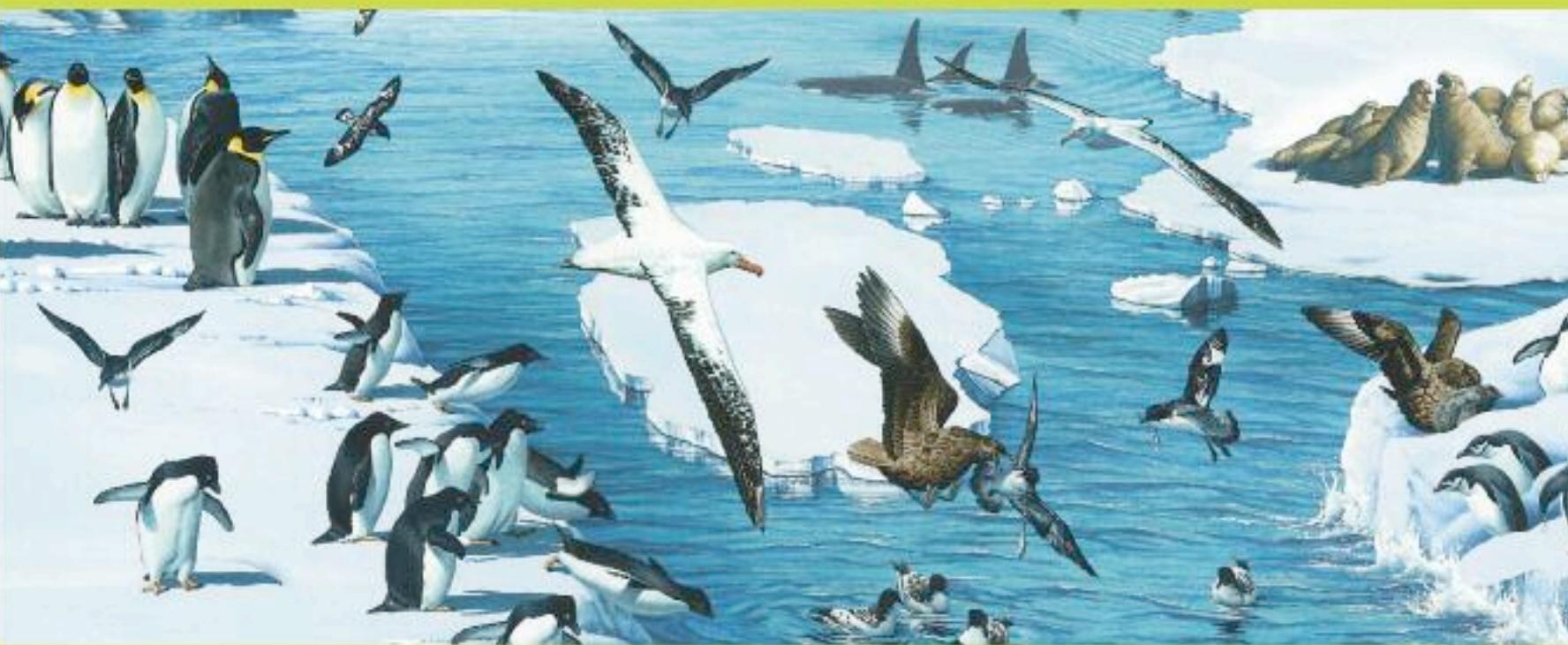
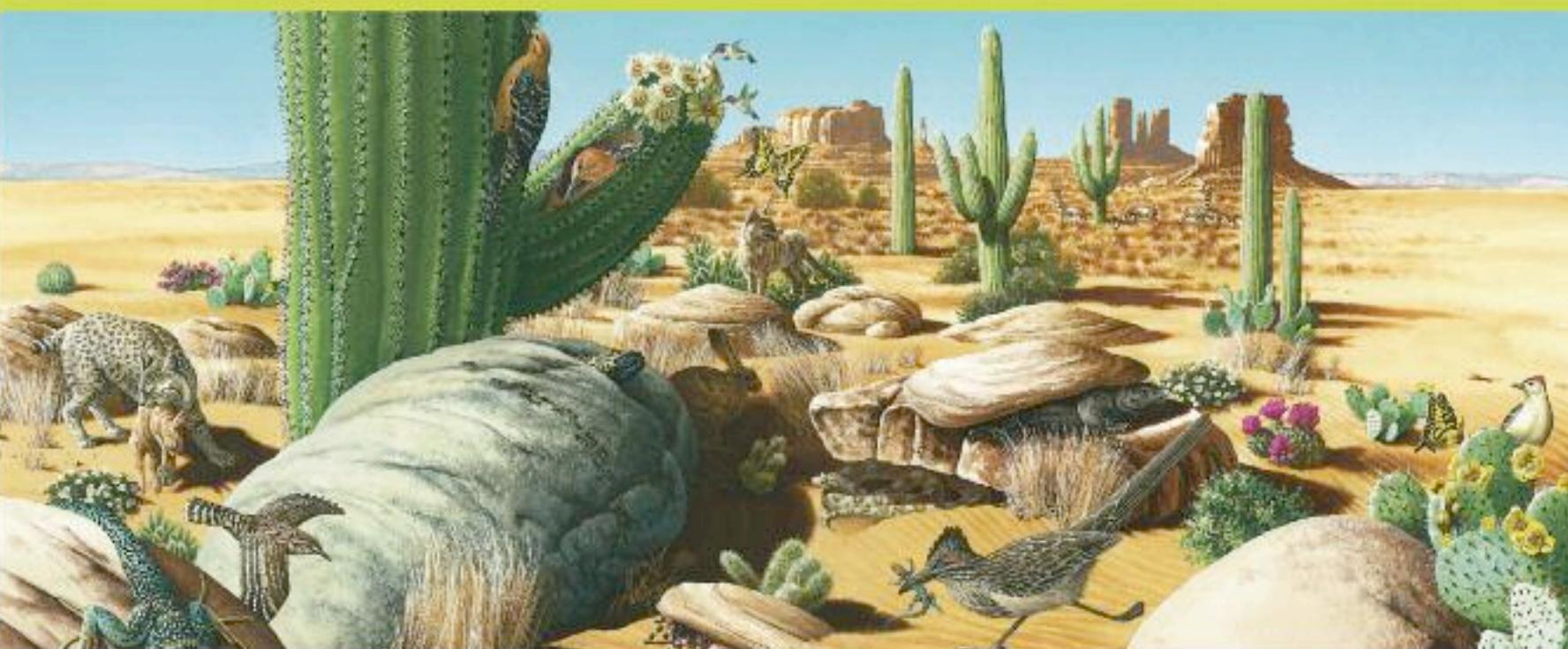


ILLUSTRATED ENCYCLOPEDIA



NATURE



More than 150 keywords

ILLUSTRATED ENCYCLOPEDIA

NATURE



ILLUSTRATED ENCYCLOPEDIA

NATURE

First published in 2012 by Orpheus Books Ltd.,
6 Church Green, Witney, Oxfordshire, OX28 4AW, England
www.orpheusbooks.com

Copyright ©2012 Orpheus Books Ltd.

Created and produced by Nicholas Harris, Sarah Hartley,
Katie Sexton, Ruth Symons and Erica Williams, Orpheus Books Ltd.

Text Ruth Symons

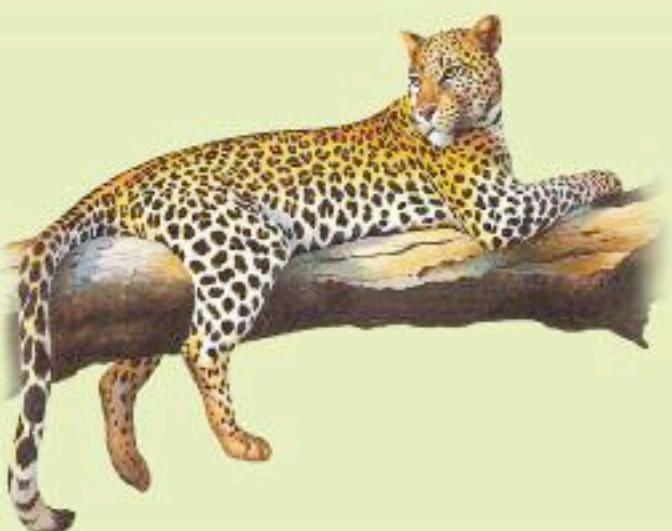
Illustrated by Susanna Addario, Mike Atkinson, Graham Austin, Andrew Beckett,
Martin Camm, Robin Carter, Stuart Carter, Jim Channell, Ferruccio Cucchiari, Peter Dennis, Fiammetta Dogi, Elisabetta Ferrero, Giuliano Fornari, Andrea Ricciardi di Gaudesi, Ray Grinaway, Gary Hincks, Philip Hood, Ian Jackson, Mike Lowe, Steve Noon, Nicki Palin, Alessandro Rabatti, Eric Robson, Claudia Saraceni, Peter David Scott, Ivan Stalio, Colin Woolf and David Wright

Consultant Chris Jarvis, Oxford University Museum of Natural History

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the copyright owner.

ISBN 978 1 7418 3764 6

Printed and bound in Singapore



Orpheus

CONTENTS

ECOLOGY	6
WORLD BIOMES	8
NATURAL CYCLES	10
TROPICAL RAINFOREST	12
WETLAND	14
DESERT	16
GRASSLAND	18
FOREST	20



UNDER THE GROUND	22
RIVERS & PONDS	24
MOUNTAINS	26
MAN & NATURE	28
INDEX	30



ABOUT THIS BOOK

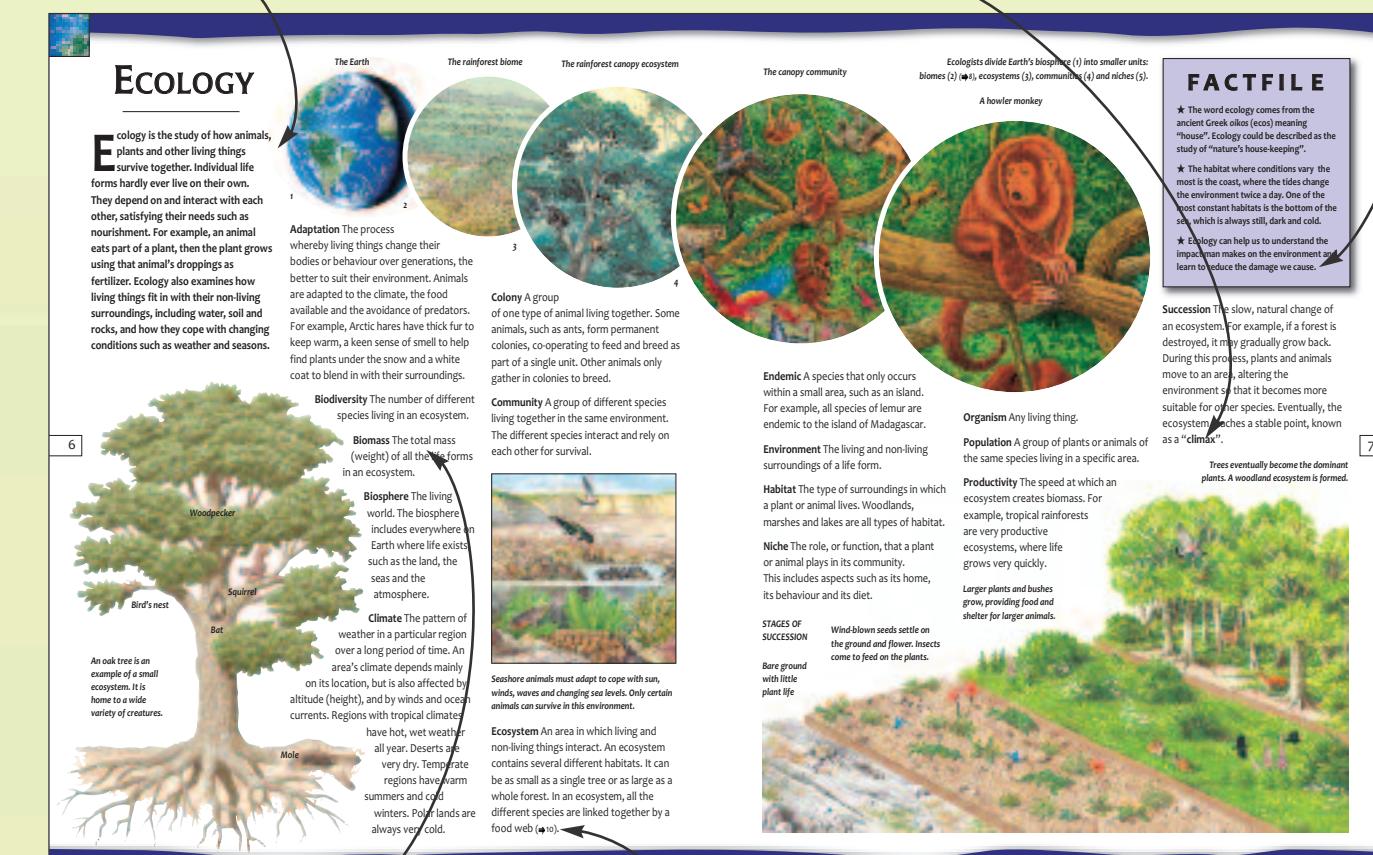
Each double page contains a brief introduction, explaining the general subject, followed by key words arranged in alphabetical order. To look up a specific word, turn to the index at the back of this book: this will tell you which page to go to. If you want to learn more about a subject, take a look at the factfile, or follow the arrows to read related entries.



INTRODUCTION
This explains the general subject and provides some basic knowledge.

BOLD WORDS
These highlight useful words that do not have their own entry.

FACTFILE
The factfile provides extra information on the subject. Facts are presented in easy to read bullet points.



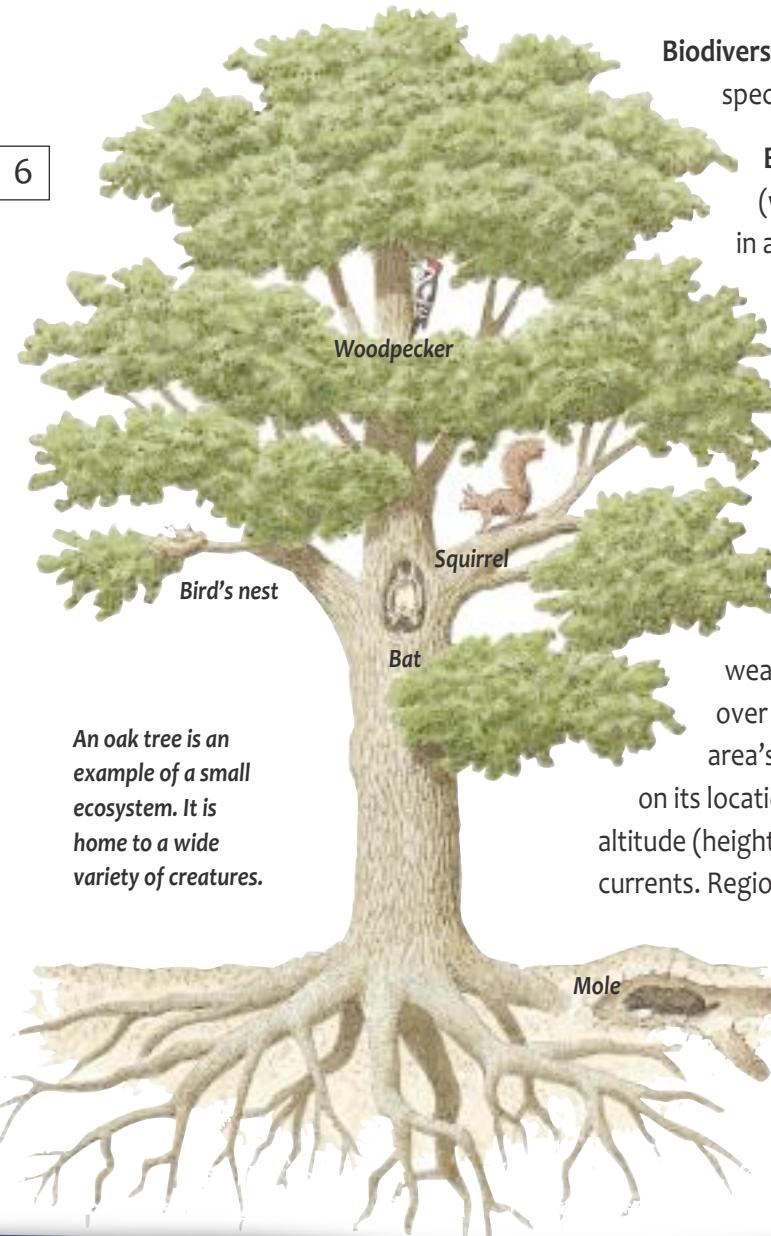
KEY WORDS AND ENTRIES
Key words are arranged alphabetically across each double page. Each entry provides a short explanation of what the key word means.

ARROWS
These arrows show you where to look up other words mentioned in the entry. For example, (→ 26) tells you to go forward to page 26 and (← 6) tells you to turn back to page 6.

PAGE NUMBER
Page numbers are easy to find at the side of the page.

ECOLOGY

Ecology is the study of how animals, plants and other living things survive together. Individual life forms hardly ever live on their own. They depend on and interact with each other, satisfying their needs such as nourishment. For example, an animal eats part of a plant, then the plant grows using that animal's droppings as fertilizer. Ecology also examines how living things fit in with their non-living surroundings, including water, soil and rocks, and how they cope with changing conditions such as weather and seasons.



6

Biodiversity The number of different species living in an ecosystem.

Biomass The total mass (weight) of all the life forms in an ecosystem.

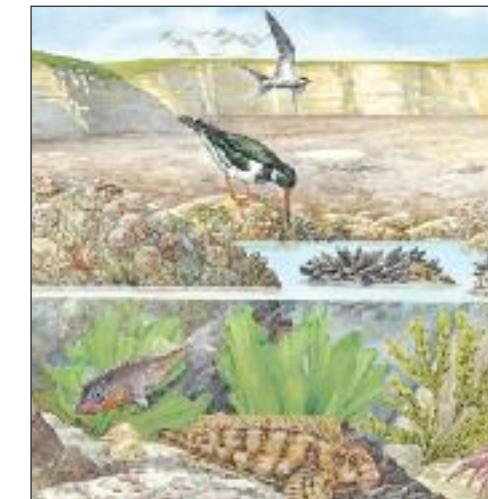
Biosphere The living world. The biosphere includes everywhere on Earth where life exists, such as the land, the seas and the atmosphere.

Climate The pattern of weather in a particular region over a long period of time. An area's climate depends mainly on its location, but is also affected by altitude (height), and by winds and ocean currents. Regions with tropical climates

have hot, wet weather all year. Deserts are very dry. Temperate regions have warm summers and cold winters. Polar lands are always very cold.

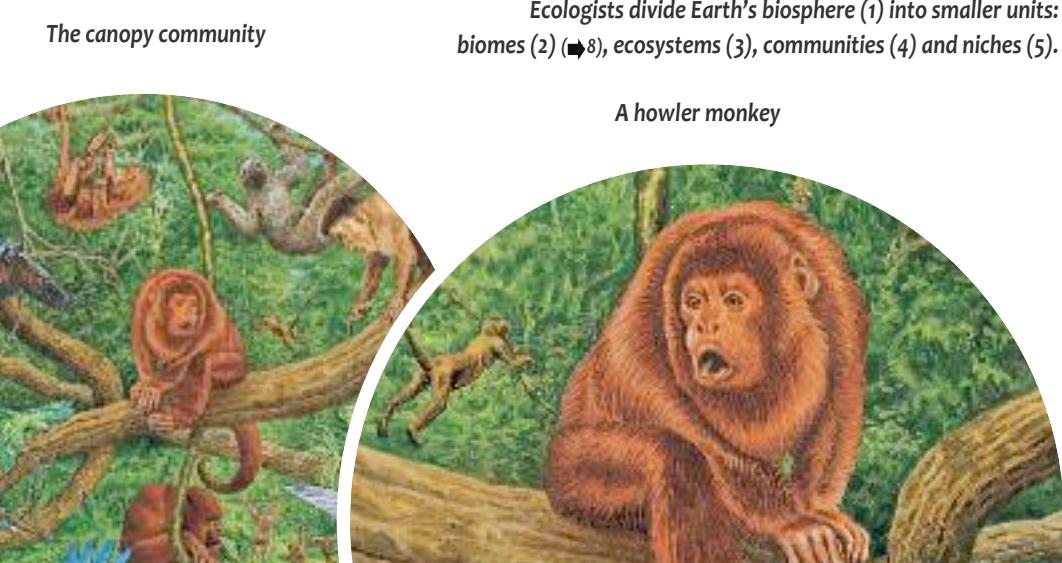
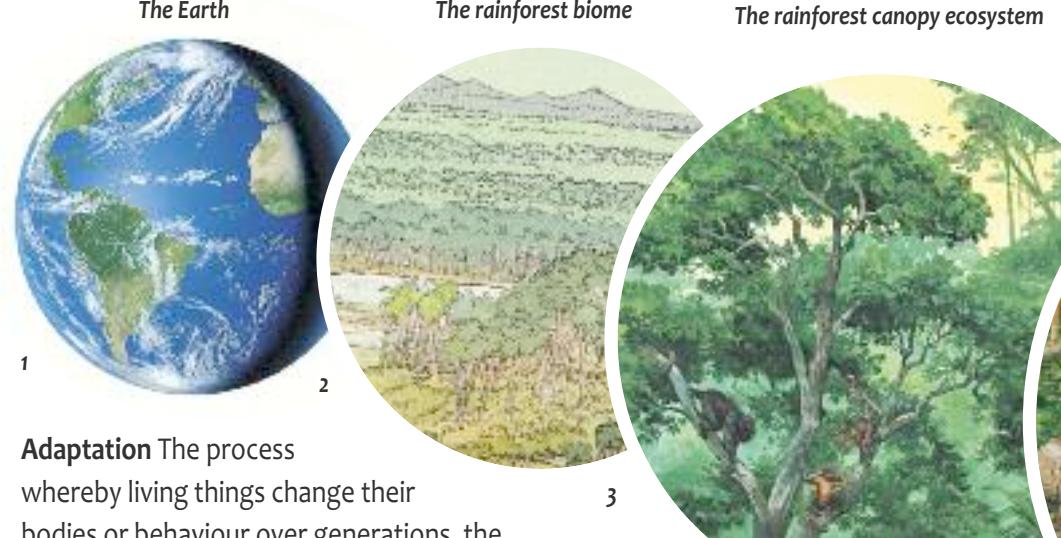
Adaptation The process whereby living things change their bodies or behaviour over generations, the better to suit their environment. Animals are adapted to the climate, the food available and the avoidance of predators. For example, Arctic hares have thick fur to keep warm, a keen sense of smell to help find plants under the snow and a white coat to blend in with their surroundings.

Community A group of different species living together in the same environment. The different species interact and rely on each other for survival.



Seashore animals must adapt to cope with sun, winds, waves and changing sea levels. Only certain animals can survive in this environment.

Ecosystem An area in which living and non-living things interact. An ecosystem contains several different habitats. It can be as small as a single tree or as large as a whole forest. In an ecosystem, all the different species are linked together by a food web (p.10).



Endemic A species that only occurs within a small area, such as an island. For example, all species of lemur are endemic to the island of Madagascar.

Environment The living and non-living surroundings of a life form.

Habitat The type of surroundings in which a plant or animal lives. Woodlands, marshes and lakes are all types of habitat.

Niche The role, or function, that a plant or animal plays in its community. This includes aspects such as its home, its behaviour and its diet.

STAGES OF SUCCESSION

**Bare ground
with little
plant life**

Wind-blown seeds settle on the ground and flower. Insects come to feed on the plants.



FACTFILE

★ The word ecology comes from the ancient Greek *oikos* (ecos) meaning "house". Ecology could be described as the study of "nature's house-keeping".

★ The habitat where conditions vary the most is the coast, where the tides change the environment twice a day. One of the most constant habitats is the bottom of the sea, which is always still, dark and cold.

★ Ecology can help us to understand the impact man makes on the environment and learn to reduce the damage we cause.

Succession The slow, natural change of an ecosystem. For example, if a forest is destroyed, it may gradually grow back. During this process, plants and animals move to an area, altering the environment so that it becomes more suitable for other species. Eventually, the ecosystem reaches a stable point, known as a "climax".

Trees eventually become the dominant plants. A woodland ecosystem is formed.

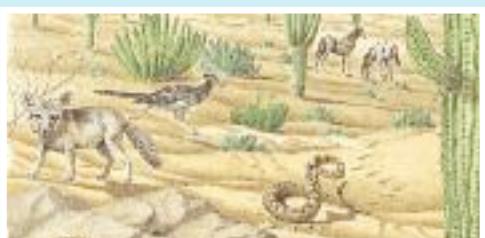
7

WORLD BIOMES

A biome is a large ecosystem with similar plants, animals and climate that occurs in different regions around the world. For example, woodlands of oak, beech, maple and other broadleaved trees (►20) make up the temperate woodland biome. There are several large-scale types of natural biome on Earth, nine of which are featured here. Each biome is the product of the climate (►6), rocks and soil of the region.



POLAR The far north and far south of the Earth, covered with ice for most of the year, are the polar biomes.



DESERT Deserts form in parts of the world where very little rain falls and the land is always very dry.

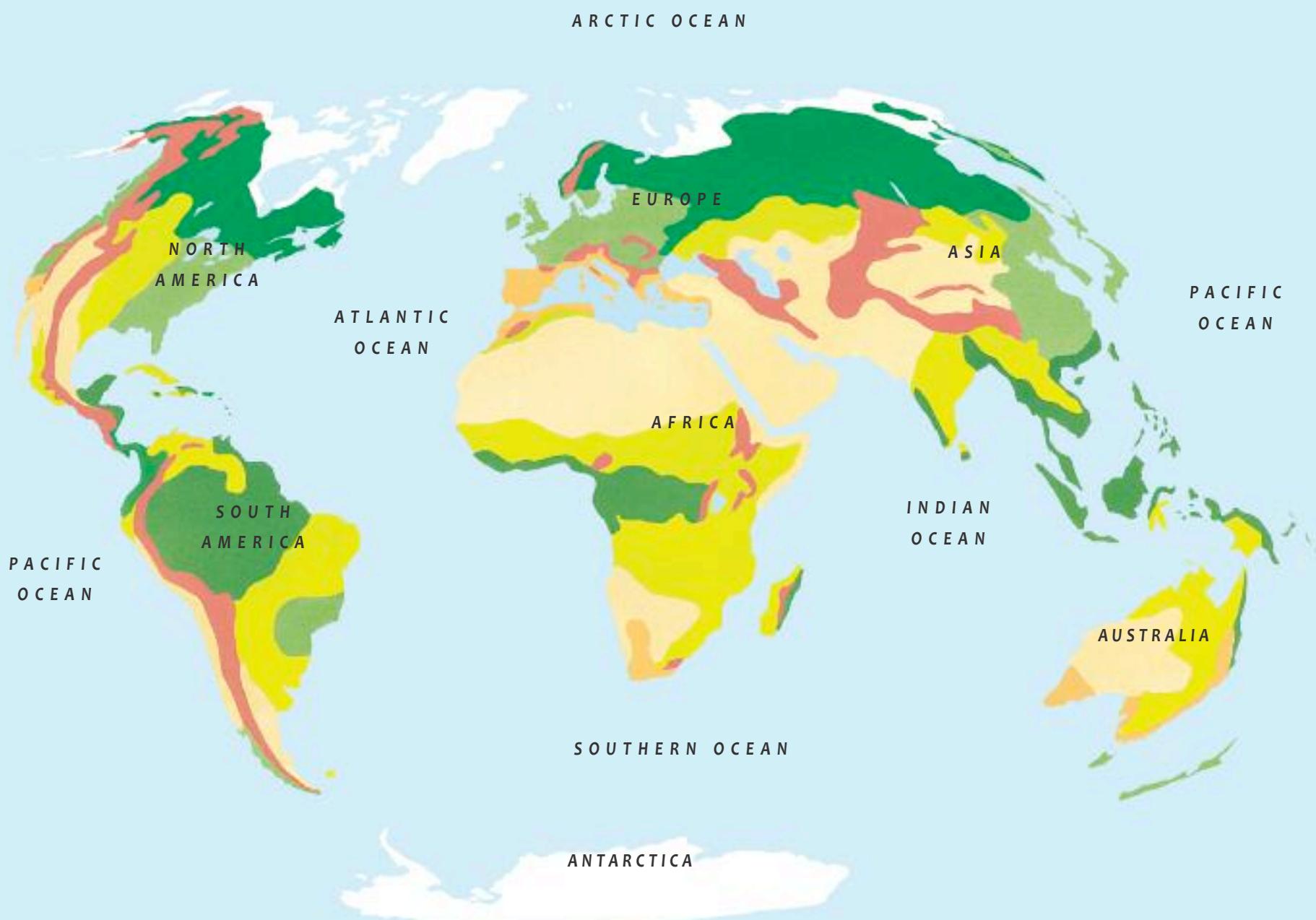


SCRUBLAND Scrublands are semi-arid regions made up of shrubs, bushes and grasses.



OCEAN An ocean is a body of salt water that covers part of the Earth. The oceans form the largest biome.

- Ocean
- Woodland
- Boreal forest
- Grassland
- Scrubland
- Tropical forest
- Desert
- Mountain
- Polar region



MOUNTAIN Around the world, cold, highland regions form the mountain biome. Only the hardiest plants and animals can survive here.



BOREAL FOREST The boreal biome is found in cold, northern regions. It is dominated by conifer trees that can withstand the harsh winter conditions.



WOODLAND In temperate woodland, summers are warm and winters are mild. Trees thrive; broadleaved trees lose their leaves in winter.



TROPICAL RAINFOREST Tropical forests grow near the equator where the climate is hot and wet throughout the year.



GRASSLAND Grasslands grow in areas that have more rainfall than deserts but less than forests. The savanna grasslands of Africa features a mixture of grassland and trees.

NATURAL CYCLES

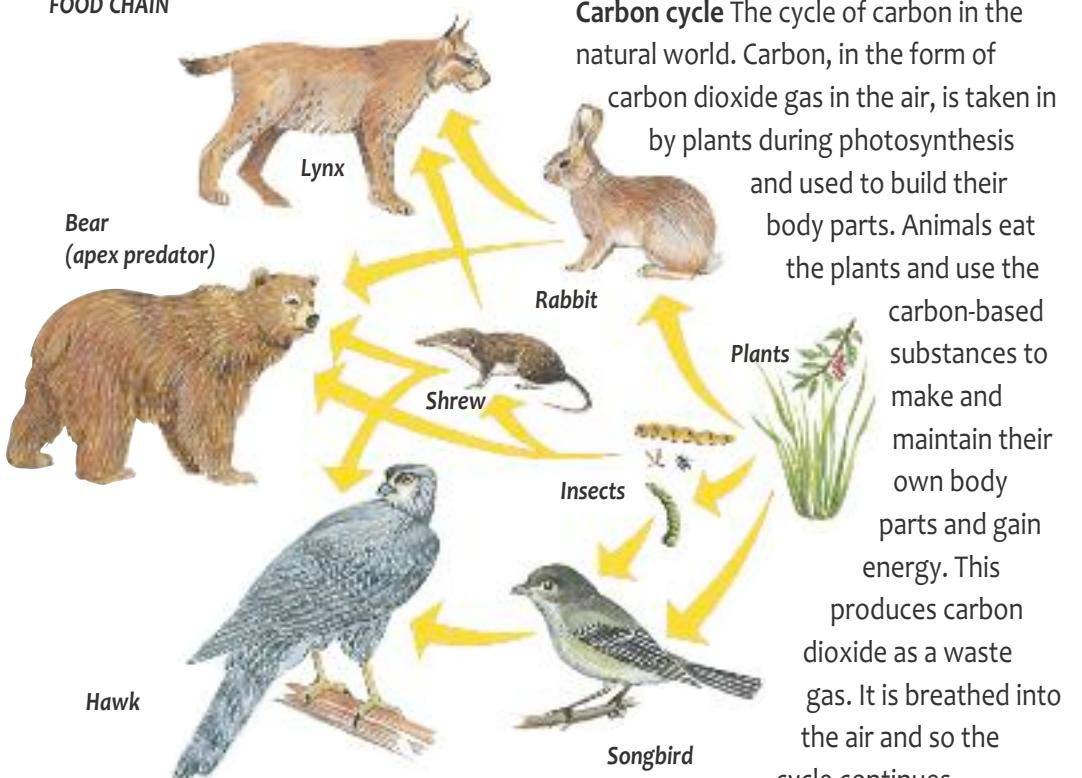
Planet Earth has a limited amount of chemical substances. In nature these chemical elements, such as oxygen and carbon, are neither formed nor destroyed. They are recycled: moved round and round in the natural world in the form of minerals and nutrients. On land, these are taken up from the soil into plants, then into plant-eating animals, which may be eaten themselves by carnivores. The nutrients return to the soil when a plant or animal dies and rots away.

Apex predator An animal at the top of the food chain, which has no natural predators of its own.

Carbon A chemical element that forms a part of living cells. The bodies of all living things are made up of carbon-based molecules.

10

FOOD CHAIN



Carbon cycle The cycle of carbon in the natural world. Carbon, in the form of carbon dioxide gas in the air, is taken in by plants during photosynthesis

and used to build their body parts. Animals eat the plants and use the carbon-based substances to make and maintain their own body parts and gain energy. This produces carbon dioxide as a waste gas. It is breathed into the air and so the cycle continues.

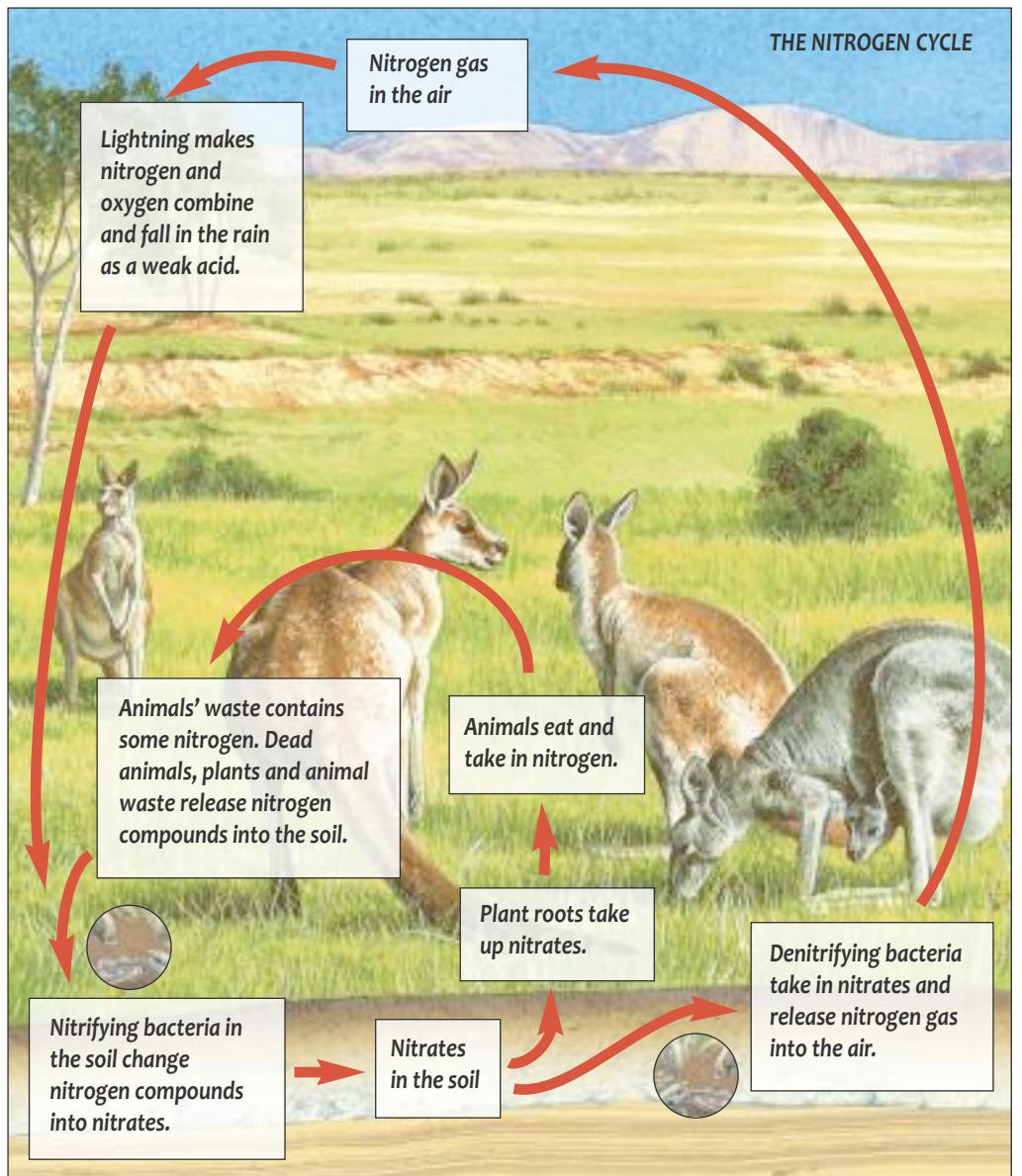
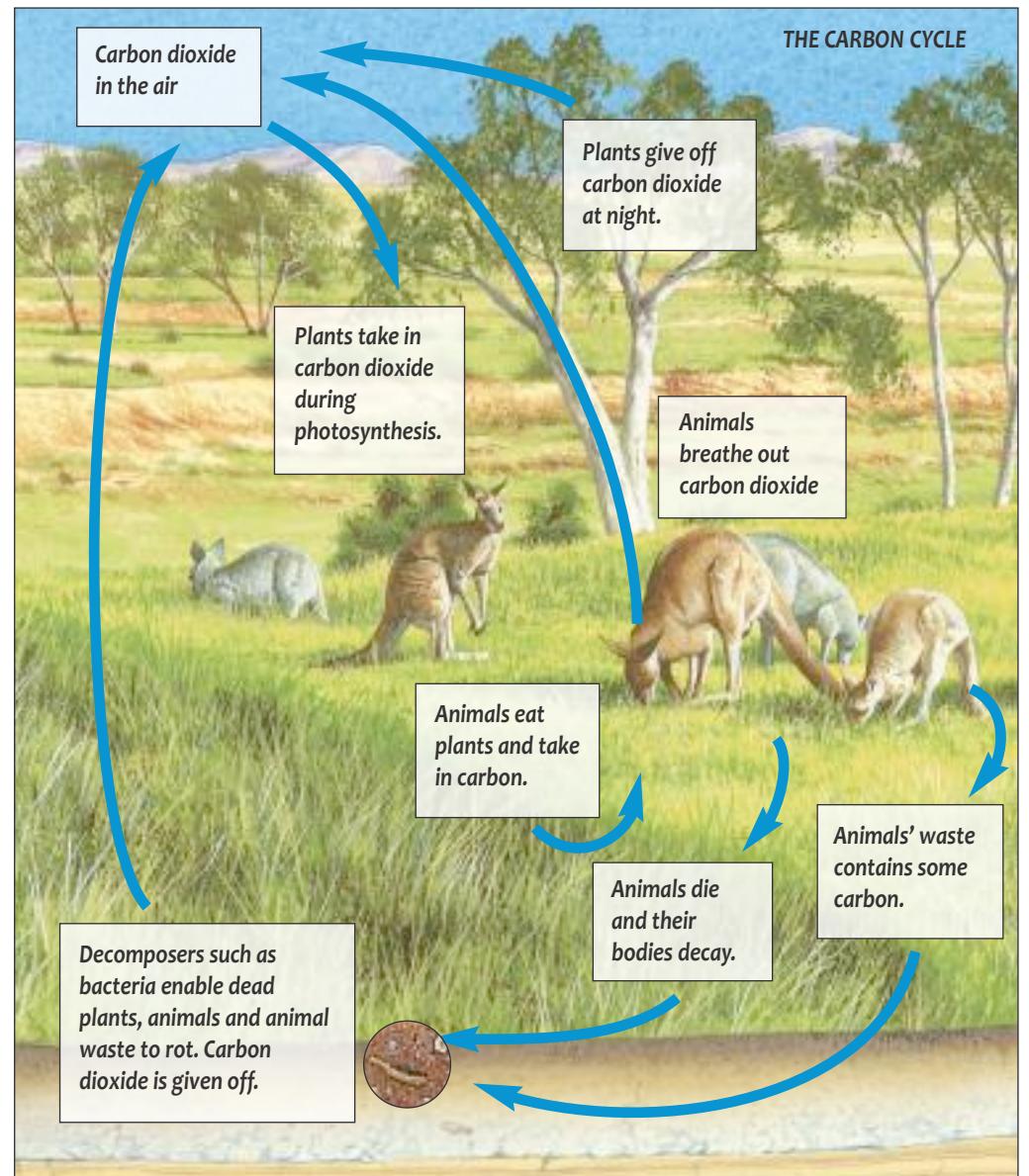
Carnivore An animal that feeds only on other animals.

Consumer An organism that obtains energy by feeding on other organisms. Consumers are sometimes called **heterotrophs**. All animals are consumers.

Decomposer An organism that breaks down dead matter and recycles nutrients. Fungi, bacteria and some animals, such as earthworms, are decomposers.

Food chain The sequence in which a plant is eaten by an animal, which is then eaten by another animal and so on. Most animals eat several different food types, so they are a part of several food chains.

Food web All the different food chains in an ecosystem (p.6) linked together.



Omnivore An animal that eats both plants and other animals.

Photosynthesis The process by which green plants use sunlight as an energy source to turn carbon dioxide gas and water into the sugars they need for food.

Predator An animal that obtains its food by hunting and killing other animals.

Prey An animal that is killed and eaten by predators.

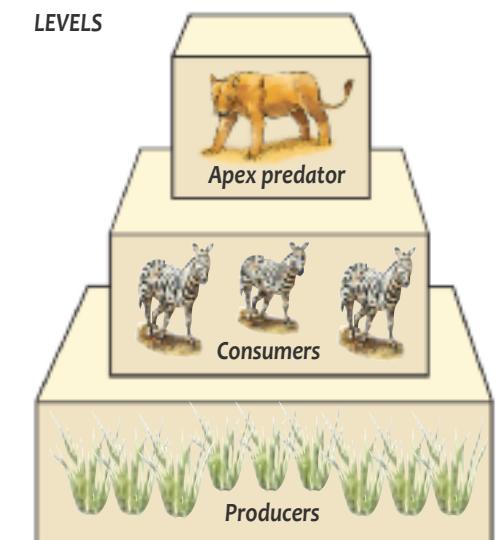
Producer A living thing makes its own food. For example, plants make their food from sunlight, carbon dioxide and water. Producers are also known as **autotrophs**.

Trophic level The level on which an animal or plant stands in the food chain. At the lowest level are the producers, which are high in number. At the middle levels are consumers. At the highest level are large predators, which are fewer in number.

Water cycle The process by which water circulates from the oceans or land to the atmosphere and back. When it is warmed by the Sun, water evaporates and rises into the atmosphere. As it rises, it cools and condenses, forming clouds. Rain and snow fall to the ground from where the water flows into rivers and seas and the cycle continues.

11

TROPHIC LEVELS



Nitrogen A colourless gas in the air. Nitrogen compounds are found in all living cells.

Nitrogen cycle The cycle of nitrogen in the natural world. **Nitrifying bacteria** in the soil convert nitrogen gas into substances called **nitrates**.

Plants take up nitrates through their roots and animals take in nitrogen when they eat the plants. When living things die, they release nitrogen into the soil, where it is changed into nitrates. **Denitrifying bacteria** in the soil turn some of these nitrates into nitrogen gas, which is released back into the air.

Nutrients Chemical substances that are needed to maintain an organism's bodily activity and new growth.

FACTFILE

★ The word trophic comes from the Greek *trophe*, meaning "nourishment".

★ Nitrogen gas makes up about 78% of the air around us.

★ Unlike most carnivores, which can leave relatively long periods between meals, herbivores have to eat for much of the day. This is because there is less energy content in plants than in meat.

Earthworms are important decomposers.

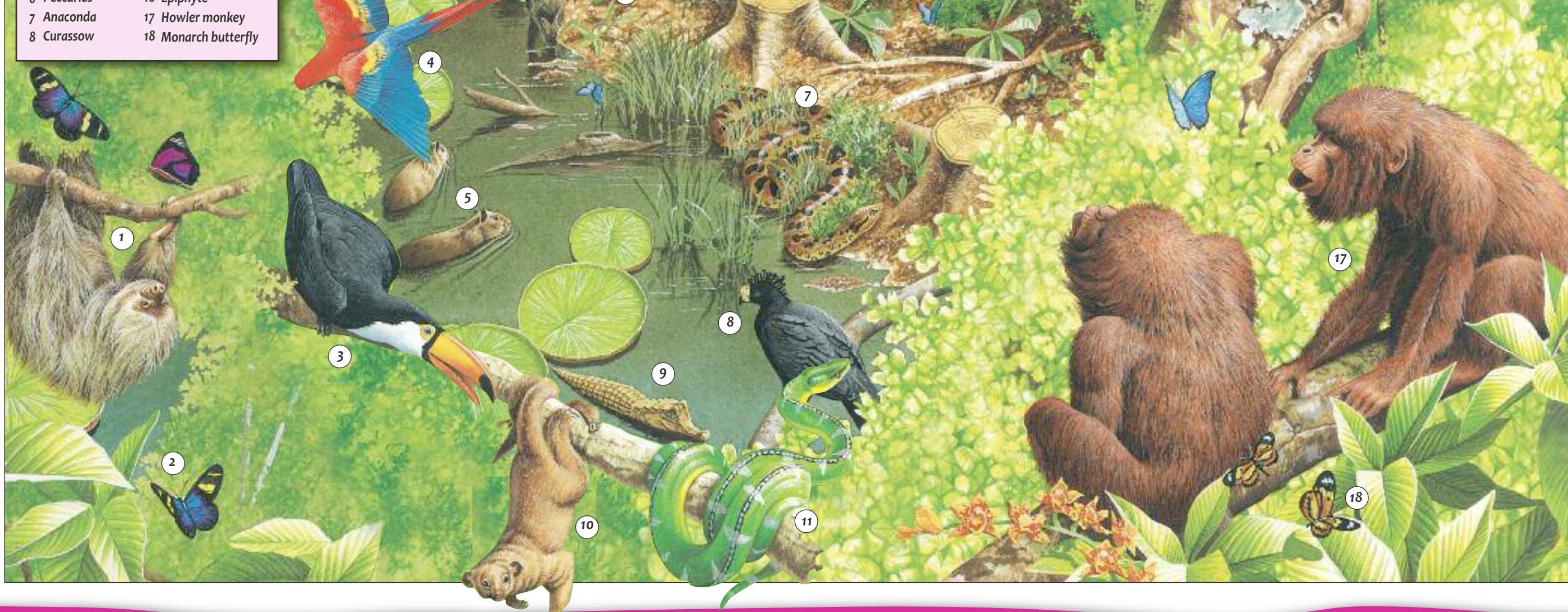


TROPICAL RAINFOREST

A tropical rainforest is a tall, dense forest found in regions that are hot and wet all year round.

Different creatures live in different layers of vegetation. Most rainforest animals live high in the sunlit treetops, rarely, if ever, descending to the ground. Others live in the rivers, or roam the forest floor searching for food.

KEY	
1 Three-toed sloth	9 Cayman
2 Sara Longwing butterfly	10 Kinkajou
3 Toco toucan	11 Emerald tree boa
4 Scarlet macaw	12 Squirrel monkeys
5 Capybara	13 Heliconia butterfly
6 Peccaries	14 Tree frog
7 Anaconda	15 Humming bird
8 Curassow	16 Epiphyte
	17 Howler monkey
	18 Monarch butterfly



Buttress roots Large, wide tree roots that grow above ground to support a shallowly-rooted tree. Buttress roots are mostly found in rainforests where the soil is so poor its roots do not grow deep.

Canopy layer The second highest layer of rainforest vegetation. It forms a “roof” of foliage where many fruits and flowers grow. This layer is where most birds, insects and monkeys live.

Drip tip A pointed tip at the end of a leaf from which excess water quickly runs off. Many rainforest plants have drip tips to avoid being damaged by heavy rainfall.

Emergent layer The highest layer of the rainforest, formed by a few trees called **emergents** that stand above the forest canopy. Some of these trees can be up to 70 m high. The emergent layer is home to large birds such as eagles.

Epiphytes Small plants that grow on other plants. They are also known as **air plants**. Epiphytes could not survive on the dark forest floor, so they root themselves among the sunlit canopy. They take moisture and nutrients from the rain and from falling fruit and leaves. Some varieties collect rain in their leaves, which animals may use to drink from, bathe in and even live in.

Forest floor The lowest level of the rainforest. Because of the thick canopy, little sunlight can reach the forest floor and few plants can grow. Insects feed on decaying plant matter that falls from the trees. They break it down into nutrients that are absorbed by the soil. Small ground-dwelling animals feed on the insects and are themselves eaten by large predators such as cats and snakes.

Lianas Woody vines that climb up other plants to reach the light of the canopy. Once there, they loop between trees, enabling animals to climb between branches.



Animals of the Amazon rainforest

Root mat A layer of interwoven tree roots on the surface of the rainforest floor. Most of the nutrients in rainforest soil lie close to the surface, so trees do not grow their roots deep. Instead, they spread them over a wide surface area to obtain as many nutrients as possible.

Understorey The middle layer of rainforest vegetation, between the canopy and the forest floor. It is also known as the **shrub layer**. Understorey plants reach around 20 m high and have large leaves to catch as much light as possible. This layer is home to insects, snakes, lizards and birds.

FACTFILE

★ The largest rainforest in the world is the Amazon rainforest in South America. Most of the wildlife of the Amazon rainforest is found along the bank of the Amazon River.

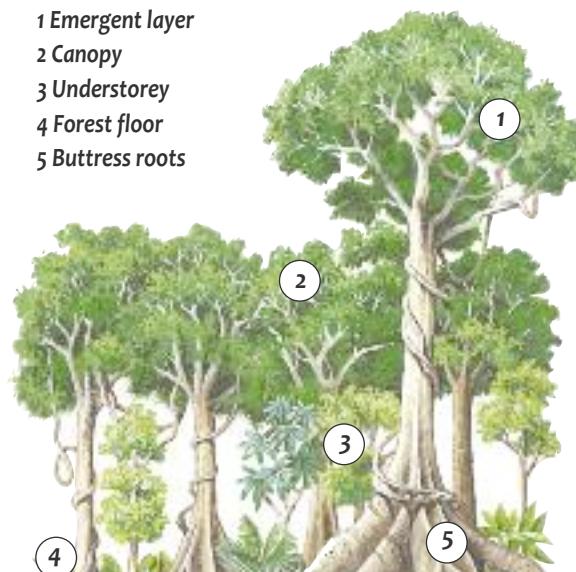
★ Two-thirds of the world's plant species grow in the world's rainforests.

★ It is thought that 40 % of the world's plant and animal species may live in the rainforest canopy.

★ Some lianas can grow up to 3 km long.

LAYERS OF THE RAINFOREST

- 1 Emergent layer
- 2 Canopy
- 3 Understorey
- 4 Forest floor
- 5 Buttress roots



WETLAND

A wetland is an area of waterlogged land. Wetlands are found on the edge of lakes, near the coast, or where rain or rivers flood the land. They can be either freshwater or saltwater environments, and vary depending on climate, location and the nutrients present in their water. A range of wildlife thrives in wetland environments. They are especially important to birds, as they provide a safe site for nests, and an abundance of insects for food.

Bog A type of wetland formed of spongy waterlogged soil. Bogs can sustain very little life. Bogs in cool regions are dominated by mosses. Tropical bogs are sometimes home to carnivorous plants. Because there are few nutrients in the poor soil, the plants trap and eat insects as an alternative source of nutrition.

Brackish Slightly salty.

Estuary The wide part of a river where it meets the sea. The animals that live in estuaries are adapted to both fresh and salt water as well as the constant change between high and low tide. Estuaries are home to many tiny shelled animals, as well as fish and wading birds (►25).

Everglades An area of swampland in Florida, USA. Wading birds (►25) such as flamingos feed in the shallows, while alligators roam the deeper waters.

The mudskipper fish (left) lives in mangrove forests. Between tides it breathes using water stored in its head near its gills. At high tide it burrows underground, but it can also climb trees to avoid predators.



The arching roots of a mangrove tree (above)

Groundwater Water below ground level that collects from rain seeping through the ground. Most of it flows into rivers or seas but some seeps to the surface and forms oases (►17) or wetlands.

Hummock A small, tear-shaped island in the middle of a swamp. It is an area of solid ground where trees can grow.

Lagoon A shallow pool of seawater cut off from the sea by a barrier of sand or coral. Lagoons may be home to a range of crustaceans and fish.

Mangrove A tree or shrub that grows on warm, sheltered coastlines. To avoid drowning, mangroves have shallow roots that stand up above the water line.

They both support the tree and allow it to breathe. Nutrient-rich mud collects in the roots, providing food for many animals.

Mangrove forest An area of mangroves found on tropical, sheltered coastlines. Fish swim in the shallow waters and small creatures burrow into the mud. Monkeys and birds perch in the trees, always on the look out for predatory snakes or crocodiles.

Marsh A low-lying, shallow wetland often found near rivers or the coast. Most marsh plants are grasses and reeds.

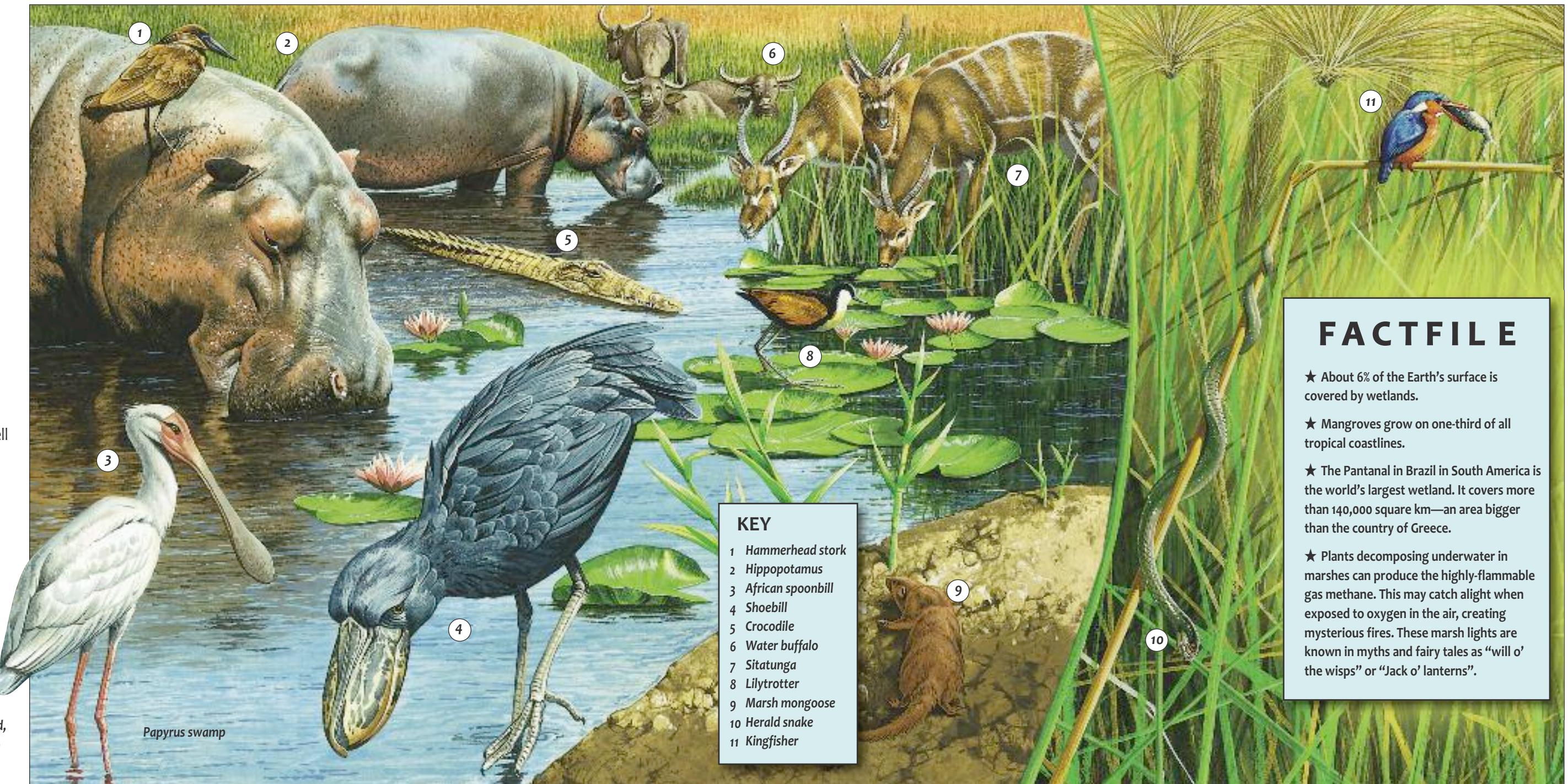
Mudflat A wetland formed from mud and sand dumped by rivers as they near the sea and flow slowly. Mudflats are home to a range of crustaceans, worms, fish. They are also an important habitat for wading birds (►25) such as herons.

Papyrus swamp A freshwater swamp, found in subtropical regions. The main plant life in these swamps is the tall, reed-like plant papyrus.

Peat A type of dark soil that forms in bogs and swamps. It is produced over a long period of time when dead plants decompose away from oxygen. Other plants grow in the peat, then die and add to it. Dried peat can be burned as fuel.

Salinity The salt content of water. Water with high salinity is very salty.

Swamp A type of wetland created by groundwater. Swamps have more plant life than other wetlands, including trees. They are home to various fish, insects, amphibians, reptiles and a range of birds.



FACTFILE

★ About 6% of the Earth's surface is covered by wetlands.

★ Mangroves grow on one-third of all tropical coastlines.

★ The Pantanal in Brazil in South America is the world's largest wetland. It covers more than 140,000 square km—an area bigger than the country of Greece.

★ Plants decomposing underwater in marshes can produce the highly-flammable gas methane. This may catch alight when exposed to oxygen in the air, creating mysterious fires. These marsh lights are known in myths and fairy tales as "will o' the wisps" or "Jack o' lanterns".

DESERT

With little or no rainfall, deserts are some of the most inhospitable places on Earth. Some are hot all year round, and others are cold. All are very dry. Despite these harsh conditions, a variety of life can be found in the desert. Plants store whatever rain there is or grow deep roots to find water underground. Many desert animals, whether herbivores or carnivores, obtain all the water they need from their food. They produce very little sweat, urine or other body liquids, thus saving valuable water.

Accelerated life cycle A very short life cycle of a plant or animal. Some desert dwellers have accelerated life cycles, which allow them to flourish during rainy periods without suffering during droughts. For example, the seeds of African Grass lie dormant until there is rain, when they grow, flower and produce seeds in just over two weeks.

16



Cactus A type of desert plant that stores rainwater in its thick stem and branches. Cacti have adapted the way they carry out photosynthesis (►11), opening their stoma (pores) to take in carbon dioxide only in the cool of the night. Most types of cactus are covered in spines to deter animals from eating them. Despite this, some animals, such as the Gila woodpecker and the Elf owl, make their homes inside cactus stems.



KEY	
1	Elf owl
2	Gila woodpecker
3	Hummingbirds
4	Coyote
5	Saguaro cactus
6	Pronghorn
7	Flycatcher
8	Scorpion
9	Roadrunner
10	Chuckwalla
11	Jackrabbit
12	Gila monster
13	Tarantula
14	Swallowtail
15	Cactus wren
16	Bobcat
17	Collared lizard

FACTFILE

★ In some deserts, the wind sweeps sand into huge wave-like dunes. In these landscapes, the sand is too unstable to support any plant life.

★ Camels can go for several weeks without food or water. When they do find water, they can drink more than 100 litres at one time. Their humps store fat, which their bodies can then make into food when they need it.

★ The Saguaro cactus is a type of cactus that grows in southwest USA. About 90% of its weight is made up of water.

★ Some animals, such as the fennec fox and the long-eared jerboa, have huge ears that stop their bodies overheating by giving out excess warmth.

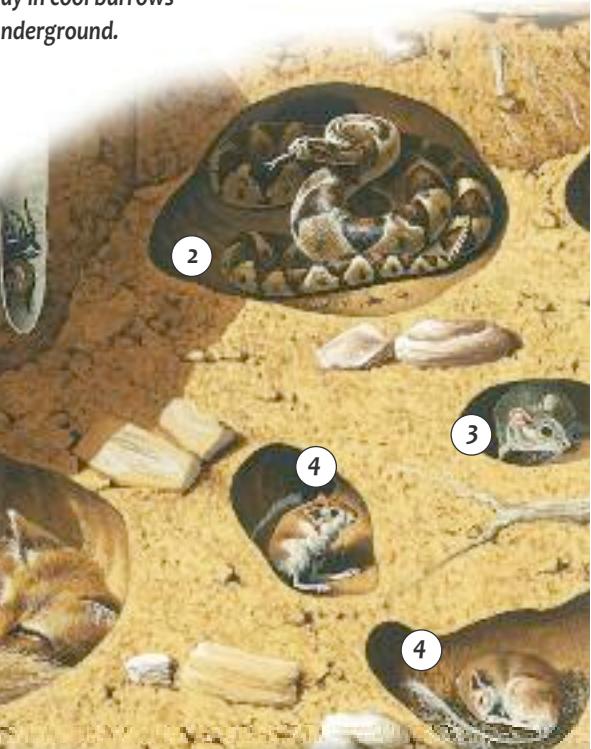


Jerboa

Succulent A plant that stores water, either in its stem, its leaves or its roots. Most succulents have small leaves and are coated in a waxy layer, which helps prevent loss of water through evaporation. The cactus is a type of succulent.

17

Many desert animals spend the day in cool burrows underground.



Cold desert An area with less than 25 cm of snow or rainfall a year, and with an average temperature of less than 10°C. Antarctica is a cold desert, because its water is locked up in ice. The Gobi desert in Mongolia is cold and dry because mountains block warm, moist air currents.

Living stone A type of desert plant that lives among rocks, taking in water that seeps into the rock crevices. Living stones have thick leaves and a waxy surface to prevent water loss. To avoid being eaten, they have evolved shapes and colours which make them look much like the surrounding rocks.

Hot desert An area with less than 25 cm of snow or rainfall a year, and an average temperature of over 20°C. Some deserts have temperatures reaching up to 50°C. Large mammals have thick coats to keep out the heat. Smaller creatures often live underground to escape the daytime heat.

Nocturnal Active during the night and inactive during the day. Many small desert mammals, such as kangaroo rats and ground squirrels, are nocturnal. They spend the day in burrows, sheltering from the hot sun, and only come out at night to feed.

Oasis An area of plant life in the middle of a desert. Most oases form where groundwater (►14) emerges at the surface. Many desert animals visit oases regularly to drink, sometimes travelling great distances. For example, the male sandgrouse flies many kilometres every day, soaking its feathers in water which it then carries back to its chicks.

Phreatophyte A desert plant with long roots that take up water from deep underground. Phreatophytes include the desert willow and the mesquite bush, which has roots longer than 50 metres.

KEY

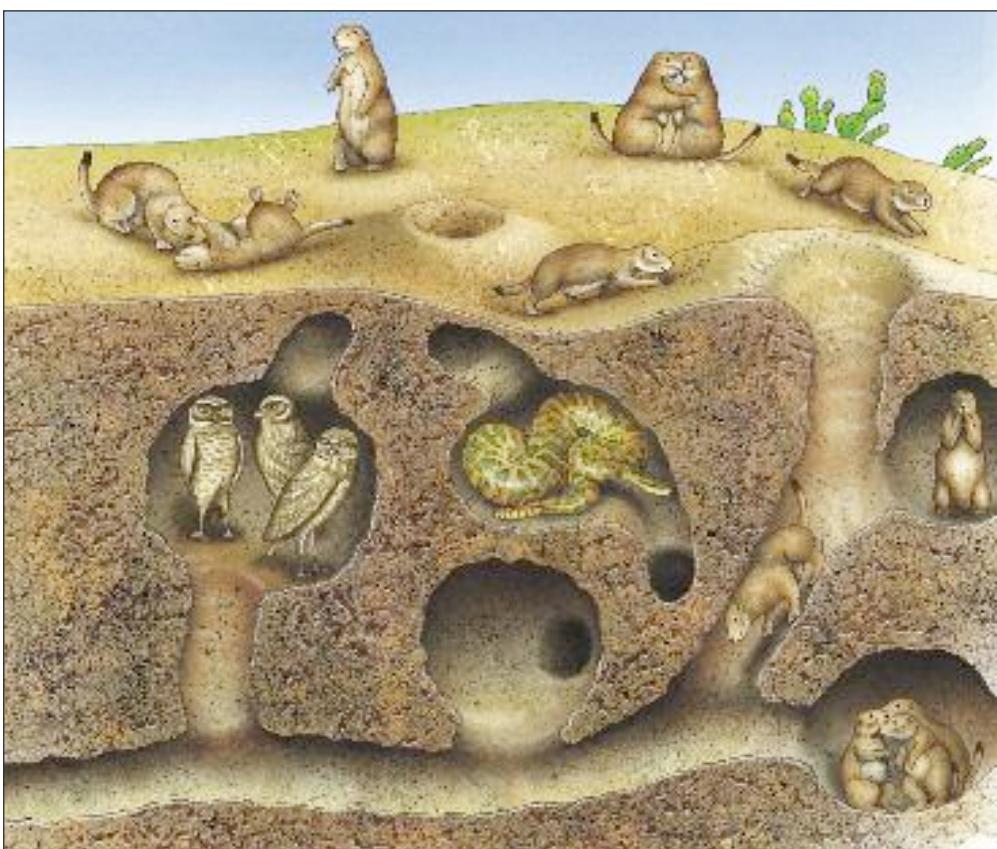
- 1 Trapdoor spider
- 2 Western diamondback rattlesnake
- 3 Pocket mouse
- 4 Kangaroo rat
- 5 Kit fox

GRASSLAND

Grasslands are open areas of land where grasses and low-lying bushes thrive. Grasslands grow in areas that have more rainfall than deserts but less than forests. Tropical grasslands have a dry season and a wet season. Temperate grasslands have four seasons, and may endure cold winters. The steppes of Asia, the prairies of North America and the pampas of South America are dominated by grasses, while the African savanna and Australian grasslands, with their tropical climates, have more trees.

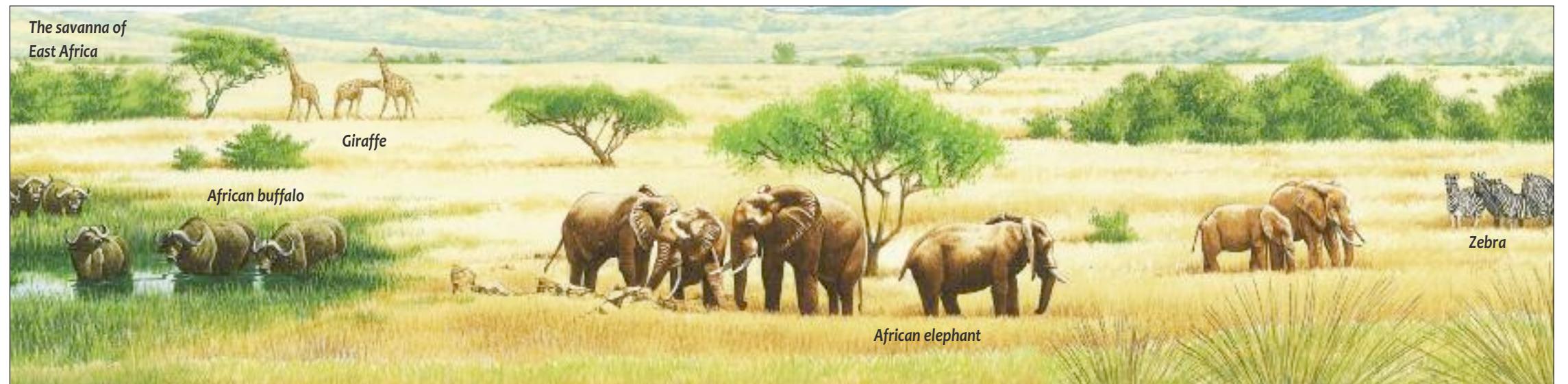
Baobab tree A type of tree ideally suited to its environment of the savanna grasslands. It survives the dry season by storing water inside its huge, bottle-shaped trunk. The largest ever measured had a circumference of nearly 50 m.

Prairie dogs protect themselves by living in burrows (p. 22). Old burrows are sometimes occupied by burrowing owls or rattlesnakes.



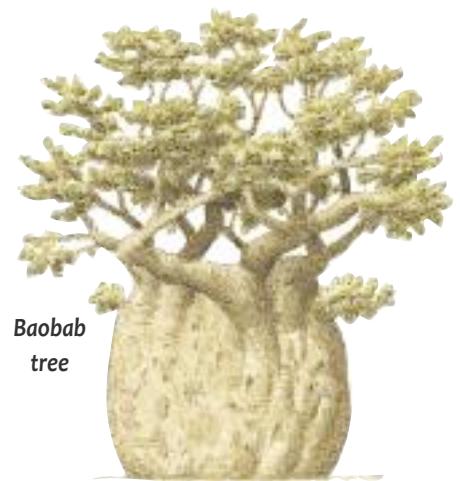
Herd A large group of animals that live and travel around together. Most hooved animals and many other plant-eaters live in herds. The herd offers them some protection, as a large group is more likely to spot predators. Herds move from place to place, according to where fresh grass and water can be found.

Pampas The grasslands of South America, east of the Andes mountains. The weather in the pampas is mild with fairly regular rainfall. Frequent wildfires prevent large bushes or trees from establishing themselves, so long grass is the main vegetation. The pampas are home to a variety of birds and other animals, such as maned wolves and the ostrich-like rhea.



Browsers Animals that feed on leaves and twigs from trees and bushes, rather than grasses. Browsers avoid competition by feeding at different levels. On the savanna, the giraffe's long neck and the elephant's trunk allow them to eat the highest leaves, while smaller animals feed lower down.

Dry season A long period of dry weather. It is one of the two seasons that occur in tropical grasslands, such as the savanna. When the dry season begins, most plant-eaters migrate from their breeding grounds to wetter areas.



Grazers Animals that feed on grasses. Deer, horses and cows are all grazers. Browsers and grazers have to eat for much of the day to gain sufficient nourishment.

Prairies The flat, treeless grasslands of North America. The prairies are hot in the summer and cool in the winter. They are home to many animals, including bison, snakes, birds and small mammals such as prairie dogs.

Savanna An area of grassland found close to the equator. The largest savanna grasslands are in Africa. Savanna is dominated by grass, but is also scattered with bushes and trees. The climate is hot, with a dry season followed by a wet season. The savanna supports many plant-eating animals, including herds of giraffe, zebra and wildebeest. They are preyed upon by large carnivores such as lions, leopards and hyenas.

Scavenger An animal that feeds on the remains of food that has been killed by another animal. In the savanna, hyenas, vultures and jackals are all scavengers.

Steppes The treeless grasslands of Asia. They are cold because they are exposed to winds from the Arctic. They are home to many animals including the saiga antelope, the Prezwalski horse and the marmot.

Wet season A long period of wet weather. It is one of the two seasons that occur in tropical climates, such as the savanna. During the wet season, plants grow quickly and animals can move around more freely because there are more watering holes.

Wildfire A fire that takes place in grassland or forest. The most common cause of wildfire is lightning. Some ecosystems depend on wildfire because certain species, such as the Australian bottlebrush, cannot drop their seeds until after a fire.



FACTFILE

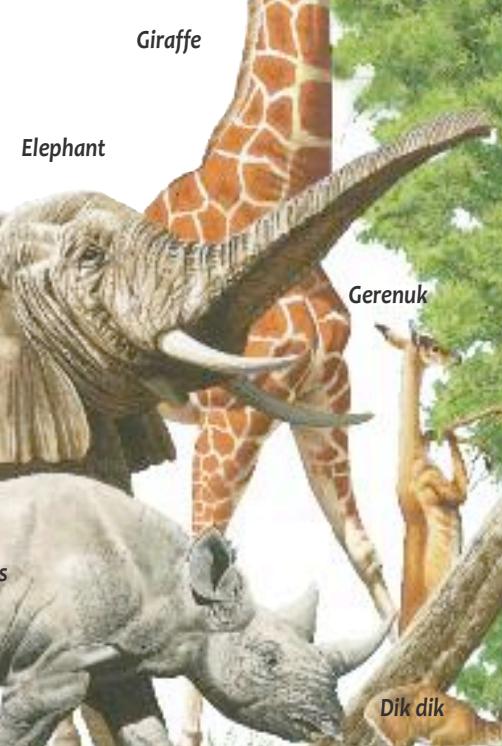
★ During the past 100 years or so, large areas of grassland have been destroyed and replaced by farmland. This is most evident in North America, where the prairies have been greatly reduced in size by crop and cattle farming. Animals such as the North American bison were hunted almost to extinction.

★ The grasslands of Africa have survived largely unchanged because of the tsetse fly, which spreads a potentially deadly disease called "sleeping sickness", which affects both animals and people.

★ The word savanna means "treeless plain" but there are usually some trees growing on the savanna.

★ The tallest grasses grow in places with warm summers and cool winters. They receive more rainfall than grassland in other climates. Some grasses can reach heights of nearly 2 m.

Savanna plant-eaters:
different species avoid
competition with
each other by
eating plant
material at
different levels.



FOREST

A forest is a large area of land covered by trees. Deciduous forests grow between the tropics and the cold regions close to the poles. Further north, coniferous forests cover huge areas of land. In winter food becomes scarce in the forest as plants die back. Some animals hibernate or migrate. Others store food during the autumn to last them through the winter.

Boreal forest The dense, coniferous forest that covers northern parts of the world, such as Russia and North America.

Broadleaves Trees such as elms and oaks that have wide, flat leaves. Most are deciduous but a few are evergreen.

Coniferous forest Forest that is mainly made up of coniferous trees. Coniferous forests grow in northern and mountainous areas. Berries and fungi provide food for animals. Conifer trees provide animals with shelter and some warmth during the winter.

Coniferous trees Trees such as pines and firs that grow their seeds inside cones and have needle-like leaves. Conifers grow in a conical shape to shed heavy snow that would otherwise break their branches. Most are evergreen but some, such as larches, lose their leaves in the autumn.

Deciduous Trees such as oak, maple and birch that shed their leaves in the autumn. This allows them to conserve water over winter. In spring they grow new leaves from buds.

Deciduous forest Forest that is mainly made up of broadleaved trees. Deciduous forests grow in areas with warm summers but cool winters. The soil is rich and some light reaches the forest floor, so there is a rich layer of ground vegetation growing between the trees.



KEY

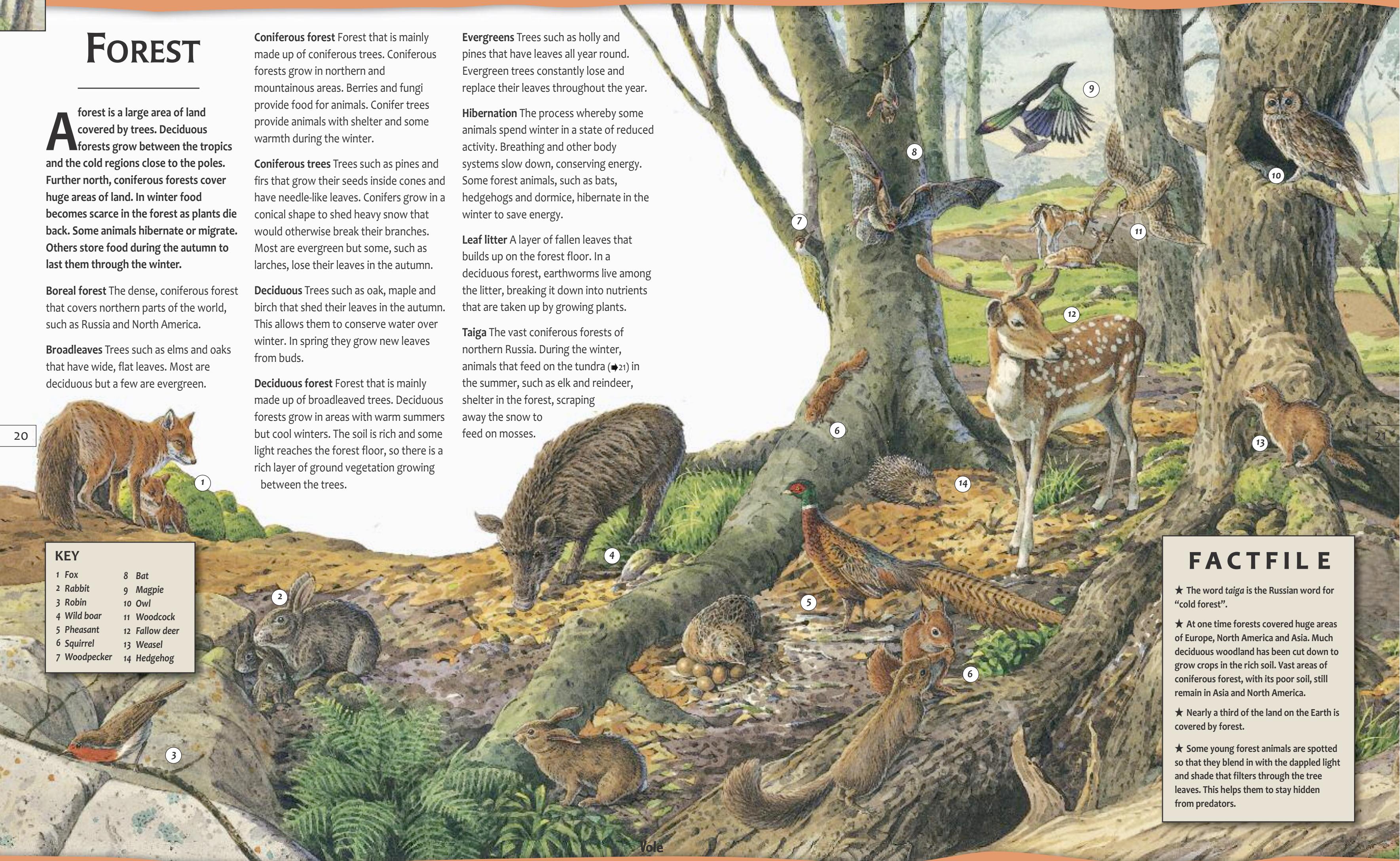
- | | |
|--------------|----------------|
| 1 Fox | 8 Bat |
| 2 Rabbit | 9 Magpie |
| 3 Robin | 10 Owl |
| 4 Wild boar | 11 Woodcock |
| 5 Pheasant | 12 Fallow deer |
| 6 Squirrel | 13 Weasel |
| 7 Woodpecker | 14 Hedgehog |

Evergreens Trees such as holly and pines that have leaves all year round. Evergreen trees constantly lose and replace their leaves throughout the year.

Hibernation The process whereby some animals spend winter in a state of reduced activity. Breathing and other body systems slow down, conserving energy. Some forest animals, such as bats, hedgehogs and dormice, hibernate in the winter to save energy.

leaf litter A layer of fallen leaves that builds up on the forest floor. In a deciduous forest, earthworms live among the litter, breaking it down into nutrients that are taken up by growing plants.

Taiga The vast coniferous forests of northern Russia. During the winter, animals that feed on the tundra (►21) in the summer, such as elk and reindeer, shelter in the forest, scraping away the snow to feed on mosses.



FACTFILE

- ★ The word *taiga* is the Russian word for “cold forest”.
 - ★ At one time forests covered huge areas of Europe, North America and Asia. Much deciduous woodland has been cut down to grow crops in the rich soil. Vast areas of coniferous forest, with its poor soil, still remain in Asia and North America.
 - ★ Nearly a third of the land on the Earth is covered by forest.
 - ★ Some young forest animals are spotted so that they blend in with the dappled light and shade that filters through the tree leaves. This helps them to stay hidden from predators.

UNDER THE GROUND

Many creatures live under the ground for all or part of their lives. Some feed on plant roots and tubers or other underground animals. Others live in burrows to stay safe from predators or to avoid extreme weather conditions above ground. Some animals spend their entire lives underground, but most others surface for part of the day. Underground animals are important as they help to mix nutrients in the soil, nourishing the plant life above them.

Bedrock The solid rock that normally lies beneath soil.

Burrow A hole or tunnel dug in the ground by an animal. Burrows provide animals with a safe place to live or rear their young. Common burrowers include mammals, such as rabbits and gophers, birds, such as puffins, and many varieties of insects, spiders and worms.

Den A home made by wild animals.

Fossorial Adapted for digging. Fossorial animals include badgers, rabbits, and moles.

Humus The dark brown part of soil that is made of decomposed organic matter. Humus is an important source of nutrients for plants and animals.

Sett A badger's underground den, made up of different "rooms" or chambers, linked by a network of tunnels. Chambers for sleeping or rearing young are lined with grass or leaves. Badgers leave their setts at night to hunt above ground.

Soil A mixture of rock fragments and living matter—mostly the decaying remains of dead animals and plants. Water and air fill the spaces between the soil particles. Also inhabiting the soil are millions of microscopic living things, such as bacteria, tiny animals like mites, plant roots and insect larvae.

Soil horizons The different horizontal layers of soil. From the surface down these are: topsoil, subsoil and bedrock.

Subsoil The layer of soil between bedrock and topsoil. It contains more rock fragments than topsoil. The roots of bushes and trees grow into the subsoil for firm anchorage.

Topsoil The top layer of soil, usually 5 to 20 cm deep. It is the most nutrient-rich layer of soil, consisting of newly-decomposed leaves and plant matter. It is home to small soil creatures and contains the roots of small plants.

Warren A burrow dug by rabbits.

A slice through the ground reveals soil horizons.



FACTFILE

★ Soils vary enormously in their thickness and in the minerals and nutrients they contain. These differences are determined by climate and the kinds of rocks that lie beneath the soil. Soil types affect what plants can grow in an area.

★ Some insects spend the early part of their life cycle as larvae buried in the soil.

★ Earthworms are very important to the condition of soil. They eat some soil then pass it out. This partly digested soil is highly fertile. Worms also mix the soil as they move through it, which helps to spread out the nutrients.



RIVERS & PONDS

Rivers and lakes are habitats for many plants and animals.

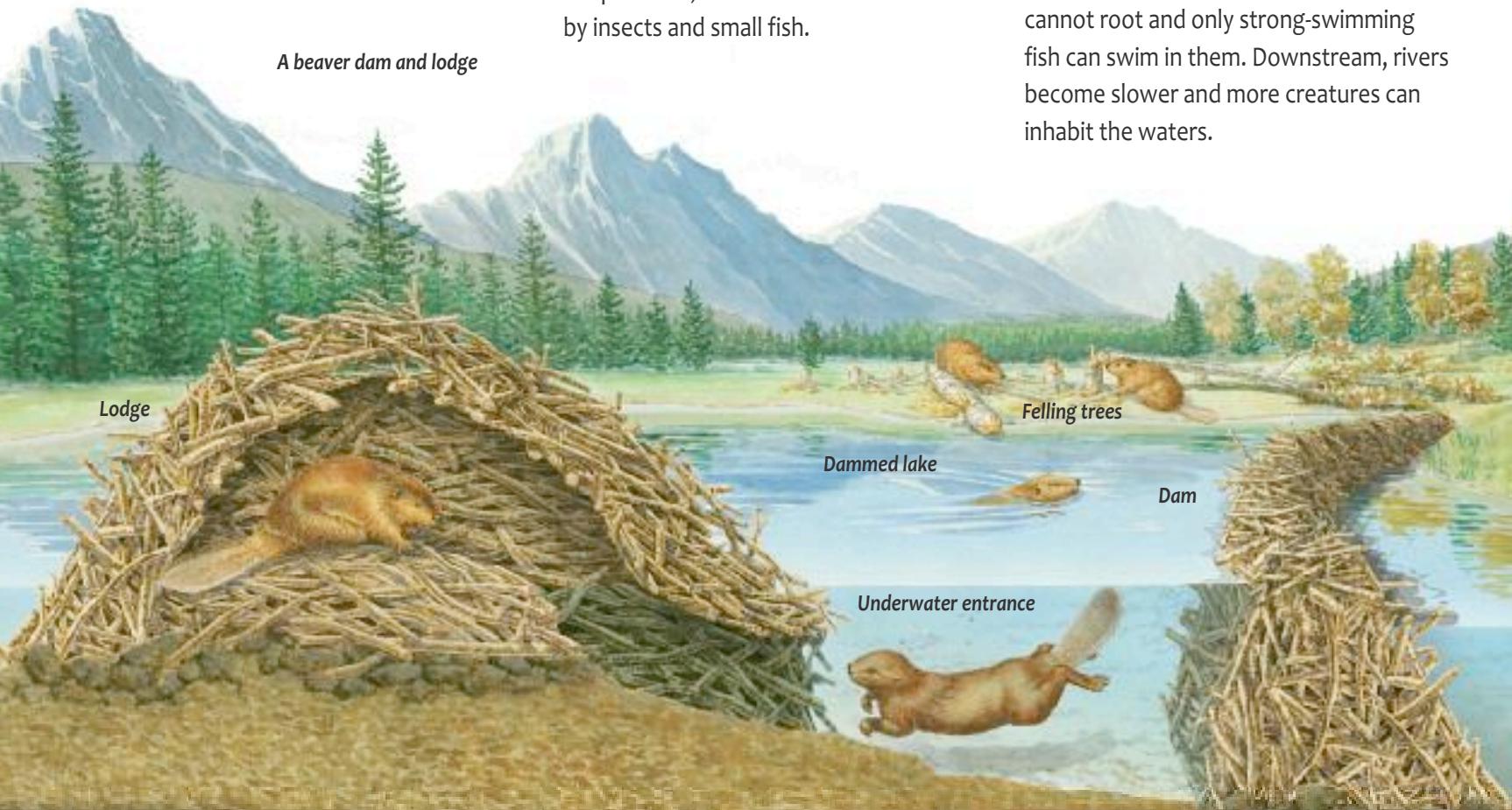
Some live in the water, and some live on the land around it. Few plants can put down roots in fast-flowing water, so animal life here depends on plant matter that falls into the water. In slow or still water, mud can collect and form a bed for plants. Worms and snails feed on plants and are themselves prey for fish, birds, frogs and large insects. Birds and mammals also feed on fish and insects.

Algae Plants without true stems, roots and leaves. Algae are found in water or moist ground. The still waters of ponds and lakes are an ideal habitat for algae.

24

Aquatic A plant or animal that lives in water.

A beaver dam and lodge



Benthic zone The region at the bottom of a lake or river (or the sea). Most of the animals that live in the benthic zone are worms, snails, insects or small crabs that burrow into the mud.

Emergent plants Plants that have roots underwater but whose tops reach above the water's surface.

Floating plants Plants that float on the surface of the water. Their roots hang beneath them in the water. Floating plants can reach more sunlight than emergent or submerged plants.

Fresh water Water that is not salty. Freshwater is found in streams, rivers, lakes and some swamps (►14).

Lake A large, still, natural pool of water surrounded by land. Most lakes are filled by rivers, but some are filled by rainwater or melted snow and ice.

Lentic ecosystem A still water ecosystem, such as a lake or pond.

Still waters are an ideal habitat for algae. They are fed upon by tiny animals called zooplankton, which are themselves eaten by insects and small fish.

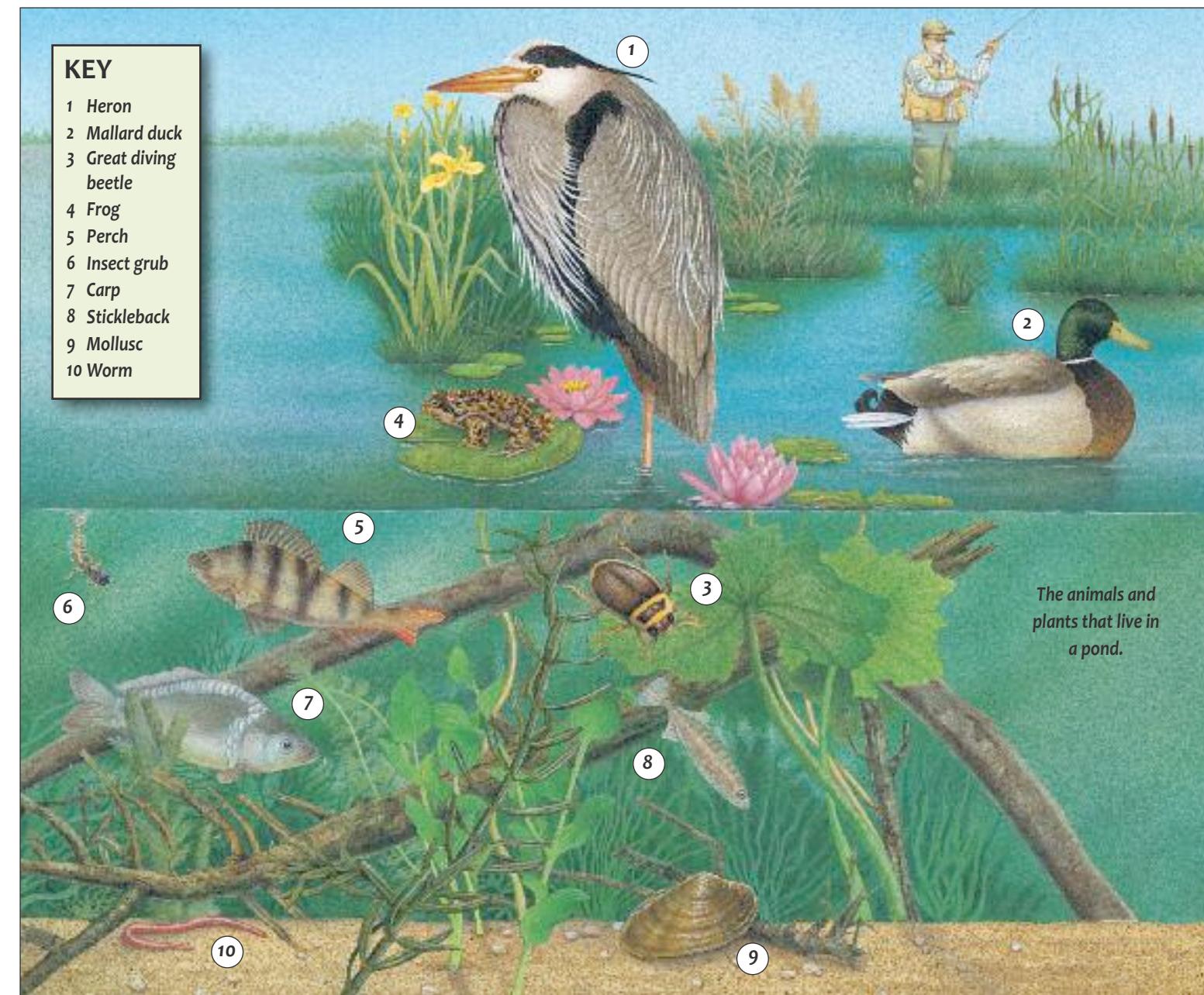
Littoral zone The region at the edge of a lake or river (or the sea). Light from the sun penetrates the water, allowing plants to grow. This is where most life is found.

Lodge A beaver's home. Beavers use trees to dam a stream and create a small, protective lake around a central lodge, made from mud and branches. The lodge is reached by several underwater tunnels.



Salmon are among the few fish powerful enough to swim against strong currents.

Lotic ecosystem A moving water ecosystem, such as a river. In their upper reaches, rivers are fast-flowing. Plants cannot root and only strong-swimming fish can swim in them. Downstream, rivers become slower and more creatures can inhabit the waters.



The animals and plants that live in a pond.

25

Pelagic zone The region of open water in the centre of a lake or river (or out to sea).

Pond A pool of freshwater shallow enough for sunlight to reach its bottom. The major predators in ponds are usually newts and frogs.

Riverbank The land on the edge of a river. Riverbanks provide shelter for many animals. Small mammals such as voles live in holes above the waterline, while birds nest among the tall reeds and rushes that often grow in the shallows.

Riverbed The bottom of a river, often covered in mud and silt. In shallow waters, plants grow in the riverbed. Small animals may also burrow here.

Submerged plants Plants that grow completely underwater. They grow in shallow, sunlit waters.

Tropical rivers Rivers that flow through hot, wet, tropical areas. Tropical rivers teem with fish, such as piranha, arawana and electric eels. Rivers are rich hunting grounds for birds as well as a source of food for land-dwelling animals.

Waders Any of the long-legged birds such as storks and herons that wade out into water to hunt.

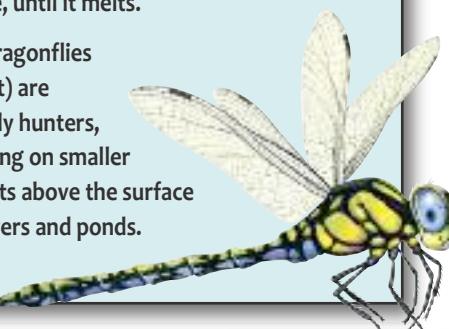
Webbed feet Paddle-like feet with a flap of skin between each toe. Webbed feet help aquatic mammals such as beavers and platypuses to swim.

FACTFILE

★ Up to 12 beavers can live inside one lodge at any time. There are usually two rooms inside a lodge: one where beavers dry off after leaving the water, and another where the family spends most of its time.

★ If ponds, lakes or rivers freeze over in the winter, the plants and animals that live in them survive, trapped beneath the layer of ice, until it melts.

★ Dragonflies (right) are deadly hunters, preying on smaller insects above the surface of rivers and ponds.



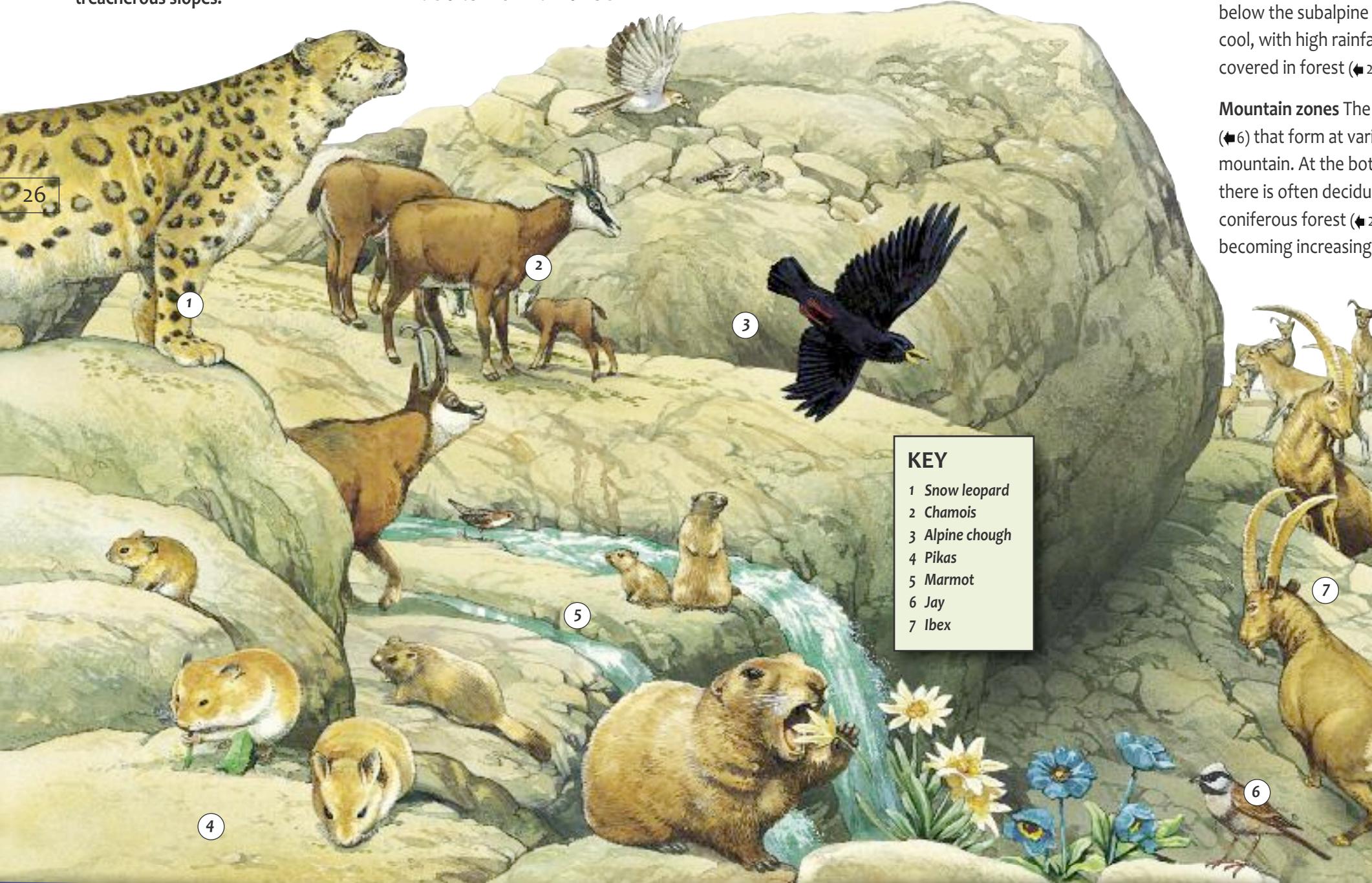
MOUNTAIN

The lower slopes of mountains are often forested, but higher up, the trees give way to scrubland (►17) and rocky terrain. The highest mountaintops may be covered with snow all year round. At such heights there is less oxygen and the winds are strong. Animals have large hearts and lungs to cope with the lack of oxygen and thick woolly coats to survive the cold. Grazing animals have nimble hooves, enabling them to scramble across even the most treacherous slopes.



Only the strongest birds, such as this Andean condor, can withstand the winds around mountain peaks.

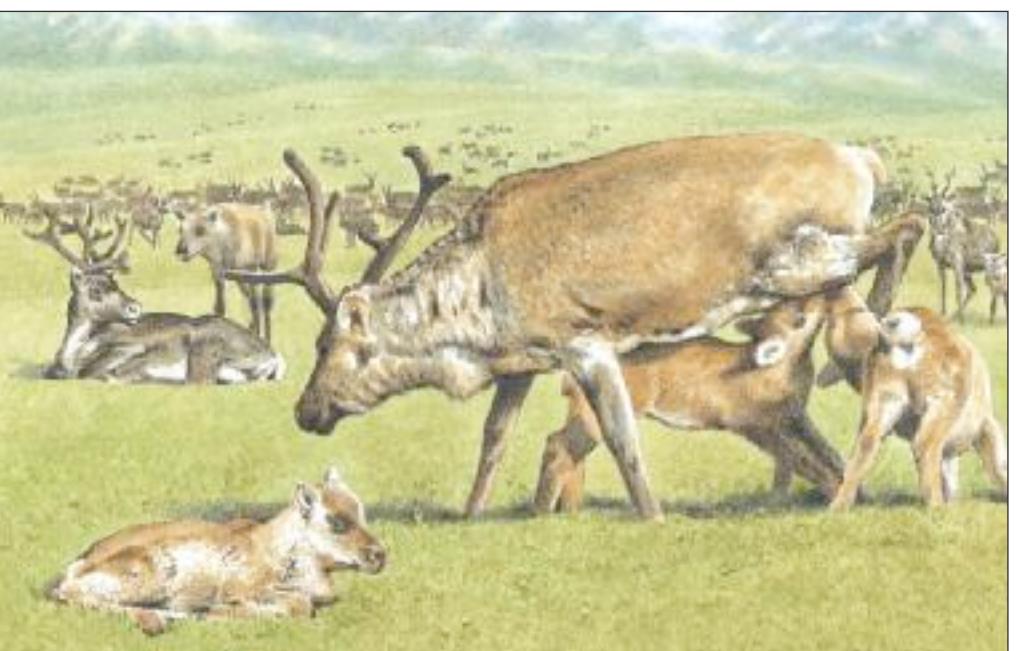
Alpine meadow Grassland that grows above the tree line on mountain slopes. It is often rich with flowers.



Alpine zone The region of mountain above the tree line. It is inhabited by mountain goats and small mammals such as marmots and pikas. Insects abound, but are mostly flightless, as they cannot contend with the winds. The plants here are short and hardy.

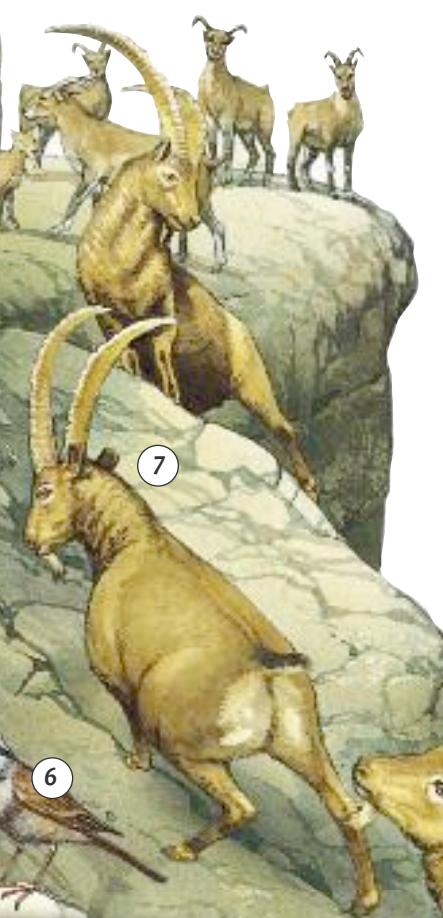
Altitudinal migration The movement of animals up and down a mountain as the seasons change. In the colder months, many animals move to lower ground where there is more food and shelter.

Cloud forest Forests (►20) that grow on tropical mountain slopes. The leaves on the trees trap moisture from the clouds around them. Mosses grow in abundance.



Montane zone The region of mountain below the subalpine zone. This zone is cool, with high rainfall. It is typically covered in forest (►20).

Mountain zones The different ecosystems (►6) that form at various levels up a mountain. At the bottom of a mountain there is often deciduous forest (►20), then coniferous forest (►20), with plant life becoming increasingly sparse above this.



In the summer, herds of reindeer migrate from the taiga forests (►20) to the tundra to feed.

Permafrost The frozen top layer of soil in the tundra. Plants can only grow here in the brief summer when the permafrost melts enough for roots to grow.

Snow line The height on a mountain above which snow lies all year round.

Subalpine zone The region of mountain above the montane zone and below the tree line. Trees thin out towards the tree line, above which no trees can grow.

Summit The highest point of a mountain, sometimes called the peak.

Tree line The height on a mountain above which trees cannot grow because of cold and the thinness of the soil.

MOUNTAIN ZONES

- 1 Alpine tundra
- 2 Alpine meadow
- 3 Shrubs and bushes
- 4 Coniferous forest
- 5 Deciduous forest

FACTFILE

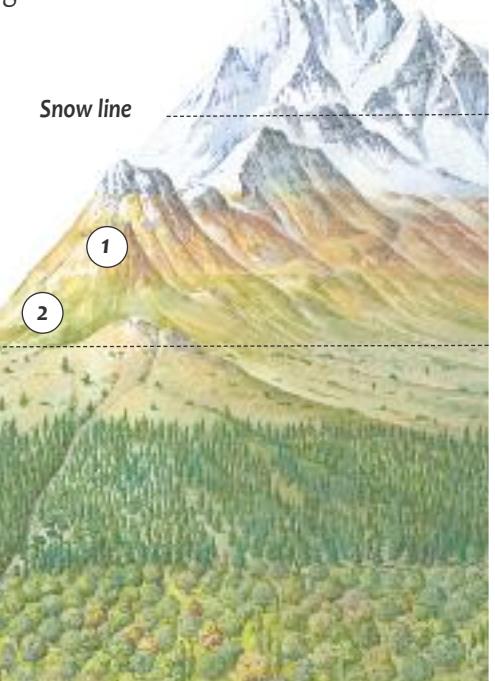
★ There are sometimes different ecosystems on either side of a mountain. Winds blow moist air over the mountains, where moisture condenses and falls as rain or snow. By the time wind reaches the far side of a mountain, it has lost most of its moisture. The climate on one side of a mountain range is wet therefore, while that on the other side is very dry.

★ The word tundra comes from the Finnish word *tunturi*, meaning "treeless plain".

★ The largest animal in the Himalaya mountains is the yak (below). It has thick fur with another coat of long hair on top. This keeps the yaks so warm that they have to move higher up the mountains to cooler areas in the summer.



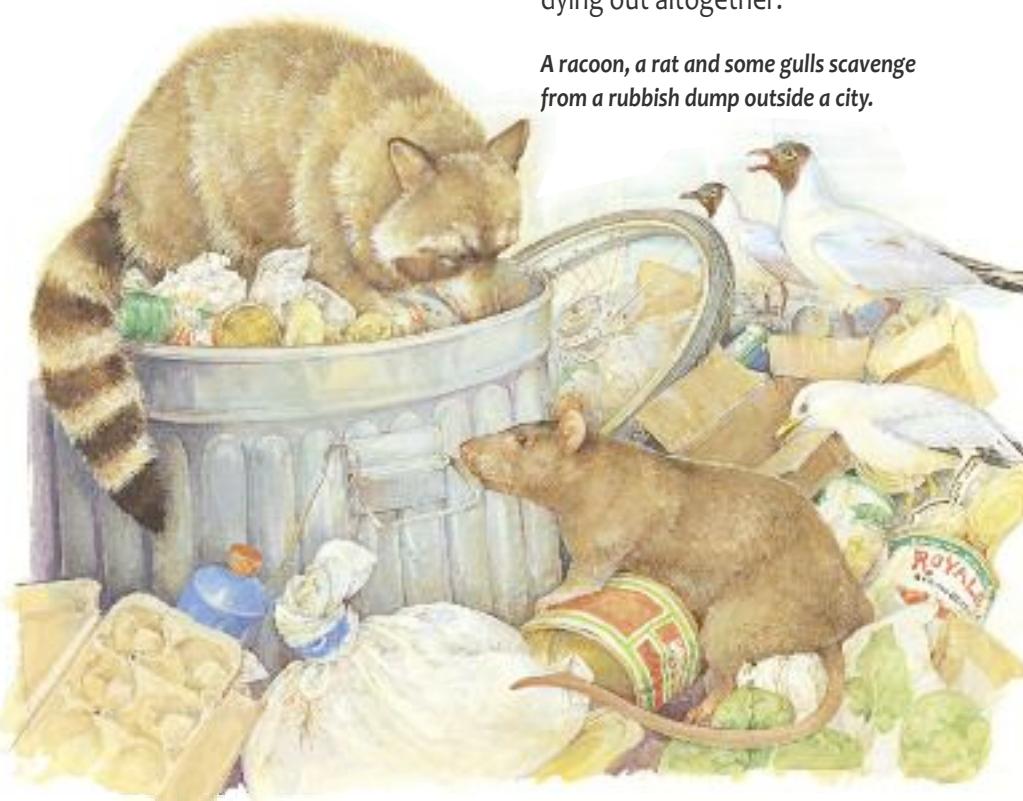
Tundra An area with little plant growth because the soil is almost always frozen. Tundra is found on the land that borders the Arctic and Antarctic oceans. It is also found on some mountain slopes. For most of the year, the tundra soil is frozen, and plant and animal life is scarce. During the summer, the ground thaws and small plants grow.



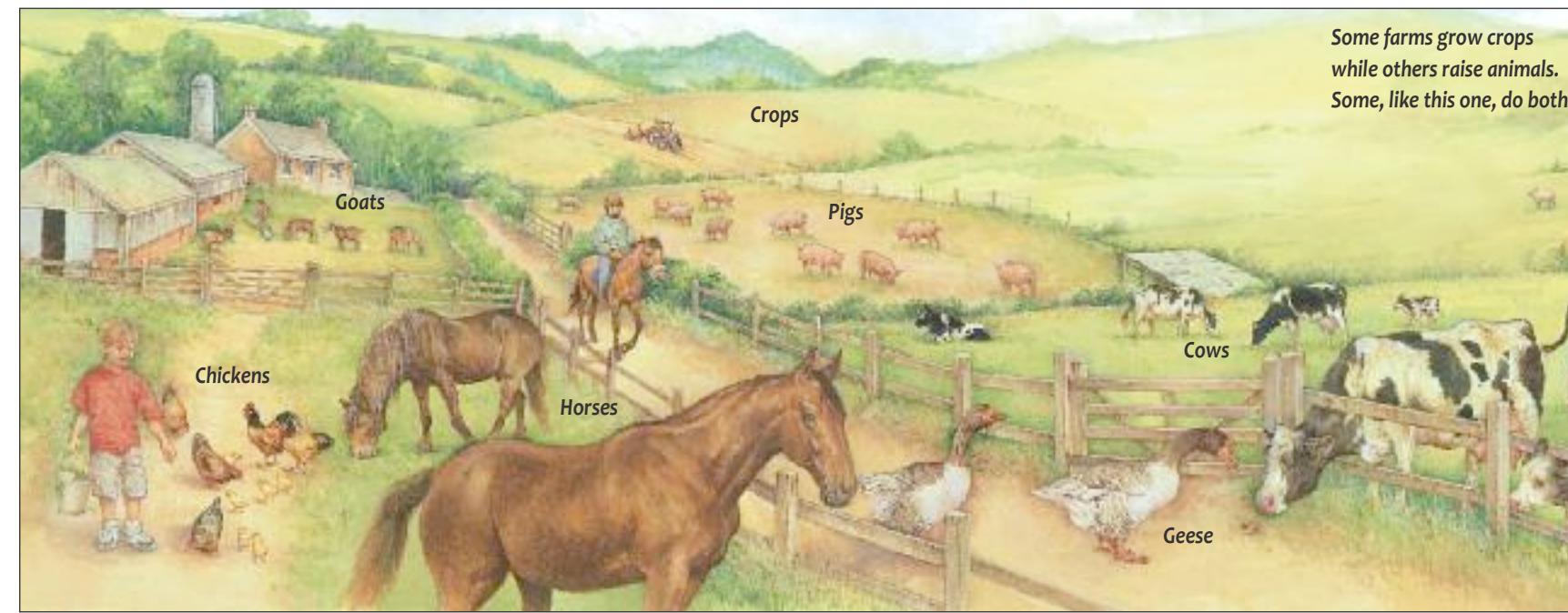
MAN AND NATURE

Human activities have had an enormous impact on nature and the environment, replacing woodland, wetland and grassland with housing, roads, factories and farming land. Humans have domesticated plants and animals for food and other products, and many people keep animals as pets. Some animals have adapted to take advantage of human environments, but others struggle for survival as their habitat is destroyed. In the face of these threats, conservation programs are fighting to save as many plant and animal species as possible.

Conservation The management and care of the biosphere, to avoid imbalances caused by habitat destruction and extinction. Conservation programmes fight to save animal and plant species through measures such as setting up reserves or creating seed banks.



A racoon, a rat and some gulls scavenge from a rubbish dump outside a city.



Deforestation The removal of forests by humans, either to clear land or to use trees for fuel or building. The destruction of forests puts many species in danger.

Domestication The process of taming wild animals and managing plants. Crops are sown and harvested by farmers. Domestic animals are chosen to provide wool, milk, eggs or meat, or to work on farms.

Endangered In danger of becoming extinct. Endangered species have such small populations that they are at risk of dying out altogether.



A hoard of elephant tusks recovered from a poacher.

Hunting The act of chasing and killing animals for sport or for food.

Introduced species A species introduced to a new environment by humans. Some introduced animals have hunted native species to extinction. For example, rats arrived on islands in Oceania with European settlers. The rats killed whole populations of birds that had previously had no predators. Other introduced species compete with native species for food. For example, red deer imported into New Zealand compete with other grazing animals there.

Ivory A hard, creamy-coloured substance that forms the tusks of animals such as elephants and walruses. They are killed for their tusks, which are made into ornaments.

Livestock Animals kept by humans for wool, meat, eggs, milk or hides.

Microclimate The climate of a small area, such as a town. Towns are generally warmer than the countryside because of warm air given off by houses, offices and factories. Together with an easy food supply and convenient nesting spaces, warmer temperatures attract birds and other animals into towns during the winter.

Native species A species of plant or animal that occurs naturally in an area.

A rainforest being bulldozed to create land for farmland.



Pesticides Chemicals designed to kill pests. The use of chemical pesticides can upset the balance of natural pest-controlling agents such as insects that feed on pests. Pesticides can also harm other animals by putting poisons into the food chain (►10).

Pests Living things that cause humans injury or inconvenience because of their behaviour or numbers. For example, locusts destroy crops, while rats have become pests in some places, eating human food and spreading diseases.

Poaching Hunting animals illegally for food, sport or to sell their body parts.

Reserve A special area of land set aside to protect wildlife. Nature reserves are guarded by wardens against hunters and poachers. Breeding programmes are carried out among the most endangered animals, to try to increase their numbers.

Seed bank A place where plant seeds are stored as a way of preserving endangered species. The seeds of many wild plants, which may have undiscovered medicinal benefits, are being stored in this way.

Traditional Chinese medicine An ancient form of medicine that mainly consists of massage, acupuncture and aromatherapy. However, some remedies use parts of endangered animals, such as sea horses, tiger paws and rhinoceros horns. This has led to the illegal hunting of these vulnerable animals.

FACTFILE

★ Rats, along with mice, are found wherever people live. Flies, fleas, lice and cockroaches also live close to humans, some spreading disease, while mosquitoes and the infections they carry are a constant danger in tropical countries.

★ Unlike other predators, humans may pursue a single species until it is extinct. Some species of whale became critically endangered during the 19th century, due to hunting for their meat and oil. "Big game" animals such as lions, tigers and elephants were shot as trophies during the early 20th century.

Pigeon: a common urban bird



Urbanization The growth of urban areas as a result of people moving to cities. Urbanization hugely alters the wildlife of an area, but many species have adapted to suit the urban habitat. Birds use roofs, gutters and chimney pots as roosting and nesting sites, instead of cliffs and trees. Rubbish also attracts rats, foxes and larger animals such as jackals or polar bears, which scavenge from dumps.

INDEX

A

adaptation 6
Africa 9, 15, 16, 18-19
air plant 12
algae 24
alpine zone 26
Amazon rainforest 13
Amazon River 13
Andes mountains 18
Antarctic Ocean 27, 29
Antarctica 9, 16
antelope 19
aquatic 24-25
Arctic Ocean 9, 27
Asia 9, 18-19, 21
Atlantic Ocean 8
Australia 9, 18
autotrophs 11

B

30
bacteria 10-11, 22
denitrifying 11
nitrifying 11
badger 22
baobab tree 18
bat 6, 20
bear
polar 29
bears 10
beaver 24-25
bedrock 22-23
beetles 23, 25
benthic zone 24
biodiversity 6
biomass 6
biome 6-7, 8
biosphere 6-7, 28
birds 6, 10, 12-15, 17, 18-19,
22, 24-26, 28-29
bog 14-15
brackish 14
Brazil 15
browsers 18
buffalo 15, 18
burrow 16, 18, 22, 24-25
butterflies 12, 17

C

cactus 16-17
camel 17
canopy 12-13
capybara 12
carbon 10
carbon cycle 10
carbon dioxide gas 11, 16
carnivore 10-11, 16
cayman 12
climate 6, 8-9, 18-19,
23, 27, 29
coast 14-15
colony 6
community 7, 17
condor, Andean 26
conifers 9, 20
conservation 28
consumer 10-11
cow 18, 29
coyote 17
crab 24
crocodile 15
crops 28-29

D

decay 10, 13, 22
decomposer 10-11
deer
fallow 20
red 28
deer 18
deforestation 28
den 22
desert 6, 8-9, 16-18
dik dik 19
domestication 28
dormouse 20, 23
Gobi desert 16
dragonfly 25
drip tip 12
drought 16

E

eagle 12
ecology 6-7
ecosystem 6-8, 10, 19, 27
elephant 18-19, 29
elk 20

emergent layer 12-13
endangered 28-29
endemic 7
environment 6-7, 9, 14,
17, 18, 28-29
epiphyte 12
equator 9, 19
estuary 8, 14
Europe 9, 21, 28
everglades 14
evergreens 20
extinction 28

F

farmland 19, 29
fish 14-15, 24-25
floating plants 24
food chain 10-11, 29
food web 6, 10
forest 6, 9, 12, 18-21, 26-27
boreal 8-9, 20
cloud 26
coniferous 8, 20-21, 27
deciduous 20-21, 23, 27
taiga 20-21, 27

fossil 22
fox 17, 20, 29
frog 12, 24-25
fuel 28
fungi 10

G

gazelle 19
gila monster 17
giraffe 18-19
domestication 28
goat 26, 28
dormouse 20, 23
Gobi desert 16
dragonfly 25
drip tip 12
drought 16

grassland 8-9, 18-19, 26, 28
grazers 18, 26, 28

herbivore 11, 16
herd 18
heron 15, 25
heterotroph 10
hibernate 20
Himalaya mountains 27
hippopotamus 15
horse 18, 28
hummingbird 12, 17
hummock 14
humus 22
hunting 11, 28-29
hyena 19

IJK

ibex 26
Indian Ocean 9
insects 7, 10, 12-15, 22-24,
26, 29
island 7, 14
ivory 29
jackal 19, 29
jackrabbit 17
kangaroo rat 16-17
kinkajou 12

L

lagoon 14
lake 7, 8, 14, 24-25
leaf litter 20, 23
lemur 7
lentic ecosystem 24
leopard
snow 26
leopards 19
liana 13
lion 19, 29
littoral zone 24
livestock 29
locust 29
lotic ecosystem 24
lynx 10

M

macaw 12
Madagascar 7
hawk 10
hedgehog 20

marsh 7, 9, 14-15
meadow, alpine 26-27
mesquite bush 17
methane 15
mouse 17, 29
microclimate 29
migration 18, 20, 26
minerals 10-11, 23
mole 6, 22-23
mongoose, marsh 15
monkey
howler 7, 12
squirrel 12
monkeys 15
montane zone 26
mosquitoes 29
mosses 14, 20, 26
mountain 8-9, 14, 20, 26-27
mudskipper 14

N

New Zealand 28
newt 25
niche 7
nitrates 11
nitrogen 11
nitrogen cycle 11
nocturnal 16
North America 8, 18-21
nourishment 18
nutrients 13, 10-11, 14-15,
20, 22-23

O

oasis 14, 17
ocean 6, 8, 11, 27
Oceania 28
omnivore 11
organism 7, 10-11
owl
elf 16-17
owls 18, 20
oxygen 10, 15, 26

P

Pacific Ocean 8-9
harvest 28
hawk 10
hedgehog 20

papyrus 15
peccary 12
pelagic zone 25
permafrost 27
pesticide 29
pheasant 20
photosynthesis 11, 16
minerals 10-11, 23
mole 6, 22-23
mongoose, marsh 15
monkey
howler 7, 12
squirrel 12
monkeys 15
montane zone 26
mosquitoes 29
mosses 14, 20, 26
mountain 8-9, 14, 20, 26-27
mudskipper 14

S

salinity 15
Pacific Ocean 8-9
pampas 18
Pantanal 15

papaya 15
peccary 12
pelagic zone 25
permafrost 27
pesticide 29
pheasant 20
photosynthesis 11, 16
minerals 10-11, 23
mole 6, 22-23
mongoose, marsh 15
monkey
howler 7, 12
squirrel 12
monkeys 15
montane zone 26
mosquitoes 29
mosses 14, 20, 26
mountain 8-9, 14, 20, 26-27
mudskipper 14

T

temperature 29
tiger 29
topsoil 22-23
tree line 26-27

trees 9, 15, 19, 20, 22,
26-27, 28
broadleaved 9, 20
coniferous 8, 20,
trophic level 11
tundra 20, 27

UV

underground 22
understorey 13
urbanization 29
vole 25
vulture 19

W

walrus 29
warren 22
wasp nest 23
water 6, 8, 11, 12, 14-20,
22, 24-25
water cycle 11
weasel 20
weather 6, 18-19, 22
webbed feet 25
wetland 14-15, 28
wildebeest 19
wildfire 19
wind 6-7, 17, 19, 26-27
wolf, maned 18
woodcock 20
woodland 7, 8-9, 21, 28
woodpecker
gila 16-17
woodpeckers 6, 20
worm
earthworm 10-11, 20, 23
worms 15, 22-25

YZ

yak 27
zebra 19
zooplankton 24