

Salinity symptoms

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Salinity symptoms include changes in the soil, vegetation, animal behaviour and/or infrastructure (roads, buildings and underground structures) due to the presence of salt and/or waterlogging. Salinity is defined by the dominant landuse in the landscape where it occurs with the three types being dryland, irrigation and urban salinity (Figure 1). The general symptoms of salinity can occur within irrigation, dryland and urban landscapes.

Single visual symptoms should not be relied on as a sole predictor of salinity. Testing should be undertaken to confirm the presence of salinity.

General salinity symptoms

Soil

- waterlogged soil (Figure 2)
- black greasy patches on the soil surface
- salt crystals
- bare patches of soil

- increased soil erosion
- 'puffy' soil surface

Water

- excessive run-off due to low vegetative cover
- very clear water in dams or channels
- water smells salty like the ocean
- reduced freshwater biota

Vegetation

- stressed or dying trees
- leaf burn, necrotic patches and defoliation
- replacement of productive plant species with salt tolerant species
- reduced crop and pasture yields
- poor plant establishment and growth
- green break-of-slope discharge areas during dry conditions or over summer

Animals

- stock congregate on discharge areas and lick the surface salt
- animals will not drink the water

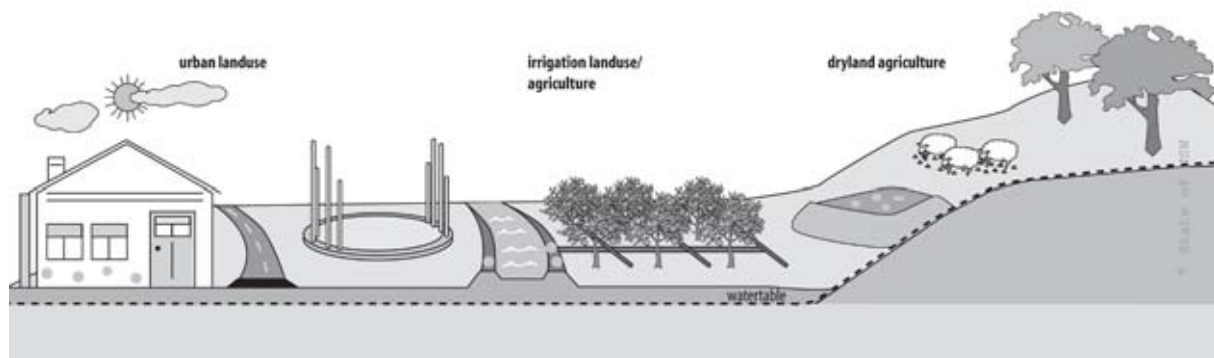


Figure 1. Salinity expressions in different land uses. The grey dots represent potential sites of accumulation of salt in the landscape. Source: Tenison (2008).

Dryland salinity

Saline discharge areas in dryland landscapes are likely to occur in the lower-lying parts of a catchment, at the break-of-slope or in other locations in response to the specific geology and soils in a landscape. The location of a discharge area is also influenced by vegetation, climate, landuse and the groundwater system.

Symptoms of dryland salinity include:

- yellow, necrotic plants and/or bare areas in crops and pastures
- premature haying-off of vegetation
- break-of-slope areas remain green during dry conditions (Figure 3)
- low-lying areas remain wet long after surrounding areas dry out
- presence of springs.

Irrigation salinity

Naturally flat or artificially levelled landscapes associated with irrigated agriculture are very different from most dryland agriculture landscapes. Consequently saline discharge areas may occur in different locations from the dryland situation such as adjacent to irrigation bays or leaking channels.

Symptoms of irrigation salinity include:

- poor crop growth in low-lying areas where water cannot drain freely due to poor layout and drainage
- waterlogging-tolerant plant species become dominant
- salt appearing adjacent to irrigation bays on non-irrigated land (Figure 4)
- salt accumulation on check/contour banks
- sodium salts from saline water make the clay of contour banks and supply channels dispersible, and therefore susceptible to tunnel erosion (blowouts)
- sodic soils with high clay content are highly dispersible. This results in slumping of banks and batters, reduced bank height and muddy water
- seepage from leaking channels with water pooling along the outside of the channel
- leaf burn at the tips and margins of plants, leaves are yellow or bronze (e.g. in rice crops irrigated with highly saline water)
- severe wilting of the plant or leaf drop often called 'haying-off'.

Urban salinity

Salinity in urban environments can be evident in buildings, parks, sporting ovals, roads and underground services.

Symptoms of urban salinity include:

- salt damage to bricks and mortar (Figure 5)
- mould growth and bubbling of paint or render inside building
- rising damp in buildings causing a white crust on the bricks and/or mortar
- salt on wooden bearers, joists and floorboards under the house
- groundwater discharges on to road or up through the road causing the road to break up
- tree die-back or death and turf decline
- bare areas and salt crystals in open spaces e.g. back yards, parks and sporting ovals
- underground structures such as galvanised pipes and fence bases corrode prematurely
- salt levels in sewerage and stormwater may increase as pipes intercept groundwater.

Salinity indicator species

The first sign of salinity is often a change in the composition of plant species. Plants adapted to growing in saline environments often replace existing species as the salinity level increases (Figure 6). Some of these indicator species, such as sea barley grass (*Hordeum marinum*) and spiny rush (*Juncus acutus*) appear almost exclusively in these environments. However, plants such as saltbush (*Atriplex* sp.) can grow in areas where there is no salinity as well as in wet and/or salty conditions.

Salinity indicator species can be used to identify a saline site, a waterlogged site, or a site that is both saline and waterlogged. Different cultivars of a species have different tolerance levels and the tolerance of a species may change with its stage of growth.

Salinity indicator species vary from region to region and with the level of salinity. Species found throughout NSW and their tolerance levels are listed in Table 1.



Figure 2. Waterlogged soil is often one of the first signs of a potential salinity problem. Source: Slinger & Tenison (2007).



Figure 3. Dryland salinity – green areas during summer are a sign of groundwater discharge sites. Source: Slinger & Tenison (2007).



Figure 4. Irrigation salinity – salt may appear adjacent to irrigation bays. Source: Slinger & Tenison (2007).



Figure 5. Urban salinity – salt damage to bricks and mortar. Source: Slinger & Tenison (2007).



Spike or spiny rush
(*Juncus acutus*)



Sea barley grass
(*Hordeum marinum*)



Common couch grass
(*Cynodon dactylon*)



Toad rush
(*Juncus bufonius*)



Ruby saltbush
(*Enchylaena tomentosa*)



Water button
(*Cotula coronopifolia*)



Annual beard grass (*Polypogon monspeliensis*)

Figure 6. Salinity indicator species. Source: Slinger & Tenison (2007).

Table 1. Salinity indicator plant species found throughout various regions of New South Wales. Source: Tenison (2009).

Salinity indicator species	Tolerance to waterlogging	Tolerance to salinity	Murray / Murrumbidgee	Border Rivers Gwydir	Lachlan / Macquarie	Hunter
Annual beard grass (<i>Polypogon monspeliensis</i>)	M-H	M-H	•	•	•	•
Australian stone crop (<i>Crassula sieberiana</i>)	M	M		•		•
Creeping saltbush (<i>Atriplex semibaccata</i>)	L-M	L-M		•	•	•
Buck's-horn plantain (<i>Plantago coronopus</i>)	M	M			•	•
Bulrushes or cumbungi (<i>Typha</i> sp.)	H	L-M	•	•	•	•
Slender barb grass (<i>Parapholis strigosa</i>)	ND	ND				
Common couch (<i>Cynodon dactylon</i>)	M	M	•	•	•	•
Common pig weed (<i>Portulaca oleracea</i>)	L-M	M	•	•	•	
Common rush (<i>Juncus usitatus</i>)	H	L-M	•	•	•	
Curly ryegrass / Coast barb grass (<i>Parapholis incurva</i>)	M-H	M-H	•	•	•	•
Paspalum (<i>Paspalum dilatatum</i>)	M-H	L-M	•	•	•	•
Phragmites (<i>Phragmites australis</i>)	H	L	•	•	•	•
Rhodes grass (<i>Chloris gayana</i>)	M	L-M	•	•	•	•
Ruby saltbush (<i>Enchylaena tomentosa</i>)	L-M	M	•	•	•	•
Salt couch (<i>Paspalum vaginatum</i>)	ND	ND				•
Salt sand-spurrey (<i>Spergularia marina</i>)	L-M	M-H	•			•
Samphire (<i>Halosarcia species</i>)	M-H	M-H	•		•	•
Sea barley grass (<i>Hordeum marinum</i>)	M	M-H	•	•	•	•
Sea club-rush (<i>Bolboschoenus caldwellii</i>)	ND	ND		•		•
Spike rush/spiny rush (<i>Juncus acutus</i>)	M-H	M	•	•	•	•
Spreading saltbush (<i>Atriplex limbata</i>)	ND	ND		•	•	
Streaked arrowgrass (<i>Triglochin striatum</i>)	ND	ND				•
Toad rush (<i>Juncus bufonius</i>)	M-H	L-M	•	•	•	
Water buttons (<i>Cotula coronopifolia</i>)	M-H	L-M	•	•	•	•
Wild aster (<i>Aster subulatus</i>)	ND	ND		•		•

ND – no data; H – high; M – medium; L– low

Investigating salinity on your property

If you find salinity symptoms on your property:

1) Contact your nearest Industry & Investment NSW (I&I NSW) office and speak with an Advisory Officer (salinity).

2) Refer to the *Salinity Glove Box Guide* relevant to your region which is available from I&I NSW, and the salinity related Primefacts on the I&I NSW website.

3) Conduct simple field tests of soil and water to determine the need for more intensive laboratory testing. You can purchase a *Salt Bag water and soil monitoring kit* from I&I NSW (Figure 7).

4) If field tests confirm salinity on your property, seek technical advice and consider more in-depth, laboratory tests, before making management decisions.



Figure 7. Contents of a Salt Bag used for salinity monitoring. Source: Slinger and Tenison (2007)

Further reading

Primefact 936, *Dryland salinity – causes and impacts*

Primefact 937, *Irrigation salinity – causes and impacts*

Primefact 938, *Urban salinity – causes and impacts*

References

Slinger, D. & Tenison, K. (2007) *Salinity Glove Box Guide: NSW Murray & Murrumbidgee Catchments*, NSW Department of Primary Industries.

Tenison, K. (2009) *Salt Training Manual* (unpub), NSW Department of Primary Industries.

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ISSN 1832-6668

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Job number 9605 PUB09/114