

# WATER

**W**ater is essential to life. A person can survive for three weeks without food but for only three days without water, therefore its discovery and conservation should be prioritised over food. Don't wait until you have run out of water before you look for it. Conserve what you have and seek a source as soon as possible, preferably fresh running water, though all water can be sterilized by boiling or by using chemical purifiers. In a survival situation a 1 litre-jug (1<sup>3</sup>Apt) can be made to last 4 days, but if necessary the last 'A litre ('Apt) can be made to last 3 days. This is achieved by dividing the last 'A litre into three, then drinking half of the day's ration at midday, and the balance at night, for 3 days.

Water is the coolant that keeps the body at an even temperature, it is needed to keep the kidneys functioning to eliminate wastes, is required for breathing, and for digestion. But the fluids contained in the body are limited. Lost water must be replaced or health and efficiency will suffer. The average human requires the minimum of 'A litre ('Apt) of water per day to survive.

## Water loss

The average person loses 2-3 litres (3'A-5V4pt) of water each day - even someone resting in shade loses about 1 litre (1<sup>3</sup>Apt). Just breathing loses fluids, and loss through respiration and perspiration increases with work rate and temperature. Vomiting and diareea increase loss further. This must all be replaced to preserve the critical water balance, either by actual water or water contained in food.

## HOW TO RETAIN FLUID



- Avoid exertion. Just rest.
- Don't smoke.
- Keep cool. Stay in shade. If there is none erect a cover to provide it.
- Do not lie on hot ground or heated surfaces.
- Don't eat, or eat as little as possible. If there is no water available fluid will be taken from the vital organs to digest food, further increasing dehydration. Fat is hardest to digest and takes a lot of fluid to break it down.
- Never drink alcohol.
  - Don't talk - and breathe through the nose, not the mouth.

## FINDING WATER

The first place to look is in valley bottoms where water naturally drains. If there is no obvious stream or pool, look for patches of green vegetation and try digging there. There may be water just below the surface which will build up in the hole. Even digging in gullies and dry stream beds may reveal a spring beneath the surface, especially in gravelly areas. In mountains look for water trapped in crevices.

On the coast digging above the high water line, especially where there are sanddunes, has a good chance of producing about 5cm (2in) of fresh water that filters down and floats on the heavier salt water. It may be brackish but is still drinkable. Where cliffs fall into the sea look for lush growth of vegetation, even ferns and mosses, in a fault in the rock formation and you may find a soak or spring.

If no freshwater can be found, saltwater can be distilled (see *Solar still* and *Distillation*, this section).



### WARNING

Be suspicious of any pool with no green vegetation growing around it, or animal bones present. It is likely to be polluted by chemicals in the ground close to the surface. Check edge for minerals which might indicate alkaline conditions. **ALWAYS BOIL WATER FROM POOLS.** In deserts there are lakes with no outlets; these become salt lakes. Their water **MUST** be distilled before drinking.

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### Dew and rain collection

Despite the acid rain produced by industrialized countries, which can cause a build-up of pollution in the soil, rainwater everywhere is drinkable and only needs collecting. Use as big a catchment area as possible, running the water off into containers of every kind. A hole dug in the ground and lined with clay will hold water efficiently, but keep it covered. If you have no impermeable sheeting, metal sheets or bark can be used to catch water in. If you have any doubt about the water you have collected, boil it.

In climates where it is very hot during the day and cold at night, heavy dew can be expected. When it condenses on metal objects it can be sponged or licked off.

You can use clothing to soak up water and then wring it out. One way is to tie clean cloths around the legs and ankles and walk through wet vegetation. These can be sucked or wrung out.

## ESSENTIALS

### ANIMALS AS SIGNS OF WATER



#### **Mammals**

Most animals require water regularly. Grazing animals are usually never far from water - though some kinds travel thousands of miles to avoid the dry season - as they need to drink at dawn and dusk. Converging game trails often lead to water; follow them downhill. Carnivores (meat eaters) can go for a long period between waterings. They get moisture from the animals on which they prey so are not a positive indication of local water.

#### **Birds**

Grain eaters, such as finches and pigeons, are never far from water. They drink at dawn and dusk. When they fly straight and low they are heading for water. When returning from water they are loaded with it and fly from tree to tree, resting frequently. Plot their direction and water can be found.

Water birds can travel long distances without stopping to feed or drink so do not necessarily indicate water nearby. Hawks, eagles and other birds of prey also get liquids from their victims so cannot be taken as a sign of local water.

#### **Reptiles**

Not an indicator of water. They collect dew and get moisture from prey so can go a long time without.

#### **Insects**

Good indicators, especially bees: they fly at most 6.5km (4 miles) from their nests or hives, but have no regular watering times. Ants are dependent upon water. A column of ants marching up a tree is going to a small reservoir of trapped water. Such reservoirs are found even in arid areas. Most flies keep within 90m (100yd) of water, especially the European Mason Fly with its iridescent green body.

#### **Human tracks**

Will usually lead to a well, bore hole or soak. It may be covered over with scrub or rocks to reduce evaporation. Replace the cover.

## WATER

### REMEMBER: RATION YOUR SWEAT NOT YOUR WATER!

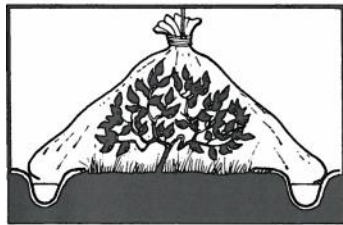
If you have to ration water, take it in sips. After going a long time without water, don't guzzle when you do find it. Take only sips at first. Large gulps will make a dehydrated person vomit, losing even more of the valuable liquid.

## CONDENSATION

Tree and plant roots draw moisture from the ground, but a tree may take it from a water table 15m (50ft) or more below, too deep to dig down to reach. Don't try; let the tree pump it up for you by tying a plastic bag around a leafy branch. Evaporation from the leaves will produce condensation in the bag.



*Choose healthy vegetation and bushy branches. On trees keep the mouth of the bag at the top with a corner hanging low to collect condensed evaporation.*



*Placing a polythene tent over any vegetation will collect moisture by evaporation which will condense on the plastic as it cools. Suspend the tent from the apex or support with a padded stick. Avoid foliage touching the sides of the trap or it will divert water droplets which should collect in plastic-lined channels at the bottom.*



*Even cut vegetation will produce some condensation as it warms up when placed in a large plastic bag. Keep the foliage off the bottom with stones so that water collects below it, and keep the foliage from touching the plastic. Use*

*stones to keep the bag taut. Support the top on a padded stick. Arrange the bag on a slight slope to encourage condensation to run down to the collecting point. When no longer productive carefully replace with fresh foliage.*

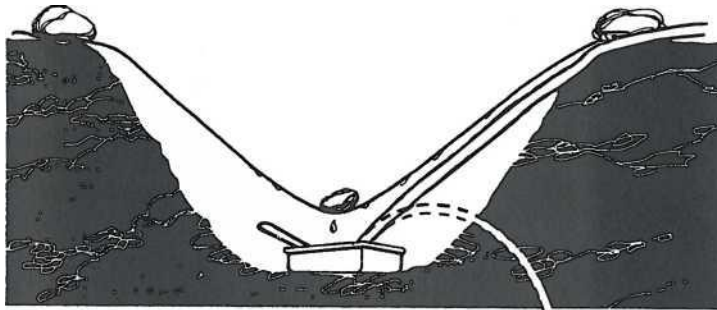
## ESSENTIALS

### Solar still

Dig a hole in the ground approximately 90cm (36in) across and 45cm (18in) deep. Place a collecting can in the centre, then cover the hole with a sheet of plastic formed into a cone. The sun's heat raises the temperature of the air and soil below and vapour is produced. As the air becomes saturated, water condenses on the underside of the plastic, running down into the container. This is especially effective in desert regions and elsewhere when it is hot during the day and cold at night. The plastic cools more quickly than the air, causing heavy condensation. This kind of still should collect at least 570ml (1 pt) over a 24-hour period.

The still may also double as a trap. Insects and small snakes are attracted by the plastic. They may slide down into the cone or wriggle underneath it and drop into the hole and then cannot climb out.

A solar still can be used to distill pure water from poisonous or contaminated liquids.



*Roughen underside of sheet with a stone to ensure droplets run down it. Use stones or weights to secure edges and keep cone shape. Fix can so that trapped creatures cannot tip it over.*

*If feasible use a syphon to a lower level (a) to draw off water without disturbing the still.*



## WARNING

### URINE AND SEA WATER

Never drink either - Never! But both can produce drinking water if distilled - and sea water will provide you with a residue of salt.



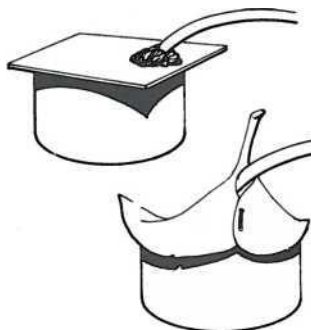
## WATER

### Distillation

Distillation kits are part of the equipment of life-rafts, but they can be improvised. To distill liquid you need to make something to do the job of a laboratory retort. Pass a tube into the top of a water-filled covered container, placed over a fire, and the other end into a sealed collecting tin which, preferably, is set inside another container providing a jacket of cold water to cool the vapour as it passes out of the tube. You can improvise the equipment from any tubing - pack frames, for instance. To avoid wasting water vapour, seal around the joins with mud or wet sand.

An easier method is a variation on the desert still. It takes a little longer for the water to condense but may be easier to set up.

*Take a tube from a covered vessel in which polluted/saltwater, or even urine, is to boil. Set the other end under a solar still. A sheet of metal or bark, perhaps weighted down, will cover the vessel. Even a cone of leaf over the water pot will help direct the steam into the tube.*



### Water from ice and snow

Melt ice rather than snow — it produces a greater volume faster for less heat: twice as much for half the heat. If forced to heat snow, place a little in the pot and melt that first, gradually adding more to it. If you put a lot of snow into the pot, the lower level will melt and then be soaked up into the absorbent snow above it, leaving a hollow beneath which will make the pot burn. Lower layers of snow are more granular than that on the surface and will yield more water.

### Water from sea ice

Sea ice is salt (no good for drinking) until it has aged. The more recently frozen, the saltier it will be. New sea ice is rough in contour and milky-white in colour. Old ice is bluish and has rounded edges, caused by weathering.

Good water can be obtained from blue ice — the bluer and smoother the better. But beware of even old ice that has been exposed to salt spray.

## WATER FROM PLANTS

### Water collectors

Cup-shaped plants and cavities between the leaves of bromeliads (many of which are parasitic on the branches of tropical trees) often collect a reservoir of water.

Bamboo often holds water in its hollow joints. Old and yellow stems are more likely to be water bearing. Shake them - if you can hear water slurping around cut a notch at the bottom of each joint and tip the water out.

*Traveller's Tree*  
**madagascariensis,**  
*one of the banana family, can hold 1-2 litres (2-4pt) of water between the bases of the*

**Ravenala**



### Vines

Vines with rough bark and shoots about 5cm (2in) thick can be a useful source of water. But you must learn by experience which are the water-bearing vines, because not all have drinkable water and some have a poisonous sap. The poisonous ones yield a sticky, milky sap when cut. You will know not to try that type again — otherwise it is a matter of trial and error and worth trying any species.

Some vines cause a skin irritation on contact if you suck them, so it is better to let the liquid drip into your mouth rather than put your mouth to the stem, and preferable to collect it in a container.

To obtain water from a vine select a particular stem and trace it upwards. Reach as high as possible and cut a deep notch in the stem. Cut off the same stem close to the ground and let the water drip from it into your mouth or into a container. When it ceases to drip cut a section from the bottom and go on repeating this until the vine is drained. Do NOT cut the bottom of the vine first as this will cause the liquid to run up the vine through capillary action.

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### Roots

In Australia the Water Tree, Desert Oak and Bloodwood have their roots near the surface. Pry these roots out from the ground and cut them up into 30cm (12in) lengths. Remove the bark. Suck out the moisture, or shave to a pulp and squeeze over the mouth.

It is not easy to find some of the most useful desert roots unless you have been shown by someone with experience. Australian Aborigines can identify a tiny twig which grows from a football-like bulbous root, which can be a life-saver — but unless you have been shown how to find them it is not worth expending your energy and resources looking.

### Palms

The Buri, Coconut and Nipa palms all contain a sugary fluid which is very drinkable. To start it flowing bend a flowering stalk downwards and cut off its tip. If a thin slice is cut off the stalk every 12 hours the flow will be renewed, making it possible to collect up to a quart each day. Nipa palms shoot from the base so that you can work from ground level, on grown trees of other species you may have to climb up them to reach a flowering stalk.

Coconut milk has considerable water content, but from ripe nuts it is a powerful laxative; drinking too much would make you lose more fluid.

### Cacti

Both the fruit and bodies of cacti store water, but not all cacti produce liquid safe to drink — the Saquarro, the giant multifingered cactus of Arizona, is very poisonous. Take care to avoid contact with cactus spines, they can be very difficult to remove, especially the very fine hair-like ones, and can cause festering sores if they stay in the skin.

The Barrel cactus *Echinocactus grusoni* (see *Desert plants in Food*) can reach a height of 120cm (4ft), is found in the southern United States through to South America and requires considerable effort to cut through its tough, spine-covered outer skin. The best method is to cut off the top and chop out pieces from the inside to suck, or to smash the pulp within the plant and scoop out the watery sap, which varies from tasteless in some plants to bitter in others. An average-sized, 100cm (3'2ft) Barrel cactus will yield about 1 litre (1½pt) of milky juice and this is an exception to the rule to avoid milky-sapped plants.



## ESSENTIALS

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*aguarro cactus* **Sereus giganteus** of Mexico, Arizona and California, grows to 5m (17ft) high and holds large amounts of fluid - but it is poisonous. Collect and place in a solar still to evaporate and

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**Opuntia** cacti - Prickly pears, or Figilinda, have big, ear-like excrescences and produce oval fruits which ripen to red or gold. Their large spines are easier to avoid than those of many cacti. Both fruit and 'ears' are moisture laden.

## WATER FROM ANIMALS

Animal eyes contain water which can be extracted by sucking them.

All fish contain a drinkable fluid. Large fish, in particular, having a reservoir of fresh water along the spine. Tap it by gutting the fish and, keeping the fish flat, remove the backbone, being careful not to spill the liquid, and then drink it.

If you need water that badly you should be careful not to suck up the other fish juices in the flesh, for they are rich in protein and will use up water in digestion.

Desert animals can also be a source of moisture. In times of drought in Northwestern Australia, Aborigines dig in dry clay pans for the desert frogs that burrow in the clay to keep cool and survive. They store water in their bodies and it can be squeezed out of them.