wetrocks

HOWARD SPRING, DARWIN NT

Spring:
Water infiltrates into the ground to become groundwater. It eventually drains out lower in the landscape under the influence of gravity. Such discharges are known as springs. For a spring to form there must be a pathway for water to flow between the aquifer and the ground surface.

Aquifer:
A layer of soil or rock with relatively higher porosity and permeability than surrounding layers. This enables usable quantities of water to be extracted from it.

Dolostone:
A sedimentary rock made of the mineral dolomite $(Ca,MgCo_3)_2$.

Claystone:
A sedimentary rock made of clay. It is normally found ontop of the Koolpinyah Dolostone.

Watertable:
The level that groundwater rises to in a borehole.

Sinkhole:
A depression or hole caused by the collapse of cavernous dolomite. They are often circular in shapet.

FIGURE 1. AERIAL PHOTO OF THE NATURE PARK, SHOWING THE LOCATION OF THE SPRING

Howard Spring located 35km east of Darwin is a natural spring that is the outlet for a major aquifer. It is a window on the health of the groundwater.

History

The European history of the Spring began in the late 1800s when they were part of large pastoral leases in this area and used as a source of stock water.

In the 1910s the Spring itself came into focus as a solution to Darwin's unreliable water supply.

Eventually, in 1939, after a community petition and delays caused by the Depression, water from the Spring was piped to railway dams, overhead tanks in Darwin, and Vesty's meat works. This arrangement served as a stop-gap measure until Manton Dam was completed in 1942. A road connecting this area with Darwin was built as part of this project.

During the Second World War, rest and recreation camps for up to 120 men were set up here for servicemen from USA and Australia. The weir was built in 1944 by the Royal Australian Engineers to improve the swimming hole.

In 1957 Howard Springs became the Northern Territory's first Reserve under the NT Reserves Board, now the Parks and Wildlife Service.

The spring emerges at the head of an oval shaped area of lush monsoon vine forest. The main outlet is a 30cm wide hole in claystone connected to the aquifer some 50m below. In its natural state prior to construction of the weir there would have been no large swimming hole as there is today.

Going further

What changes have been made to the spring and surrounding areas by man?

How did it form?

The aquifer that supplies Howard Spring is a layer of rock known as the "Koolpinyah Dolostone". Dolostone is prone to dissolve when slightly acidic water comes into contact with it. Rainwater in the Top End is naturally acidic. The dolostone aquifer is made up of a network of small (and large) holes where the rock has dissolved away. In some cases so many holes develop that the rock collapses, forming a circular depression known as a sinkhole. The spring is on one such sinkhole. The downstream wall of the sinkhole has been eroded away by the creek. Groundwater is able to reach the surface through the broken rock and sand beneath the collapse.

There are many similar sinkholes in the area but most do not have springs in them because they are too high in the landscape. The groundwater level is situated below ground level in those cases and the groundwater cannot escape. Howard Spring is only 20 m above sea level and the groundwater level is normally above the ground at that point.

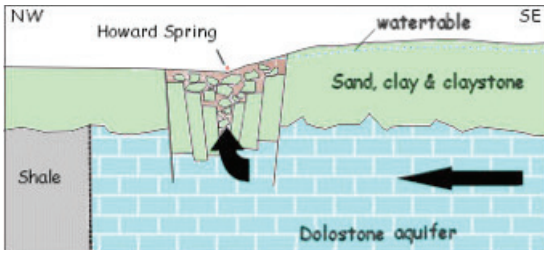

FIGURE 2. HOWARD SPRING FORMED ON A SINKHOLE

Going further

Look on Google Earth for other signs of sinkholes around Howard Springs.

Seasonal changes

The discharge of the spring is directly dependent on the height of the watertable. When the watertable is high in the wet season the spring has a correspondingly strong flow, typically about 300 litres per second. As the dry season progresses, the watertable falls and the spring flow decreases. This cycle is repeated every year.

Australian Government
National Water Commission

TESEP
Teacher Earth Science Education Program

wetrocks

HOWARD SPRING, DARWIN NT

What is a DNAPL?
A dense, non-aqueous phase liquid (or DNAPL), is a liquid that is heavier than water and does not readily dissolve into water. DNAPL contaminants can be difficult to manage in groundwater, as they move downward through the ground based on gravity and where the permeability is greatest. This makes it difficult to predict their movement and therefore to find them when looking to clean them up. Once in the ground, they form a long term source of contamination, as they slowly dissolve into the passing groundwater.

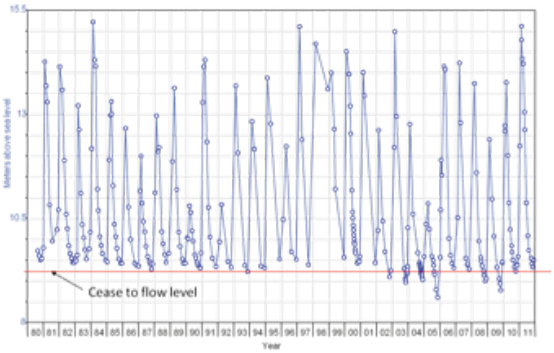

FIGURE 3. GROUNDWATER LEVELS FROM A BOREHOLE CLOSE TO THE SPRING. WHEN THE WATER LEVEL REACHES THE LEVEL OF THE RED LINE THE SPRING STOPS FLOWING.

Going further

Have a close look at Figure 3 and see what it tells you about how aquifers work, development of the aquifer and recharge?

Human impacts

In recent years, towards the end of the dry season the spring has stopped flowing. This is despite some of the annual rainfalls being above average. Over the past forty years many people have settled in the rural area. Most rural blocks have their own borehole to supply their house and garden. In addition to this groundwater is pumped from the dolostone aquifer to supplement Darwin's watersupply. Up to 20% of Darwin's water comes from bores.

Going further

Where does the other 80% of Darwin's water come from?

A window on the health of groundwater

With increasing development water that would have previously discharged from the spring is now being pumped from bores. The spring is effectively competing for the water. Despite the relatively high rainfall in the Top End groundwater is not a limitless resource. Declining spring flows are an inevitable consequence of development. It is up to us to make sure that an acceptable balance is reached between development, protection of the natural environment and preservation of cultural and recreational values.

Going further

How else could human activities affect the spring?

The spring is one of the main outlets of the aquifer. If pollutants find their way into the aquifer they will eventually end up in the spring water. The spring can therefore be seen as a window on the health of the groundwater. Its health can be viewed from the point of view of the amount of water available and the quality of the water.

Going further

Suggest some measures that individual residents could take to help preserve spring flows?

Water Quality

Like all groundwater from dolomite aquifers in the Top End, the spring water is rich in calcium, magnesium and bicarbonate salts. These are sourced from dissolution of the rock itself. Such waters are termed "hard".

At the source of the spring you will notice that there is a rust coloured film on the rocks. This is an iron loving bacteria. The groundwater contains a lot of iron and the bacteria obtain their energy by oxidizing ferrous iron.

Going further

Research how hardness and iron affects the uses of water?
Google "iron bacteria" to find out more about how it lives.

More information on Howard Spring:
http://www.nretas.nt.gov.au/national-resource management/water/ground/springs/howard

http://www.nretas.nt.gov.au/national-parks and-reserves/manage/plans/hsnaturepark

Australian Government
National Water Commission

TESEP
Teacher Earth Science Education Program