FACT SHEET

Wetland Salinity:
Predicting the ecological consequences

Fact Sheet No. 3 What is salinity and how is it measured?

What is salinity?

In aquatic ecosystems salinity is the total amount (concentration) of dissolved salts (ions) present. The salts present are typically dominated by four cations: calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}), potassium (K^{+}); and three anions: carbonate (HCO_3^{-}/CO_3^{2-}), sulfate (SO_4^{2-}) and chloride (Cl^{-}). In general Na^{+} and Cl^{-} are the most abundant ions present in saline aquatic ecosystems.

Wetland salinity

Excessive land clearance and large-scale irrigation have caused groundwater to rise, often carrying high concentrations of salts that are then deposited at the soil surface. Saline groundwater may directly infiltrate into rivers and wetlands. Surface run-off also carries salts into wetlands and rivers. The effects of salinity on plant and animal life within a wetland or river depend on the amounts of salt present. Therefore it is important to know the concentration of salts in the water.

Measuring salinity

Salinity is a measure of the concentration of salts in the water. The three most common estimates of salinity are:

1. Total dissolved salts

The most precise way to measure salinity is by establishing the total amount of dissolved salts (in mg/L) in the water with laboratory analysis.

2. Total dissolved solids (TDS)

The amount of dissolved material in the water is often used to estimate salinity, but because it usually includes dissolved organic matter it will overestimate the amount of salt present. Total dissolved solids are measured in the laboratory and are typically recorded in mg/L.

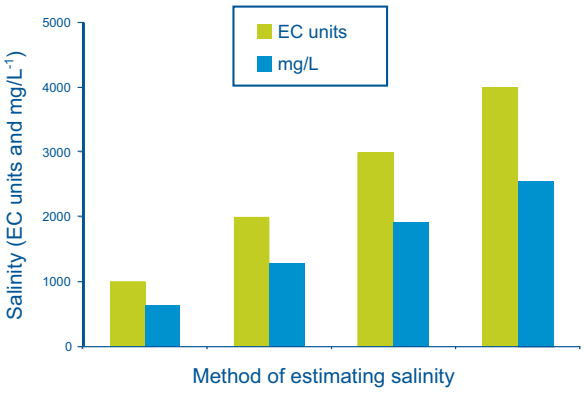
3. Electrical conductivity (EC)

Electrical conductivity is the most common measure of salinity and the easiest to determine. A probe consisting of two metal electrodes that are exactly 1.0 cm apart is placed into the water. A constant voltage is applied across the electrodes. An electrical current flows through the water due to this voltage and is proportional to the concentration of dissolved salts in the water — the more salts the more conductive the water, resulting in a higher electrical current (measured electronically). EC is usually expressed in microSiemens per cm at 25°C (µS/cm) .

Relationship between EC and TDS

Typically, a relationship of TDS = 0.64 EC units is used to calculate salinity (Figure 1). However this relationship between EC and TDS varies with the concentration of salts in the water and the proportions of the various salts present. The concentrations and proportions of salts also vary between locations, primarily due to differences in catchment geology. For that reason EC does not always give an accurate measure of salinity.

Figure 1. Relationship between two measures of salinity — EC units and mg/L of salt



Salinity tolerance of plants and animals

Some organisms are adapted for living in freshwater, others for living in salt water. In general, freshwater plants and animals cannot survive in either saline or slightly saline water. Consequently, as salinity increases in freshwater environments there will be a reduction in the numbers (abundance) and types (species richness) of plants and animals. Usually these reductions will begin to occur once salinity exceeds 1000 mg/L (≈1500 EC).

For more information contact:

Dr Daryl Nielsen Murray-Darling Freshwater Research Centre
PO Box 991, Wodonga VIC 3689 Ph 02 6058 2360
Email daryl.nielsen@csiro.au

Dr Margaret Brock Department of Natural Resources
PO Box U245, Armidale NSW 2351 Ph 02 6773 5268
Email margaret.brock@dnr.nsw.gov.au

For Fact Sheets 1 and 2 in this series, see:
www.dlwc.nsw.gov.au/salinity/science

NSW Government
DEPARTMENT OF NATURAL RESOURCES

The Murray-Darling Freshwater Research Centre

eWater CRC
www.ewatercrc.com.au