ALEP

26

Aboriginal Landcare Education Program

CONDUCT EROSION & SEDIMENT CONTROL ACTIVITIES




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CONTENTS

PUBLICATION NOTES

BHP Billiton Iron Ore is proud to support Greening Australia to provide valuable conservation and land management training to communities throughout the Pilbara through the Indigenous Training Program.

This Learning Guide series has been developed as part of our partnership of the program.

Gavin Price, Head of Environment, BHP Billiton Iron Ore

Greening Australia is proud to produce and provide the comprehensive suite of new ALEP Learning Guides. The guides are compatible with the new horticulture and conservation industries training package and suited to developing skills in Indigenous communities within remote areas of the country where employment opportunities are limited. We would like to thank BHPBIO for their generous support in the development of the guides.

Brendan Foran, National CEO Greening Australia

The second series of ALEP Guides is aligned with a number of units of competence from the *Training Package AHC10 – Agriculture, Horticulture and Conservation and Land Management* (Release 8.0). The units selected are frequently used within Certificates I to III in Horticulture and Conservation and Land Management. As such they cover, where possible, the elements, performance criteria and required skills and knowledge of each unit.

The principal goal of these resources is to support the learning process; the learning activities may complement a trainer's assessment plan. The intent is that they will be used in an interactive manner with learners rather than as self-paced study guides. The structure and sequence have been designed to follow the logical steps of the practical tasks wherever possible. Concepts are introduced and then consolidated with discussion and/or practical activities.

The writers consider that these guides can provide a sound technical foundation but also strongly encourage trainers to complement the guides with additional, authentic resources from relevant industry texts and websites. The guides can be used in part or in their entirety but should always be linked to practical activities to strengthen the teaching and learning.

Genuine consideration was given to the level of language used in the guides. The goal has been to find a balance between simplifying the language to an accessible level and ensuring that the vocational concepts are addressed. The writers contend that with appropriate support these texts can provide an opportunity for students to strengthen their language, literacy and numeracy skills, which may be required for pathway progression.

A number of Aboriginal people have been involved in developing this ALEP Guide, which is considered suitable for use within a program based on Aboriginal pedagogies.

INTRODUCTION

Welcome to *Conduct erosion & sediment control activities*. This learning guide will support you to understand the basic causes of erosion, the problems that can happen as a result of it and the kinds of activities that can be used to prevent it.

This learner guide only presents the knowledge aspects of the unit. It is important that you are able to visit sites at risk of, or experiencing, erosion and become involved in implementing solutions to the issue.

This unit may be studied alone or holistically with other relevant units. Suggested relevant ALEP Guides that may support this delivery are:

- *Maintain cultural places*
- *Participate in environmentally sustainable work practices*
- *Carry out natural area restoration works*

ALEP
Aboriginal Landcare Education Program

RESOURCES REQUIRED

To complete this training you will need the following:

1. Personal protective equipment (PPE), tools, machinery and equipment to implement erosion control activities relevant to the work area
2. Vehicle to travel to the work area

LEARNING ACTIVITIES

There are three kinds of activities to complete. These activities may go toward your final assessment.

SECTION	ACTIVITY	SATISFACTORY (Y/N)	DATE
DISCUSSION ACTIVITIES			
1.1	Wind and water erosion		
1.1	Factors affecting erosion		
2.1–2.6	Legislation governing the land you are working on		
RESEARCH ACTIVITIES			
2.1–2.6	How to report an offence or breach of the legislation in your state or territory		
PROJECT			
3	Select the site		
4	Manage the site		

1 ABOUT EROSION

1.1 WHAT IS EROSION?

Erosion happens when soil particles are moved from one place to another by wind, water or both.

WATER EROSION

When rain hits bare soil it can break up the soil and carry sediment away in the run-off. The sediment is carried away and deposited somewhere else in the landscape.

5 **Five factors affect water erosion**

1. **Erodibility of soil** – the likelihood that soil will erode. This can be determined by looking at the soil type (sand, silt, loam or clay), soil cohesion (loose, friable or compacted), amount of organic material, infiltration rate (how easily water enters the soil), soil moisture (dry, moist or saturated). For example, soil that is sandy, loose and dry is highly erodible.
2. **Vegetation cover** – plants reduce the impact of water on soil in a few ways. For example, foliage can break the force of the rain; water can flow over long grassy cover and root systems can hold the soil together. and help water to soak in.
3. **Slope** – the steeper the slope, the greater the chance erosion will occur.
4. **Rainfall patterns** – heavy rain that continues for a long time is more likely to cause erosion.
5. **Tracks and pathways** – water will generally find its way along a track or path, whether natural or constructed. Wheel ruts, animal tracks, walking paths and fence lines can all allow water to concentrate. This increases the likelihood of erosion.

These five factors often work together to increase the likelihood of erosion.

The likelihood of erosion is always higher in an area where the soil is disturbed and the land is cleared. Erosion will almost certainly happen if the area is sloped and heavy rain occurs.

Erosion is not as likely in a natural landscape where the land is not cultivated or cleared, even if it is sloping and there are heavy rains. If there are noticeable animal tracks down the slope, however, these will increase the likelihood of water erosion.

SEDIMENT

Sediment is the material that is moved in the process of erosion.

Sediment varies in size. It can be smaller than a grain of sand, the size of gravel or pebbles, or even as big as boulders.

WIND EROSION

Wind erosion happens when sediment is moved to another place by the wind. Particles can be picked up and carried or rolled along the ground. Fine sediment can be moved hundreds of kilometres in a dust storm. Larger particles might move only a few metres.

3 Three factors affect wind erosion

1. **Erodibility of soil** – the likelihood that soil will erode. This can be determined by looking at the soil texture (sand, silt, loam or clay), soil structure (loose, friable or compacted), amount of organic material and soil moisture (dry, moist or saturated). For example, soil that is sandy, loose and dry is highly erodible.
2. **Vegetation cover** – plants reduce the impact of wind on soil in a few ways. For example, foliage protects the soil from the wind, and root systems can hold the soil together.
3. **Wind speed** – the wind speed needs to be great enough to move the sediment. High wind speed is more likely to contribute to erosion.

These three factors often work together to increase the likelihood of erosion.

The likelihood of erosion is always higher in an area where the soil is disturbed and the land is cleared. Erosion will almost certainly happen if the area has little vegetation and is subject to very high-speed winds.

Wind erosion is not as likely in a natural landscape where the land is not cultivated or cleared. However, stock might break up dry soil and change the soil structure. If there are high-speed winds, this will increase the likelihood of wind erosion.

DISCUSSION ACTIVITY

Think of some areas where you have seen evidence of erosion. Do you think the erosion was caused by water or wind?

You will have the chance to go and look at these places in the next section.

NAME OF AREA	WATER OR WIND?

DISCUSSION ACTIVITY

Can you think of any other places where there is a risk of erosion happening?

What are the main factors that increase the risk of erosion at that site?

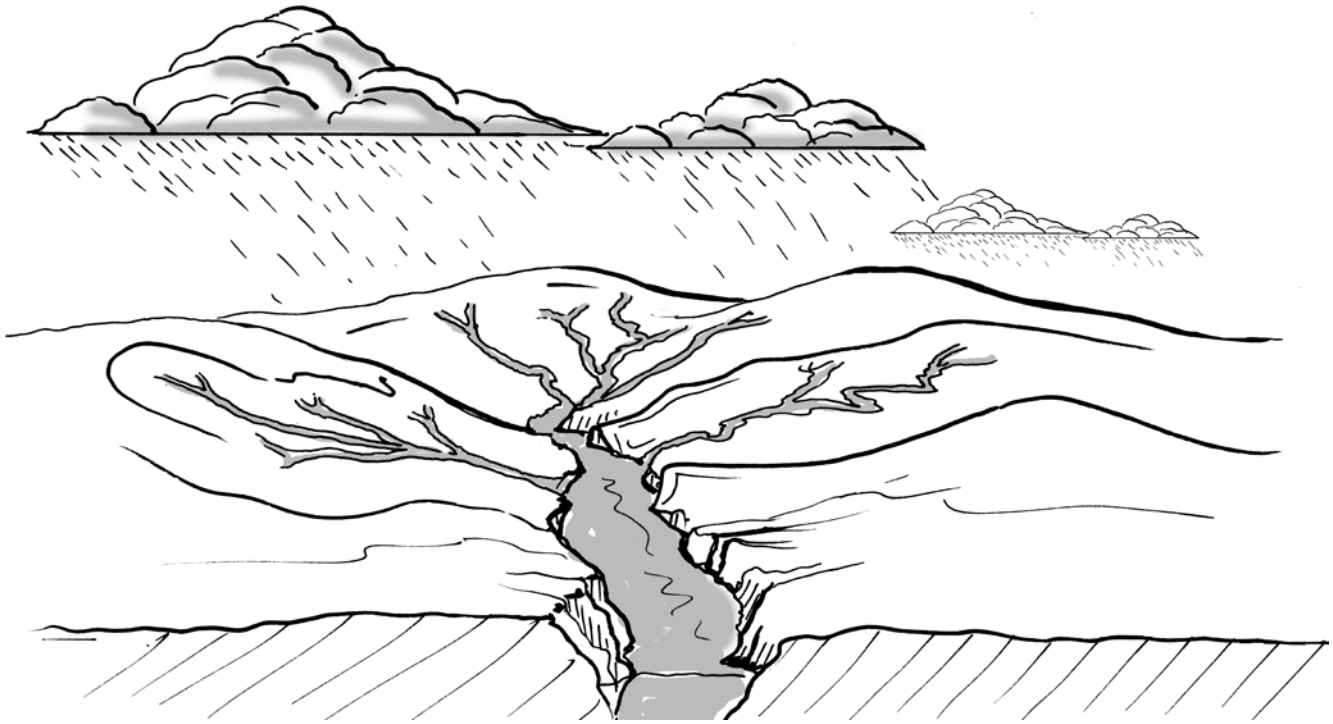
What might happen if erosion becomes a problem at this site?

You will have the chance to go and look at these places in the next section.

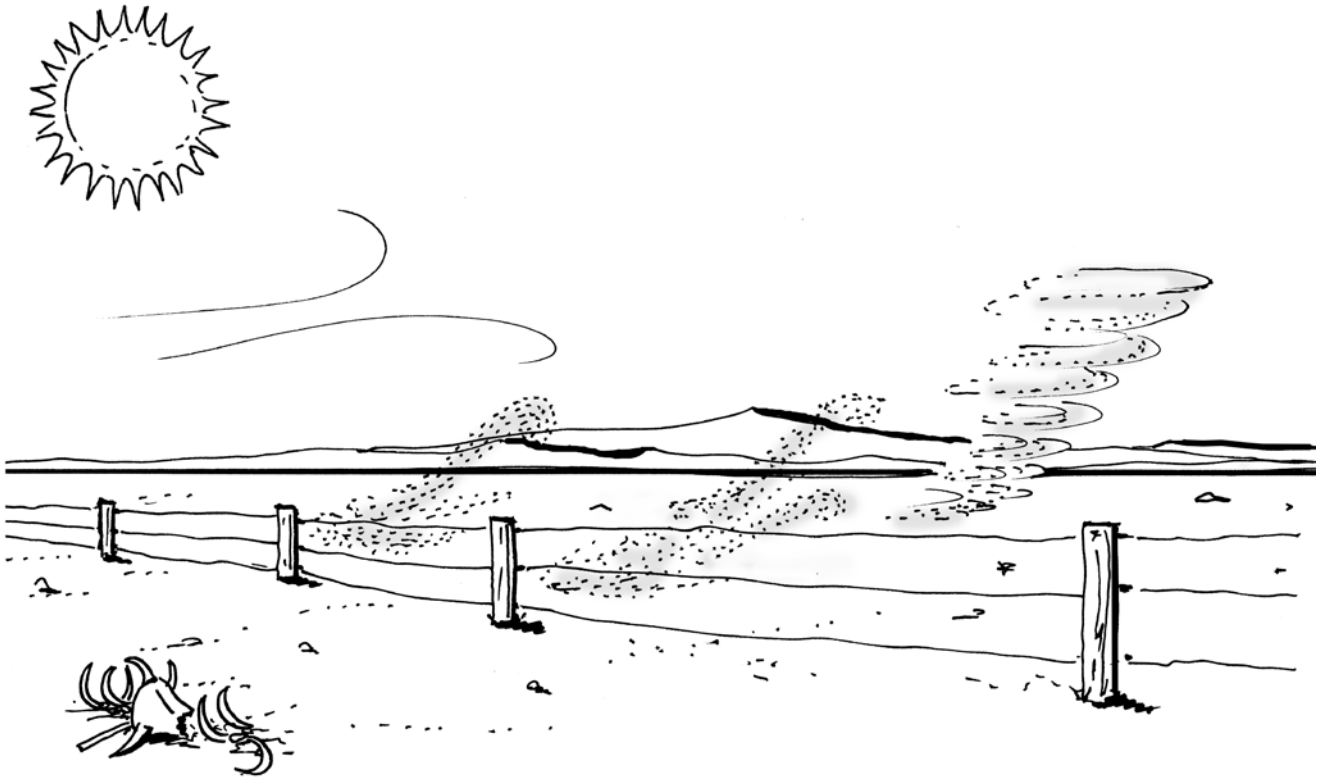
NAME OF AREA	FACTORS LEADING TO EROSION	WHAT MIGHT HAPPEN

1.2 WHY IS EROSION A PROBLEM?

Water erosion is more likely to cause problems in a sloping catchment area. A catchment area extends from the highest points that water flows from after rain, to the lowest point where the water settles or moves away.



Wind erosion is more likely to cause problems in open areas that are not sheltered from the wind.



ON-SITE EFFECTS

The term 'on-site' refers to the area that is eroded; the place where the soil particles are moved from.

Erosion removes the top layer of soil that contains organic material, which provides nutrients to vegetation. This leads to the breakdown of the soil structure and reduces the stability of the soil. Cultivated land can become unproductive if it loses the topsoil. In natural areas, the loss of organic matter can lead to loss of vegetation. This in turn can lead to loss of habitat for native animals.

As soil is moved away, gullies are formed and these can cause access problems for vehicles, people and stock. These gullies will often erode more with each rainy season.

River banks can also be eroded. This can happen naturally, but removal of vegetation from the banks and trampling by stock can increase the problem. This can reduce productive land, broaden the river and alter the water course. It can also cause problems with siltation further down the river.

Coastal erosion is caused in a similar way. Vegetation can be damaged or removed by clearing, stock and pollution. Recreational activities such as camping and quad bike riding can also affect fragile coastal areas. Structures such as marinas, breakwaters and rock groins can cause changes to tidal movement. This will impact the foreshore areas. Severe storms will exaggerate the problems experienced in coastal areas.

OFF-SITE EFFECTS

The term 'off-site' refers to the areas where the sediment is moved to. There are a number of problems that occur off-site.

Water bodies – some problems happen as sediment flows into water bodies. The sediment may contain nutrients and chemicals that can accumulate in water. These can contaminate the water and cause algal blooms. Algal blooms take oxygen from the water. Fish and other living organisms can die when water is contaminated and does not contain oxygen. Erosion can therefore cause a change in the ecosystem of the water body. Other animals and people who depend on the water supply will also be impacted. Estuaries and wetlands are extremely vulnerable, as there is less movement there than in creeks and rivers. These areas often sustain very complex and fragile ecosystems.

Preferred water channels – erosion can change the course of creeks and rivers. This can move water away from areas where it naturally flows.

Creation of new channels – as water flows, it can create new channels that form gullies and washouts. Over time these can keep eroding. Large gullies and washouts can cause problems as they cut through tracks, roads and fence lines. It is very difficult to control these new channels once they begin forming. Often new roads and fences need to be constructed.

Existing vegetation – other problems occur when the sediment is moved to an area with existing vegetation. The sediment can bury and destroy the vegetation. It might also be carrying weed seeds. This might affect food crops or habitat for native animals. Sediment can also build up around fence lines, allowing stock to wander.

Atmospheric pollution – air quality can be damaged by the particles moved by wind erosion. This can affect both animals and people.

2 LEGISLATION & INDUSTRY PRACTICE

In this section we look at the legislation around erosion and sediment control for each state. You only need to look at the information for your state.

2.1 NEW SOUTH WALES

NSW Soil Conservation Act 1938

The Commissioner may issue a Soil Conservation Notice to stop any activity that is likely to result in land degradation or soil erosion. The landowner may be prosecuted if they do not comply with the requirements of the notice within the given time frame. The Commissioner may carry out work to resolve the issue if the landowner does not.

The whole Snowy River catchment is an Area of Erosion Hazard. The Minister may identify other places as Areas of Erosion Hazard if required. Landowners within these areas are required to follow land management directions from the Minister, such as the number of livestock they may carry, the kinds of pasture they may grow and the kinds of works they may undertake.

The Minister may identify any water body considered to be at risk of damage by land degradation, siltation or soil erosion as a Catchment Area. This may require landowners to take particular actions in the Catchment Area to protect the water body.

Proclaimed Works are structures such as dams and reservoirs, for example, Burrinjuck Dam, Hume Reservoir and Wyangala Dam.

Fines may be issued to people who undertake activities that risk damage to Catchment Areas or Proclaimed Works.

NOTE

This legislation is implemented by the NSW Office of Environment & Heritage.

DISCUSSION ACTIVITY

With your supervisor and/or trainer, find out answers to the following questions.

- Is the land you are working on part of an Area of Erosion Hazard?
- Is the land you are working on part of a Catchment Area or Proclaimed Work?
- Has a Soil Conservation Notice been issued in relation to the land?
- If the answer to any of the above questions is yes, what are the requirements you need to comply with?

RESEARCH ACTIVITY

Visit the Office of Environment and Heritage website (there's a link in the *Resources* section) and find a contact number you could use if you needed to report a breach of the legislation.

An example of a breach is if you saw someone clearing vegetation in a Catchment Area without authority.

R1

See the link at *Resource R1*, page 32

2.2 NORTHERN TERRITORY

Soil Conservation and Land Utilisation Act

The Commissioner may issue a Soil Conservation Notice to stop any activity that is likely to result in soil degradation or erosion. Activity may include any agricultural or pastoral practices, clearing of land or removal of vegetation. A fine may be imposed if the landowner does not comply with the requirements of the notice.

The legislation provides for Soil Conservation Officers to provide advice and assist with implementation of erosion and sediment control activity. They can also provide loans to assist with necessary works.

Under the legislation, an area may be declared an Area of Erosion Hazard. Activity is undertaken to control the risk of erosion. This may involve limiting the number of livestock and identifying works to be carried out.

Other areas may be declared Restricted Use Areas. In these areas, erosion is affected by public access. These areas restrict vehicle access and activities such as the removal of vegetation, sand, gravel and rock.

NOTE

This legislation is implemented by the NT Department of Land Resource Management.

DISCUSSION ACTIVITY

With your supervisor and/or trainer, find out answers to the following questions.

- Is the land you are working on part of an Area of Erosion Hazard?
- Is the land you are working on part of a Restricted Use Area?
- Has a Soil Conservation Notice been issued in relation to the land?
- If the answer to any of the above questions is yes, what are the requirements you need to comply with?

RESEARCH ACTIVITY

Visit the Department of Land Resource Management website (there's a link in the *Resources* section) and find a contact number you could use if you needed to report a breach of the legislation.

An example of a breach is if you saw someone driving in a Restricted Use Area.

R1

See the link at *Resource R1*, page 32

2.3 QUEENSLAND

Soil Conservation Act 1986

This legislation is largely designed to protect properties from run-off from neighbouring properties.

Landowners may submit a Property Plan for approval by the Chief Executive. This plan will describe all soil conservation measures, including controlling or directing run-off water flow. Neighbouring property owners can agree to the plan or raise an objection. The negotiation will be managed by the Chief Executive. Works in the plan may be community works or owner works.

The Chief Executive may enter into a cost-sharing arrangement with an owner to ensure successful implementation of the plan.

NOTE

This legislation is implemented by the Queensland Department of Natural Resources and Mines. The Department of Agriculture and Fisheries is also interested in soil management.

DISCUSSION ACTIVITY

With your supervisor and/or trainer, find out the answer to the following question.

If the land you are working on has a Property Plan associated with it, what are the requirements you need to comply with?

RESEARCH ACTIVITY

Visit the Department of Natural Resources and Mines website (there's a link in the *Resources* section) and find out how to report an offence.

An example of an offence is if a property owner does not control run-off from their property and this causes sedimentation on a neighbouring property.

R1

See the link at *Resource R1*, page 32

2.4 SOUTH AUSTRALIA

Natural Resources Management Act 2004

The SA Natural Resource Management (NRM) Council prepares, monitors and evaluates the State NRM Plan. This plan identifies risks of degradation, sets goals and priorities, determines policies to protect the environment and promotes integrated management of natural resources.

The state is divided into NRM regions. Each region has an NRM board and an NRM group. Each board prepares a regional NRM plan. The plan includes actions to address stormwater management, flood prevention and drainage of land. The plan also ensures proper management of wetlands, estuaries and marine resources. The NRM groups are actively involved in the implementation of the plans by carrying out projects.

An NRM board may require a landowner to prepare an Action Plan if the members believe that a landowner has used land management practices that have led or could lead to degradation of land. A landowner can be charged if they do not develop and implement an Action Plan.

The Minister may enter into a Management Agreement with a landowner to protect, rehabilitate or manage any natural resources. This may require specific work to be carried out or a restriction of particular activities.

South Australia also has a Strategic Plan for the state. Part of this plan is to increase the protection of agricultural and pastoral land. Reducing erosion is a key aspect of achieving this goal. This is being achieved through the adoption of improved farming practices, including no-till farming methods, stubble retention and controlled grazing.

NOTE

This legislation is implemented by the SA Department of Environment, Water and Natural Resources.

DISCUSSION ACTIVITY

With your supervisor and/or trainer, find out answers to the following questions.

- Which NRM region does the land you are working on sit within?
- Are there any specific actions relating to erosion and sediment control in the NRM plan for your region?
- Does the land you are working on have an Action Plan or a Management Agreement associated with it?
- If the answer to any of the above questions is yes, what are the requirements you need to comply with?

RESEARCH ACTIVITY

Visit the Department of Environment, Water and Natural Resources website (there's a link in the *Resources* section) and find out how to report an offence.

An example of an offence is if a landowner is not following the Action Plan for their property.

R1

See the link at *Resource R1*, page 32

2.5 VICTORIA

Catchment and Land Protection Act 1994

This Act covers all aspects of catchment protection, not only erosion and sediment control. Only information relevant to erosion and sediment control is summarised here.

A Catchment Management Authority is established for each catchment and land protection region. The board of each authority prepares a Regional Catchment Strategy. Each strategy assesses the land and water resources of the catchment and sets out a program of activity to improve use of land and treat land degradation.

Land in a region may be declared a Special Area. A Special Area Plan is written with specific land management actions to be taken in the area. The plan may also limit the uses of the land through Land Use Conditions.

Landowners must take all reasonable steps to conserve soil and avoid causing land degradation. They must comply with plans covering the region and area in which they are located. A Land Management Notice may be served on a landowner who does not comply with the relevant plan(s). An Interim Land Management Notice can be served if it appears immediate action could prevent serious land degradation. A notice may prohibit the use of specified land management practices and require actions to be taken to rehabilitate land or prevent land degradation. Penalties apply if a notice is not followed within the given time.

NOTE

This legislation is implemented by the Victorian Department of Environment and Primary Industries.

DISCUSSION ACTIVITY

With your supervisor and/or trainer, find out answers to the following questions.

- Does the land you are working on sit within a Catchment Strategy region?
- Is the land you are working on classified as a Special Area?
- Does the land you are working on have any Land Management or Interim Land Management Notices related to it?
- If the answer to any of the above questions is yes, what are the requirements you need to comply with?

RESEARCH ACTIVITY

Visit the Department of Environment and Primary Industries website (there's a link in the *Resources* section) and find a way to report a breach of legislation.

An example of a breach of legislation is if a landowner is using land management practices that are prohibited by Land Use Conditions.

R1

See the link at *Resource R1*, page 33

2.6 WESTERN AUSTRALIA

Soil and Land Conservation Act 1945

The Minister may declare Soil Conservation Districts. Activities such as burning, clearing or using specified agricultural practices may be regulated in these districts. The regulations are implemented by a district committee comprising landholders in the district.

The Commissioner may recommend areas be established as Soil Conservation Reserves. In these areas it is illegal to light fires, remove or destroy vegetation or allow stock to graze.

An area of land may have a covenant related to it. This means that,irrespective of who owns the land, they must follow the directions in the covenant. This may prevent an area from actions such as being cleared or used as pastoral land. Such covenants to protect soil are registered with the Commissioner.

The Commissioner may issue a Soil Conservation Notice to stop any activity that is likely to result in soil degradation or erosion. Prohibited activity may include any agricultural or pastoral practices, clearing of land or removal of vegetation. The Soil Conservation Notice may alternatively direct someone to undertake a particular activity in order to protect the land.

NOTE

This legislation is implemented by the WA Department of Agriculture and Food.

DISCUSSION ACTIVITY

With your supervisor and/or trainer, find out answers to the following questions.

- Is the land you are working on part of a Soil Conservation District or Soil Conservation Reserve?
- Does it have any covenants related to it?
- Have any Soil Conservation Notices been issued in relation to the land?
- If the answer to any of the above questions is yes, what are the requirements you need to comply with?

RESEARCH ACTIVITY

Visit the Department of Agriculture and Food website (there's a link in the *Resources* section) and find out how to make a land management complaint.

R1

See the link at *Resource R1*, page 33

2.7 AUSTRALIAN CAPITAL TERRITORY

The ACT does not have any specific legislation covering erosion and sediment control. Information about protecting the environment can be found at the Environment and Planning Directorate website.

http://www.environment.act.gov.au/home

2.8 TASMANIA

Tasmania does not have any specific legislation covering erosion and sediment control. Information and advice about soil conservation and management can be found at Department of Primary Industries, Parks, Water and Environment.

Local Natural Resource Management (NRM) groups may also undertake soil management projects as part of their regional plans. Follow the link to your regional NRM group and see if they are working on any soil management projects.

- NRM North – http://www.nrmnorth.org.au/
- Cradle Coast NRM – http://www.cradlecoastnrm.com/
- NRM South – http://www.nrmsouth.org.au/

If you are working in a reserve such as a national park, you will need to be guided by the legislation governing these.

2.9 INDUSTRY PRACTICE

Erosion and sediment control are important to think about in a number of industries:

- Conservation and land management
- Agriculture
- Pastoral grazing
- Mining
- Water management
- Local council
- Civil engineering – roadwork, building and construction

Planning to minimise issues must happen before any work is performed with or on soil. Many of these industries have legislation and codes of practice to prevent land degradation.

In this guide we mainly think about conservation and land management. The work you do as a ranger, or in a similar role, often involves protecting the environment through maintenance and construction of walking tracks, fences and roads. You might also be involved with construction and maintenance of structures such as huts and ablution blocks or other structures. Other work may involve rehabilitation of areas that have been eroded or are at risk of erosion.

There are no codes of practice or specified industry guidelines for conservation and land management, but you can be guided by those from other industries.

In addition to your state legislation, you might also have local government by-laws that affect the activity you do. You will need to discuss these with your supervisor.

Finally, you need to follow the workplace policies and procedures of your organisation.

R2

POWER KNOWLEDGE

See the *Industry Guidelines* in the *Resource* section, page 33

3 HOW TO DETERMINE SOIL TEXTURE

SAND

SILT

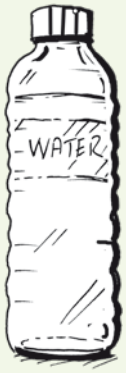
LOAM

CLAY

PROCEDURE TO DETERMINE SOIL TEXTURE

This is a very basic method to help you to think about soil texture in general terms. You will find out if the soil at your site is:

- Sand
- Silt
- Loam
- Clay



You will need

- Water to moisten soil if it is dry

- Soap and water to clean hands when finished

METHOD

1. Gather several handfuls of soil.

2. Get rid of any rocks or large pieces of organic matter.

3. Add water to the soil slowly.

4. Roll it into a ball between the palms of your hands. This is called a 'bolus'.

5. Notice how well the ball holds together or if it keeps falling apart.

6. Notice how the soil feels in your hand.

SOIL TEXTURE	FEELS	BOLUS
Sand	Gritty	Falls apart
Silt	Silky	Holds together
Loam	Spongy	Loosely holds together
Clay	Sticky	Holds together

Soil is actually often a combination of textures mixed together, for example, loamy sand, sandy loam, clayey sand. These can be identified using a ribbon test or a more complex sedimentation percentage analysis.

7. Wash your hands with soap and water when finished.

PROJECT – SELECT THE SITE

With your work team, visit some of the places you identified in the previous section. While you are there, think about the causes of the damage. Discuss ideas to manage the problem with your supervisor and work team.

With your work team and supervisor, select one of the sites to work on as part of the project.

Examine the soil texture at this site using the method on the previous page. Record your findings on the form below.

NAME OF SITE

.....

SOIL TEXTURE

- ☐ Sand
- ☐ Silt
- ☐ Loam
- ☐ Clay

SOIL COHESION

- ☐ Loose
- ☐ Friable
- ☐ Compact

INFILTRATION RATE

- ☐ Water flows through easily
- ☐ Water flows through slowly
- ☐ Water does not flow through

SOIL MOISTURE

- ☐ Dry
- ☐ Moist
- ☐ Saturated

Discuss the soil with your supervisor and work team. Tick the box that best describes the soil's erodibility.

- ☐ Highly erodible
- ☐ Moderately erodible
- ☐ Stable (low erodibility)

What are the main factors leading to erosion, or risk of erosion, at this site?

WATER EROSION

(tick those that apply)

- ☐ Erodibility of soil
- ☐ Vegetation cover
- ☐ Slope
- ☐ Rainfall patterns
- ☐ Tracks and pathways

WIND EROSION

(tick those that apply)

- ☐ Erodibility of soil
- ☐ Vegetation cover
- ☐ Wind speed

4 EROSION CONTROL ACTIVITIES

There are a few ways to control erosion. Following are some of the common methods you might use in your work.

4.1 GRADE STABILISING STRUCTURES

'Grade' refers to a slope. A 'stabilising structure' is something that is built to stop changes. When thinking about erosion, grade stabilising structures are built to stop the slope from changing. They reduce erosion by stopping soil from moving down a sloping area or bank, either slowly or in a landslip.

Grade stabilising structures have three benefits:

- They are relatively cheap to build
- They can be built in position as needed
- They are very effective at holding back an earth bank

TYPES OF STRUCTURES

Gabions are wire frames filled with rocks.

Retaining walls can be made from timber, rock or cement.

4.2 OUTLET PROTECTION STRUCTURES

These structures are built to stop soil from being washed away by water that is coming out of a drain or outlet, or off a broad flat surface such as a road. They channel water from one area, usually higher, to another lower area. These structures allow the water to move along a hard, smooth or raised surface without contacting the soil below, therefore minimising the risk of erosion.

TYPES OF STRUCTURES

Flumes are concrete or rock structures.

Stabilised drain outlets reduce the force of the water coming out of the drain to minimise erosion.

4.3 STORMWATER DETENTION STRUCTURES

'Detention' means to hold something. Stormwater detention structures are big constructed ponds that catch water during a storm. The base is sometimes made from rock, concrete or stone. This minimises soil disturbance in the pond.

There are several benefits to holding water in this way:

1. The rate of flow is reduced by capturing the water. It can then either drain out more slowly or be held until it evaporates. This can reduce erosion from areas where water would otherwise have flowed.

2. Silt has very fine soil particles that can be held by water. Detention structures are sometimes called silt traps. While water is held in the pond, silt settles to the bottom. Detention structures can help reduce off-site problems caused by sedimentation, such as destruction of habitat.

3. Stormwater can bring other sorts of contaminants into the pond. Depending on the environment in the catchment area, this may include animal waste, oily residues from roads, chemicals or nutrients from agricultural areas and rubbish dropped by people. Capturing these contaminants can reduce other off-site problems caused by pollution, such as algal blooms and destruction of habitat.

If ponds are being used to catch silt, pollution and rubbish, then at some stage they need to be cleared out, otherwise the system will block up over time.

4.4 DUST CONTROL

Dust can be a problem in several settings, and the right control method can be chosen to suit the situation. Dust can be blown by the wind or created by traffic, animals and disturbed, bare soil surfaces.

Water can be used to settle dust at earthworks sites and in high traffic areas on dirt roads. It can also be sprayed on stockpiles. It is a cheap, short-term solution.

Chemicals that bind dust particles together are used on open areas of soil. Different chemicals are used for different environments. In general they are sprayed onto the area. Some are okay for traffic to drive on. Others are for non-traffic areas. This can be a longer term solution than just spraying water.

Hydromulching uses waste paper mixed with water, glue and often grass or shrub seeds to create a layer over the soil. This has two benefits:

- It prevents fragile soil from blowing away
- It speeds up revegetation, as seed is held in place by the mixture

4.5 REVEGETATION

Bare soil can be protected from wind and water erosion by planting vegetation. Planting and maintaining vegetation helps prevent on-site erosion. Vegetation can also reduce contamination of drinking water caused by sediment and nutrients flowing into and collecting in a dam.

Revegetation projects often begin by direct seeding quick-growing sterile annual grasses or cereals, which grow quickly to provide some wind protection for the bare soil area. This seed mix may also include native species. Hydromulching is an effective way of spreading seed in areas that are sloping, difficult to access and very fragile. This method mixes seed with mulch and water. The mix is sprayed from a tank over the regeneration area.

Over the next three to six months, the slower growing native species germinate and the cereal crop dies off. The dry stubble and root system help keep the area stable but do not compete with the young native seedlings. Large areas can be easily revegetated in this way.

The following season, additional seedlings can be planted in areas with easy access if required. It is best to match the mix of plants with those that grow naturally in the area. Over several years, and with good weather, the original ecosystem of the area will begin to be restored. This will attract insects and animals back into the new habitat.

Revegetation sites are very fragile in the early stages. It is important that animals, people and traffic are kept off the area until it is established. Often organic mulch or biodegradable matting is used to help protect the soil. The plants can grow up through this. Protective barriers may be used around plants while they are young. Good weed management is also important.

PROJECT – MANAGE THE SITE

With your work team, visit some of the places you identified in the previous section. This project requires you to work with your supervisor and colleagues. You will identify an area that is experiencing erosion or problems with sediment. Next work out what activities to undertake, then conduct activities to control the problem.

There are two steps to the project.

STAGE 1

Plan the actions you will take to manage the area.

Complete the planning sheet on page 34 to show how you did this.

R3

See the link at *Resource R3*, page 34

STAGE 2

Carry out the work with your colleagues. Make sure you are following your workplace procedures, industry guidelines and legislation. You will need to:

- Participate in a Job Safety Analysis (JSA)
- Follow Standard Operating Procedures (SOPs) or Safe Work Method Statements (SWMSs)
- Report any breaches of legislation to the appropriate authority

R4

See the link at JSA *Resource R4*, page 35

Take photos or video while you are working. You can use these to show what you did and how you did it.

RESOURCES

R1 LEGISLATION WEBSITE LINKS

NEW SOUTH WALES

Legislation: *Soil Conservation Act 1903*

http://www.legislation.nsw.gov.au/viewtop/inforce/act+10+1938+pt.1-sec.1+0+N

Office of Environment & Heritage

http://www.environment.nsw.gov.au/

Look at this site for some general information about soil degradation in NSW.

http://www.environment.nsw.gov.au/soildegradation/index.htm

NORTHERN TERRITORY

Legislation: *Soil Conservation and Land Utilisation Act*

http://www5.austlii.edu.au/au/legis/nt/consol_act/scalua396/

Department of Land Resource Management

http://www.lrm.nt.gov.au/

Look at this site for information about soil management in the NT. Use the menu down the left-hand side to navigate around this section of the site.

http://www.lrm.nt.gov.au/soil

QUEENSLAND

Legislation: *Soil Conservation Act 1986*

https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/S/SoilConservA86.pdf

Department of Natural Resources and Mines

https://www.dnrm.qld.gov.au/

Look at this site for general information about soil management.

http://www.qld.gov.au/environment/land/soil/

SOUTH AUSTRALIA

Legislation: *Natural Resource Management Act 2004*

http://www.legislation.sa.gov.au/LZ/C/A/Natural%20Resources%20Management%20Act%202004.aspx

This site has links to the websites for each NRM region. From here you can find the NRM plan for your region.

http://www.naturalresources.sa.gov.au/home

VICTORIA

Legislation: *Catchment and Land Protection Act 1994*
http://www5.austlii.edu.au/au/legis/vic/consol_act/calpa1994267/

Department of Environment and Primary Industries
http://www.depi.vic.gov.au/home

Look at this site for some general information about managing soil and water.
http://www.depi.vic.gov.au/agriculture-and-food/farm-management/soil-and-water

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WESTERN AUSTRALIA

Legislation: *Soil and Land Conservation Act 1945*
https://www.slp.wa.gov.au/legislation/statutes.nsf/main_mrtitle_901_homepage.html

Department of Agriculture and Food
https://www.agric.wa.gov.au

Look at this web page to see an overview of soil management. You can click on the links from the menu to find more specific information.
https://www.agric.wa.gov.au/climate-land-water/soils

INDUSTRY GUIDELINES

Dwyer, P. and Kidd, R. (1993). *A resource guide for local councils: Erosion and sediment control*. Sydney, NSW: Department of Environment and Conservation.
Retrieved from http://www.environment.nsw.gov.au/resources/stormwater/erosionsediment0642.pdf
See Appendix B for the model code of practice for local government.

International Erosion Control Association, Australasia (no date). *Best Practice Erosion and Sediment Control* document.
Retrieved from http://www.austieca.com.au/publications/best-practice-erosion-and-sediment-control-bpesc-document

Catchments and Creeks. (2015). *Catchments and Creeks* [website].
Retrieved from http://www.catchmentsandcreeks.com.au/index.html
This site has some interesting fact sheets and posters related to erosion and sediment control.

PROJECT PLANNING SHEET

What kind of damage could be caused if action is not taken at this site?

- ☐ Loss of habitat
- ☐ Damage to water quality
- ☐ Damage to equipment or infrastructure
- ☐ Loss of productive land
- ☐ Other – describe

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Is the land you will work on governed by any legislative requirements?

You discussed these in Section 2.

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What activities are you going to use to control erosion and sediment at the site?

(tick those that apply)

- ☐ Grade stabilising structures
- ☐ Outlet protection structures
- ☐ Stormwater detention structures
- ☐ Dust control
- ☐ Revegetation

Provide some further details about the control measures you will use.

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JOB SAFETY ANALYSIS

Organisation		
Job	Location	
Procedure developed by	Approved by	Date

Tick the box for the PPE required.

Task Steps in the job	**Hazards Identified** What could cause injury?	**Risk Score**	**Controls** What can be done to minimise the risk of injury?	**Final Risk Score**

GLOSSARY

Algal blooms	Algal blooms are microscopic algae that grow very quickly and can make a blanket of scum on the top of water.
Compacted	Something that is compacted and has had force applied to it so that it is compressed or dense.
Contaminant	A contaminant is something that can contaminate other things. For example, pollution can contaminate waterways.
Erodible	If soil is erodible it is likely to erode. If it is highly erodible, then it is very likely to erode.
Friable	Soil that is friable can be easily crumbled between your fingers.
Loam	Loam is a mix of sand, silt and a little clay. It has particles of varying sizes. It holds water, has good soil aeration and drains well. It is generally friable and contains organic matter.
No-till farming	No-till farming is a method of growing crops without digging, or tilling, the soil.
Sedimentation	Sedimentation is the process of soil particles being moved from one place and settling in another place. During erosion, particles are moved by water or wind.
Sterile	A sterile plant is not able to produce seed that will germinate.
Add your own words and meanings here	

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Northern Territory Horticultural Association. (2008). *Soils: Best practice for sustainable land use in the Northern Territory Guidelines.* Darwin, NT: Author.

Standing Committee on Soil Conservation. (1990). *Preventing Soil Erosion* [poster]. Canberra, ACT: Author.

Standing Committee on Soil Conservation. (1990). *Types and causes of soil erosion in Australia* [poster]. Canberra, ACT: Author.

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ALEP

Aboriginal Landcare Education Program

CONDUCT EROSION & SEDIMENT CONTROL ACTIVITIES

This learning guide covers information about causes of erosion, the problems that can happen as a result of it, and the kind of activities that can be used to prevent it.

There is also an overview of legislation relating to soil conservation measures in each state.

Topics include:

- ABOUT EROSION
- LEGISLATION AND INDUSTRY PRACTICES
- EROSION CONTROL ACTIVITIES

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