Salinity Explained

WHAT IS SALINITY?

The term salinity refers to the movement and concentration of salts, dissolved in water, though the landscape. Both soils and water can become saline, therefore salinity is usually described as either soil or water salinity.

Salts include sodium chloride (common table salts), calcium carbonate (limestone) and many others. These salts are dissolved by water as it runs over and through rocks and soils.

All natural waters contain small amounts of dissolved salts which are vital for life of aquatic plants and animals. High levels of salt however, can make it hard for many plants & animals to absorb water, leading to dehydration, upsetting natural electrolyte levels & in severe cases, leading to death. High levels can also make water unsuitable for such uses as irrigation and drinking water.

WHERE DOES SALT COME FROM?

There are three major sources of salt in Australia. Retreating seas, rain and rocks have contributed to the amount of salt in our soils and natural waters.

Rain

Salts can be evaporated with sea water and carried by strong winds in cloud to fall as rain across inland areas. Salt concentration in rainfall is obviously higher nearer to the coast, but still contributes a substantial amount of salt to inland environments. Between 20 and 200 kg/ha of salt can be deposited during a year of average rainfall.

Retreating Seas

Many areas across Australia were once covered by an inland sea. When the sea retreated about 10 million years ago, the sediments that were left behind contained large amounts of salt.

Rocks

Salts are contained within rocks and are released during the weathering process. Many types of rocks including marine sediments, granites and rhyolites contain high levels of sodium and potassium (salts) which may be mobilised after weathering.

SALINITY IN VICTORIA

Throughout the Australian landscape, there are large amounts of naturally occurring salt. Many Australian rivers drain to internal lakes where they have, over time, been concentrating salts. Naturally occurring salt affected areas such as these are referred to as *primary salinity.*

Salinity problems in Victoria have resulted largely from human activities which have modified the natural distribution of salt in the landscape. The saline areas that have resulted (due to human activity) are referred to as *secondary salinity*.

Naturally, water moves into the soil during and after rainfall and is stored in the soil profile. Much of this water is used by plants but the remainder finds its way past the root zone and into the groundwater system, dissolving salts as it percolates through the soil. This leads to a natural concentration of salts in groundwater. The upper surface of the groundwater is known as the watertable.

Many of the salinity affected areas in Victoria were once covered by deep rooted, native vegetation, which kept the watertable well away from the soil surface. Native plants act as large 'water pumps', evaporating what they don't use back into the atmosphere. In many cases, native vegetation has been replaced with shallow rooted crop plants and pasture grasses, which has led to an increase in the rate of groundwater recharge and a rise in watertable level, bringing dissolved salts with it. This process is known as *dryland salinity,* which is the most common form of salinity in the state.

SOIL SALINITY

When the watertable reaches 1-2 meters below the ground's surface, the water moves by capillary action (like a sponge) and brings salt with it. As this water evaporates, it leaves the salt within the surface layers of the soil. Over time this causes the soil to become saline and limits the growth of vegetation. Salt sensitive plants begin to die and can leave the soil prone to erosion. High salt content also causes the decline of soil structure which further exacerbates soil erosion. This accumulation of salt in the soil is referred to as *soil salinity.*

WATER SALINITY

Salt deposits on surface can 'washoff' into streams when it rains and is a major contributor to stream salinity in many areas. As the watertable rises, it may reach the soil surface. This will usually occur in the lower parts of the landscape such as streams and other surface water accumulation points. Stream incision (caused by increased stream power, usually due to the removal of vegetation) is very common and increases the likelihood that raised groundwaters will discharge into streams. This groundwater intrusion is referred to as *baseflow,* which can also contribute high amounts of salt to surface waters.

IMPACTS OF SALINITY

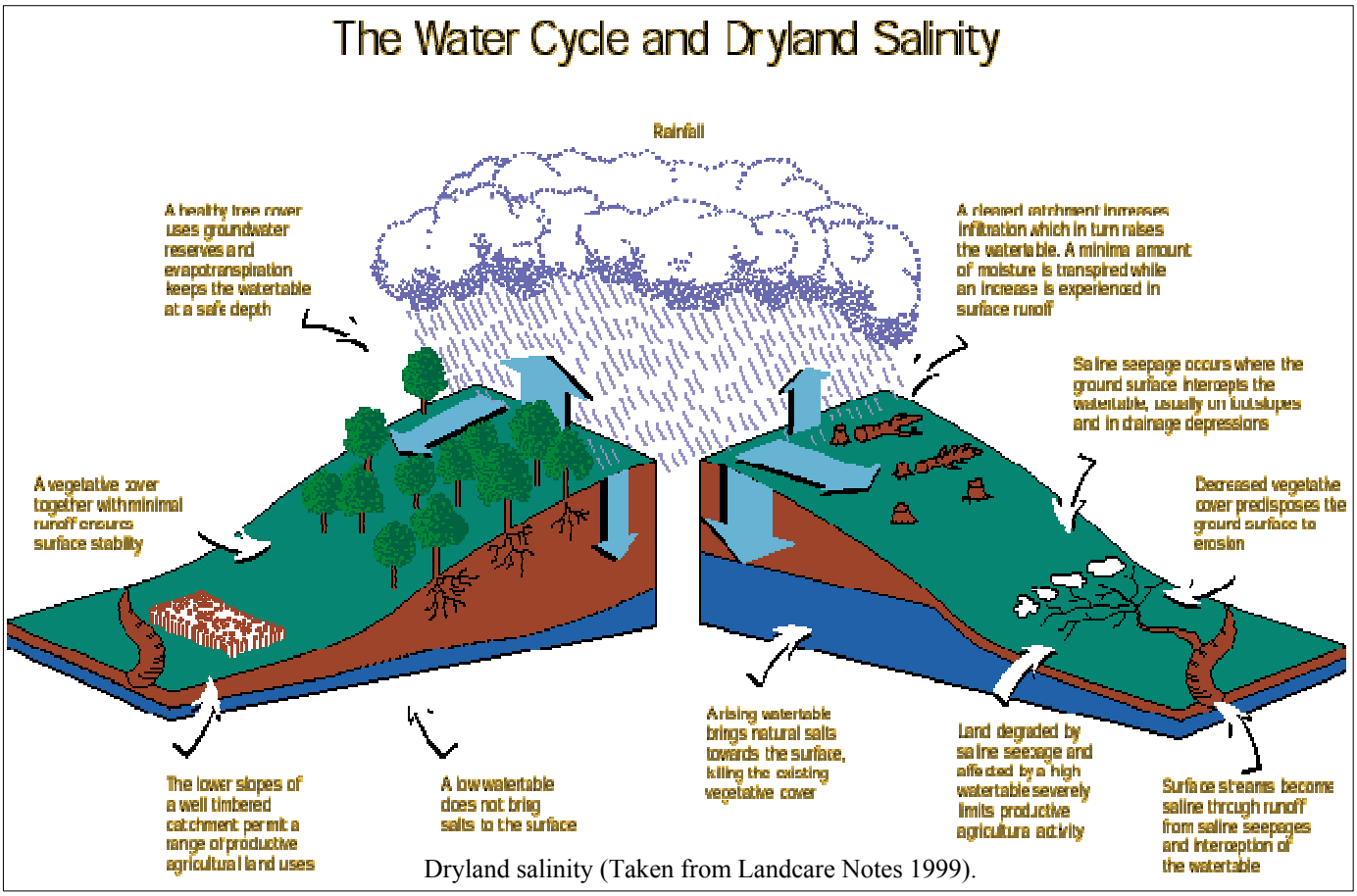
Salinity problems in Victoria have resulted largely from human activities which have led to salt being carried near, or to, the soil surface.

Plants and animals need small amounts of salts to live. Some beneficial salts are even *added* to soils, in the form of fertilisers, to increase productivity. To much salt; however, can make it hard for plants to absorb water, leading to reduced growth rates or death if salt concentrations are high enough. Salinity can therefore lead to loss of vegetation cover, crop productivity losses, habitat decline and reduced biodiversity.

One of the main routes of salt intake for animals is through water, especially aquatic animals. If water salinity rises beyond the tolerance level of aquatic animals, they will disappear from the system. Stock become unhealthy and unproductive and water becomes unfit for human consumption at elevated salinity levels.

Salt (especially sodium) can cause soils to become more susceptible to erosion. Earthen infrastructure such as irrigation channels may be damaged and stream water quality may be affected.

Salt also weakens tarmac and concrete. Salinity leads to road damage, and in the urban environment may cause severe damage to houses, footpaths, and underground concrete pipes.



Dryland salinity (Taken from Landcare Notes 1999).

MANAGEMENT OF SALINITY

The long term solution to salinity involves lowering the groundwater table to a level where interaction with the soil surface and saline discharge to streams is minimised. This can be achieved through catchment wide planting of deep rooted vegetation. Considering that much of the land cleared since European settlement is utilised for agriculture and grazing, revegetation on the scale required may be difficult if not impossible. Irrigation techniques can be modified to reduce watertable rise, and channels may be dug to drain groundwater.

Salinity tolerant building materials may need to be used in some areas. Deep rooted crops may be planted such as Lucerne to relieve salinity issues by maintaining the watertable. Salt tolerant crops and pastures can be planted in areas affected by salinity. Research in this field is progressing and promising results are being obtained.

Groundwater may be pumped and utilised for saline aquaculture or harvest of salt and minerals. Saline groundwater can even be used to produce electricity!

Unfortunately many of these options are not viable at a scale that will make a real impact on the Australian salinity issue. Integration of salinity management options and further research into options for saline land use are integral to successfully living with salt in Australia.