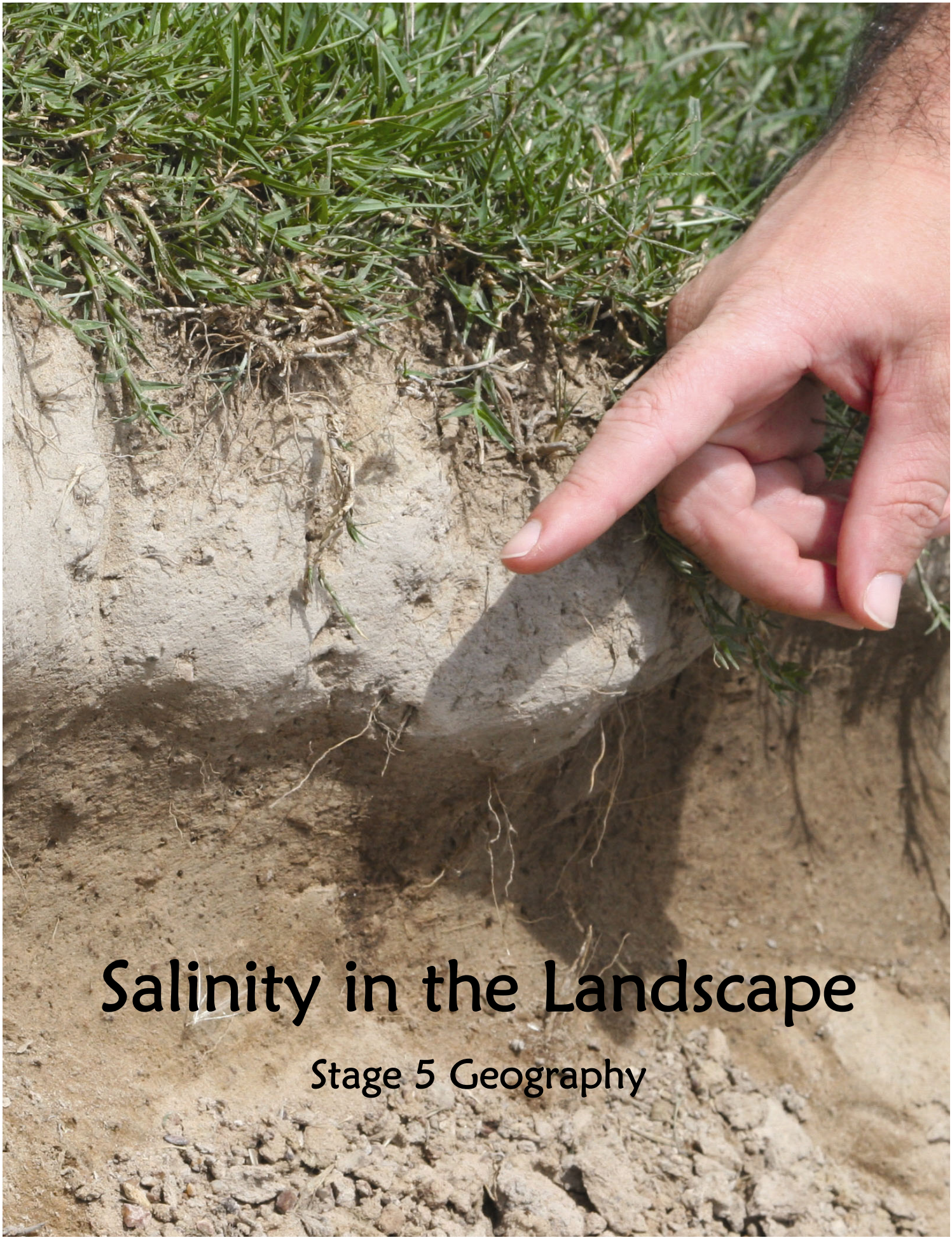


Salinity in the Landscape

Stage 5 Geography

NSW GOVERNMENT

Border Rivers-Gwydir
CATCHMENT MANAGEMENT AUTHORITY

CARING FOR OUR COUNTRY

Salinity in the Landscape

Stage 5 Geography

Unit Description

Salinity is a land degradation process that affects most of Australia. This unit provides an opportunity to look at how Salinity affect the Border Rivers-Gwydir Catchment, conduct a field excursion, and take a closer look at conducting your own salinity assessments.

By completing this unit of work your students will gain a greater understanding in the interaction of human actions and the land in a local context. They will develop a wide range of skills including the gathering of primary and secondary data, drawing conclusions for management from evidence, use of testing equipment.

This unit can be used to complete a research action plan using the Focus Area 5A3 Issues in Australian Environments.

Syllabus Outcomes

Objectives Students will develop:	**Stage 5 Outcomes** A student:
skills in acquiring, processing and communicating geographical information	5.1 identifies, gathers and evaluates geographical information 5.2 analyses, organises and synthesises geographical information 5.3 selects and uses appropriate written, oral and graphic forms to communicate geographical information
skills in choosing and applying appropriate geographical tools	5.4 selects and applies appropriate geographical tools
knowledge and understanding about the characteristics and spatial distribution of environments	5.5 demonstrates a sense of place about Australian environments
knowledge and understanding about how people and communities modify, and are affected by, the environment	5.6 explains the geographical processes that form and transform Australian environments 5.7 analyses the impacts of different perspectives on geographical issues at local, national and global scales

Time

Field excursion: 1 hour 30 minutes

Activity

1. In the Classroom

Discuss the theory behind salinity, how it is caused, measured and managed. The best resource to help with this is "Saltwatch – A resource book for schools" (see the link under References). Even though this is a Victorian based publication, this book is a great resource to get you started with understanding salinity. Another great resource is the "Avon Salinity Education Kit" from Western Australia.

To help your students understand the process and people involved in looking at a salinity problem in the landscape and how to try and manage it, go through the **Role Play activity**. This activity can be completed either before or after the field excursion.

If this unit is to be used for the research action plan, the following focus questions provide an example to get started.

1. Surface Water Focus Questions

- Is the local waterway saline?
- What differences in salinity exist between sites in the local area?
- Is salinity affected by weather conditions?
- Does salinity affect vegetation in my local area?
- Do salinity levels change along the same river?
- Does water salinity affect plants and animals?
- Has the salinity levels charged over time in the local area?

2. Groundwater Focus Questions

- What factors cause changes in the watertable in the local area?
- Does the watertable change between sites in the local area?
- How saline is the groundwater in the local area?
- Is the local area affected by a local or regional groundwater system?
- Is there a relationship between weather and watertables?
- How does the landforms/geology of the local area affect groundwater and salinity?
- Is groundwater a resource or a problem in the local area?
- How does groundwater affect land use in the local area?
- What type of salinity occurs in the local area?
- How does salinity affect plants and animals in the local area?
- What tools can be use to identify salinity in the landscape?

3. Urban salinity

- Is my town affected by salinity?
- What parts of my town are affected by salinity?
- How does salinity affect infrastructure in my town?
- Does the school water use assist in salinity management?
- Can salinity be managed in an urban area.

4. Salinity Management

- How do farmers manage groundwater in the local area?
- How have on-form strategies affected salinity?

- Can salt affected land be productively used?
- Is my town water efficient?
- What role does technology play in managing salinity?
- How is salinity monitored in the local area?
- What plants will reduce the salinity impact?

2. Out in the field

Back up your theory by taking the class out into the field to see the effects and management of saline sites in your local area. The Border Rivers-Gwydir Catchment Management Authority have been conducting field excursions with schools in the Inverell region for many years. Field recording sheets are provided for you to use and/or modify to suit your unit of work on salinity.

There are two sites that have been previously used to run the field excursions located approximately 20 mins from Inverell:
1. “Forest Hill”, Bannockburn
2. “Nullamanna Station”, Nullamanna

3. Salinity tests

During the field excursion students get to see how to conduct soil and salinity tests. To help understand these tests better take some samples back to the classroom so that all students can do the tests themselves. It is also a good idea to ask students to bring in some of their own samples to compare with the known saline sample. Use the information sheets provided to help guide you through this process. The Border Rivers-Gwydir CMA has test kits available for borrowing to help you complete these tests. Contact them and find out more.

Resources

Contact the Border Rivers-Gwydir CMA education unit about borrowing resources like:
- Soil pH test kits
- Electrical Conductivity meters
- Activity books and reference materials on salinity

References

Land and Water Australia Education Resources
http://www.lwa.gov.au/Publications_and_Tools/Education_Resources/index.aspx

National Dryland Salinity Program
http://www.ndsp.gov.au/

Avon Salinity Education Kit
http://www.avonnrm.org.au/news/other_newsletters/ear_to_the_ground/

Saltwatch – A resource book for schools
http://www.saltwatch.org.au/saltwatch/saltbook.pdf

Salinity Solution NSW
http://www.naturalresources.nsw.gov.au/salinity/index.htm

OUR SALINE PROBLEM

The Salinity Situation

Salinity is experienced in every state in Australia. Its effects have been noted and quantified on agricultural land and now the off site impacts onto water quality, infrastructure and environmental assets are being seen to be of major importance.

It is estimated that currently 2.5 million hectares of land is effected in Australia and that this will grow to 12 million hectares in the next 50 to 100 years. This represents 4.5% of currently cultivated land.

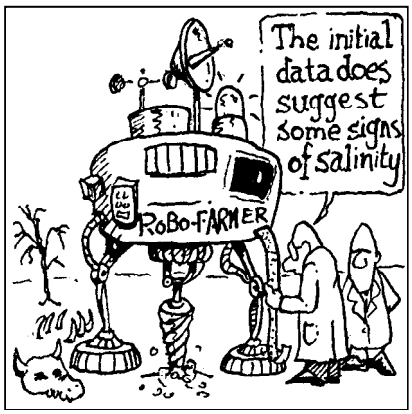
In Western Australia there is 1.8 million hectares of salt effected land. This area will double in the next twenty years and double again in the following 50 years. This would make a total of over 6 million hectares effected if current trends continue. Over half of the states divertible water supply is either saline or marginal.

In South Australia salinity is experienced in all agricultural districts. Over 20% of surface water resources have salinity levels above those recommended for human consumption.

Salinity is rapidly expanding in Queensland and Tasmania with sites also being reported in the Northern Territory. The problems experienced in Victoria are of a similar type and scale to those in NSW (LWRRDC 1998, PMSEIC 1998).

Salinity in NSW

In NSW the area of salt affected land is currently reported to be 120,000 hectares. (Smith 1998). This area is underestimated due to low levels of awareness and quality of mapping. If current patterns of landuse and trends in groundwater rise continue this area has the potential to grow to a staggering 7.5 million hectares by 2050 (PMSEIC 1998).



The land that is effected is mainly west of the Great Divide in the rainfall zone that receives between 400 and 850 mm of yearly rainfall. A number of towns and large rural centres in this area are effected by salinity. Salinity problems are also being experienced in Western Sydney (Dias & Thomas 1996).

The “Salt Trends” report compiled by the Murray Darling Basin Commission showed streams and rivers are increasing in salinity and salt load in our major inland rivers of NSW (Williamson 1997).

The Salinity Audit (1999) released by the Murray Darling Basin Commission stated that out of a total study area of 59,980,000 hectares 12,300,000 has rising water tables. This report estimated that between 2-4 million hectares will become salt effected in the NSW section of the Murray Darling basin.

Salinity in the Border Rivers-Gwydir Catchment

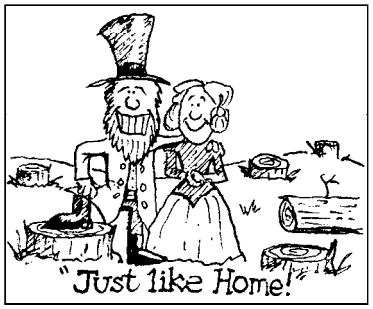
See Factsheets 2 and 3 of the Border Rivers-Gwydir Catchment Management Authority.

The Processes of Salinity

Salt is stored in the Australian landscape

In Australia large amounts of salt are stored in the landscape. This salt is stored in soils, rocks and weathered material. The salt has come from deposition of sea spray, rock weathering and ancient ocean sediments.

The water balance is changing and water tables are rising



With European settlement the water balance has been changed in the Australia. The native vegetation, with a variety of deep-rooted perennial plants, has been replaced by large areas of shallow-rooted plants. We have replaced woodland and forest with wheat paddocks and clover paddocks. This has meant that more water is getting through to the water table and the water table is rising. As the water table rises, it mobilises the salts stored in the landscape. These salts accumulate at points in the landscape and what we recognise as salinity, occurs. It is incredibly ironic that inefficient water use and too much water is causing this problem in Australia - which is considered to be the second driest continent on Earth.

Dryland Salinity

Dryland salinity occurs when water tables rise to between 2-3 meters of the surface. Capillary rise bring the salts to the soil surface and concentration of these salts occur to a point where they effect the environment.

Irrigation Salinity

Water that is added for irrigation and not used by crops and vegetation builds up in shallow water tables and causes salinity in all irrigation districts. Irrigation salinity is caused by over irrigation, inefficient water use and poor drainage.

Further Information

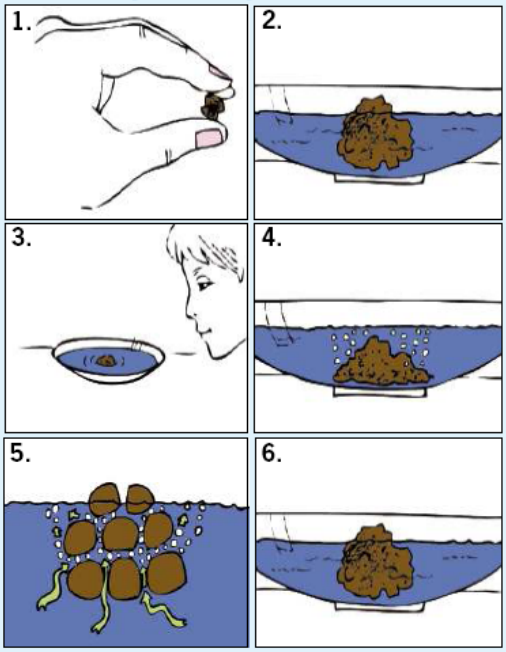
Salinity Solution NSW
http://www.naturalresources.nsw.gov.au/salinity/index.htm

National Dryland Salinity Program
http://www.ndsp.gov.au/

Testing soil slaking, dispersion and salinity

(Source: Border Rivers-Gwydir Catchment Management Authority (2008) *Practical Guide to Soil Erosion.*)

• Testing slaking



What this test tells you

This test indicates whether you have sufficient organic matter in the soil to hold your soil together.

1. Take a small lump of soil, about as big as a marble.
2. Place it carefully in a saucer of water.
3. Watch to see whether anything happens.
4. If small bubbles appear in the water, and the lump collapses, your soil has slaked. It has no humus or decaying organic matter to hold the soil particles together.
5. When soil slakes, water rushes into the air spaces in the soil, forces the air out (as bubbles) and explodes the soil particles. Slaking occurs when soil is cultivated without any organic matter going into the soil.
6. If nothing happens to your soil lump, it has enough organic matter in it to hold it together. It has good structure.

Scoring and interpreting the slaking test

Score: 0 = No slaking (the lump remains intact)
1 = The lump collapses around the edges but remains mainly intact
2 = The lump collapses into angular pieces about 2 mm or bigger
3 = The lump collapses into small (less than 2 mm) rounded pieces, forming a cone
4 = The lump collapses into single grains (if you can see the sand grains)

What to do

Score 0 - 1 Means that your soil is stable to wetting, probably due to the presence of organic matter. Current management can continue as long as ground cover is maintained and soil is not over-cultivated.

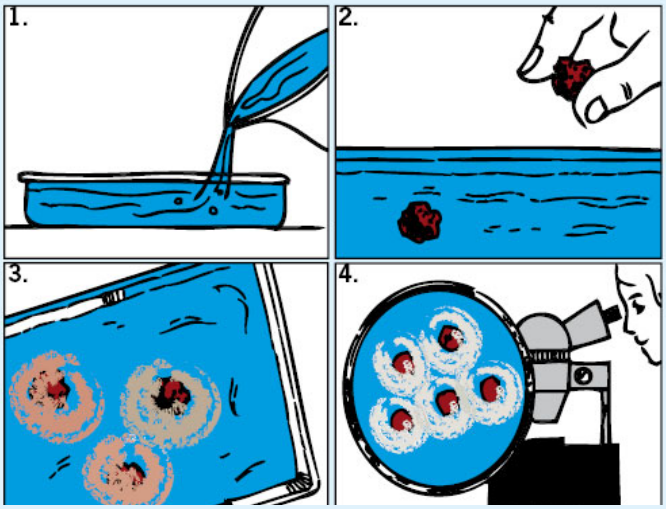
Score 2 This is a score typical of self-mulching soils. Use the dispersion test, and if it does not disperse then continue with the current management that has achieved this good condition.

Score 3 - 4 This score may indicate you have low organic matter in your soil and it may also have a surface crust or be hard setting. This type of soil should support perennial pasture or be subject to no-till operations to increase organic matter in the soil.

• Testing dispersion

What this test tells you

Dispersion is a measure of how your soil disintegrates into its individual components (clay, silt and sand) in water, and testing it is a very simple process. The results can give you an indication of how your soil will behave when wet, and its erosive potential. The following simple tests can be done by you on-farm.



1. Place some rain water or distilled water into a shallow dish (do not use town or treated water).
2. Place several lumps of dry soil (marble-sized) into the water and do not disturb for several hours.
3. Check after 10 minutes to see if the water around the soil has started to go cloudy. If it has, it means that the soil has started to disperse and it could indicate that your soil is sodic. Check again after 30 minutes and two hours to check for additional cloudiness.
4. Sodic soil has sodium attached to the clay and will attract a water shell around the soil and prevents the soil from joining together. The dispersed clay particles make the water look cloudy or muddy.

Interpreting and using the results of the dispersion test

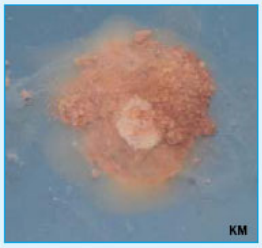
Sodic soils

If the tests indicate you have sodic soils, then this can indicate that you will have a problem with erosion if you do not manage your land in an appropriate manner. Sodicity affects around a third of all soils in Australia and, along with the increased threat of erosion, can cause waterlogging, surface crusting and poor water infiltration.

▲ **Extreme rill erosion of sodic soils near the Texas-Keytah Bridge.**

Sodic soils on sloping land are vulnerable to water erosion, which means your topsoil will be lost for production. When water follows small drainage lines in these areas it can cause rill erosion. In severe cases, gullies will develop.

If the subsoil is sodic on sloping land, water flowing through the sodic layer will create tunnel erosion, leaving cavities which will eventually collapse and form gullies.



▲ **Dispersed sodic soil, surrounded by cloudy water.**

What to do

A calcium-containing substance like gypsum can be applied to the affected soil. The calcium replaces the sodium in the clay and makes it less likely to disperse into its individual particles. However, very large amounts of gypsum may be required to help even in the short term. In most cases, a property or sub-catchment approach to the management of sodic and other problem soils is the best way to manage your soils. Decisions based on an understanding of water movement and the distribution of soils on your farm will give a longer-term solution. Talk to the soils experts located at the CMA for more advice on how to manage sodic soils on your property.

What to do

If the test results indicate that you have saline soil, you should speak to your local salinity officer at the CMA or speak to other experienced people. In most instances, management of the saline area will need to be changed and should be different from the non-saline areas of your property. Fencing the area from stock and planting salt-tolerant pastures or trees, as well as mulching the soil, may help with short-term improvement of ground cover. The cause should be treated as well as the symptoms, so recharge and discharge areas should both be managed with strategic planting of perennial species (grasses, shrubs and trees).

The *Salinity Glove Box Guide, NSW Namoi, Border Rivers & Gwydir Catchments* details the causes, identification, and management options for saline sites and a copy is available from the CMA.

Conversion factors for soil texture groups

If you have access to a conductivity meter to do the $EC_{1:5}$ test, the table below shows the conversion factors that you will need to use to multiply the result to get an accurate idea of how saline your site is. For example if you get a an $EC_{1:5}$ of 0.3 dS/m and you have sandy loam soil the EC_e will be 0.3 x 14 = 4.2 dS/m.

SOIL TEXTURE GROUP	*CONVERSION FACTOR (MULTIPLY BY)*
SANDS	17
SANDY LOAMS	14
LOAMS	9.5
CLAY LOAMS & LIGHT CLAYS	8.6
MEDIUM AND HEAVY CLAYS	6.7

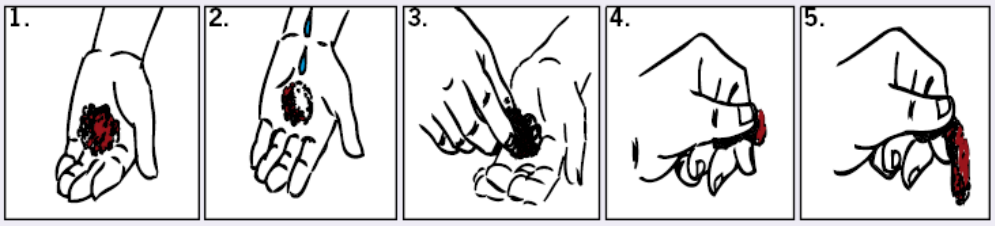
◄ Salinity site near Bundarra that lacks ground cover.

Testing Soil Texture

(Source: Border Rivers-Gwydir Catchment Management Authority (2008) *Practical Guide to Soil Erosion.*)

What this test tells you

Soil texture tests give an indication of the proportions of sand, silt and clay in your soil sample. Differing proportions of these three mineral particles in your soil will give it different physical properties. In particular, it influences the cohesiveness of your soil. The higher the clay content the more cohesive your soil will be. Clay soils are less likely to become eroded. However, this cohesiveness may cause other land management problems such as difficulty in cultivation when too wet or too dry.



Modified from Department of Primary Industries (date unknown)

1. Take a small handful of soil.
2. Add enough water to make a ball. If you can't make a ball then your soil is very sandy.
3. Feel the ball to see if it is gritty (sand), silky (silt) or plastic/sticky (clay).
4. Re-roll the ball and, with your thumb, press it out over your forefinger to form a hanging ribbon of soil.
5. The longer the ribbon the more clay you have in your soil. Measure the ribbon length (ruler on the rear of book) and refer to the table to assess your soil texture.

The following table shows how to interpret your soil texture test. (Source: Evans, 2001)

Ribbon length (mm)	Coherence (way ball holds together)	Feel and other features of a moist ball of soil	Approx. clay %	Texture class
Nil	Nil	Gritty feel, sand grains adhere to fingers, cannot be moulded	Less than 5%	Sand (S)
5	Very slight	Gritty, medium size sand grains felt, cannot be moulded	5-10%	Loamy sand (LS)
5-15	Slight	Sticky, sand grains adhere to fingers, cannot be moulded, clay stains discolour fingers	5-10%	Clayey sand (CS)
15-20	Slight to just firm	Gritty, dominant sand grains are medium size and visible	10-20%	Sandy loam (SL)
15-25	Just firm	Fine sand can be heard when rubbed between thumb and forefinger	10-20%	Fine sandy loam (FSL)
About 25	Spongy to firm	Smooth spongy feel, greasy if organic matter present, ball easy to manipulate, no obvious sandiness	About 25%	Loam (L)
About 25	Firm	Silky, very smooth when manipulated	25%	Silty loam (SiL)
25-40	Strong	Sandy to touch, medium sand grains visible in fine matrix	20-30%	Sandy Clay Loam (SCL)
40-50	Firm	Smooth and sandy, fine sand felt and heard	30-35%	Fine sandy clay loam (FSCL)
40-50	Firm	Smooth and silky feel	30-35%	Silty Clay Loam (SiCL)
40-50	Strong	Smooth plastic feel, no obvious sand grains.	30-35%	Clay loam (CL)
50-75	Firm	Plastic and smooth, fine sand felt (SC), silky feel (SiC), can be moulded and rolled into a rod	35-40%	Sandy clay (SC) Silty Clay (SiC)
50-75	Firm to strong	Plastic and smooth, slight resistance to shearing, is easily moulded and rolled into a rod	35-40%	Light clay (LC)
75-85	Strong	Plastic and smooth, slight to moderate resistance to shearing, rod forms a ring without cracking	40-45%	Light medium clay (LMC)
85-100	Strong	Plastic and smooth, handles like plasticine, resistant to shearing, rod forms a ring without cracking	45-55%	Medium clay (MC)
More than 100 mm	Very strong	Plastic, like firm plasticine, firm resistance to shearing, rod forms a ring without cracking	More than 55%	Heavy clay (HC)

12

Salinity Role Play

Happy Valley Catchment
You live in Happy Valley Catchment, which contains agricultural activities and a large town. The local community has heard about the problem of salinity and different views are held about the issue. Identify the perspectives of each person and indicate whether you feel that they are contributing to the salinity problem in the catchment.

PERSPECTIVES IN THE RURAL AREA

Steve Smart: Agricultural Advisor
Steve Smart is the local agricultural advisor. He has noticed that salinity has increased in the past 10 years. He considers that farmers need advice and incentives to change their landuse practices to reduce salinity. Steve believes that there are still too many annual pastures and tree clearing in the catchment. An education strategy will also be important in rural and urban areas.

Tom Tillage: Landholder
Tom has a cropping and grazing property on the mid slopes in the catchment. He is a traditional farmer, who ploughs before he sows his crop. Recently, Tom was concerned about the yellowing and low germination rate in his crop. He had a soil test completed and found that the organic content in the soil was 1.8% and the soil salinity 1.6 decisiemens/metre. Tom does not consider he has a salinity problem because he has worked the farm for 40 years there are no salt scalds on his farm. He considers the farms lower in the catchment have the salinity problem due to the shallow watertable on these farms.

Sam Scald: Landholder
Sam owns a farm in the bottom of the catchment. He is a member of the local Landcare croup and has received financial incentives for fencing out his salt scald and planting salt tolerant pastures. Sam has observed that despite his efforts to manage the salt on his farm, the problem is getting worse. He feels that Tom is causing his problems and needs to change his landuse practices. Sam would like Tom to join the Landcare group and attend the local salt field days, to increase his awareness of the salinity issue.

Catchment Management Authority, (CMA)
The Catchment Management Authority has set end of valley salinity targets for Happy Valley. They have identified that incentives need to be provided to farmers in the recharge areas, to reduce the salinity impact at the end of the valley. They will provide cash incentives and advice to farmers to assist them to modify their land use practices.

Hilda's Hideaway: Retiree
Hilda has purchased a farm in the upper catchment and was attracted to the location due to the rugged hills and unusual rock formations. These rocks seem to be volcanic in origin, but have huge vertical cracks along them. Hilda had heard about the salinity problem and is keen to replant the hills with trees, to encourage wildlife. She has also heard that trees will help the salinity problem lower in the catchment.

PERSPECTIVES OF TOWN DWELLERS

Paula Prestige: Town Dweller
Sarah lives on the hill overlooking happy Valley township. She has a beautiful house and garden. She does not consider that she is contributing to the salinity problem in the town as she has an automatic sprinkler system in her garden. Sarah knows that salinity occurs close to the town centre and thinks that the people in this area of the town should do something about their water use. Sarah was quite concerned recently, when she received a $2000 excess water bill from the council.

Bob Battler: Town Dweller
Bob lives in a small house close to the shopping centre. He has very little garden so never uses excess water. He is concerned that his lawn has bare patches in it despite watering it every night. Bob has also noticed dampness under the house and white crystals on the ground. He considers that salinity is a rural problem, probably caused by irrigators.

Fred Trainer: Football Coach
Fred is the local football coach and has heard about salinity in the town. He has checked his house and doesn't think it is a problem for him. Fred is concerned about the football oval as it has developed bare patches. Fred thinks it has the potential to cause an injury and need to be fertilised or watered. Fred has also reported a leaking pipe in the change rooms. He reported the matter to the Sportsground Trust.

Sarah Snippet: Newspaper Cadet Reporter
Sarah is a cadet reporter. She is on probation and knows that she needs to write a "good" story to secure her job. She is aware of the salinity issue and decided to write a story to raise awareness of the issue, She researched the issue and provided some useful information for town and rural *dweller,* In the article, Sarah included a map of the salt affected areas of the town. Sarah did not realise that this would affect land values and would not solve the salinity problems!!

Who is responsible for salinity? You be the judge!!

Attitudes to Salinity in Happy Valley Catchment

Name and Occupation	View of Salinity	Comments (Contributions to salinity problem)

Suggested Answers

Name & Occupation	View of Salinity	Comments (Contributions to salinity problem)
Steve Smart Agricultural Advisor	• Too many annual pastures • Too much tree clearing • Farmers need incentives • An education strategy needed in rural and urban areas	These changes would reduce the salinity within the catchment.
Tom Tillage Landholder	• Salinity is caused by shallow water tables lower in the catchment.	Tom is contributing to salinity; • Low organic matter increases leakage to groundwater • Salinity of the soil is of concern. • First signs of salinity are evident with poor germination and yellowing of crops.
Sam Scald Landholder	• Salinity caused by farmers higher in the catchment.	• Sam has an understanding of salinity issues as it is impacting on his farm. • Sam has implemented strategies on his own farm • Sam recognises the importance of management across the whole catchment.
CMA	• Recognises the need to reduce salinity and has set end of valley targets. • Recognises the need to change landuse practices.	• Incentives should encourage landholders to consider management options for salinity.
Hilda Retiree	• • Replanting trees on the hills will • reduce salinity.	• Hilda needs to be aware that the rock formations on her property are contributing to the salinity problem as they have high recharge to groundwater. However, the planting of trees will help.
Paula Prestige Urban Dweller	• Considers that she is not causing the salinity problem as she has an automatic watering system. • Salinity is caused by overwatering in the valley, close to the shopping centre.	• Paula is contributing to the problem. She is living in the local recharge area and is overwatering, as evidenced by the excess water rate bill she received.
Sarah Snippet	• Has researched the salinity issue and understands the environmental impacts but considers that the people in the areas affected by salt are the cause of the problem.	• Salinity can cause economic costs. Housing prices can be affected when salinity is identified in specific locations.
Fred Trainer	• Salinity is not affecting his home, so it is not his problem	• Fred notices bare patches on the football field and leaking plumbing, but does not realise it has anything to do with salinity. He suggests more irrigation for the football field.
Bob Battler	• Considers that salinity is a rural problem caused by irrigators.	• Bob is contributing to the salinity problem as o He overwaters his lawn o Salt crystals and waterlogging are evident under his house.

SALINITY FIELD EXCURSION WORKSHEET
Site description

Describe what the site looks like, also sketch the site in the space below. Note the area (size) of the site is.

PROPERTY NAME: _____

LOCATION IN THE LANDSCAPE: _____

_____

LOCATION IN THE CATCHMENT: _____

_____

SITE DESCRIPTION: _____

_____

_____

_____

_____

_____

Collecting data

In the spaces above the tables write an explanation of the purpose of that particular field test.

1. Piezometer water level

Depth to groundwater (m)	Risk of salinity	Bore 1	Bore 2
Less than 1	High		
1 to 2	Medium		
2 to 3	Low		
More than 3	Very low		

Why is shallow groundwater a problem?

2. Groundwater salinity

Groundwater salinity (dS/m)	Salinity	Bore 1	Bore 2	Dam
Less than 0.8	Fresh			
0.8 to 1.6	Marginal			
1.6 to 4.8	Brackish			
More than 4.8	Saline			

Could this water be used for anything? If so, what? (see information below)

Sample	Suitable for use (yes/no)	What it could be used for?
Bore 1		
Bore 2		
Dam		

Livestock	No adverse affects on animals expected (dS/m)	Use	Water salinity (dS/m)
Beef cattle	0 – 5.97	Human drinking water	0.83
Dairy cattle	0 – 3.73	Irrigation with no limitations	< 0.28
Sheep	0 – 7.46	Environmental impacts can occur	1.5
Horses	0 – 5.97	Maximum limit for mixing herbicides	4.7
Pigs	0 – 5.97		
Poultry	0 – 2.98		

(Stock water information comes from the Australian Water Quality Guidelines 2000.)

3. Surface water

Where did the sample come from?

_____

_____

Surface water salinity	Salinity	Result
Less than 0.28	Low	
0.28 to 0.8	Medium	
0.8 to 1.5	High	
More than 1.5	Very high	

Are there any restrictions with using this water? What could it be used for?

_____

_____

4. Soil salinity test

Location	Soil texture	Soil Factor	$EC_{1:5}$ (dS/m)	EC_e * (dS/m)	Plant options **	Soil salinity class***	pH	Slaking & dispersion
Example	*Loam*	*9.5*	*0.5*	*4.75*	*Rhodes grass, barley*			
Grass area								
Bare area								

*** EC_e (dS/m) = Soil Factor x $EC_{1:5}$ (dS/m)**

****Plant tolerances to salinity**

Plant	Soil salinity (EC_e in dS/m)
Barley	8
Tall wheat grass	7.5
Rhodes grass	7
Sorghum	6.8
Phalaris	4.2
Fescue	3.9
Rose Clover	1

*****Soil salinity class**

Class	Soil salinity (EC_e in dS/m)	Comment
0-2	Non-saline	Salinity effects mostly negligible
2-4	Slightly saline	Affects yields of very sensitive crops
4-8	Moderately saline	Yields of many crops affected
8-16	Very saline	Only tolerant crops yield satisfactory
>16	Highly saline	Very few crops yield well

What caused dryland salinity?

The effects of dryland salinity:

Impacts on farms

Impacts on infrastructure eg roads

Solutions

What has been and is being done at the site? What benefits have arisen? What problems exist?

Has the site changed over time? If so why?

Other possible solutions

The role of Landcare/Catchment Management Authority

Space for extra information

Names of staff who gave up their valuable time to further your education

Soil Texture, Slaking, Dispersion and Salinity Results Sheet

Location	Soil texture	Soil Factor	$EC_{1:5}$ (dS/m)	EC_e * (dS/m)	Plant options**	Soil salinity class***	pH	Slaking	Dispersion
Example	*Loam*	*9.5*	*0.5*	*4.75*	*Rhodes grass, barley*	*Moderately Saline*	*9*	*0-4*	*Sodic / non-Sodic*

*** EC_e = Soil Factor x $EC_{1:5}$**
** Plant tolerances to salinity – see Field Excursion Worksheet
*** Soil salinity class – see Field Excursion Worksheet

Managing your landscape

Using the results from your tested soil samples, try and develop some potential management options for each site.

Location	Soil texture	EC_e (dS/m)	pH	Slaking	Dispersion	Management Option/s

For more information

Border Rivers-Gwydir Catchment Management Authority

Inverell Office
15 Vivian Street | PO Box 411 Inverell NSW 2360
T: 02 6728 8020 F: 02 6728 8098

Moree Office
66-68 Fromet Street | PO Box 569 Moree NSW 2400
T: 02 6757 2550 F: 02 6757 2568

www.brg.cma.nsw.gov.au
brg@cma.nsw.gov.au