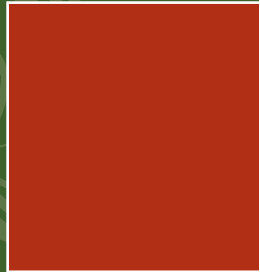


Improve your garden



Salinity In Your Backyard

Protect your property



Contribute to a sustainable
future for Dubbo



What Is Salinity?

Salinity refers to the amount of salts in soil and water. Salinity can occur naturally, but where human intervention has disturbed natural environments and changed the movement of water through the landscape, the movement of salts into rivers and onto land has been accelerated.

Salts occur naturally in our soil, groundwater, rain and effluent and may also come from fertilizers, swimming pools, and industry.

When the concentrations of salts in our soil and water reach the extent that they contaminate and damage our natural and built environment, action must be taken to reduce the effects caused.

In Dubbo and other areas across the Central West Catchment, salinity is a serious issue and is costing the community.

Erosive salt scald near Dubbo reduces agricultural viability ↓



Salt crystals forming ↑ on the ground surface in Troy Gully



Macquarie River Weir ↓

Over
230,000 tonnes
of salt flow down
the Macquarie River
every year



Salinity Affects You!

Salinity is occurring throughout the Dubbo area. Within the city, salinity has been targeted for some time in the Troy Gully catchment including Richmond, Eastridge and Boogadah Estates. There are also incidents of salinity in Firgrove Estate, CBD, South Dubbo, Delroy Park, and in rural areas and villages, particularly Ballimore and Wongarbron.



↑
Home and office buildings
with salinity damage
in South and Central Dubbo

Salinity affects plant growth
and infrastructure such as buildings,
driveways, fences and roads.



Salinity and high
groundwater
effect vegetation
growth near
← Troy Gully.



Tide mark on this
South Dubbo wall indicates
presence of groundwater
↓

- Homes may have paint and brickwork eaten away.
- Gardens and lawns are killed by excess salt in the soil.
- Farmers find it difficult to grow crops, pastures and water stock.
- Shade trees die and metal sheds and fence posts rust.
- Industry / Council and the community are faced with extra building and infrastructure maintenance and operation costs. Surfaces of parks, sporting facilities and reserves become harder and more expensive to maintain and may become unattractive or unusable.
- There is also an environmental cost; such as the loss of flora and fauna both on land and in our rivers.

- Increased cost to treat water for drinking and industry.

The whole Community is affected by Salinity and we must work together to reduce rising ground water

Ongoing maintenance
of roads is costly for the
community ⇒



Contributing Factors- Urban Irrigation, Land Clearing

In urban environments, we have changed the natural landscape to build homes, parks and roads, and this may intercept or expose groundwater or saline soil.

The extra water we soak into our lawns, gardens, parks and sporting fields contributes to our rising groundwater table.

In rural areas, land clearing means less water is used by deep rooted trees allowing more recharge of groundwater to occur.

As increasing quantities of water enter these aquifers, a discharge, seepage, or

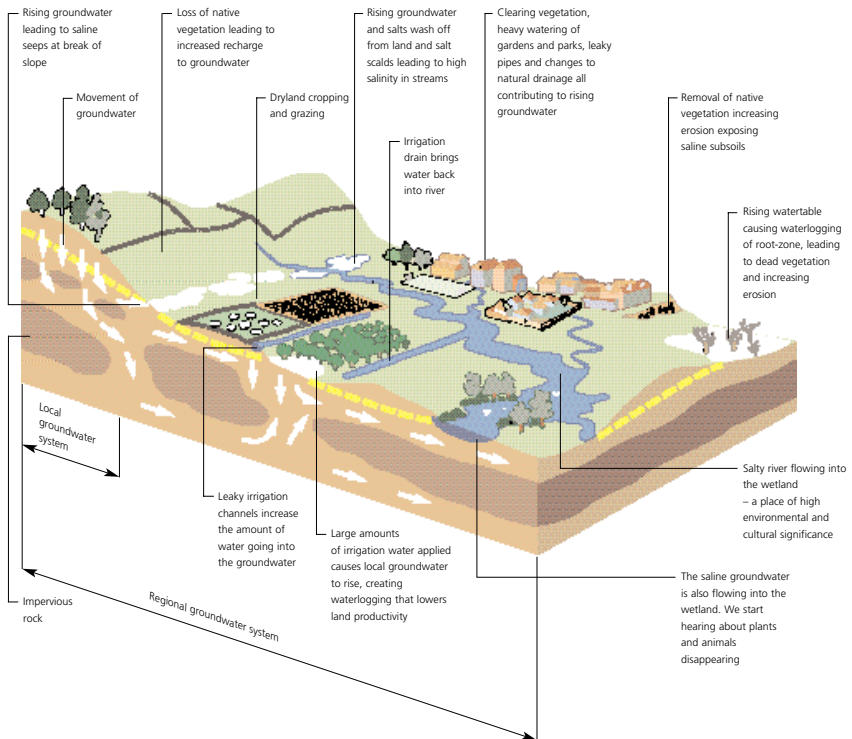
flow of water will occur when the rising watertable meets the surface.

This is often where there is a change in slope of the ground, at a change in rock type, or along a rock fracture.

Where saline water rises to within two metres of the surface, water can be taken up by plants or can evaporate through the soil. Evaporation results in the dissolved salts being left behind and concentrated as deposits at the soil surface.

Salinity is a result of human Activities

changing the way water moves through our landscape



What Can You Do!



↑ Connect downpipes to the stormwater system don't discharge onto the ground



↑ Overwatering gardens and lawns causes the groundwater to rise, bringing salt to the surface

Damp proof course will protect brickwork ↓



At Home....

- ✓ Plant a water wise garden.
- ✓ Reduce the amount of water we apply to our gardens and lawns – only water when plants need it.
- ✓ A good soaking, less frequently will encourage deep roots, making plants more drought tolerant and plants will access more soil moisture.
- ✓ Use timers and drip irrigation to limit leakage into the groundwater.
- ✓ Keep lawn areas to a minimum and avoid close-to-ground mowing.
- ✓ Mulch gardens to reduce the need to water.
- ✓ Don't water in winter when plants are dormant.
- ✓ Protect brickwork by keeping gardens away from buildings so moisture doesn't bypass damp proof course.
- ✓ Use correct building materials when constructing or renovating a house.

- ✓ Maintain taps, gutters and downpipes so they don't leak.
- ✓ Connect stormwater to the street gutter, not rubble drains.
- ✓ Connect sewerage and pool backwash to sewer where possible.

On the Farm....

- ✓ Ensure septic disposal systems are adequately sized for the amount of effluent disposed.
- ✓ Plant large native trees and shrubs in open spaces and groundwater recharge areas, such as cleared hilltops on farmland.
- ✓ Bushland is important – retain it, maintain it and add to it.
- ✓ Avoid over-grazing and long fallows

Plant large native trees and shrubs to prevent groundwater rising ↓



a lot of the **water** you add to your **Lawns** and **gardens** contributes to rising groundwater and therefore increases **salinity**.

What Are Council And The Community Doing?

Urban Salinity Network

Commencing in 2004 with 129 bores covering the urban area (including Firgrove and Richmond Estates), the Urban Salinity Network is one of the best monitoring networks in Australia. Five of the bore network sites are fitted with interpretive signs to demonstrate groundwater levels to the community.

These signs are located at:

- Gipps St, (No 2 Oval)
- Cnr Fitzroy St & Cobra St, Elston Park
- Yarrandale Rd, Dubbo Senior Campus
- Cnr Thompson St & Victoria St, West Dubbo
- Cobbora Rd at Troy Gully

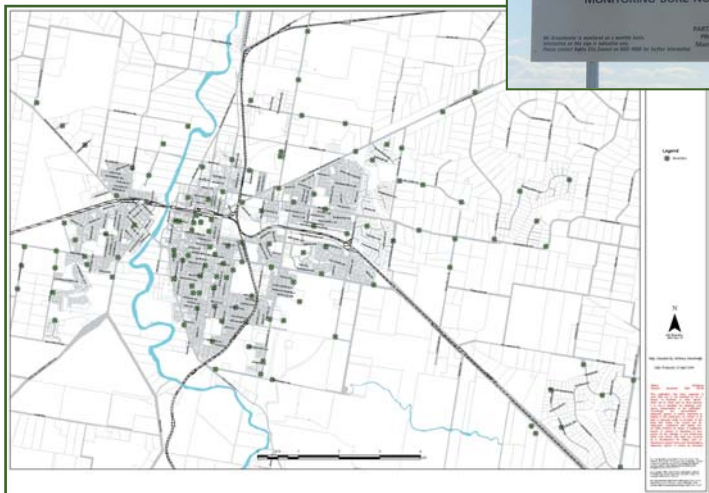
For 10 years, the bores were monitored on a monthly basis, and in 2015 this was reduced to every two months. Groundwater levels and conductivity (a measure of 'saltiness' of water) data are collected to assist Council in effectively monitoring and managing salinity across the urban area.

In 2010, a further project was undertaken to identify the hydro geological landscape (HGL) of the Dubbo region. A HGL describes soil, geological, climatic and landform conditions that influence salinity; different types of HGL require different management techniques. The project identified 20 different HGLs in the Dubbo urban area. This information, along with the monitoring data, means that Council is able to proactively identify any worsening trends in regards to salinity and address them accordingly.



← Weather Station

Location of Monitoring Bores ↓



Victoria Park Demonstration Project ↓

Victoria Park Demonstration Project

In 2005, Council partnered with Central West CMA, Hydrodata Pty Ltd, Omnibae Consulting and Ecowise Pty Ltd to benchmark water use in seven (7) landuse types in Victoria Park.

A network of piezometers was constructed across the park to measure water input so that the water requirement for each landuse could be determined.

Water Wise Demonstration Garden – Eastridge Estate

The demonstration garden was established in 1999 and provides a visual, hands on and working demonstration display garden which highlights the concepts, techniques and various plants (the majority of which are from the local area) together with a range of efficient watering systems that can be combined to not only produce an attractive garden but also greatly reduce the water requirement of urban gardens.

Revegetation Projects

Troy Gully has been the focus of revegetation activities since 1995.

Tree plantings have been undertaken by Council Community groups and Council initiated planting days.

Significant works in the Troy Gully area have also been undertaken by the Troy Gully Landcare Group, and Dubbo College Senior Campus.

The works conducted have greatly reduced the effects of salinity in Troy Gully.

Central West Councils Environment and Waterways Alliance

The CWCEA is a partnership of 18 Councils across Central West NSW, encompassing both the Central Tablelands and the Central West Local Lands Service Regions. The Alliance exists to improve Environmental outcomes across the region. Much of the focus of the Group surrounds issues, such as salinity, that affect our waterways and rivers. For more information on the Alliance and current projects, see www.cscewa.com.au



Water Wise Demonstration Garden – Eastridge Estate ↓



Revegetation Projects ↓



Water Wise Gardening

Benefits of Water Wise gardening

- Less water, less chance of rising groundwater and salinity
- Lower water cost
- Less digging, less weeding
- Less mowing
- Fewer plant deaths due to hot, dry weather
- Fewer holiday worries
- More time to admire and enjoy your garden

Mulching can prevent up to **75% of water loss** by evaporation on hot days as well as preventing run-off and weed growth.

Adding **organic material** like lawn clippings and compost to the soil **helps the soil absorb water** and prevents it from reaching the water table, therefore reducing salinity.

Looking after your lawn

- Leave lawns at least 2cm long so they don't dry out and die off.
- Replace unused lawn areas with groundcovers and mulched gardens. Lawns use up to 90% of all water used in the garden.
- Do not overwater – Give it a good soak less frequently.
- Do not water in full sun or windy days.

Water Wise and Salt Tolerant Plants

The following plant list is indicative only of what may be suitable. Plant growth will be affected by soil type and location. Have a look at which plants are growing well in your area or seek advice from a local nursery.



Water Wise and Salt Tolerant Plants

N = NATIVE

E = EXOTIC

W = WATER WISE

S = SALT TOLERANT

GROUNDCOVERS

SCIENTIFIC NAME	COMMON NAME		
BRACHYCOME MULTIFIDA	SWAN RIVER DAISY	N	W
CARPOBROTUS GLAUCESCENS	PIGFACE	N	W, S
CHRYSOCEPHALUM APICULATUM	YELLOW BUTTONS	N	W
COPROSMA REPENS 'KIRKII'		E	S
DAMPIERA LINEARIS	COMMON DAMPIERA	N	W
EINADIA NUTANS	CREEPING SALTBUSH	N	W
EREMOPHILA BISERRATA	PROSTRATE EREMOPHILA	N	S
GREVILLEA SP.	GREVILLEA	N	W
HIBBERTIA SCANDENS	CLIMBING GUINEA FLOWER	N	S
JUNIPERUS CONFERTA PROSTRATE	SHORE JUNIPER	E	W, S
KENNEDIA PROSTRATA	RUNNING POSTMAN	N	W
LANTANA MONTEVIDENSIS SYN. L.SELLOWIANA	TRAILING LANTANA	E	S
MYOPORUM PARVIFOLIUM	CREEPING BOOBIALLA	N	W, S
OSTEOSPERMUM ECKLONIS SYN. DIMORPHOTHECAECKLONIS	VELDT DAISY	E	W
PELARGONIUM PELTATUM	IVY GERANIUM	E	S
RHAGODIA SPINESCENS	SPINY SALTBUSH	N	S
SCAEVOLA AEMULA	FAIRY FAN FLOWER	N	S

PERENNIALS TO ONE METRE

AGAPANTHUS AFRICANUS	AFRICAN / KAFFIR LILY	E	W
ANIGOZANTHUS SP.	KANGAROO PAWS	N	W
ARCTOTIS X HYBRIDA	AURORA DAISY	E	W
ARMERIA MARITIMA	THRIFT, SEA PINK	E	W
ARTEMISIA ABSINTHIUM	WORMWOOD	E	W
ASPIDISTRA ELATIOR	ASPIDISTRA, CAST IRON PLANT	E	W
BRACHYCOME MULTIFIDA	SWAN RIVER DAISY	N	W
CHEIRANTHUS CHEIRI	WALLFLOWER	E	W
CHRYSOCEPHALUM APICULATUM	YELLOW BUTTONS	N	W
DIANTHUS	GARDEN PINK	E	W
DIETIES IRIDIODES SP.D. VEGETA	DIETES	E	W
FELICIA AMELLOIDES	BLUE MARGUERITE	E	W
GAZANIA X HYBRIDA	GAZANIA	E	W
GERBERA LINDHEIMERII	BARBERTON DAISY	E	W
HIPPEASTRUM SP.		E	W
IRIS SP.	IRIS	E	W
KNIPHOFIA SP.	RED HOT POKERS	E	W
LOMANDRA LONGIFOLIA	MAT RUSH	N	W
LYCHNIS CORONARIA	DUSTY MILLER	E	W
NERINE SP.	SPIDER LILIES	E	W
OENOTHERA SPECIOSA	EVENING PRIMROSE	E	W
POA LABILLARDIEREI	COMMON TUSOCK GRASS	N	W
SALVIA	FLOWERING SAGE	E	W
THEMEDA AUSTRALIS	KANGAROO GRASS	N	W
VERBENA X HYBRIDA	COMMON VERBENA	E	W

SMALL TO MEDIUM SHRUBS

ACACIA CARDIOPHYLLA	WYALONG WATTLE	N	W
ACACIA CULTRIFORMIS	KNIFE-LEAF WATTLE	N	W
ACACIA DECORA	WESTERN GOLDEN WATTLE	N	W
ACACIA ITEAPHYLLA	FLINDERS RANGES WATTLE	N	W, S
ACACIA SPECTABILIS	MUDGEES WATTLE	N	W
ACACIA UNCINATA	WEEPING WATTLE	N	W
ALYOGYNE HAKEIFOLIA	RED-CENTRED HIBISCUS	N	S

Water Wise and Salt Tolerant Plants

N = NATIVE

E = EXOTIC

SMALL TO MEDIUM SHRUBS *Continued*

W = WATER WISE

S = SALT TOLERANT

SCIENTIFIC NAME	COMMON NAME		
ASTARTEA FASCICULARIS	ASTARTEA	N	W
ATRIPLEX CINEREA	COAST SALTBUCH	N	S
ATRIPLEX NUMMULARIA	OLD MAN SALTBUCH	N	S
ATRIPLEX RHAGODIODES	SILVER SALTBUCH	N	S
BAECKEA VIRGATA	TWIGGY BAECKEA	N	W
BANKSIA ERICIFOLIA	HEATH BANKSIA	N	W, S
BANKSIA MARGINATA	SILVER BANKSIA	N	W, S
CALLISTEMON CITRINUS	LEMON-SCENTED BOTTLEBRUSH	N	S
CALLISTEMON PHOENICEUS	BOTTLEBRUSH	N	S
CALOTHAMNUS QUADRIFIDUS	COMMON NET BUSH	N	W
CEANOTHUS CULTIVARS	CALIFORNIAN LILAC	E	W
CORREA ALBA	WHITE CORREA	N	S
CHAMELAUCIUM UNCINATUM	GERALDTON WAX	N	W
CISTUS SP.	ROCK ROSE	E	W
ENCHYLAENA TOMENTOSA	RUBY SALTBUCH	N	S
EREMOPHILA SP.	EMU BUSH	N	W
EREMOPHILA CALORHABDOV	RED ROD, SPIKED EREMOPHILA	N	S
EREMOPHILA MACULATA	SPOTTED EMU BUSH	N	S
GREVILLEA SP.	GREVILLEA	N	W
HEBE SP.	HEBE OR VERONICA	E	S
KUNZEA BAXTERI		N	S
MELALEUCA DECUSSATA	CROSS-LEAVED HONEY MYRTLE	N	S
MELALEUCA HYPERICIFOLIA	ULLADULLA BEACON	N	S
MYOPORUM INSULARE	BOOBIALLA	N	S
MICROMYRTUS CILIATA	MICROMYRTUS	N	W
SENNA ARTEMISIOIDES	SILVER CASSIA	N	W, S
TEUCRIUM FRUTICANS	SHRUBBY GERMANDER	E	W
WESTRINGIA FRUTICOSA	COASTAL ROSEMARY	N	W

MEDIUM TO LARGE SHRUBS

ACACIA LONGIFOLIA	SALLOW WATTLE	N	S
ACACIA PYCNANTHA	GOLDEN WATTLE	N	S
ACACIA RETINODES	WIRILDA	N	S
ACACIA SALIGNA	GOLDEN WREATH WATTLE	N	S
CALLISTEMON SALIGNUS	WILLOW BOTTLEBRUSH, PINK TIPS	N	S
EREMOPHILA BIGNONIIFLORA	EURAH	N	S
MELALEUCA ARMILLARIS	BRACELET HONEY MYRTLE	N	S
MELALEUCA ERICIFOLIA	SWAMP PAPERBARK	N	S
NERIUM OLEANDER	OLEANDER	E	S

TREES SUITABLE FOR SUBURBAN GARDENS

ACACIA ACUMINATA	RASPBERRY JAM WATTLE	N	S
ACACIA PENDULA	MYALL OR BOREE	N	S
ACACIA SALICINA	COOBAH, NATIVE WILLOW	N	S
ACACIA STENOPHYLLA	RIVER COOBA	N	S
ALBIZIA JULIBRISSIN	SILK TREE	E	W, S
ALBIZIA LOPANTHA	CAPE WATTLE, SWAMP WATTLE	E	S
BANKSIA INTEGRIFOLIA	COAST BANKSIA	N	S
CASUARINA STRICTA		N	W
CASUARINA LITTORALIS		N	S
CASUARINA GLAUCA	COAST SHE-OAK	N	S
CALLISTEMON VIMINALIS	'HANNAH RAY'	N	S
CERATONIA SILIQUA	CAROB TREE	E	S

Water Wise and Salt Tolerant Plants

N = NATIVE

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W = WATER WISE

S = SALT TOLERANT

TREES SUITABLE FOR SUBURBAN GARDENS *Continued*

SCIENTIFIC NAME	COMMON NAME		
AGONIS FLEXUOSA	WILLOW MYRTLE	N	W,S
CERCIS SILIQUASTRUM	JUDAS TREE	E	W
CHAMAECYTISUS PROLIFERUS	TREE LUCERNE OR TAGASASTE	E	W
CORDYLINE AUSTRALIS	N.Z. CABBAGE PALM	E	W
EUCALYPTUS CAESIA	GUNGURRU	N	W
EUCALYPTUS CAMPASPE	SILVER-TOPPED GIMLET	N	S
EUCALYPTUS EREMOPHILA	TALL SAND MALLEE	N	S
EUCALYPTUS ERYTHRONEMA	RED-FLOWERED MALLEE	N	S
EUCALYPTUS KRUSEANA	BOOKLEAF MALLEE	N	S
EUCALYPTUS FORRESTIANA	FUCHSIA GUM	N	W
EUCALYPTUS LEHMANNII	BUSHY YATE	N	W
EUCALYPTUS LEUCOXYLON SSP. MEGALOCARPA SYN. E. LEUCOXYLON 'ROSEA'	LARGE-FRUITED YELLOW GUM	N	S
EUCALYPTUS MACRANDRA	LONG-FLOWERED MARLOCK	N	S
EUCALYPTUS SCOPARIA	WALLANGARRA WHITE GUM	N	W
EUCALYPTUS SPATHULATA	SWAMP MALLEE	N	S
EUCALYPTUS TORQUATA	CORAL GUM	N	S
EUONYMOUS JAPONICUS	JAPANESE SPINDLE TREE	E	W
HAKEA LAURINA	PINCUSHION HAKEA	N	W
LAGUNARIA PATERSONII	PYRAMID TREE	E	S
MELALEUCA HALMATURORUM	SWAMP PAPERBARK	N	S
MELALEUCA LANCEOLATA	MOONAH	N	S
MELALEUCA LINARIIFOLIA	SNOW-IN-SUMMER	N	S
MELALEUCA QUINQUENERVIA	BROAD LEAVED PAPERBARK	N	S
MELALEUCA STYPHELOIDES	PRICKLY PAPERBARK	N	S
PITTIOSPORUM ANGUSTIFOLIUM	BUTTERBUSH	N	S

LARGE TREES NOT SUITABLE FOR SUBURBAN GARDENS

ALLOCASUARINA LEUHMANNII	BULL-OAK	N	S
BRACHYCHITON POPULNEUS	KURRAJONG	N	S
CASUARINA CRISTATA	BELAH	N	S
CASUARINA CUNNINGHAMIANA	RIVER SHEOAK	N	S
CASUARINA GLAUCA	GREY BULOKE	N	S
CASUARINA OBESA	SWAMP OAK	N	S
EUCALYPTUS ASTRINGENS	BROWN MALLEE	N	S
EUCALYPTUS CAMALDULENSIS	RIVER RED GUM	N	S
EUCALYPTUS INTERTEXTA	GUM-BARKED COOLIBAH	N	S
EUCALYPTUS KONDININENSIS	KONDININ BLACKBUTT	N	S
EUCALYPTUS LEUCOXYLON	YELLOW GUM	N	S
EUCALYPTUS OCCIDENTALIS	SWAMP YATE	N	S
EUCALYPTUS SARGENTII	SALT RIVER MALLEE	N	S

LAWNS

CYNODON DACTYLON	CREEPING COUCH GRASS		W, S
PENNISETUM CLANDESTINUM	KIKUYA		S
STENATAPHRUM SECUNDATUM	BUFFALO GRASS		W



**WATER WISE
IS SALT SMART**

Further Information

Dubbo Regional Council

www.dubbo.nsw.gov.au

**Central West Councils Environment and Waterways
Alliance** www.cwcewa.com.au

Central Tablelands LLS

www.centraltablelands.lls.nsw.gov.au

Central West LLS

www.centralwest.lls.nsw.gov.au

NSW Department of Primary Industries

www.dpi.nsw.gov.au/agriculture/soils/salinity

The Local Government Salinity Initiative (LGSi)

www.environment.nsw.gov.au/salinity/solutions/urban.htm

- Introduction to Urban Salinity
- Indicators of Urban Salinity
- Broad Scale Resources for Urban Salinity Assessment
- Site Investigations for Urban Salinity
- Roads and Salinity
- Building in a Saline Environment
- Waterwise Parks and Gardens
- Salinity Indicator Plants
- Groundwater basics for Understanding Urban Salinity
- Costs of Urban Salinity

Murray Darling Basin Authority

www.mdba.gov.au

Department of Environment and Heritage

<http://www.environment.nsw.gov.au/salinity/index.htm>

CSIRO

<https://csiropedia.csiro.au/soil-salinity-australia-2001/>

Local Nurseries

A Dubbo Regional Council Salinity
Prevention initiative