, access to school grounds and supervision according to school policy.

Introducing the work

Ask the children if they know of any ways that people have trapped animals in the past, or in the rainforest (jungle) today. Someone may suggest that a pit was used into which the animal fell. Tell the children that they are going to use the same technique but they will only be making small pits.

Outcomes

The children can:

- Use simple equipment appropriately and safely.
- Make a table and record results in it.
- Use data to draw conclusions.

Background

The traps must be set up in the afternoon and emptied the following morning. The animals should be released once they have been examined. The children should set the traps up in different places, such as under a tree, under a bush, partially out in the open, completely out in the open, by a wall, in grass and among stones. The traps could be set up a few times in each season.

The children could construct a table as shown below.

Trap No.	Site	Animals found
1		
2		
3		
4		

10

Name: ..... **Form:** .....

See **pages 22 and 23** of Living Things in their Environment

Habitats change through the seasons

Many different plants can live in the sa place if they grow and flower at differe times of year.

Snowdrop Bluebell Primrose Bracken

Q1. What time of year is it when the snowdrop is flowering?

✎ .....

Q2. Write down the order in which the other plants grow.

✎ .....

Q3. Which of the plants above does not produce flowers?

✎ .....

Q4. How can these plants grow so well when there is little sunlight to make food?

✎ .....

✎ .....

Q5. What would happen if all four plants tried to grow at the same time of year?

✎ .....

✎ .....

Q6. Why do these flowering plants grow so early in the year?

✎ .....

✎ .....

10 Teacher's sheet: Comprehension

See **pages 22 and 23** of Living Things in their Environment

Answers

Q1. Winter, January to February.

Q2. Primrose, bluebell, bracken.

Q3. Bracken.

Q4. They use food they have stored underground.

Q5. They would compete for water and sunlight and grow less well. Since the bracken is the larger plant, it may shade out the others and kill them.

Q6. So they can use the sunlight that reaches the woodland floor to make food. Later, when the trees come into leaf, there is not enough sunlight for them to make food.

Introduction

Ask the children to describe the local park at this time of year. The description will depend on the time of year and may include: bare trees, trees are just coming into leaf and plants like daffodils or bluebells. Ask if the children see the same plants all the time and look for an answer that different plants are found at different times of year. Ask what might happen if all the plants were in leaf and flower at the same time and look for an answer about how they would crowd each other out. Check this idea by reading through the spread.

Practical work

10: How plants change with the seasons

Integrating the practical work

When the children have completed the spread, ask them how they could thoroughly investigate how plants in the local environment change with the seasons.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Meadows and fields' on pages 34–35.

Background

Most perennial plants have shoots that die back in autumn while other parts of the plant survive in the soil and contain a store of food. A bulb is made from a disc-like stem which contains the swollen bases of leaves. This structure is easily seen in an onion. Daffodils, snowdrops and bluebells have bulbs. The crocus has a short, fat stem called a corm in which it stores food. The primrose stores food in a vertical, underground stem while the bracken, which is not a flowering plant but a fern, stores food in stems which grow horizontally just below the ground surface.

The energy and materials in the stored food are used to make the plant grow quickly when conditions become warmer after winter. Once the plant has produced leaves, it can make its own food to further speed the growth and flower formation. After the flowers have set seed the plant stays in leaf to make more food which it stores below ground for the following year.

Plants do compete for light, water and minerals, but by growing at different times they reduce competition so that all may survive in the same habitat.

10A

Name: ..... **Form:** .....

See **pages 22 and 23** of Living Things in their Environment

Practical: How plants change with the seasons

1. Select an area which has plants growing in it.
2. Make a map showing where the trees and bushes are.

3. Shade in places on the map where grass is growing.
4. Look for plants in flower such as dandelions and daisies. Note the colours of the flowers and use reference books to identify them.
5. Label where the flowering plants are on the map.
6. Look at the trees and bushes. Note if they are in leaf, losing leaves, or have flowers or fruits.
7. Take a photograph with a digital camera and print it using the computer.
8. Repeat steps 2 to 7 at the same place in each season.
9. Describe how the plants change.

✎ .....

✎ .....

10A Teacher's sheet: Practical

See **pages 22 and 23** of Living Things in their Environment

Resources

An area of trees and bushes that may only be a few metres square. Visits made in accordance with school policies. Secondary sources on recognition of plants, digital camera, computer and printer.

Introducing the work

Tell the children that most people only notice how the surroundings are changing with the seasons when trees come into leaf or lose them, or brightly coloured flowers like daffodils bloom. In this practical, the children will make detailed observations on how plants change with the seasons.

Outcomes

The children can:

- Make careful observations.
- Record observations in the form of a map, and in written descriptions.
- Conduct an investigation over a long period of time.

Background

If this project is started in the autumn term the children can identify the trees and bushes by their leaves and their fruits. They can record plants that are dying back. They could see which trees lose their leaves first and which hold on to them the longest. In winter, small plants in sheltered places may still be in flower. In spring, the succession of plants coming into flower can be noted and the order in which trees and bushes leaf and flower can be recorded.

Fungi may be noted, especially in the autumn, and to a small extent in the spring. Fungi are not plants. They form their own group of living things which feed on the dead bodies of plants and animals (and animal waste) and produce spores to reproduce. Children must not touch any fungi.

You may wish to extend this practical to recording changes in animal activity too.

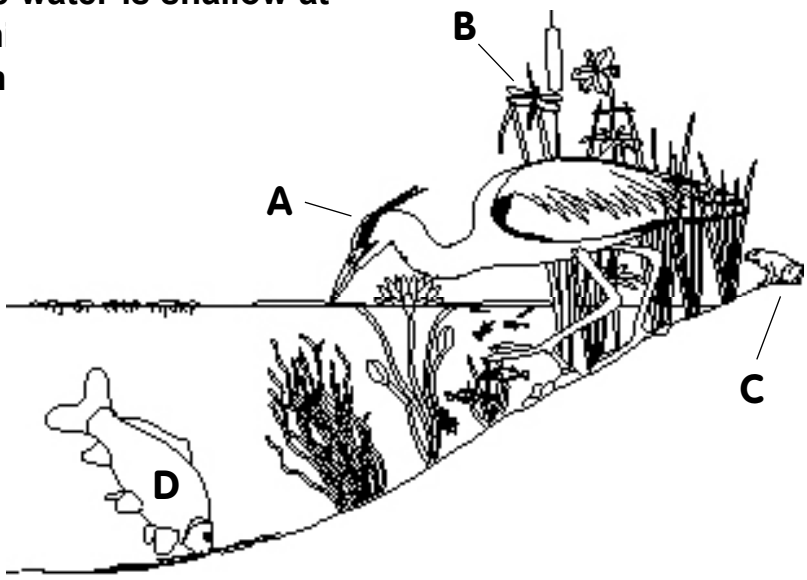
11

Name: ..... **Form:** .....

See **pages 24 and 25** of Living Things in their Environment

Ponds

Ponds contain still water. The water is shallow at the edge and deeper in the m opportunities for different kin



Q1. Name the animals labelled A, B and C.

A ✎ .....

B ✎ .....

C ✎ .....

Q2. Which of the animals labelled A to D spend their early lives in the pond?

✎ .....

Q3. (i) What is the food of animal D? (ii) Make a food chain using animal D and one other animal in the diagram.

(i) ✎ .....

(ii) ✎ .....

✎ .....

Q4. (i) Label a water lily plant with an L. (ii) Write down one way in which a water lily is adapted to life in a pond.

(ii) ✎ .....

Q5. What makes pond water green?

✎ .....

Q6. If you take a plant out of the pond it collapses. Why is this?

✎ .....

✎ .....

11 Teacher's sheet: Comprehension

See **pages 24 and 25** of Living Things in their Environment

Answers

Q1. A = heron, B = dragonfly, C = frog.

Q2. B – dragonfly, C – frog, D – fish.

Q3. (i) Worms and insects; (ii) Decaying material ➔ worms ➔ fish ➔ heron; or decaying material ➔ insects ➔ fish ➔ heron.

Q4. (i) The water lily plant is below the heron's neck; (ii) It has floating leaves.

Q5. Large numbers of algae.

Q6. It does not have a strong stem as it is adapted to the water giving support.

Introduction

Ponds are exciting places and you may want the children to visit a pond before they begin a formal study. If you do, make sure that your visit is in accordance with school policies. The children could collect some pond life, such as water weeds and snails, for the classroom aquarium tank. They could study the pond life while they are working through the spread and the practical work, then return to the pond on a second visit, to look at the pond again in the light of what they have learned.

Alternatively, if the children have performed Practicals 6A and 6B, you may like to remind them of the work now.

Practical work

11A: Testing model algae

Integrating the practical work

You may introduce the practical work when the children have studied plants in a pond and looked at picture 2 on page 25.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Rivers' on pages 26–27, 'Rock pools' on pages 28–29 and 'Thoughtless changes' on pages 36–37.

Background

The water flea is a crustacean. It is related to crabs and lobsters. It can be seen by the naked eye. It swims jerkily by moving its antenna. Two other small crustaceans may be seen in pond water. One is called Cyclops. It is carrot-shaped with two long antennae on top and may have a pair of egg bags lower down. The other is a tiny bean-shaped animal called an ostracod which may be seen swimming around algae filaments.

Some algae from tiny, slimy threads called filaments. Some algae exist as single, round bodies with spines.

11A

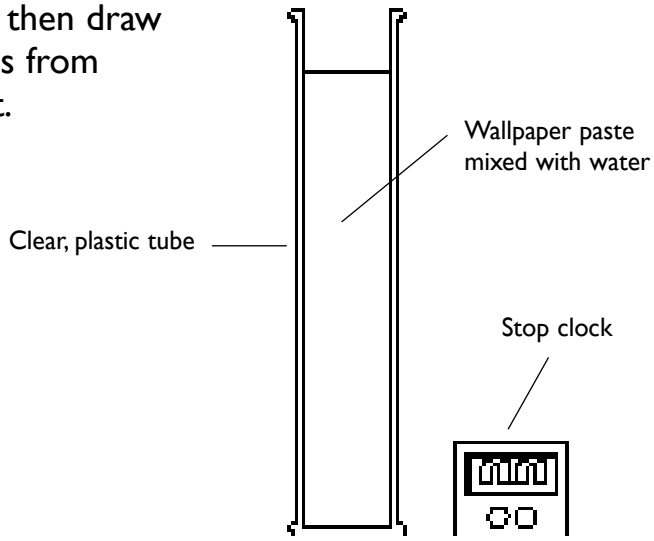
Name: ..... **Form:** .....

See **pages 24 and 25** of Living Things in their Environment

Practical: Testing model algae

1. Make four small balls of Plasticine, then draw out two spines from one, three spines from another and four spines from the last.

Plasticine models to test



2. You are going to drop each model down a tube of wallpaper paste mixed with water and time how long it takes to sink.

3. Decide how many times you are going to try the test with each model.

4. Make a table to record your results, like the one below. On the first line, below 'Time taken to sink', write in 'Test 1', 'Test 2', etc – up to the number of tests you decided upon.

No. of spines	Time taken to sink
One	
Two	
Three	
Four	

5. Now carry out your tests and fill in the table as you go along.

6. What do the results show?

✎ .....

✎ .....

11A Teacher's sheet: Practical

See **pages 24 and 25** of Living Things in their Environment

Resources

Plasticine, long clear plastic tube with stopper, non-allergic wallpaper paste, water, stop clock.

Introducing the work

Show the children picture 2 on page 25 and ask them to notice the spines on the algae. Tell the children that when scientists notice something striking like the algae spines they try and find out why they are there. As algae are so small and difficult to handle, larger models can be made to investigate the effect of the spines on the algae.

Outcomes

The children can:

- Use simple equipment appropriately and safely.
- Make a table and record results in it.
- Use measurements to draw conclusions.

Background

Algae used to be classed as a plant group but are now placed in a separate group with single-celled animals, called the Protoctista.

The spines increase the surface area of the algae and as they fall through the water the spines slow them down. This is particularly useful, for if the algae sink into deep water they will not receive enough light to make food and survive. By sinking slowly the algae have a greater chance of being swept upwards by currents in a pond or lake.

The balls from which each model is made should have a weight of 0.5 grammes. The children should find that as the number of spines is increased the models sink more slowly.

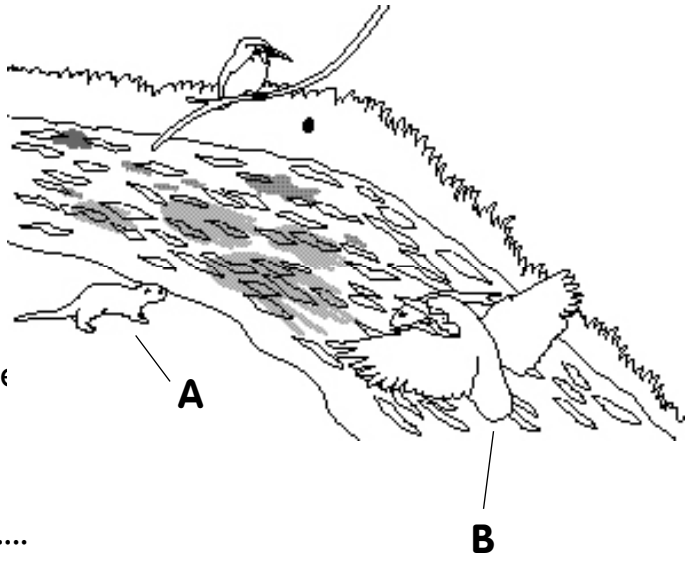
12

Name: ..... **Form:** .....

See **pages 26 and 27** of Living Things in their Environment

Rivers

Rivers often begin as fast-flowing streams with stony beds, then get slower and flow over muddy beds as they near the sea. As a result, rivers contain many different types of life.



Q1. (i) What is animal A? (ii) State three ways in which its body is adapted to its way of life.

(i) ✎ .....

(ii) ✎ .....

✎ .....

Q2. (i) What is animal B? (ii) How is its beak adapted to catching its food?

(i) ✎ .....

(ii) ✎ .....

Q3. Why are there few plants in the upper part of a river?

✎ .....

✎ .....

Q4. (i) An insect larva feeds on a leaf and then is eaten by a small bream. Write a food chain from this information. (ii) Add another animal to the food chain.

(i) ✎ .....

(ii) ✎ .....

Q5. How is the tidal part of a river different from the middle reaches?

✎ .....

✎ .....

12 Teacher's sheet: Comprehension

See **pages 26 and 27** of Living Things in their Environment

Answers

Q1. (i) Otter; (ii) Webbed feet, waterproof coat, sharp claws and teeth to catch fish, closes its ears to keep water out.

Q2. (i) Kingfisher; (ii) Beak is strong and pointed for stabbing fish.

Q3. Because the water is fast flowing and there is a rocky bed which does not allow roots to grow.

Q4. (i) leaf ➔ insect larva ➔ bream.

(ii) leaf ➔ insect larva ➔ bream ➔ otter (or kingfisher or heron).

Q5. It has mudflats and sandbanks which contain large numbers of animals. Large numbers of plants grow there. The water is salty.

Introduction

If the children have studied the spread on 'Ponds', ask them how the water in a river is different from that in the pond. Look for an answer about the water flowing, then ask how this could affect plants and animals. Look for answers about being swept away but also be prepared for anecdotes about paddling in rivers where the stones were covered in slimy algae and wriggly creatures on the underside of stones. Also look for answers about fish living in rivers.

Practical work

12A: How do liverworts grow?

Integrating the practical work

When the children have completed the spread, tell them that the damp areas on the river bank caused by splashing water and humid air and by water evaporating from the river surface create an ideal habitat for a very primitive form of plant which has existed on the Earth for hundreds of millions of years.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Thoughtless changes' on pages 36–37.

Background

The three parts of the river form three different river habitats. In the upper part, the water is very cold. This allows it to take up more oxygen as it splashes over the rocks. The animals that live here, such as mayfly and stonefly nymphs, are very sensitive to a high oxygen concentration and would perish if they were swept lower down to where the oxygen level is lower. The animals here are adapted to clinging to rocks and feeding on items that fall into the river. Some caddis fly larvae spin nets to catch small food particles as they are carried along with the current. The dipper is capable of walking underwater to feed.

In the middle part, the water is warmer and holds less oxygen. Plants that grow here are adapted to withstand the currents. They have strong roots which grip the bank. Those plants immersed in the water have flexible stems that move with the water currents and leaves which overlap, and point in the direction away from the current source, so they are not pulled off the stem.

In the tidal part of the river the water is somewhat salty and brackish. Plants and animals that live here must be adapted to the brackish conditions. Animals swept here from higher up the river would die.

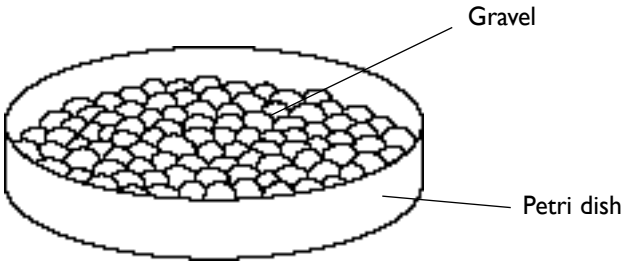
12A

Name: ..... **Form:** .....

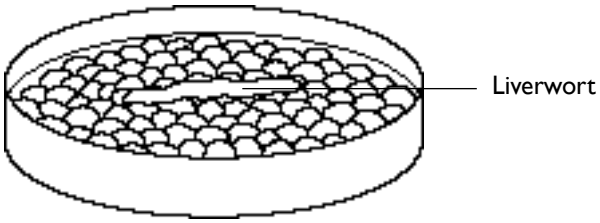
See **pages 26 and 27** of Living Things in their Environment

Practical: How do liverworts grow?

1. Put some aquarium gravel in a Petri dish.



2. Add some water but do not let it cover the stones.



3. Put a piece of liverwort in the centre of the dish on the gravel.

4. Put the lid on the dish. Look down on the liverwort and draw its outline on the lid.

5. Put the dish in a warm, light place and every week check its growth and draw its new outline on the lid in a different colour.

6. Describe here how the liverwort changes over time.

✎ .....

✎ .....

✎ .....

7. Plan an investigation to find out how much water a liverwort needs to stay healthy.

✎ .....

✎ .....

✎ .....

12A Teacher's sheet: Practical

See **pages 26 and 27** of Living Things in their Environment

Resources

Liverworts from river bank, damp wall or pavement, petri dish, felt-tip pen or crayon, gravel.

Introducing the work

Show the children a liverwort. Tell them that it is so primitive it does not have roots, stems or leaves. It just has a green, strap-like body with strands like roots growing out underneath it. It does not produce flowers, but instead grows stalks which release microscopic spores into the air. Tell the children that this type of plant was one of the first types of plants to develop on land hundreds of millions of years ago (long before dinosaurs) and has still kept its simple body form.

Outcomes

The children can:

- Use simple equipment appropriately and safely.
- Use diagrams to record results.
- Plan and carry out a fair test.

Background

Liverworts grow in many damp places. They can be found growing between paving flags and on damp walls, in addition to growing on river banks. They form a mat of green straps, or 'tongues'. The correct name for each 'tongue' is a thallus. Separate them into straps about 2 to 3cm long by 1cm wide for this practical.

The outline drawn by the felt-tip pen or crayon should not be thick, as the growth of the liverwort will be gradual. The liverwort may produce bright green swellings on its sides which develop into new straps.

13

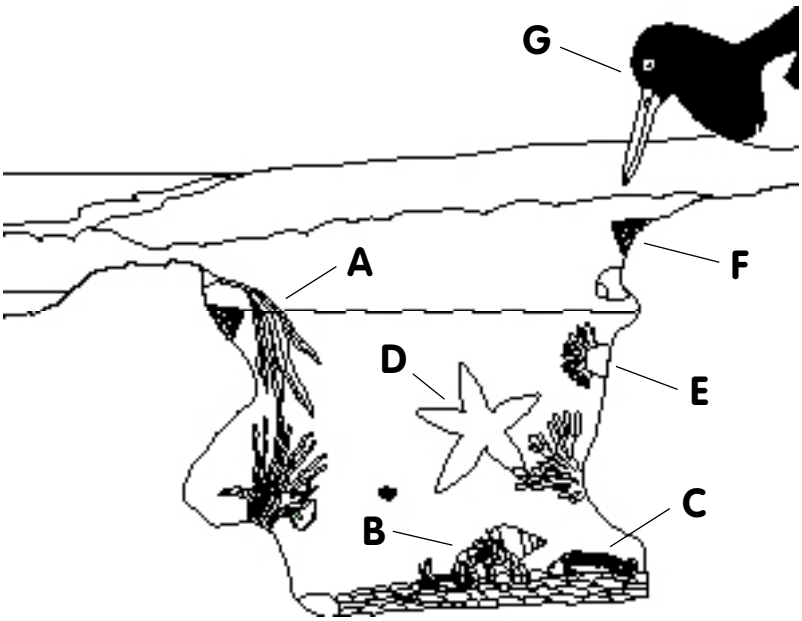
Name: ..... **Form:** .....

See **pages 28 and 29** of Living Things in their Environment

Rock pools

Some animals can live in rock pools, even though they are battered by waves, if they are adapted in the right way.

Q1. Name the living things labelled A to G.



A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

E ✎ .....

F ✎ .....

G ✎ .....

Q2. What does A give to the water that helps the other living things survive?

✎ .....

Q3. What do the other living things give to the water that helps A survive?

✎ .....

Q4. How often is the rock pool covered with sea water?

✎ .....

Q5. State two ways in which F is adapted for life on a rocky shore.

✎ .....

✎ .....

✎ .....

✎ .....

Q6. Which living thing is living in the remains of a dead animal? ✎ .....

13 Teacher's sheet: Comprehension

See **pages 28 and 29** of Living Things in their Environment

Answers

Q1. **A = seaweed, B = hermit crab, C = blenny, D = starfish, E = sea anemone, F = limpet, G = oystercatcher.**

Q2. **Oxygen.**

Q3. **Their wastes.**

Q4. **Twice a day.**

Q5. **1 = Streamlined shell to stop breaking waves pulling it off.**

2 = Thick shell which does not crack when hit by pebbles in waves.

Q6. **B, the hermit crab.**

Introduction

You may like to introduce this topic by first considering life in the sea. You could show the children a video about a coral reef, or about exploring the sea floor, to show how the ocean world is very different from life in freshwater and on land. Tell the children that a rock pool is a place on the very edge of the ocean and as the tide goes in and out the living things that survive there need special adaptations to the unusual conditions which are found there.

Practical work

13A: Rock pools and salt water

Integrating the practical work

When the children have completed the spread they can make their investigations in the practical work.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Ponds' on pages 24–25.

Background

Seaweeds are not flowering plants. They are large algae. They do not have roots, but a root-like structure called a holdfast, which secures the seaweed to the rock. They do not have leaves. The flat, green structures are called fronds. The bladderwrack is a seaweed which is adapted to keeping its fronds in the upper, well-lit water by using air bladders which makes the fronds float.

The shore can be divided into different regions according to how long it is exposed between tides. Organisms found on the lower shore cannot survive long periods of being out of water, while organisms on the upper shore can survive for many hours before being immersed in sea water again.

The height of the tide varies throughout each month. The lowest tides of the month are called neap tides and the highest are called spring tides. The height of the tides is controlled by the position of the Moon in its orbit around the Earth.

13A

Name: ..... **Form:** .....

See **pages 28 and 29** of Living Things in their Environment

Practical: Rock pools and salt water

Rock pools

1. Set up a selection of dishes, bowls and tanks in a sunny and warm position. These are your rock pools.

2. Fill each pool nearly to the brim. Record how much water you add to each 'rock pool'.

3. Take the temperature of each rock pool and record it every half hour. On the back of this worksheet, or on a separate piece of paper, make a table for your results.

4. Write down your prediction for how the temperature of the 'pools' will change during the day.

✎ .....

5. After several hours, compare your results with your prediction.

Growing plants in salt water

6. Could cress live where the water is salty? Plan an investigation to show that it can or cannot live in salty conditions.

7. Write down what you will need.

✎ .....

✎ .....

8. Write down what you will do.

✎ .....

✎ .....

✎ .....

9. Make a table on a separate sheet of paper.

10. Carry out the investigation and prepare a full report of your findings.

13A Teacher's sheet: Practical

See **pages 28 and 29** of Living Things in their Environment

Resources

Selection of dishes and bowls – some small and some very large, thermometer, cress seedlings, measuring cylinder, salt.

Introducing the work

Introduce the practical work on rock pools by telling the children that in the ocean the temperature of the water stays steady for long periods and only changes slowly. This is because the huge amount of water needs a very large amount of heat energy to make its temperature change. Then ask what will happen if sea water is trapped in small amounts like those in rock pools?

Introduce the practical work on growing plants in salt water by asking the question: Does salty water affect land plants like cress?

Outcomes

The children can:

- Make systematic measurements.
- Make a prediction and test it.
- Make a table and record results in it.
- Plan and carry out an investigation.

Background

The organisms which live in rock pools have to be tolerant of a wide range of temperatures, and of rapid changes in temperature. As the water evaporates from a rock pool during the course of exposure, the concentration of the salt in the water increases and the organisms have to be tolerant of this too.

The table below can be used in the rock pool investigation.

Some plants which live at the top of the shore, such as the sea holly, can tolerate being splashed with salty water and salty water entering the soil.

Rock pool	Volume cm^3	Temp at 10am	Temp at 10.30am	Temp at 11am	Temp at 11.30am	Temp at Midday	Temp at 1.30pm	Temp at 2pm

14

Name: ..... **Form:** .....

See **pages 30 and 31** of Living Things in their Environment

Mountains

Mountains have cool summers and harsh, snowy winters. They are places where only the specially adapted can survive.

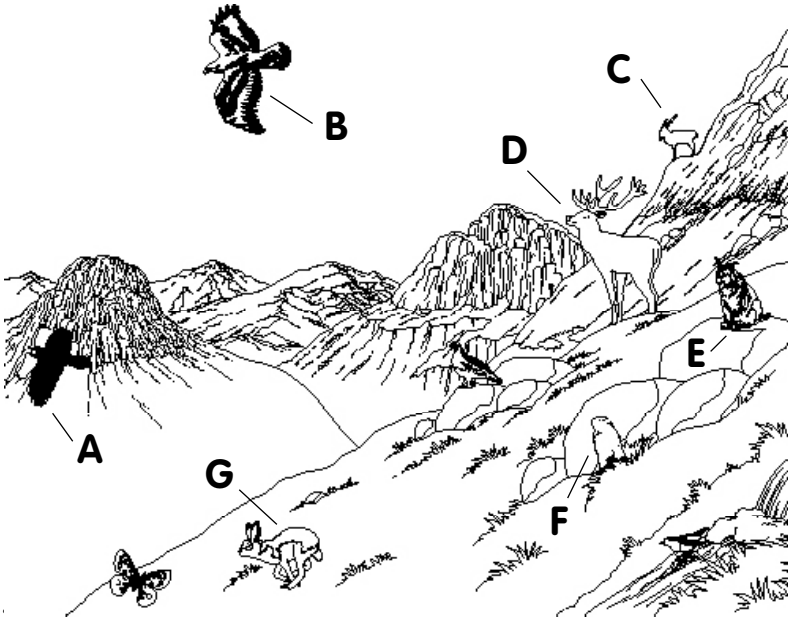
Q1. Shade in the areas where you may find trees on the mountains.

Q2. Name two plants which grow above the tree line.

1 ✎ .....

2 ✎ .....

Q3. Name the animals labelled A to G.



A ✎ .....

B ✎ ..... C ✎ .....

D ✎ ..... E ✎ .....

F ✎ ..... G ✎ .....

Q4. The ptarmigan is a mountain bird which changes colour during the year.

(i) Why does it do this? (ii) How does its colour change from winter to summer?

(iii) Name another animal in the picture which changes colour like the ptarmigan.

(i) ✎ .....

(ii) ✎ .....

(iii) ✎ .....

Q5. When winter comes, what does animal C do?

✎ .....

Q6. When winter comes, what does animal F do?

✎ .....

14 Teacher's sheet: Comprehension

See **pages 30 and 31** of *Living Things in their Environment*

Answers

Q1. In the valley.

Q2. Heather, edelweiss, sedges, mosses, hardy grasses, lichens.

Q3. A = raven, B = golden eagle, C = mountain goat, D = red deer, E = lynx, F = marmot, G = mountain hare.

Q4. (i) It changes colour to camouflage itself so it is not eaten by predators.

(ii) It changes from white to brown.

(iii) G, mountain hare.

Q5. It migrates to the lower part of the mountain.

Q6. It hibernates.

Introduction

You could begin by reviewing what the children know about mountains and mountain life. You may find that it is useful to develop the discussion by showing a video about mountaineering which shows the cold, windy and inhospitable conditions. In contrast, you could also show a video of people who live in the mountains and compare how their lives are different from people who live at lower altitudes. This should set the scene for looking at how plants and animals survive in mountain conditions.

Practical work

14A: Comparing soils

Integrating the practical work

If you have used the suggested introduction, then turned to pages 30 and 31 in the student book, you could let the children look at the pictures of the plants and animals and let them read the first paragraph, which ends by describing mountain soil. At this point, introduce the practical work to further show how a mountain environment is different from environments at a lower level.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Finding out where plants live' on pages 40–41 and 'In the soil' on pages 44–45.

Background

Lichens are plants which are found on mountains and also at much lower altitudes. You may even find some growing on walls around the school. Lichens are formed by a symbiotic relationship between a fungus and a type of algae. The fungus grips the rocky surface and supports the algae, which makes food both for themselves and the fungus.

14A

Name: ..... **Form:** .....

See **pages 30 and 31** of Living Things in their Environment

Practical: Comparing soils

1. Look at soil A and soil B which your teacher has given you. Describe how they are similar and how they are different.

✎ .....

✎ .....

✎ .....

2. In which soil do you think most animals could live? Explain your answer.

✎ .....

✎ .....

✎ .....

3. Which soil do you think would hold on to the most water when a shower of rain fell on it? Explain your answer.

✎ .....

✎ .....

✎ .....

4. Plan an investigation to test your answer.

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

5. Carry out your investigation and prepare a report, including a table of your results, on a separate sheet.

14A Teacher's sheet: Practical

See **pages 30 and 31** of Living Things in their Environment

Resources

Small gravel, coarse sand, fine sand, humus such as peat or peat substitute, a loam either from local soil or a potting compost, filter funnel, stop clock, pot with drainage holes.

Introducing the work

Place some gravel, coarse sand, fine sand and some humus on your desk and tell the children that you are going to make mountain soil. Mix the ingredients together to produce a brown, gravelly, gritty substance which only shows a slight trace of humus. Show the children a rich loam and tell them that they are going to compare the soils.

Outcomes

The children can:

- Make written observations.
- Use scientific knowledge to explain predictions.
- Plan and carry out a fair test.

Background

Soils are produced by the weathering of rocks and the development of humus from dead plants and animals. On a mountain the rocky surfaces are weathered and great deal of rocky fragments are produced. The smaller fragments are washed away more easily that the larger pieces. The climatic conditions restrict plant growth and this in turn leads to only small amounts of humus being made. At lower levels the soil contains a much higher proportion of small rock particles and as the climatic conditions are more favourable to life there is a more humus in lowland soils.

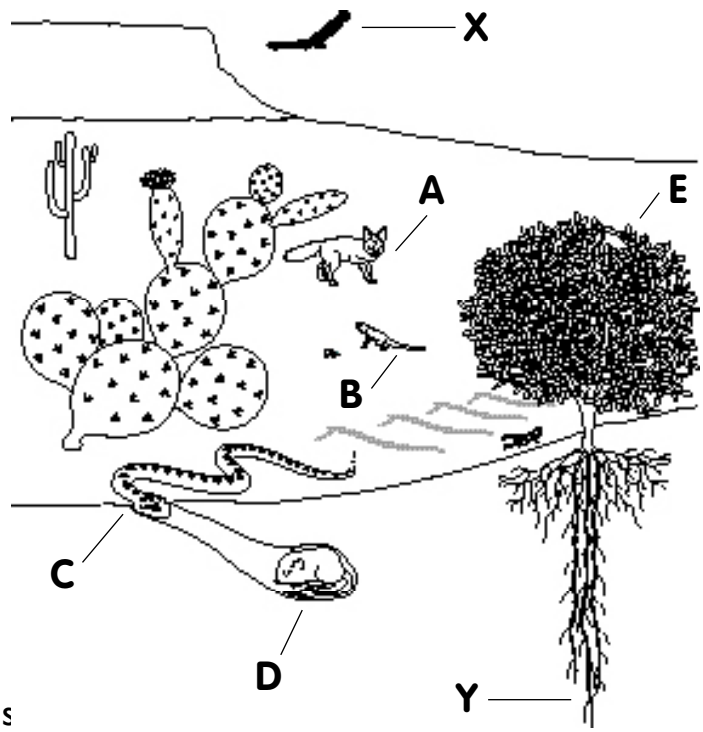
15

Name: ..... **Form:** .....

See **pages 32 and 33** of Living Things in their Environment

Deserts

Deserts are mainly hot places with very little rainfall. Very few plants and animals can survive such difficult conditions.



Q1. Name the animals labelled A to D.

A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

Q2. One of the animals feeds on seeds

Make two food chains using seeds, this animal and other animals in the diagram.

✎ .....

✎ .....

Q3. Why is the bird X flying so high?

✎ .....

Q4. (i) What is the name of plant E? (ii) What is the part labelled Y?

(i) ✎ ..... (ii) ✎ .....

Q5. Where do cacti store water?

✎ .....

Q6. How is a camel adapted to living in the desert?

✎ .....

✎ .....

✎ .....

15 Teacher's sheet: Comprehension

See **pages 32 and 33** of Living Things in their Environment

Answers

Q1. A = desert fox, B = lizard, C = sidewinder snake, D = kangaroo rat.

Q2. Seeds ➔ kangaroo rat ➔ sidewinder snake.

Seeds ➔ kangaroo rat ➔ desert fox.

Q3. To spot its prey or dead animals.

Q4. (i) Creosote bush; (ii) Tap root.

Q5. In their stems.

Q6. It can store water in its body and survive when it has lost up to a third of the stored water. It can store fat which allows it to go without food for weeks. It has thick fur to protect it from the heat. It has pad-like hooves for travelling across soft ground.

Introduction

Children have a good idea about what a desert is, so build on this by comparing the climate of a desert with that of the local climate. Show the children the annual change in temperature and rainfall in your locality and compare this to the annual change in temperature and rainfall for a desert such as the Sahara. On our web site **www.CurriculumVisions.com**, click on world weather, then weather stations, then make a choice. You could also find the current time of year and compare how conditions would be different in the desert.

Practical work

15A: Desert feet

Integrating the practical work

Introduce the children to the practical work when they have read about the camel.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Finding out where plants live' on pages 40–41.

Background

It is important to remind the children that deserts may be very hot during the day but they are also cold at night, so the daily range of temperature is also greater than here. This is due to the lack of cloud cover. There is no cloud to absorb some of the heat in the Sun's rays in the day and no cloud blanket at night to stop heat rays from the Earth passing out into space.

15A

Name: ..... **Form:** .....

See **pages 32 and 33** of Living Things in their Environment

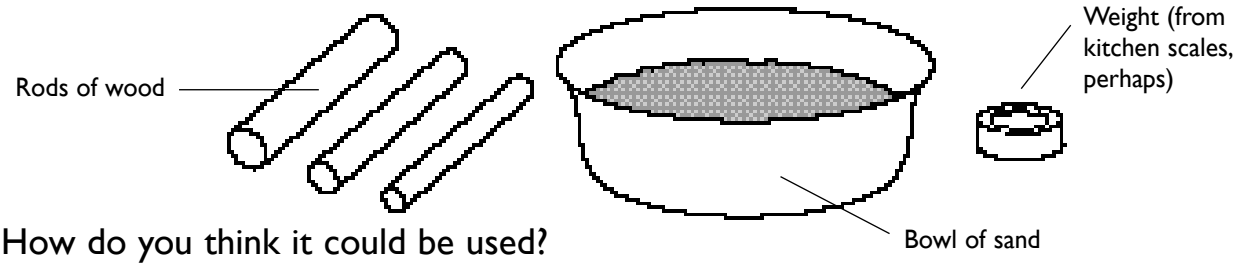
Practical: Desert feet

1. Think about this question.

Does the size of the foot really affect the way the body sinks into the sand?

You must plan an investigation to answer it.

2. Here is some equipment that could be used to test the idea.



How do you think it could be used?

✎ .....

✎ .....

✎ .....

✎ .....

3. Plan your own investigation. You can use only the equipment in the diagram, some of the equipment shown and some other equipment or a different set of equipment.

✎ .....

✎ .....

✎ .....

✎ .....

4. Construct a table for your results on a separate piece of paper and try your plan.

5. What do the results show?

✎ .....

✎ .....

15A Teacher's sheet: Practical

See **pages 32 and 33** of Living Things in their Environment

Resources

Rods of wood of different thicknesses, a half kilogram mass or similar, sand.

Introducing the work

Remind the children that the camel has pad-like hooves which make it possible for it to travel across soft sand. Tell the children that the pads cover a large area and this suggests that having a large area in contact with the sand will keep the camel from sinking into the sand. Ask the children how they could use model feet to make an investigation about sinking in sand and surface area. Record their suggestions on the board, then issue the sheet to show how the model feet can be made of different sized rods.

Outcomes

The children can:

- Use simple equipment appropriately and safely.
- Plan and carry out an investigation.
- Make a table and record results in it.
- Draw conclusions from observations and measurements.

Background

A force acting over an area exerts a pressure on that area. The force of the weight of the camel is transmitted to the sand through its feet. If the camel had small feet, a high pressure would be generated which would displace some of the sand and make the feet sink in. By having a wide surface area, the pressure on the sand is reduced so that the feet do not sink.

16

Name: ..... **Form:** .....

See **pages 34 and 35** of Living Things in their Environment

Meadows and fields

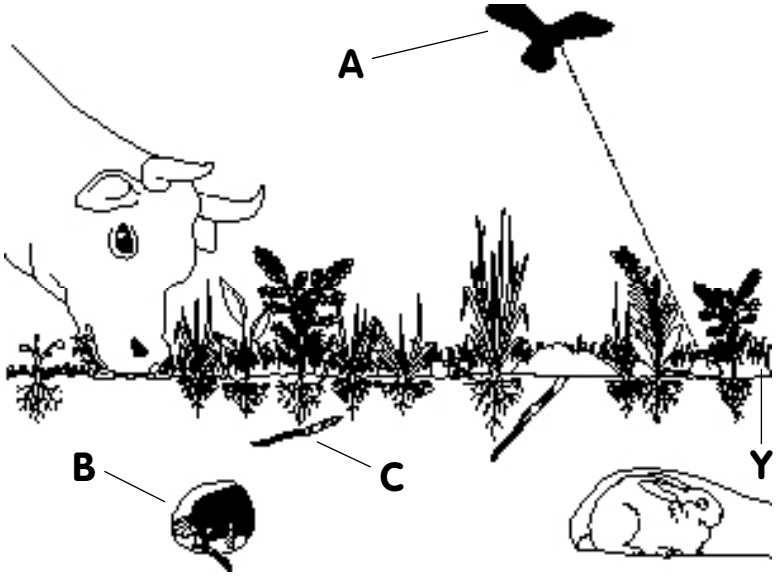
Many habitats have been changed by people. One of the most common is the meadow. It exists because of the long-term care, or stewardship, of the farmer.

Q1. Name the animals labelled A, B and C.

A ✎ .....

B ✎ .....

C ✎ .....



Q2. Make a food chain which uses animals B and C.

✎ .....

✎ .....

Q3. (i) Name two ways in which animal B is adapted to its way of life.
(ii) Why does it not live in a wood?

(i) ✎ .....

✎ .....

(ii) ✎ .....

Q4. Why do many different types of plants grow in meadows?

✎ .....

✎ .....

Q5. (i) Put an X where a vole may be found. (ii) Why would it be found in this place?

(ii) ✎ .....

Q6. Why can plant Y survive in a meadow in which animals are grazing?

✎ .....

✎ .....

16 Teacher's sheet: Comprehension

See **pages 34 and 35** of *Living Things in their Environment*

Answers

Q1. A = kestrel, B = mole, C = earthworm.

Q2. Dead leaves ➔ earthworm ➔ mole.

Q3. (i) It has a body which is shaped for moving through the soil, strong short arms, spade-like paws, sharp claws;
(ii) Tree roots would get in its way.

Q4. There are no trees to shade them and stop them making food.

Q5. (i) The tunnel used by the rabbit;
(ii) It is hiding from hunting birds.

Q6. It can sprout a new shoot from the base of its stem.

Introduction

The major feature of a meadow is its range of grasses, so you may like to begin by showing the children a clump of grass (complete with its soil). Let them see that it is a tangle of grass roots and stems with leaves and flower stalks growing upwards. You may develop the idea of the meadow as a food producer for farm animals by cutting your grass with a pair of scissors, until it is close cropped, and letting the children weigh the cuttings. If you have done Practical 7B 'How much food do animals eat', you may like to tie this work in.

Water the grass and leave it in a sunny place. Let the children look for signs of re-growth, then cut and weigh the grass again to find out how productive it is.

As you are setting up the grass in the practical above, introduce the children to the concept of stewardship, in which people change the land for their own use but also have a responsibility not to destroy wildlife. You may mention that in the past, thousands of miles of hedgerows were pulled up to make large fields for growing crops and that both wild plants and animals were destroyed by the loss of habitat. You can add that many farmers today leave a part of their field as a wild place so that wildlife can survive.

Practical work

16A: Growing towards the light

Integrating the practical work

You may like the children to try the practical work after they have read about the many variety of plants on page 34 of the student book and looked at the photograph which shows the thick vegetation in a meadow.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Thoughtless changes' on pages 36–37 and 'Finding out where plants live' on pages 40–41.

Background

The grass plant is particularly useful for cultivating for grazing animals. The growing point of its shoot is below the reach of the grazers mouth so it cannot be damaged when the leaves and grass stalks are removed. The plant is not totally dependant on producing seeds for reproduction so if the flower stalks or seeds are eaten, it can still reproduce vegetatively by sending out side shoots called tillers. These grow out along the surface of the meadow, or just below it, and have side buds which develop new grass plants. The network of plants produced in this way becomes a sort of skeleton for the turf and helps hold the soil in place, thus preserving the habitat. The hard-wearing nature of the plant leaves prevents them from being shredded when grazing animals pass by and this, in turn, keeps the soil from being exposed and eroding.

16A

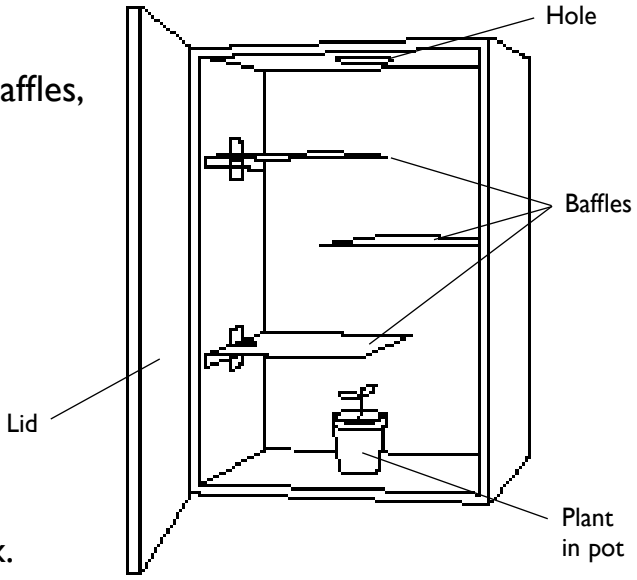
Name: ..... **Form:** .....

See **pages 34 and 35** of Living Things in their Environment

Practical: Growing towards the light

1. Take a box and paint it black inside.

2. Cut out pieces of cardboard to make baffles, paint them black and fit them in the box as the diagram shows.



3. Put a seedling in the bottom of the box.

4. Make a drawing of the inside of your box with the seedling.

5. Close the lid. The next day, look inside the box and draw the new position of the seedling. Put the date by the new position.

6. Repeat task 5 every day for a few days.

7. How successful is the seedling at finding light?

✎ .....

16A

Teacher's sheet: Practical

See **pages 34 and 35** of Living Things in their Environment

Resources

Shoe box with a hole in one end, cardboard, sticky tape, black paint, brush, pea or bean seedling in a pot.

Introducing the work

Ask the children to think about what it would be like for a seed germinating in a meadow when the grass has grown. They should think of the leaves overlapping above and keeping out the light. Give out the sheet and explain how the shoe box, with its baffles and dark interior, can simulate the conditions faced by a seedling growing up in a meadow which has thick vegetation.

Outcomes

The children can:

- Use equipment appropriately and safely.
- Use diagrams to record results.

Background

Plant shoots are sensitive to light. If there is only a small amount of illumination, the plant shoot grows towards it. Plants which are grown in shady places can be long and weak, while plants grown in the light are shorter and more sturdy. Once a seedling has found enough light for its leaves to produce the food it needs, it grows more sturdily and makes a strong plant.

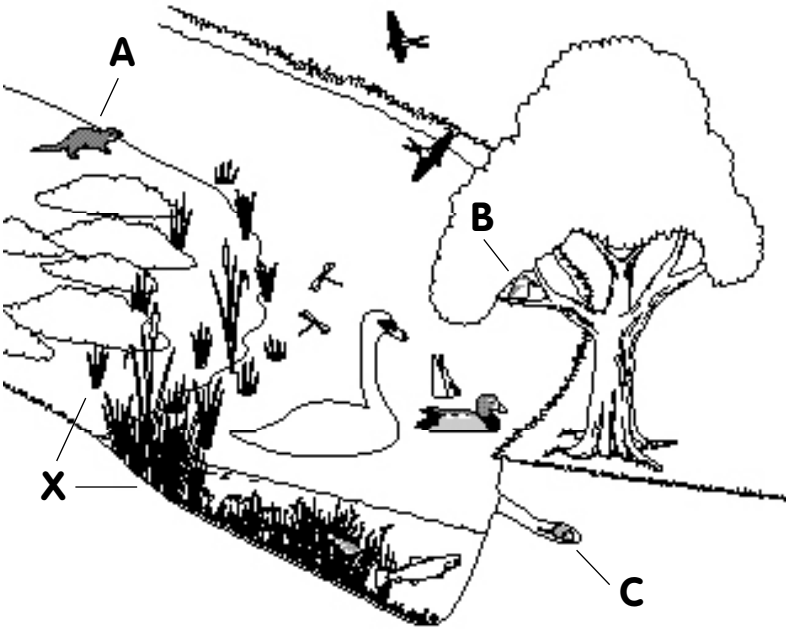
17

Name: ..... **Form:** .....

See **pages 36 and 37** of Living Things in their Environment

Thoughtless changes

When rivers are cleared out, the habitats for many living things may be lost. This is an example of poor stewardship.



Q1. (i) Name the living things labelled A to C.

A ✎ .....

B ✎ .....

C ✎ .....

(ii) Name two kinds of plant found in region X.

✎ ..... ✎ .....

(iii) What is happening at the part labelled C in the diagram?

✎ .....

Q2. Why may people want to change a river?

✎ .....

✎ .....

Q3. Name two things that engineers do to rivers to change them.

✎ ..... ✎ .....

Q4. How is wildlife affected when a river is changed?

✎ .....

✎ .....

✎ .....

✎ .....

17 Teacher's sheet: Comprehension

See **pages 36 and 37** of *Living Things in their Environment*

Answers

Q1. (i) A = otter, B = kingfisher, C = vole.
(ii) Rushes and reeds. (iii) The vole is digging a shelter in the river bank.

Q2. To stop floods, to use the river for boats, to use fertile land nearby for farming.

Q3. Straighten them, dredge them.

Q4. The shelter and the variety of places to live is reduced. There are fewer plants and animals of all kinds. Some plants and animals are lost completely. Missing links in the food chain can cause the food chain to collapse.

Introduction

To get children into the nature of this complex discussion, ask one child to stand up and be an oak tree. Ask another child to stand up and be a squirrel. Say that a squirrel eats acorns and put a length of yarn between them to represent the food chain. Using just one 'oak tree' child, set up the following two chains in a similar manner: oak, bark beetle, woodpecker; and oak, woodmouse, owl. Tell the class that you are chopping down the oak tree and ask the 'oak tree' child to sit down. Ask the class what will happen to the squirrel, bark beetle and woodmouse, and look for answers that they would die because they would have no food. Let each child sit down as its animal is pronounced dead. Follow this with asking about the woodpecker and the owl. When all the children have sat down, let them think about how destroying one living thing can affect others.

Practical work

17A: How do habitats compare?

Integrating the practical work

When the children have completed the spread, tell them that they can examine how people change the soil when they remove a woodland and plant a garden.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Improving the environment' on pages 38–39.

Background

The key to the destruction of a habitat is the destruction of the plants. They are at the beginning of all the food chains and also provide shelter and nest materials for animals. If the number of plants is reduced, the herbivorous animals will have to compete for food and some will starve to death. In this way the numbers of herbivores is reduced. This in turn causes starvation and death among the carnivores and their numbers are also reduced. Some animals can only eat a small range of food or just one type of food. If that is removed, that animal population also dies out. Food chains are also linked together to form food webs. An example of a food web is shown on page 16 in the student book. You may wish to point out that removing one organism from a food web has a 'knock on' effect on all the others. For example, if grass is destroyed, the rabbit population would also be destroyed and then the fox would have to eat more chickens.

17A

Name: ..... **Form:** .....

See **pages 36 and 37** of Living Things in their Environment

Practical: How do habitats compare?

1. Collect some soil and leaf litter from a woodland or hedge.

2. Collect some soil and leaf litter from a flower bed.

3. Examine each sample for animal life. Record below the animal life you find in each sample.

4. What do the results show?

✎ .....

✎ .....

5. How else could you compare the animal life in a wood or hedge with the animal life in a flower bed? Plan some investigations you could make and write about them here.

✎ .....

✎ .....

✎ .....

✎ .....

17A

Teacher's sheet: Practical

See **pages 36 and 37** of Living Things in their Environment

Resources

Woodland soil and associated leaf litter, soil and leaf litter (if any) from a flower bed (both samples taken from areas not frequented by dogs). White tray or newspapers, collecting jars, pooter (optional), magnifying glass.

Introducing the work

Remind the children of how the river was changed when it was straightened for human purposes. Tell the children that the main habitat in most of Britain before humans arrived was woodland. When humans arrived they cut down the woodland to make space for farms and towns. In time they made parks and gardens with flower beds. Tell the children that they are going to compare soil from a woodland with soil from a flower bed, and think about how the woodland habitat has been changed.

Outcomes

The children can:

- Make accurate observations.
- Record and display data.

Background

Flower beds are artificial habitats and in order to keep them tidy dead leaves are often removed. This in turn leads to a reduction in the leaf litter which is the home of some soil animals. In the wood, where the leaves are left to decay naturally, they form a home for many different kinds of animals.

Animals to look for in this practical work are centipedes, millipedes, ground beetles, woodlice, slugs, snails, spiders, harvestmen, earwigs and springtails. Springtails are very small insects which leap about by releasing a fork-like appendage under their abdomen. Although they may appear to leap like fleas, they do not feed on blood but on organic matter in the soil.

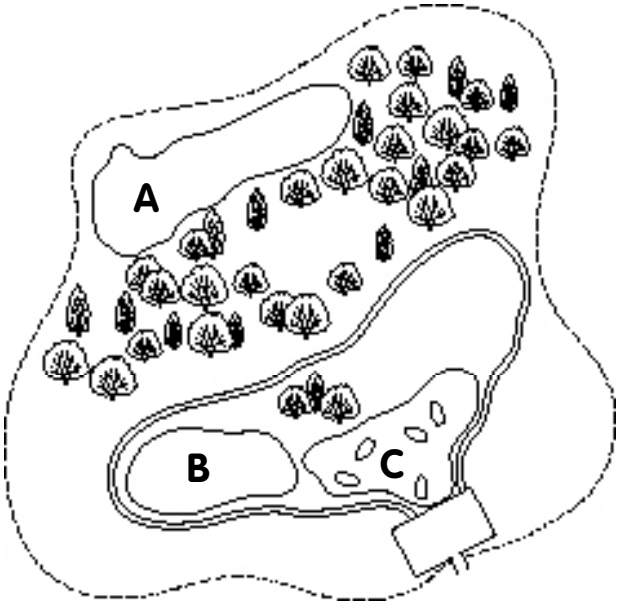
18

Name: ..... **Form:** .....

See **pages 38 and 39** of Living Things in their Environment

Improving the environment

By making country parks we can turn waste ground into places where many species can thrive. It is one example of many ways in which we can be more considerate for other living things while enjoying the world ourselves.



Q1. The diagram shows a country park with three kinds of lakes labelled A, B and C.

(i) Identify each type of lake.

A ✎ .....

B ✎ .....

C ✎ .....

(ii) Which lake has the most varied wildlife?

✎ .....

Q2. Name three locations of wasteland in a town or in the countryside.

✎ ..... ✎ ..... ✎ .....

Q3. What are most country parks built on? ✎ .....

Q4. Why does there need to be a variety of habitats in a country park?

✎ .....

✎ .....

Q5. When a lake is dug out, what other feature can be made in the country park?

✎ .....

Q6. How can paths in a country park help shy creatures?

✎ .....

✎ .....

✎ .....

18 Teacher's sheet: Comprehension

See **pages 38 and 39** of Living Things in their Environment

Answers

Q1. (i) A = wilderness lake, B = fishing lake,
C = boating lake.

(ii) A = wilderness lake.

Q2. Old factory sites, old coal mines, old gravel pits.

Q3. Reclaimed land.

Q4. To create different types of land for different species to thrive.

Q5. Hills.

Q6. People visiting the park keep to the paths and leave much of the land undisturbed so shy creatures can live there.

Introduction

Show the children an empty aquarium tank and tell them that you were thinking of keeping frogs in it. Ask them if the frogs would be happy to be just placed in the empty container, or should some other things be added. Draw out the children's knowledge of frogs and use it to establish that there needs to be damp soil and grass, stones to hide under and animals such as earthworms and slugs for the frogs to eat. Tell the children that they have worked in the same way as a country park manager when he or she is trying to attract wildlife.

Practical work

There is no practical worksheet for this work. The children could consider setting up an area of the school grounds as a wildlife area. They could simply plan what they would do if they had the resources or, if provision can be made, they could set up a real wildlife area.

Integrating the practical work

When the children have completed the spread ask them for a suitable site in the school grounds which could be set up as a wildlife area. Let the children debate the advantages and disadvantages of different sites.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Thoughtless changes' on pages 36–37.

Background

Frogs move away from ponds outside the breeding season but still need a damp habitat.

Probably the most noticable animals in a habitat are birds. People often make an effort to improve the habitat for their garden birds by putting out food, and perhaps also putting up a nest box.

If conditions around the school allow, you may wish to set up a feeding station. This could be a bird table or a nut cage. You could also set up a bird bath using a large, upturned lid.

You could also provide plants such as the buddleia, for butterflies, and a wide range of flowering plants for bees.

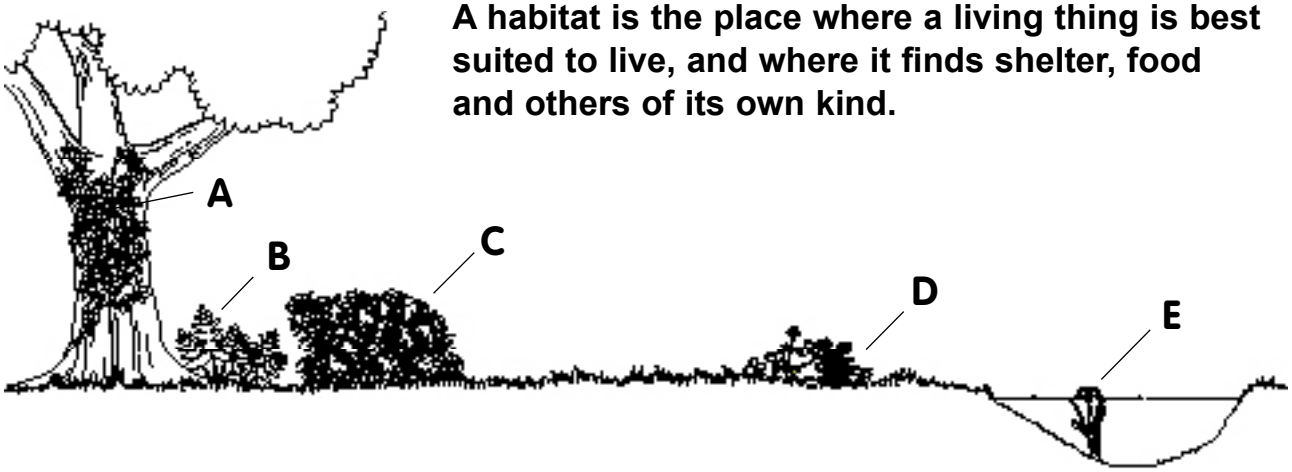
If space permits, a wild area could be set up, perhaps with a large rotting, moss-covered log as its focus. Rocks could be arranged so as to provide shelter for passing frogs and toads. Tussocks of grass could be planted to provide extra shelter and food for animals that live on or just below the ground.

19

Name: ..... **Form:** .....

See **pages 40 and 41** of Living Things in their Environment

Finding out where plants live



A habitat is the place where a living thing is best suited to live, and where it finds shelter, food and others of its own kind.

Q1. (i) Name the plants labelled A to E in the three habitats.

A ✎ ..... B ✎ ..... C ✎ .....

D ✎ ..... E ✎ .....

(ii) Shade in the shady habitat.

Q2. What is a habitat in which trees are found? ✎ .....

Q3. Name a watery habitat. ✎ .....

Q4. (i) Name two habitats of the dandelion.

✎ ..... ✎ .....

(ii) What do the two habitats have in common? ✎ .....

✎ .....

Q5. (i) Why does a water lily have floppy stalks?

✎ .....

(ii) What would happen to the stalks if the plant was brought onto the land?

Explain your answer.

✎ .....

✎ .....

✎ .....

19 Teacher's sheet: Comprehension

See **pages 40 and 41** of Living Things in their Environment

Answers

Q1. (i) A = ivy, B = fern, C = bramble, D = grass, buttercups, daisies and dandelions, E = water lily.

(ii) The area under the tree should be shaded (up to midway through the brambles).

Q2. Woodland.

Q3. Sea, pond, river, coral reef, etc.

Q4. (i) Playing field, garden, park. (ii) They are open places with lots of sunshine.

Q5. (i) They let the leaves bob up and down in the water. (ii) They would collapse because they do not have the strength to hold the plant up.

Introduction

Ask the children to imagine that they are plants and that they are growing out in the middle of a playing field. Ask them about the conditions they may have to endure in the course of a year. Look for answers about heat and cold, rain and wind, even snow and ice. Tell the children that the plants that live there are adapted to withstand all these changes, but some are less tolerant and can only be found in more sheltered places. People take plants for granted and do not really notice where they live. Many people probably think any plant can live anywhere.

Practical work

19A: Using a plant key

Integrating the practical work

After the children have read about where dandelions live, introduce the plant key and tell the children they are going to learn how to identify some other common plants by their flowers.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Habitats change through the seasons' on pages 22–23.

Background

It is important for the children to realise that a large habitat is made up of a collection of smaller habitats. For example, there are also clearings and rotten logs, which are smaller habitats within the woodland habitat.

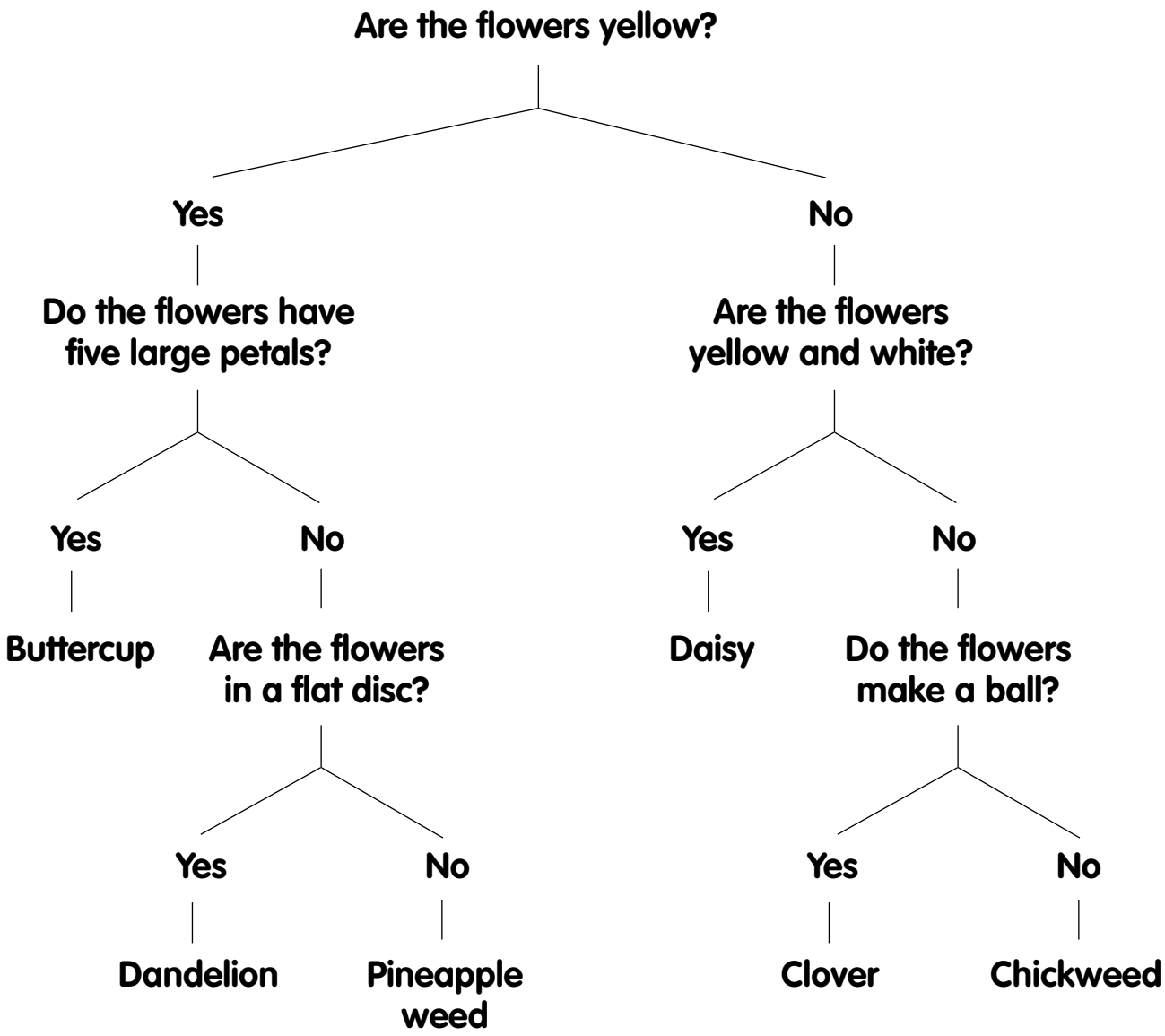
Habitats can change naturally. For example, when the trees at the edge of a wood grow out into a field, they change the open, sunlit habitat of the field into one of shade. In time this affects the plants that grow there. Plants needing a large amount of light fail to survive, while shade-loving plants from deeper in the wood spread out into the edge of the field. This type of slow change is happening all the time.

Name: ..... Form: .....

See **pages 40 and 41** of *Living Things in their Environment*

Practical: Using a plant key

1. Look at the plant key and make sure you know how it works.
2. Use the plant key to identify some of the plants growing outside.



3. On a separate sheet of paper write down the habitat of each plant you identify.
4. Do any plants share the same habitat? Name them and describe the habitat.
5. Do any plants live on their own in a habitat? Name them and describe the habitat.

19

Teacher's sheet: Practical

See **pages 40 and 41** of Living Things in their Environment

Resources

Supervised access to the school grounds, or a supervised walk around a park in accordance with school policies.

Introducing the work

You may wish to begin by asking the children if they can tell a buttercup from a daisy. When they answer, make a decision tree on the board. The first line could be: 'Is the flower yellow?' Under this, write 'Yes' and 'No'. Under 'Yes' write 'Buttercup' and under 'No' write 'Daisy'. Tell the children that this way of identifying living things is called a key and that large keys can be built up to identify more plants.

Outcomes

The children can:

- Use a key to identify some common plants.
- Describe the habitat of a plant.

Background

Some plants, such as the buttercup, produce a single flower on a stalk. Others, such as the dandelion, daisy and pineapple weed produce a large group of small flowers packed closely together to form a flower head.

Buttercup, daisy, dandelion and clover are very well known and you can probably also identify them from their leaves. The pineapple weed is less well known but is similar to a common weed called groundsel. However, it has a much larger and rounder head of small flowers. If the head is squashed, a pineapple scent is released. Chickweed is common in damp places. The white flowers are tiny and may sometimes be closed. The plant has a weak stem which straggles over the ground. You may think that its leaves and stems look a little like watercress, but the two plants are not related.

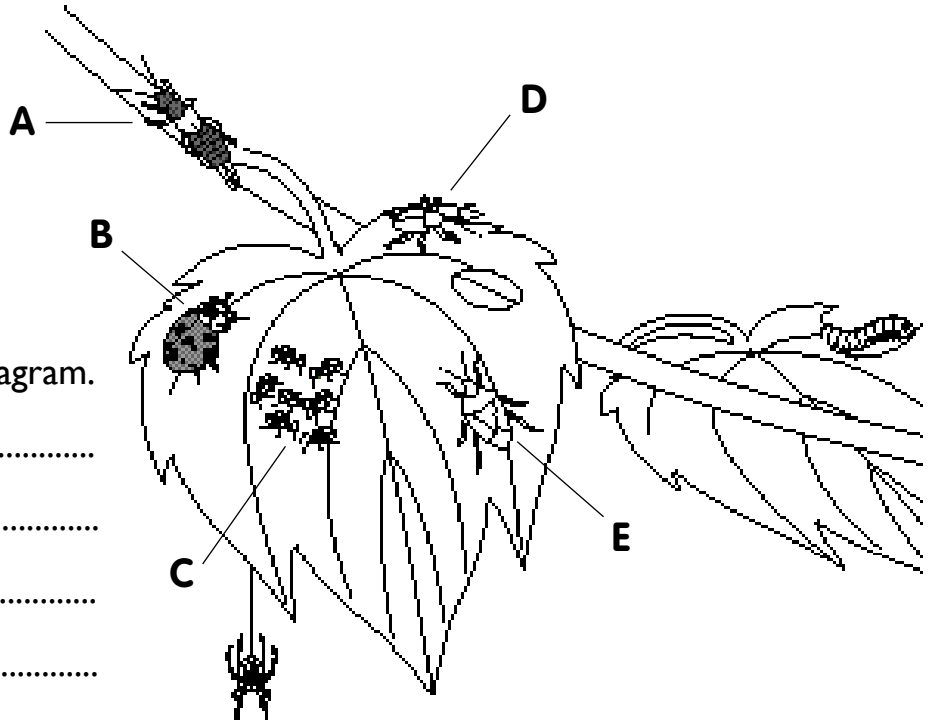
20

Name: ..... **Form:** .....

See **pages 42 and 43** of *Living Things in their Environment*

Investigating mini-habitats

The leaves of a tree or bush can be home to a wide variety of animals.



Q1. Name the animals labelled A to E in the diagram.

A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

E ✎ .....

Q2. Why are animals living on a branch difficult to see?

✎ .....

Q3. Which kind of animal sucks sap? ✎ .....

Q4. (i) What is a small, black, ball-shaped thing on a leaf called?

✎ .....

(ii) What made this object? ✎ .....

(iii) What is inside the object? ✎ .....

Q5. Name two animals that are hunters on the branch.

✎ ..... ✎ .....

Q6. Name two reasons why animals live on branches.

✎ .....

✎ .....

20 Teacher's sheet: Comprehension

See **pages 42 and 43** of *Living Things in their Environment*

Answers

Q1. A = earwig, B = ladybird, C = greenfly (aphid), D = weevil, E = leaf bug.

Q2. They are similar in colour to the leaves.

Q3. Aphid.

Q4. (i) A gall; (ii) A small wasp; (iii) Egg and larva of the wasp.

Q5. Ladybird, spider, bird.

Q6. Branches are sheltered. There is a source of food.

Introduction

If the children have done Practical 8A 'What is on the branches?' you may want to remind them of it now and say that the branches are a mini-habitat within the larger habitat of the tree. If the children have not done Practical 8A you might want them to try it after they have studied this spread.

Practical work

8A: What is on the branches?

Integrating the practical work

When the children have looked at pictures 1 and 2, ask them how they could perform an investigation on a tree or bush to discover the animals that are living on it. Write their suggestions on the board, then issue the Practical 8A worksheet so they can assess their scientific planning.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'A tree as a home' on pages 18–19.

Background

The insect group is divided into many smaller groups. On a branch you may find members of the beetle group. They have two pairs of wings, but one pair is made into wing cases which fold across the back and protect the more delicate wings (used for flying) underneath. The ladybird is easily seen because of its red and black wing cases. The weevil is a member of the beetle group.

Although the earwig looks a little like a beetle, it is in a group on its own. The sex of an earwig can be told by looking at the pincers on its tail. The male earwig has curved pincers and the female has straight pincers. Earwigs tend to fly at night.

The bug group is huge and contains small insects like bed bugs, and large insects like cicadas, which live in warmer climates and the children may have seen on holiday. Aphids also belong to the bug group. Bugs have two pairs of wings which fold across the back. The front pair of wings may be clear and used for flying, like the second pair of wings, or they may have hard parts and form a protective cover for the second pair of wings.

Moths and moth caterpillars may also be found on branches.

Each type of caterpillar can only survive on a small number of plants. Many caterpillars have died because they have been collected and given the wrong food plant, or even just grass! If caterpillars are to be kept and reared, it is important to note the plant they are feeding on and to provide a constant supply of suitable leaves.

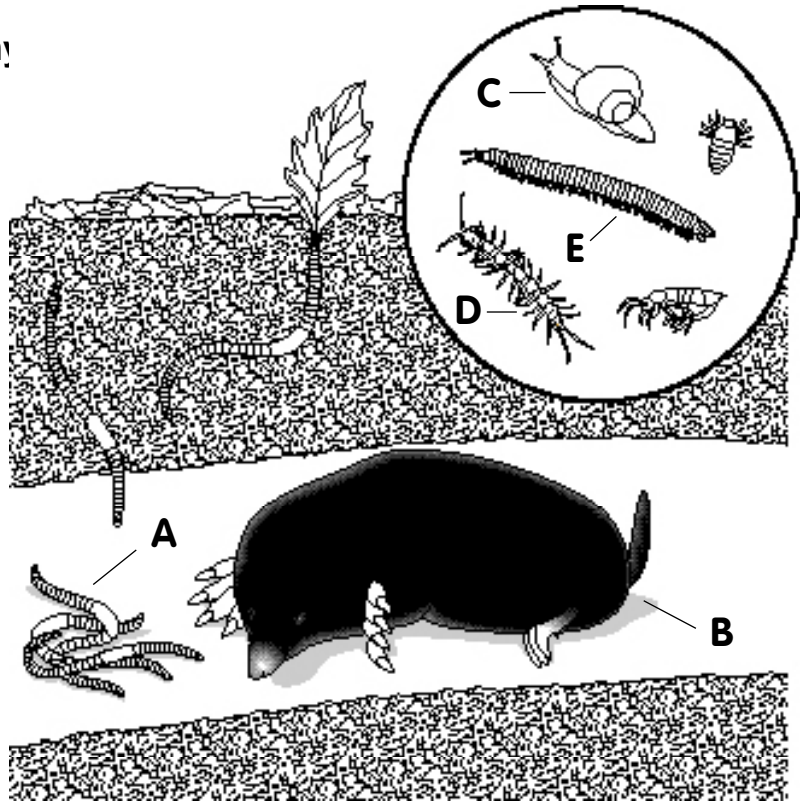
21

Name: ..... **Form:** .....

See **pages 44 and 45** of Living Things in their Environment

In the soil

A huge variety of life and many habitats can be found in the upper layers of the soil.



Q1. Name the animals labelled A to E.

A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

E ✎ .....

Q2. Name three things that soil animals could eat.

✎ ..... ✎ ..... ✎ .....

Q3. How do earthworms burrow through soil?

✎ .....

Q4. (i) In which part of the soil do earthworms live? ✎ .....

(ii) Why do they live there?

✎ .....

Q5. (i) What kind of animal is a springtail?

✎ .....

(ii) Where would you expect to find springtails in the soil? Explain your answer.

✎ .....

✎ .....

✎ .....

21 Teacher's sheet: Comprehension

See **pages 44 and 45** of Living Things in their Environment

Answers

Q1. A = earthworms, B = mole, C = snail, D = centipede, E = millipede.

Q2. Plant roots, dead leaves, seeds, dead animals. Also moles eat earthworms.

Q3. By eating the soil.

Q4. (i) The topsoil; (ii) There is more food there.

Q5. (i) A tiny, wingless insect; (ii) In moist, dead leaves. The soft, moist leaves are easier to eat than dry leaves.

Introduction

Tell the children that when they go outside onto a lawn, or into a wood, they are actually walking over a habitat. Ask the children what they think this habitat is and look for an answer about soil. Ask the children what animals they think live in the soil and write the names on the board, then check off their answers as they read through the spread.

Practical work

21A: Identifying soil life

Integrating the practical work

You may like to introduce the practical work after the children have read about underground homes.

Extension

See page 132 of this Teacher's Guide.

Links

This spread links with 'Mountains' on pages 30–31 and 'Meadows and fields' on pages 34–35.

Background

Earthworms belong to a group of worms called Annelids. They have a segmented body. Each segment contains more or less identical parts of the main internal organs, which join up through the internal walls separating the segments. The earthworm has four pairs of hairs, or bristles, on the underside of its body, which help it to move.

The earthworm moves by extending some of its segments while contracting others. The earthworm sticks out the bristles in these segments so they grip the sides of the burrow while the extended parts move forwards. These parts then contract while the others elongate and catch up. Inside each segment is a cavity of water which supports the muscles as they move the earthworm. The earthworm also has a reflex action. This works when the earthworm is attacked, and makes the earthworm shoot backwards into its burrow.

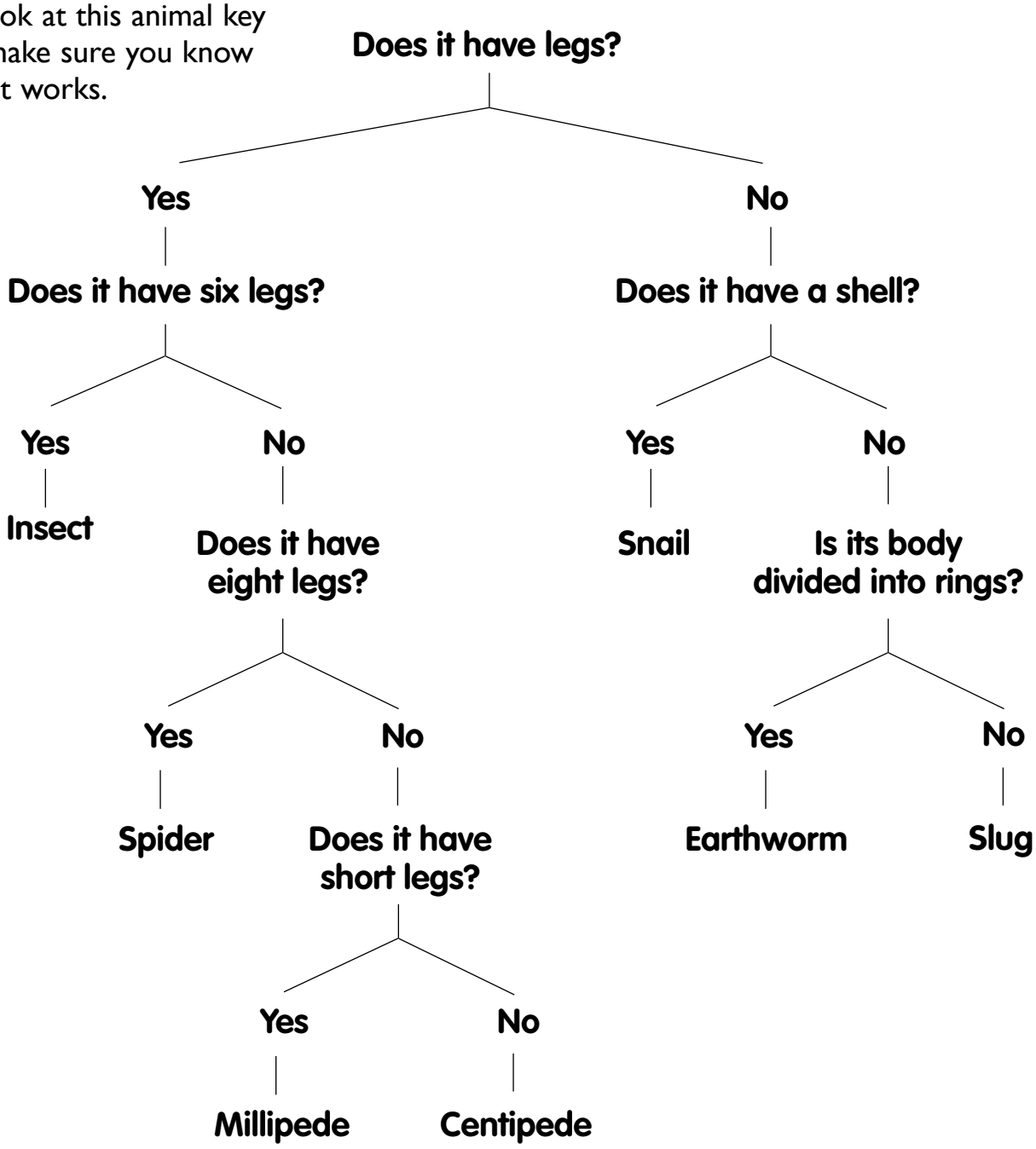
Centipedes and millipedes also have segmented bodies. They do not have a hundred legs or a thousand legs. You can tell them apart because centipedes only have one pair of legs on each body segment and are fast movers; while millipedes have two pairs of legs on each body segment and move more slowly.

Name: ..... **Form:** .....

See **pages 44 and 45** of *Living Things in their Environment*

Identifying soil life

1. Look at this animal key and make sure you know how it works.



2. Use the key to identify some of the animals that you find in the soil.

3. For each soil sample that you examine, count the number of animals that you identify. Record your results on a separate sheet.

4. Which animals were most numerous?

5. Which animals were present only in very small numbers?

Teacher's sheet: Practical

See **pages 44 and 45** of Living Things in their Environment

Resources

Depending on resources, and the ability and attitude of the children, use one of the following: (1) Access to soil in the school grounds or an area partially covered with stones. (2) If working in the classroom – bags of soil including some turf, white tray or newspapers, collecting jars, paint brush, pooter (optional), magnifying glass.

Introducing the work

If the children have tried Practical 6B 'Identifying pond life' and 19A 'Using a plant key', remind them of it now, then introduce this sheet.

Outcomes

The children can:

- Use a key to identify some soil animals.
- Handle living things with care.
- Draw conclusions from data.

Background

Centipedes and spiders are active carnivores and are probably present only in small numbers. When a centipede is disturbed, it runs away quickly and may not be caught. If you think you may have a centipede in a sample bag, empty it into a deep-sided bowl to prevent the animal running away across the table.

Millipedes usually sleep coiled up during the day and may be more easily handled. You must stress that the children handle the animals with care and do not harm them.

All keys have their limitations and you may point this out by showing the children that it does not help them identify a woodlouse.