Managing salinity with engineering

Salinity is managed by a combination of revegetation and engineering strategies—designed to lower the watertable in salt affected areas.

Careful planning is the key to cost-effective management and strategies should be determined by the characteristics of the affected site.

Engineering strategies for salinity management include:

- drainage to intercept and redirect groundwater
- groundwater pumping
- irrigation using groundwater.

Drainage to intercept and redirect groundwater

Surface drains are effective where the watertable is close to the surface. They remove run-off and seepage before it can recharge the groundwater or evaporate at the soil surface.

Subsurface drains (Figure 1) are more expensive than surface drains, however they do not use up productive land and they avoid the inconvenience and safety risk of surface drains.

The effectiveness of drainage is dependent on a number of factors including slope, soil type and disposal options. The ability of the soil to transmit water (permeability) will dictate the drain spacing. In heavy clay soils (commonly found in discharge areas), drains may need to be positioned so close together that this form of management becomes impractical.

Figure 1. Installing subsurface drainage

The appropriateness of using drains depends on the quality of the groundwater. Disposal of good quality water leads to fewer problems. However, draining salty water may simply transfer the problem elsewhere.

If water is slightly salty it can be used by mixing with better quality water where alternative supplies are available.

To determine the best location for drains dig a number of holes across the slope to identify the width, depth and quality of groundwater (Figure 2). This is important as water quality can vary considerably

If useful water is found during sampling, locate the drain to intercept good quality water across the slope, and discharge this water safely into a waterway, drainage line, dam or storage area.

Indiscriminate disposal of poor quality water can affect natural ecosystems and agricultural productivity in a catchment. The *Environmental Protection Act 1994* requires landholders to show due diligence by disposing of poor quality water so that there is no risk to the environment. For advice on disposal contact your local extension adviser or the Queensland Government.

Groundwater pumping

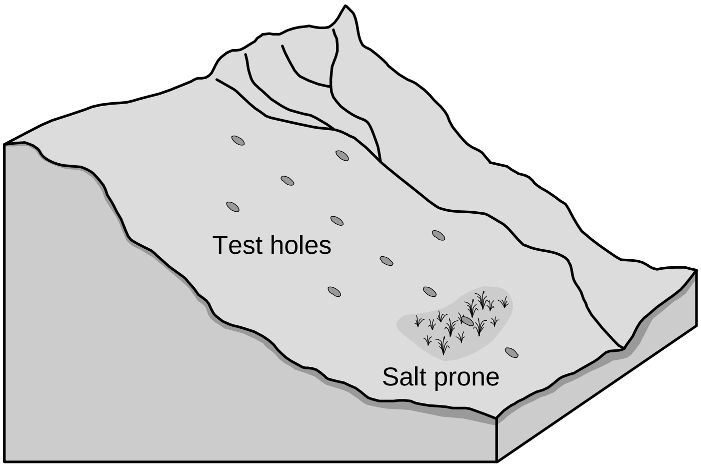

Figure 2. Sampling pattern used to identify the width, depth and quality of shallow groundwater.

Groundwater pumping may be an effective salinity management tool in a water-logged or salt affected area. Good quality water can be stored for future use, or used for irrigation or watering stock. Poor quality water needs appropriate disposal.

To select sites for investigation, use local knowledge and the results of any previous drilling in the area. Check whether a drilling and pumping license is required under the *Water Act 2000*.

A test bore will determine water quality and flow rate. Several bores may be required to reduce salinity over a large area. The bore flow rate will determine the best pumping option. Windmills and solar pumps are the most efficient on bores with low flow rates. Running costs are negligible but capital costs can be high.

A number of factors will determine the success of a bore including the:

- area of the aquifer captured by the bore
- ability of the soil to drain water freely
- pump efficiency and bore hole diameter
- interference from other bores.

Where watertables are close to the surface, an efficient and low cost option is using an air-lift pumping unit. This type of system can deliver compressed air to multiple bores within a seven kilometre radius, using poly pipe.

Where large volumes of water are available, diesel pumps are an option. The pumps have changeable pumping rates but are a high cost option with the cost of fuel, fuel storage and the delivery of power supply to electric pumps. This option is mainly used on large-scale irrigation projects.

Trenches may also be constructed to get access to groundwater close to the surface.

Irrigation using groundwater

The suitability of a shallow watertable for irrigation depends on the quantity and quality of the groundwater available. Key issues include:

- preventing excessive salt accumulation in the root zone
- maintaining stable soil structure
- minimising excess movement of water below the root zone.

The amount of water required for irrigation depends on factors such as climate, plant type, stage of plant growth, soil type and irrigation method. Installing an irrigation scheduling system insures against excessive or insufficient water-use and reduces salinity risks.

Irrigating crops, pastures and trees with shallow groundwater within the plants' salt tolerances does not affect plant growth and yield. Irrigating highly porous soils with groundwater poses little risk of salt build up.

By lowering the watertable, salt accumulated in the upper soil will be leached deeper into the soil during high rainfall. In the long-term, lowering watertables by irrigation may result in previously unproductive land being returned to farming.

The quality of water used for irrigation should be monitored as it may change over time.

Further information

This and other science notes are available from the Queensland Government website www.qld.gov.au – search ‘science notes’. For further information about this science notes series phone **13 QGOV** (13 74 68) – ask for science notes – Land series L55.

For further information on salinity visit < http://www.qld.gov.au/environment/land/soil/salinity/> or email soils@qld.gov.au.