



# Water facts 7

WATER AND RIVERS COMMISSION DECEMBER 1998

## The water cycle

The amount of water in the earth's environment never changes, whether it is as a liquid (fresh water, seawater, rain, tiny droplets in clouds), as a gas (water vapour) or in its solid state (snow, ice or hail). There is also water inside living organisms. Water continually circulates between the land, the oceans and the atmosphere. It is called the Water Cycle or Hydrologic Cycle.

This Water Facts sheet describes the water cycle, how human activities alter the cycle, and how water resource management linked to the natural water cycle can help to restore the balance.

### How does the water cycle work?

Heat from the sun causes water to become a gas, or vapour. This is called evaporation. As the earth's surface warms, rising currents of air carry the water vapour upwards. The water vapour becomes cooler as it rises, and condenses into tiny drops, forming clouds. These drops join together and fall back to the earth as rain, hail or snow.

Rainfall may:

- evaporate directly from water, land or vegetation
- run off the land into streams and wetlands
- soak a little way into the ground, be absorbed by plant roots and then return to the water vapour in the air by *evapotranspiration* from the leaves of plants
- soak deeper into the ground and add to the groundwater, moving slowly along the direction of groundwater flow towards rivers, wetlands or the sea.

This cycle has existed since water was formed on earth, but human activities change the way water moves through the landscape.

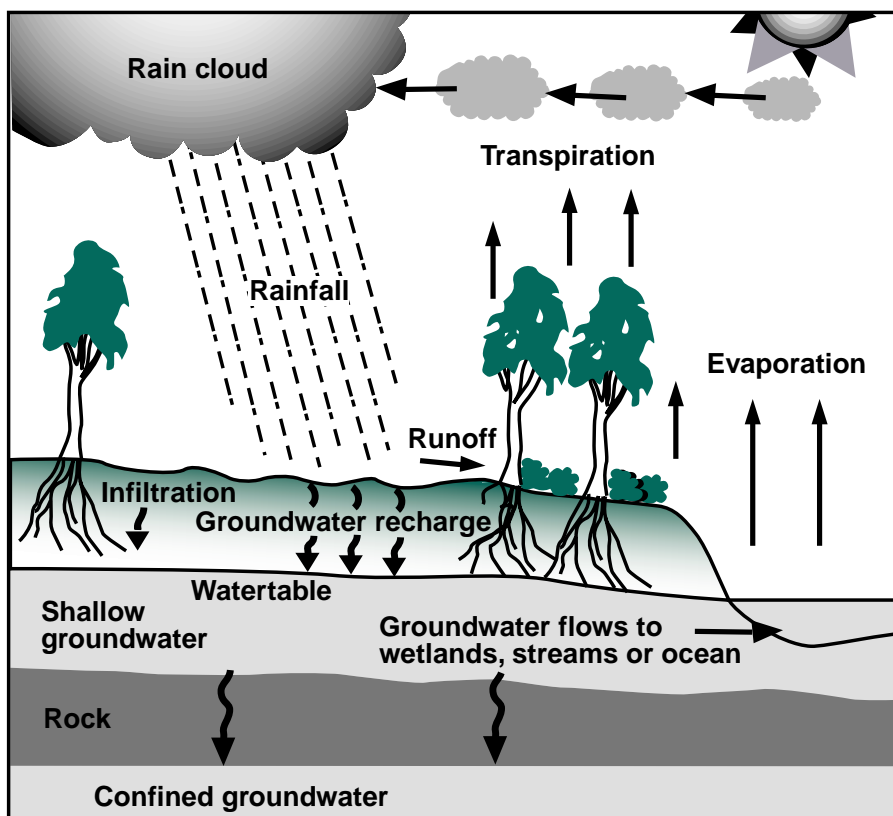


Figure 1: The natural water cycle.



## Impacts of development

Development changes how much water soaks into the ground, the way water moves across the landscape, and what materials the water carries with it.

Impacts on water in one part of the water cycle will have consequences in other parts of the cycle. For example, damming rivers reduces downstream flow, and can cause upstream flooding.

### Pollution

*Pollution* in one place can cause impacts at another (see Fig. 2).

- ① Air pollution can contaminate rain (causing ‘acid rain’, for example) damaging forests and rivers.
- ② If groundwater is polluted, the contaminant can move as a ‘plume’.
- ③ Contaminated groundwater can pollute water supplies, wetlands and rivers.
- ④ Streams and drains can carry pollution and nutrients many kilometres to cause algae blooms and other impacts in rivers, wetlands, estuaries and the ocean.

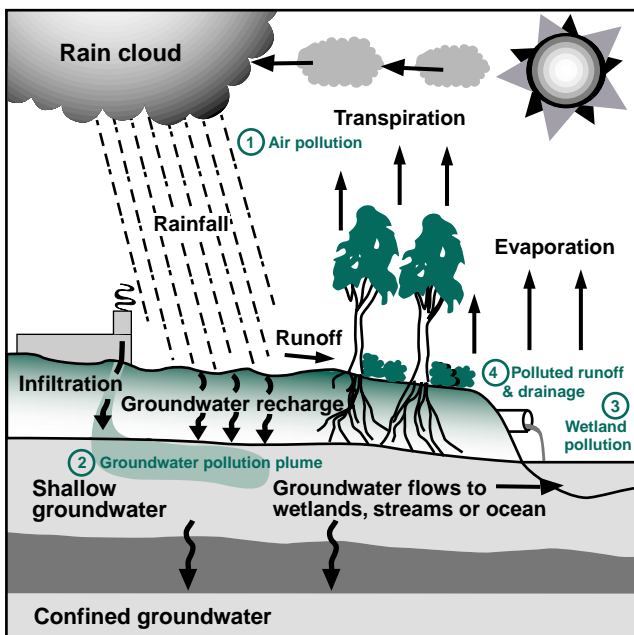


Figure 2: Pollution in the water cycle.

### Changing water levels

Changing the *water balance* in one place can impact on other parts of the water cycle. Drainage, clearing, drawing water for water supplies, and construction can have complicated effects on the local water balance.

Some activities raise the watertable, raise wetland levels, and cause normally seasonal wetlands to be often or permanently flooded (see Fig. 3).

- ① Constructing hard surfaces such as roads, roofs and car parks, reduces groundwater recharge and increases runoff.
- ② Water channelled away in drains may raise wetland levels elsewhere.

- ③ Clearing vegetation and removing trees reduces the draw of water up through the roots, allowing the watertable to rise.
- ④ In some places, the rising watertable dissolves salts in the soil and brings them to the surface, causing salinity problems.

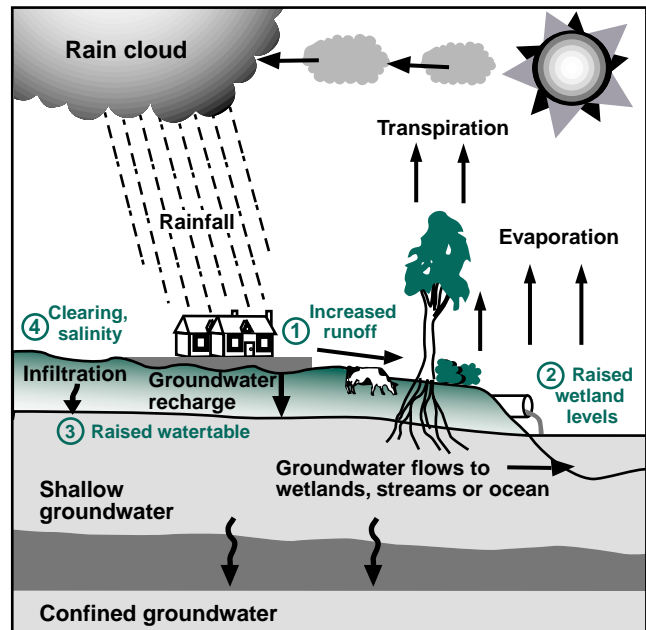


Figure 3: Raised watertable.

Other activities can lower the watertable and dry out wetlands (see Fig. 4).

- ① Draining wet, low-lying land for housing or agriculture destroys wetlands and moves water from one place to another, for example to drainage sumps, other wetlands or rivers.
- ② Excessive use of shallow groundwater can lower the watertable and dry out wetlands some distance away from the bores.
- ③ Lowered watertables can damage native vegetation and wetland ecology.

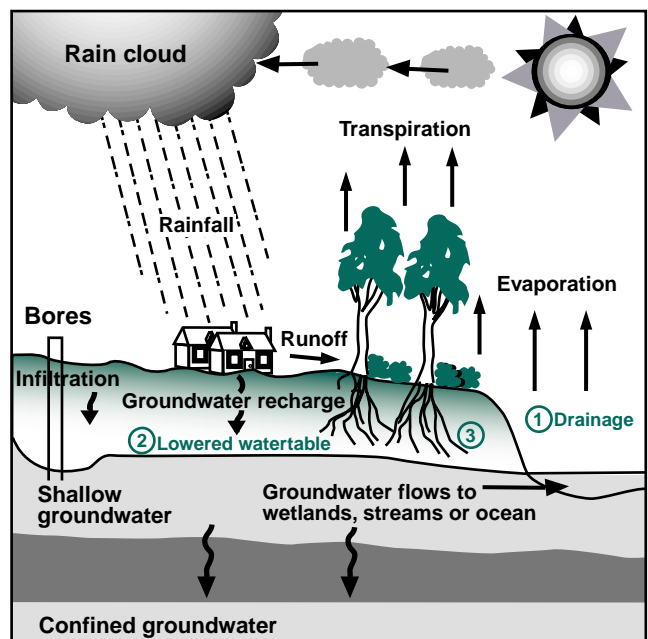


Figure 4: Lowered watertable.



## Impacts on the environment

Impacts on the environment resulting from these changes to the water cycle include:

- groundwater pollution
- wetland and river pollution
- algal blooms
- salinisation of agricultural land and rivers
- lower watertable and wetland levels, with associated damage to water-dependant plants and animals
- higher watertable and wetland levels, flooded seasonal wetlands, changed ecology
- loss of habitat and biodiversity
- reduced or increased streamflow
- erosion and sedimentation
- flooding

## Managing our water resources

Good water management is based on understanding the interconnections in the water cycle. An understanding of the whole catchment water balance is needed.

*A catchment is the area of land which intercepts rainfall and contributes the collected water to a particular surface water (stream, river, wetland) or groundwater resource.*

Tools to achieve this include *Integrated Catchment Management*, which links planning and resource management across a surface or groundwater catchment, and *Water Sensitive Design*, which aims to retain the natural water balance as much as possible in developed areas.

It is preferable to keep and benefit from water within the catchment, rather than to 'dispose' of it to drains and watercourses that carry excess water away to upset the balance elsewhere. For example, runoff from a housing development can be minimised by directing water into the soil in landscaped areas rather than channelling it away in gutters or drains. Planting trees will increase water use on site, as well as providing welcome shade and wildlife habitat. Efficient irrigation and planting landscaped areas with local native plants will save water and reduce water and fertiliser loss to streams and wetlands.

## The role of the Water and Rivers Commission

The Water and Rivers Commission manages and protects Western Australia's water resources at many stages of the water cycle, both as surface water (in streams, rivers, wetlands and estuaries), and beneath the ground (groundwater).

This includes:

- measuring and monitoring water resources,
- allocating (decisions on shares) water for water supplies and to protect the environment, and
- protecting and restoring waterways and wetlands.

### Integrated Catchment Management (ICM)

*The coordinated planning, use and management of water, land, vegetation and other natural resources on a river or groundwater catchment basis. ICM is based on cooperation between community groups and government agencies at all levels to consider all aspects of catchment management.*

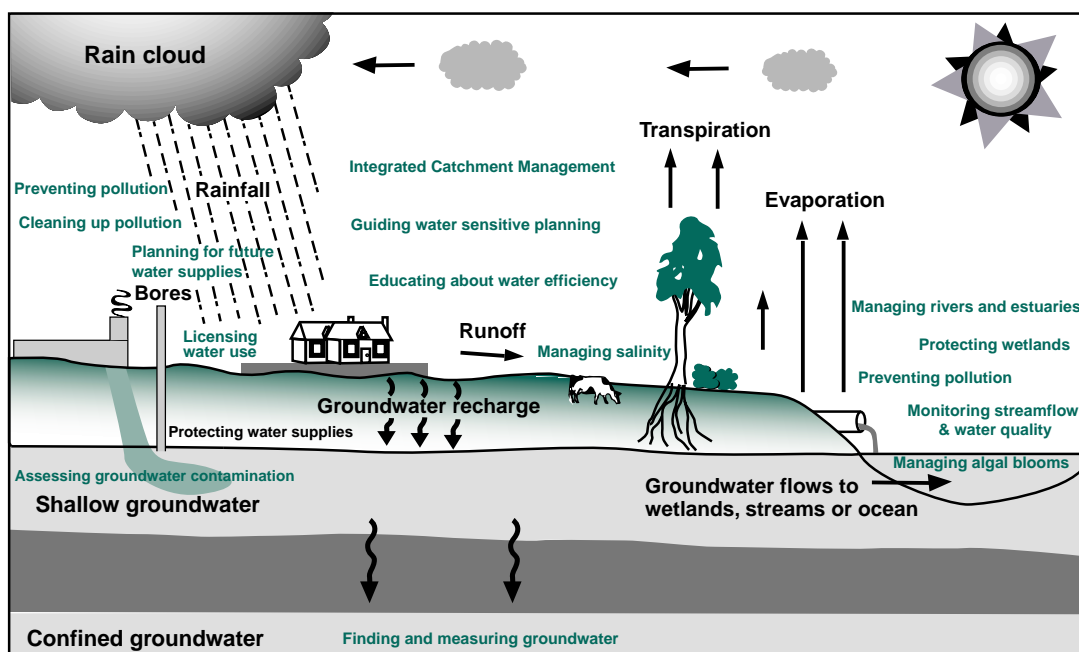


Figure 5: Managing water resources.



For more information contact



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This Water Facts sheet is one in a series providing information on water issues of interest to the community.

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