Making More From Sheep

MODULE 5

Protect Your Farm's Natural Assets

A joint initiative of Australian Wool Innovation and **Meat & Livestock Australia**

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Protect Your Farm's Natural Assets

What does this module do for you?

Healthy, resilient natural assets including soil, water and vegetation underpin livestock production, increase the capital value and profitability of your enterprise, and add immeasurably to the comfort, satisfaction and temperament of all who live or work there.

A beautiful, well managed property can be a source of pride for its owners and an inspiration for neighbours and visitors.

Many sheep producers are showing how compatible boosting farm profit is with better management of the farm's natural resources.

A well managed property can help store carbon in grasses, shrubs, trees and soil, to offset carbon released as the greenhouse gas, methane, by ruminants like sheep.

This module builds on the principle of multiple benefits and that long-term profitability and sustainability go hand-in-hand.

Implementing the procedures in this module will help you build the capital value and profitability of your sheep enterprise and keep your natural assets functioning effectively now and into the future.

Procedure 5.1

Plan the vision for your business and grazing enterprise

Background information

Imagining how your grazing enterprise could look in 10 years works best if the activity includes the whole family - children are often better at imagining the future than adults. It involves developing a personal vision for your farm and how you will achieve profitable livestock and cropping enterprises within a framework of sustainability and personal satisfaction.

Before starting, it is important to recognise the very long term nature of some of these activities, so that sometimes the next generation will see more of the benefits than you do.

Strategic planning will help you take a long-term view of your activities. Use it to also account for the personal aspirations family members may have for the enterprise into the future.

Once you have a vision, switch to operational planning to work out how to assemble the resources (time, skills, dollars, etc) that allow you to turn it into a reality. Getting the strategic planning right with your team will save you effort and time when developing the "how to".

Key decisions, critical actions and benchmarks

Where do you want your grazing enterprise to be?

Make time to develop a vision for your grazing enterprise. Without a longer term vision, it is very difficult to know if individual, day-to-day actions on the farm are taking you closer towards or further away from your 'ideal' outcome. It is also very difficult to involve your family or team in achieving that vision if it's only your vision, or the vision is only recorded in your head.

There is no 'right way' to develop a vision for how you want your farm to look in ten years, but if everyone is going to work towards it, then everyone needs some ownership of it.

Develop or revisit your business plan (tool 1.3 in ***Plan for Success***) and make sure you also capture in that plan, your team's vision for the farm's natural resources, including:

- Soil
- Water
- Vegetation, including native pastures and remnant vegetation
- Weeds and pests
- Native and feral animals.

Several tools in ***Plan for Success*** can make it easier for you to involve your team in the strategic planning process.

- Tool 1.4 contains a set of 'starting questions' to help you and/or a family or farm team imagine what the farm could look like in ten years

AT A GLANCE

- Include the whole family and/or farm team in developing the vision for your grazing enterprise
- Plot your vision onto an aerial photo or map of the farm
- Seek multiple benefits - environmental outcomes that boost production and vice versa
- Devise your management plan

- Tool 1.5 is a fun technique that lets everyone who is old enough to hold a camera (or to instruct someone to hold it for them), have an equal input into the farm vision.

Document your vision and plan

As the planning progresses, it is essential to document the vision and plan to some degree. An early and simple step, and one that fits well with the strategic planning approach in tools 1.1, 1.2 and 1.3 in ***Plan for Success***, is to work on an aerial photo. A laminated aerial photo of your property, a set of white-board markers (non permanent pens) and several plastic overlays will let everyone share their vision for the farm, and build on contributions from other family members. This 'birds eye view' will provide extra insights, such as

where vegetation corridors might best be located, as well as providing a good snapshot of 'day one' of your ten-year plan.

Plan for multiple benefits

Resources are scarce on every farm and must be allocated carefully. Environmental outcomes often have long lead times, making it hard to justify the inputs unless they also improve enterprise profitability. This is the concept of multiple benefits – seeking to improve environmental values in ways that boost production, and conversely, ensuring that production focused activities also deliver environmental outcomes.

Some examples of multiple benefits are:

➜ All fences have two sides, so a fence constructed primarily to protect vegetation, can, if planned that way, increase subdivision and therefore increase grazing management and pasture utilisation options. Fencing for vegetation corridors can also provide the basis for a laneway system to facilitate stock movement

➜ Fencing off a bare hill and mid slope and allowing them to revegetate may simplify your decision making, allowing more inputs (fertiliser, your time, etc) to be applied in areas that give better returns

➜ Revegetation to provide a corridor between remnants, might also deliver more shade and shelter for livestock, increase water use to prevent the spread of dryland salinity, or commercial opportunities such as firewood, sawlogs or wood chips

➜ Current thinking is that remnant vegetation and other conservation areas need to be fenced off, but not forgotten. These areas are managed primarily for their environmental value, but are still part of the farm feed supply unless they contain poisonous plants

➜ When constructing a farm dam primarily for water supply, incorporate some design features (eg, an island) to improve the opportunities for biodiversity

➜ Pasture cropping - sowing winter crops into summer-active, native pastures without killing the pasture - is a new 'multiple' benefit that is gaining momentum (see signposts).

Case studies of sheep producers managing farm waterways, native vegetation and pastoral country on their properties for multiple benefits provide practical examples of managing natural assets as part of a profitable grazing enterprise (see signposts). These case studies may give you some good ideas to incorporate into your own vision for your grazing enterprise.

Firm up and resource your plans

Mark all the relevant patches and paddocks on your aerial photo or farm map with a permanent pen, and mark your plans with a non-permanent marker (see procedure 5.1).

Once you and your family have drafted your vision onto an aerial photo, the next step is to make sure your plan is attainable and practical. This is the switch from strategic to operational planning.

A network of regional natural resource management (NRM) authorities is responsible for investing in land management practices that achieve community and environmental benefits.

These authorities are called catchment management authorities (CMAs) in NSW and Victoria, Regional NRM councils in WA, NRM Boards in SA, NRM Regional Committees in Tasmania and Regional NRM Bodies in Queensland.

Contact your regional authority (see signposts) and get them to help assess your options and outline what support they might be able to provide. Depending on your particular regional NRM authority, this support might include:

➜ Assistance with the planning

➜ Advice on incentive funding

➜ Help to complete an application for incentive funds

➜ Taking you to visit farms that are a few years down the track (i.e. just properly started) and 10 years down the track (to see the sort of progress that you might expect in 10 years)

➜ Cash assistance.

Signposts

Read

Physical Property Planning – a step-by-step approach to planning your farm layout to manage your soil types and land capability for sustainable production (The principles in this booklet are portable to other states). Purchase a copy from NSW DPI by:

➜ Calling: 1800 025 520

➜ Visiting the website: www.dpi.nsw.gov.au and search for Physical Property Planning.

The Land Water & Wool section of the AWI website has information and case studies relevant to sheep producers on a range of natural resource management issues. Visit www.wool.com and click on Grow > Environment > Land Water & Wool

View

Grantslink website: find funding from a variety of grant programs for individual, business and community projects. Visit: www.grantslink.gov.au/

Procedure 5.2

Prepare an inventory of your farm's natural assets

Background information

To make the best use of this procedure, it is important that you have a good 'picture' of the amount, condition and location of the natural assets, weeds and pests that that you need to manage in your grazing enterprise. Remember that these resources include:

- Soil: healthy productive soils, as well as gullies, eroded areas and paddocks with special needs (eg, low pH or erodible)
- Water: the amount, pattern and ability to capture your annual rainfall. Stock water supplies are included here
- Vegetation: weeds, native and sown pastures (and their condition), shelter belts, and remnant woody vegetation
- Riparian land, i.e. any land that adjoins a permanent or temporary body of water, be it a river, stream, wetland or farm dam
- Native and feral animals: the species present and their havens.

Farm sustainability

Use a self-assessment tool (SAT) to audit your farm's financial, social and environmental sustainability.

Tool 5.11 lists a number of SATs which are general enough for any sheep producer to use.

Identify and assess soil erosion risks

Use tool 6.1 in ***Healthy Soils*** to assess and record the land classes across your farm. From your knowledge of the farm and the land classes, identify the key areas at risk of soil erosion and record them on your aerial photo.

Three forms of soil erosion are reasonably common on sheep properties:

- Sheetwash (sometimes called rill or hillslope) erosion is the movement of soil downslope by running water. The key factors are rainfall intensity, groundcover, slope length, gradient and soil erodibility
- Wind erosion is most common in drier areas. Typically, areas subject to wind erosion are exposed and have easily transported, unconsolidated, loose and fine sand-size aggregates
- Gully erosion is most common in higher rainfall zones. Gullies produce poor quality run-off and, with streambank erosion, are the main sediment sources across southern Australia.

Maintaining and/or increasing groundcover can prevent and/or reduce the impact of these erosion processes. Set goals for groundcover in each land class on your farm using the benchmarks in procedure 6.2 in ***Healthy Soils***.

Use tools 6.2 and 6.3 in ***Healthy Soils*** to measure groundcover at the sites with highest erosion risk on your property.

Assess the salinity risk

The primary cause of dryland salinity in Australia has been the replacement of deep rooted/perennial native vegetation with shallow rooted/annual crops and pastures that use less water. A 1,000ha farm receiving 500mm of rainfall has 5,000 megalitres of water to manage each year.

Poor management of the water cycle (see figure 5.1) directly impacts on many of our resource management issues, including soil erosion, high nutrient loads in rivers, soil acidity and dryland salinity.

AT A GLANCE

- Identify and assess the condition of and threats to your farm's natural assets and pests
- Include all aspects of your on-farm natural resources

The excess water (often called recharge) not used by plants drains below the root zone causing the water table to rise. It may bring saline groundwater up towards, and eventually into, the root zone, somewhere 'downslope' (often called discharge). Sufficient salt in the root zone can restrict or stop plant growth. Contact your regional natural resource management agency (see signposts) to determine the risk of salinity in your area. Use the following tools to assess that risk to your grazing enterprise:

➜ The pasture assessment techniques in tool 7.6 in ***Grow More Pasture*** to measure the perenniality of your pastures. Compare your result with the benchmarks in tool 7.6

➜ If areas are salty, tool 5.1 will help rate salinity across your paddocks. SALTdeck cards (see tool 5.10) will help you identify the indicator species listed in tool 5.1.

Water draining through the soil leaches nitrogen and contributes to soil acidity. Perennial pastures can assist in preventing soils becoming more acid.

Productive pastures, profitable grazing systems and improved sustainability are all about efficient management of the water cycle.

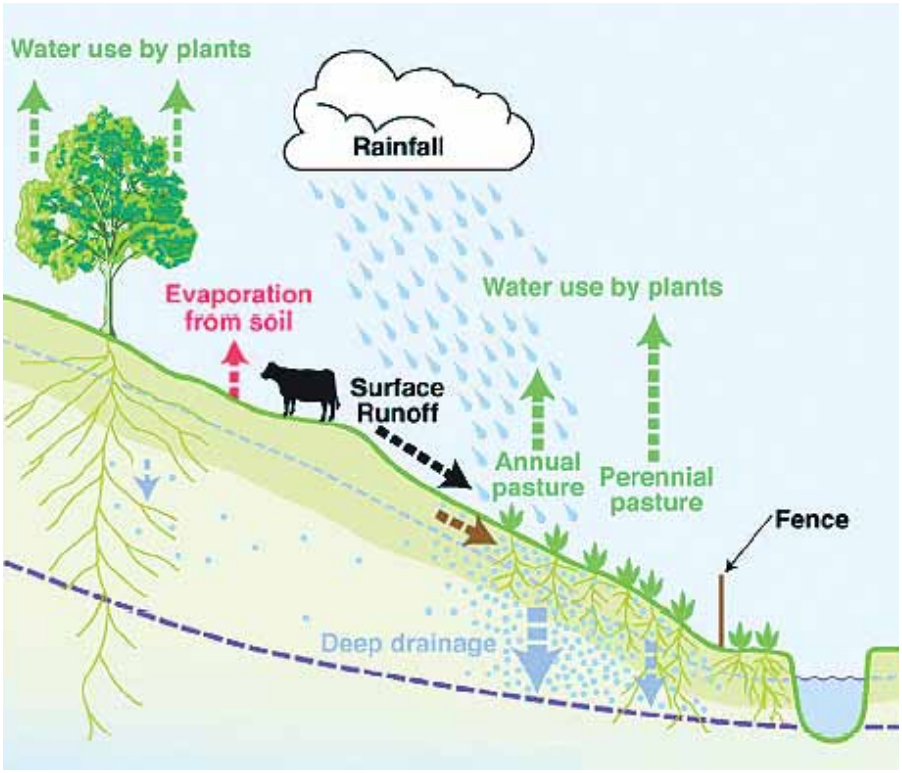

Figure 5.1 The 'water cycle' on a grazing property

(**Source:** Towards Sustainable Grazing – the Professional Producer's Guide)

Assess the condition of native vegetation

It is important to identify what native species are present on your property to inform future management actions. Native pastures provide reliable (because of their diversity) and low input production while helping to maintain healthy soils and ecosystems. Much of Australia's fine wool comes from native pastures because they provide a persistent, consistent feed supply.

Native grasses are more persistent when allowed to recover after grazing, so that rotational grazing/resting for at least part of the year is an advantage.

Native pastures respond positively to low rates of fertiliser, but higher rates destabilise the pasture, with annuals and weeds crowding out native perennials, though this can be mitigated by grazing management to some degree.

Species identification tools are not included in this package but tool 5.10 contain many useful references and links. Most regional NRM authorities (see signposts) have tools, access to local experts and information to help sheep producers identify native species.

Several assessment and monitoring tools are listed in tool 5.10. Use one of these tools to quickly and simply assess the condition of native bush, riparian zones and native pastures on your farm and for on-going monitoring.

Discuss and record what you would like to see in your areas of native bush, riparian vegetation and native pastures, what changes could be made to protect areas at risk (eg, make them larger, denser, more diverse, etc), and when you will address these risks.

Survey birds as 'focal' species

Birds have received more attention than any other animal group when designing landscapes for environmental outcomes. Birds are a popular choice for several reasons:

➜ Birds are mobile - they move across the landscape at the planning scale of hectares (paddocks) and kilometres (properties)

➜ Birds are relatively easy to survey, being abundant and visible during the day

➜ Birds are placed well towards the top of food chains - an ibis can eat 250 grasshoppers/day and a magpie can eat 40 scarab beetle larvae/day.

➜ A diverse range of bird species inhabiting the ground, the understorey layers and mature trees indicates the remnant vegetation is healthy.

Native birds are perhaps the most useful 'indicator' group. A farm with a rich diversity of birds will also have a relatively high diversity of trees, shrubs, mammals, reptiles, frogs and invertebrates. If the small birds are missing, there is something wrong with the habitat. Too many larger birds or noisy miners indicate a lack of balance.

Use Quickchecks (see signposts) to assess bird numbers and diversity on your

property. The tool accounts for the fact that different parts of the farm will have different bird groups, highlighting the fact that a variety of habitats is required across the farm.

Alternatively, keep a small notebook in the ute and record birds (and/or native animals) as you come across them in your ordinary day's work. All family members can make entries in the notebook and later add them to a master list.

Tool 5.10 lists many useful references and links to help you identify birds.

Identify changes you can make to the vegetation on your farm to improve bird populations, and when you will make them.

Assess the prevalence of weeds

Pests and weeds threaten both pasture productivity and natural resources.

The threat posed to biodiversity by weeds is ranked second only after land clearing.

Successful weed management is much more than ad hoc weed control. It is important to work out why weeds are a problem on your property; set realistic goals for both pasture and weed management; undertake the appropriate weed management practices on time, every time; check whether your weed management has been successful and adapt your plan as needed.

This approach of Deliberation, Diversity and Diligence is called the '3Ds of Weed Management'. Each step has key decisions and critical actions. Use the Deliberation table in tool 5.3 to compare a stocktake of your current weed problems (species and density in key paddocks) and agree on priorities for action based on what you want the weed level to be. Record what changes could be made to weed populations on your farm by when.

Assess invertebrate pests

Invertebrate pests, including insects and mites, can significantly reduce pasture productivity throughout the year.

Across Australia, Red-legged earthmite (RLEM) infest 20million ha of pasture, causing $200million damage to the wool industry alone.

The first step on the farm is to correctly identify the pest. Your local agronomist can help you identify the species present. Other sources of information include CSIRO Entomology (see tool 5.10) and State Departments of Primary Industries/ Agriculture.

Identify what you would like the pest level to be, and what changes could be made to reduce and keep pest populations small.

It is important to choose the appropriate tools to manage each pest, using an integrated approach (integrated pest management or IPM – see procedure 5.3) and to monitor the effectiveness of your approach.

Different pests require different management strategies. For example, red-legged earthmite (RLEM) and blue oat mite (BOM) look very similar but have different lifecycles. This difference means that the timing of pesticide spraying using TIMERITE® (see signposts in Procedure 5.3) works for RLEM, but not for BOM.

Assess vertebrate pests

A variety of vertebrate pests affect sheep farms across Australia, including:

➜ Introduced pests such as goats, deer, rabbits, pigs, foxes, and wild dogs

➜ Native browsers such as kangaroos, wallabies and wombats.

Many of the habitats that support native animals and birds on farm also favour the vertebrate pests. Individual sheep producers and their families have to find the balance that suits their situation.

Rabbits damage vegetation by ringbarking trees and shrubs; prevent regeneration by eating seeds and seedlings; and degrade the land through burrowing and reducing groundcover. Selective grazing by rabbits changes the composition of the vegetation.

Where rabbits have caused the slow decline of, say, bulokes on roadsides in western Victoria, there are fewer food trees for species such as the red-tailed black cockatoo that have declined as a result, though clearly not from direct 'competition' from the rabbits.

The impact of rabbits often increases during and immediately after drought and/or fire, when food is scarce and they eat whatever remains or re-grows.

2-3 rabbits/ha is sufficient to severely depress the regeneration of native shrubs and trees.

Spotlight transect counts (the number of rabbits seen along a set route or transect) are an accurate way to monitor rabbit populations, though the number of rabbits seen in the car headlights when driving home provides a good enough indicator of rising or falling rabbit numbers.

Fox control can increase lamb marking percentages by as much as 25% when programs are implemented. In addition, foxes are major predators of rabbits (good) and small native mammals and reptiles (not good).

While monitoring rabbit numbers is useful on farm, monitoring fox numbers is not. This is because of the highly variable (and imprecise) relationship between predator numbers and their impacts on prey species, and because with sheep, it is only at lambing that predation is likely.

Identify the prevalence of vertebrate pests and their location on your farm, what you would like the pest level to be and what changes could be made to reduce and keep numbers down.

Audit stock water supplies

The majority of Australia's livestock drink from water that falls on the property.

A variety of measures can improve water use efficiency in sheep grazing systems, including creating additional watering points and maintaining healthy soils to minimise run off.

Manage your farm's natural assets for multiple benefits

Healthy soil drives higher pasture productivity and benefits the environment through greater use of water and nutrients in the paddock and less risk of run-off, erosion and deep drainage (see procedure 6.4 in Healthy Soils).

Like a feed budget (see tool 8.4 in ***Turn Pasture into Product***), tool 5.2 will allow you to calculate how much water you have, how much your stock need, and/or how long a dam or water supply will last.

Use tool 5.2 to complete a stock water audit of the quantity, quality and reliability of your stock water supplies.

A life-cycle analysis of water use in red meat production found that it takes 103 - 540 litres of water to produce a kilogram of red meat. This is in stark contrast to 50,000 litres per kg meat often quoted (See www.redmeatgreenfacts.com.au/reduce-water).

Climate change and greenhouse gases

The Earth's surface temperature depends on the balance between incoming and outgoing radiation.

The main greenhouse gases - water vapour, carbon dioxide (CO2), methane, nitrous oxide and ozone - absorb and re-radiate much of the infrared radiation released by the Earth's surface.

All of these gases occur naturally. They produce a natural greenhouse effect, maintaining the temperature of the Earth's surface some 33°C warmer than it would otherwise be.

Together, they make up less than 1% of the atmosphere, which is comprised mainly of nitrogen and oxygen.

Between 1750 and 2005, methane concentrations rose by nearly 150% and nitrous oxide by 18% (IPCC, 2007).

However, atmospheric methane concentrations have remained relatively stable since 2000, despite significant increases in livestock numbers globally.

Australia's livestock industry (including dairy) produces 10.2% of Australia's total greenhouse gas (GHG) emissions. Most of these emissions are methane from the natural digestion process of cattle and sheep. Energy generation represents 37% of Australia's greenhouse gas emissions.

Climate change impacts on sheep enterprises

Australian sheep producers have always dealt with a variable climate and its associated droughts and floods. Climate change scenarios suggest this variability will increase.

In the sheep industry, climate change is likely to impact on:

- ➜ pasture and fodder crops
- ➜ water resources
- ➜ wool production and quality
- ➜ animal health and reproduction
- ➜ land stewardship
- ➜ competition from other agricultural activities
- ➜ national and international markets.

For example, farm input costs like electricity, fuel and fertiliser will rise when a carbon tax is introduced in Australia.

Increased heat stress associated with climate change could reduce the reproductive performance of sheep in areas where temperature and humidity increases.

Vegetable fault and dust contamination in wool could increase where pasture composition changes, particularly if weeds and bare ground increase.

Sheep producers now face not only the continued challenge of managing production of food and fibre, given the variability in climatic conditions, but the new challenges created by the community's desire to see reductions in carbon emissions.

Sheep enterprise impacts on climate change

A life cycle assessment of sheep meat production in a southern Australian production system measured total emissions of 78 kg CO2 per kilogram carcase weight.

Wool has excellent 'natural' credentials - it is a renewable, biodegradable protein, and more than 99% is produced in extensive grassland terrain.

Use the FarmGAS Calculator (see signposts) to estimate your farm's annual GHG emissions, both at the individual enterprise activity level and for your farm as a whole, and to examine the financial impacts that different greenhouse mitigation options may have on farm business profitability.

Signposts

Read

Towards Sustainable Grazing – the Professional Producer's Guide: a collation of proven best practices for modern grazing enterprises in southern Australia. Available from MLA.

Quickchecks: Natural Resource Monitoring Tools for Woolgrowers – tools to measure the health of your pastures, soils, woody vegetation, farm watercourses, paddock production levels and birds. Download your free copy (2.27MB) on-line at: www.wool.com click on Grow > Environmental > Land Water & Wool and browse through native vegetation and biodiversity.

The Potential Impact of Climate Change on Woolgrowing in 2029: a report commissioned by AWI that details the effects of climate change on the wool industry. Click on the following link and scroll down to find a downloadable PDF file (1.1 mb): http://www.wool.com/6786.htm

Greenhouse Gas Emissions from Australian Beef and Sheepmeat Industries: a report commissioned by MLA on the possible implications for industry and government policy arising from issues in global climate change and the Greenhouse Effect. Search at www.mla.com.au

Greenhouse and the Red Meat Processing Industry: a report commissioned by MLA that examines the implications of government legislation on greenhouse gas and its effect on the red meat processing industry.

Order copies of these MLA reports (free for MLA members) by:

- Calling: 1800 675 717
- Emailing: publications@mla.com.au
- Visiting: www.mla.com.au/publications

View

The Land Water & Wool section of the AWI website has information and case studies relevant to woolgrowers on a range of natural resource management issues. Visit www.wool.com and click on Grow > Environment > Land Water & Wool.

Regional NRM Authorities: critical links for natural resource management and funding – if you know your local authority website, proceed straight to it, but for access to all regional NRM Authorities across Australia go to http://www.nrm.gov.au and click on What is natural resource management > What's an NRM region.

MLA Tips & Tools – a range of publications are available covering native vegetation, earthworms, biodiversity benefits, birds and soil health. Get your free copies of these MLA 'Tips & Tools' by:

- Calling: 1800 675 717
- Emailing: publications@mla.com.au
- Downloading from: http://www.mla.com.au/publications

Red Meat Green Facts: a website created by MLA listing the facts about the impact of farming on the environment and the initiatives undertaken by farmers and processors across Australia. Visit: www.redmeatgreenfacts.com.au

Climate Change Resource Centre: MLA has made it easy for sheep producers to access a range of resources on the impact of climate change on Australian livestock industries, tips on adapting to these impacts. Visit: www.mla.com.au and click on About the red meat industry > Environment.

Or order copies of MLA publications on Climate Change by:

- Calling: 1800 675 717
- Emailing: publications@mla.com.au
- Visiting: www.mla.com.au/publications

Managing Climate Variability Research and Development Program: a partnership of rural research and development corporations has developed and made available a range of practical tools that help incorporate climate information into farm business decisions. Visit: www.managingclimate.gov.au/

Australian Farm Institute: the Australian Farm Institute is an independent organisation that conducts research into farm policy issues to benefit Australian agriculture. The Institute has released four publications on different aspects of emissions trading and its potential impact on agriculture. You can purchase these publications online by visiting: www.farminstitute.org.au

Attend

The MLA EDGE*network*® program is coordinated nationally and has a range of courses to assist sheep producers. Contact can be made via:

- Phone: 1800 993 343
- Email: edgenetwork@mla.com.au
- Website: www.mla.com.au/edgenetwork

Farmer's guide to managing climate risk: a NSW I&I PROfarm course for sheep producers interested in understanding weather and climate and managing risk. For further information:

- Visit: www.profarm.com.au
- Call: 1800 025 520
- Email: profarm@tocal.com

Procedure 5.3

Devise and implement your action plan

Background information

Better management of your farm's natural assets is about environmental as well as production and financial benefits. Farms are operating ecosystems, with everything interconnected. The healthier the natural assets, the better the production outcomes, the more sustainable the farming system, and the more enjoyable it is to live and work on the farm.

Now that you have an inventory of your farm's natural assets (procedure 5.1), make your farm a more attractive place to live and work by managing your farm's natural assets for multiple benefits. Look for multiple benefits from any action, eg, perennial pastures sown to meet animal feed demand (see procedure 8.2 in ***Turn Pasture into Product***) can also reduce salinity and soil erosion when sown in the right spot.

Community resources are often available to fund environmental outcomes that benefit both your grazing enterprise and the community.

Key decisions, critical actions and benchmarks

Prevent soil erosion

Prevent sheetwash and gully erosion by slowing water down, letting vegetation regenerate and groundcover build up. Re-establish riparian vegetation to filter and trap dissolved nutrients and slow water movement. Maintain existing structural works to slow or divert flows where riparian vegetation is in poor condition.

Aim for 70% groundcover in flatter areas and 100% on slopes (see tool 6.2 in ***Healthy Soils***).

This requires management of how hard and long stock are allowed to graze areas. Feed budgeting (see tool 8.4 in ***Turn Pasture into Product***) is a key tool to ensure sufficient pasture is available for livestock production, to determine the number of stock that should be placed in a paddock, and how long they can stay there and maintain groundcover. The signposts contain resources to help you achieve this.

To manage wind erosion, implement management practices that avoid erosion, not just repair erosion after the event. Maintain vegetation cover over more than 50% of the soil surface (see tool 6.2 in ***Healthy Soils***) to:

- Act as a blanket that prevents the wind from picking up any soil particles
- Absorb the force of the wind and reduce the wind speed at ground level
- Trap eroded soil particles and reduce the bombardment of the soil surface.

Stubble, plants, grass butts or small shrubs (higher than 10cm) that sit up into the air offer even more protection, so you will require slightly less cover. Shrubs and tussock grasses protect the soil when the spacing between the plants is less than three times their height, and when they are evenly distributed across the paddock.

The signposts contain a number of useful resources on managing grazing and cropping paddocks in areas prone to wind erosion.

AT A GLANCE

- Devise an action plan with explicit targets and descriptions based on your vision for the resource base.
- Implement management practices that avoid erosion, not just repair erosion after the event
- Manage stock access to dams and waterways to improve water quality
- Apply the 3Rs of vegetation management - Retain before Restore before Revegetate
- Use integrated pest and weed management methods
- Adopt management practices that help reduce the impact of climate change on your farm

Set targets for what priority areas will look like when you prevent erosion. An example target may be 'maintain 1,000 kg DM/ha all year round'; or 'gully walls stabilised'.

Devise an action plan to achieve the targets for each area. Set a date for achieving these targets. Remember it is much easier to break a big issue into smaller, manageable chunks, or individual steps.

Commit to monitoring the change (see procedure 5.4).

Control salinity with best practice

There are two aspects of best practice for salinity management:

➜ Reduce recharge, then

➜ Manage saline areas for production and to prevent further environmental decline.

Reduce recharge with perennial pastures

A CSIRO report summarised the potential of perennial pastures to reduce leakage:

➜ High rainfall zone (more than 600 mm/year). Near Rutherglen in Victoria, leakage under perennial grasses was estimated to range from 50–120 mm/year depending on grazing management and plant nutrition. Researchers concluded a high proportion of trees would need to be incorporated into the landscape to achieve a significant reduction in recharge

➜ Medium rainfall zone (400–600 mm/year). Perennial systems can reduce leakage by 20–50% when compared with annuals, but leakage remains 2-3 times greater than leakage under the original woodland. However, lucerne grown continuously can reduce leakage by up to 90%

➜ Low rainfall zone (less than 400 mm/year). In the Upper South East of SA, lucerne reduced leakage to the level of natural mallee vegetation (< 1 mm/year). In western NSW, there appeared to be no increase in leakage on heavier soils when trees were replaced by well-managed grazing systems.

Large scale replanting of catchments to trees is unlikely. To increase water use by pastures and reduce water table recharge rates, use pasture plants which grow longer into the season and explore a greater volume of soil (deeper root systems). Provide the right soil conditions for growth (see procedure 7.1 in ***Grow More Pasture***) to improve water use efficiency.

Perennial pasture establishment can be expensive. However, perennial pastures on recharge areas can deliver multiple benefits to your farm by reducing additions to the water table and increasing pasture productivity.

Set targets for what the outcome of preventing or addressing salinity would look like for the priority areas identified in your inventory (procedure 5.2). Example targets may be 'plant perennial pasture (or trees) on the mid-slopes' or 'implement a simple four-paddock rotational grazing system.'

Devise an action plan to achieve the targets for the priority areas. Set a date for achieving these targets. Remember, it is much easier to break a big issue into smaller manageable steps.

Commit to monitoring the change (see procedure 5.4).

Manage discharge

Saline soils are one of the 'problem soils' included in procedure 6.4 in ***Healthy Soils***. Saline soils are included here because saline discharge sites are often associated with water quality problems, eg, salt wash-off into streams and increased erosion, and with the decline and death of native vegetation.

Apply the guidelines in tool 5.5 to better manage any saline sites you identified on the farm.

Manage native vegetation

When managing native vegetation, there are two elements of overriding importance – extent (amount and degree of connection between patches) and condition. Now that you have assessed the condition of your native vegetation (see procedure 5.2), manage the vegetation according to its condition to achieve your vision for your grazing enterprise (see signposts in procedure 5.1).

The following general principles for native pasture management can give both production and environmental benefits:

➜ Avoid overgrazing: regrowth is slow when pastures have been overgrazed (negative for production) and the diversity of native species will decline (negative for conservation)

➜ Rotationally graze perennial species: rotational grazing (rather than set stocking) favours perennial plants (native and exotic) over annuals (see procedure 8.3 in ***Turn Pasture into Product***)

➜ Bare ground benefits many weeds: manage grazing to minimise bare ground, but remember that the forbs and other small non-grass plants that contribute to the diversity in native pastures rely on some bare ground between the tussocks.

Apply the "3Rs" – Retain then Restore then Revegetate - when managing, protecting and enhancing native vegetation and biodiversity on your property. Cost and degree of difficulty increase as you move from:

➜ Retain: areas of native vegetation that are in good condition are extremely valuable and retaining them in that condition should be the focus

➜ Restore: the vast majority of remnant vegetation on sheep properties has been altered, reducing its conservation value. Restoration of 'somewhat degraded' native vegetation (through changes in grazing management, weed eradication, natural regeneration, or enhancement planting) is much easier than starting from scratch

➜ Revegetate: while 'revegetation' is nominally the last resort, the reality on many properties is there is insufficient

native vegetation to underpin a healthy farm ecosystem. Revegetation is most effective if it is used to enhance, enlarge or link existing patches of native vegetation. Natural regeneration is the cheapest and most effective, if there is a bank of seed of all the key species still in the soil. Seed banks will be very low on properties that have been extensively cleared for many years, slowing the pace of natural regeneration.

Set targets for priority areas of native vegetation that describe your desired changes. Example targets may be 'increase remnant areas by 10ha each year up to X% of the farm'; 'manage native pastures to increase their perennial content from 40% to 70%'; 'fence a 1ha area around individual paddock trees to encourage revegetation.'

Devise an action plan to achieve the targets for your priority areas. Set a date for achieving these targets. Remember, it is much easier to break a big issue into smaller manageable steps.

Design for birds

Apply some or all of the ten guidelines for attracting birds to your farm while improving the natural assets on which your grazing enterprise depends:

- ➜ Local native vegetation (including native pastures) should cover at least 30% of the total farm area
- ➜ Re-create local conditions
- ➜ Exclude high-impact land uses from at least 30% of the farm area
- ➜ Maintain native pastures and avoid heavy grazing
- ➜ Native vegetation cover should be in patches of at least 10ha and linked by strips at least 50m wide
- ➜ Manage at least 10% of the farm area for wildlife
- ➜ Maintain a range of tree ages
- ➜ Leave fallen trees to break down naturally
- ➜ Maintain shrub cover over at least one-third of the area within a patch of farm trees
- ➜ Maintain native vegetation around water.

Sheep can help control Paterson's curse in pastures and grazing cereals

While it is preferable to follow the suggestions about size, shape, structure and connectivity of vegetation, even small isolated patches of revegetation provide habitat for some native birds and lay a foundation for future birdscaping endeavours. Some model bird havens started out as barren and degraded landscapes. You've got to start somewhere.

Use a diversity of approaches to manage weeds

To successfully manage weeds, choose a diverse combination of weed control activities, targeting the weak points in weed lifecycles. The Diversity table in tool 5.3 will help you scope a range of methods for weed control, then choose the tools you can apply to manage the weeds to achieve the goals you identified using the Deliberation table (tool 5.3). Use the Diligence table in tool 5.3 to keep your weed management plan on track, and make sure you "do it on time, every time".

The CRC for Weed Management has described five 'tactic' groups of interventions (see tool 5.4), where you aim the particular intervention to the weak points in the weed's armour. Tool 5.4 specifically focuses on weeds in native vegetation, but the principles stated have relevance to pasture weeds in general.

Set targets that describe success in weed management for priority areas. Example targets may be 'thistles occupy less than 10% of the paddock within five years'; 'weed spraying costs will be 30% lower within five years.'

Devise an action plan to achieve the targets for the priority areas. Set a date for achieving these targets. Remember, it is much easier to break a big issue into smaller manageable steps

Integrated management of insect pests

Integrated Pest Management (IPM) is the increasingly popular system of managing insect pests by monitoring populations, replacing broad-spectrum insecticides that kill pests and beneficial insects alike with more selective insecticides and using other strategies like baiting and seed dressings.

Farmers who have tested an IPM approach have reduced their reliance on broad acre spraying with direct savings of between $5/ha and $30/ha (see signposts).

Rabbit warrens can remove groundcover leaving the soil exposed to erosion

Time spent spraying is often replaced with regular monitoring of paddocks. A new level of skill is required to identify the beneficial insects as well as the pests and to know the appropriate strategies to apply. Farmers who have tried an IPM approach say holding your nerve and waiting for the beneficial insects to do their job is the most difficult part.

IPM results are confirming what many have suspected for years – well balanced farms, with a good range of more 'native' areas have fewer problems with insect pests in crops and pastures. Implement IPM by:

➜ Increasing the number and diversity of birds on your property - birds are natural predators of many insect pests

➜ Establishing windbreaks for animal shelter, NRM benefits, and, with a complex understorey, harbour for predatory invertebrates that prey on insect pests in the adjacent pastures

➜ Sowing tolerant plant varieties - plant varieties can vary significantly in their tolerance to invertebrate pests, e.g. sub clover is highly susceptible to RLEM attack, while gland clover has increased tolerance to RLEM. Sow pasture species with increased tolerance to invertebrate pests to decrease pesticide use

➜ Applying pesticides at the appropriate time and location For RLEM, TIMERITE® predicts the optimal date for spraying in spring to minimise insecticide use and to maximise effectiveness (see signposts).

Persist with rabbit control

Review the rabbit control measures analysed in tool 5.6 and use a combination of these. In order of cost effectiveness, poisoning, warren ripping and fumigation are likely to be the most important primary control methods. With rabbits, it's a matter of persistence.

Set targets for rabbit management. Example targets may be 'rabbit density will be 60% lower in five years'; or '50% of the farm's warrens are ripped in two years.'

Devise an action plan to achieve the rabbit control targets in priority areas. Set a date for achieving these targets. Remember, it is much easier to break a big issue into smaller 'manageable chunks', or individual steps.

Target the weak points in the fox lifecycle

There are a range of control measures for foxes (see tool 5.7), and as for rabbit control, it is often best to use a combination. Foxes are highly mobile so without a coordinated effort with your neighbours, control programs are unlikely to have a lasting impact.

Concentrate baiting efforts in March and August/September each year. Around August/September is when mating season has finished and vixens are actively seeking additional food prior to whelping. Also at this time of the year the fox population is at its lowest. In March, juvenile foxes disperse to find their own territory, displacing older foxes. Well placed baits will be readily taken in March. This concentrated, twice yearly baiting slows the recovery of the fox population, as foxes breed only once a year.

Seek local advice on managing native browsers

Many farms with or near large areas of bushland face significant grazing competition from native animals, especially kangaroos and wallabies. In most cases, these are native animals that have benefited considerably from the creation of extensive grasslands and watering points for sheep and cattle and are often present in greatly increased numbers.

Control of native animals often faces strong community resistance. It is not possible to provide best practice guidelines here because what is appropriate in one jurisdiction can be illegal in another.

In most states, sheep producers can obtain permits to cull if certain native animals are causing damage or economic hardship. In extensive grazing areas, culling is the only viable control method. In more intensive grazing areas where competition from native browsers is high, exclusion fencing can be viable. Local advice is essential, as the type of fencing required varies depending on the animals to be excluded.

Manage stock access to water supplies

There are many good reasons for excluding stock from waterways, including the:

➜ Damage they can cause to vegetation and stream banks

➜ Decline in water quality they cause through pugging and fouling

➜ Damage they can do to favourite fishing, yabbying or picnic spots

➜ Risk of stock losses or stock straying into neighbouring properties.

Many management options are available to minimise the downsides of direct stock access to water bodies. These actions involve the careful design and construction of:

➜ Crossing points that allow stock (and vehicles) to cross creeks or other water bodies. These are best located where the slope of the banks is not steep, where the stream bed is firm and, if possible, across a narrow section

➜ Water access points that restrict stock to a limited number of sites, and can involve 'strengthening' the access point with concrete, gravel or logs to minimise pugging. The best water access points have the same basic features as crossing points but they also have minimal shade or shelter to discourage stock from remaining in the area other than to drink.

Use the Land & Water Australia booklet, ***"Stock and Waterways: a manager's guide"*** (see signposts) to develop a strategy to manage riparian land productively and sustainably.

Consider reticulated water supplies

Carefully designed reticulated stock watering systems will require more maintenance than other stock water supplies such as dams. However, reticulated systems can provide multiple benefits for production and the environment. Some simple principles include:

➜ Single watering points in large paddocks lead to uneven grazing. Minimise uneven grazing by locating the trough near the centre of the paddock. In cropping paddocks, troughs are best placed close to fences but away from gateways

➜ Troughs are best located away from:

- Stock camping areas: to minimise dung and dust contamination and algal growth
- Trees: sheep will lie down around the trough and prevent timid animals from accessing the water
- Remnant vegetation: overgrazing and nutrient build up in the vicinity of the trough will escalate the degradation of the remnant vegetation
- Steep or erosion prone areas: where the constant trampling will exacerbate any problems

➜ A shade structure over troughs will limit algal growth, reduce evaporation and keep the water cool, but must be kept to a minimum size to discourage camping.

Multiple benefits from farm water storages

Some farm dams are ideal candidates for the concept of multiple benefits. Good design and management of farm dams and the surrounding vegetation can protect your farm dam, improve water quality and water yield and increase the value of the dam and surrounds for wildlife habitat. Most farms have one or two dams that can provide excellent habitat for a range of wildlife like birds, frogs, mammals and fish.

Restrict stock access to let vegetation establish around the dam. Consider limiting stock to a controlled watering area, or providing a reticulated supply. Stock access to some parts of the dam will benefit birds (like swans and ducks) that prefer open space beside water.

Good groundcover in the dam catchment (not applicable to roaded catchments) will improve water quality by reducing soil, nutrient and faecal contamination and sedimentation. Shelterbelts provide shade and can reduce evaporation from the dam's surface. Reduce wave action with strategic placement of islands and surrounding vegetation, and allow taller reeds and sedges in parts of the dam.

Another simple (but potentially expensive) way to increase wildlife habitat is to construct a dam island. Add vegetation or dead branches to provide nesting and roosting sites for waterbirds on the island. Next time a dam has to be cleaned out, include an island or a vegetated buffer zone in the new design.

Reduce the impact of climate change

Review the range of options for reducing greenhouse gas emissions from your farm using the FarmGAS calculator (see signposts in procedure 5.2).

A sheep enterprise can either:

➜ Reduce emissions from livestock

➜ Offset livestock emissions by storing more carbon in the landscape.

Reduce emissions from sheep

The key to reducing livestock emissions is to maximise their growth rates and convert as much of their energy intake as possible into meat and fibre. This can also increase profit.

Research underway at the Sheep Cooperative Research Centre (CRC) showed:

➜ Daily methane production of sire groups was related to their liveweight, liveweight gain and feed conversion ratio, but not feed intake

➜ Australian Sheep Breeding Values (ASBVs) for yearling liveweight (YWT) are positively correlated with daily methane production.

Selective breeding (see procedure 9.1 in Gain from Genetics), improved feed management (see procedure 8.2 in ***Turn Pasture into Product***), maximising animal health (see procedure 11.2 in ***Healthy and Contented Sheep***) and improving livestock genetics (see procedure 9.2 in ***Gain from Genetics***) are essential to the future profitability and sustainability of the livestock industry and the environment.

Store carbon in the landscape

Organic carbon stored in soil is a significant carbon sink, and is increasingly recognized in strategies to mitigate climate change.

Soil can store around 50-300 tonnes C per ha, equivalent to 180-1100 t CO2.

Pastures and crops store 2-20 tonnes C per ha, while plantation forests can store up to 250 tonnes C per ha.

Maintain groundcover (see procedure 6.2 in ***Healthy Soils***) to minimise erosion losses, maximise organic input to soil, and offset methane emissions from your sheep enterprise.

Inclusion of soil carbon management in any future carbon reduction scheme will rely on the development of cost-effective methods for estimating soil C change under changed land management practices.

Signposts

Read

Towards Sustainable Grazing – the Professional Producer's Guide: a collation of proven best practices for modern grazing enterprises in southern Australia. Order your copy from MLA by:

- Calling: 1800 675 717
- Emailing: publications@mla.com.au
- Ordering on-line: www.mla.com.au/tsg

The Land Water & Wool section of The Australian Wool Innovation website has information and case studies relevant to wool growers on a range of natural resource management issues. Visit www.wool.com and click on Grow > Environment > Land Water & Wool.

There are many publications that can be downloaded that deal with managing natural resources on farms under the following headings:

- Native vegetation and biodiversity
- Rivers and water quality
- Sustainable grazing on Saline land
- Managing Pastoral Country
- Managing climate variability

On-farm water reticulation guide: practical, technical advice to help sheep producers plan, design and install piped systems. Download a copy from: www.gwmwater.org.au click on services > Wimmera Mallee Pipeline > on-farm water reticulation guide.

Farm Dams: Planning Construction and Maintenance (2002), by Lewis, B. Landlinks Press. Buy on-line at: www.fishpond.com.au

View

Exchange – a service provided by Greening Australia to link practical knowledge with research knowledge, and provide you with the resources and contacts to help resolve vegetation management challenges. Visit: www.greeningaustralia.org.au and search for exchange

Review ***tips on managing wind erosion under grazing and cropping*** at:

- The Department of Agriculture and Food WA website: www.agric.wa.gov.au and search for wind erosion
- The Department of Environment and Climate Change in NSW: www.environment.nsw.gov.au and search for wind erosion

Managing for Wildlife – the collective experiences and knowledge of organisations, researchers and managers on planning and managing native vegetation.

Visit the webpage on managing for wildlife, including birds at: http://live.greeningaustralia.org.au/nativevegetation/pages/page115.html

Weed Management A range of publications and resource on weed management can be found at www.weeds.gov.au/publications

3D Weed Management publications: guidelines for identifying and managing African Love Grass, Chilean Needle Grass, Paterson's Curse, thistles, Serrated Tussock, and Silver Leaf Nightshade. Free copies of the management fact sheets are available by:

- Calling: 1800 070 099

Downloading from: http://www.wool.com.au/Grow and click on pastures & nutrition > pasture pests and weeds.

WEEDeck: over 200 identification cards with photographs to identify a range of Australian weeds. Purchase your copy from http://www.sainty.com.au/orderingWD/wdorders.html

Weedbusters: this website contains links to all state based weed control bodies: www.weedbusters.info/yourstate.htm

SALTDeck: 50 colour cards to help you identify and select saltland plant species. Puchase your copy from www.sainty.com.au click on WEEDeck and look for SALTDeck.

Prevent gully erosion by maintaining or increasing ground cover

Healthy, resilient natural assets can increase the capital value of your farm and be a source of pride for you and your team

TIMERITE®: a reliable and effective option for control of redlegged earth mites (RLEM) on your farm. Visit the AWI website at www.wool.com.au, click on Grow and select Timerite from the drop down list.

Grain & Graze Integrated Pest Management: recent results show IPM systems can increase biodiversity on mixed farming enterprises and reduce the environmental impact of the business. Visit: www.grainandgraze.com.au/Research_Projects/index.aspx

MLA Tips & Tools: a range of publications area available covering weed management, NRM, grazing management, native pastures, soil health, deep drainage, groundcover.

Get your free copies from MLA by:

➜ Calling: 1800 675 717

➜ Emailing: publications@mla.com.au

➜ Downloading from: http://www.mla.com.au and search under publications

Regional NRM Authorities: critical links for natural resource management and funding – if you know your local authority website, proceed straight to it, but for access to all regional NRM Authorities across Australia go to http://www.nrm.gov.au/nrm/region.html which includes a map for easy navigation.

Grantslink website: find funding from a variety of grant programs for individual, business and community projects. Visit: www.grantslink.gov.au/

Australian primary industries transforming for a changing climate: the CSIRO Climate Adaptation Flagship is working to understand how primary industry businesses, communities and sectors can transform their practices to adapt to climate change. Visit: www.csiro.au and search for Climate Adaptation Flagship.

State agency climate change resources: some state specific resources on the impact of climate change, and adaptation options for sheep producers. Visit:

➜ Industry and Investment NSW: www.dpi.nsw.gov.au/research/topics/climate-change/response

➜ WA Department of Agriculture and Food: www.agric.wa.gov.au/PC_94076.html?s=1393414126

➜ Primary Industries SA: www.pir.sa.gov.au and click on the Climate Change Management Framework link on the home page

➜ Victorian Department of Primary Industries: http://new.dpi.vic.gov.au/agriculture/farming-management/climate

➜ Queensland Office of Climate Change: www.climatechange.qld.gov.au/whatsbeingdone

Greenhouse in agriculture: a website from the University of Melbourne with a range of spreadsheet tools for calculating greenhouse gas emissions from agricultural enterprises, including a specific spreadsheet for sheep enterprises. Visit: www.greenhouse.unimelb.edu.au

Greenhouse gas abatement and feed efficiency: the latest findings from Sheep CRC research into tools to help sheep producers manage greenhouse gas emissions from sheep. Visit: www.sheepcrc.org.au/research/sheep-and-their-management/greenhouse-gas-abatement.php

Attend

The MLA EDGE*network*® program is coordinated nationally and has a range of courses to assist sheep producers. Contact can be made via:

➜ Phone: 1800 993 343

➜ Email: edgenetwork@mla.com.au

➜ Website: www.mla.com.au/edgenetwork

Procedure 5.4

Measure, manage and monitor your progress towards the vision for your grazing enterprise

Background information

Sheep producers have many resources to manage, such as money, people, sheep and other livestock, machinery and land. Many sheep producers regularly check the performance of these resources, particularly money, as part of normal business management.

The monitoring tools and management recommendations in procedures 5.1, 5.2 and 5.3, and other modules, will allow to you add your natural assets, weeds and pests to this list and track your progress towards your vision for your grazing enterprise. They may also allow you access to markets for environmentally assured products.

Key decisions, critical actions and benchmarks

Maintain a photo record

Monitoring progress is critical in long term projects because it is impossible to remember what things were like at the start and how much 'progress' is being made despite the ups and downs of the seasons.

A sequence of photos taken over a period of time can provide a rich source of information to monitor short and longer term change resulting from management decisions, climatic conditions/impacts and natural events. Use tool 5.8 to establish and maintain photopoints.

Tool 5.8 and Quickchecks (see signposts) can help you set up photo sites to record change over time. The "before and after" photos in tool 5.9 show how well photos can visually record progress towards your vision over the years.

Label (date, location) and file your photos so you can find them when you need to:

- Locate the site to take another photo at regular intervals
- Prove the multiple benefits arising from your improved management.

AT A GLANCE

- Track your progress towards your vision for your grazing enterprise
- Work with your family to regularly monitor and document the condition of your natural assets, weeds and pests
- Carefully record and store your monitoring results

Commit to regular monitoring

Define the best month/s to assess the condition of your natural resources, pests and weeds, then take measurements (photos, assessments, counts, etc) at that time. The timing will vary according to your rainfall pattern (see procedure 8.1 in ***Turn Pasture into Product***):

- Winter and uniform rainfall zones: late autumn (before the break) is often the 'worst' for vegetation, groundcover, birds and insects, while mid spring is the 'best'
- Summer rainfall zones: spring and autumn can also be the most appropriate periods, but autumn will sometimes be 'better' than spring.

Seasonal variations can modify the times, but experience has shown that the twice-per-year / stronger-and-weaker approach is fairly robust over time.

Use the tools suggested in this and other modules to monitor change in soil, pastures, salinity, soil pH, remnant vegetation or any of the key resources you have identified.

Whichever tool or combination of tools you use, clearly identify your monitoring sites and come back to the same areas each time you monitor.

Monitor long-term impacts

Use the monitoring tools repeatedly over time to determine if the condition of your key resources is moving towards or away from your vision. Collect information over a number of years so you can clearly see trends over time.

Don't commit to a program that is too demanding over time. Quickchecks (see signposts) can help you determine the priority sites and monitoring methods according to your vision for your grazing enterprise. The most important thing is to monitor the priority sites at about the same time each year to establish trends. Write these dates in your calendar or diary and commit to implementing your strategy over time.

Explore market opportunities

New markets are likely to emerge for environmentally assured sheep products as domestic and overseas consumers continue to demand greater confidence in the way a product (meat/wool) is produced.

Procedure 2.2 and tool 2.5 in ***Market Focused Wool Production*** explore market opportunities that may be available for environmentally assured wool. These markets may want proof of your farms environmental credentials.

Use AgriSure (see signposts) or one of the self-assessment tools listed in tool 5.11 to document your farm's environmental credentials

Use monitoring tools repeatedly over time to determine if the condition of your key resources is moving towards or away from your vision

Photos taken over a number of years can visually record progress towards your shared vision for the farm

Signposts

Read

Quickchecks: Natural Resource Monitoring Tools for Woolgrowers – tools to measure the health of your pastures, soils, woody vegetation, farm watercourses, paddock production levels and birds. Download a copy from www.wool.com.au. Click on Grow > Environment > Land Water & Wool > Nature vegetation and Biodiversity and look for Quickchecks under the Guides Section.

The MLA Pasture Health Kit: a field kit for producers to assess pasture health in the paddock. The kit can be ordered from MLA by:

- ➜ Calling: 1800 675 717
- ➜ Emailing: publications @mla.com.au
- ➜ Ordering on-line at: www.mla.com.au/publications

View

Landleader: a voluntary tool that aims to identify and promote the environmental and livestock stewardship credentials of the wool and red meat industries. Visit the website at: www.landleader.com.au/

AgriSure Environmental Stewardship module: MLA is developing this module as part of the on-farm business management and quality assurance program AgriSure. Visit: www.mla.com.au/Livestock-production/Environmental-management/Environmental-Stewardship

ATTEND

The MLA EDGE*network*® program is coordinated nationally and has a range of courses to assist sheep producers. Contact can be made via:

- ➜ Phone: 1800 993 343
- ➜ Email: edgenetwork@mla.com.au
- ➜ Website: www.mla.com.au/edgenetwork

Tool 5.1
Indicators of saline land

(**Source**: Productive Solutions for Salinity, Land, Water and Wool)

Salinity rating	Indicator species	Other indicators
Low	No limitation to desirable species	Even growth of pasture.
Moderate	Wimmera ryegrass (*Lolium rigidum*) Water buttons (*Cotula coronopifolia*) Windmill grass (*Chloris truncata*) Wallaby grass (*Danthonia eriantha*) Spiny rush (*Juncus acutus*) Sea barley grass (*Hordeum marinum*) Couch grass (*Cynodon dactylon*)	Reduced growth in areas. Clovers, capeweed disappear. Grasses are pale from low nitrogen due lack of clovers and salt effects. Generally no bare areas.
High	Sea barley grass Couch grass Windmill grass Spiny rush Creeping brookweed (*Samolus repens*) Ice plant (*Mesembryanthemum crystallinum*) Australian salt grass (*Distichlis distichiphylla*) Annual beard grass (*Polypogon monspeliensis*)	White crystals may appear on the bare soil when the soil is dry. Animal graze and lick salty areas. Water in dams and drains may become very clear. Watertable shallow (less than 1.0m). Clay soils may have the appearance of being well structured.
Extreme	Samphire (*Halosarcia pergranulata*) Sea blite (*Suaeda australis*) Trees will be dying.	Areas of bare ground. Sheet and gully erosion. Water table at, or close to the soil surface.

Use this tool in conjunction with SALTdeck - 50 colour cards to help you identify and select saltland plant species. Order SALTdeck cards from www.sainty.com.au and click on Weedeck for details.

Tool 5.2
Stock water requirements

The best way to manage and maintain stock water is to have reliable information about your property's water supplies. This means knowing where the water is, how much is available and whether it is 'fit for purpose'. A water stocktake will provide this vital information.

Farm water comes from a number of different sources. These may be natural sources such as rivers and channels, or they may be constructed in the form of dams, ground tanks, wells or bores. Whatever the sources, the suitability of water you have now and the water you need for the future depend on its quantity, quality and reliability.

Water stocktake: quantity

Knowing where water is on your property and how much you have available is vital in times of drought. Assessing your water resources involves:

- Personal knowledge of your property
- Continuous observation
- Knowing the quantity of each water storage
- Knowing the safe pumping rate from bores or wells
- Being aware of any conditions (like cease-to-pump rules) in any water sharing plans for your area
- Monitoring evaporation rates
- Drawing on past experiences of water use during drought and long dry spells, eg, which water storages are spring fed and which have had extremely poor quality water in the last 10-15 % of years.

Your major water storages are critical in times of drought. You can always pipe water

What size are your existing dams?

Step 1 - In the 'Calculation Table' (next page), list all the water storages on your property that can be used for stock watering purposes.

Step 2 - Determine the width, length and depth of each water storage and fill in the calculation table accordingly.

Step 3 - Using the formula relevant to the water storage shape, calculate the surface area in square metres of each water storage and enter in the table.

Step 4 - Using the following formula, calculate the volume in cubic metres (m^3) and enter the results in the table.

Volume (m^3) = 0.4 x Surface Area x Depth

0.4 is a conversion factor that takes into account the slope of the sides of water storages.

Step 5 - Calculate the capacity of each water storage in megalitres (ML) by dividing the volume in cubic metres (m^3) by 1,000 and enter in the table.

Step 6 - Add up the storage capacity of all your water storages in the table to give your Total Existing Water Storage Capacity.

(Extract from NSW Department of Natural Resources Updated March 2006 DIPNR 04_ 029)

Calculation table

Water storage name or number	Width (m)	Length (m)	Depth (m)	Surface area (m^2)	Approx volume in m^3	Water storage capacity in ML
eg, Ground tank 1	30	30	4	900	0.4 x 900 x 4	1.44
eg, Ram paddock	100	150	4	15000	0.4 x 15000 x 4	2.40

Water stocktake: quality

Good quality water is vital for your stock, household and business. It is, therefore, important to identify and correct any water quality problems. Knowing your water quality allows you to plan for water treatments to avoid problems such as poor plant growth, blocked irrigation or stock watering pipes, staining and other undesirable effects.

Problems with water quality may have a chemical basis (e.g. pH or concentrations of certain elements) or they may be due to physical causes (e.g. turbidity when the water is cloudy with suspended solids). Some problems may be more obvious, while other problems may require more extensive analysis and treatment. Some of the common problems that affect water quality are hardness, algae and salinity. Poor water quality can even render water unusable.

After testing, water quality problems can be identified and corrected.

Common problems affecting water quality include pH (best between 6.5-8.5), iron hardness, corrosion, salinity, other elements, turbidity/cloudiness, algae, colour, taste and odour, bacterial growth.

Water quality testing

If you have any doubt about the quality of water that you use for irrigation, stock or domestic purposes you should get it tested by an accredited laboratory. It is a good idea to have your water tested before, and sometimes during use.

If stock show any reluctance to drink, provide an alternative supply if possible, and consider getting your water tested.

Water stocktake: reliability - meeting the water demand

As part of assessing your property's water sources you will need to consider the average versus peak demand and how well-equipped you are to meet an unexpected interruption to normal water supplies.

Thinking about your property's water supplies as 'managing your water budget' is a good way to begin looking for efficiencies in water use across all your operations. A water budget plan may limit the situation of a forced destock due to insufficient water supplies.

Water requirements and maximum advisable levels of salinity and conductivity vary widely according to the type of stock and the type of grazing.

Stock type	Consumption per head per day (L)
Weaners – average all feeds	2–4
Adult dry sheep – grassland	2–6
Adult dry sheep – saltbush	4–12
Ewes with lambs – dry feed	4–10

Notes:

- Water consumption by sheep can increase by 80% in extreme, hot conditions.
- Sheep can drink 40% more in summer than winter, and 50-80% more if their water contains more than 2,000ppm total dissolved salts (TDS).
- Water at 4,000-10,000 ppm TDS may cause problems initially until animals adjust.
- Include native animals in your calculations, although sheep drink around 6.5 times more water each day than kangaroos.
- When planning water supply requirements, allow for evaporation losses, eg, the NSW Southern Tablelands average 25% loss of dam water over the late spring, summer, autumn period.

Remember: your water budget is just as critical as your feed budget

Example

A water storage on your property has a capacity of 1.44Ml. At assessment, the water storage is 60% full. How many stock could this water storage potentially service over the spring, summer and autumn period without rainfall top up?

Total water capacity	= 1,440,000 L
60% capacity	= 864,000 L
Less 15% residual*	= 216,000 L
Less 25% evaporation**	= 216,000 L
Available stockwater	= 432,000 L
1,000 dry sheep at 4L/hd/day	= 108 days

*15% of 100% capacity unuseable due to fouling, bogging, etc.

**25% of 60% of capacity lost in evaporation

This document was prepared with the assistance of Greg Meaker, NSW Department of Primary Industries Livestock Officer Goulburn, and StockPlan®.

Tool 5.3

The 3D approach to weed management

Weeds are a major threat to pasture productivity, native vegetation and biodiversity. It is estimated that weeds cost the grazing industries $1.8 billion each year in lost revenue. The threat posed by weeds to biodiversity is ranked second only after land clearing.

Weed management needs to be planned using the 3D approach - Deliberation, Diversity and Diligence.

Deliberation - stocktake of weed problems and priorities

Ask yourself	Action	Result
What have I got?	Use Quickchecks (see signposts in procedure 5.4 and/or tool 7.6 (in ***Grow More Pasture***) to assess both the desirable and weed species in the paddocks of most concern to you	Tailor your strategies and set your goals
Where are the weeds on my farm?	On a farm map plot where your weed infestations are, which species are present and how dense they are at each location	Firm up your priority areas for weed management
Where did/are the weeds coming from?	Determine if the weed/s: ➜ Were already present ➜ Came in from a particular source such as stock feed or machinery contamination	Help you determine how to prevent future weed incursions
What are my goals for my weed management?	Identify on your farm map: ➜ Clean areas: prevent new weed incursions ➜ Small or scattered infestations: eradicate the weeds ➜ Moderate to dense infestations: eradication may not be possible at first, so contain the infestation, and ensure it doesn't spread further. Once contained, then start eradicating the plants ➜ Dense with ongoing sources of reinfestation: management of the infestation is an appropriate goal	Determine achievable goals for weed management in your priority areas. Allocate the right amount of time and money to achieve each goal.
What tactics are most appropriate to achieve my weed management goals?	Use the Weed CRC 5 tactic weed control matrix (tool 5.4)	Choose the right tactic to achieve my weed management goals.

On a sheep enterprise in the southern NSW tablelands, African lovegrass and serrated tussock are both significant problems. The long-term management of serrated tussock meant that it did not get away and the goal for serrated tussock on this property is eradication. However, not much was known about African lovegrass when it was first identified on this property. It is now such a problem that eradication is not a feasible goal at this point in time and the current goal is controlled management.

Diversity - management tactics to target weak points in weed lifecycles.

Ask yourself	Action	Result
What weed management tools do I have in the toolbox?	Use as many tactics as you can: ➜ Competitive perennial pastures and/or other vegetation. ➜ Grazing management ➜ Biological control ➜ Herbicides ➜ Cultivation/avoiding cultivation (dependant on species present) ➜ Slashing ➜ Crop rotations ➜ Burning ➜ Fertilizer application	Integrated weed management: adoption of a diverse range of weed control practices that reduce the reliance on herbicides.
Which tools will help achieve my weed management goals?	See the AWI and MLA 3D Weed Management brochures on: ➜ Paterson's curse ➜ Onorpordum thistles ➜ Serrated tussock ➜ Chilean needle grass ➜ African lovegrass and ➜ Silverleaf nightshade. MLA Tips & Tools: Weed Removers Pasture Improvers Review tool 5.4 Select a variety of tools that can work together to target your weeds, using the tactics you identified in Deliberation.	Choose the right tools to achieve your vision for weed management in your grazing enterprise
When is the best time to carry out each option to target priority weeds?	Establish a calendar of activities to target the weeds throughout the year to: ➜ Apply herbicide at the right time. ➜ Ensure groundcover is maintained at critical times to minimise weed germination.	'Do it on time every time'

On a central NSW sheep property, Paterson's curse has been present for 20 years. The current tactic for managing Paterson's curse is to prevent seed set to reduce the population over time. A number of tools are used to achieve this including competitive pastures to limit the number of weed plants present; biological control; slashing at early flowering if necessary to prevent seed set; and herbicides used in crop rotation, spray grazing and spot spraying of small infestations, fence lines and around sheds.

Diligence - monitor progress then adjust your strategy accordingly

Ask yourself	Action	Result
Has my weed management been successful?	Monitor weed levels after key management activities, and on an annual basis to track changes in weed distribution and density	Proof that you are achieving your weed management goals
What can I do to improve my weed management?	In the short term: ➜ Reapply a management tool that wasn't successful, or ➜ Try a new management technique if the original technique wasn't suitable In the longer term, reassess your weed management strategy and goals based on the outcomes of your monitoring program	Re-adjust your strategy to: ➜ Set new goals and priorities for weed management ➜ Re-allocate your time and money to achieve existing and new weed management goals

On the southern NSW tablelands sheep enterprise, diligence is a key factor in the management of serrated tussock. Once a year the entire property is checked for serrated tussock and any live plants are spot sprayed there and then. The sheep producer says this job is neither difficult nor expensive; you just have to be persistent and get up and do it. To assist with this, every vehicle on the property has either a knapsack sprayer with fluproponate or a mattock to remove the weed immediately once it's spotted. It is this vigilance which has enabled him to reduce his serrated tussock management time over fifteen years from three months per year to less than a week per year.

Tool 5.4
Weed CRC weed control tactics

The 5-tactic weed control matrix applied to native vegetation

Weed control tactics in native vegetation	Objective	Example actions to choose from
Tactic 1 Deplete the potential for on-going weed establishment.	To encourage weed germination to allow application of Tactic 2.	Burning, soil disturbance, reducing groundcover.
	To reduce viability of weed seeds or other propagules.	Burning, grazing, biological control.
	To remove weed seeds or other propagules from area.	Predation, grazing and physical removal of propagules.
	To reduce germination opportunities.	Maintaining high levels of groundcover can prevent many annual weeds from establishing.
Comments – many of the actions required for this tactic are not applicable in established native vegetation, but can greatly assist by reducing the weed burden before a re-establishment project commences. On the other hand, it is critical in native vegetation (especially native pastures), to ensure that the germination opportunities for weed species are minimised – usually by leaving a higher level of residual feed in the paddock than would be usual for improved pastures.		
Tactic 2 Kill and/or remove weeds from target areas.	To kill weeds.	Physical removal, herbicide application, cultivation, burning, biological control, cutting.
	To increase competition from desirable vegetation.	Plant desirable, competitive species to replace the weeds; improve competition by using appropriate plant density, fertiliser, disease control, mulching and insect control.
Comments – most weed control programs begin with (or include) killing the current population of mature, seed producing weeds. All effective weed control programs equally focus on 'strengthening the competition', otherwise the original weeds will simply re-invade, especially if the removal of the weeds has created disturbance and open spaces.		
Tactic 3 Stop weeds setting viable seeds (or other propagules).	To control weed seed set or other propagule formation while minimising the effects on the desirable vegetation.	Use alternative herbicide application techniques (e.g. wick wiping, selective spray-topping, spot spraying), hand rouging, spray-graze, strategic cutting or pruning.
	To control weed seed set or other propagule formation even if there is a significant impact on the desirable vegetation.	Non-selective herbicide, strategic cutting, burning or heavy grazing, cutting pasture for hay or silage.
Comments – the more severe the weed infestation, the stronger the initial focus will need to be on stopping weeds from setting seeds or forming other viable propagules, even if there is a significant impact on desirable vegetation. This tactic will only be successful if followed by a major effort to revegetate and to increase the competition from desirable vegetation.		

Weed control tactics in native vegetation	Objective	Example actions to choose from
Tactic 4 Prevent the occurrence of weed seeds or other propagules or nearby weeds entering the target area.	Physical removal of viable propagules from target area.	Removing and destroying propagules, eg, seed heads or fruit by picking, cutting or burning.
	Use Tactics 2 or 3 in the area where the weeds produce seeds or other propagules that are likely to enter the target area	Selective or non-selective spraying, burning, grazing, physical removal, etc., in the source area potentially delivering seeds into the target area.
Comments – this tactic is best suited to weed species that are undesirable in any location (e.g. gorse or blackberry) and not at all well for species that are weeds in conservation areas, but desirable species on other parts of the farm (e.g. phalaris). This tactic often requires collaboration with neighbours if they are the source of weed seeds.		
Tactic 5 Prevent viable propagules from external sources entering the target area (quarantine).	Improve hygiene of area to prevent entry of new weeds.	Quarantine the area, limit animal (e.g. livestock), machinery (e.g. recreational vehicles or boats, excavators, etc) or feed sources (e.g. hay) access to area. Use weed-free seed, seedlings, tube stock, mulch, etc. when establishing desirable plants in the area. Dispose of removed weeds/ seeds/fruit by burning, deep burial, composting, covering with plastic or send to tip.
Comments – this tactic is simply good farm hygiene and a sensible (cautious) approach to quarantine to minimise the risk of importing further weeds (production or environmental) onto the farm.		

Tool 5.5

Best practice guidelines for salt land

Sheep producers can access a range of information on managing saline land through the Sustainable Grazing on Saline Land (SGSL) sub-program of Land, Water & Wool. For the most up to date information, products and tools, visit www.saltlandgenie.org.au

This tool summarises the findings from SGSL into a set of general principles that can be applied to saline land across southern Australia.

Best practice for saline land includes:

- Identifying the extent of the problem. Many saline areas remain 'undiagnosed' on farms, especially in their early stages, when the more severe symptoms (bare scalds with white crystals on the surface) have not yet appeared. Early detection makes rehabilitation much easier. Saline sites will tend to be wetter than the rest of the paddock. The vegetation will change, with salt-tolerant species such as sea barley grass becoming more common. Often soil colour will change (usually it becomes darker), and sheep will graze these areas preferentially because of the salt content. Use tool 5.1 to identify the symptoms of early stage saline land in your district, and/or contact a neighbour with saline land or regional NRM authority (see signpost in procedure 5.1) for assistance.

- Control the grazing of salt affected land. Sheep can graze salty land right down to bare ground. If you set stock, fence the saline area to reduce the time sheep spend on the salty area, but don't put the fence too close to the edge of the saline area if the site is expanding. Preferential grazing is less of a problem for systems that use high intensity, short duration grazing.
- Many saline sites that appear completely lifeless are only that way because of overgrazing, particularly by sheep. These sites will often return to reasonable productivity simply by fencing and conservative grazing. Across all the SGSL sites, fencing and rotational grazing of the volunteer 'pastures' restored saline sites to an average of 60% of the productivity of adjacent, non-saline land.
- Many regional NRM authorities have funds to help you fence saline areas because these salty patches are often highly erodible, and reduce water quality by contributing salt and sediment to streams.
- For some sheep producers and some situations, simply fencing the site and conservatively grazing it is the best long term option. For other sites and situations, further improvements in productivity and profitability are worth pursuing. For small and/or highly 'visible' sites, non-grazing options (trees and shrubs) can be the best option. See the signposts in procedure 5.3 for resources to help you decide the best management action for your site.
- Determine the productive capability of the saline area. In some cases, the productive capability will be greater than for the rest of the paddock, typically where the salinity level is low and the extra water lengthens the growing season. Identifying the salt-tolerant species that have colonised the saline site is a critical component of determining the capability.
- If local experience/advice suggests that the pasture production justifies the cost, then specialised saltland pastures can be established and these are often very useful for out-of-season feed.
- If saltland pastures are not warranted due to a lack of productive capacity or if the site is too small to justify establishing pasture, then other options, based on occasional grazing of the volunteer pasture or revegetation with salt-tolerant trees and shrubs will give the management control needed to minimise erosion and salting of streams. Local knowledge is needed to assess the pasture options for saline land, and many regional NRM authorities, State Departments of Primary Industries/Agriculture, and agronomists can assist.
- Explore non-grazing options. Many farms have small patches of saline land that are too small to make a significant contribution to the farm's feed resources. Some saline sites are highly visible – near the house or the road – and aesthetics may be more important than productivity.
- In any of these situations, non-grazing options (salt tolerant trees and shrubs) can be the best option. Saline sites can contribute to the farm's vegetation and biodiversity as well as visual appeal.
- Seek local advice. The symptoms and the best approaches to salinity management vary greatly across southern Australia so getting local advice and assistance is recommended. Your local NRM authority can give you, or will know where to get the best local information. This is particularly important if you plan to establish a saltland pasture because salty sites have a higher risk of establishment failure than non-saline paddocks.

Tool 5.6
Rabbit control options

This tool is a brief analysis of the range of rabbit control methods that can be used in appropriate combinations to suit your goals

Control option	When best to use	Benefits	Precautions
1080 baiting	Late summer or when population is usually at a minimum.	Most cost-effective method. Large areas covered quickly. Many native animals tolerant of 1080 but can be affected if baits misused. Foxes killed by eating poisoned rabbits. Loses toxicity on exposure to rain.	No effective antidote. Livestock and pets (cats and dogs) can be at risk. Uneaten baits should be buried. Dry weather required. Approval can be bureaucratic in some jurisdictions.
Pindone baiting	Best late summer. Before seeding, planting or regeneration efforts.	Moderate cost. Less hazard to domestic animals because an antidote is available.	Must not be used in presence of some native animals (toxic to kangaroos, birds of prey and bandicoots).
Warren ripping	Summer for sandy soils. Winter for clay soils. Before planting/ seeding.	Good for large, paddock infestations. Reduces recolonisation. Long-term solution. Can be adapted (e.g. use of a back-hoe arm) for use in native shrubland	Labour-intensive but can be less than for fumigation. Can cause soil erosion if not properly carried out. Must be used selectively in bushland to avoid destroying native vegetation. Not suitable in some rocky country.
Warren fumigation	Best late summer. Before seeding, planting or regeneration efforts.	Useful if rabbits are underground in inaccessible or scattered areas. Good follow-up after baiting, ripping. Does not increase erosion risk.	Labour-intensive. Prior ripping or baiting required. Cannot be used where rabbits live above ground or where warrens cannot be sealed.
Harbour destruction	Before seeding, planting or regeneration efforts.	Good follow-up method but not suitable in all situations (e.g. native vegetation).	Labour-intensive. Little value alone – must be combined with other methods.
Rabbit-proof fencing	Before seeding, planting or regeneration efforts.	Long-term effect, stops reinvasion.	High initial cost and labour requirement and needs regular checking.

Control option	When best to use	Benefits	Precautions
Bio-control (Myxomatosis and Rabbit Calicivirus)	Effective in reducing numbers before other controls are used.	Naturally spread - no cost. In NSW farmers can purchase Calicivirus baits from Livestock Health and Pest Authorities (LHPAs).	Timing and effectiveness is unpredictable. Deciding when to make releases depends on good knowledge of prior outbreak patterns.
Shooting, trapping, ferrets	Late summer or when population is usually at a minimum.	Appropriate for low rabbit numbers. Can complement other methods.	Very labour-intensive. Little value alone – must be combined with other methods. Need permit for many trap types. Trapping and shooting not suitable in built-up areas.

Tool 5.7
Fox control options

A brief analysis of the range of fox control options

Control option	When best to use	Advantages	Disadvantages
Aerial 1080 baiting	Recommended for large, sparsely populated areas that are remotely located and inaccessible by vehicles.	Lethal baiting is considered to be the most effective method currently available. Foxes are amongst the most sensitive species to the effects of 1080. Cost effective over large areas.	Risk to non-target species. No way to assess number of baits taken. Risk to trappers' dogs. Foxes tend to be bait shy. Not suited near urban/ residential areas.
Ground 1080 baiting	Ground baiting is the preferred method on rural properties or national parks and forestry estates that are accessible by road.	Lethal baiting is considered to be the most effective method currently available. Foxes are amongst the most sensitive species to the effects of 1080. Cost effective over large areas. Untaken baits and fox carcasses can be collected.	Risk to non-target species, including farm dogs. Not suited near urban/ residential areas.
Feralmone™ is a product developed by AWI (stink in a can!) that is sprayed on baits and increases their attractiveness to foxes and wild dogs. Feralmone™ is available from leading rural merchants and agencies responsible for fox and wild dog control programs.			

Control option	When best to use	Advantages	Disadvantages
Den fumigation with CO_2	Fumigation should be carried out only when active dens containing young cubs more than 4 weeks old can be located. This will usually be around August to October.	Best suited to localised fox problems such as active dens within lambing paddocks or near poultry. Relatively humane. Little risk to non-target species. Not affected by weather conditions.	Time-consuming and labour intensive. Inefficient method for large-scale fox control. Very young foxes are relatively resistant to elevated CO_2 levels. CO_2 is highly toxic to humans.
Shooting	Shooting is often used prior to lambing season and as an adjunct to other control methods.	Good supplement to other control measures. Suitable when fox numbers don't justify a more comprehensive approach. Little risk to non-target species.	Labour intensive – skilled operators with the appropriate licences are needed. Not suited for large scale fox control. Preferentially targets young, non-breeding foxes. Not suitable for areas of dense scrub or near urban areas.
Trapping (soft jaw traps or cage traps)	Where poison baiting is unacceptable and other methods cannot be used, e.g. semi-rural and urban/ residential areas.	Useful for the control of nuisance animals. Non-target species can be easily released.	Not effective as a general fox control method on farm. Time consuming and labour intensive.

Purchase 1080 and other pest animal baits from the following state agencies and organisations:

- **Victoria:** From 1 January 2008 bait users in Victoria can purchase 1080 bait products from accredited retailers or authorised licensed pest control operators. To purchase 1080 pest animal baits under this new system, you are required to complete a 1080 training course. Contact the Victorian DPI for more information.
- **Western Australia:** Trained landholders can purchase bait products containing 1080 (sodium fluoroacetate) after they have obtained Baiting Approval from an authorised officer of the Department of Agriculture and Food.
- **South Australia:** NRM Board officers are authorised to supply poisoned bait in appropriate situations.
- **Tasmania:** Pest animal baits can only be supplied by "Competent" DPIWE Wild Animal Management Officers or by "Competent" Fox Task Force Officers. Users must hold an "Authority to Purchase, Possess and Use 1080" issued by a DPIWE "Competent Officer".
- **Queensland:** Pest control baits to assist in the management of animal pests are available for purchase from the Queensland Department of Natural Resources and Water.
- **NSW:** Pest control baits to assist in the management of animal pests are available for purchase through NSW Livestock Health and Pest Authorities.

Other useful references and links

Review the fox control regulations relevant to your states at:

- **NSW:** DPI website: http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests
- **Queensland:** DNRW website: http://www.dpi.qld.gov.au/4790-8282.htm
- **SA:** SA DLWBC website: http://www.dwlbc.sa.gov.au/ then choose > Biodiversity > Pests (Animals and Weeds) > Exotic Animals > European Red Fox
- **Tasmania:** DPIWE website: http://www.dpiw.tas.gov.au/inter.nsf/ThemeNodes/LBUN-5K438G?open
- **Victoria:** DPI website: http://www.new.dpi .vic.gov.au/agriculture/pests-diseases-and-weeds/pest-animals/foxes-and-their-impact
- **WA:** DAFWA website: www.agric.wa.gov.au then choose Vertebrate Pests > Wild Dogs, Dingoes & Foxes

Tool 5.8
Establishing a photopoint

Photopoints are permanent or semi-permanent sites from where you take a series of photographs over time to monitor short term or long term physical changes. For comparison, the pictures need to be taken at the same location, with the same direction (south is best but not always practical), angle, focus points and preferably camera settings. Photographic records provide a permanent visual record of change on your property without reliance on memory or taking physical measurements. Other advantages include low capital and time requirements and little impact on surrounding areas or ongoing management.

Types of photopoints

Choosing which of the three key types of photopoints described below – spot, trayback, and landscape – will depend very much on what you want to monitor. Often a combination is best across the farm.

The spot photo

This is a photo taken from head height looking nearly vertically down on a spot marked with a 1m x 1m frame as shown in Figure 1. Spot photos provide a detailed picture of the groundcover, litter and plant species for a standard sized area. If there is great variety at the site, take several spot photographs but ensure they are marked so that you return to the same spot next time.

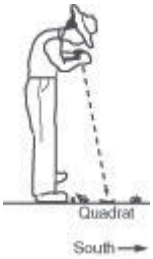

Figure 1: Taking the spot photo – try and keep the top of your feet out of the frame, and angle the camera down as straight as possible

The 'trayback' photo

The trayback photograph is taken standing on the back of a ute tray or on a step ladder. The vehicle (or step ladder) is positioned at the photopoint post (Figure 2). Focus the middle of the viewfinder on the base of the sighter post located 10m to the south of the photopoint post. The photopoint post and the sighter post are left permanently in place.

This photo angle will best illustrate ground condition and the amount of feed available in a pasture. It can also show the amount, type and condition of nearby vegetation or the condition of a small gully.

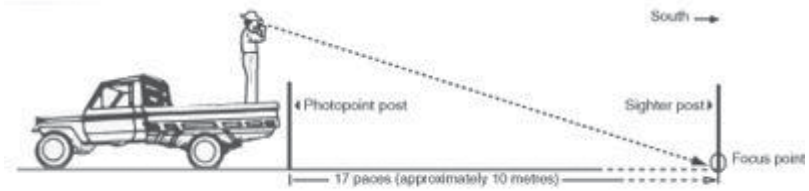

Figure 2: Taking the 'trayback' photo with viewfinder centred on the base of the sighter post.

The landscape photo

Setting up a landscape photo can be simple using two permanent posts a distance apart (Figure 3). Sometimes it may be more appropriate to use landmark features which can be matched up with in future pictures instead of (or as well as) the sighter post. Stand next to the photopoint post as shown in Figure 3, position the top of the sighter post in the middle of the viewfinder and focus on infinity.

Landscape photos will best illustrate the general condition of the site showing major changes in shrub and tree populations, such as a time series taken to show hillside revegetation or repair of gully erosion.

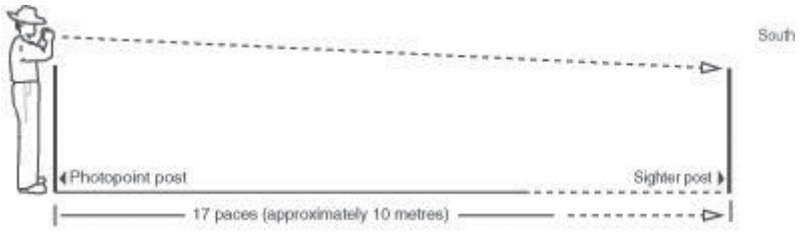

Figure 3: Taking a landscape photograph from a photopoint marker, with the top of the sighter post in the centre of the viewfinder and focus on infinity.

Some final tips

- Make sure the top quarter of each post (photopoint posts and sighter posts) is painted bright white or yellow for safety purposes and for locating them each time.
- Mark each photopoint with a unique number which is useful for identifying the site and for keeping records. Sheep eartags can be good identifiers.
- Where practical, you can double the value from your photo points by standing at the sighter post and taking a photo back towards the photopoint marker. This second shot will give you a different perspective from the same site.
- Mark a post in an existing fenceline as your photopoint post, and sight your photos using a landscape feature to avoid problems with stock rubbing on a lone sighter post in the paddock.
- Take a hard copy of previous pictures with you to make lining up the shots easier, especially if you are using landscape features instead of a sighting post.
- Label the back of the initial photographs taken at each location, marking plants or features of interest to be monitored for change over time. Include these photographs in your field notebook to help you shape the photos on later visits.
- Take two photos or more per year at the sites, preferably in contrasting seasons.
- Don't include too much sky as it won't change. For landscape and tray photos, fill the photo with at least 4/5 land and vegetation and no more than 1/5 sky.

Tool 5.9
Before and after photographs

Below is an example of 'before' and 'after' photos for helping inspire the 10 year vision.

Before

Source: Neil Hodge, Land, Water & Wool

After

Source: Neil Hodge, Land, Water & Wool

These before and after photos were taken on a sheep grazing property in the eastern Mt Lofty ranges of SA. They show the impact of fencing off and revegetating a drainage line running through a saline scald. Prior to 1999 when the 'before' photo was taken, the scald zone became a quagmire of acid sulphate soil during the wet winter months. Five years later, revegetation had progressed to the point where the area could again be returned to productive use, providing shelter and a valuable source of native perennial fodder during the dry summer months.

Tool 5.10
Species identification resources

Plant species identification resources

Grassland Flora - a field guide for the Southern Tablelands (NSW and ACT): a field guide with descriptions and photos of about 300 species in grasslands in Southern Tablelands and elsewhere in south-eastern Australia. Purchase a copy from:

"Grassland Flora"
Wildlife Research and Monitoring
PO Box 144
LYNEHAM ACT 2602
Telephone: (02) 6207 2126

Grass Identification Manual - for everyone: pictorial guide to recognition of 78 native and exotic grasses commonly found around Adelaide and in the Mount Lofty Ranges, South Australia. Contains colour photos and black and white drawings. Visit the website at: www.nativegrassgroup.asn.au/pubs.html. Purchase a copy from the Native Grass Resources Group (SA) by:

- Emailing: emailchairperson@nativegrassgroup.asn.au
- Writing to the Native Grass Resources Group
  Mt Lofty Ranges Catchment Centre
  cnr Mann & Walker Streets
  Mt Barker, SA, 5251

Native Plant or Weed: full-colour, side-by-side photos of weed and native "look-alikes" for landcarers, farmers and bush-regenerators in the high rainfall zone. Purchase a copy from CB Alexander College, Tocal, Paterson NSW:

- By calling: 1800 025 520 or
- On-line at: www.tocal.nsw.edu.au/publications

Plants of Western NSW: descriptions and photos of the plants of the dry pastoral portion of NSW and throughout Australia. Purchase a copy from any good bookstore, or on-line at the NSW Government Bookshop: www.shop.nsw.gov.au/pubdetails.jsp?publication=7738

Managing Tasmanian Native Pastures – a Technical Guide for Graziers: presents the findings of relevant scientific Tasmanian field experiments, studies and surveys and provides information about managing native pastures in Tasmania. It was written with input and involvement from Tasmanian graziers. Download your free copy from www.dpiw.tas.gov.au/inter.nsf/publications/ljem-6sa3ht?open

Native pasture groups – groups in each state have websites with contact details. Links to many state-based associations can be found at www.stipa.com.au

Salinity identification resources

SALTDeck: 50 colour cards to help you identify and select saltland plant species. Order a set of SALTdeck cards from www.sainty.com.au/weedeck

Insect identification resources

CSIRO Entomology "About Insects" webpage – insect information, resources and fact sheets to help you identify and learn more about some of the 220,000 insect species living in Australia. Visit the webpage at: www.ento.csiro.au/about_insects/index.html

Insects – southern region: the Ute Guide: a guide to insects and other invertebrates found when monitoring field crops and pastures across southern Australia. Purchase a copy from NSW DPI at: http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/field-guide-insects

Tool 5.11
Monitoring and assessment tools

Monitoring tools

Quickchecks - Natural Resource Monitoring Tools for Woolgrowers: tools to measure the health of your pastures, soils, woody vegetation, farm watercourses, paddock production levels and birds. Download your free copy on-line at: www.wool.com and click on Grow > Environment > Land Water & Wool > Native vegetation and biodiversity and look under guides for quickchecks.

The MLA Pasture Health Kit – a field kit for producers to assess pasture health in the paddock. The kit can be ordered from MLA by:

- Calling: 1800 675 717
- Emailing: publications@mla.com.au
- Ordering on-line at: www.mla.com.au/publications

Monitoring change in native pastures – shows how pasture monitoring can improve grazing management and maintain pasture productivity. It also describes some objective methods for monitoring native pastures. Download for free from: http://products.lwa.gov.au/downloads/publications_pdf/PN061152_ch12.pdf

Self-assessment tools

Farming for the Future Self Assessment Tool – move towards a sustainable farm business that is optimising its natural, financial and social resources by completing this Self-Assessment Tool, and/or implementing any number of the practices on your farm. Download the tool from: www.agric.wa.gov.au/content/SUST/f4fhomepage.htm

FarmSAT – producers of any commodity can quickly assess environmental assurance issues relevant to their enterprise. Visit the website and download the tool from: www.tfga.com.au/pages/TFGAFarmSATProject.htm

Environmental Management Systems (EMS) for Victorian Agriculture: describes two new tools – EMS and BushTender – that could be used to drive sustainable development for biodiversity. Visit: www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/lwm_biodiversity and click on Environmental Management Systems (EMS) under "Related Links".

The Leakage Calculator: WA sheep producers can quantify the amount of water leaking past the root zone of agricultural plants with a view to tailoring recharge minimising strategies for salinity management. Visit: www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/LWE/SALIN/SMAN/LEAKAGECALCULATOR_WEBINFO.HTM

AgriSure Environmental Stewardship module: MLA is developing this module as part of the on-farm business management and quality assurance program AgriSure. Visit: www.mla.com.au/Livestock-production/Environmental-management/Environmental-Stewardship

Tool 5.12
Wild dogs and feral pigs

Wild dogs and feral pigs cause considerable economic and environmental damage. AWI and MLA have both invested into research and development to assist in their control. Resources to help producers understand control options and available products include:

Tracks and Traps: E-book containing producers stories and ideas on wild dog control. Available at www.leadingsheep.com.au

The Invasive Animal Cooperative Research Centre publishes research results and pest control information at www. feral.org.au, including the pest smart tool kit and species fact sheets.

Various State Government Departments of Primary Industries as well as AWI and MLA also have useful resources on their websites.

Notes

Notes

For the most up-to-date Making More from Sheep information, including web signposts, products, publications and events, visit **www.makingmorefromsheep.com.au**

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