Spring-fed dam at Tallulah Photo by Tanya Rucosky

UMCCC – Upper Murrumbidgee Catchment Coordinating Committee

GROUNDWATER

IN THE UPPER MURRUMBIDGEE - understanding your bore

What is groundwater?

Groundwater is water found beneath the surface of the earth and it is an important part of the water cycle. When it rains on land, some water evaporates, some flows into creeks and rivers and some soaks into the soil and is used by vegetation. Excess water may soak into the soil beyond the plant root zone until it reaches the **saturation zone**. At this point all spaces in the soil and rock are full of water. This water is called **groundwater**.

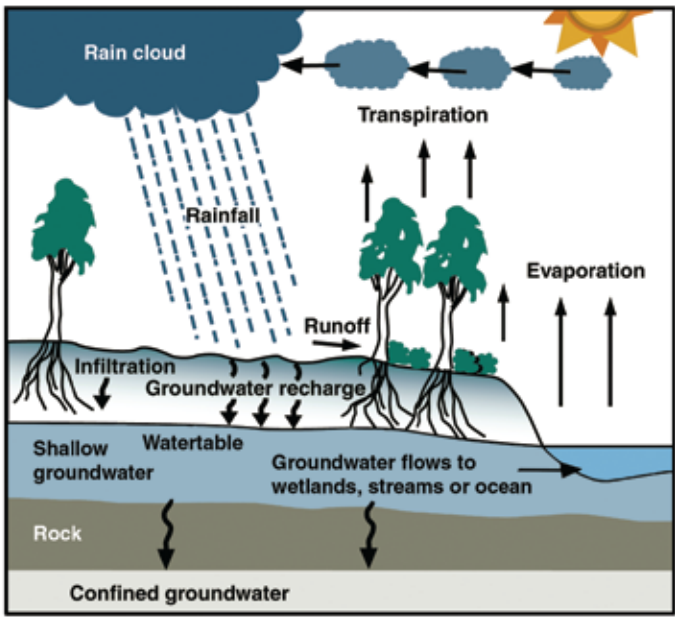

Figure 1 The natural water cycle
(WA Dept of Water)

Groundwater is stored in and moves slowly through layers of soil, sand and rock called **aquifers**. The top of the groundwater zone is called the **water table**. The depth to the water table varies greatly within the landscape and may be a few centimetres or many hundred metres down.

Groundwater may come to the land surface naturally, from a spring or flow into creeks and wetlands. Groundwater can also be accessed by drilling a bore into the aquifer. A **bore** is simply a pipe in the ground that fills with groundwater. A pump will usually be needed to bring the water to the surface though some groundwater can flow under natural pressure.

In general there are two groundwater systems – sedimentary rock aquifers and fractured rock aquifers. Typically sedimentary aquifers yield and store more groundwater than fractured rock systems. The upper Murrumbidgee catchment is predominantly fractured rock.

Once, groundwater 'belonged' to the landholder. Now groundwater is managed by the States and Territories – it is treated as a shared resource.

Landholders may acquire the rights to use a portion of groundwater but can no longer look at groundwater access as a 'right'.

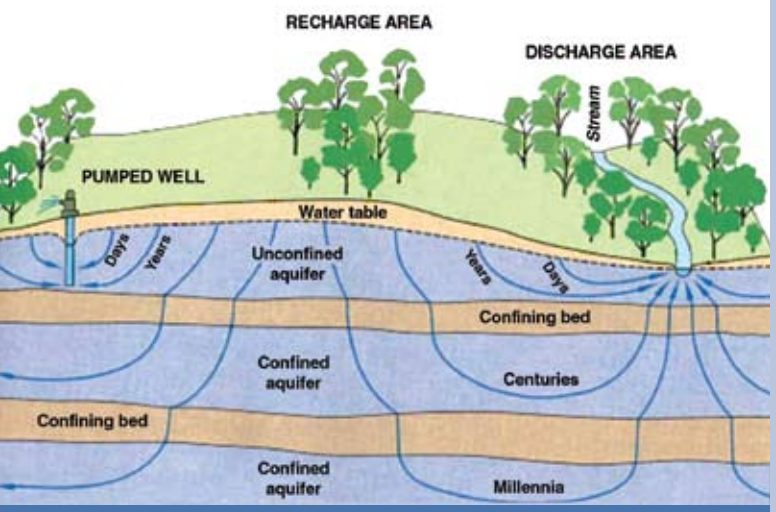

Figure 2 Groundwater flow times
(diagram courtesy of the U.S. Geological Survey)

How does groundwater move?

Groundwater is constantly moving, albeit very slowly. Groundwater moves from an area of **recharge** (rainfall on the hills) into a saturation zone or aquifer before moving towards a **discharge** area such as a spring, wetland or creek. Groundwater flow generally follows the surface topography of the land in a downhill direction.

Water moves very slowly - often measured in centimetres per day – and may take hundreds of years to reach its natural discharge area. This depends on the local geology, recharge rates and groundwater extraction rates.

Along the way it may be intercepted by a bore and accessed for use. Groundwater accessed by a bore may have been underground for a few days or for millions of years.

GROUNDWATER & SURFACE WATER

Groundwater and surface water in a catchment are part of the same system; they are connected. In order to manage both groundwater and surface water systems sustainably the connection between the two needs to be understood. Rainwater drains into creeks and streams and may raise their levels but the baseflow in creeks and streams is a result of the watertable being exposed at the ground surface. Creeks and streams will dry up if the water table drops far enough.

What is a catchment? *A catchment is an area where water is collected by the natural landscape. In a catchment, all rain and run-off water eventually flow to a creek, river, lake or ocean, or into the groundwater system. Natural and human systems such as rivers, bushland, farms, dams, homes, plants, animals and people can co-exist in a catchment.*

The amount of groundwater that can be extracted from an area before creek or stream water flows are affected differs in each catchment. Every litre of groundwater extracted via a bore, is a litre of water lost from another part of the system – though the loss may not become evident for many years.

If too much water is taken out of the system:

- water tables may be lowered and yield from bores may decline;
- in extreme cases bores, lakes, creeks and streams may also dry up;
- ecosystems within catchments that are dependent on groundwater such as wetlands may suffer;
- water of poorer quality (often salty) can move into the aquifer;
- there may be a reduction of flow from groundwater in to local creeks and streams.

GROUNDWATER AVAILABILITY

The amount of rainwater that enters a system depends on the rainfall and the ground cover in the catchment. A large proportion of rainfall is lost to evaporation and significant recharge to groundwater systems may only occur during prolonged rainfall. Many rainfall events will not contribute at all to groundwater recharge.

The availability of groundwater is also controlled by the geology of the area. The type of rock, sediments and the size of spaces (known as **voids**) available to fill with water all affect the amount of groundwater.

The rate at which water enters the aquifer (**recharge**) compared to the rate at which it is taken out (**extraction**) also affects how much groundwater remains available.

GROUNDWATER RECHARGE

Groundwater recharge is an important part of the water balance of a catchment. Changes in rates of recharge influence both groundwater and surface water quality and quantity.

Groundwater is recharged in three main ways:

- by rainfall (sometimes quite remote from the aquifer);
- by leakage from creeks, lakes, dams when water tables are low; and
- by water rising from a deeper aquifer.

The key factors that control groundwater recharge are:

- the amount and intensity of rainfall and evaporation;
- the amount of water already in the soil from recent rainfall events;
- the type of soil and geology;
- the type of vegetation and landuse; and
- the topography.

On a longer time scale, changes in climate can have a significant impact on groundwater availability. In some areas groundwater currently being accessed via bores entered the system when the climate was much wetter. Recharge is not happening at a similar rate today and accessible groundwater will decline if too much is extracted.

Photo by Tanya Rucosky

Can I have a bore and how do I get one?

It is no longer an automatic right to be able to have a bore and access groundwater. Access to groundwater is managed to allow equitable use for human and environmental needs.

Different laws apply in NSW and the ACT.

In NSW

Before you sink a bore in NSW you must obtain consent to 'construct the bore' from the Department of Water and Energy.

After the bore is constructed you **do not** need a licence to take groundwater for domestic or stock use.

However, if you wish to use groundwater for a commercial use such as irrigation, aquaculture, guest accommodation or feedlots you must **obtain consent** to construct the bore *and* take water from it.

The contractor who sinks the bore must be a licensed driller registered by the Department of Water and Energy.

It is the responsibility of the landholder to ensure the driller is appropriately licensed in NSW – penalties apply for using unlicensed drillers.

For further information see **www.dwe.nsw.gov.au**

In the ACT

In the ACT a licence is required to take and use groundwater for any purpose and a licence is required to drill a bore. Groundwater licences are only available within the constraints of the ACT catchment water sharing plans.

To apply for a licence contact Canberra Connect on **13 22 81** to obtain the application forms. A site inspection will follow.

Only qualified drillers licensed in the ACT may construct, modify, or seal a bore. A list of licensed drillers is available when consent is given to extract groundwater.

It is the responsibility of the landholder to ensure the driller is licensed in the ACT – penalties apply for using unlicensed drillers.

For further information see **www.act.gov.au** or call Canberra Connect on **13 22 81.**

Now I have a bore, how do I know the groundwater is OK to use?

Groundwater quality can vary hugely in location and over time.

It is wise to **get your groundwater tested** to ensure you can use the water in the way you want. Getting your groundwater tested annually can be a condition of an access licence.

Water quality guidelines show you what groundwater can be used for safely. There are guidelines for drinking water, other domestic use such as toilet flushing, stock use and irrigation. See **www.mincos.gov.au/publications**

The quality of your groundwater will determine what you can do with it.

It may not be suitable for domestic use – it may stain, it may taste unpleasant, soap won't lather, clothes won't wash clean and your kettle and hot water system elements get covered in calcium deposits. However the same water may be perfectly adequate to flush toilets and water the vegetable patch.

Alternatively it may not be suitable for any irrigation but be okay for you to water stock over summer.

Where do I get my water tested?

There are a number of places that will test groundwater quality. Ensure that you tell them what you want to use the water for. You should receive a simple written report as well as the chemical analysis.

Ecowise Labs in Fyshwick, ACT **www.ecowise.com.au** offer a number of water analysis packages such as Domestic Stock and Irrigation Package, Irrigation and Stock Package, Water Tank Package. They also offer a Complete Package for sensitive crops.

NSW Department of Primary Industries' Environmental Laboratories also provide a water testing service. Sampling kits are available from all Departmental offices. Standard laboratory reports provide detailed information on pH, salinity, chloride, alkalinity, turbidity, hardness, saturation index, sodium absorption ratio and electrical conductivity. See **www.dpi.nsw.gov.au/agriculture/vetmanual/submission/water_testing**

This page Photos by Lynton Bond

Protecting your groundwater quality

You live above your groundwater resource. Your land use, water use, and waste disposal will affect your groundwater supply and quality.

Contaminants such as microbes from sewage and effluent, heavy metals, petroleum fuels and solvents, nutrients such as phosphates and nitrogen, salt and detergents can all enter the groundwater system. Herbicides can pollute shallow groundwater systems and high nitrate levels can occur with high stock numbers.

It is far better to prevent groundwater contamination than have to try to fix a problem.

Things you can do to protect your groundwater

Be aware of your catchment area, identify and manage recharge areas.

Have your bore sunk by a professional.

Avoid a bore anywhere near sewage or septic tanks. Ensure bores are well capped and kept clear of debris, overland runoff and fenced from stock.

Test your bore water quality annually.

Keep household and farm chemicals, paints and oils well away from waterways and bore. Dispose of them responsibly at a waste collection site. Limit the use of pesticides and herbicides on your property.

Conserve water in the home and on your property so you don't use more than you need to.

FOR MORE INFORMATION CONTACT

NSW

Department of Water and Energy **www.dwe.nsw.gov.au**
Phone **1800 353 104** or email **information@dwe.nsw.gov.au**

ACT

Department of Environment, Climate Change, Energy and Water (DECCEW) – **www.act.gov.au**

Canberra Connect **13 22 81**

Useful publications:

Bureau of Rural Sciences
Science for Decision Makers – September 2007
"Managing non-renewable groundwater resources"
"Groundwater recharge"
"Understanding groundwater"

Publication Sales **1800 020 157**
info@brs.com.au or **www.brs.gov.au/shop**

Drilling Rig Photo by Lynton Bond

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Upper Murrumbidgee Catchment Coordinating Committee UMCCC

Australian Government

The Upper Murrumbidgee Catchment Coordinating Committee (UMCCC) brings together local government, community groups, and relevant ACT and NSW government agencies in the Upper Murrumbidgee Catchment with an interest in natural resource management (NRM). The Committee provides a network for the exchange of information, ideas and experiences and facilitating awareness about regional NRM issues.

Figure 1 The Natural Water Cycle used with permission of the Western Australia Department of Water. Water and Rivers Commission 1998 *Water Facts 7 The Water Cycle* available at: **http://portal.water.wa.gov.au/portal/page/portal/WaterQuality/Publications/WaterFacts/Content/WRCWF07.pdf**

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