Managing dryland salinity in Tasmania

Where is salinity an issue?

Salinity in Tasmania is mostly limited to areas where the average annual rainfall is less than about 800 mm. Salt affected areas are most common in drainage lines where groundwater flows are impeded.

The drivers of salinity; changes to the hydrology

Salinity occurs naturally in some areas of the Tasmanian landscape, for example the salt pans in the Midlands. This is called ***primary salinity*** and is not related to human activity. Many saline areas have developed since the land was developed for agriculture. In these situations salt moved in the landscape to be concentrated at, or close, to the soil surface. This is called ***secondary salinity***.

Secondary salinity is entirely due to changes in water movement. The simplest example is where native vegetation is cleared from hilltops. More of the rain that falls in these recharge areas soaks below the root zone to the groundwater. This water moves down the slope and commonly accumulates in the valleys, bringing the water table closer to the surface. Salts in the underlying materials are mobilised and brought to the surface with this water and accumulate in surface soils as water evaporates.

This concept of water and salt movement applies in many areas of Tasmania, so we commonly find that salinity often occurs in association with waterlogging.

Where does the salt come from?

The greatest source of salt is in rainfall, with annual contributions of 50–200 kilograms of salt per hectare per year. Over geological times this salt has accumulated in subsoils in some areas of the State.

In Tasmania, the main salinity risk is associated with changes that result in a saline water table rising to affect the root zone or saline groundwater accumulating in lower parts of the landscape. A saline watertable within 2 metres of the soil surface is a risk for crops and pastures. Water from this depth moves slowly to the soil surface under capillary action. As water is removed by plants and evaporation, salts then concentrate at the surface.

Identifying salinity.

Some plant species are more tolerant of salt in the soil than others. The first sign of salinity is a decline in plant health and vigour, followed by an increasing density of salt indicator species, replacing the pasture species within the affected area of a paddock.

Annual and perennial clovers commonly disappear first, although Strawberry Clover is very tolerant of waterlogging and moderately tolerant of salt, so it will persist where soils are moist throughout the summer.

Although Perennial Ryegrass is moderately tolerant of salinity, other grass species such as Fescue are more tolerant of waterlogging, and will replace Ryegrass in such circumstances.

As salinity levels increase, improved pasture species are commonly replaced with Sea Barley Grass (*Hordeum marinum*), a small grassy annual (commonly mistaken for Barley Grass, which is a larger plant with a longer flower-head).

Sea Barley Grass (photo courtesy DPIWE, Saltpak)

At higher salinity levels, Buck's Horn Plantain (*Plantago coronopus*) is more common. This plant is commonly found in exposed areas, for example bare soils around farm tracks. Where soil salinity levels are low, plants are typically green and can be lush and vigorous. At higher salinity levels, the rosettes are stunted and the leaves a dark burgundy colour.

Buck's Horn Plantain(photo courtesy DPIWE, Saltpak)

In persistently wet and saline conditions a plant called Water Buttons (*Cotula coronopifolia*) sometimes occurs. Water Buttons are usually confined to drainage lines and on the edges of wet soaks.

Water Buttons (photo courtesy DPIWE, Saltpak)

Where salinity levels are severe, all plant growth ceases and soils become "scalded". Scalds are subject to compaction and soil erosion, as there is no vegetation to protect and hold the topsoil. Such areas are subject to increased evaporation rates and are very difficult to rehabilitate. It is very important to maintain a healthy vegetative cover to reduce the accumulation of salt at the surface.

It is often difficult to separate waterlogging from soil salinity, particularly where the salinity levels are low to moderate, and the waterlogging reduces the vigour of many improved pasture species.

Testing water for salinity

Salinity is most easily measured in water by measuring the electrical conductivity. Although the conductivity varies depending on the types of salts in the water, the variation is minimal with sodium chloride being most common. An understanding of ECw is important for determining crop, stock and human tolerance levels.

You can convert "conductivity" reported as dS/m to "parts per million of salt" (ppm) by multiplying by 640. Also 1dS/m is equivalent to 1000 microS/cm or 1000 EC Units.

Water over 0.8 dS/m can create problems for irrigation. The limit for livestock is around 6-10 dS/m, depending on the type of stock. Sea water has an ECw around 54 dS/m.

Conductivity is easily measured with a hand-held meter that retails for around $150. An important issue is that these meters need to be checked against standard solutions regularly as they do drift with time. Conductivity is also related to temperature. Meters will compensate, but you need to allow time for the meter and the sample to equilibrate, so allow a minute or so for the reading to settle.

Measuring soil salinity

Soil salinity is also measured with a conductivity meter, using a 1 part soil to 5 parts water suspension. Simply mix a sample of crushed soil with distilled or rain water in these proportions by volume and take the EC reading. The soil sample needs to be thoroughly dispersed in the water. This is easiest if the soil is first dried then crushed, particularly for clayey samples. Conductivity of the dispersed solution can then be measured. There are standard tables to show the effects of water and soil salinity on crop performance.

What you can do to manage soil salinity

Managing soil salinity is largely a matter of managing water in a saline environment. In areas where the soil is already salty, this includes planting salt-tolerant plant species that will:

- Lower the watertable and reduce the upward capillary movement of salts to the soil surface.
- Make the area more productive, particularly by providing fodder for livestock.
- Improve the appearance of salt scalds.

Surface and subsoil drains also help to lower watertables and flush salts away. However, the discharge of salty water might raise the salinity of water and soils for others lower in the catchment. Careful planning and assessment is required to reduce the possibility of offsite impacts.

Many farmers are concerned that their land management practices may be increasing the area of salt-affected land on their properties, so monitoring of salinity is important. Recommended procedures include soil analyses (surface and subsoil samples), recording trends in groundwater depth and salinity and the use of Electro-Magnetic induction techniques (determines salt stores within the soil profile). Photo-points and air photos can also be used. Unfortunately, none of these techniques is straight-forward and farmers are encouraged to seek expert advice to establish the best monitoring procedures.

Trees, shrubs and perennial pastures in recharge areas will reduce the amount of groundwater moving to lower parts of the catchment where it can raise the level of saline watertables. Knowledge of groundwater flow systems and local processes controlling salinity will help to strategically locate vegetation that uses more water for effective salinity management.

The most important actions are to establish a monitoring procedure so you can see whether the area of salt-affected land is increasing and improve the productivity on land that is already affected by salt.

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