Government of South Australia
Primary Industries and Resources SA

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FACT SHEET

No: 66/00

Testing for soil and water salinity

Why test for salt?

Salinity can be a concern when streams, bores, dams and soils become more saline.

It is important to know how much salt is in water used for irrigation or stock supplies. Similarly, the amount of salt in the soil will determine which crops, pasture plants or trees can be grown.

Salty water can cause problems with the health and growth of livestock. Stock shifted from better to poorer quality water may suffer health disorders or even death.

Salinity affects crops and pastures by reducing establishment, vigour and yield. The severity of soil salinity determines which plants can be grown successfully. As salinity increases, traditional crop and pasture plants do not grow or have very low productivity.

Indicators of soil salinity

The presence or absence of certain plants can give valuable clues to indicate the degree of soil salinity. Observed effects of soil salinity include reduced growth and performance of cereals and grain legumes, loss of clovers and medics from pastures and invasion by salt-tolerant weeds (e.g. sea-barley grass). Native tree and shrub species can also be at risk from increasing soil salinity.

A good indicator of potential salinity problems is the depth and quality of groundwater. If groundwater is saline and the watertable is shallow or rising, there is the potential for salinity problems to occur in the future.

A guide to the assessment of saline soils

The following table outlines the indicators for various ranges of soil salinity.

Severity of salinity	Non-saline	Low	Moderate	High	Severe
Indicators	Most plants unaffected. Uniform "healthy" plant growth. Waterlogging, if occurs, is not caused by a rising watertable.	Sensitive plants affected. Reduced vigour of annual legumes. Some grain legumes affected. Cereals generally not affected. Most horticultural crops affected.	Many plants affected. Annual legumes struggling to survive or are absent. Plant growth often patchy. Grain legumes, wheat and oats affected. Most perennial grasses affected.	Tolerant plants affected. Annual legumes absent. Barley and cereal rye affected. Sea barley grass often dominates. Small bare areas present. Trees may be dying.	Only suitable for highly tolerant plants. Areas of bare ground. Salt crystals occur in summer. Waterlogging is common. Trees dead or dying.
Approx. soil salinity, ECe (dS/m)	0-2	2-4	4-8	8-16	>16
Approx. depth to water table	greater than 3 to 4m	2 to 3m	1.5 to 2.5m	0.5 to 1.5m	0 to 1m

Measuring salt in soil

The early signs of soil salinity are often difficult to pick visually and a soil test is required to determine the degree of salinity. If salinity is suspected, take soil samples both inside and outside the area (or zone) in question, and compare the results. Soil samples taken from the subsoil will provide information of salinity below the soil surface. Results should be interpreted in conjunction with indicator plants.

The salinity of a soil sample is determined by measuring the electrical conductivity. Salinity units are expressed as deci-Siemens per metre (dS/m). Information on plant tolerance is based on a soil saturated paste extract (ECe). While this method is reliable and most accurately describes the salinity status of the soil, it requires laboratory facilities to be completed properly.

Field measurements are usually carried out by mixing a ratio of one part soil to five parts de-ionised (or distilled) water (on a volume basis), shaking, allowing to settle and determining the electrical conductivity of the clearer fluid at the top of the settled mixture (EC1:5). Results from a 1:5 soil:water test (EC1:5) can then be converted to an ECe equivalent using the following factors: - multiply the results by 14.0 for sand, 9.5 for loam and 6.5 for clay soils.

A rapid field test for soil salinity

The rapid field salinity test should be used as a guide only since it is not as accurate as the saturated paste extract method. If attempting to grow plants with low tolerance, salinity should be checked by a recognised soil testing laboratory.

Soil sampling

Take soil samples in late summer to early autumn when the concentration of salt in the top soil is highest. Define salinity zones based on type and presence (or absence) of vegetative cover and take at least ten samples from each zone. Sample down to 10cm using a tube sampler in preference to a spade. If a salt crust has formed it should also be included and not scraped off.

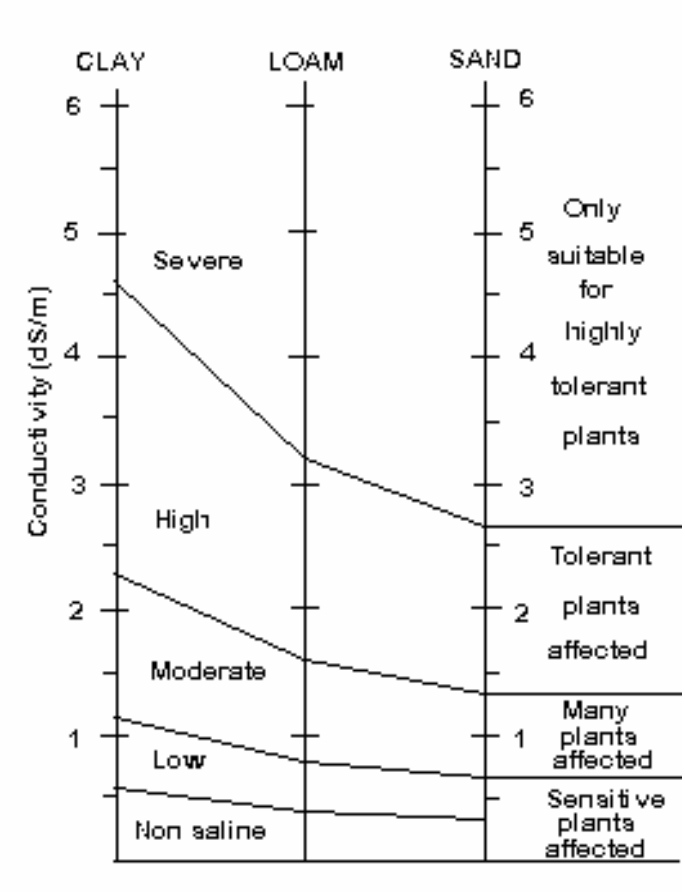
Bulk soil samples from the same salinity zone and mix thoroughly. In some cases a subsoil sample is also beneficial. Remove stones, sticks and plant material and break down any large soil clods. Then place the soil sample on a tray to dry.

Soil testing

Thoroughly mix the dry soil sample.

1. Obtain a bottle or small jar with graduated markings. An old baby bottle is ideal.
2. Place soil in the bottle up to the 100ml mark, and tap gently to settle the soil.
3. Add rainwater *(NOT tapwater)* up to the 600ml mark.
4. Place the cap on the bottle and shake for one minute.
5. Allow soil for settle for about another minute.
6. Measure the conductivity of the clearer fluid at the top of the settled mixture using a conductivity meter. Units are expressed as deci-siemens per metre (dS/m). Ensure the meter has been correctly calibrated before use.
7. Use the following chart to determine the degree of soil salinity. Choose the appropriate soil texture column for your soil (e.g. clay, loam or sand). Locate the soil salinity test value in this column. The approximate severity of the salinity is indicated by non saline, low, moderate, high or severe. This interpretation chart is for the rapid field salinity test only.

Interpretation for the rapid salinity test



Measuring salt in water

An electrical conductivity meter is used to measure the salinity of a water sample (ECw). The standard units of electrical conductivity are micro-Siemens per centimetre (µS/cm) or deci-Siemens per metre (dS/m), which are equivalent to milli-Siemens per centimetre (mS/cm). Total Dissolved Salts are expressed as milli-grams per litre (mg/L), which is equivalent to parts per million (ppm), while grains per gallon (gpg) is an old outdated imperial unit.

Interpreting test results

The tables (see next page) show at what levels soil and water salinity has an affect on plants and animals. Conversion between the various units of salinity is shown.

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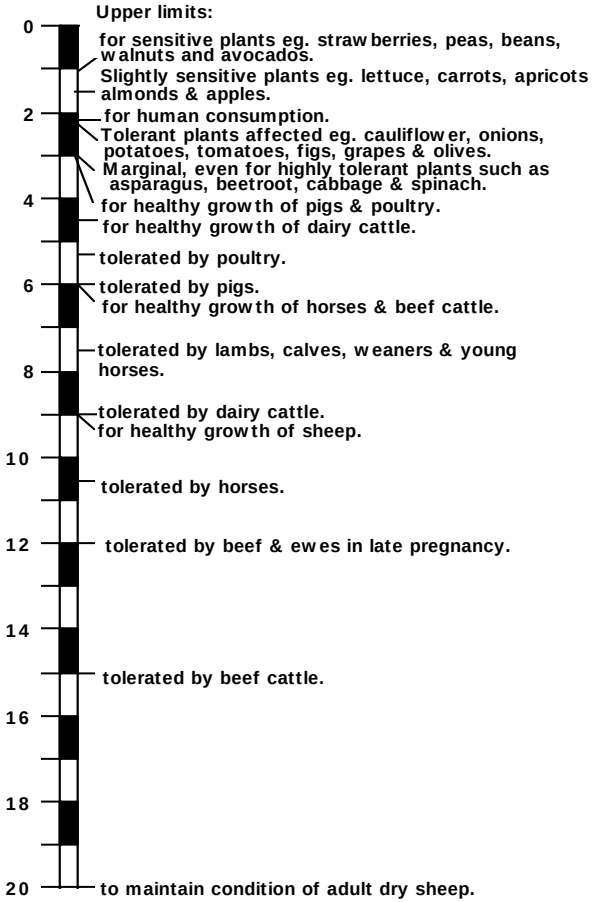
Table 1

Water

Measured on a water sample

(ECw dS/m)



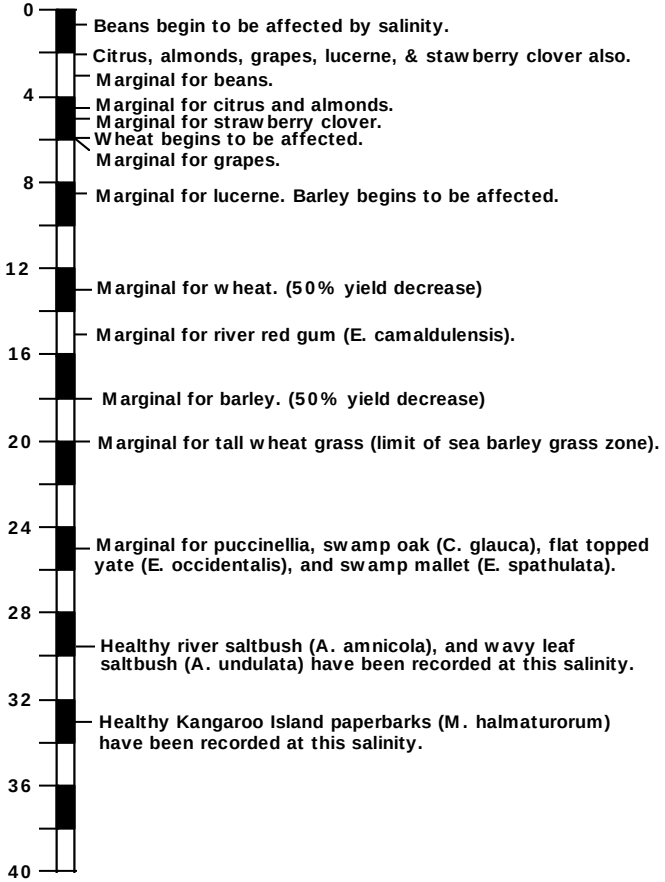
Note: Upper limits of salt tolerance depends on the amount of moisture and salt in feed.

Table 2

Soil

Measured on an extract from a saturated paste

(ECe dS/m)



Information compiled from various sources
Primary Industries SA, July 1994

Table 3

Conversion Table

Use this table to convert other units to dS/m