7. YASS VALLEY SUB-CATCHMENT

7.1 DRYLAND SALINITY

What is dryland salinity ?

Dryland salinity occurs when there is a build up of salt in the surface soil, usually as a result of rising groundwater tables.

What is its impact ?

In NSW, dryland salinity has reduced land values by $40 million and resulted in lost agricultural production of more than $22 million each year (DLWC 1998). Nationally, over $130 million is lost each year due to dryland salinity (PMSEIC 1999).

Between 120,000 and 174,000ha of land is affected by dryland salinity in New South Wales (DLWC, 2000a). Without land management changes, salinity affected land (including irrigation salinity) in the NSW part of the Murray-Darling Basin could increase to 2-4 million hectares by 2050 (DLWC 2000a). Nationally, 5.7 million hectares are considered at risk or affected by dryland salinity (NLWRA 2001).

Salinity reduces farm productivity and land value, causes erosion, damages infrastructure such as roads, and affects urban gardens, buildings and businesses. It also has a major impact downstream such as affecting water quality, habitat, irrigation supplies and causes erosion. In south-western NSW, it is estimated that 34% of state roads and 21% of national highways are affected by high water tables costing the community about $9 million every year (Blackmore 1999).

The signs and symptoms of rising watertables and surface salts are:

- *Reduced yields and productivity*
- *Decline in plant growth*
- *Decline in water quality*
- *Waterlogging*
- *Change in species, favouring salt tolerant varieties*
- *Increased erosion hazard*
- *Dead and dying native vegetation.*

In urban areas the signs and symptoms of salinity include:

- *Road surfaces breaking up*
- *Bare patches in lawns and sporting fields*
- *Dead & dying trees*
- *Deterioration of house foundations, reduced life of concrete slabs*
- *Corrosion of underground services – pipelines and cables*
- *"Rising damp" in buildings – public and private*
- *Salt crusting on bricks, concrete and pavers*

(Extract from "Reading and Designing the Landscape, 2000)

What causes dryland salinity ?

The reduction of vegetation, through clearing or grazing, has reduced the amount of rainfall being utilised by vegetation on the surface. The rainfall then leaks below the root zone (recharge), and adds to the water tables. As water tables rise, salt is bought to the surface (discharge) killing vegetation and leading to soil erosion and degradation.

Ordovician sedimentary geology has historically contributed to the development of much of the Yass Valley's dryland salinity problems. This is related to the high re-charge nature of landforms associated with this geology type. However, saline areas of large spread and more recent growth have tended to occur on silurian acid volcanic geology.

What is the impact on the Yass catchment ?

The Yass River has recorded a salinity level rise of 7% per year which is approximately double the State's average (Franklin 1999).

In 1993, 1.2% (1,451 ha) of land was recorded as severely salt affected (Nicholl & Scown 1993). Mapping conducted by Yass Valley landcare groups has identified a further 67 sites showing signs and symptoms of dryland salinity. In addition, mapping conducted by DLWC identified a further 79km of dryland salinity along eroding gullies and 1,584 ha in areas of identified soil erosion.

The Yass Valley sub-catchment is ranked as the third highest area contributing to overall salinity levels in the Murrumbidgee catchment. At the local level, DLWC, Yass have carried out monitoring of water quality in 24 sites in the Yass Valley, and have prioritised these areas. The areas have been assessed in terms of; the area of salt affected land, and areas of cleared high recharge country (see table below).

This prioritisation is important in ensuring that works are targeted to achieve the most effective results. The high priority areas include; Williams Creek, Nowlands Creek, Back Creek and Sawpit Creek. YANLG and DLWC are currently developing a project to produce small scale local maps with accompanying land management recommendations and actions to reduce the salt load in the sub-catchment.

Table 3:YASS VALLEY DRYLAND SALINITY SUB-CATCHMENT PRIORITIES

	Sampling Site	Rating Based on Salt tonnes / ha Catchment	Rating based on % Catchment area high recharge	Rating based on % Catchment area discharge	Final Priority
1	Brooks Ck (Fed Hwy)	20			
2	Yass River Upper	21	7		
3	Yass River (Brooks)	10	7		
4	Brooks Ck (to Yass R)	18			
5	Gundaroo Creek	22			
6	Back Creek	1	8	6	3
7	Sawpit Creek	4	7	2	4
8	Nelanglo Creek	12			6
9	Nowlands Creek	3	3	2	2
10	Williams Creek	2	2	1	1
11	Dicks Creek	8	1	2	5
12	Corregans Creek	9			
13	Manton Creek	15	4	5	6
14	Bango Creek	6	6	8	6
15	Derringullen Creek	11	5	9	
16	Bowning Creek	17			
17	Washpen Creek				
18	Reedy Creek	18			
19	Rainbow Creek				
20	O'Briens Creek	5		7	8
21	Kitty's Creek	7		4	8
22	M'bateman Creek - Upper	16	9	3	7
23	M'bateman Ck - Mid	14	9	3	6
24	M'bateman Ck - Lower	13	9	3	7

Priority

The impact of dryland salinity, particularly in the Yass Valley sub-catchment, is becoming increasingly evident and is therefore recognised by the landcare groups as a high priority for management. The main focus being to manage the cause of the problem rather than treating the symptoms.

Local Actions to Date

2000-2001

- Implementing the Yass Valley Sub-catchment Plan - Salinity on-ground works
- Stop our salt and soil entering Yass River project
- Manton (Yass) gully stabilisation, salt mitigation and bio-diversity project
- Targeted revegetation for salinity recharge in upper-mid Lachlan & upper Murrumbidgee catchments

1999-2000

- Implementing the Yass Valley Sub-catchment Plan - Salinity on-ground works

1998-1999

- Jerrawa Creek Salinity project

1997-1998

- Jerrawa Creek Dryland Salinity reparation project
- Jerrawa Creek Salt Action project

1995-1996

- Jerrawa Creek Salt Action project

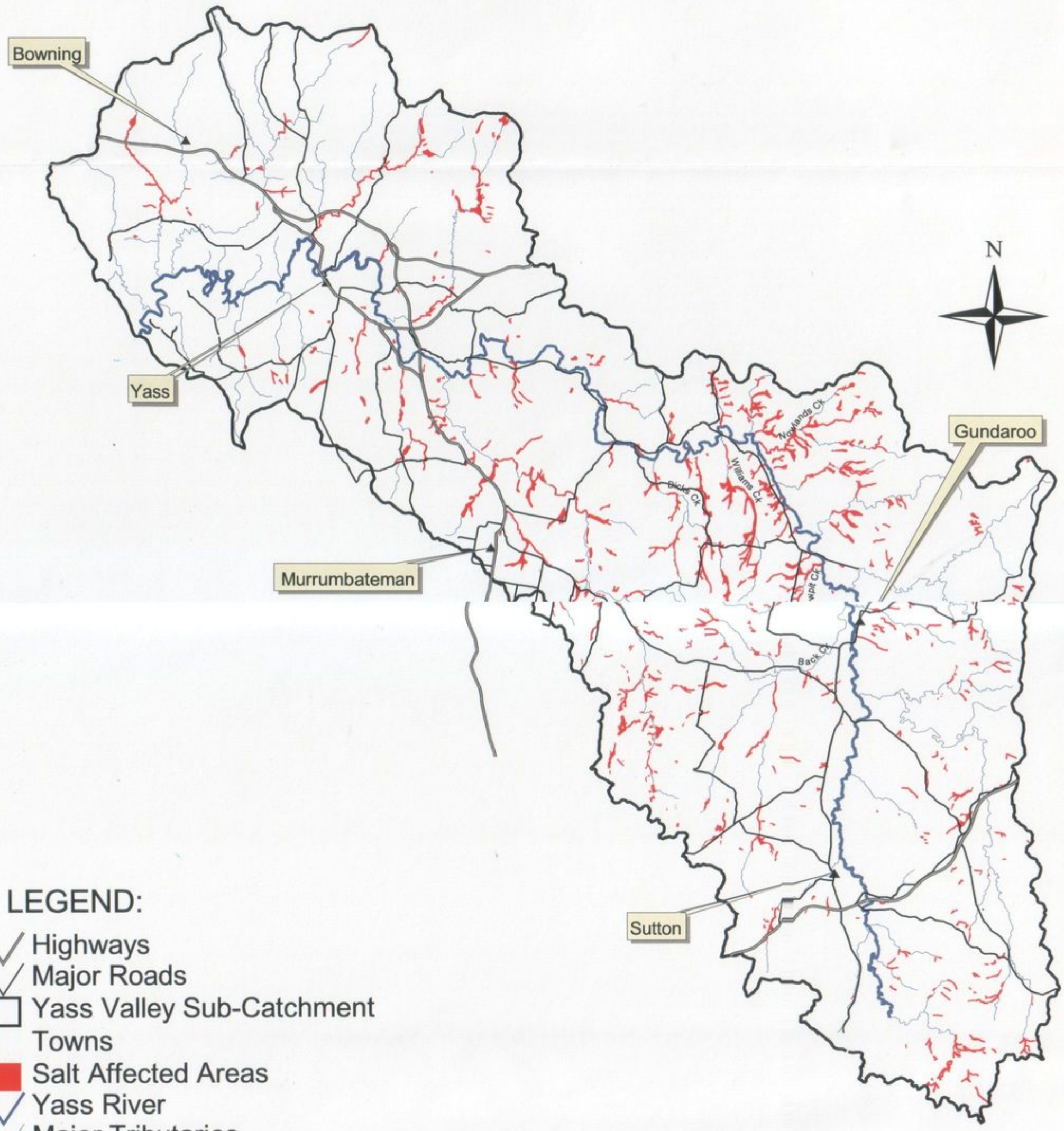
1993-1994

- Jerrawa Creek Salt Action project

See also in the Appendix:
Section 7.1 *Dryland Salinity*

YASS VALLEY SUB-CATCHMENT

Map 6: Dryland Salinity



LEGEND:

- Highways
- Major Roads
- Yass Valley Sub-Catchment
- Towns
- Salt Affected Areas
- Yass River
- Major Tributaries

SCALE: 1:250000

SOURCE: Department of Land & Water Conservation, 1999 & NRPA 2000

1. DRYLAND SALINITY ACTION PLAN

WHAT WILL WE DO ?	WHY ARE WE DOING IT ?
Manage the landscape to control and ameliorate dryland salinity.	To maintain sustainable productive farmland and to minimise the community impacts of salinity locally and downstream.

HOW DOES IT CONTRIBUTE TO MURRUMBIDGEE CATCHMENT BLUEPRINT TARGETS ?

Soil Health √	Salinity √	Biodiversity √	Community Building √

HOW WILL WE DO IT ?

(codes in brackets indicate Matching Blueprint Actions)

Identify the problem

DS1. Seek expert advice on local causes.

DS2. Use tools such as the Salt Identification Kit to identify problems and severity.

DS3. Target priority areas (see Dryland Salinity BMP).

Implement management practices

DS4. Retain existing native vegetation. (PrMA3)

DS5. Manage grazing to promote groundcover & maintain grasses at their highest water using growth stage. (BMA2, SMA5)

On-ground works

DS6. Fence off and protect remnant vegetation in identified high recharge country. (PrMA3, SMA5, BMA2, BMA7)

DS7. Replace annual pastures with perennial species (incl natives). (PrMA1, SMA8)

DS8. Revegetate identified high recharge country (eg Bidgee Hilltops project, Upper-Mid Lachlan & Upper Murrumbidgee Targeted Revegetation project). (PrMA4, BMA7)

DS9. Revegetate in interceptor areas. (PrMA6)

DS10. Rehabilitate high priority saline discharge areas by fencing to control stock, revegetate with salt-tolerant pasture and tree species, promote groundcover using fertiliser and gypsum application, mulching and earthworks where necessary. Graze to encourage water use where appropriate. (PrMA16, PrMA17)

Promote and educate

DS11. Promote practices that minimise recharge to groundwater, and reduces salt in streams, in both urban and rural situations by developing educational and awareness raising material/activities. (CBMA11)

DS12. Provide education and information to promote improved grazing management practices (eg PROGRAZE). (SMA5)

Monitor

DS13. Monitor salinity periodically to show extent of salinity, long term trends and results of management. Monitor local discharge and downstream river salt levels, and promote successes to encourage further actions. (CBMA11)

BEST MANAGEMENT PRACTICES

DRYLAND SALINITY

What is dryland salinity ?

The introduction of European farming practices in the Australian landscape included the removal and modification of the natural deep-rooted perennial vegetation. As a consequence, less rainfall was used up by plants and more could soak through the soil into the water table (this is called *recharge*). This causes water tables to rise to the surface bringing with it the natural salts stored in the geology, subsoils and soils (*discharge*). The salts are left on the surface after the water evaporates. This concentrates salt levels in the root zone to the point where only salt tolerant plant species can survive. In more severe cases even salt tolerant species die and erosion from surface water often occurs.

Why do we need to manage it ?

Elevated saline water tables discharge more salt into the rivers and creeks which has a large downstream impact on other farms and towns. Across Australia, costs associated with dryland salinity are estimated at $130 million every year (PMSEIC 1999). In parts of the Yass catchment, dryland salinity is a major problem. Salinity is reducing productivity in our agricultural land, costing all Yass ratepayers in treating drinking water, causing damage to roads as well as costing downstream users due to reduced water quality.

What can I do ?

Three main types of landscapes have been identified in the Yass Valley Sub-catchment, (1) high recharge areas, (2) good grazing areas, and (3) discharge sites. Different management practices are required in each to address the salinity problem.

These have been called:

1 "Plug the Leaks" (high recharge areas)
2 "Feed the Sheeps" (good grazing areas)
3 "Cover the Seeps" (discharge sites).

1. "Plug the Leaks" (high recharge country) see Map 7

These are typically the areas of rocky outcrop, and shallow stony soils associated with the top of hills and ridgelines in the landscape. Best management practices in this area are to:

- Retain native trees and shrubs
- Improve degraded remnant vegetation through revegetation and regeneration
- Revegetate cleared areas with native trees, shrubs and grasses
- Manage native grasses and pastures to maximise water use
- Fence these areas to separate from the more productive parts of the landscape and protect from stock

2. "Feed the Sheeps" (good grazing country) see Map 8

These are the more productive parts of the landscape and range from the mid-slopes to creek and river flats. Best management practices in this area are:

- Retain native trees and shrubs
- Maintain and manage good remnant native pasture country in less fertile parts of the grazing landscape
- Improve productivity of native pastures where appropriate by application of super phosphate and sub-clover seed
- Utilise introduced deep-rooted perennial pastures in more productive parts of the grazing landscape.
- Manage introduced pastures for high water use and production

- Adopt management fencing that separates native pastures from introduced pastures and allows more intensive grazing for shorter periods consistent with production and water use goals

3. "Cover the Seeps" (discharge areas) See Map 9

These are areas where saline groundwater is discharging on the surface. These sites vary from wet boggy areas covered in vegetation to bare and eroding sites. Best management practices for these areas are:

- Fence area from the remainder of the property
- Where erosion is a problem, divert surface water flows away from the discharge sites to a safe disposal area
- Maintain groundcover where present
- Reinstate groundcover where discharge area is bare, utilise salt tolerant species
- Manage grazing regime to maintain vigour of vegetation and > 80% groundcover
- Plant interceptor tree plantings above these sites where consistent with farm management goals

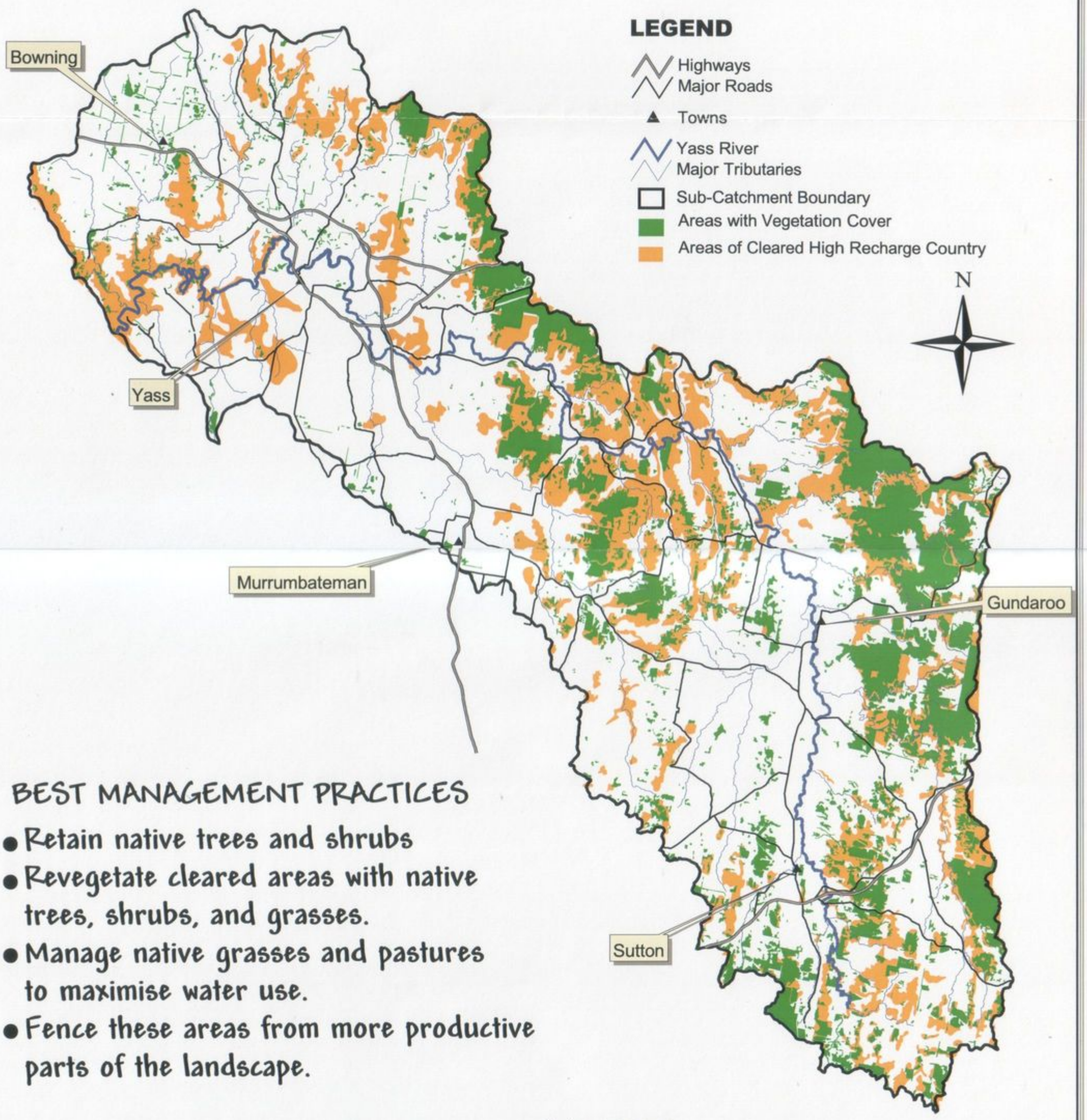
Who can help ?

Department of Land and Water Conservation, Yass Office, phone 6226 1433
NSW Agriculture, Yass Office, phone 6226 2199

YASS VALLEY SUB-CATCHMENT

Map 7: Plug the Leaks

Yass Area Network Landcare Groups
Working together



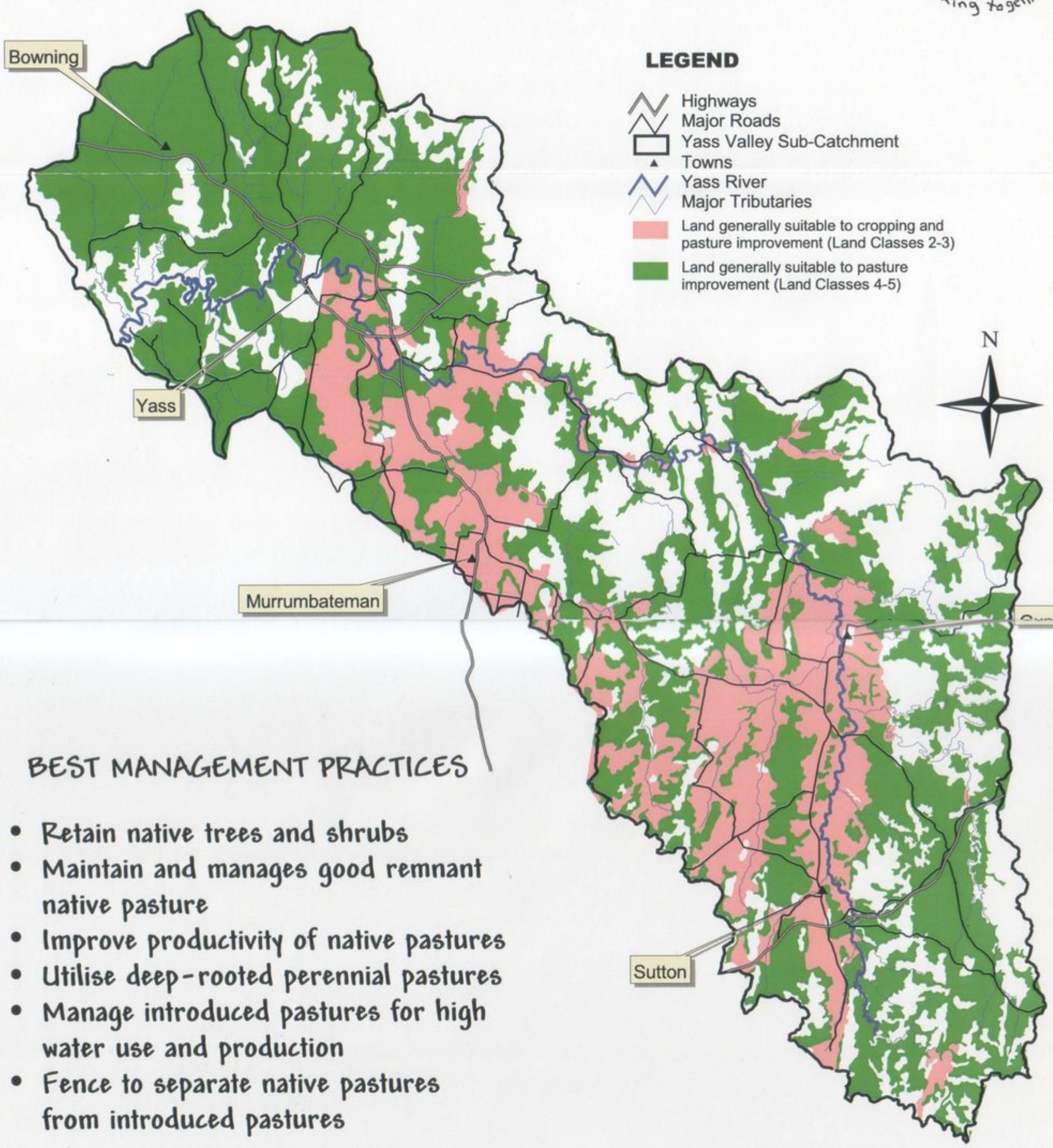
BEST MANAGEMENT PRACTICES

- Retain native trees and shrubs
- Revegetate cleared areas with native trees, shrubs, and grasses.
- Manage native grasses and pastures to maximise water use.
- Fence these areas from more productive parts of the landscape.

YASS VALLEY SUB-CATCHMENT

Map 8: Feed The Sheeps

Yass Area Network Landcare Groups
Working Together



LEGEND

- Highways
- Major Roads
- Yass Valley Sub-Catchment
- Towns
- Yass River
- Major Tributaries
- Land generally suitable to cropping and pasture improvement (Land Classes 2-3)
- Land generally suitable to pasture improvement (Land Classes 4-5)

BEST MANAGEMENT PRACTICES

- Retain native trees and shrubs
- Maintain and manages good remnant native pasture
- Improve productivity of native pastures
- Utilise deep-rooted perennial pastures
- Manage introduced pastures for high water use and production
- Fence to separate native pastures from introduced pastures

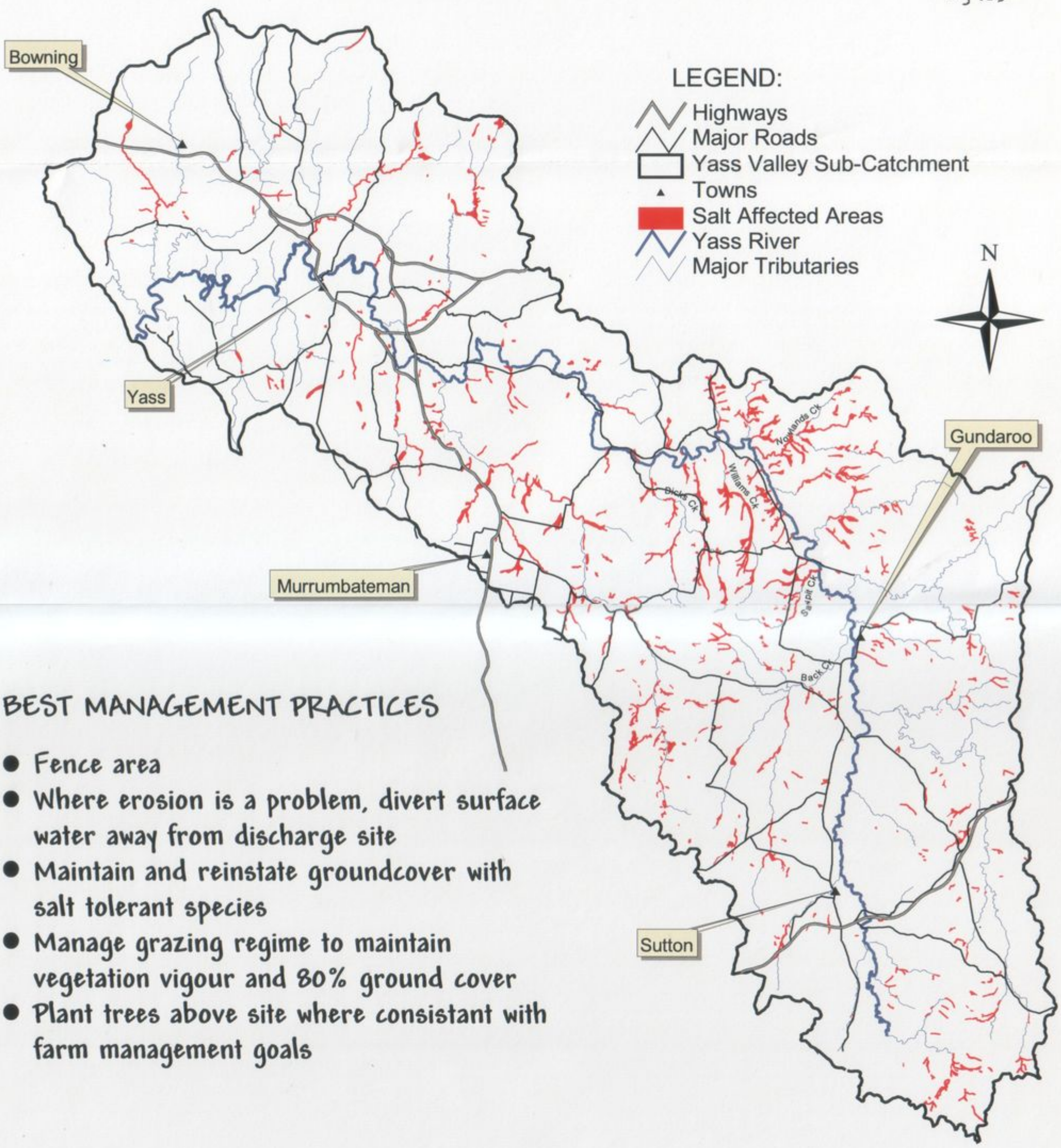
Scale 1:250000

10000 0 10000 20000 Metres

YASS VALLEY SUB-CATCHMENT

Map 9: Cover the Seeps

Yass Area Network Landcare Groups
Working together



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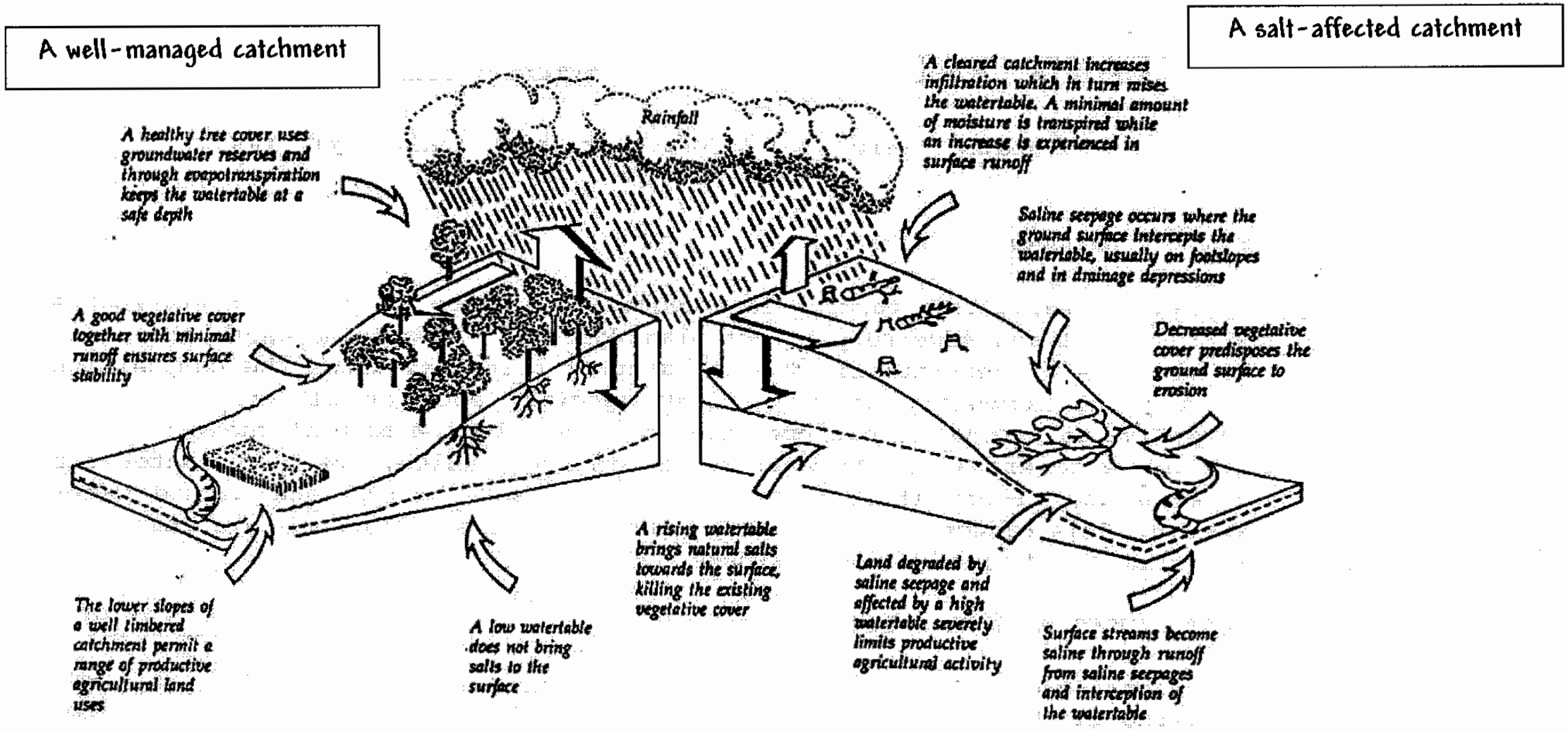
BEST MANAGEMENT PRACTICES

- Fence area
- Where erosion is a problem, divert surface water away from discharge site
- Maintain and reinstate groundcover with salt tolerant species
- Manage grazing regime to maintain vegetation vigour and 80% ground cover
- Plant trees above site where consistant with farm management goals

THE DRYLAND SALINITY WATER CYCLE



FACT SHEET

WHAT ARE THE SIGNS OF DRYLAND SALINITY?

Even though dryland salinity is a well-known problem in rural Australia, it is sometimes hard to recognise the early signs of salinity until the impact becomes severe. Here are some events that may indicate salinity. If you recognise one or more of these on your property and believe you have a salinity problem, you should seek advice on early action you can take to prevent the problem becoming more severe. (see contacts below). These signs are likely to occur at the bottom of slopes and in drainage depressions and be known as 'discharge' sites.

1. **Waterlogged soil and areas of new wet patches.**
   Waterlogging does not indicate salinity in every case, but is an early warning sign.

2. **Trees dying**
   As the saline groundwater table rises, trees begin to die for no apparent reason, usually before any impact on pastures is evident.

3. **Loss of productive annual and perennial vegetation species**
   As the ground becomes more saline, annual and perennial species die. Often, in their place grow more salt tolerant plants, such as sea barley grass, couch, annual beard grass, spike rush or strawberry clover.

4. **Bare patches of soil**
   Bare areas of soil appear and become larger. The soil may also set hard as it dries out. Often referred to as a 'salt scald'.

5. **The area attracts stock**
   Stock love to lick the salt from the ground, and usually gather together in a large group around the saline area.

6. **Visible salt crystals**
   When the surface is dry, salt crystals appear on the surface of the soil. It may look like white dust or powder.

7. **Puffy soil**
   When dry, the surface of the soil is "puffy" and shatters when walked on.

8. **Excess water runoff**
   The area is eroding from large quantities of water runoff.

9. **Clear dam water**
   Water in dams close to the site tends to be quite clear as the salt settles the sediment.

10. **A salty smell**
    Salt can be smelt in the area.

Who can help?
Department of Land and Water Conservation, Yass Office. Phone (02) 6226 1433

FACT SHEET

HOW TO MANAGE SALINE DISCHARGE SITES

What is a saline discharge site?

A saline discharge site is an area where the water table has risen and salt has affected vegetation and soil on the surface. Its impact varies, but usually results in

- a reduction in pasture and crop performance,
- bare scalded areas,
- dead trees,
- salt crystallisation and
- excessive erosion.

How do I manage it?

The appropriate way to manage a discharge site will vary depending on the severity of the problem. The main options are below, but also ask the local extension officer from agencies such as the Department of Land and Water Conservation office for advice (contact details below).

1. Fence the site

Stock should be kept off the site (they like to lick the salty ground). The fence should be at least 20 metres from the edge of the salt affected area. Vegetation changes will indicate the boundaries of the salt affected site. If the land is flat around the site, the fence should be placed further away as salt is likely to spread.

2. Carry out earthworks

Earthworks are usually needed for more severely affected areas. The type of earthwork will depend on the site, but some options include creating diversion banks to divert the flow of water away from the site, gully control structures, and deep ripping to assist in revegetation.

3. Plant salt tolerant grass species

Grasses, rather than trees, are usually more successful in revegetating saline areas. However, trees are useful in planting above and around the site to contain it. Good grass species include Tall Wheat Grass, Puccinella and Strawberry Clover (see the *Salt Tolerant Species Fact Sheet*).

4. Apply straw mulch, gypsum and fertiliser

Straw mulch protects the bare soil and reduces evaporation. It also protects seed for revegetation and provides organic material. Gypsum improves the soil structure, drainage, adds calcium and breaks the surface crust on bare soil. Fertiliser should also be applied on all saline sites to improve nutrient levels.

5. Manage and monitor the site!

Stock access to the site should be limited to when they will do least damage and when the area can stand some grazing ('crash' grazing method can be used ie high stock numbers for short periods). The site should be monitored for any spreading and any increase in salinity level. Piezometers may be useful to assess and measure the depth of the ground water. Once productive species are established, keep them well grazed so they use as much water as possible.

Who can help?

Department of Land and Water Conservation, Yass Office. Phone (02) 6226 1433

Other reading

Salt Tolerant Species Fact Sheet (in this Plan)

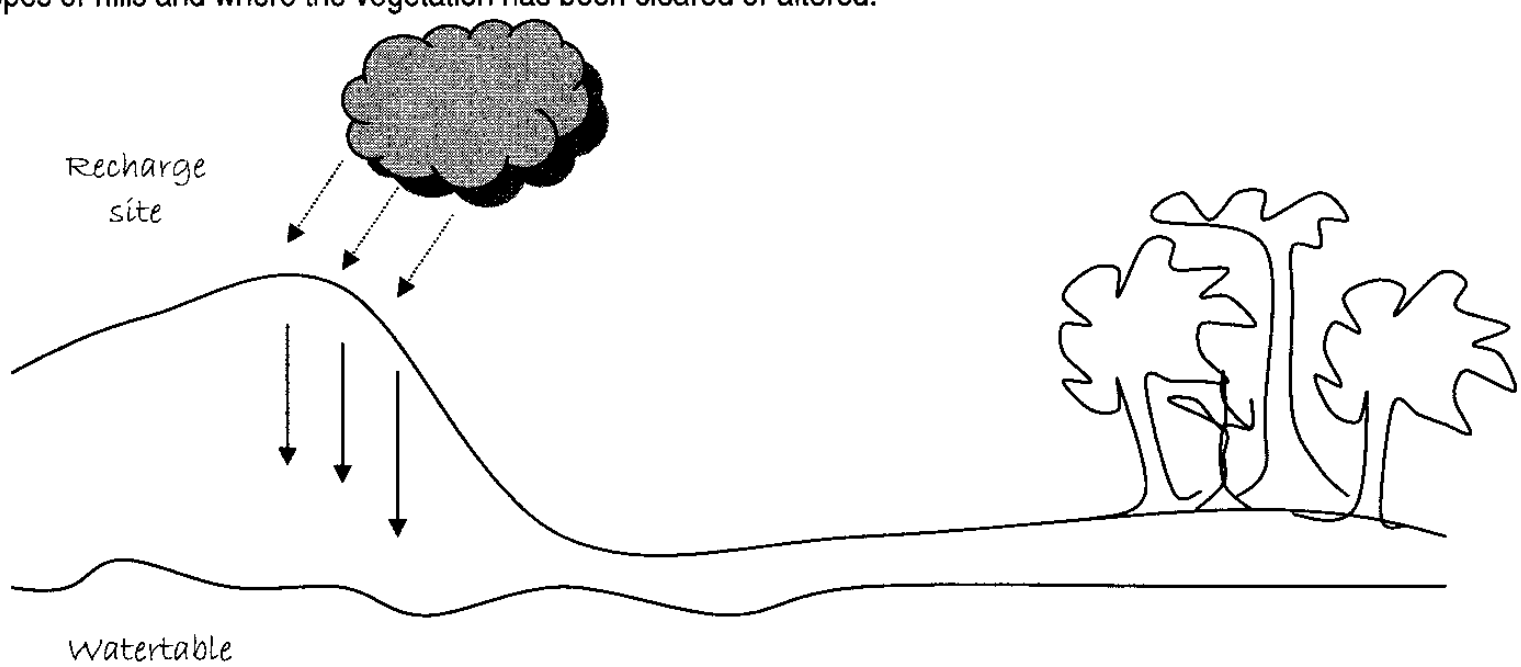
Dryland Salinity, Booklet 4. Productive Use of Salt Affected Land, DLWC.1993

FACT SHEET

HOW TO MANAGE SALINE RECHARGE SITES

What is a saline recharge site?

Recharge areas are the points at which water (rainfall) enters the groundwater table. Recharge occurs in all parts of the landscape except for discharge sites. Highest rates of recharge are usually in the higher parts of slopes or hills and where the vegetation has been cleared or altered.



How do I manage it?

There are many options for managing recharge sites. Your choices will depend on the severity of the problem, how it fits your whole farm plan, your resources (time, money), and the physical characteristics of the site such as access. Some options are to;

1. Revegetate
   Revegetate the area with deep-rooted trees, shrubs and grasses.

2. Establish perennial pastures
   Increase water use on the rest of your property by ensuring growth of deep-rooted perennial grasses and pasture. Ensure you carry out appropriate weed, pest and disease control, as well as fertiliser treatment to maintain good growth. Graze well to maximise water use.

3. Native grasses
   In areas where pasture improvement is not suitable, ensure good growth of native grasses.

4. Engage in appropriate management practices
   Avoid inefficient irrigation, long fallow periods and poor cropping practices in recharge areas.

Further Reading

Dryland Salinity 8. Options for Control DLWC 1994

Who can help?

NSW Department of Agriculture, Yass Office (02) 6226 2199
NSW Department of Land and Water Conservation, Yass Office (02) 6226 1433

FACT SHEET

PASTURE MANAGEMENT

Pastures are a dynamic system. They include native and introduced species and are subject to grazing, pest and disease attacks, as well as varying inputs, such as rainfall.

The management of pastures to address and prevent dryland salinity means using pastures to increase water use. The choice of pasture must fit the site on-farm taking into account soil type, pH, depth, drainage, degradation or erosion, and enterprise (wool, beef etc).

Seek advice about which option will best suit the different areas on your property.

What can you do?

- Sow pasture species that are suited to the land capability. eg. salt tolerant, acid tolerant.
- Plant pasture species that use more water than annual pasture species, such as lucerne, phalaris, cocksfoot.
- Don't fallow. Recharge is increased if left to long fallow periods.
- Take advantage of extra moisture for opportunity cropping when conditions are appropriate, but make sure the land is able to sustain such activities.
- Use a phase cropping system. Rotate annual crops with perennial pastures for example, after 5-7 years of continuous cropping plant 5-7 years of lucerne.
- Use the alley cropping method. Plant annual crops in alleys among rows of perennial plants that will provide shelter, increase water use and provide other benefits such as fodder and habitat.
- Ensure existing native and introduced pastures are productive and self-sustaining. It is important to have a significant component of perennial pasture.
- Plant and maintain trees, particularly near grazing pastures.
- Fertilise pastures to maximise growth and therefore water use.

Who can help?
NSW Department of Agriculture, Yass Office (02) 6226 2199

FACT SHEET

SALT TOLERANT TREE & GRASS SPECIES FOR THE YASS AREA

Revegetation is an important component in the treatment of dryland salinity. The tree and shrub species listed below have varying levels of tolerance to salinity. Trees and shrubs generally should not be planted directly into scalded discharge areas (ie. bare salty patches), but rather on the boundary of the affected area (see also the Fact Sheet; *How to Manage Saline Discharge Areas*). Bare saline sites are best managed by sowing salt tolerant pasture species (listed below).

SALT TOLERANT TREES AND SHRUBS

BOTANICAL NAME	COMMON NAME	SALT TOLERANCE	GENERAL COMMENTS
Acacia longifolia	Sydney golden wattle	slight-moderate	tolerates wet sites, frost tolerant
Acacia mearnsii	Black wattle	slight (varies with provenance)	fast growing
Acacia melanoxylon	Blackwood	slight-moderate *(varies with provenance)*	tolerant of periodic waterlogging, slow growing
Acacia retinoides	Swamp wattle	moderate-high	tolerant of wet sites with saline sub-soils, frosts
Casuarina glauca	Swamp she-oak	moderate-high (varies with provenance)	tolerates waterlogging, mild-moderate frost tolerance
Eucalyptus aggregata	Black gum	slight	good in wet areas
Eucalyptus camaldulensis	River red gum	moderate (large variation in provenance)	tolerates waterlogging
Eucalyptus camphora	Swamp gum	slight-moderate	good in wet areas
Eucalyptus melliodora	Yellow box	slight-moderate	slow growing
Eucalyptus ovata	Swamp gum	slight	tolerates waterlogging, frost tolerant, slow growing
Melaleuca ericifolia	Swamp tea-tree	moderate	highly frost tolerant

OTHER REVEGETATION SPECIES USEFUL FOR SALINE AREAS

BOTANICAL NAME	COMMON NAME	SALT TOLERANCE
Callistemon citrinus	Crimson bottlebrush	medium salt tolerance
Casuarina obesa	Swamp she-oak	highly salt tolerant tolerates waterlogging tolerates mild frosts
Eucalyptus astringens	Brown mallet	slightly salt tolerant
Eucalyptus botryoides	Bangalay	low-moderate salt tolerance tolerant of waterlogged soils
Eucalyptus leucoxylon	Yellow gum	slight/moderate salt tolerance sub-species variation in tolerance
Eucalyptus robusta	Swamp mahogany	moderately salt tolerant highly tolerant waterlogging
Eucalyptus sideroxylon	Mugga ironbark	slightly salt tolerant
Melaleuca bracteata	River tea-tree	moderately salt tolerant moderately frost tolerant
Melaleuca decussata	Cross-leaf honey myrtle	highly salt tolerant highly frost tolerant

SALT TOLERANT PASTURE MIX

For slightly saline sites - 2-4 dS/M*

COMMON NAME	RATE OF MIX
Australian phalaris	2 kg/ha
Tall wheat grass	4-6 kg/ha
Demeter fescue	4 kg/ha
Trikkala or gosse sub clover	2 kg/ha
Perennial ryegrass	2 kg/ha
Palestine Strawberry clover	1 kg/ha
Paradana Balansa clover	1 kg/ha
Fertiliser - nitrogen and phosphorus mix with sulphur present, eg Starter 15	125 kg/ha

* *deci-Siemens per metre*

For moderately saline sites - 4-8 dS/M*

COMMON NAME	RATE OF MIX
Australian phalaris	2 kg/ha
Tall wheat grass	4-6 kg/ha
Demeter fescue	4 kg/ha
Puccinellia	2-4 kg/ha
Perennial ryegrass	1-2 kg/ha
Palestine Strawberry clover	2 kg/ha
Paradana Balansa clover	2 kg/ha
Fertiliser - nitrogen and phosphorus mix with sulphur present, eg Starter 15	125 kg/ha

* *deci-Siemens per metre*

For severely saline sites - 8+ dS/M*

COMMON NAME	RATE OF MIX
Tall wheat grass	6-10 kh/ha
Puccinellia	2 kg/ha
Palestine Strawberry clover	2-3 kg/ha
Fertiliser - nitrogen and phosphorus mix with sulphur present, eg Starter 15	125 kg/ha

* *deci-Siemens per metre*

FURTHER SALINITY READING

Assessing the Texture of Your Soil. Save Our Soils. NSW Agriculture and NSW Department of Land and Water Conservation.

Detecting Dryland Salinity on the Southern Tablelands of New South Wales, DLWC and Salt Action

Dryland Salinity, Salt Action Series, DLWC , 1993, 1994

1. The Causes
2. How Severe is Your Discharge Area
3. Piezometers - How and Why
4. Productive Use of Salt Affected Land
5. Crop Management for Central and Southern NSW
6. The Role of Vegetation Management
7. The Economic Picture
8. Options for Control

Dryland Salinity - a land management issue, not a disaster, in Rising Water Tables and Salinity in the Yass River Valley, J.Franklin, DLWC 1999 (pp 31-55)

NSW Salinity Strategy, NSW Department of Land and Water Conservation, 2000

Dryland Salinity and its Impact on Rural Industries and the Landscape. Prime Minister's Science, Engineeringand Innovation Council, Occasional Paper No 1, Department of Industry, Science and Resources, Canberra 1999

Productive Solutions to Dryland Salinity GRDC Canberra, July 2001.

Trees, Water and Salt: An Australian guide to using trees for healthy catchment and productive farms. Joint Venture Agroforestry Program, Rural Industries Research and Development Corporation 2000.