A teachers guide to exploring:

This pack aims to :

aid the pursuit of relevant topics,
provide information, ideas and resources.

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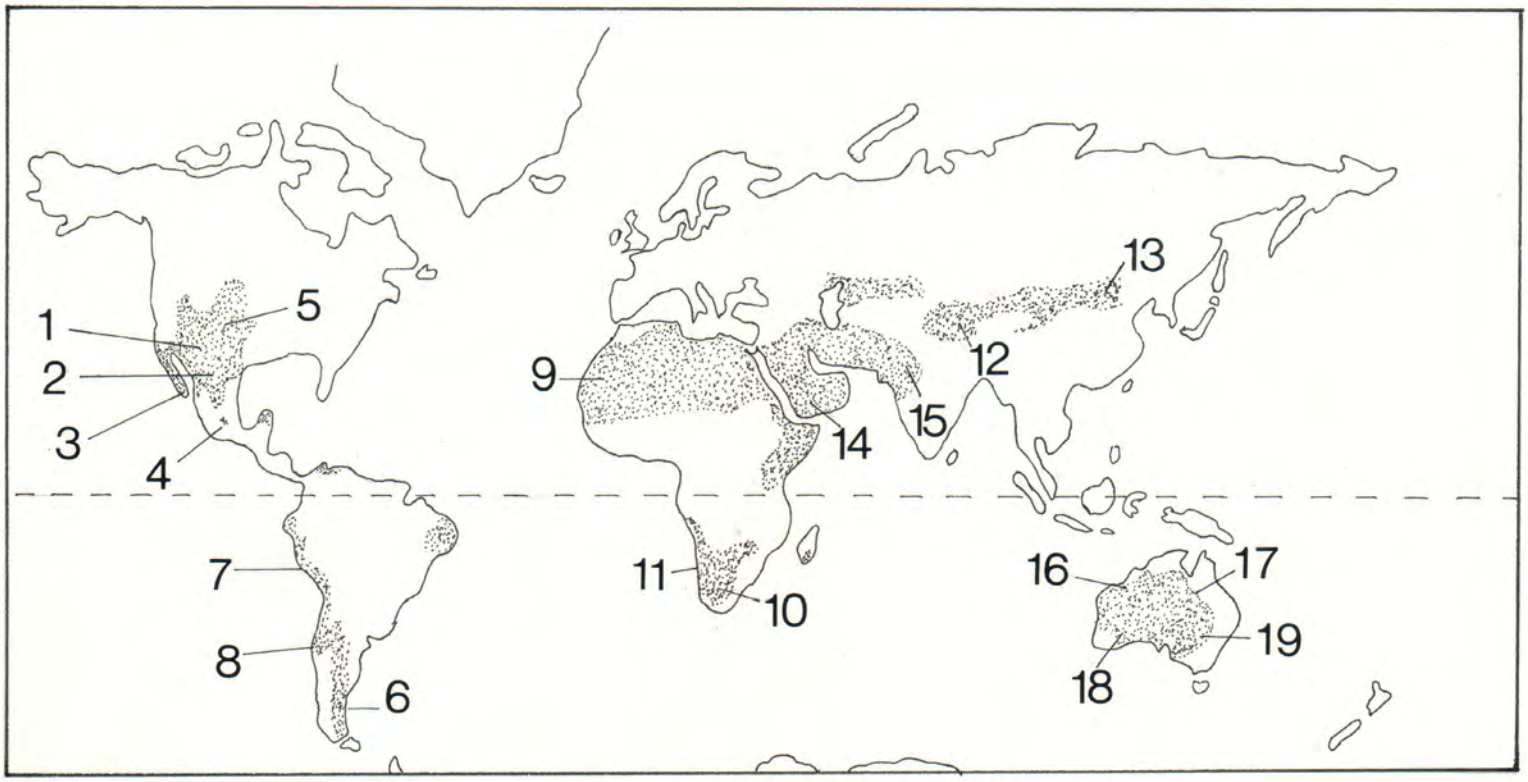
DJ Cox '88

WHERE ARE THE DESERTS?

Hot deserts are distributed along two discontinous bands, one to the north and one to the south of the Equator.

1. Great Basin
2. Mojave
3. Sonora
4. Chihuahua
5. Grand Canyon
6. Patagonian
7. Peruvian
8. Atcama



9. Sahara
10. Kalahari
11. Namib
12. Takla-makan
13. Gobi
14. Rub' alkali
15. Thar
16. Great Sandy
17. Simpson
18. Great Victorian
19. Stuart

Sahara - worlds largest desert, occupying a belt 2,012km (1,250 miles) wide.

Namib - water reaches this desert usually as fog or dew.

Death Valley between the Mojave and Sonora - air temperature of 56°C (134°F).

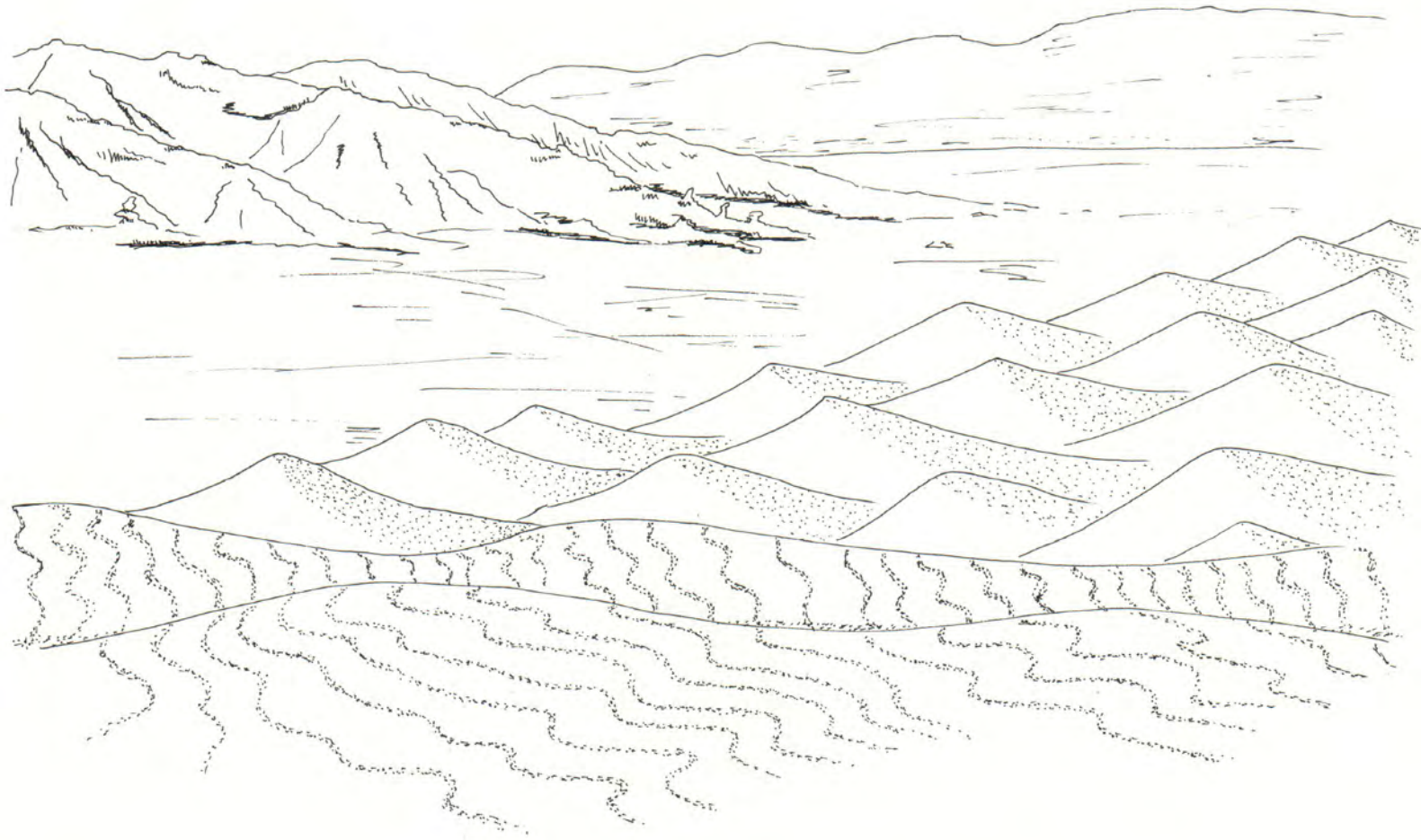
Over half of Australia is classed as desert, 20% of the continent has less than 65mm of rain each year.

WHAT IS A DESERT ?

Deserts are arid, inhospitable regions characterised by an annual rainfall of less than 255mm.
This occurs due to dry winds blowing across these regions, the air loses its moisture over the cool sea rather than over the warm land.
Due to this the the skys are cloudless for most of the time and as the earth absorbs heat rapidly (90% of the Sun's heat) high daily temperatures are reached. At night, the earth loses heat rapidly and with no cloud cover(which acts as a blanket keeping heat in) the temperatures often fall below zero.

Deserts come in a variety of forms :

sandy, rocky hills, stony plains, claypans, salty mudflats.



The main characteristic of a desert - ie. its low annual rainfall, means that the Polar ice-caps can also be included as deserts !

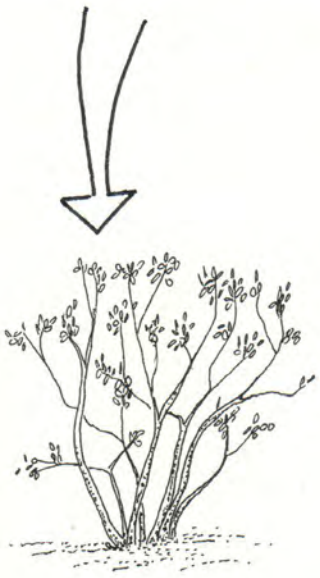
DESERT PLANTS

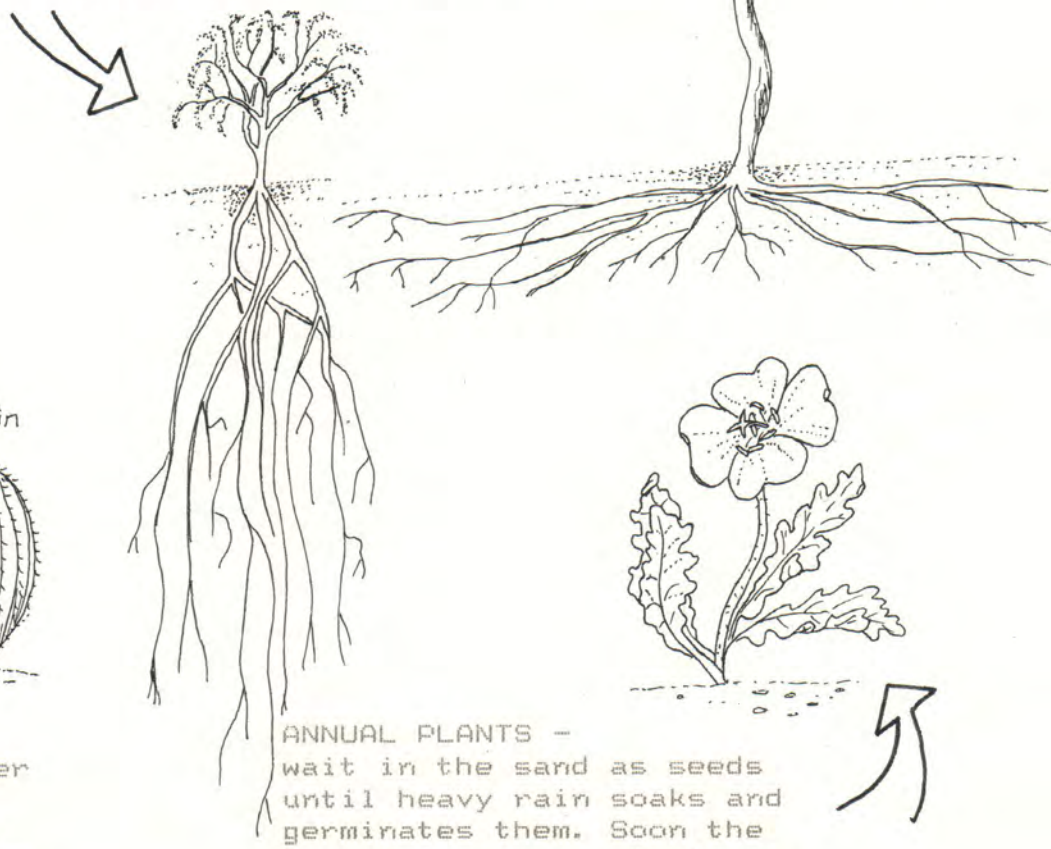
These plants have to cope with little water and extremes of temperature. Survival is achieved in different ways:

CREOSOTE BUSH -
very small leaves with a waxy coating for minimum water loss. Also produce a toxin in the roots which prevents other plants (even its own seedlings) from growing nearby. In extreme and prolonged heat the leaves are dropped.

ACACIA -
small leaves held vertically to reduce the amount of surface area exposed to direct sun-light and so minimise waterloss. Shallow root system spreads out over as much as 1km.

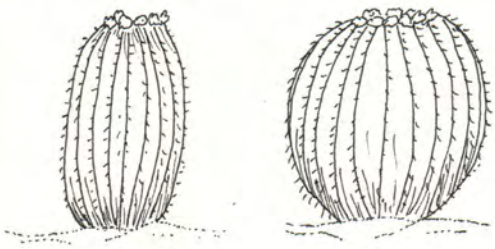
MESQUITE - long taproots grow deep into the soil to reach the water table which may lie over 30m(100ft) down.





Before rain

After rain

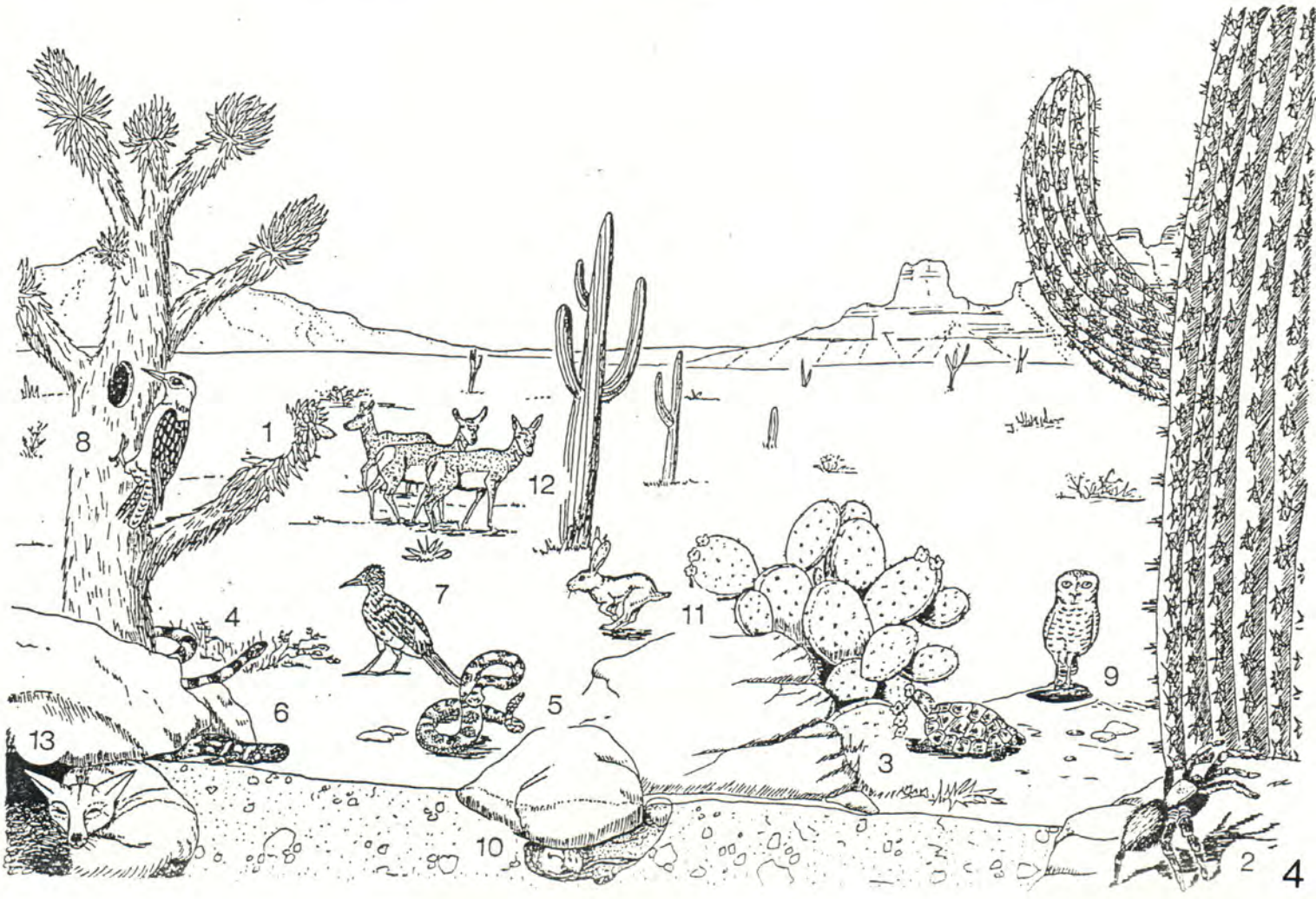


CACTI -
ability to store water in the stem enables them to live in arid conditions where other plants would die. The pleated trunk expands during rain to store more water. Leaves are reduced to spines.

ANNUAL PLANTS -
wait in the sand as seeds until heavy rain soaks and germinates them. Soon the desert is a mass of blooms which quickly set seed and die back when the rains end. Eg. Large Yellow Desert Primrose.

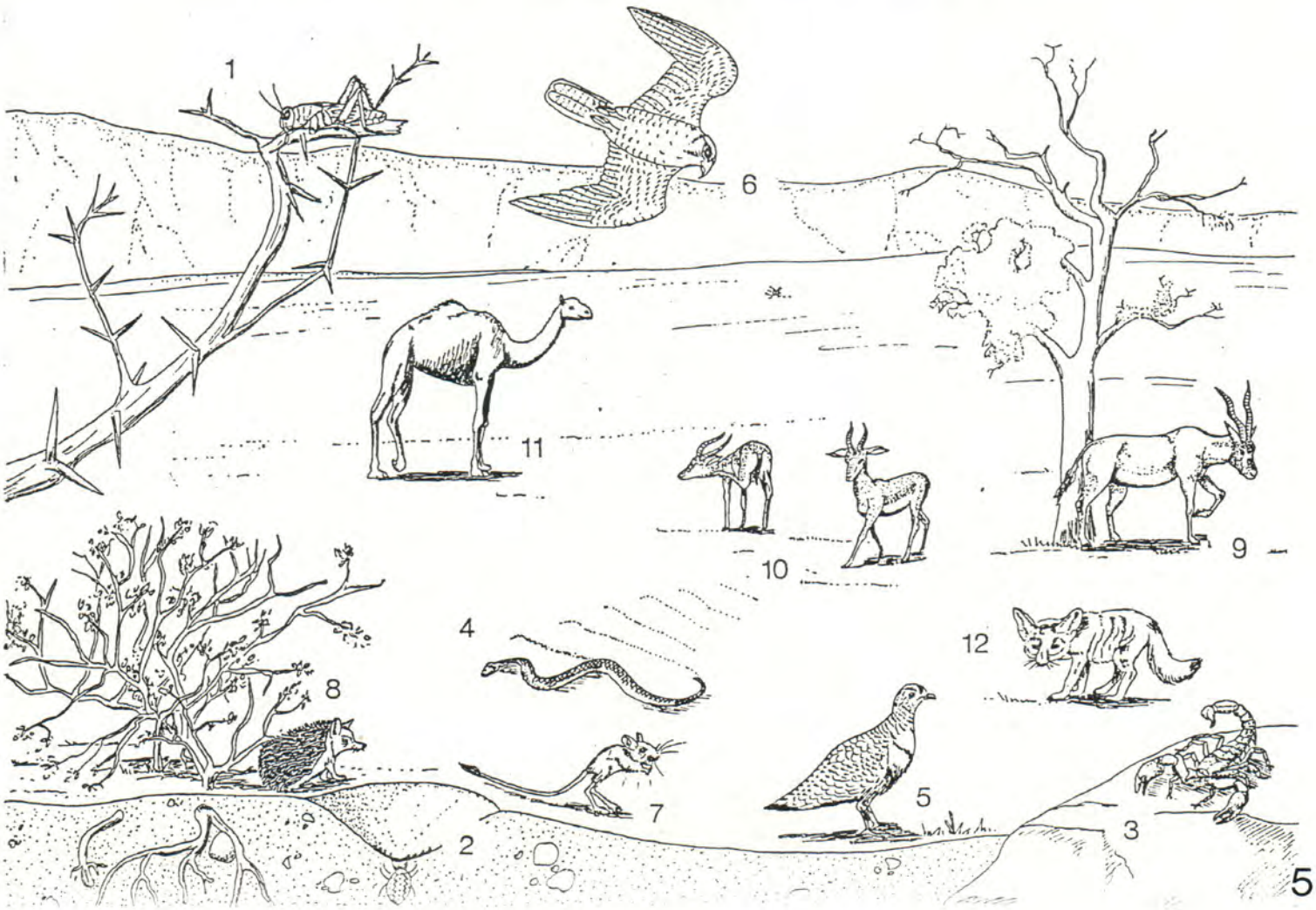
AMERICAN

	SPECIES	TYPE OF ANIMAL	ADAPTATIONS AND NOTES
1	Yucca moth	Insect	Larvae feed only on the developing seeds of the Yucca plant, so the insect pollinates the plant in return - an example of close relationships assuring the survival of two species.
2	Tarantula	Arachnid (Spider)	Lives in a hole in the ground. This large spider waits for prey to come close to its burrow and then ensnares it in the web.
3	Desert Tortoise	Reptile (Tortoise)	Spends the hottest parts of the day and the dryest part of the year in a tunnel dug using its front legs. The tortoise protects itself from attack by drawing its head and limbs into its shell.
4	King Snake	Reptile (Snake)	Desert King Snakes obtain their water from their food. They are able to eat rattlesnakes due to immunity to the venom. King Snakes are harmless to man, their only defence is the bright colours and patterns immitating poisonous snake species.
5	Rattlesnake	Reptile (Snake)	One of the more venemous reptiles in the desert, they advertise their presence with a rattling sound created by shaking a group of loosely interlocking rings of dead scales on the tail.
6	Gila Monster	Reptile (Lizard)	One of the few venemous lizards. Its' bold patterns and bright colours act as a warning. The venom, from glands at the back of the mouth mixes with the saliva and kills the prey when bitten
	Pupfish	Fish	A group of strange fish which are tolerent of salt and warmth. Found only in the relict lakes of the Great Basin. The fatal heat of the desert lake forces the fish to the "cooler" edges.
7	Roadrunner	Bird	Swift-running terrestrial cuckoo, is so called as it was often found running alongside the waggons of late 19th century pioneers Feeds on rodents, seeds, reptiles, insects, eggs, fruit.
8	Gila Woodpecker	Bird	Carve out nesting holes in the giant Saguaro Cactus, usually pecking out damaged or diseased areas so helping the cactus. Spends hot days in the cool, shady holes.
9	Burrowing Owl	Bird	Tiny, long-legged owl. Nests in holes in the ground, often taking burrows abandoned by the animal that made it. Where neccessary the owl will enlarge the hole with its powerful feet.
10	Kangeroo Rat	Mammal (Rodent) (Pocket Mice)	Front legs short, hind legs long for rapid leaping. More related to squirrels than rats. Breeding depends on the germination of annual plant seeds - food shortage leads to no breeding.
11	Jack Rabbit	Mammal (Lagomorph)	Is actually a hare. Active by night, the day is spent in the shade. Controls body heat by regulating blood flow in the ears - losing or absorbing heat according to environmental temperature.
12	Pronghorn	Mammal (Even-toed Ungulate)	Worlds' second fastest land animal - up to 86km/h (55mph), and able to keep up 70km/h (45mph) for over 6.4km (4mi).
13	Kit Fox	Mammal (Carnivore) (Dog)	Large ears for heat loss & acute hearing. Nocturnal. Moves swiftly over short distances to catch prey especially kangeroo rats. Other prey includes small rodents, lizards & birds.



AFRICAN

SPECIES	TYPE OF ANIMAL	ADAPTATIONS AND NOTES
1 Locust	Invertebrate (Insect)	During long migratory flights, a swarm may eat 20,000 tonnes of vegetation & grain a day - resulting in famine.
2 Antlion	Invertebrate (Insect)	Creates a sandy conical pit. Lies at the bottom with its jaws open waiting for prey to fall in. The shape of the pit does not allow the prey to get a foot-hold and the Antlion gets a meal.
3 Scorpion	Invertebrate (Arachnid)	Sting on end of tail is used to kill prey and to defend itself. Sting relays venom that, in some species, is dangerous to man. Hide by day in burrows or under wood and stones.
4 Sidewinder	Reptile (Snake)	Moves by hurling itself sideways in an S-shape so that only two points on its body are in contact with the hot sand at one time. Swallows prey whole. Grows up to 45cm in length.
5 Sandgrouse	Bird	Flies large distances to find water. Soaks it up in the breast feathers where it is retained by helical coils of fuzzy down, then return to chicks who strip the water from the down-layer.
6 Lanner Falcon	Bird of prey	Found in most of the drier parts of Africa and in South-western Europe. Feeds on birds, rodents and lizards. Nests on rock ledges or in trees.
7 Jerboa	Mammal (Rodent)	Hind legs four times as long as the front legs - superbly adapted for jumping. Live in burrows during the day where the temperature and humidity are regulated by opening and closing various tunnels at various times of the day. Has specially adapted kidneys to concentrate urine and so reduce water loss.
8 Desert Hedgehog	Mammal	Active during the night. Digs and lives in burrows up to 40-50cm deep, each burrow is occupied by a single hedgehog throughout the year. Feed on any available food from insects to carrion.
9 Addax	Mammal (Even-toed Ungulate)	Superbly adapted to desert life - generally does not drink but obtains moistur from its plant food. Hooves enlarged to help walking over sand. Endangered due to disturbance & over-hunting.
10 Dorcas Gazelle	Mammal (Even-toed Ungulate)	Note countershading for camouflage - underparts lighter than upperparts, thus reducing the shadow and making the animal less conspicuous to predators.
11 Dromedary Camel	Mammal (Even-toed Ungulate)	Closeable nostrils, long eyelashes, wide feet, long hair on top, short hair underneath, fat storage in hump all add up to a superbly adapted desert dweller. Can drink salty water and tolerates salty plants. Eats almost any desert vegettion and, if hungry, will also take fish, meat, bones and skin.
12 Fennec Fox	Mammal (Carnivore) (Dog)	Nocturnal habits, small size, large ears and pale fur are all adaptations for life in a hot desert. The huge ears act as radiators dispersing its body heat.

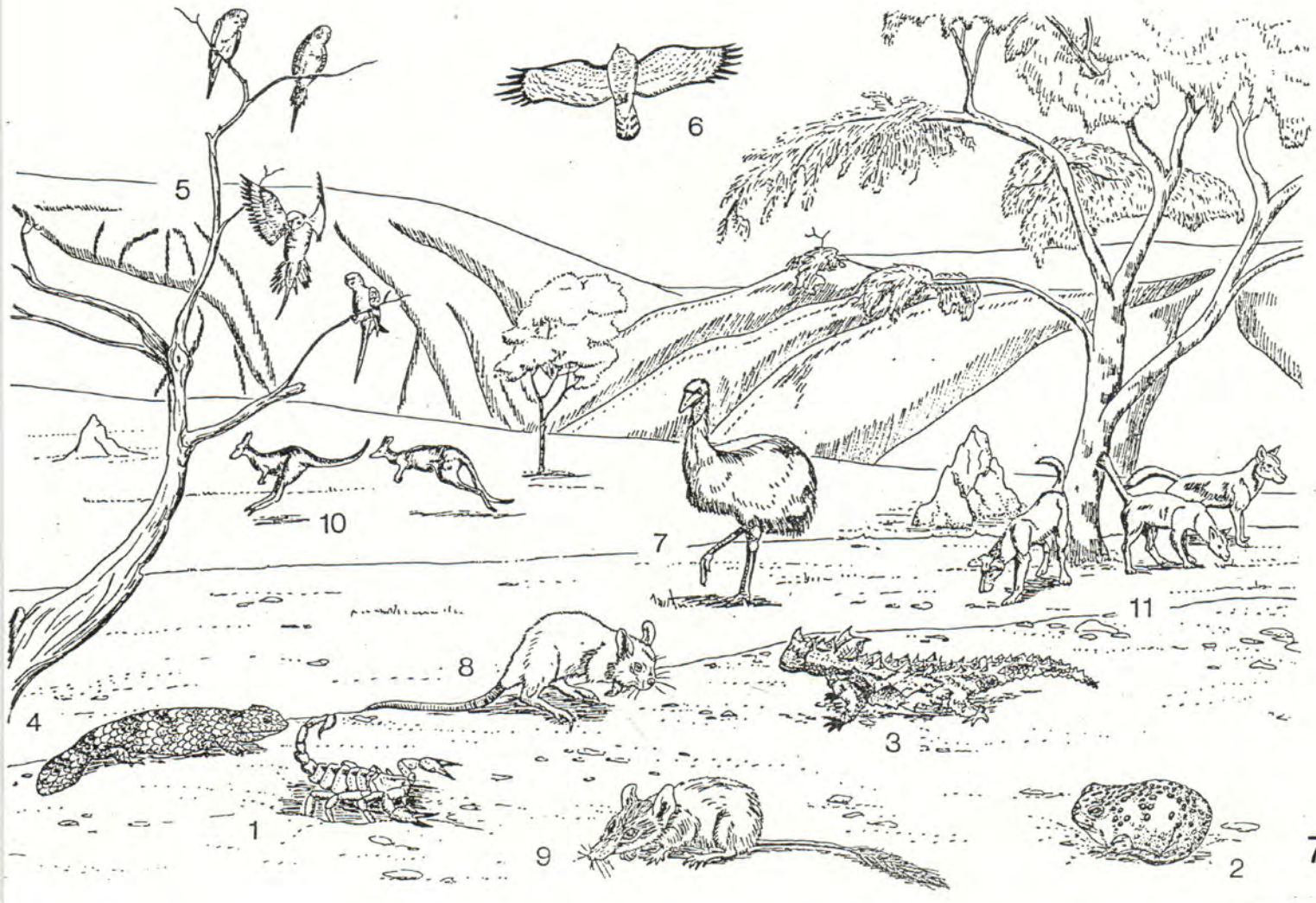


ASIAN

	SPECIES	TYPE OF ANIMAL	ADAPTATIONS AND NOTES
1	Horsefield's Tortoise	Reptile (Tortoise)	Only 20cm long, feeds on short lived plants & young shoots, will drink water but can live without drinking. Avoids the fierce heat by burrowing deeply into the sand.
2	Toad-headed Agamid	Reptile (Lizard)	These lizards live in sand dunes, burrowing into the cooler sand at the bottom of the dune. Can bury itself almost instantly. Colour and pattern give excellent camouflage.
3	Desert Monitor	Reptile (Lizard)	Can reach 1.6m (5ft) long and is a swift runner - reaching speeds of 100 to 120m per minute. Feeds on various animals - insects, snakes (even the venemous ones), birds and rodents.
4	Central Asian Cobra	Reptile (Snake)	Rare. Has a powerful venom, dangerous to man. Snake gives warning when threatened by adopting upright posture and hissing loudly. Lives in hilly areas with sparse grass, abundant shelter and many rodent burrows.
5	Desert Warbler	Bird (Passerine)	Drab yellow and grey plumage provides good camouflage. Lives in desert with scattered shrubs. Feeds on insects & some seeds.
6	Greater Sand Plover	Bird	Breeds in clay and salt deserts, surviving harsh conditions intolerable to other birds as they make do without water. However, once the three or four chicks have hatched they move to river or lake banks where there is ample food and water to raise a family.
7	Gerbil	Mammal (Rodent)	Found mainly in sandy deserts. They dig complex and deep burrows which have hundreds of exits. They live in colonies and are diurnal. Feed on green plant parts. Store food for winter.
8	Jerboa	Mammal (Rodent)	Highly developed for desert life. Long hind legs allow speeds of up to 22mph (36km/h) and leaps of 10ft (3m) or more. Different species are adapted for different desert habitats eg. Hairy-pawed Jerboa to sand, Five-toed Jerboa to clay/stone desert.
9	Asian Wild Ass	Mammal (Odd-toed Ungulate)	Lives in desert & semi-desert of central Asia. Slim, long-legged - can run at 40mph (62km/h). Must drink regularly, so distribution is limited around suitable water holes. Feeds on a variety of plants, altering diet to suit the season.
10	Goitred Gazelle	Mammal (Even-toed Ungulate)	Feeds on grasses and shrubs. Its' medium size, elegant shape and long legs allow speeds of 40mph (62km/h). Females are smaller than males and usually lack horns.
11	Asian Cheetah	Mammal (Carnivore)	Very rare race of cheetah. Live in clay and sandy deserts. Flexible spine and long legs allow speeds of 60mph (96km/h) in short bursts of about 200m. If the prey is not caught in this short burst of amazing speed then the cheetah must give up as it will be exhausted.

AUSTRALIAN

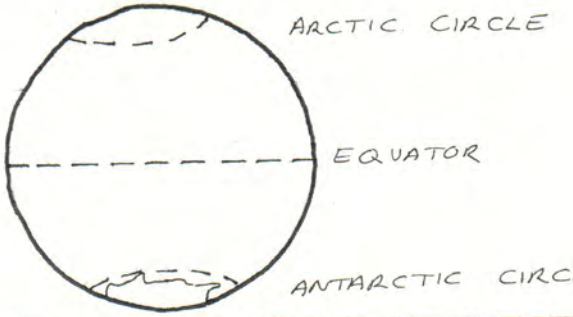
SPECIES	TYPE OF ANIMAL	ADAPTATIONS AND NOTES
1 Desert Scorpion	Invertebrate (Arachnid)	Digs spiral burrow in the sand to 1m (3ft) deep, where it spends the day out of the fierce heat in a nest in the permanently cool, moist sand. At night - catches insects at its "front door".
2 Catholic Toad	Amphibian	Lives and breeds in freshwater desert pools. During drought lives in burrow and stores water in its body tissues. Can survive two years of drought by remaining underground in mucus envelope.
3 Thorny Devil	Reptile (Lizard)	Up to 20cm long. Feeds on ants (7,000 per day) using its sticky tongue. Defends itself by putting its head between front legs & bears most of attack on large spike at back of head.
4 Stump-tailed Skink	Reptile (Lizard)	This slow reptiles only defence is surprise - when disturbed it suddenly opens bright pink mouth, sticks out blue tongue and hisses loudly. Stores fat in tail as food source during drought.
5 Budgerigar	Bird (Parrot)	These small parrots live in flocks. Feed on seeds and nest in tree holes. All wild budgies are green. Domesticated since 19th Century
6 Grey Goshawk	Bird of prey	This light coloured bird of prey feeds on birds, small marsupials and reptiles, catching them in the powerful talons. All its water requirements are obtained from its food.
7 Emu	Bird (Ratite)	The words' second largest bird is flightless, but is a good runner. Eats the most nutritious parts of plants (seeds, fruits, & flowers). Swallows pebbles to help grind food in the gizzard.
8 Rat Kangeroo	Mammal (Marsupial)	Feeds on grasses and root tubers. Related to kangeroos. They are very aggressive to each other. Store fat in the tail, which is then absorbed in times of food shortage.
9 Swainson's Phascogale	Mammal (Marsupial)	Small carnivore preying on insects, birds, rodents and lizards. The long, conical snout facilitates catching prey in crevices. Large eyes and ears, and bushy tail are thought to have some signalling function.
10 Red Kangeroo	Mammal (Marsupial)	Worlds' largest marsupial; old males may measure 2m tall and weigh over 200kg. Long, powerful hind feet for leaping - can jump 8m long and 2.5m high and can reach speeds of 30mph (48km/h). Generally young (joeys) are produced only if rainfall is adequate
11 Dingo	Mammal (Carnivore)	Brought into Australia by the Aboriginies thousands of years ago. Feed on small animals such as lizards and grasshoppers when hunting alone. In packs they hunt cooperatively for larger prey. Subject to control measures (poisoning, trapping) as a sheep killer.

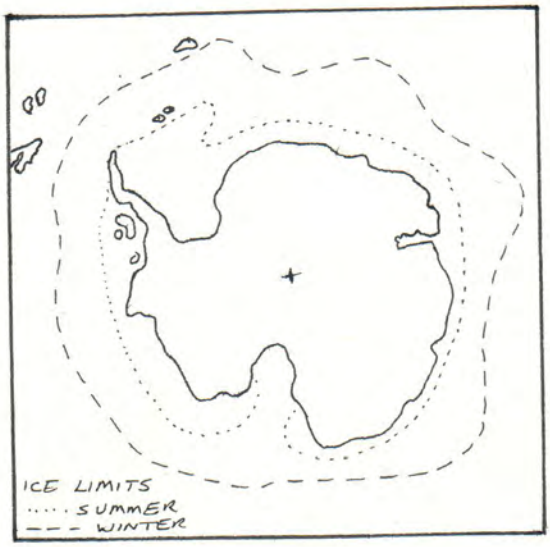


THE POLES

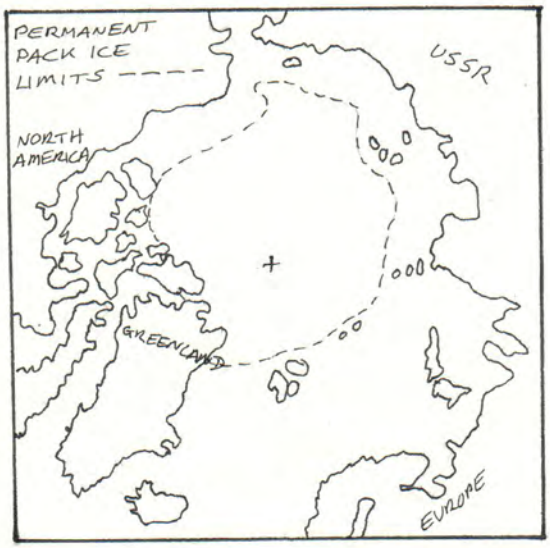
These areas receive less than 5cm of rain a year, and so can be classified as deserts.

Where are they ?





ANTARCTICA



THE ARCTIC

Covers 13.9 million km (5.5 million miles).

Most of the land has permanent ice cover (only 4% thaws the top ice layer in summer), 2% of Antarctica is sometimes snow free.

All true Antarctic land animals are invertebrates - midges being the largest animals not relying on the sea for food.

Other animals include 3 species of penguin, 4 species of seal and the Giant Petrel - all of which spend most of the time at sea.

Differs from Antarctic by consisting of frozen ocean surrounded by land, rather than frozen land surrounded by ocean.

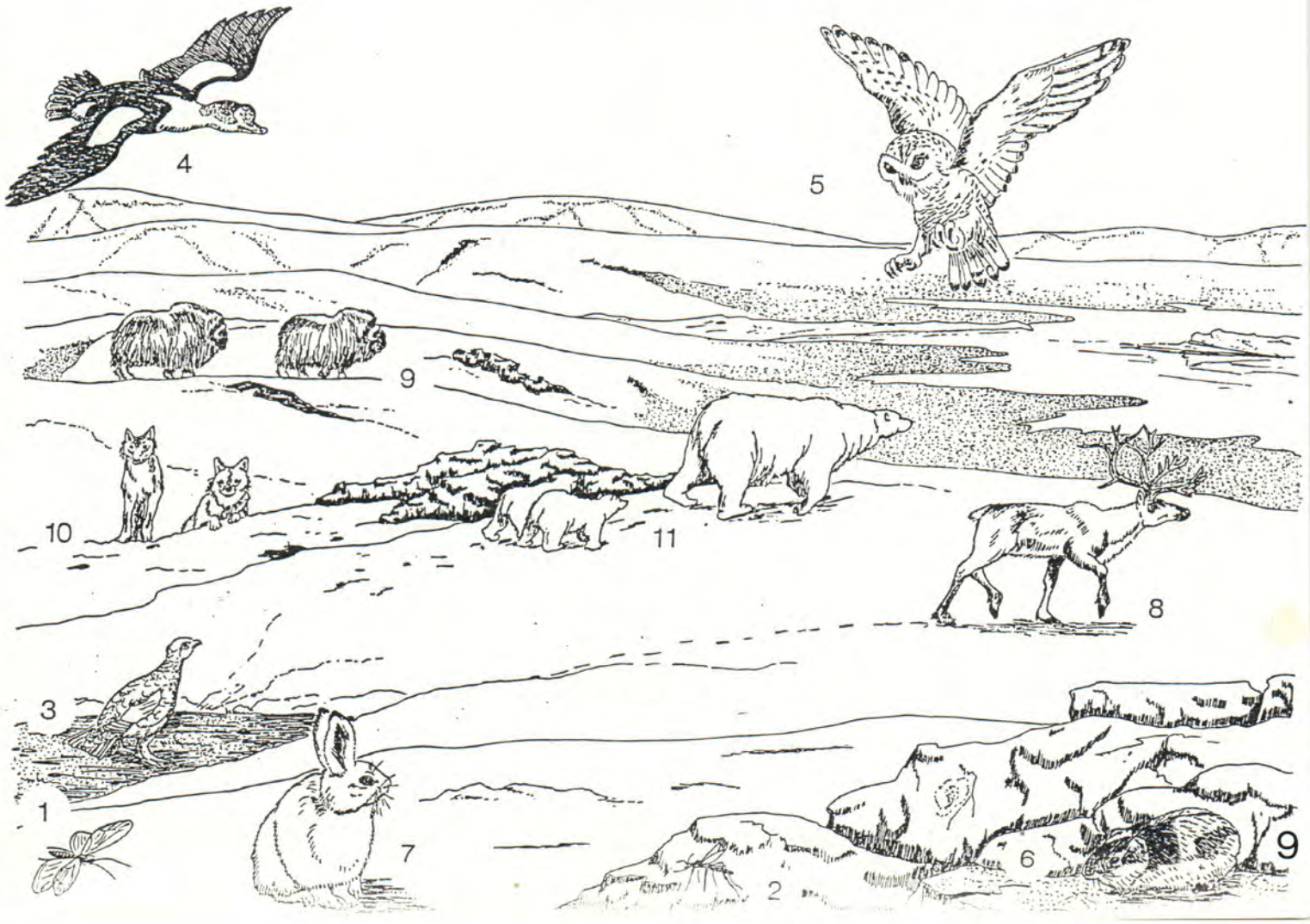
Over 1,000 species of mosses and lichens and 800 to 900 types of flowering plants are found here.

There is an abundance of insects in summer (mainly mosquitos), vertebrates include Polar Bears, Seals, Wolves, Hares, Ptarmigans and people.

More life occurs in the Arctic because the temperatures rise more than the correesponding latitudes in Antarctica.

ARCTIC

	SPECIES	TYPE OF ANIMAL	ADAPTATIONS AND NOTES
1	Caddis Fly	Invertebrate (Insect)	Swarm over pools in summer, providing food source for many birds. The larvae in the pools providing food for ducks & waders.
2	Mosquito	Invertebrate	Larvae feed on algae in thawed streams & lakes. Adults form droning swarms of millions from June to August all searching for mammalian blood so that they may mate and lay eggs. Eggs lay dormant over winter when the adults are killed off by the cold.
3	Ptarmigan	Bird (Grouse)	Feet covered in long feathers to protect them from the cold. Moult brown & black summer coat to dense, white winter coat for camouflage. The moult and colour change is initiated by change in temperature. Feed mainly on buds and twigs of dwarf willow.
4	King Eider	Bird (Duck)	Marine duck. Feed on seaweed and marine invertbrates. The female lines her nest with her down - warmest naturally occuring material. Eiderdown is used commercially by people to stuff quilts
5	Snowy Owl	Bird (Owl)	White plumage for camouflage. Ground nesting, so the female moults to grey-barredsummer plumage from its winter plumage. Feed largely on voles, lemmings & hares.
6	Lemming	Mammal (Rodent)	In winter the forefoot claws lengthen for digging roots and shoots underneath the snow. Subject to large population cycles of peaks and troughs - they do not "commit suicide" by jumping off cliffs, this is simply a folk legend.
7	Arctic Hare	Mammal (Lagomorph)	Thick, warm fur and fur between foot pads to keep warm. High Arctic hares remain white all year round andlive in "herds". Mainland Arctic hares turn partly brown in summer.
8	Reindeer	Mammal (Even-toed Ungulate)	Adaptations to Arctic include broad, flat feet which form "snow shoes" and hairy nose. Both sexes have antlers. These semi-wild deer are herded by Lapps for meat, hides and milk.
9	Musk Ox	Mammal (Even-toed Ungulate)	Related to mountain goats. They have a thick winter coat of long hair (up to 62cm long) which moults in summer, and broad snow-shoe-like feet. Adults form protective circle round calves.
10	Arctic Wolf	Mammal (Carnivore)	Largest of wolves. Coat varies from black to white. Live and hunt in packs led by the breeding pair who often mate for life. Defend their territory by scent marking and howling. Feed largely on Caribou but will take any prey that is available.
	Northern Fur Seal	Mammal (Pinniped)	Breed in the Arctic and migrate south in the winter. Thick blubber layer under the skin and dense fur protect the seal from the cold. Oil secreting glands keep the fur waterproof.
11	Polar Bear	Mammal (Bear)	One of the Worlds' largest carnivores. Its' white hairs provide camouflage & are hollow so that the Suns' heat reaches the black (heat absorbing) skin beneath. Hairy soles on the feet for warmth and help to grip the ice and snow. Feed mainly on seals, will also take smaller prey & in summer eat berries.



DESERT PEOPLE

Dspite the harsh conditions, the adaptability of humans has led to some groups of people inhabiting deserts.

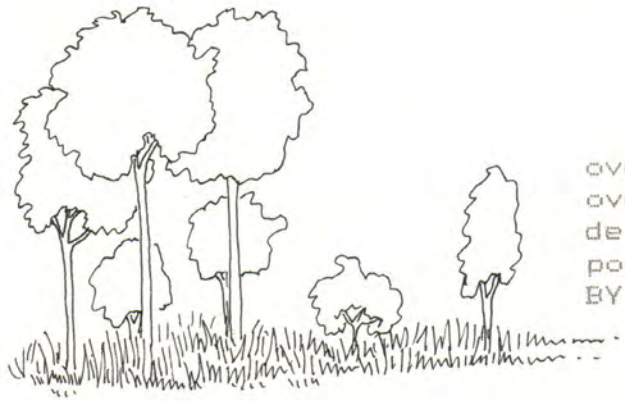
KALAHARI BUSH PEOPLE -
possess less heat insulating fat than non-desert people. Traditional knowledge of water storing desert plants allows survival in areas where other humans would perish.

TUAREG -
and other wandering herdsmen of African deserts traditionally used the Hema system. Hemas are reserves of land, some used for grazing livestock while others where left to protect the plant life for beekeeping and hunting. System has unfortunately died out due to overpopulation, overgrazing and settling of the nomads.

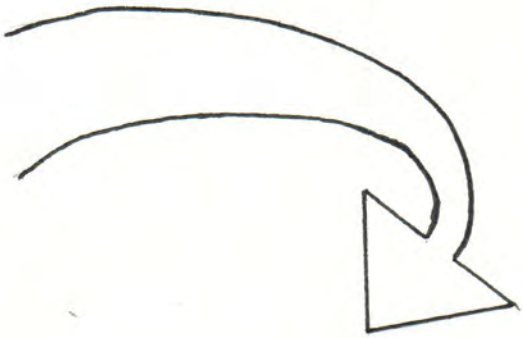
INUIT -
or Eskimo have short, compact bodies with flat faces, straight black hair and brown eyes. Live by skillful hunting and trapping of caribou (wild relation of the reindeer), fish, seals, walrus and whales. Inuit lived in tents in summer and stone/wood houses in winter. The igloo was more often a temporary shelter for hunters. Today, most are affected by Western culture and their lives have changed due to the introduction of mechanisation.

DESERTS & THE FUTURE

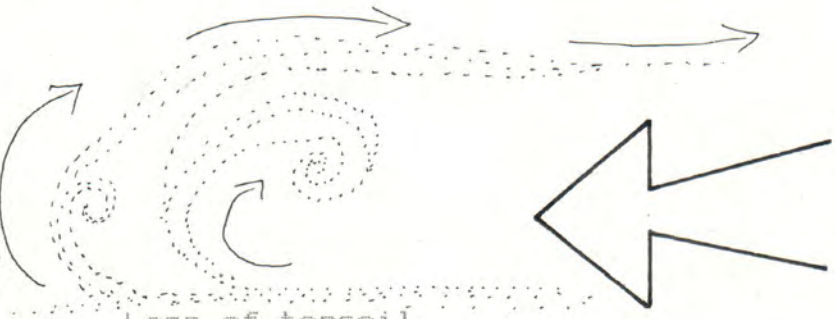
Desert areas are increasing at an alarming rate - here's how it's done.



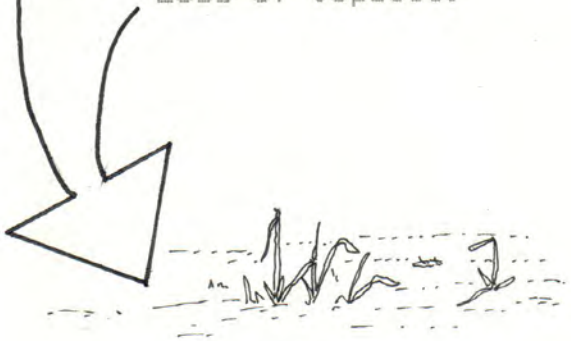
overgrazing
overcultivation
deforestation
poor irrigation
BY PEOPLE !



Nothing to hold the soil together.



Loss of topsoil.



Loss of nutrients and water holding plants.

DESERT

30% of Earths' surface is desert, becoming desert or in danger of becoming desert.
In 100 years this could be 50% - meaning that the Earths' population will be confined to less than half the Earths' surface UNLESS SOMTHING IS DONE.

Natural desert is irreversible, it is the borderlines that need the application of caring agriculture - the planting of shrubs and bushes to hold back the sand dunes, the planting of resilient grasses and the practise of sensible livestock husbandry.
So with careful use of agriculture deserts could be kept to their natural borders.

Penscynor Wildlife Park Handy Plan

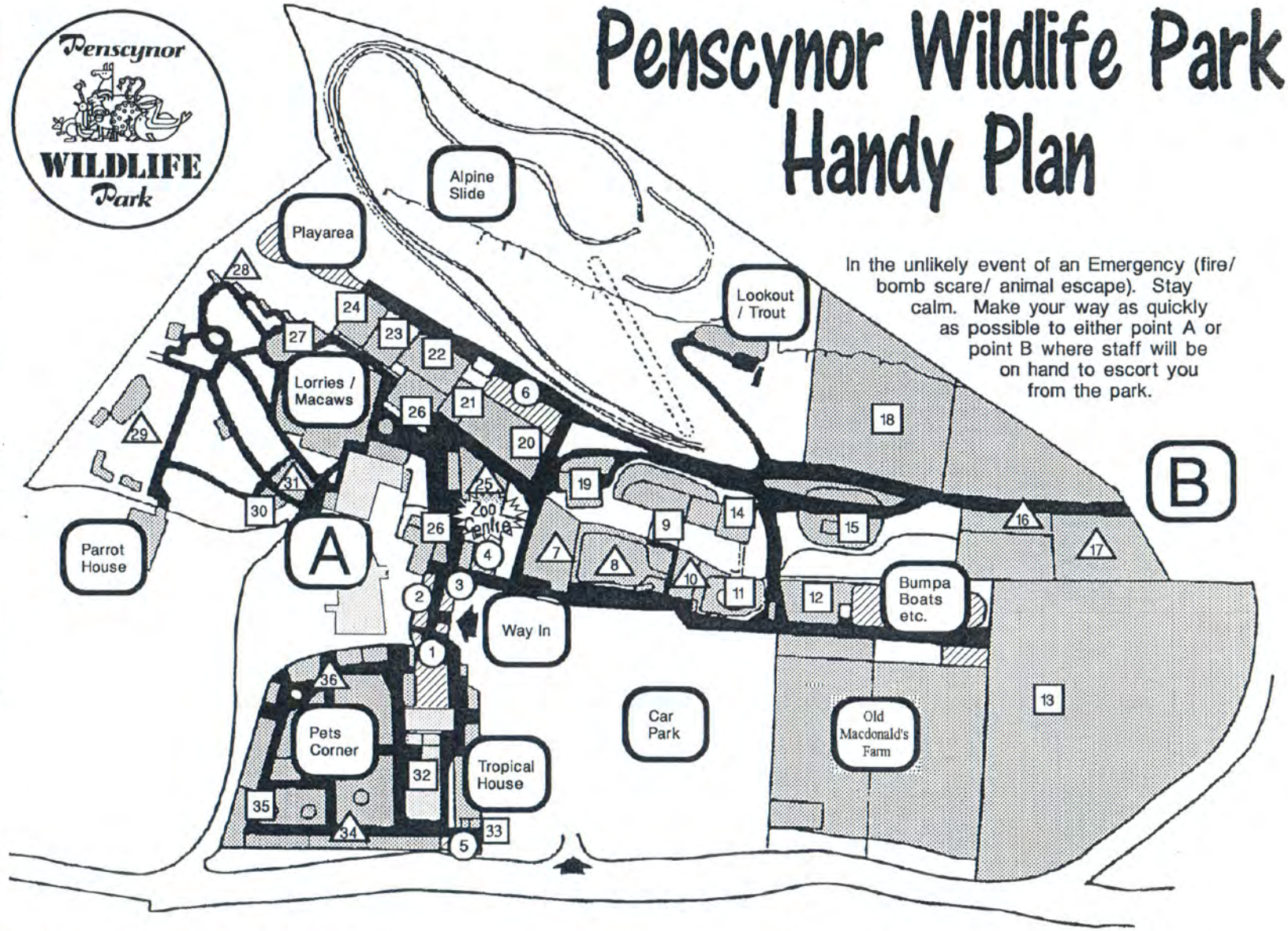
Useful Locations

The Zoo Centre is located next to Penguin Pool (7), between Burger Bar (4) and Waterfowl aviary (25)

1. Main Office
   First Aid Point
   Gift shop
   Copper Kettle Coffee Shop
2. Toilets
3. Toy Shop
   Ice-Creams
4. Burger Bar
5. Book shop / Sweet shop
6. Picnic Area

Enclosure key

□ - Mammals △ - Birds



In the unlikely event of an Emergency (fire/ bomb scare/ animal escape). Stay calm. Make your way as quickly as possible to either point A or point B where staff will be on hand to escort you from the park.

7. Penguins
   Pelican
8. Waterfowl
   Trout
   Squirrel Monkeys
9. Chimpanzees
10. Scarlet Ibis
    White Fronted Wood-Duck
11. Empty At Present
12. Meerkats
13. Shetland Pony
    Guanaco
    Deer
14. Black & White Ruffed Lemurs
15. Emperor Tamarin Island
    Trout
16. Rheas
17. African Crowned Crane
18. Wallabys
    Muntjac
19. Marmoset House
20. Prairie Dogs
21. Pygmy Goats
22. Empty at present.
23. Lar Gibbons
24. Ring-Tailed Lemurs
25. Sacred Ibis
    Night Herons
    Silver Gulls
    Demoiselle Cranes
26. Sooty Mangabeys
27. Asian Short-Clawed Otters
28. Hillside Parrot Aviaries
29. Flamingos
30. Porcupines
    Mongooses
31. African Fish-Eagle
32. Eastern Black and White Colobus
33. Dourocouli Monkeys
34. Mixed Aviaries
35. Farm Animals
    Rabbits
    Guinea Pigs
    Polecats
36. Mixed Aviaries

DESERT ACTIVITIES

LOOK at desert animals-
discuss how they are adapted to hot or cold deserts.
Invent your own desert adapted animal.

DRAW desert animals.

COMPARE hot desert animals with cold desert animals.

DESERT CULTURE/HISTORY-

Research Arabic culture and the influence of Islam.

Look at Ancient Egyptians and their sacred animals.

Research into the ways that modern technnology has changed the lives of desert peoples.

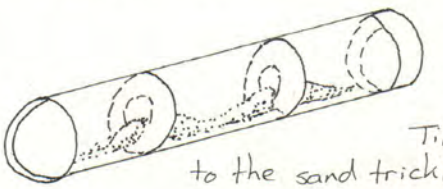
FOOD/NUTRITION -
if you had to go through a day without drinking (DON'T DO IT) what sort of foods would you eat to help you survive.
Think and talk about the types and amount of food desert animals have to eat.

MAKE a wall collage depicting desert life.

HABITATS -
make a mini desert with sand, pebbles, sand paper, gravel, and strips of silver foil for mirages.
mini Arctic with icy blue shiney papers and fabrics, silver foil, polystyrene chips, fake snow.

SHIFTING SANDS - make a sand trickler to illustrate wind-blown dust and sand.

Tape 3 or 4 cylindrical containers (of about 8 - 10 cm diameter) end to end. After cutting a hole in the bases + lids (of about 4 cm diameter). Leave the lid and base of end containers intact.



Pour in a mug of dry sand or rice + seal the lid. Tilt slowly + listen to the sand trickling through.

CREATIVE WRITING -
write about a day in the life of a hot desert animal - does it shelter anywhere, is it nocturnal, what does it eat etc.

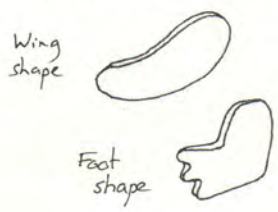
Imagine being lost in a desert - how do you feel, what do you do?

EXPERIMENT - in a large sand pit or sand dunes see which feet are best for moving on sand.
- human feet
- pair of stilts
- flippers
measure how fast you can move over 25m,
measure how deep you sink.
Look at your results and discuss the reasons for them.

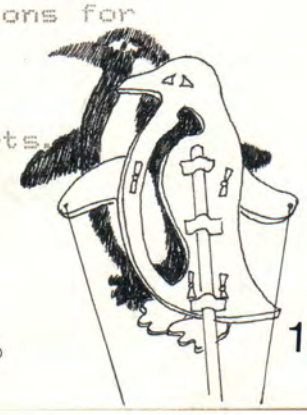
DESIGN zoo enclosures for desert animals. Remembering the animals needs and the keepers needs to feed and clean in safety.

BUILD desert peoples homes either to scale or as models -
cardboard box igloo
Bushmans' shelter
Beduin tent.

MAKE penguin shadow puppets.



Cut out shape from cardboard. Cut out 2 wing shapes + 2 feet - attach to body with paper fasteners. Make holes in end of each wing + thread stiff wire through.
Attach cane to back of body with sticky tape.
Hang a cotton sheet from ceiling with a table lamp behind it - move penguin between lamp + sheet.



USEFUL INFORMATION

GLOSSARY

ARACHNID - invertbrates with eight legs, such as spiders and scorpions

DIURNAL - active during the daylight hours.

GIZZARD - muscular part of birds stomach which squeezes the stomach contents.

LAGOMORPH - group of mammals including rabbits, hares & pikas.

MARSUPIAL - group of mammals which give birth to poorly developed young which then develope in the mothers pouch.

PASSERINE - perching bird.

PINNIPED - group of aquatic mammals including seals, sea lions, walrus, manatees etc.

RATITE - group of flightless birds.

UNGULATE - Hoofed mammal.

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