



Department of Environmental Protection Water and Rivers Commission

Amalgamating to form the Department of
Environment, Water and Catchment Protection

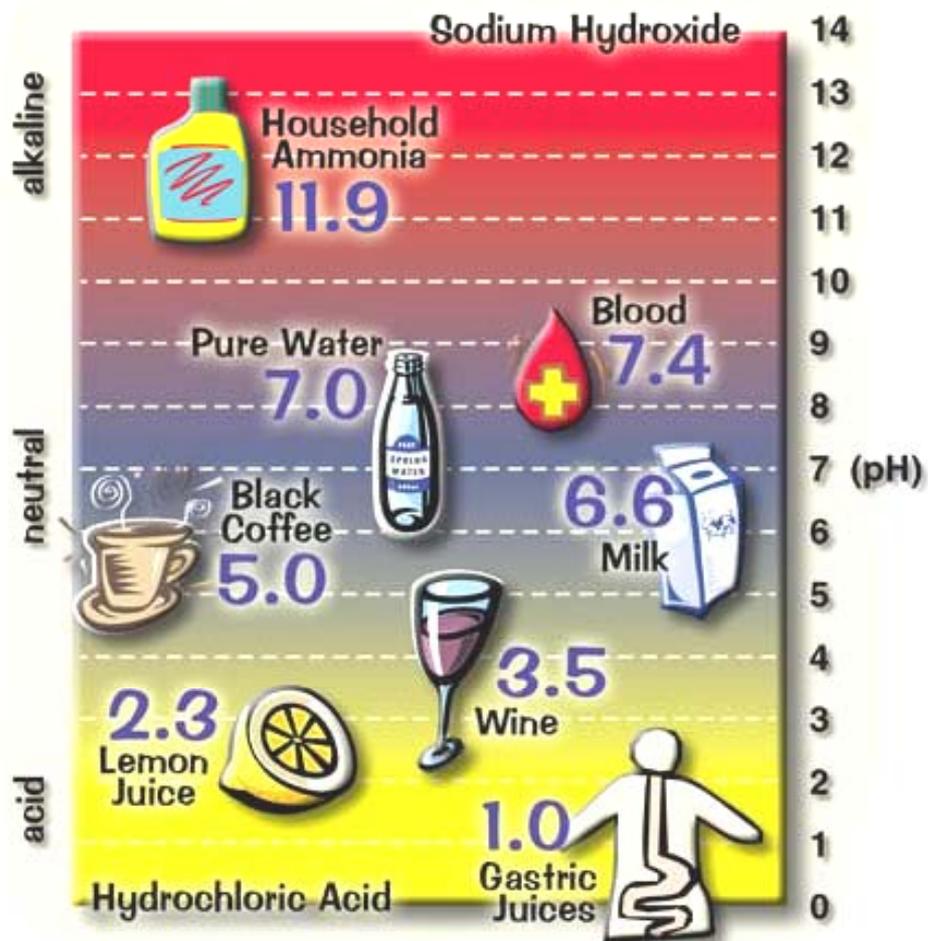
ASSESSING THE ACIDITY OF WATER DRAINING INTO RIVERS AND ESTUARIES

Introduction to acidity and pH

The acidity of water is usually measured with the pH scale. This is a number that varies between 1 and 14. A pH of 7 is said to be neutral. A pH value of more than 7 is said to be alkaline, and a pH of less than 7 is said to be acidic. The degree of acidity increases as the pH value decreases below 7.

A drop of one pH unit means that the acidity increases ten times. For instance, a pH of 2 is ten times more acidic than a pH of 3.

The following figure shows the pH of some common substances.



The effect of acidity on fish

Fish and other aquatic life are very sensitive to changes of acidity in water. High levels of acidity in water that flows into our rivers and estuaries can make fish prone to disease (particularly “red spot” disease), can reduce fish spawning, and, in extreme cases, can cause fish kills. Acid water can also kill bottom-dwelling animals that fish rely on as a food source.

Fish normally need the pH of water to remain in the range of 5 to 8 to remain healthy. Most water that drains from land into rivers and estuaries falls within this range. However, water that drains from swampy areas near rivers and estuaries may be very acidic. These areas are often underlain by sulfide-rich soils called **acid sulfate soils**. When these soils are exposed to air by drainage or excavation, sulfuric acid is formed which can leach into drainage water. This acidic water can then flow into rivers and estuaries.

Drainage from areas with acid sulfate soils commonly has a pH of less than 4, and may be as low as 2 in extreme cases.

You can download a booklet from the following web site that gives additional information about acid sulfate soils in Australia:

<http://www.ea.gov.au/coasts/programs/cassp/booklet.html>

Visual signs of acidity

It is very likely that water in a drain or river is acidic, or at risk of becoming acidic, if you see any of the following signs:

- **Crystal-clear water** – This often indicates that the pH is in the range 3 to 4. Although visually appealing, crystal clear water may indicate that the water contains high concentrations of aluminium, which is very toxic to fish.
- **Yellow-brown, turbid water** – This is due to large amounts of iron that are leached by acidic water. The more intense the colour and turbidity, the greater the risk that acid will eventually leach into a river or estuary. The iron is dissolved when the pH is less than 4.



- ***Iron flocs (particles)*** – Particles of iron minerals can occur in water below pH 4. They are usually coloured red-brown or brown-yellow. The particles may sit on the bottom as a sludge, or may float as a film on the water and look like an oil slick (you can tell that they are not an oil slick by poking the film with a stick – an iron film will break up into a number of “rafts” whereas an oil slick will not break up). Iron flocs generally form below a pH of 4.



- ***Milky blue-green water*** – In coastal areas, this is caused by aluminium mineral flocs. The pH of water with this appearance is typically 4 to 5.



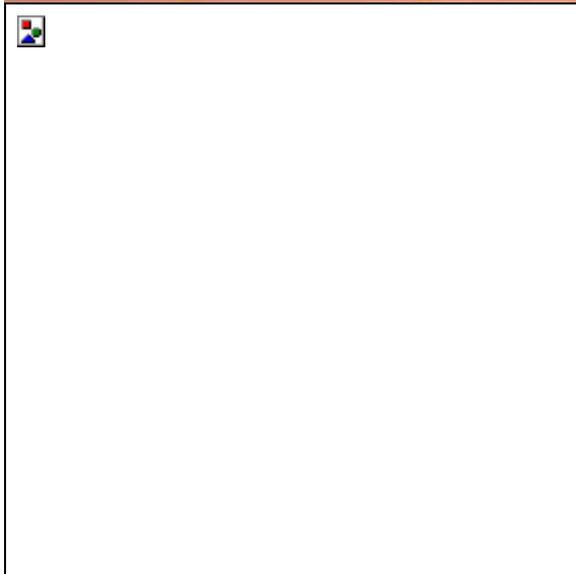
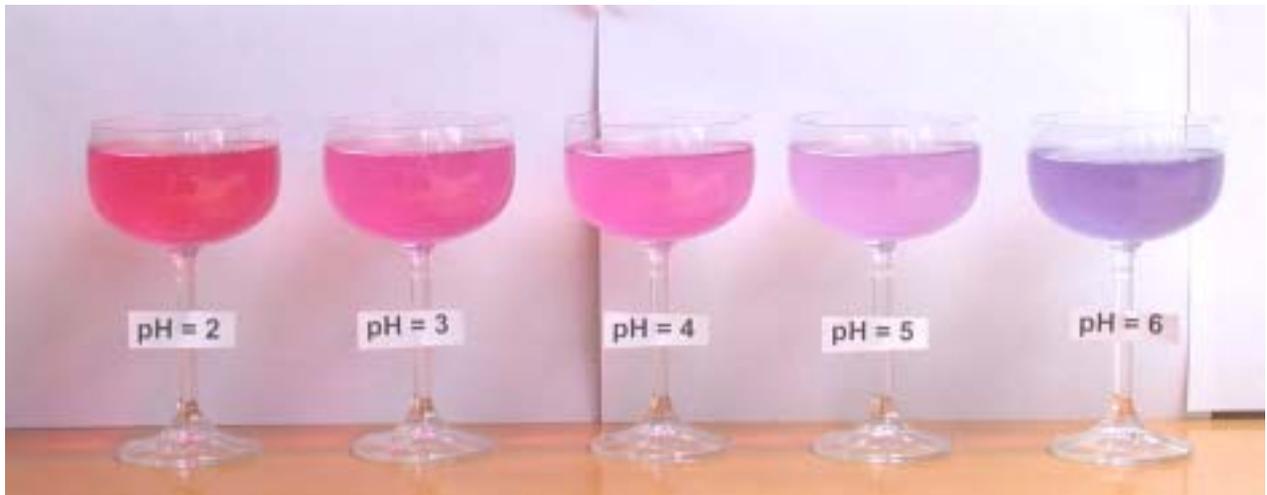
- ***Scalds*** – These are bare patches in areas with swampy vegetation where the soil is particularly acidic. There may be dead trees and salt crusts.

Testing pH

You can test the pH of water using a colour indicator that you can easily make yourself using the juice of a red cabbage. This is made by boiling a quarter of a cabbage in a saucepan full of water until the water is stained purple. Allow to cool, and strain the coloured water into a jar. Screw a cap onto the jar and store in the fridge.

To use your indicator to measure pH, collect a sample of water in a glass jar and add about two teaspoons of red cabbage juice. Note the colour change and compare with the photograph below to determine the pH of the water. The colour will be easier to see if you hold a sheet of white paper behind the jar.

Colour variation of red cabbage juice with pH



Reporting acid drainage

You can help protect our rivers and estuaries by reporting any occurrences of acid drainage to the Land and Water Quality Branch of the Water and Rivers Commission by phone at 9278 0300 or 9222 7000. Reporting both visual indicators and any low pH measurements that you have found (i.e. a pH of 4 or less) will help us locate the source of acidity so that it can be managed to protect fisheries.