The Saltwatch Resource Book

Part B: Saltwatch for Schools

Queensland Government
Natural Resources and Mines

WATERWATCH Queensland
Communities Caring for Catchments

Acknowledgments

This resource book was revised in 2004 by Cindy Trevor and Kirstin Kenyon for the Department of Natural Resources and Mines.

This resource book was revised in 2003 by Mandy Botterell and Kirstin Kenyon for the Department of Natural Resources and Mines.

This adaptation builds on the earlier version:

Department of Primary Industries, (1994) *Saltwatch Activity Book: Involve me and I'll understand*
Which sourced some material from :
Lubczenko, V. (1992) *Salt Action, Victoria.*

Preface

The Saltwatch Resource Book, Part A: What is Salinity? contains background information on salinity that is suitable for a variety of different audiences including primary and secondary students and community groups. *The Saltwatch Resource Book, Part B: Saltwatch for Schools* contains a range of activities that are suitable for school students.

The information presented was accurate at time of updating. Please refer to the Department of Natural Resources and Mines website for the latest research and information concerned with salinity. http://www.nrm.qld.gov.au

If you would like to become involved in the Saltwatch program in Queensland, please visit the Waterwatch Queensland website www.qld.waterwatch.org.au

The Saltwatch Resource Book

Part B: Saltwatch for Schools

Contents

Activity 1. Let's halt the salt

This activity requires you to source articles/case studies from the Department of Natural Resources and Mines website and the National Dryland Salinity Website.

National Dryland Salinity Website:

http://www.ndsp.gov.au/15_publications/15_salt_newsletter/salt_newsletter.html

Department of Natural Resources and Mines web links:

Salinity in the Burdekin River catchment
www.nrm.qld.gov.au/salinity/pdf/salinity_infosheet_a4.pdf
www.nrm.qld.gov.au/salinity/pdf/burdekin_salinity.pdf

Salinity in the Burnett Mary and Western catchments of South East Queensland
www.nrm.qld.gov.au/salinity/pdf/burnettmary_info.pdf
www.nrm.qld.gov.au/salinity/pdf/burnettmary_map.pdf

Salinity in the Fitzroy Basin
www.nrm.qld.gov.au/salinity/pdf/fitzroy_info_sheet.pdf
www.nrm.qld.gov.au/salinity/pdf/fitzroy_map.pdf

Salinity in the Queensland Murray-Darling Basin
www.nrm.qld.gov.au/salinity/pdf/salinity_infosheet.pdf
www.nrm.qld.gov.au/salinity/pdf/salinity_hazard_map.pdf

Using the Case Studies

Procedure

After reading your chosen case studies, complete the following tasks. Try to identify case studies from the following Queensland regions.

1.1. Fill in the relevant parts of the following retrieval chart.

Retrieval Chart

	Region name:	**Region name:**	**Region name:**	**Region name:**
Evidence of salinity				
Extent of salinity				
Rainfall pattern				
Past land use				
Contributing factors to the problem				
Specific causes of the problem				
Investigations undertaken				
Management Options				
Current action being taken				
Ongoing issues				

1.2. Using the information in the retrieval chart:

ii. Identify common features across the **three** (3) case studies. Use a highlighter pen to mark them.

iii. Describe and attempt to explain any similarities and differences (in any of the headings of the retrieval chart). This information could be put into a table, e.g.

Similarities	Differences

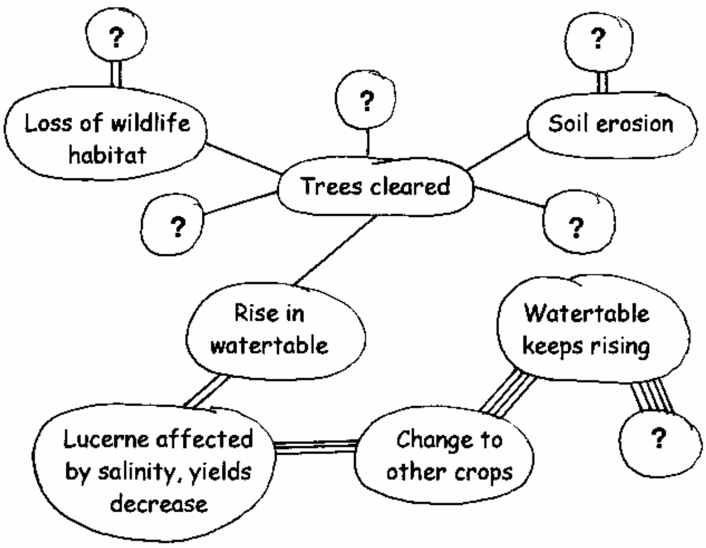
iv. Discuss this information with a neighbour and/or the class.

2.1. Explain to your neighbour how various factors have contributed to salinity in each of the case study areas.

2.2. Compare the causes and effects of salinity in the case.

2.3. Describe and explain any similarities and differences.

3. Complete a futures or consequences wheel see above to show what is happening at each of the case study areas. Futures or consequences wheels are useful for analysing the consequences of an event and implications for the future.



An example of a futures wheel

3.1. Start the wheel by writing the initial event at the centre of the page.

3.2. Brainstorm the consequences of that event of trend. Write these ideas on spokes radiating out from the centre of the wheel. (You might draw these on a single line or spoke.) These are called "first-order" consequences.

3.3. Brainstorm “second-order” consequences that may result from first-order consequences. (You might draw on a double line/spoke.)

3.4. Continue with third and fourth etc. consequences using three and four lines/spokes until you cannot think of any more consequences.

3.5. Discuss the cause and effect wheel you have designed. Which are the positive and negative effects and how can the positive ones be increased and the negative ones decreased?

4. Write down a list of values that you think are important when making decisions about managing salinity. Discuss these values with your neighbour.

5. Compare the geological factors which have contributed to salting at each of the case study locations.

- **i.** What are the geological formations called?
- **ii.** How are they similar and/or different?
- **iii.** How are processes causing salting in each case study similar and/or different?

6. Arrange for your class or group to go to a salinity site I your local area and see if you can arrange to have an extension officer visit the site with you.

7. Write an article for the school or community newspaper (with maps, pictures etc.) to alert the local community to the problem of salinity and to inform readers about what they can do to help.

(Adapted from: Teaching for Ecologically Sustainable Development, Guidelines for Years 11-12 Geography, *Department of Education, Queensland, 1992, p.17)*

Activity 2. Catchment hunt

Aim

To help students gain a basic understanding of catchments.

Materials Required

A map of the school ground showing the layout of buildings, playgrounds, and streets.

Procedure

Have the students go into the school grounds and prepare a catchment map based on the visible surface features they note as they move around the school. A completed map should show the main water routes (beginning at the school roof downpipes) and feeder routes such as gutters. The directions of movement should also be shown.

***Note:** The map need not be in conventional form. Perhaps the students could construct a three-dimensional map, using matchboxes for various part of the school and coloured wool to indicate the flow of water. Perhaps some students could work together on smaller catchments within the school limits, or in their street or garden at home.*

Following up

- **i.** What is a catchment?
- **ii.** Trace the path of a drop of water falling on the school roof until it leaves the school grounds.
- **iii.** Where does the water eventually end up after it has left the school grounds?
- **iv.** If you were to build a dam in the school grounds, where would it be best located?
- **v.** Using a topographic map of your local area determine the catchment boundary of your local creek or river.
- **vi.** Where does your drinking water come from? Where does your wastewater go to? Interview people who can help you answer these questions.

Activity 3. In which catchment is my school located?

Aim

To identify the catchment in which students live.

Materials required

a topographic map of the local area, preferably the 1:100 000 map used for locating your samples

plastic overlay or tracing paper

fine point, non-permanent OHP pens, or pencils

Procedure

i. Using non-permanent OHP pens or pencils (in case you make a mistake) place your overlay/tracing paper over the topographic map and mark in any rivers or creeks that flow through your region.

ii. Using a fine-point non-permanent pen or pencil draw a dotted line to outline the catchment boundary (watershed) for your local creeks and boundaries.

A catchment is the area surrounding a creek or river from which surface water flows into the creek or river. The boundary (watershed) follows the highest points around the creek/river.

iii. Referring to your catchment map, complete the sentences below:

a. The topographic map which includes the area in which I live is ___________.

b. I live in the ____________ creek/river catchment.

c. My school is in the ___________ creek/river catchment.

d. The land use activities that happen in my catchment are ____________.

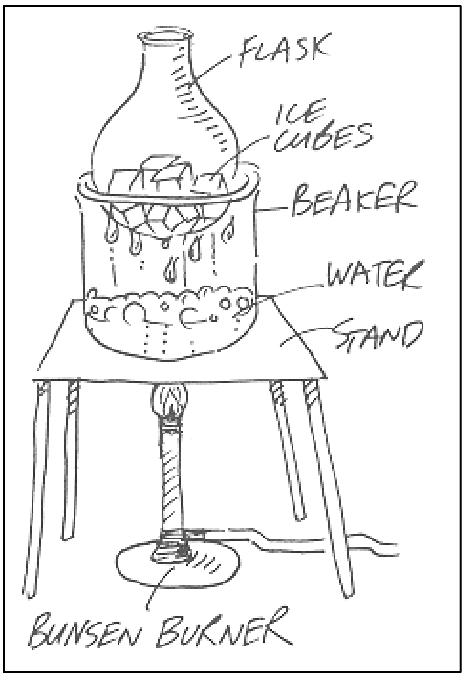
Activity 4. A model water cycle

Aim

To model the processes involved in the water cycle.

Materials required

Bunsen burner	Round bottom flask
Stand	Water
Beaker	Ice cubes



A model water cycle

Procedure

i. Half fill the beaker with water.

ii. Place the beaker on the stand with the Bunsen burner directly underneath.

iii. Heat the water until it is steaming.

iv. Place the ice cubes in the round bottom flask.

v. Position the flask on top of the beaker.

vi. Observe any cycling (repetition of change) in the model.

Discussion

i. What parts of the experiment represented clouds, rain and lakes?

ii. Explain the terms evaporation, condensation and precipitation.

iii. In nature, what would heat the rivers, lakes and sea?

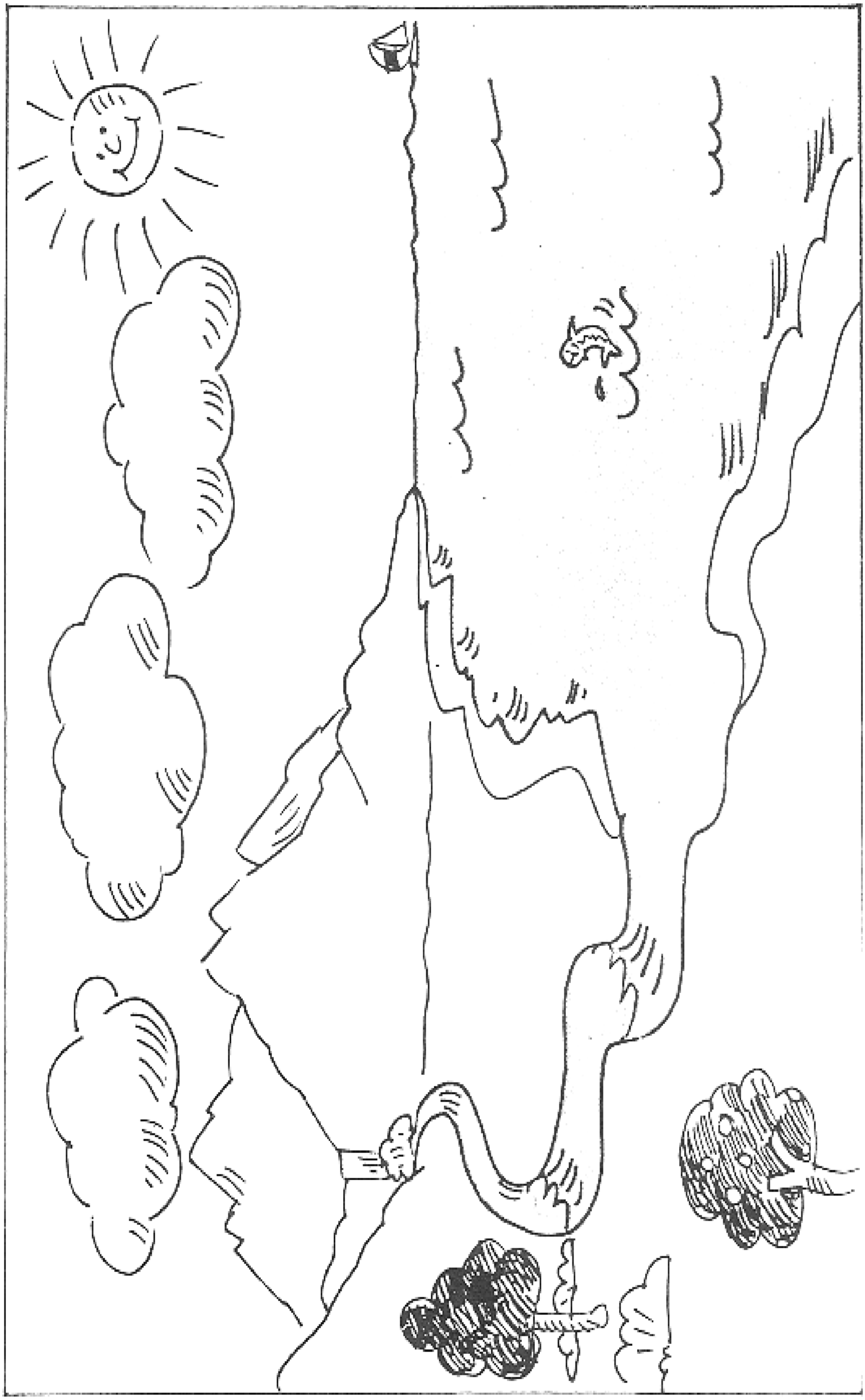
iv. Is there any water lost from the natural cycle? Explain your answer.

v. On the ***Processes involved in model water cycle*** diagram on the next page:

a. Label the clouds, rain, sea, rivers and lakes

b. Draw arrows to represent the movement of the water cycle.

c. Label condensation, precipitation and evaporation.



Processes involved in a model water cycle

Activity 5. A dramatic water cycle

Aim

To reinforce the concepts of evaporation, condensation and precipitation and to introduce the concepts of runoff and transpiration.

Materials required

One litre cartons, for example, milk containers

Labels marked with the words **evaporation, condensation, precipitation** and **transpiration**

Preparation

i. Arrange the classroom (or another open space) to provide four separate areas which will represent a part of the water cycle:

a. a lake whose boundaries should be outlined in chalk or other suitable means

b. clouds which should be based on an elevated position such as desks, tables or a platform

c. a forest

d. a river

ii. Students play various roles in the simulated water cycle:

a. *Water Carriers* - take water from the lake and deliver it to the clouds. This role represents the process of evaporation.

b. *Clouds and Water Drops* – The *clouds* take delivery of the water from the water carriers. Here the process of condensation can be explained. Precipitation can be demonstrated with the clouds becoming *water drops* and leaving the elevated area to deliver water to the rivers and vegetation.

c. *River and Trees* - receive the water from the water drops.

Procedure

i. Place all water containers in the lake.

ii. Allocate roles to all students. About ⅓ of the class should be **water carriers**, ⅓ **clouds and water drops**, and the remaining ⅓ should be divided between the **rivers and trees.**

iii. Run through the following sequence three times with each process being discussed and the appropriate label presented.

a. Water carriers each collect a water container from the lake and travel to the cloud area.

Discuss: What is happening to the water? Present the label evaporation.

b. The clouds receive the water containers from the water carriers who then return to the lake areas.

   Discuss: How cold is it up in the clouds? What effect does the cold have on the water held by the clouds? Present the label condensation. Ask the clouds what they are going to do with the water they are holding!

c. Clouds can then become water drops and leave the elevated platform.

   Discuss: What is happening to the water? Where is the water going? What do we call this water? Present the label precipitation. NOTE: To further demonstrate the different forms of precipitation, students in this role should wear labels stating rain, hail, snow and sleet.

d. The water drops deliver the water containers to the trees and river and then return to the clouds. The tree and river people keep the water at this stage. After three cycles, the lake area should become depleted of water containers while the trees and river are becoming overloaded.

   Discuss: What should the river be doing with the water? Introduce the term runoff.

e. Continue the activity for two more cycles with the river passing some of the water containers onto the lake. The trees will now be overloaded with water containers.

   Discuss: How do trees use water? Do trees store all of their water? Do trees lose some of their water? Introduce the term transpiration with the appropriate label. Run through the cycle with the trees giving some water containers back to the clouds.

Following up

i. Discuss why the water cycle is called a cycle. Relate this to the movement of the water containers in the activity.

ii. The concept of water infiltrating into the soil and ground water can also be incorporated into the activity.

a. Discuss as a class:
   - Where else could water go besides transpiration and runoff?
   - Water can run over the top of soil, but what else can it do?

b. The concept of ground water can be demonstrated in the activity. Ground water can be represented by positioning some students under a cover such as a blanket. The activity can be followed through with the water drops delivering some water containers to the ground water. Some water can be stored and some passed along to the lake.

Activity 6. The wishing well

Aims

To demonstrate the interaction of surface water and ground water.

To enable students to have a basic understanding of ground water occurrence and development.

Materials required

Aquarium gravel	Small aquarium or wide-mouthed glass jar
Plastic drinking straws	Simulated trees
Small pebbles	Plants

Procedure

i. Place the gravel in the aquarium at an approximated 45° angle.

ii. Carefully introduce tap water into the aquarium until the water level covers approximately 50% of the gravel.

iii. Place the pebbles and plants in the dry portion to simulate land conditions.

iv. Note the interaction between the surface water (visible) and the ground water (visible only through the glass sides of the container).

v. Drill a well on the dry (land) side of the container by pushing the drinking straw into the gravel to the ground water.

Discussion

i. What would happen to the ground water if water was added to the visible pool? What natural condition does this illustrate?

ii. What would happen to the surface pool if water was slowly poured onto the gravel? What natural condition does this illustrate?

iii. Could we remove most of the water from the aquarium by sucking on the drinking straw? What ground water phenomenon does this illustrate?

Activity 7. Recharge research

Aim

This activity demonstrates the effects that different soil types have on the rate of recharge occurring in the upper parts of catchments. The greater the recharge, the greater the build up in the ground water will be.

Materials required

Small amounts of three different soils

Three old plastic soft drink bottles (1.25L size)

Three old jam jars or similar

Water

Procedure

- **i.** Cut the bottom off the three bottles, so that you are left with the neck and sides of the bottles – this is the part of the bottle to be used in this experiment.
- **ii.** Place the inverted bottle top in a jam jar, so that the bottle top is standing 'upside down' in the jar. Make sure that the mouth of your bottle is resting on the bottom of the jar to stop the soil falling straight out.
- **iii.** Carefully fill each upside down bottle top with a different soil type.
- **iv.** Gently pour the same amount of water into each bottle and observe the rate of flow of the water through each of the different soil types.

Following up

- **i.** Through which soil did the water pass most readily (quickest)?
- **ii.** Through which soil was the rate of movement the slowest?
- **iii.** How might these rates have been altered if a plant had been growing in the soil in each bottle?
- **iv.** What would this have meant in a natural landscape?

Activity 8. Introduction to mapping

Part 1. What makes a good map?

Aim

To identify the important features of a map and encourage students to include this information on any map they draw.

Materials required

A number of maps, preferably large so that they are easy for students to read. They should be simple maps an all have a title, legend/key, direction of north, scale, and preferably a border.

The topographic map for your area

Procedure

Study your maps carefully and list the **four** (4) important labels on your map. (These 4 labels should be on any map that you use or draw.)**

Following up

i. See if you can see any maps that do not have these features.

ii. Look at the topographic map you are going to use for Saltwatch. Identify each of the 4 labels on this map.

**Answers – Title, legend/key, north point, scale

Part 2. Using the legend

Aim

To identify what a legend/key is and how it can be used.

Background

If you look at a map you will see that it has a *legend* or a *key*. This allows a lot of information to be shown on the map without cluttering it up with too many words.

Materials required

Copies of the ***Property Plan of Wyoming*** (on next page)

A copy of the topographic map being used for Saltwatch

Procedure

iii. The ***Property Plan of Wyoming*** has a legend or a key. See how many of the features in the legend you can find on the map. Check this with your neighbour.

iv. What does the legend/key tell you about how this farmer uses his farm?

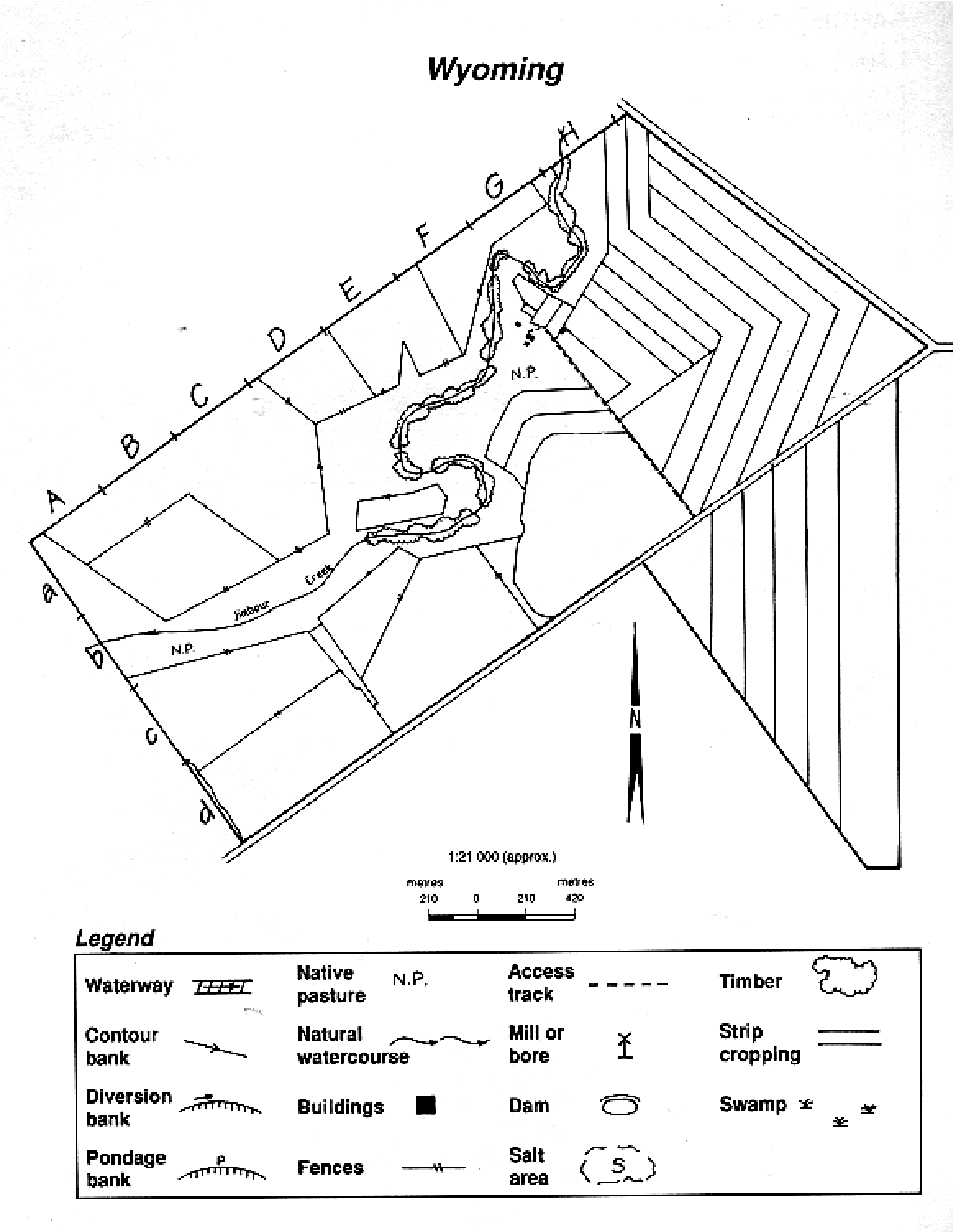
Discussion: Why are there some features in the legend that do not appear on your map?

v. Look at the legend on your Saltwatch topographic map and identify any symbols similar to those in the ***Property Plan of Wyoming*** .

vi. What are some of the different symbols? What do they represent?

vii. Using your Saltwatch topographic map, study the legend carefully and:

- **a.** work out how different colours are used to represent different types of features
- **b.** identify some of the features around your home, school and local community.



Property Plan of Wyoming (from Landcare in the Field: Dalby Farm Studies)

Part 3. Drawing your own map

Aim

For students to see that plans/maps may be simple and are easy to draw.

Materials required

Paper

Pencils

Erasers

Procedure

i. Draw a square or rectangle to represent your classroom.

ii. Use symbols, letters or colours to plot the following features on the map/plan:

- **a.** blackboard
- **b.** door
- **c.** teacher's desk
- **d.** student's desks/tables

iii. Be sure to give you map a title eg. "My Classroom" and draw up a simple legend.

Following up

You might like to draw a map or plan of your favourite room at home.

Part 4. Scale… what is it?

Background

When areas are represented on a map or a plan they are drawn "to scale", ie. the object which is drawn on the map is in proportion to the object it is representing on the ground. When you drew your plan of the classroom you estimated its shape and size. From your drawing it is not possible to work out the size of your classroom. If you drew it to scale you would be able to calculate distances and sizes.

Aim

For students to understand what a simple scale is and how it is used.

Materials required

paper, pencils, eraser and ruler

the *Fence Diagram* (at the end of this activity)

a tape measure (preferably builder's size)

Procedure

Calculating distance

i. The *Fence Diagram* below has been drawn using a scale where 1 cm represents 1 metre.

a. How many centimetres long is the fence from point A to B?

b. If 1 cm represents 1 metre, how long is the fence in metres?

c. How many centimetres high are the tops of the fence posts from the ground?

ii. Using the same scale 1 cm represents 1 m, how:

a. wide is the double gate?

b. high is the gate?

iii. How fare from the gate (approximately) is the letter box?

iv. You have been given enough trees to plant at 1.5 metre intervals along the fence.

a. using the scale 1cm represents 1 m, mark on the fence where you will plant the trees.

b. How many trees will you be able to plant?

Drawing things to scale in the classroom

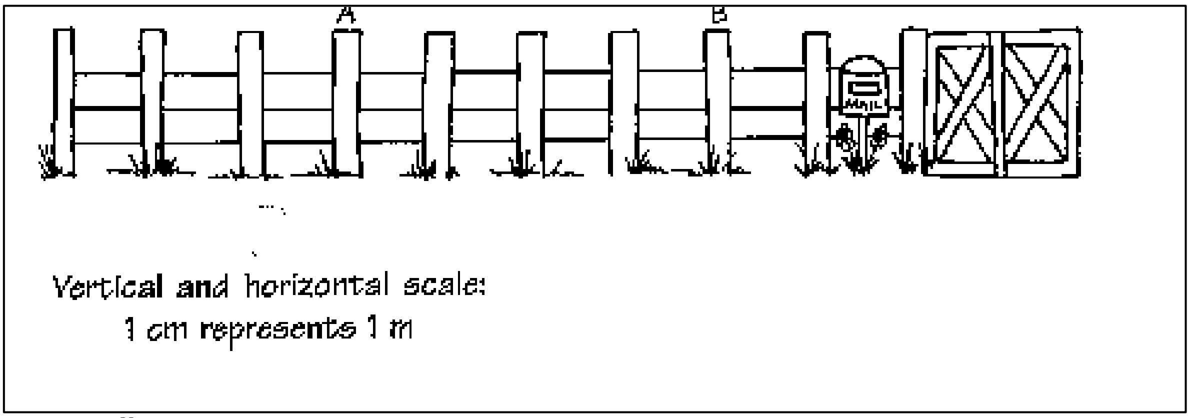
v. In groups of three (two groups using the tape measure and once recording the distances) measure the width and length of your classroom.

vi. With your teacher, work out a suitable scale for your plan that you are going to draw.

vii. Using this scale draw up a plan of your classroom.

viii. Measure the doorway width and some of the windows and mark these on your plan.

If you are adventurous you might like to draw other features of your classroom (tables, etc.) to scale on your plan.



Fence diagram

Part 5. Using a scale

Aim

To understand how scale on a map is presented and used.

Background

There are three main ways that scale is shown on a map:

1. As a ration, eg. 1:100 000 where the unit of measurement is the same on both sides of the ration symbol (:). It may be centimetres, metres, kilometres, etc.
2. As a statement, eg. 1 cm on the map represents 1 km on the ground.
3. As a linear or line scale. 

Most maps will include the linear and the ration form. When you use these you often put them into statement form.

Handy hint: There are 100 000 centimetres in a kilometre.

Materials required

Topographic map being used for Saltwatch or other maps

Ruler

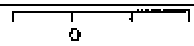
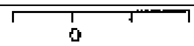
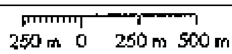
Pencil

Procedure

i. Using your Saltwatch topographic map find out the ways in which scale is shown on the map.

ii. If there is a linear scale, work out how many kilometres to the centimetre there are. How many metres will there be for each centimetre?

iii. Complete the table below by filling in the gaps.

Ratio	Word/statement	Linear/line
1:250,000	1 cm represents__________	
1:100,000	1 cm represents 1 km	
________________________	1 cm represents 0.5 km	
________________________	________________________	
1:10,000	________________________	________________________

iv. Using your Saltwatch map select some obvious locations or features and measure the distance "as the crow flies" (in a straight line directly from one point to the other) between these features. Use the scale on the map to calculate the distances in kilometres and metres. Try some small distances, eg. 400 m, so that you use the smaller divisions on the linear scale.

Part 6. Finding locations on a map

Aim

To introduce students to locating features using a simple reference system.

Materials required

The *Property Plan of Wyoming* (used in '*Part 2. Using the legend'.*)

Street directory

Procedure

i. Using the *Property Plan of Wyoming* identify which feature is located at each of the reference points listed below. The letters on the reference refer to the upper and lower cast letters around the edge of the map.

- **a.** Ec
- **b.** Fb
- **c.** Gd
- **d.** Cc
- **e.** Aa
- **f.** Hc

ii. Find the page in your street directory where your school is located. Identify some features in your area and work out the reference for them. Use the letters and numbers around the map.

iii. Test your neighbour with the references you have worked out.

iv. Why is it difficult to give references for the exact location of any feature when using only two numbers in the reference?

Activity 9. Making soil

Aim

To help students understand that soil takes a long time to form.

Materials required

2 pieces of sandstone

a teaspoon

a stopwatch

a handful of soil

Procedure

i. Rub two pieces of sandstone together and collect the particles produced on a piece of paper.

ii. Answer the following questions:

a. How long does it take to make a teaspoonful?

b. Is this material really soil? Why/why not?

c. Do you think plants would grow well in this material? Why/why not?

Following up

i. Collect a handful of soil from around you school or home. Sort the soil into grains of sand, plant particles, animal particles, and other things.

ii. If the ground-up rock you made previously had all these particles in it, it would also be called soil. Make your ground-up rock into soil.

iii. You have mixed up many of the ingredients found in soil to make your home-made soil, but there is one thing you can't add – time. It takes hundreds of years to make soil.

Activity 10. Protecting our soil

Aim

To see which absorbs water more quickly – a bare or grassed soil surface.

Materials required

A watch or stopwatch

String

A bucket of water

Procedure

- **i.** Put the string out into a 30 cm x 30 cm square on bare flat soil. (Have your watch ready for timing.)
- **ii.** Pour the water from the bucket onto the soil from a height of 5 cm. Pour it as fast as you can without letting it spread outside the square. Time from when you start pouring until all the surface water has soaked into the soil. How long did it take for the water to soak in?
- **iii.** Repeat the activity on a square of soil with a healthy grass cover. Make sure you use the same amount of water. How long did it take for the water to soak in this time?
- **iv.** Repeat *Steps 1-3* but this time quickly tip all of the water out of the bucket in one go. Does all the water soak in? What is the name for water spreading outside the square?

Discussion

- **i.** In a storm, in which situation (bare or plant covered soil) is water more likely to run off and cause soil erosion? Explain your answer.
- **ii.** What happens to the water that soaks in?

Activity 11. A taste of salt

Aim

To allow students to taste water of known salinity concentrations and to compare these with little known salinity levels from various catchments.

Background

A measure of salinity is the concentration of salt ions in the water. Concentration is often expressed as microsiemens per centimetre (µS/cm). To the uninitiated, concentration figures may be meaningless. This activity aims to overcome that hurdle, by inviting you to taste solutions of varying concentrations. It is guaranteed to capture your interest and serves as a useful introduction to the topic of salinity. It also serves as a timely reminder of just what salty water is really like!

Materials Required

- distilled water (6 L)
- table salt
- six 1 L containers
- laboratory scales
- disposable cups (enough for each member of the class)

Procedure

i. Number the 1 L containers 1-6

ii. In each container prepare a salt solution by adding one litre of distilled water and the amount of salt indicated in the below table.

Container	Salt added (grams)	Environment simulated
1	0	Control – distilled
2	0.15	Upper limit of fresh water – 250 µS/cm
3	1	Upper limit of marginal fresh water – 1 667 µS/cm
4	3	Upper limit of brackish water – 5000 µS/cm
5	35	Sea water – 58 333 µS/cm
6	130	Once recorded salinity of a saltwater pool in Barr Creek, a tributary of the Murray River – 216 666 µS/cm

Note: One level teaspoon holds about five grams of salt.

iii. Taste each of the six solutions in turn. Cups should be rinsed out after each tasting.

Activity 12. The visible and the invisible

Aim

To demonstrate the difference between dissolved and suspended solids in water.

Materials required

a large glass beaker or jar table salt

blackboard chalk or talcum powder

spoon or stirring rod

Procedure

i. Fill the beaker with tap water.

ii. Place a teaspoon of table salt into the jar and stir. Note what happens to the salt.

iii. Place a teaspoon of chalk into the jar. Observe that the dispersed powder is visible in the jar.

iv. Answer the following questions:

  a. Which material was dissolved in the water and which was suspended.

  b. Which material would be easier to remove? Why?

  c. How could we detect the presence of the salt in the water?

Following up

As an additional step the suspended powder can be removed using a sand filter.

Activity 13. Making salt

Aim

To demonstrate that all natural waters contain salts.

Materials required

Pyrex beaker Bunsen burner

Procedure

i. Fill the pyrex beaker with tap water and place it on a Bunsen burner. Let it boil until all the water has evaporated.

ii. Remove the beaker from the heat as soon as the water has evaporated. The beaker will be very hot when you take it off the flame, so place it on a heat-resistant mat and wait until it cools before you refill it with cold water.

iii. Carefully add more water. Alternatively, remove the beaker from the flame, let it cool slightly, and fill it with warm water.

iv. Repeat this process a number of times. After three to six repetitions, depending on how much water you use and whether tank water or town water is used, a layer of salt should develop in the bottom of the beaker.

Following up

i. Accurately measure the weight of dissolved salts in water from different locations.

ii. ***Note:*** *This experiment can only be conducted if a balance is available which can accurately weigh samples to a level of accuracy of 0.01 grams.*

iii. Take 1 L samples of water from a number of different sites (creeks, bores, ocean, and so on). Measure the electrical conductivity of each sample as you do for Saltwatch.

iv. Accurately weigh a number of pyrex beakers at room temperature. Using one beaker per water sample, evaporate each of the water samples completely (as described in steps 1-5 above). Alternatively, the water can be evaporated in an oven at 80°C, but this will take a few days.

v. When the beakers have cooled to room temperature, weigh them again. Subtract the initial weights from the final weights to determine the weight of salt in mg/L.

vi. On graph paper, plot the electrical conductivity (EC) of each sample against its weight of dissolved salts in mg/L.

a. What is the relationship between the two sets of data?

b. Discuss any discrepancies in the data.

c. What else, other than salt, could be dissolved in the water samples?

Activity 14. Desalination

Aim

To understand the concept of desalination.

Background

Although 97% of the world's water is held in the oceans, it is of very little use to people except for recreation, waste disposal and for transportation. We cannot drink it because the taste is unpleasant and if consumed in sufficient quantities, it will make us sick. It cannot be used for washing, since most soaps will not lather in it. Machines and metals rust and decompose very quickly in salt water, so it cannot be used in industry. It is possible to obtain fresh water from the oceans or other salty water. The process is called desalinisation. The following experiment illustrates this process.

Materials required

For each group carrying out the experiment prepare:

- A large beaker which does not have a pouring lip
- A small beaker (which will fit with a lot of room to spare in the large beaker)
- A concave dish which will fit over the top of the large beaker
- Some table salt
- A lead sinker

Procedure

i. Dissolve some salt, say three tablespoons, in a litre of water in the large beaker.

ii. The students may care to place a little of the water on their tongues to determine how salty it is. If the water is not very salty, add a little more salt.

iii. Sit the small beaker in the large one, ensuring that none of the saline water gets into the small beaker. The small beakermay start to float. Perhaps a lead sinker in the bottom of the small beaker will overcome the problem.

iv. Place the concave dish face up over the large beaker.

v. Place the beakers in a sunny spot. Observe what happens over several days.

vi. When the experiment has finished discuss with your group what happened. Write a report describing what you have observed and attempt to explain what has occurred.

Activity 15. Salt – what if?

Aims

To develop receptivity to other perspectives and acquire an understanding of the systemic nature of the world.

Materials required

Role cards

Chart with scenario (below) written up or on handouts or blackboard

Students may wish to present using a variety of media such as posters, photographs and charts.

Scenario

A farm in the middle of a catchment has a salinity problem. There are farmers upstream and down who are yet to discover any salinity. There are the typical problems on the farm of trees dying, loss of farming potential, water logged ground and salty bore water. The local town relies on farm produce and on farmers spending their money in the town. Town people rely on work on the local farms. People in the not-too-far away large city also rely on the farm products. The Landcare or Waterwatch facilitator has called a meeting for these people to attend to discuss the salinity problem.

Roles

- *Farmer with salt problem* - You have lost land to salt, reduced land for crops and stock. The water form your bores is salty.
- *Farmer upstream* - No salt yet; lots of cleared farming land.
- *Farm downstream* - No salt yet.
- *Animals, domestic and native, on farm* – Loss of habitat, feed and water
- *Stock hand* – From the small town; may lose job if land is not able to be farmed; no other qualifications
- *Shopkeeper* – May lose trade from farmer, stockhands and others in community if farms lost productivity.
- *Local government councillor* – has to help solve problems with limited funds.
- *Social worker/religious minister* – Have to respond to increasing number of people in crisis
- *Consumer in large city* – has to pay more for items to come from farther away
- *Landcare facilitator* – Helps community decide what they are to do, if anything.

Procedure

i. Students choose a role individually, or preferably in pairs or small groups and discuss their roles.

ii. Then all come together for the meeting to discuss the following:

   a. What should the farmer with the salt problem do, if anything?
   b. What is the role of others?

The Landcare/Waterwatch facilitator (possibly the teacher, especially for younger students) needs to run the meeting ensuring all groups have an opportunity to speak and to encourage ideas being built on other ideas. The facilitator should not influence the group decisions directly by voicing his/her opinion but by questioning and drawing out ideas. The areas which should be considered by each role taker involve:

- Income for food, shelter and clothing
- Implications of loss of income and how this affects individuals, local community, nation and globe
- Source of funds for implementation of correction measure or changed farming techniques
- Individuals changing their work practices and how they can get help/training in doing this.

Activity 16. Water movement in plants

Aims

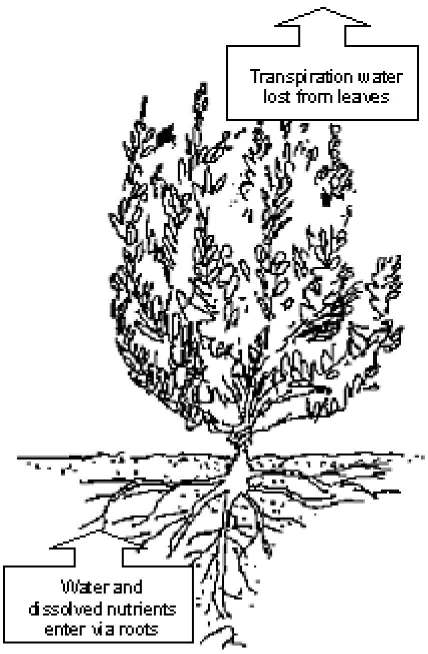
To carry out two simple experiments that will provide evidence of how water travels through plants.

Background

Despite the variety in plants, all flowering plants have the same basic structure. The main parts of the flowering plant are the roots, stems, leaves and flowers. Each of these parts carries out its own special functions, so that the plant as a whole is able to grow and reproduce itself.

The principal function of the roots is the absorption of water and dissolved substances from the soil. These dissolved substances are called mineral salts. The solutions are conducted up the stems to the leaves through a system called xylem (pronounced zy-lem) vessels.

A living plant does not retain all the water it receives from the soil; much of it evaporates into the atmosphere through tiny openings in the leaves called stomata. This process is called transpiration. It is essential to the life of the plant since this water movement helps to pull solutions up the stem, providing rigidity for the plant. If the leaves are removed, the roots absorb water at a much slower rate.



Water Movement in Plants

Materials required

rubber bands	freezer bags with ties
coffee jars	food dye
celery stalks	water
single edged razor blades	pot plant (optional)

Procedure

__Experiment A.__

i. At the start of the lesson, place a dry freezer bag over part of a plant in the school garden and secure with a twist tie

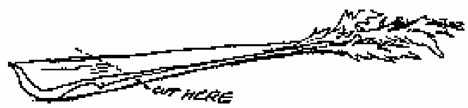
ii. Alternatively, place the freezer bag over a pot plant and secure with a twist tie.

iii. Next day observe the bag, and carefully remove it. Record your observations.

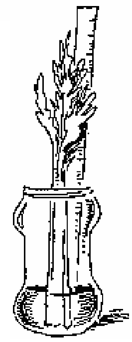
iv. Draw a series of sketches to show how you carried out this experiment. Include an explanation of what you did.

__Experiment B.__

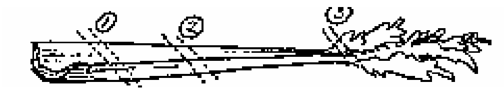
i. Obtain a stick of celery and carefully cut straight across the base.



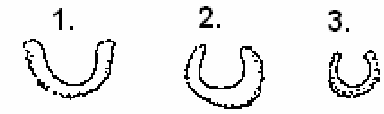
ii. Place this end into a coffee jar containing food dye or ink dissolved in water. Ensure that the celery stick stands upright. Leave overnight.



iii. Carefully make slices of the stem.



iv. Draw a sketch and colour it in the same as the sections you see below.



v. Examine the leaves, sketch and colour what you see. Cut them into smaller pieces if you wish.

vi. Complete your observations with brief notes.

Experiment questions

i. Study your observations carefully and answer the following questions:

ii. What did you find in the freezer bag when you returned the next day?

iii. Where might this have come from?

iv. How does water travel from the roots to the leaves?

v. What effect might the large-scale removal of trees and other deep-rooted plants in a catchment have on the moisture (water) content of soil?

vi. Suggest how this action could contribute to a salinity problem in the catchment.

Activity 17. The effect of salinity on seed germination

Aim

To investigate the effect of salinity on crop germination

Background

This experiment is best run over a period of one to two weeks in order to give the seeds adequate time to germinate. Bean and sunflower seeds are suggested, however, seeds of barley, lucerne, wheat, oats, mung beans and millet are equally worth investigation. Students may compare results for different seeds.

Materials required

seeds of sunflowers and beans

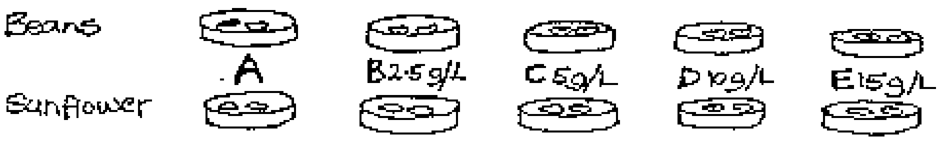
10 petri dishes
filter paper
distilled water
plastic film (food wrap)

five salt solutions at the following concentrations in plastic squash (squirt) bottles:

- **a.** Distilled water
- **b.** 0.25 grams salt per litre (g/L) distilled water
- **c.** 1 g/L
- **d.** 2 g/L
- **e.** 2.5 g/L

Procedure

- **i.** Place filter paper in the bottom of each petri dish.
- **ii.** Label two dishes for each concentration (i.e. you should have two dishes labelled a. distilled water, two labelled b. 0.25 g/L, etc.)
- **iii.** Spread bean seeds (not too thickly) across the filter paper on one of the dishes labelled ‘a’. Then spread sunflower seeds in the other dish labelled ‘a’ (Other seeds, as listed above can be used.)
- **iv.** Repeat step 3 for each of the remaining dishes labelled ‘b’-‘e’. There should be five bean dishes and five sunflower dishes.
- **v.** Add distilled water to each dish labelled ‘a’. Add sufficient only to moisten the seeds. Excess water is not necessary.
- **vi.** For each of the remaining dishes, moisten using the appropriate salt solutions. For example, solution b.0.25 g/L should be added to the dishes labelled ‘b’.



vii. Cover each dish with plastic film to prevent it drying out. Place the dishes on a bench in a safe place, not necessarily in sunlight.

viii. Check the dishes every two days and add solution as necessary to keep the seeds moist. At each check, count the number of germinated seeds.

ix. Continue checking and recording over a period of one to two weeks.

Studying the data

i. Record the results in a table similar to the table below (one table for each seed type).

Seed type:			
Salt Concentration	Number of germinated seeds		
	1st count	Final count (continue up to final count)	Class total
A			
B			
C			
D			
E			

ii. Draw bar graphs of the results, showing the bars for beans in one colour and sunflowers in another.

iii. What effect does salt appear to have on see germination? Explain.

iv. How did the two kinds of seed respond to the salt solution? Point out any differences between them.

v. What are the implications for farmers in salt-affected areas?

Activity 18. The effect of salinity on plant growth

Aim

To test the effect of different salinities on the growth of plants.

Background

High salinity in the root zone affects the growth of many plant species. Total growth and leaf area are affected. Different plant species may have different tolerances to salinity. This experiment takes approximately 5-6 weeks to complete.

Materials required

20 litres non-saline nutrient solution ("Aquasol" or similar mixed as per instructions; ensure micro-nutrients are included)

germinated seeds from pervious activity

coarse washed sand

5 plastic flower pots (15 cm diameter)

measuring cylinders

beakers

foil

5 salt solutions using the nutrient solution in plastic squirt bottles at the following concentration:

- **a.** nutrient solution only (control)
- **b.** 0.25 grams of salt per litre (g/L) of nutrient solution
- **c.** 1 g/L
- **d.** 2 g/L
- **e.** 2.5g/L

Procedure

- **i.** Germinate the seeds in washed coarse sand using the non-saline nutrient solution pots until they have reached the first trifoliate leaf stage. Have four plants in each 15 cm diameter pot of sand.
- **ii.** Make up nutrient solutions.
- **iii.** Irrigate each of the pots when necessary from the top of the sand and let the excess solution drain away through the bottom of the pots. To save on solution you can grow the plants in beakers of solution and change the solution once a week-the plants will deplete the solution of some of the elements over that time and it needs to be replaced. If growing in solution, it will be essential to provide aeration to all root solutions. Use an air pump (e.g. an aquarium pump and a fish tank aerator in each beaker). The beakers of solution need to be wrapped (e.g. foil) to keep the roots dark.
- **iv.** Carefully measure the amounts of solution to, and amount of drainage from, each pot over the next three weeks. Measure plant growth i.e. height of stem above soil. Note events such as appearance of new leaves, and any strange

symptoms on leaves. Use table at the end of this activity to record your observations.

v. At the end of 3-4 weeks when obvious differences have occurred in the treatment plants, harvest the trial, dry and weigh the shoots. If the equipment is available samples of shoots could be analysed for Cl and/or Na contents.

Following up

i. Compare a halophyte such as a saltbush with non-halophyte such as a bean to see the effect of different levels of salinity on growth and survival.

(Kindly reproduced from Victorian Saltwatch Activity Book.)

Solution (salt g/L)	Observations									
	Amount of solution						Stem height	New leaves	Leaf appearance	Harvest dry weight (relative yield)
	Wk 1		Wk2		Wk3					
	I	O	I	O	I	O				
Control										
0.25 g/L										
1 g/L										
2 g/L										
2.5 g/L										

I = in or added
O = out of drainage

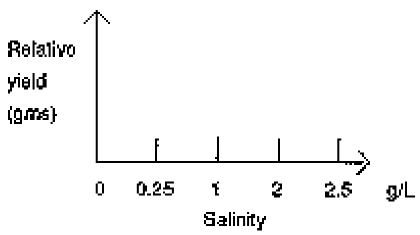
<u>Using the Table</u>

ii. Describe your results

iii. Is there a relationship between the amount of water used and the salinity of the different experiments? Explain.

iv. Plot:
   a. the harvest dry weight (relative yield) against salinity on graph a.
   b. the stem height against salinity on graph b.

a.



b.

v. Is there any relationship revealed by the data? Explain.

Activity 19. Building your own groundwater observation equipment

Aim

To show students how to make and use their own equipment.

Materials required

1 x 3 m length of 90 mm PVC storm water pipe

2 x 90 mm push-on storm water caps

1 x 3 m length of 12 mm dowel

1 x plastic bottle with a lid

a 100 mm soil auger which can be extended from one to three metres in length. A 150 mm diameter hole is preferred

a hacksaw

Procedure

Note: Before starting this activity check the depth of your local watertable. If it is deeper than 3 m this activity will be too difficult to do.

i. Dig a hole 3 m deep with the soil auger.

ii. Use a hacksaw to cut clots into the PVC pip at 10cm intervals. Make sure the slots extend to half the length of the pipe.

iii. Drill an 11 mm hole through the lid of the plastic bottle. Insert the dowel into the lid, ensuring the lid seals against the dowel to prevent water entering the bottle, and then screw onto the bottle.

iv. Through one storm water cap or stop end, drill a hole which will allow the dowel rod to slide freely through it. Drill three small holes in the other storm water cap or stop end to allow water into the base of the test well.

v. Push the stop end with three small holes onto the slotted end of the pipe. Insert the dowel with the bottle attached into the opposite end of the pipe. The remaining stop end with the single hole is then placed over the dowel and onto the top of the pipe.

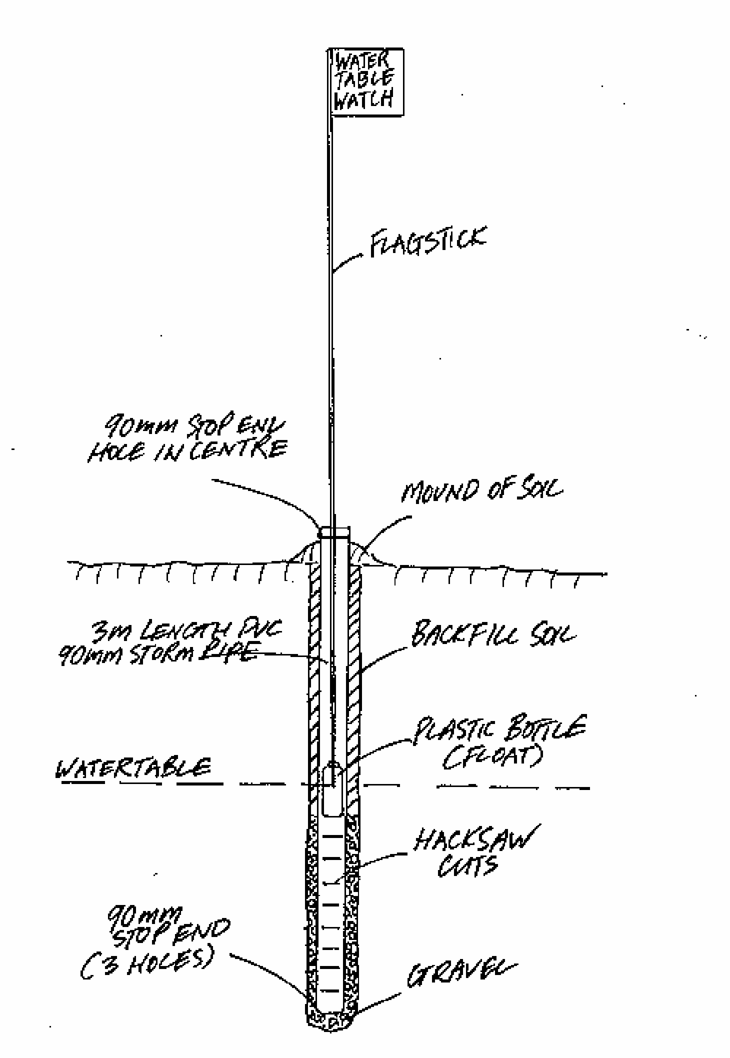
vi. Cover the bottom half of the pipe with a suitable material to keep dirt out of the test well. An old stocking or panty hose leg works very well. The test well is now ready for installation (see diagram of ***A ground water observation bore*** below).

vii. Throw a handful of gravel into the bottom of the hole before putting in the test well as this prevents silting. Place the completed well into the hole, then backfill it with sand or gravel to a level just above the slots. Fill in the remainder of the hole with loose soil.

viii. Ensure the top of the well is mounted to prevent surface water from filling the well and giving a false reading.

ix. The test well works when water from the saturated soil enters the well through the slots on the bottom of the pipe. The gravel or sand apts as a filter preventing dirt entering the test well with the water. As the level of the watertable rises, the bottle begins to float and pushes the dowel rod further out of the well, thus giving an easy reading of the watertable level.

x. Use your ***easy-read test well*** and bailer and plopper to monitor the watertable level at regular intervals over a period of time.



A ground water observation bore

Activity 20. Games to play

Salt Monster

Aim

To consolidate knowledge about salinity.

How to play

Salt Monster is another variation of "tiggy". Initially, a single student takes on the role of the Salt Monster. All the other students represent plants. Using an appropriately evil sound, the Salt Monster chases the potential victims. The first student caught becomes part of the Salt Monster by holding onto the Monster's waist. As each student is caught, they become the end of the monster's tail - until all the students have become part of the monster.

Salt Patch

Aim

To consolidate the knowledge that plants are affected by salt.

Materials

hoops or chalked shapes marked on the floor or school-ground to represent salt patches

How to play

Eight or so people hold hands to form circles round each salty danger area. Each player, while pulling and trying to maneuver the others into the salt patch, tries to keep out of the salt. They must not let go hands. At the end of the game, those plants which have not encountered the salt, win the survival battle. They live. Those plants which brushed the salt wilt and wither. Those which were right into the salt can stage a slow and dramatic death.

SSSSSSSSalt

Aim

To consolidate knowledge about salinity.

Materials required

one blindfold for each participant

Note: The space must be cleared of all obstacles, since all players will be blindfolded. ***NO RUNNING is a firm rule.***

How to play

One person is designated Salt, while the rest are plants. With blindfolds in place, everyone moves slowly about the space, arms outstretched. Salt also moves about, making a s-s-s-s-s sound until they catch someone, whereupon the sound becomes s-s-s-s-salt!, thus alerting the rest that someone has been caught. The other plants must listen closely to locate the s-s-s-s; and try to avoid being caught by moving away from the sound. The caught ones become salt-affected, and try to catch each other in the same way. Eventually, the salt will have insidiously affected all the plants, because as more and more voices are hissing, it becomes harder to avoid capture.

Variation

Two or three people can be designated Salt, and as people are caught they can remove their blindfolds and move to the sidelines to watch. This way, it becomes harder for the salt ones to catch others as more space is cleared, but it can get boring for those captured early on.

Try both and let the students decide!

Activity 21. What do you know?

By now, you probably know quite a bit about salinity and the problems it causes. Why not test your friends and family on their knowledge of salinity?

You may like to design your own questionnaire, or use some of the questions below for starters. The questions on this page are designed to be read verbally (out loud) to the person you are interviewing. It is important that you keep the questions in the same order, otherwise you might give away clues to the correct answers! Happy surveying!

1. What is the single greatest threat facing the environment of Queensland?
   a. bushfires
   b. erosion
   c. salinity
   d. pollution

2. At the time of European settlement (1824), Queensland was covered mostly by ”forest” or ”dense woodland”. About what proportion of Queensland still has this type of cover?
   a. 55%
   b. 33%
   c. 25%
   d. 10%

3. The Murray-Darling river basin extends across parts of which Australian states?
   a. SA, Vic, NSW and Qld
   b. NSW, Vic and the ACT
   c. NSW, Vic and SA
   d. SA, Vic, NSW, Qld and the ACT

4. Does Queensland have a salinity problem?
   a. yes, in some areas
   b. no
   c. impossible to say
   d. it really depends on the weather

5. Where is salt-affected land found in Queensland?
    a. in some irrigation regions
    b. in the Lockyer Valley
    c. mainly in south-eastern Queensland
    d. in some non-irrigation areas
    e. in all of the above

6. How much of Queensland's productive land has already been damaged by salt?
    a. 500 000 ha
    b. 100 000 ha
    c. 40 000 ha
    d. 10 000 ha

7. What is the fundamental cause of Queensland's salinity problem?
    a. removal of natural vegetation
    b. rising saline watertables
    c. erosion
    d. the use of agricultural chemicals
    e. summer fallowing of crops

8. A shall watertable threatens about 385 000 ha of Australia's largest irrigation area. What is the area called?
    a. The Shepparton Irrigation Region
    b. The Murrumbidgee Irrigation Area
    c. The Goulburn-Murray Irrigation District

9. Who does the salinity problem in Queensland really affect?
    a. all Queenslanders
    b. all rural communities
    c. some rural communities
    d. some farmers and their families

Answers: 1. b, 2. b, 3. d, 4. a,a5. e, 6. d, 7. a, 8. c, 9. a.

Activity 22. A quiz for Saltwatchers

1. Can you sort out these jumbled words?
   a. trawe
   b. ilos
   c. niystlai
   d. vrrei

2. How is the salt content of water measured in Saltwatch? (circle the correct answer)
   a. by smelling it
   b. by using an EC meter
   c. by looking at the colour of the water

3. What does the unit of measurement "EC" stand for?
   a. energy cells
   b. ET's cousin
   c. Electrical conductivity

4. What is the watertable?
   a. the name given to the bedside table of someone who sleeps in a waterbed
   b. the upper surface of the ground water
   c. the special table used in laboratories for examining water

5. What is ground water?
   a. water found below the earth's surface in a wet zone of the soil or rock
   b. water which has been crushed very finely
   c. water which is salty

6. What is a bore?
   a. a type of tractor
   b. a male pig
   c. a hole drilled into the ground to reach the ground water

7. What is a catchment?
   a. a type of raincoat
   b. an area of land in which water drains to the lowest point (for example, creek, river, lake)
   c. an area of salt-affected land

8. Underline the odd word out in each of the following:
   a. soil / water / dairy / forest / river
   b. green / salt / salinity / ground water / watertable
   c. catchment / paddock / farm / lucerne / field

9. What is the name of the important river along the Victorian/New South Wales border which has been getting salty?

10. There are two main types of salting associated with land use. What are they?
    a. _ r _ _ a _ _ salting
    b. _ r _ _ g _ t _ _ n salting

Think about this: How does your involvement in Saltwatch help us to work together to solve Queensland's salinity problems?

Answers: 1a. water. b. soil. c. salinity. d. river. 2. b. 3. c. 4. b. 5. a. 6. c. 7. b. 8a. dairy. b. green. c. lucerne. 9. Murray River. 10. dryland. b. irrigation.

Activity 23. Super salinity puzzle

Find the hidden words

F	K	P	B	V	L	D	V	D	V	Q	C	O	X	J	P	P	R	O	C	K	K	G	D	E	W	Y	W	E	W
L	R	P	T	I	N	S	E	O	T	L	E	Y	W	I	X	T	X	F	M	Z	S	Z	N	I	P	B	Q	C	H
F	X	D	N	C	D	E	A	D	R	C	U	S	Z	V	G	F	R	U	N	O	F	F	Q	I	X	Y	O	O	M
M	U	J	W	N	E	D	R	Z	T	A	N	R	U	Q	B	C	Y	Y	Z	X	Y	Q	K	N	P	N	U	I	K
K	Y	Y	G	V	H	Y	M	D	R	Z	W	S	M	F	O	B	S	E	B	N	J	F	Q	W	D	M	M	D	M
I	N	Z	W	O	F	Y	Q	A	L	H	L	Z	Q	O	P	K	T	A	E	C	D	D	B	U	A	E	U	M	N
J	Z	H	K	G	U	C	V	M	D	W	F	I	M	O	G	Y	J	X	V	G	J	G	C	J	H	X	V	P	C
Y	H	S	Z	S	A	K	A	S	I	S	S	F	V	I	F	R	P	G	S	W	O	T	Z	W	W	X	L	J	R
Q	K	S	M	J	W	V	O	G	A	F	S	H	Z	C	Z	G	Z	Q	H	C	I	C	Y	C	A	Z	Q	B	Q
L	U	N	T	M	Y	L	Z	L	T	U	L	U	L	P	G	X	T	F	W	V	L	Y	E	H	W	P	J	F	D
Z	U	C	V	O	C	J	I	G	J	E	K	T	E	S	F	J	L	E	I	N	S	U	O	T	I	A	K	E	F
R	N	G	Z	M	O	N	O	C	U	R	E	M	J	E	I	Y	J	T	G	B	R	V	L	L	U	I	C	I	G
J	P	X	X	W	I	R	L	Y	D	R	C	F	A	L	U	R	Y	S	D	N	R	R	R	A	E	B	U	M	D
C	V	Y	F	T	A	M	P	Z	O	O	P	C	O	A	K	F	E	T	N	K	G	L	E	S	G	M	A	N	B
G	D	U	Y	U	Z	K	S	S	V	K	O	E	L	E	V	Z	S	U	I	H	Z	S	L	D	Z	E	S	Q	U
R	S	J	W	A	Z	Q	I	P	T	S	K	C	A	R	C	T	Y	N	D	D	D	Z	K	G	L	O	A	U	B
U	D	T	I	Z	K	O	C	H	X	P	H	N	P	C	J	C	W	O	Y	M	G	E	E	D	I	G	W	Y	P
I	B	T	P	I	N	H	O	P	Y	M	N	O	X	S	A	A	R	B	F	B	W	U	N	L	X	D	A	L	W
L	Y	Q	K	W	L	O	A	W	Z	F	H	T	N	E	J	E	Y	G	M	B	T	U	V	O	F	I	T	P	A
O	Q	V	U	E	O	V	M	J	Z	I	J	K	C	K	N	D	L	A	L	B	O	H	N	Q	U	I	E	P	P
Y	D	E	Z	E	N	K	Q	Z	P	Q	M	W	Z	F	I	Q	R	G	E	R	L	G	U	H	E	J	R	F	Y
Q	W	G	S	T	E	G	A	W	P	I	U	L	V	I	U	M	B	Z	G	E	L	H	H	A	G	A	J	D	N
K	O	E	I	O	J	N	W	A	B	A	S	H	J	U	R	I	G	T	Q	V	M	N	P	V	H	G	J	X	E
A	V	T	V	X	P	T	S	P	H	O	W	G	H	T	P	L	B	S	J	A	H	M	W	G	Q	L	Y	W	W
D	N	A	L	Y	R	D	F	L	U	L	R	M	F	F	N	L	U	J	Y	H	Y	A	R	R	U	M	K	O	N
I	R	T	F	H	U	D	W	R	A	A	E	A	J	K	V	I	Q	M	R	U	S	O	U	L	U	G	S	S	Q
Y	A	I	T	T	U	N	D	N	Q	N	Y	Y	F	L	I	O	O	U	K	O	K	E	A	J	A	V	C	E	P
Z	D	O	L	W	B	W	L	F	R	D	D	D	G	B	V	N	X	M	N	G	R	L	R	J	D	T	F	J	C
H	E	N	M	W	N	I	X	P	D	N	H	A	L	V	B	S	N	G	A	V	P	M	Q	F	N	H	J	W	U
G	R	K	S	N	L	A	C	I	R	T	C	E	L	E	C	Q	K	M	V	J	Z	K	H	U	J	Z	T	I	L

Words

1. conductivity
2. main
3. salinity
4. EC
5. pumping
6. use
7. ground
8. land
9. runoff
10. dryland
11. NSW
12. soil
13. fresh
14. root
15. ruin
16. dead
17. Murray
18. sea
19. erosion
20. rock
21. water
22. cracks
23. millions
24. salt
25. electrical
26. Queensland
27. vegetation

Activity 24. Find-a-word

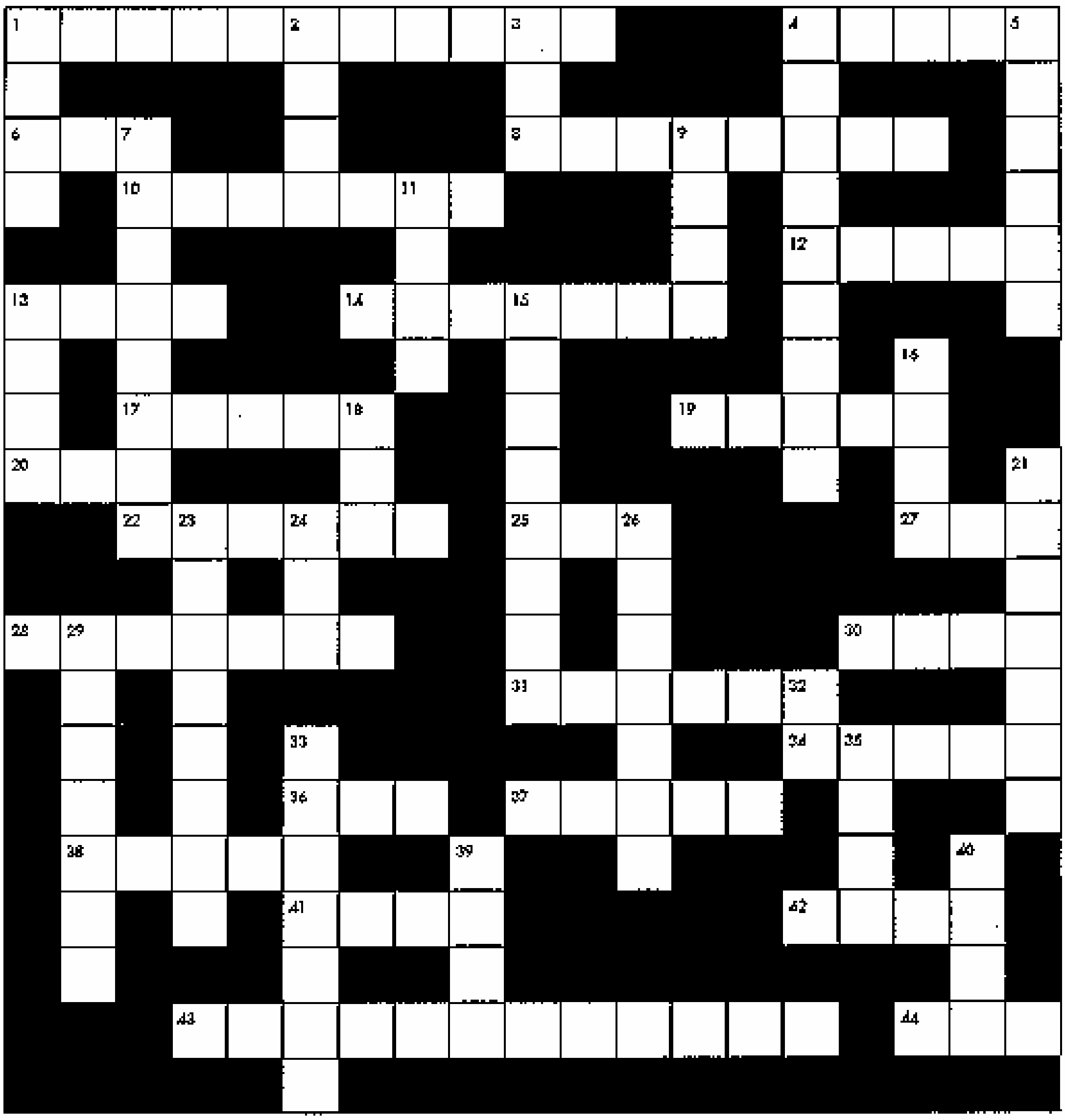
Find the hidden words in the puzzle

I	T	C	R	A	C	K	S	E	R	S	M
H	Q	S	A	U	T	H	T	O	G	T	S
M	M	U	R	R	A	Y	C	O	D	I	A
I	R	A	E	D	W	K	R	D	N	A	L
L	S	E	Y	E	O	M	L	U	C	M	I
L	S	Y	H	A	N	D	R	I	S	I	N
I	E	X	N	D	N	S	E	A	A	E	I
O	A	S	B	U	H	Y	L	E	W	S	T
N	E	G	O	C	M	R	O	A	I	E	Y
S	X	R	L	I	I	N	T	M	N	N	T
L	G	I	N	A	L	E	Y	S	T	D	A
A	L	A	C	I	R	T	C	E	L	E	O

Words

1. Queensland	**5.** water	**9.** land	**13.** cracks
2. dead	**6.** salinity	**10.** soil	**14.** millions
3. sea	**7.** use	**11.** Murray	**15.** electrical
4. trees	**8.** ground	**12.** rock	

Activity 25. Salty crossword puzzle



Clues across

1. The process of water changing from a liquid to a vapour.
4. These plants use more water than most plants.
6. Cation exchange capacity.
8. Groups to fight issues including salinity.
10. Brisbane's salad bowl.
12. In which European country might you get a salty tortilla?
13. A salty sea.
14. Shiny salt.
17. _ _ _ _ _ too much water and you have a salt problem.
19. Aerosol
20. A flat, salt-affected area.
22. Water found under the surface of the earth.
25. A rock _ _ _ can prevent a stream from deepening.
27. A period of time.

28. A high watertable.
30. Symptom of salt-affected plants.
31. A form of salt obtained from mines.
34. Water without sediment.
36. An electrically charged atom formed by loss or gain or electrons.
37. A very salty liquid.
38. The red-green form of this often occurs in inland streams.
41. A place form where we get salt.
42. Rising water levels in a _ _ _ _ indicate a potential salinity problem.
43. Evaporation _ _ _ _ _ _ _ _ _ _ _ _ _ salts.
44. An irrigation district in Queensland.

Clues Down

1. P_ _ _ _ trees can't tolerate high salt levels.
2. A substance of sedimentary, metamorphic or igneous origin.
3. A valuable liquid often found close to ground water.
4. Water movement from plants.
5. Salty.
7. Tree _ _ _ _ _ _ _ _ _ can lead to salt problems.
9. You need salt to make these pickles.
11. Australia's largest natural salt lake.
13. You can dive into this water.
15. A salt tolerant shrub.
16. A slice of volcanic rock that can obstruct the flow of ground water.
18. Salt will corrode _ _ _ cans.
21. Animal feed.
23. Water entry into aquifers.
24. Inappropriate land _ _ _ may lead to salt problems.
26. Drainage can _ _ _ _ _ _ _ _ salt-affected land.
29. A green gem.
32. An _ _ meter is used to test for salinity.
33. A unit (micro _ _ _ _ _ _ _) for measuring salt levels.
35. A compound containing calcium often used in agriculture.
39. An indefinitely long period of time.
40. A constituent of soil.

Answers across

1. evaporation, 4. trees, 6. CEC, 8. landcare, 10. Lockyer, 12. Spain, 13. Dead, 14. crystal, 17. input, 19. spray, 20. pan, 22. ground, 25. bar, 27. era, 28. perched, 30. wilt, 31. halite, 34. clear, 36. ion, 37. brine, 38. algae, 41. mine, 42. well, 43. concentrates, 44. Ayr

Answers down

1. each, 2. rock, 3. oil, 4. transpire, 5. saline, 7. clearing, 9. dill, 11. Eyre, 13. dep, 15. saltbush, 16. dyke, 18. tin, 21. pasture, 23. recharge, 24. use, 26. reclaim, 29. emerald, 32. EC, 33. siemens, 35. lime, 39. aeon, 40. clay