



## Station 6 – Which water?

Students observe unknown samples (e.g. dam water, rainwater, town water, bore water or seawater) and predict which water they think is which. They then analyse the samples for pH, salinity and turbidity and compare and contrast them to known samples. The Students reflect on their predictions and the test results and attempt to explain the differences between the water types.



### Key concepts

**Salinity:** Salty water conducts electricity more readily than fresh water; therefore electrical conductivity is routinely used to measure salinity. Salty water contains the following ions (charged atoms) chloride, sulphate, carbonate, sodium, magnesium, calcium and potassium. The basic unit of measurement of electrical conductivity is MicroSiemens per centimetre ( $\mu\text{S}/\text{cm}$ ). Salinity is affected by several aspects in the catchment such as the geology and soils, the rate of flow in a waterway and over-clearing of native vegetation. (Ribbons of Blue: Water Quality Teachers Notes).

**Turbidity:** Turbidity is the murkiness of water due to suspended particles in the water causing a reduction in the transmission of light. Suspended material can be

particles of clay, silt, sand, algae, plankton, micro-organisms and other substances. Turbidity is expressed as nephelometric turbidity units (NTU). Turbidity is affected by many things such as runoff, soil erosion, stormwater discharge and excessive algal growth. (Ribbons of Blue: Water Quality Teachers Notes).

**pH:** pH is a measure of the concentration of hydrogen ions ( $\text{H}^+$ ) in the water and indicates how acidic or alkaline the water sample is. pH is measured on a scale of 1-14 with a pH of 7.0 being neutral. Solutions with a pH of 7.0 to 14.0 are basic (alkaline) while solutions with a reading of less than 7.0 are acidic. pH can be affected by the geology and soils in the area, salt content (increased salinity causes an increase in pH), disturbance of acid sulphate soils, discharges of industrial waste and rainfall, (as it is slightly acidic due to the dissolution of atmospheric carbon dioxide forming carbonic acid. (Ribbons of Blue: Water Quality Teachers Notes).

### Images

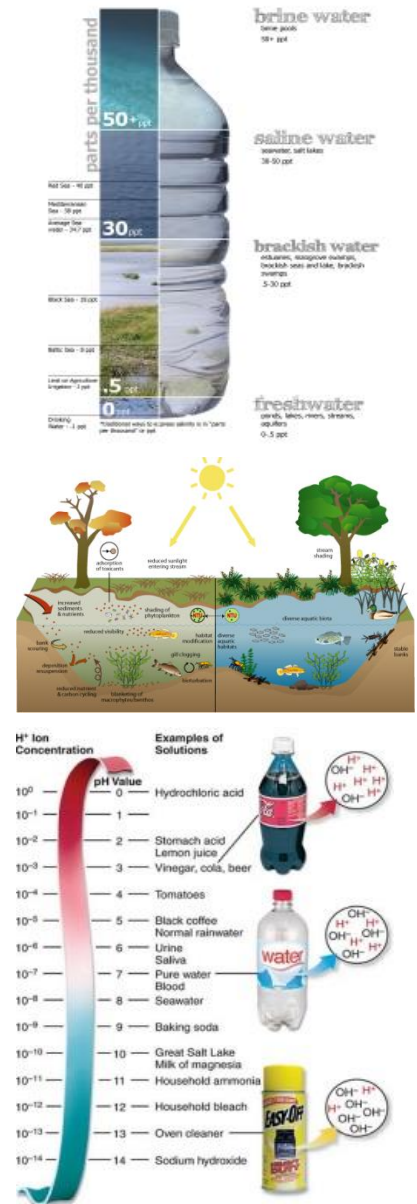
*Turbidity WetlandInfo*, DEHP Queensland. (Healthy/unhealthy creek)  
<http://en.wikipedia.org> bottle  
<http://academic.cuesta.edu> pH  
<http://rouswater.nsw.gov.au> girl & glass

### Water literacy list

**Bore water:** Water that has been drawn from a body of underground water, usually with a deep pipe and windmill or other pumping mechanism. It may contain dissolve minerals or chemicals and may not be fit for drinking.

**Dam:** A dam is not the big pool or lake of water as we commonly say. It is actually the barrier that is built across a creek or river to stop the water flow.

**Ions:** Charged atomic particles.



**pH:** The measure of the concentration of hydrogen ions (H<sup>+</sup>) in the water and indicates how acidic or alkaline the water sample is.

**Plankton:** Microscopic organisms (plants and animals) that float freely with water currents.

**Pure:** A material is pure if it contains only one chemical substance and so cannot be separated further

**Rainwater:** Capturing and storing rain. This is harvested from roofs and gutters into collected in tanks.

**Salinity:** The concentration of dissolved salts in water or soil and is expressed in terms of concentration (mg/L) or electrical conductivity. [www.mdba.gov.au](http://www.mdba.gov.au)

**Seawater:** Water from a sea or ocean. On average seawater in the world's oceans has a salinity of approximately 3.5% or 35 parts per thousand. This means that for every 1 litre of seawater there are 35 grams of salts (mostly, but not entirely, sodium chloride) dissolved in it. Although a vast majority of seawater is found in oceans with salinity around 3.5%, seawater is not uniformly saline throughout the world. <http://www.sciencedaily.com>

**Sediment:** Soil, sand and other materials washed from the land into the water, usually by rain. When these particles settle to the bottom of the water body this is called sedimentation.

**Stormwater:** Excess rain that runs down from streets, roads and hard surfaces down stormwater drains. These lead to creeks, rivers and out to sea.

**Suspension:** Very fine particles of solid mixed with a liquid. If the solid is in suspension the water will often look cloudy e.g. flour and water shaken together. <http://www.mikecurtis.org.uk>

**Turbidity:** The murkiness of water due to suspended particles in the water causing a reduction in the transmission of light.

## Teacher reference

Senior Waterwatch Teachers' Guide, Section 4: Background to water quality tests. [Link to pdf](#)

## Link to our local water supply and sustainable water use

There are three key steps towards reducing your water footprint (consumption). The first is to foster water saving behaviours e.g. have short showers and use the half flush toilet button. The second is to fix leaks or drips and choose water efficient fixtures e.g. 4<sup>+</sup> WELS rated dishwashers and showerheads. The third step is to find new ways to use less of the town water supply e.g. install rainwater tanks and grey water systems for toilet, laundry and garden use.

Rous Water's Future Water Strategy has three key actions. Considering different water types for different water uses plays a significant role in this:

- Key action 1—Maximise water efficiency through demand management and conservation.
- Key action 2—Investigate increased use of groundwater as a new water source.
- Key action 3—Investigate the suitability of water re-use as an additional new water source.

For more information visit the Rous Water website, Future Water Strategy Section:

[http://www.rouswater.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-BYN-38-23-04](http://www.rouswater.nsw.gov.au/cp_themes/default/page.asp?p=DOC-BYN-38-23-04)

## Kids section

Prepare your own acid indicator from a red cabbage and use it to look at how acidic things in your kitchen are!

<http://www.youtube.com/watch?v=C8JmzyW-lc0>

**Science scenarios** - Research and design an experiment that will show each statement to be correct:

- Rainwater is slightly acidic.
- Plants decrease the turbidity of runoff.
- An increase in salinity causes an increase in pH.

## Experiment

### ***What is the effect of carbon dioxide in water?***

What you need: Two transparent cups, a straw, pH indicator fluid and tap water.

What you do:

1. Half fill each cup with tap water.
2. Add a few drops of the indicator fluid to each cups.
3. Insert a straw and gently blow bubbles into the water for several minutes. Wear safety goggles and do not blow too hard.
4. Watch for a water colour change.
5. Compare the colour of the bubbled water with the colour of the water in the other cup.

If indicator fluid is unavailable you can make your own using purple cabbage. Prepare two small cups or containers of cabbage water. The initial purple colour of the cabbage water indicates a pH of around 7.0.

*PREDICT, OBSERVE & EXPLAIN.*

What happening? With every breath, we take in oxygen and exhale carbon dioxide. By blowing into the water you are adding carbon dioxide (CO<sub>2</sub>), making the water slightly acidic. When carbon dioxide is bubbled through water, some of it dissolves into the water. Carbon dioxide is one of the greenhouse gases, so named because it helps to keep Earth's heat from escaping into space. The amount of carbon dioxide in our atmosphere is increasing and this is causing significant changes to our climate. <http://www.csiro.au/helix/sciencemail>