# GROUNDWATER

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**This factsheet was written for primary school students aged 9-11 years. A factsheet for teachers and a general audience is also available on the website:**

www.geolsoc.org.uk/factsheets

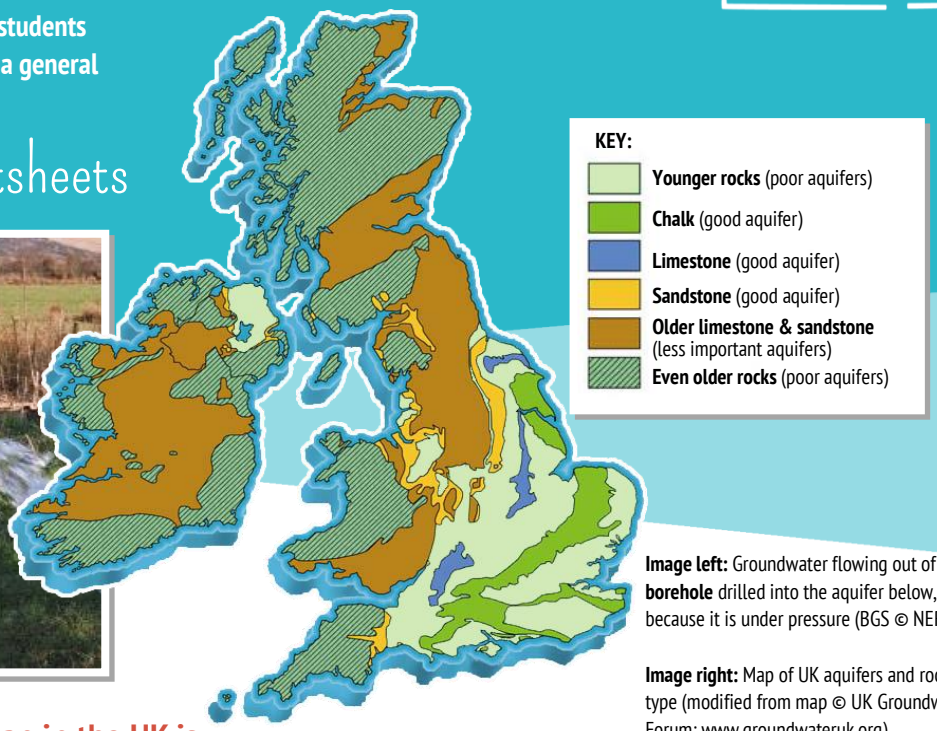


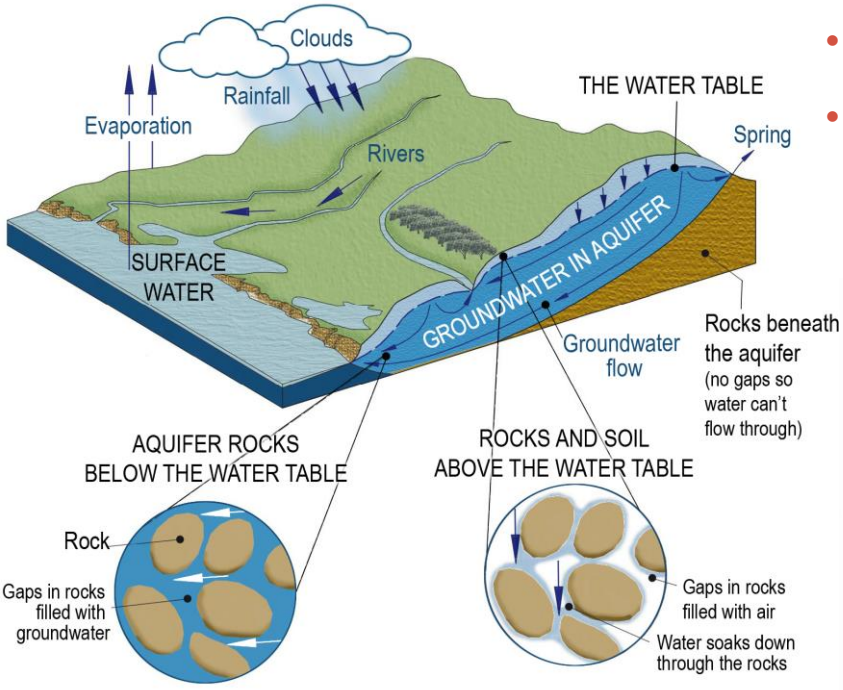

**Image left:** Groundwater flowing out of a **borehole** drilled into the aquifer below, because it is under pressure (BGS © NERC)

**Image right:** Map of UK aquifers and rock type (modified from map © UK Groundwater Forum: www.groundwateruk.org)

**Supplying drinking water to every tap in the UK is a huge challenge. Water hidden underground, or groundwater, is important to this process, but can also cause flooding.**

When rainwater falls it soaks into the ground and flows down through the soil and into the rocks beneath us. If these rocks contain cracks and gaps, they act like a sponge and water collects in them. Most gaps in the rocks are very small, although some can form **caves**.

Below a certain depth, called the **water table**, the rock spaces are full of water, or **saturated**. The water moves through these rocks (often very slowly) until it resurfaces as a spring or flows into rivers, lakes or the sea. This is all part of the **water cycle**:




**Groundwater in the Water Cycle** (modified from diagram © UK Groundwater Forum)

## Aquifers and UK water

Rocks containing groundwater that can be extracted are called **aquifers**. Some rock types, such as **sandstone**, **limestone** and **chalk**, make good aquifers because they have lots of cracks and gaps for water to pass through. Other rock types, like **granite**, have less gaps so water can't pass through. These rocks make poor aquifers.

Groundwater is a vital source of drinking water in many parts of the United Kingdom and around the world. We can extract it by constructing wells or boreholes. The **geological map** above shows the main UK aquifers.

- In areas with good aquifers, such as much of South East England, most drinking water comes from groundwater.
- In other areas, like Scotland and Northern Ireland, the aquifers are smaller and used less. These areas have lots of water in rivers, lakes and reservoirs. This is called **surface water** and supplies most of their drinking water.

## DID YOU KNOW?

The average person in the UK uses about 3,400 litres of water every day (about 10 large fish tanks). Some of this is 'direct use' such as drinking or washing, but most is 'hidden use' in things like growing our food or manufacturing things we use. Growing a single apple takes around 70 litres of water. Producing a glass of milk takes 200 litres!

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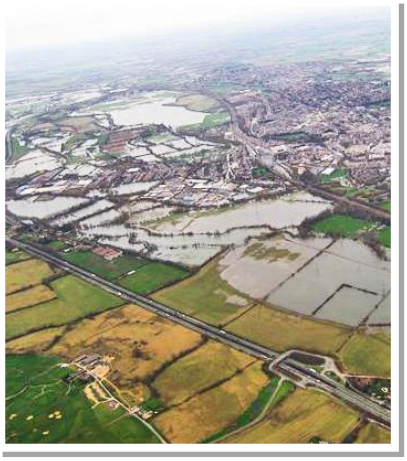
## Groundwater Flooding: why do areas away from rivers flood?

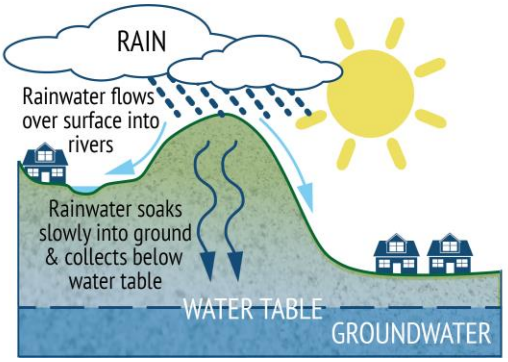
In very wet weather, rivers rise and overflow their banks if too much rain falls, causing **surface flooding**. Surface floods drain away quickly, but **groundwater flooding** may take much longer to drain away, and can flood areas far from rivers.

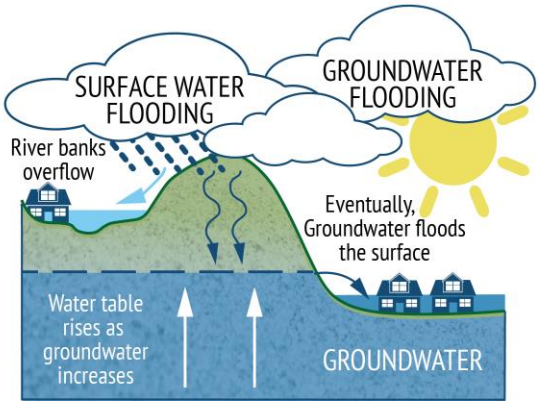
Groundwater flooding happens after wet weather, as more rainwater than usual soaks down into the rocks from the surface. More rocks fill with water and the **water table** rises, and eventually groundwater floods the surface. Groundwater moves slowly so groundwater flooding can come as a surprise, some time after the rainfall that caused it.



Groundwater flooding in Oxfordshire (BGS © NERC 2007)

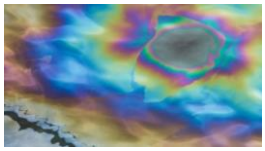
## Groundwater flooding vs surface water flooding:




## Groundwater pollution

Groundwater is less easily polluted than surface water. However, some pollutants are harmful to living things (including humans) and cleaning up pollution can be extremely expensive. Natural contamination can occur, but pollution is mostly caused by human activities. Find out more in the table below:

| How do pollutants get into groundwater? | | | Effects of pollution |
|---|---|---|---|
| **Farming** |  | Animal dung and chemicals used in farming can be washed into rivers & groundwater after rainfall. | Some cause health problems including cancer, or kill fish in rivers. |
| **Landfill sites used to bury rubbish** |  | If landfill sites leak, liquid from rotting rubbish can seep into groundwater. | Landfills may contain substances harmful to humans. |
| **Oil and petrol** |  | Underground storage tanks (such as those at petrol stations) may leak into groundwater. | Many oil-based chemicals can cause cancer in humans. |

## Groundwater around the world

Most of the liquid fresh water on Earth is groundwater (some fresh water is frozen in the ice caps at the North and South Poles). It is a very convenient source of water because:

- Aquifers have enormous storage capacity – more than any man-made reservoir
- Groundwater is usually safer to drink as it is less easily polluted than surface water
- It is relatively simple to extract in urban areas

Many parts of the world rely on groundwater for their water supply, particularly cities and areas without much surface water. In 1998, **Mexico City** used enough groundwater a day to fill six of the world's largest oil tankers! This can be a problem when not enough groundwater is replaced by rainfall, leading to **groundwater drought**.

Some countries are reducing their use of groundwater. One example is **Saudi Arabia** where about half of public water is supplied by removing salt from seawater (**desalination**).

**Desalination Plant, United Arab Emirates**
© Ryan Lackey / Flickr

## FIND OUT MORE...

**Earth's water resources & water scarcity:** www.geolsoc.org.uk/factsheets
**Hard and soft water:** www.geolsoc.org.uk/waterhardness