

Look after your natural assets

REVISED EDITION



Landcare for the bush block
and small farm acreage
in the Murrumbidgee catchment

Landcare

Landcare is a unique Australian response to natural resource management and to reversing land and water degradation. Networks of local landowners are the backbone of Landcare. Landcare groups plan, implement and monitor on-ground works to counter land and water degradation and conserve the natural environment. They also raise awareness and share resources and knowledge.

There are more than 1,400 Landcare groups in New South Wales and the Australian Capital Territory working on a wide range of degradation problems.

How to find your local Landcare group

Telephone numbers for voluntary Landcare organisations are subject to change, so contact your local Shire Council or Environment ACT for details of a Landcare group near you.

Look After Your Natural Assets was produced by members of the Geary's Gap Wamboin Landcare Group with assistance from Australian taxpayers through the Natural Heritage Trust.

The revised edition was initiated and supported by the Upper Murrumbidgee Catchment Coordinating Committee and by the local government councils listed on the back cover.

Compiled and edited by Maria Taylor, Frances Lowe, Jenny Curtis, Guy Cotsell, Jo Perkins, Jo Daly and Julie Stokes

Original illustrations for this booklet: Ric Beviss, Rainer Rehwinkel

Index: Julie Stokes

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The Upper Murrumbidgee Catchment Coordinating Committee (UMCCC)

The UMCCC is a community-based organisation representing those community sectors that live in, and are responsible for, natural resource management in the Upper Murrumbidgee Catchment. Its members include rural land managers, local government, conservation groups, utility agencies, community Landcare groups and representatives of both NSW and ACT government agencies.

The UMCCC seeks to provide a forum through which the Upper Murrumbidgee Catchment community can work to ensure that its natural resources are managed on an ecologically sustainable basis. Other aims include encouraging the development and dissemination of best available information supporting the management of natural resources, and facilitating education, public awareness and communication of catchment management and natural resource management issues.

We hope that this publication contributes to those aims by providing up-to-date and relevant information to the managers of smaller rural landholdings.

First port of call

Upper Murrumbidgee Catchment local government contacts

There are six local governments, as well as the Australian Capital Territory Government, whose area is wholly or partly in the Upper Murrumbidgee Catchment (UMC). Local government is responsible for many if not most of the land management decisions in the catchment.

See the back cover for a list of local government contacts.



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A TIME OF CHANGE

THE UPPER MURRUMBIDGEE CATCHMENT

The Upper Murrumbidgee Catchment (UMC) is experiencing rapid changes in land use as larger properties are subdivided into smaller units — hobby farms, lifestyle/ bush blocks or rural residential subdivisions. Land use now varies widely, as do the expectations and skills of new rural residents.

At the same time natural systems — soils, water, vegetation and animals — are facing a new set of challenges with settled bush blocks and small farm acreage. But change can be both positive and negative.

This book aims to provide landholders with some tools and contacts for positive land management. You'll also find the personal experiences of small acreage landholders who share what they have learned about practical land care.

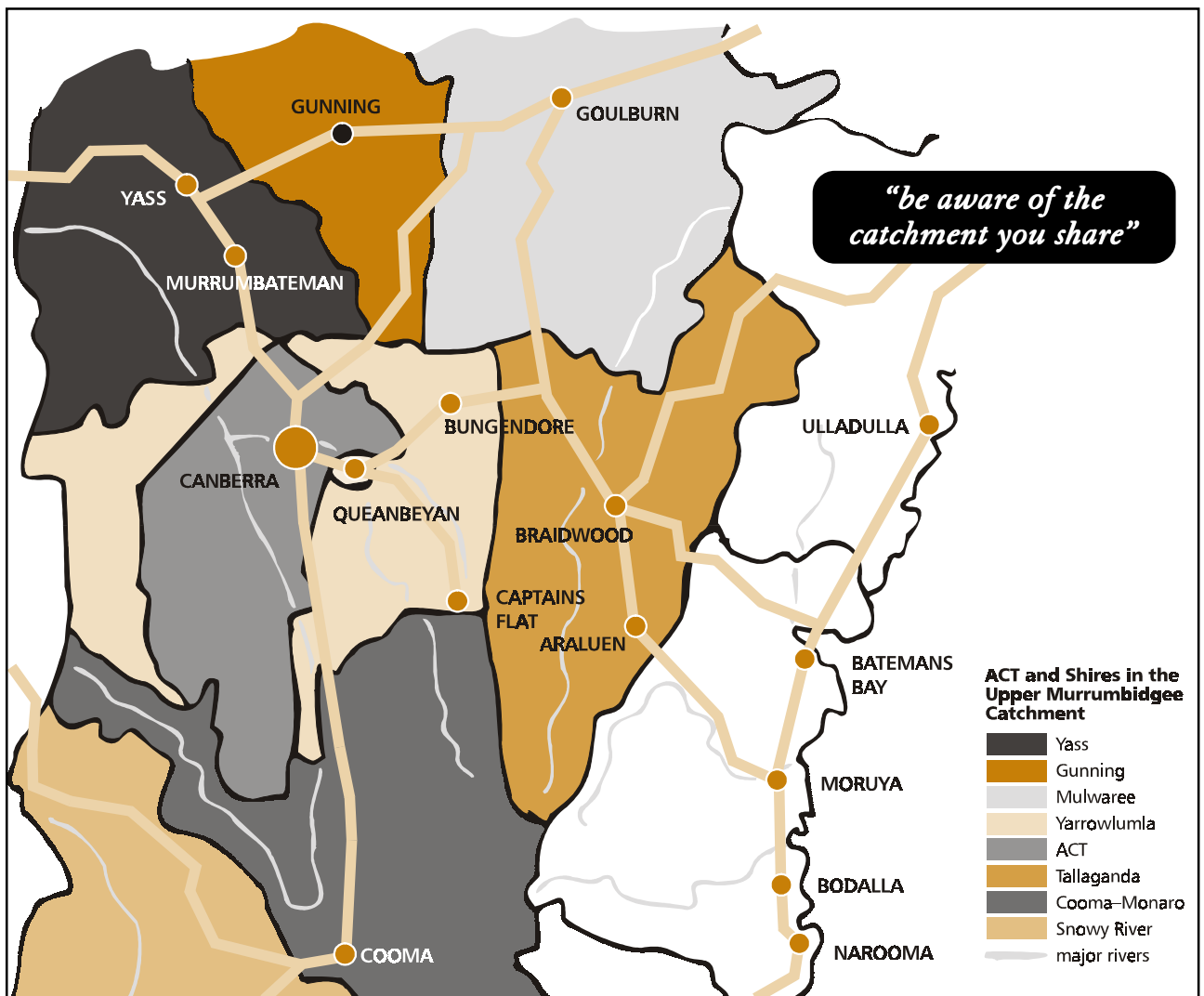
“Everyone living in rural areas has a role to play to ensure that our natural systems are preserved and enhanced. While individuals are primarily responsible, our environment operates at a broad scale across tens or even thousands of hectares — this scale is beyond the scope of individual managers in most of the UMC.

As a result, other organisations have important roles in planning and carrying out activities to ensure environmental health. Local government has a key planning role, while Landcare and catchment groups, schools, social groups etc have a vital role to coordinate and undertake work over large areas. These groups form the crucial social fabric of rural areas.

Some new landowners may wish to ‘get away from it all’ but neighbourly interaction will be necessary to tackle many rural issues — fire, weeds, soil erosion, salinity, to name a few.

Our hope is that this publication will be a useful source of information and a guide for practical action so that we can all live in harmony with our bush blocks.”

— Val Wiseman, UMC Coordinating Committee Chair



Subdivision of rural land results in increased human and financial resources available to manage the land so significant improvements to the natural resources may be made. Significant proportions of rural residential landowners do not live on their properties, visiting them irregularly for mainly recreational purposes. In general this reduces the closeness of landholders' association with the property, and the importance of issues such as weed and pest animal management is often not adequately recognised.

— *Murrumbidgee Catchment Action Plan for Integrated Natural Resource Management*

Catchment facts

The Upper Murrumbidgee Catchment extends from the headwaters of the Murrumbidgee River, above Tantangara Dam in Kosciuszko National Park, down to Burrinjuck Dam — a total of 14,060 km². For catchment management purposes, the Lake George internal drainage basin (970 km²) is included.

The UMC is bounded to the south and east by the Great Dividing Range, and as such it forms part of the south-eastern edge of the Murray–Darling Basin. The Mudoonen and Fiery Ranges respectively form most of the northern and western boundaries. The Australian Capital Territory (2,400 km²) is located wholly within the UMC.

The Murrumbidgee River initially flows in a south-easterly direction, before turning to the north near Cooma and flowing through the ACT. There are 13 major subcatchments, including Lake George. The main tributaries include the Numeralla, Bredbo, Queanbeyan, Cotter, Molonglo, Yass and Goodradigbee Rivers. Significant sections of these rivers, and the Murrumbidgee itself, are deeply incised, while there are other areas with narrow and relatively flat floodplains.

Changes brought by European settlement have altered native vegetation communities through clearing, grazing, pasture improvement, urbanisation, fire management and radiata pine plantations. Weeds and feral animals have also caused considerable changes to native communities. While their effects have been significant, large areas remain relatively unaltered and in some areas there is also evidence of increased tree cover since settlement.

Land use

Wool and beef production are the major land uses in the UMC. Other forms of agriculture are limited by soils, climate and topography, but include the grazing of deer and ostriches as well as dryland cropping and production of irrigated vegetables, stone and berry fruit and wine grapes — the latter has expanded greatly in recent years.

Other significant land uses in both NSW and the ACT are hardwood and plantation softwood forestry, and conservation reserves including national parks and nature reserves.

A mid-1990s estimate of agricultural establishments in the UMC showed they covered about 56% of the total land area. Agricultural establishments are now declining with the continuing urban development in Canberra and Queanbeyan and subdivision of rural land for rural residential developments representing significant changes in land use from broadacre farming.

Population

The estimated population of the UMC is 378,900. Ninety-five per cent are urban residents in Canberra, Queanbeyan, Cooma and Yass. The annual population growth rate for the ACT and UMC local government areas has been 0.4–3%. The continuing demand for rural residential living is reflected in ongoing developments near Yass, Murrumbateman, Sutton, Gundaroo, Bungendore and Michelago.

UPPER MURRUMBIDGEE CATCHMENT FACTS

- The UMC is the water catchment of the Murrumbidgee River above Burrinjuck Dam wall
- The UMC is an important part of the headwaters of the Murray–Darling Basin
- The UMC includes over 14,000 km² of land
- Important rivers include the Numeralla, Bredbo, Queanbeyan, Cotter, Molonglo and Yass Rivers
- Important habitats in the UMC include areas of upland grasslands, riverine gorges, open woodlands and chain-of-ponds wetlands
- About 16% of the UMC is in the ACT, the rest is in NSW
- Over 80% of the people in the UMC live in Canberra and Queanbeyan. Other main towns include Cooma, Yass, Adaminaby, Gundaroo, Murrumbateman, Bredbo and Nimmitabel

STARTING OUT

Information for new residents and developers

Each local council has different land management policies. It is essential that you contact your local authority to check on what applies in your area.

f Contact details are on the back cover.

Stocking rates

Overstocking can be a quick route to destroying pastures and bushland. When starting out, seek advice from NSW Agriculture and/or your local council and consider the whole environment on your block.

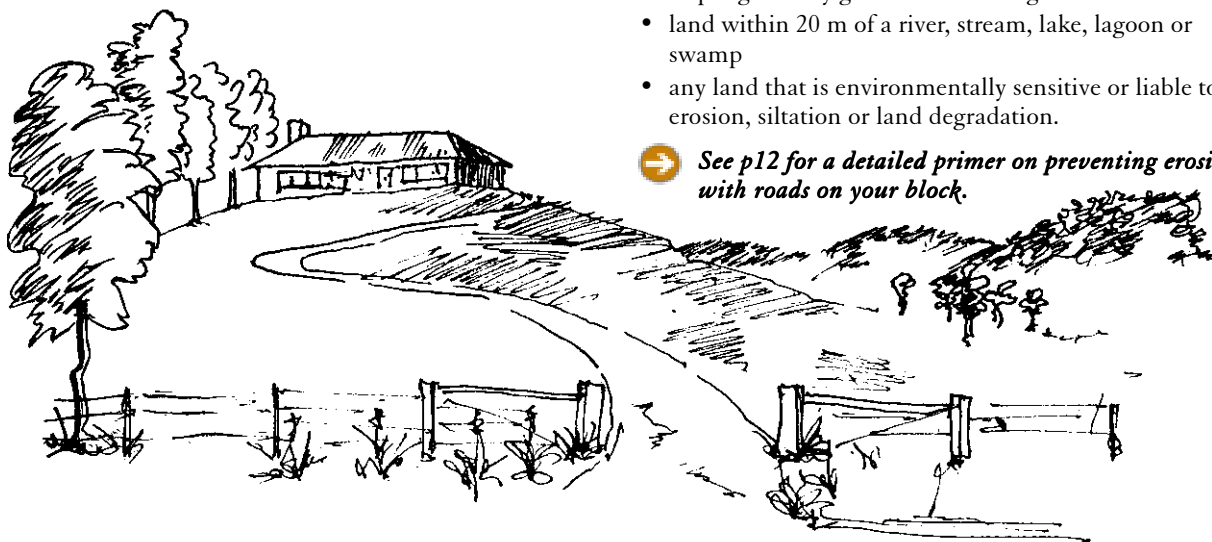
Rule of thumb: Keep at least 70% vegetation cover at all times. If feed is scarce, fence trees so horses don't ringbark them.

Stocking rates below are recommended by NSW Agriculture as a rough guide. *These figures assume no supplementary feeding and are clearly subject to the quality/productivity of the pasture.*

	Introduced pasture	Native pasture
Sheep	8 per ha	3 per ha
Cattle	1 per 2 ha	1 per 6 ha
Horses	1 per 2 ha	1 per 6 ha
Alpacas	5 per ha	—
Llamas	5 per ha	—
Goats	8 per ha	3 per ha
Camels	1 per 2 ha	1 per 6 ha

i For more information about keeping livestock, contact the Livestock Officer at either the Yass or Goulburn office of NSW Agriculture, or your Shire Council.

→ See also *native pasture horse management p20*.



Tree Preservation Order

Some local councils (such as Yarrawlunla Shire and the ACT) have a Tree Preservation Order covering their area. This Order prohibits the ringbarking, cutting down, topping, lopping, removing, injuring or wilful destruction of trees with a height greater than 3 metres and a branch spread at any height exceeding 3 metres, without the consent of council.

A Tree Preservation Order permits prosecution by council of those persons who contravene, or cause or permit to be contravened, the Tree Preservation Order.

→ See also *Native Vegetation Conservation Act (NSW) p23*.

Weeds

Weeds are highly competitive plants that can rapidly establish, colonise and exclude other plants. They degrade natural systems and agricultural land, and choke waterways. Weeds are increasing in numbers and distribution in much of the Upper Murrumbidgee, due to natural and human influences. (*Murrumbidgee Catchment Action Plan for Integrated Natural Resource Management 1998*)

The responsibility for weed control lies with all land managers, both private and government.

→ For more on weeds see pp31–33.

Roads and clearing

Be aware of any council Tree Preservation Ordinances and the *Native Vegetation Conservation Act* (p23).

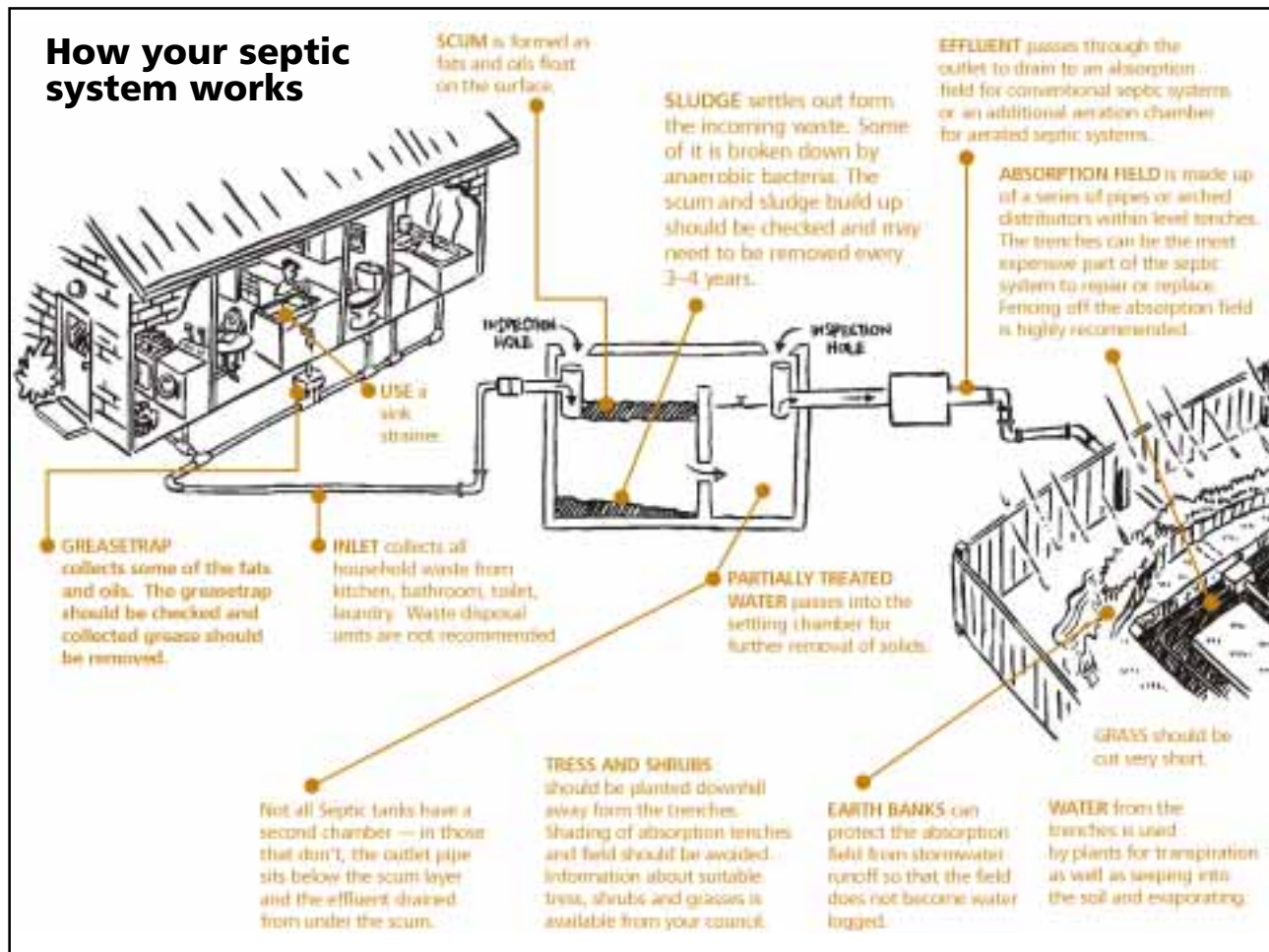
- Limit clearing to 0.5 m on either side of the track.
- Clear by felling rather than dozing to limit disturbance of topsoil.

Designated parts of catchments cannot be cleared — these include:

- slopes generally greater than 18 degrees
- land within 20 m of a river, stream, lake, lagoon or swamp
- any land that is environmentally sensitive or liable to soil erosion, siltation or land degradation.

→ See p12 for a detailed primer on preventing erosion with roads on your block.

Why everyone's septic system matters



Concerns across NSW that many septic systems do not meet environmental and public health requirements have led to State legislation requiring that all 'sewerage management systems' be registered with and approved by local councils.

Subdivision continues to expand in all Shires. With more and more people, there is a decreasing capacity of thin and shaley soils to absorb all the waste water, and the nutrients and salts in the effluent.


Too many nutrients entering dams, creeks and rivers lead to algal blooms, bacterial contamination and loss of stream and river life. This is a real concern as waterways in the Upper Murrumbidgee feed into rivers such as the Yass, Queanbeyan, Numeralla, Cotter, Gudgenby, Naas, Goodradigbee and Molonglo Rivers. All these rivers eventually run into the Murrumbidgee River, which is part of the Murray-Darling Basin.

Rules for septic systems

- All septic tank systems (including standard septic, aerated systems and composting toilets) must be registered with local councils.
- Councils are prepared to advise and work with owners to solve problems.
- Remedies might include reducing water demand, diverting stormwater around septic absorption fields and minor filling works to cover ponding. Residents should be aware that absorption trenches last 5–10 years, depending on maintenance and level of use. Wetland plant species can help filter and absorb runoff.

absorption trenches last 5–10 years

- Owners may be encouraged to seek longer-term solutions. Councils acknowledge that there are costs involved with upgrading septic systems. The New South Wales Government says it is up to local councils to strive for a balance between costs and health and environmental protection.
- New systems require approval to ensure they are adequate and sited properly. They must be accompanied by a site assessment and soil report. Councils can recommend consultants to do these reports.

 For further information and pamphlets about different septic systems, contact your local council.

BETTER SEPTIC PERFORMANCE

- Maintain your system
- Keep stock and machinery off the absorption trench; mow regularly — this increases the water uptake by the grass
- Reduce your water usage
- Use phosphorus-free detergents
- Divert stormwater and seepage from disposal areas
- Find out how much sodium salt is in your washing detergent, and switch to a lower-sodium-salt brand



“This used to be a pretty good picnic spot.”

The sodium factor

Sodium can be a major factor in the failure of septic systems because sodium salts reduce the infiltration capacity of soils. Fillers used in most laundry powders can be a major contributor.

Since sodium salts are not affected by septic tank or municipal waste treatment systems, large amounts of salts are going into our rivers and streams.

Rule of thumb: Powders contain a lot more sodium than liquid detergents. People might like to ask detergent manufacturers how much sodium salt is in their products.

try to use liquid detergents for laundry and for automatic dishwashers for better septic performance

SOME WATER USAGE FACTS

- The average family living on tank water uses about 150 litres of water per person per day
- Showers use 10–30 litres per minute — 200 litres in 10 minutes
- Baths use an average of 120 litres
- Toilets can use up to 11 litres per flush — modern dual-flush cisterns use a 3/6 flush (3 litres for half flush, 6 litres for full flush)
- Washing machines use around 100 litres per load
- Dripping taps can use 5 litres per hour
- Dishwashers use up to 50 litres per cycle

Always choose appliances with AAA water ratings.

REFERENCES



Available from Shire Councils:

Managing Waste Water in Your Backyard

Your Aerated Waste Water Treatment System

Your Waterless Composting Toilet

Your Septic System (contains excellent hints on how to keep your system working better)

Your Land Application Area

You can also consult *The Environment and Health Protection Guidelines: On-site sewage management for single households* at the local government website (www.dlg.gov.au).

Plantings for permanently boggy soil

e.g. near septic

Some larger, hardy native species for the Southern Tablelands are useful in taking up water from waterlogged soil surrounding septic tanks. They should not be planted right alongside the absorption trench, but can be used anywhere within 20 m distance up to within 3 m of the trench.

Landowners can create a very attractive feature which will provide harbour for wildlife, turning a potential environmental problem (runoff) into an environmental asset.

Here's another reason to steer clear of detergents containing phosphates (besides too many nutrients in local waterways): they can make establishment of some species more difficult.

WATERLOGGING-TOLERANT SPECIES

Scientific Name	Common Name	Approx. Height	Approx. Width
<i>Acacia dealbata</i>	Silver Wattle	5 m	4 m
<i>Acacia floribunda</i>	White Sallow Wattle	5 m	5 m
<i>Baeckea linifolia</i>	Weeping Baeckea	1.5–3 m	1–2 m
<i>Baeckea virgata</i>	Twiggy Heath Myrtle	4 m	2 m
<i>Banksia robur</i>	Swamp Banksia	3 m	2 m
<i>Bauera rubioides</i>	River Dog-rose	1 m	1.5 m
<i>Callistemon citrinus</i>	Crimson Bottlebrush	4 m	2 m
<i>Callistemon citrinus</i> cultivars	(many named varieties)	4 m	2 m
<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush	3 m	4 m
<i>Callistemon pallidus</i>	Cream Bottlebrush	5 m	3 m
<i>Callistemon pinifolius</i>	Pine-leaved Bottlebrush	2 m	2 m
<i>Callistemon ptyoides</i>	Alpine Bottlebrush	2 m	2 m
<i>Callistemon sieberi</i>	River Bottlebrush	4 m	3 m
<i>Callistemon subulatus</i>	Bottlebrush	3 m	3 m
<i>Callistemon viminalis</i>	Weeping Bottlebrush	4–5 m	4–5 m
<i>Carex appressa</i>	Tall Sedge	1 m	1 m
<i>Casuarina cunninghamiana</i>	River She-oak	20 m	15 m
<i>Casuarina glauca</i>	Swamp She-oak	20 m	8 m
<i>Eucalyptus aggregata</i>	Black Gum	15 m	9 m
<i>Eucalyptus crenulata</i>	Silver Gum	7 m	7 m
<i>Eucalyptus globulus</i>	Blue Gum	Up to 30 m	15 m
<i>Eucalyptus ovata</i>	Swamp Gum	25 m	15 m
<i>Eucalyptus parvifolia</i>	Small-leaved Gum	10m	8 m
<i>Eucalyptus stellulata</i>	Black Sally	15 m	8 m
<i>Grevillea rivularis</i>	Carrington Falls Grevillea	3m	5m
<i>Grevillea victoriae</i>	Royal Grevillea	2 m	2 m
<i>Hakea nodosa</i>	Yellow Hakea	3 m	3 m
<i>Hakea salicifolia</i>	Willow-leaved Hakea	5 m	5 m
<i>Kunzea ericoides</i>	Burgan	4 m	3 m
<i>Kunzea parvifolia</i>	Violet Kunzea	2 m	2 m
<i>Leptospermum juniperinum</i>	Prickly Tea-tree	4 m	3 m
<i>Leptospermum lanigerum</i>	Woolly Tea-tree	5 m	3 m
<i>Leptospermum obovatum</i>	River Tea-tree	4 m	3 m
<i>Lythrum salicaria</i>	Purple Loosestrife	1.5–2 m	1.5 m
<i>Melaleuca armillaris</i>	Bracelet Honey-myrtle	5 m	
<i>Melaleuca decussata</i>	Totem-poles	2 m	2 m
<i>Melaleuca ericifolia</i>	Swamp Paperbark	5 m	3 m
<i>Melaleuca lateritia</i>	Robin Red-breast	1.5 m	1.5 m
<i>Melaleuca thymifolia</i>	Thyme Honey-myrtle	1 m	1 m
<i>Melia azederach</i>	White Cedar	7 m	7 m
<i>Prostanthera lasianthos</i>	Victorian Christmas Bush	4 m	2m

Rules for new dams

the average existing rural residential dam holds 1–1.5 megalitres of rainfall runoff. Rules for new subdivision depend on property size

Water allocation in NSW has become tighter with the spread of irrigation and increased rural development. Subdivision dams play a role by diverting water that would otherwise flow to streams and rivers.

The NSW Farm Dams Policy gives all landholders the right to capture and use 10% of rainfall runoff from their property for any purpose. How much you are entitled to in megalitres or dam capacity is calculated by a formula involving your property size and area-specific rainfall and runoff calculations.

Existing domestic and stock dams constructed before 1 January 1999 are not affected by this ruling. However, new domestic and stock dams as well as dams of whatever age built for commercial irrigation purposes must abide by

the new equation. There is also an exemption for small properties that received development consent before 1999.

CONTACTS

Contact the nearest NSW Department of Land and Water Conservation office or phone 1800 353 104 for a *Rural Production and Water Sharing Information Package* which explains the rules and how to calculate the dam capacity for your property.

Building a dam?

Consult NSW Department of Land and Water Conservation 02 6297 6477

REFERENCE

Harris, Greg (1990) *Water Supply and Farm Dam Construction* (3rd edition), Soil Conservation Service of NSW.

A mountain of waste

Recycle at home?

Solid waste management constitutes a major challenge for every local jurisdiction.

While commercial packaging hasn't abated at all, recycling is often at the mercy of market forces. For example, because of market conditions, some local governments no longer recycle paper or cardboard. Glass and plastic bottles are generally accepted. Check recycling opportunities with your local council.

Plastic bags (first remove checkout slips/paper and other foreign material) can be recycled at local supermarkets.

The best advice is to recycle as much as you can on your own property, e.g. compost kitchen waste and lawn clippings; mulch or burn other garden/tree clippings; consider paper and cardboard 'bricks' for the fire.

Fire management

Protection of life and property is the overriding priority in fire management, particularly as urban areas expand and rural residential developments bring more people into fire-prone areas. Some developments that take advantage of the scenic values of steep wooded land are in high-risk areas.

So how do you manage your grassland or bushland in both an environmentally friendly and bushfire-safe fashion?

Several authorities responsible for fire management have developed detailed fire management plans. These include the 2002 ACT Bushfire Fuel Management Plan and National Parks and Wildlife Service fire management plans. Keeping properties safe from fires is, however, the responsibility of every landholder.



Frank Capinski

Here are some pointers:

- Talk to the Rural Fire Service (through your local bushfire brigade) *before* you build a house.
- Create a fuel-free zone around any buildings — this doesn't require ripping down trees in a half-kilometre radius; contact your local bushfire brigade for a free inspection and advice.
- Stocking and slashing beat burning as grassland fire-management techniques. However, it's a good idea to

seek expert advice, as these techniques can degrade native pasture, if not done properly.

- Broad-scale fuel-management burns under the guidance of the Fire Services can be considered if a dozen properties get together, but most native vegetation does not benefit from burning at intervals more frequent than 15 years or so.
- If you burn too regularly, you alter the vegetation to become more fire-prone and therefore a hazard.
- Be aware of the provisions of the *Native Vegetation Conservation Act* (NSW); any proposed burn greater than 2 hectares requires an environmental study by the Department of Land and Water Conservation, with the costs borne by the landholder.
- Burns should be low-intensity, and conducted in the cooler months; permits may be required.
- In all cases contact your local bushfire brigade first for advice; in many instances the brigade would prefer to conduct a fire for you rather than put it out should it get away.

CONTACTS



IN EVENT OF FIRE OR EMERGENCY RING 000 (24 HOURS)

Yarrowlumla Shire Fire Control
02 6297 1840

Yass Shire Council Bushfire Control Officer
02 6226 3100

Queanbeyan City Council
02 6297 1840

Snowy River Shire Council Fire Control Centre
02 6450 5100

Cooma-Monaro Shire Council Fire Control Office
02 6450 1712

Gunning Shire Council Fire Control Centre
02 4845 1579

ACT Emergency Services Bureau
02 6207 8444

REFERENCES



Department of Bush Fire Services publications (Rural Fire Service (NSW)):

Bush Fire Control

Bush Fire Prevention in Urban Bushland Areas

Choosing an Urban-Bushland Homesite

Everyone's Guide to Rural Homesite Selection and Layout

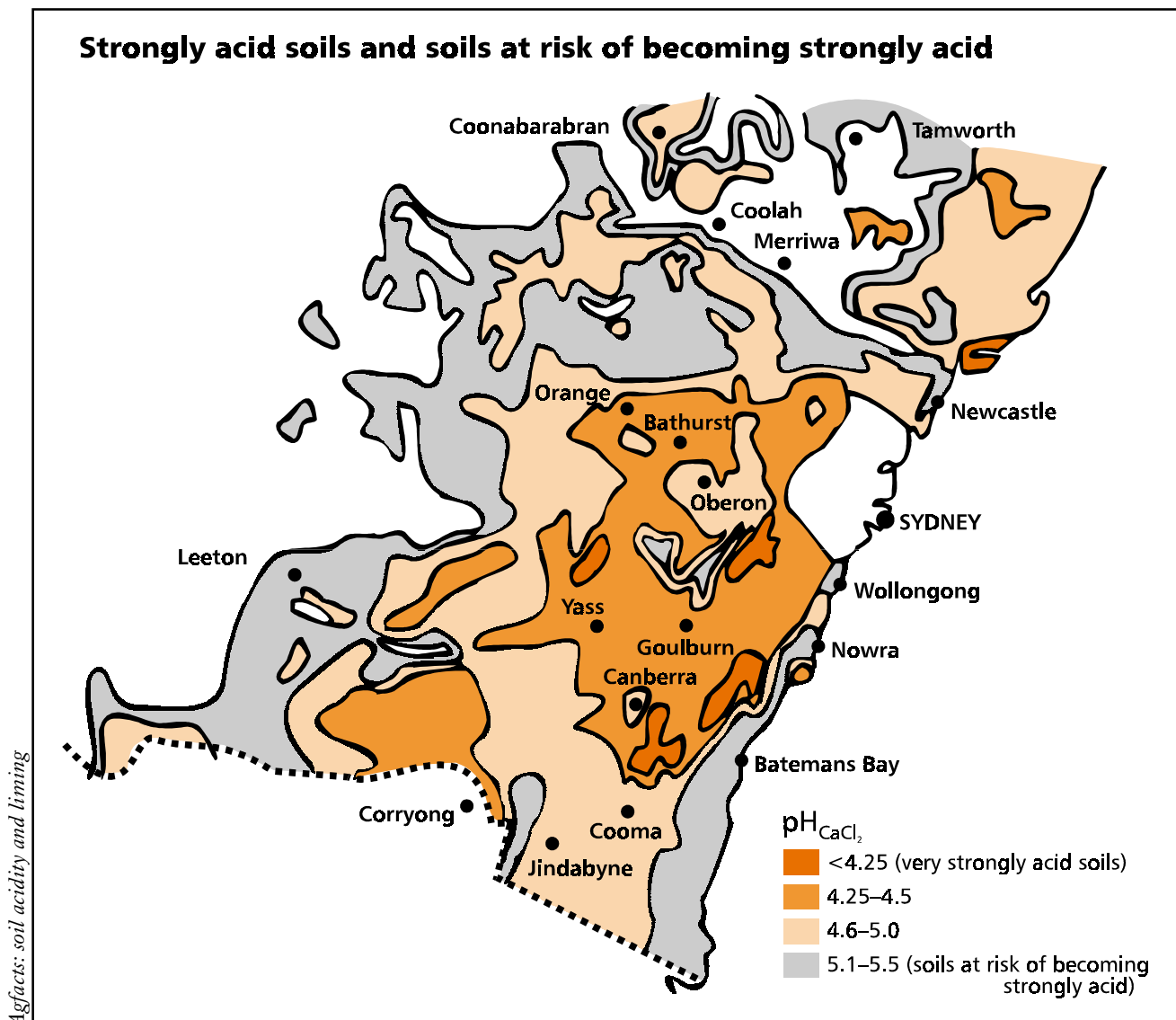
House Design and Modification in Bush Fire Prone Areas

Wild Fire Prevention in Rural Areas

These booklets can be obtained from your Shire Fire Control Office/Centre.

THE RESOURCE BASE

SOILS



What's the nature of our soils?

soil acidity is a major feature

Soil types vary considerably on the Central and Southern Tablelands of New South Wales.

Basalt

Less than 5% are fertile basalt soils. Where rainfall is above 500 mm, these soils are suited to high-input pasture systems based on introduced species. Acidity problems are low to minimal, and these soils have high rainfall infiltration rates.

Granite

About 30% of the Upper Murrumbidgee Catchment has granite soils with substantially lower natural fertility than basalt soils but they can sustain introduced pasture species.

However, introduced pastures have been increasing the level of acidity over time. Some of these soils are also highly erodible.

Dryland salinity is occurring on some of the lower slopes and in discharge areas.

Sedimentary duplex soils

More than 50% of the total area is covered by sedimentary duplex soils. These are by far the most challenging and diverse. Many are naturally acid (pH 4.5 or below in $CaCl_2$ measurement), and are located in semi-arable to non-arable environments. Frequently these soils have acidity extending to a depth of 1 m or more.

Soil tests recommended

The use of soil tests is strongly recommended to properly diagnose acid soil and saline soil problems. However, the following landscape features provide some strong clues.

Source: 'Recognising and managing landscape and pasture diversity' by Peter Simpson, NSW Agriculture, in *Proceedings of the 14th Annual Conference of the Grassland Society of NSW*.

Naturally occurring acid soils

These areas can be identified easily by the native timber and pasture species present. Peppermint (*Eucalyptus dives* and *E. radiata*), Scribbly Gum (*E. rossii*), She-oak (*Casuarina* spp.) and Sifton Bush (*Cassinia* spp.) nearly always indicate strongly acid soils.

Wiregrass (*Aristida ramosa*), Weeping Grass (*Microlaena stipoides*) and some Wallaby Grasses (*Danthonia* spp.) are also highly acid-tolerant and, where they dominate, the likelihood is that soils will be acid.

Kangaroo Grass (*Themeda triandra*) and Redgrass (*Bothriochloa macra*) tend not to grow in strongly acid soils and are usually associated with Yellow Box (*E. melliodora*) or Apple Box (*E. bridgestiana*) trees.

How can you tell saline soils?

Dryland salinity can be detected by changes in introduced pasture composition. Cocksfoot and white and subterranean clover thin out and disappear as salinity levels increase, and are progressively replaced by more salt-tolerant species including Paspalum, Yorkshire Fog, Couch and Barley Grass.

REFERENCES



Grassland Society of NSW (1999) *Proceedings of the 14th Annual Conference of the Grassland Society of NSW*. Available from Grassland Society of NSW, c/- South Orange Post Office, Forest Road, Orange NSW 2800.

Hird, C. (1991) *Soil Landscapes of the Goulburn 1:250 000 Sheet*, Soil Conservation Service of NSW, Sydney.

Simpson, P.C. (1994) 'Perennial grasses — acid soil tolerance' in C.H. Bastick et al. (eds) *Landcare in the Balance: Proceedings of the 1994 Australian Landcare Conference*, Hobart.

Dryland salinity

In the Murray–Darling Basin, the land area at risk from dryland salinity will expand from about 250,000 hectares now, to about 8–10 million hectares in the next 50–100 years, unless significant new policy interventions are made.

In the high-rainfall southern zone, it is likely that

about 15% of (agricultural) land will be salt-affected in 50–100 years.

Salinity levels in the Murrumbidgee River are increasing at 3–15% per annum, depending on the location.

— *An edited excerpt from a paper presented by Don Blackmore, 'Major landscape issues and developments affecting the high rainfall southern zone of the Murray–Darling Basin', in Proceedings of the 14th Annual Conference of the Grassland Society of NSW (1999). Mr Blackmore is Chief Executive of the Murray–Darling Basin Commission.*

Dryland salinity occurs naturally when groundwater discharges or seeps to the surface bringing soil salts with it. However, when the water balance is disturbed, i.e. when deep-rooted perennial vegetation is removed, dryland salinisation is accelerated. Dryland salinity can cause vegetation loss and stream salinisation and can act as a precursor to soil erosion. Urban areas and infrastructure are also affected by dryland salinity.

In the last 40 years the area in the Southern Tablelands affected by dryland salinity has increased rapidly. Saline scalds have been developing in the Yass River subcatchment for more than 30 years. Anecdotal reports suggest that salinity outbreaks were observed near the upper Murrumbateman Creek following the 1902 drought. Aerial photos of the Yass River subcatchment indicate increasing extent and severity of salinity between 1941 and 1973, with particularly severe problems evident in the early 1960s.

In other subcatchments of the UMC, there is a lack of information on existing and potential dryland salinity problems, largely due to lack of groundwater monitoring. Minor salinity outbreaks have been observed in the Molonglo and Queanbeyan River subcatchments and the Lake George Basin, indicating there could be other problem areas and that there is a risk of more widespread problems if further action is not taken.

Urban salinity has been identified in Canberra and Queanbeyan with the Gungahlin area of Canberra affected by emerging salinity. Yass township is also considered susceptible to urban salinity.



SALINITY IN THE YASS RIVER SUBCATCHMENT

In 1993, dryland salinity was estimated to affect 1–5% of the Yass Valley (total area 159,000 ha) with the potential to degrade up to 20% of some areas. Saline land is indicated by scalds and the dominance of salt-tolerant grasses that are often unpalatable to stock. Shallow groundwater in the saline areas is generally brackish.

The estimated economic cost of dryland salinity in the Yass River Valley for 1991 included \$400,000 per year to local and state governments and between \$200,000 and \$500,000 per year for landholders.

The Murrumbateman Landcare Group has produced self-directed tour notes for the Yass Valley salinity demonstration sites to promote awareness of the problem and its management.

Causes of dryland salinity

- Replacement of deep-rooted perennial vegetation with shallow-rooted pastures and crops that use less water resulting in an elevation of the watertable — bringing salt to the surface
- Over-irrigation of crops, lawns and recreation areas with similar effect to the above
- Rock /sediments containing high levels of salt
- Salt in rainfall: rainfall amount and distribution
- Landform and hydrogeology characteristics

Effects of dryland salinity

- Loss of desirable vegetation
- Growth of salt-tolerant species
- Reduced crop and pasture production and decreased enterprise flexibility
- Waterlogged soil
- Soil erosion on bare areas
- Increased salt loads in waterways
- Reduced surface and groundwater quality
- Declining soil structure
- Damage to buildings, roads, septic tanks and pipes

Soil acidity

Many of our soils are naturally acid, but common management practices, particularly the use of annual legume-based pastures, encourage even greater soil acidity. This is because of the inefficient use of nitrogen, leading to an accumulation of nitrate in the soil. When there is a mismatch between rainfall and plant demand for nitrogen, nitrogen is leached from under pastures or crops, which lowers the soil pH. The result? Many plant species will not grow as acidity increases.

soil acidity is a long-term soil degradation issue that has links to both soil erosion, through reduced ground cover, and dryland salinity, through reduced water use by annual crops and pastures

Causes of soil acidity

- Natural pH decline through leaching
- Past and present land use
- Build-up of soil organic matter
- Removal of alkaline plant and animal produce and waste products
- Nutrient uptake by plants
- Use of shallow-rooted legumes for pasture and hay production
- Continued application of ammonium fertilisers

Effects of soil acidity

- Reduced agricultural viability and production rates
- Increased production costs, i.e. addition of lime
- Ground cover decline, increasing likelihood of soil erosion and water quality decline
- Reduced water use by vegetation contributing to salinity

- Development of subsoil acidity
- Soil structural decline
- Loss of native vegetation species and weed invasion

Soil acidity in the Upper Murrumbidgee Catchment

Almost all soils in the UMC are classified as strongly acid (pH 4.25–5.0) and there are some areas of very strongly acid soils (pH less than 4.25). Subsoil acidity is known to occur in some areas, although it is difficult to detect.

There are three basic strategies for managing acid soils:

- Use perennial pastures to reduce nitrate leaching and slow the rates of acidification
- Use lime to raise soil pH
- Use plants that are tolerant of acid soil conditions

In practice a combination of all three strategies may be used on any property.

What is soil pH?

The pH of the soil is a measure of its relative acidity or alkalinity, providing a guide to the overall chemical balance of the soil. The pH scale is divided into 14 points, each of which is 10 times more or less than its neighbours. A pH of 7.0 is considered neutral, above 7.0 is alkaline and below 7.0 is acidic. *(There are two scales, water and CaCl₂, which give slightly different numbers.)*

Your soil pH, nutrients and worms

Soil pH controls the availability of plant nutrients. It can also help or hinder the activity of earthworms. Earthworms prefer to live in a neutral environment, where the soil pH is near 7.

What is the best pH for agricultural plants?

A soil pH (CaCl₂ — measured as calcium chloride) between 5.0 and 8.0 provides the best conditions for most agricultural plants. If the pH drops below 5.0, it has a negative effect on plants (such as Lucerne) that are sensitive to acidity.

Plants that are more tolerant of acidity, such as subterranean clover, continue to grow normally until the pH falls below 4.5. Below pH 4.2 all plants, except the very highly acid-tolerant, show a significant reduction in production. Very few plants survive below pH 3.8.

The material above is excerpted from:

CSIRO, *Soil pH Test Kit* leaflet.

Fenton, G. et al. (1996) *AgFact AC.19 Soil Acidity and Liming*. NSW Agriculture.

Acid Soil Action program —

provides information on managing soil acidity and can provide funding to community groups for better management of acid soils. Extension officers are also available to speak to groups about acid soils.



NSW Agriculture in Queanbeyan, 02 6297 1861.

Sodicity

Soil sodicity is an obscure cousin of soil salinity. The two are often confused, probably because both involve sodium, a metal widespread in Australian soils.

Compared to salinity, sodicity is a more widespread form of land degradation. It affects nearly a third of all soils in Australia causing poor water infiltration, surface crusting, erosion and waterlogging.

Its impacts extend to water catchments and the environment. Runoff from sodic soils carries clay particles into waterways causing water turbidity or cloudiness. Turbidity causes environmental problems in rivers and wetlands. Runoff from sodic soils is more likely to carry higher levels of nitrogen and phosphate into waterways, contributing to algal blooms.

The difference between saline and sodic soils

In **saline soils**, sodium has a partner in crime, chlorine, with which it forms a salt. The presence of salt in the soils reduces the availability of water to plants and, at high enough concentrations, can kill them.

In **sodic soils**, much of the chlorine has been washed away, leaving behind the sodium ions attached to clay particles in the soil. As a result these clay particles lose their tendency to stick together when wet, leading to unstable soils which may erode or become impermeable to both water and plant roots.

Treating sodicity

Sodicity can often be treated by applying gypsum to the affected soil, the cheapest and most effective treatment

TRACKING EROSION ABOUT THE PLACE

Roads and access tracks on the bush or hobby farm block can cause substantial erosion and threaten water quality if they are not carefully designed and maintained.

Construct for minimal erosion and maintenance. That means:

- DRAINAGE, DRAINAGE, DRAINAGE (*see diagrams below*)
- plant or maintain vegetation beside the track, even on the track
- follow the lie of the land
- minimise cut and fill
- if you have to cut into a bank, make the cut straight up and down unless it is higher than 1.5 metres
- avoid soil and vegetation disturbance
- minimise pushing soil around with your tractor blade.

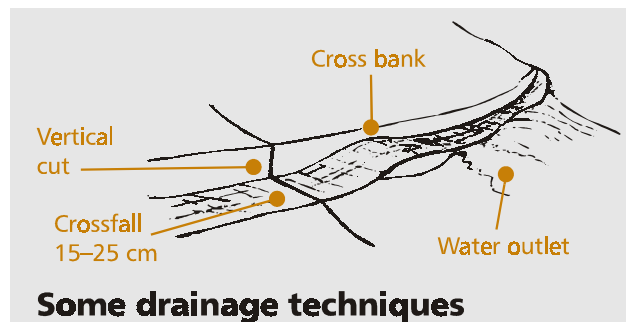
Keep grades gentle:

- grades should generally be 10% — about 6 degrees
- cross-banks will scour out above this grade
- grades greater than 7% (4 degrees) will need special drainage works such as lining of table drains, etc.

Outfall drainage

Tracks should have a cross-fall to shed water.

This should normally angle away from the hillside, except where a built-up bank is unstable or higher than 1.5 metres.



Cross-banks

If outfall drainage isn't enough to control runoff, cross-banks can be a good, cheap long-lasting solution.

A cross-bank (also known as a 'whoa boy') is like a large speed hump built across the track. It is formed by digging a trench 20–30 cm deep on a slight slope across the track and using the excavated earth to form a bank on the downhill side.

How to make a cross-bank

Rip the road for one or two tractor lengths to the outlet point you have chosen. Then push the loose earth down the roadline to form a bank, commencing at the uphill side of the road and working across to the outlet side. A long, shallow excavation is best.

If you need to cross a drainage line...

... use fords, culverts or bridges. Fords cost less and can often be built with little disturbance to the stream bed or banks. If you do use culverts, make sure they are aligned as closely as possible to the natural drainage lines.

Shallow depressions and swampy areas can often be stone-paved or laid with logs side by side across the wheel tracks.

CONTACT & REFERENCES



Soil Conservation Service (under NSW Department of Land and Water Conservation) — Queanbeyan 02 6297 6477

Soil Conservation Service of NSW/ Department of Land and Water Conservation:

Harris, *Soil Conservation for Small Farms*

Jacobs, *Soil and Water Conservation on Farms*

Marshall, *Guidelines for the Planning, Construction and Maintenance of Tracks*


Levy, Chris, *Saving Our Soil: Soil Erosion and Its Control*, State Bank of NSW.



readily available. But large quantities of gypsum may be needed to have anything more than a short-term effect.

Source: *Sodicity? A dirty word in Australia* <http://www.science.org.au/nova>

REFERENCES

 Department of Conservation and Land Management (Salt Action) *Detecting Dryland Salinity on the Southern Tablelands of New South Wales* — pamphlet with photos of indicator plants, symptomatic landscape features.

Department of Conservation and Land Management (Salt Action and the National Soil Conservation Program) (1994) *Dryland Salinity 8: Options for Control*.

NSW Agriculture (1996) *AgFact AC.19 Soil Acidity and Liming*.

NSW Agriculture (1996) *Agfact AC.10, 2nd edition, Improving Soil Structure with Gypsum and Lime*.

Useful websites:

Salinity information website for NSW DLWC — <http://www.dlwc.nsw.gov.au/care/salinity/index.html>

Salt Action website — <http://www.dlwc.gov.au/community/index.html#8>

Erosion

The various forms of erosion, including sheet, rill, gully and wind erosion, are problems in different parts of the catchment. The main protection against erosion is adequate vegetation cover.

Soil erosion results in loss of valuable land, through the removal of soil, nutrients and organic matter, and can cause sedimentation, turbidity, declining productivity and dust storms.

Sheet, rill and gully erosion results from water flowing across the land surface. They occur in all land areas where there is insufficient ground cover to provide protection for the soil.

There is evidence that major soil erosion problems occurred in the UMC during the 1800s as a result of land management practices (particularly the introduction of sheep, cattle, horses and rabbits) and flood events. During this peak period of erosion, estimated rates of sediment delivery from gully erosion were 1,000 tonnes per square kilometre per annum.

most soils in the UMC have moderate to high erosion hazard

Causes of soil erosion

- Excessive runoff related to ground cover loss and soil compaction
- Land management activities including overstocking, poor pest animal control, excessive or inappropriate clearing, urban development
- Drought conditions
- Naturally unstable soils
- Intense rainfall events

Effects of soil erosion

- Loss of topsoil, nutrients and organic matter
- Increased turbidity in streams and storage dams
- Sedimentation of storage dams
- Sedimentation and flooding of infrastructure, i.e. roads, bridges
- Destruction of aquatic habitat
- Increased mobility of nutrients and pollutants in waterways

The highest levels of **gully erosion** are east of the Murrumbidgee River between Cooma and Michelago, and between the northern ACT border and Burrinjuck Dam. Current erosion mapping shows that many gullies are active, but some have been stabilising over the last 50 years, either naturally or as a result of management activities.

Sheet and rill erosion is comparatively minor and localised in extent. For example, the Bredbo area has suffered extensive sheet erosion on moderate slopes and cleared areas. Sheet erosion is considered severe where there is 20–30% bare ground and obvious disturbance to the soil surface.

The current estimated sediment yield from all sources from the UMC is 36.6 tonnes per square kilometre per annum.

Tips to prevent erosion on an established block

- Farm tracks should be well sited, constructed and maintained — utilise higher country or ridges and avoid creeks and wet areas
- Site tracks in sunny aspects where possible, to dry the track surface
- Consider rotational grazing and do not overstock or overgraze
- Dams are not necessarily an answer to stopping erosion
- Locate stockyards on high ground
- Do not use bare earth firebreaks
- Gravel or otherwise hardpan any boggy sections
- Maintain, enhance or revegetate with appropriate native vegetation along flow lines
- Do not remove natural vegetation on highly erodible country and revegetate marginal land with native species
- Restrict stock access to marshy land or flow lines
- Keep ground vegetation at 70% coverage

Gully filling: how to do it

Filling is a viable means of restoring erosion gullies. However, some people have used toxic and other inappropriate materials to fill gullies, causing pollution. Poorly stabilised fill material has also been washed out of gullies, causing considerable water turbidity and downstream sedimentation. For this reason, gully filling is usually subject to a council development application.

As a rule gullies should be filled only with clean excavated natural materials (soil and rock). This is regarded as inert waste. Inert waste does not mean concrete, bricks or timber. Contact your local council to explore gully-filling options.

THE RESOURCE BASE

WATER

Development depends on surface water

there is continuing pressure on surface water availability from rural residential development and associated land use such as vineyards

Limited groundwater availability has meant a heavy reliance on surface water in the catchment, with increasing demand from all sectors.

Groundwater resources have not been well assessed — meaning that, in areas where groundwater is available, it has been used without consideration of the local or regional impact. Further rural residential growth ensures there will be continued demand on groundwater.

Water quality

Surface water quality in the UMC, which has been generally good, is declining due to current land use and management. Water quality issues include salinity, eutrophication, turbidity and chemical contamination. The community and agencies are responding with a range of programs such as ‘Streamwatch’ and ‘Waterwatch’, which incorporate monitoring, management, awareness and education through a hands-on approach.

In the UMC most of the usable **groundwater** occurs in fractured rock. The worst groundwater quality problems are around Murrumbateman, where raised nitrate levels occur, and Bungendore, where high levels of bacteria have been identified. These problems are associated with rural residential developments, which have introduced septic tanks, higher water use, and more intensive land use.

A Groundwater Management Plan is being developed in the Murrumbidgee Catchment and will include the UMC areas.

Towns and villages such as Murrumbateman, Sutton and Bungendore rely largely on limited groundwater. Adaminaby, Cooma, Bredbo, Captains Flat and Yass all draw water from local rivers. The Bendora, Cotter and Corin Dams supply Queanbeyan and Canberra.

Water law — in the Australian Capital Territory

The use of water in the ACT is regulated under the *Water Resources Act 1998* (ACT).

All groundwater use must be licensed.

Surface water, including water from a dam, to be used for commercial purposes must be licensed.

A licence is not required for surface water use for stock or domestic purposes. However, the user must have legal access to the water.

A permit is required before a bore is constructed or altered.

Only drillers licensed in the ACT may construct, modify or seal off a bore located within the ACT. It is an offence to waste bore water or to place any matter including water in a bore without approval.

A permit is required to construct or alter a dam or other water control structure if it will be on a waterway of larger than 2 megalitres capacity. The construction of a dam may also require a development approval.

CONTACTS



Environment ACT website at <http://www.environment.act.gov.au/>



Environment ACT Helpline 02 6207 9777 during business hours.

For information about activities requiring development approval in the ACT, contact Applications Secretariat in Planning and Land Management 02 6207 7794.

REFERENCE



Environment ACT, Environment Protection: *Water Resources Act 1998* Fact Sheet 1–4.

dam construction requires development consent in some local government areas — contact your local council

— in New South Wales

The Department of Land and Water Conservation (DLWC) administers the management of surface and groundwater.

‘Harvestable right’ / Farm Dams Policy

All landholders in NSW have a right to capture and use a certain volume of runoff water from their properties without requiring a licence — for any purpose including irrigation. This is called the ‘harvestable right’ and is the basis of the Farm Dams Policy. Any amount over the harvestable table right is subject to licensing.



See p7 ‘Rules for new dams’.

Entitlements and water trading

Irrigation and other commercial access to surface water above a property’s harvestable right are constrained by an embargo on the issuing of new water entitlements.

That means new water licences or licences for additional water (apart from exempt purposes) can be obtained only by buying the required water entitlement from someone else — ‘water trading’. There are guidelines established for ‘water trading’ within catchments in NSW and you should contact your nearest DLWC office.

Domestic and stock rights

All landholders in NSW with frontage to any river, estuary or lake may take water for the purpose of domestic use and/or watering stock.

Groundwater

All groundwater bores in NSW require licensing before drilling. Licences will specify how much water can be pumped and for what purposes this water can be used.

There are fees and charges for irrigation bores, which vary depending on usage.

CONTACTS



DLWC offices

Cooma:	02 6452 1455
Leeton:	02 6953 0700
Queanbeyan:	02 6297 6477
Wagga:	02 6923 0400
Yass:	02 6226 1433
Head Office:	02 9228 6111

REFERENCES



The Farm Dams Policy and 'harvestable right' are explained in detail in the *Rural Production and Water Sharing Information Package* available at all DLWC offices free of charge.

Managing riparian zones

The riparian zone is the area directly influenced by the river, generally extending from the normal river level to the floodplain. Riparian vegetation plays a significant role in riverbank stability, water quality and biodiversity.

Aerial photos and other evidence indicate that native riparian vegetation is declining. This decline leaves stream banks more vulnerable to erosion and weed infestation. Grazing management and revegetation are underway in some areas to protect this sensitive zone but other areas are still under pressure.

Careful stocking to protect stream banks

When stock rely on streams for their water supply, some level of disturbance to soil and vegetation is unavoidable. Stock can cause stream bank erosion (resulting in soil loss and water quality decline), graze and trample vegetation, inhibit regeneration and cause faecal pollution of water.

Cause of riparian zone degradation

- Recreational activities
- Invasion and competition by pest species
- Land management practices, i.e. grazing and cropping
- Erosion
- Channel realignment

Effect of riparian zone degradation

- Flow regulation
- Weed invasion
- Loss of topsoil and livestock trampling
- Reduced water quality
- Reduced biodiversity
- Reduced aesthetic value
- Loss of windbreak and shelter
- Reduced aquatic flora and fauna
- Unstable stream banks

Aquatic plants and animals

Native aquatic flora and fauna are part of a healthy river system. Native aquatic vegetation is noticeably absent from many inland rivers and this is a contributing factor in increased sediment and nutrient load, including in the UMC.

(Aquatic habitats in the extensive gorges and the subalpine areas are considered generally diverse and in good condition.) Changes to the river ecosystem can be attributed mainly to human intervention including reduced flow, increased erosion and the introduction of exotic species (willows, carp, trout).

Restoring or developing wetlands

Many rural blocks have wetlands of some kind — a dam, a creek, that boggy patch down in the far corner. These areas can be a wonderful habitat for wildlife and aesthetically pleasing as well as a source of water for farm activities.

Water quality depends on what is happening further upstream. Signs of poor-quality water are murkiness, odour, salinity and excessive growth of algae.

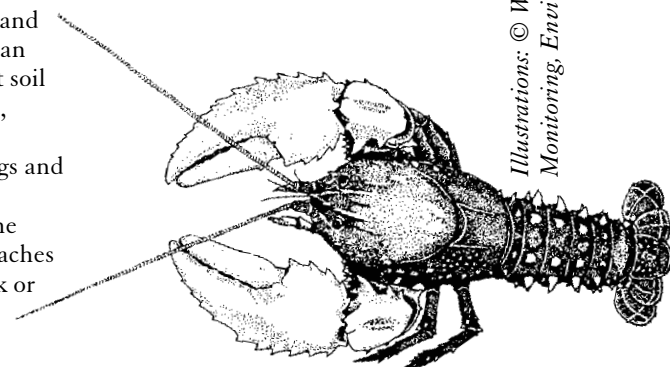
Strategies to improve water quality

- Fence stock out of dams and creeks. Consider pumping drinking water for stock to troughs in less fragile areas where stock will do less damage.
- Avoid use of fertilisers, herbicides and pesticides in areas around dams and waterways.
- Revegetate your wetlands: reeds, sedges and rushes at water edges, grasses and shrubs on the banks. These help remove extra nutrients from the water, improving water quality, and create habitat for wildlife.
- Beware of large trees near the water's edge: they can drop large numbers of leaves into the water which degrade the water quality — and their roots penetrate dam walls causing leaks.
- Consider the whole water catchment area, both upstream and downstream. Actions you take will affect the water quality for others further downstream.



Dam care

- Clearing of trees and understorey increases soil erosion. Soil erosion releases phosphorus into the water leading to algal blooms.
- Water flowing through areas that are heavily grazed or fertilised picks up nutrients and silt. The water will be muddy and poor quality.
- Grasses and shrubs can filter out soil particles, animal droppings and fertiliser before the water reaches the creek or dam.



Illustrations: © Wildlife Research and Monitoring, Environment ACT

LIVESTOCK CONTROL NEAR CREEKS, STREAMS AND RIVERS

Why should stock be kept off stream banks?

- They eat, trample and destroy the vegetation that protects banks from erosion.
- They compact the soil making plant growth difficult.
- They push soils off steep banks.
- They make tracks, which can concentrate the flow of water down the banks causing erosion.
- They may injure themselves falling over steep banks.

Why should stock be kept out of streams?

- They eat, trample and destroy water plants and reeds that control erosion and provide fish habitat.
- They stir up mud.
- They add excess nutrients with manure.
- They scare away native fish.

How will stock get a drink if they can't get to the stream?

You can install:

- a paved ramp down to the water, preferably on the inside of a bend
- a bore and tank in the paddock
- a dam in the paddock
- a pump and trough in the paddock.

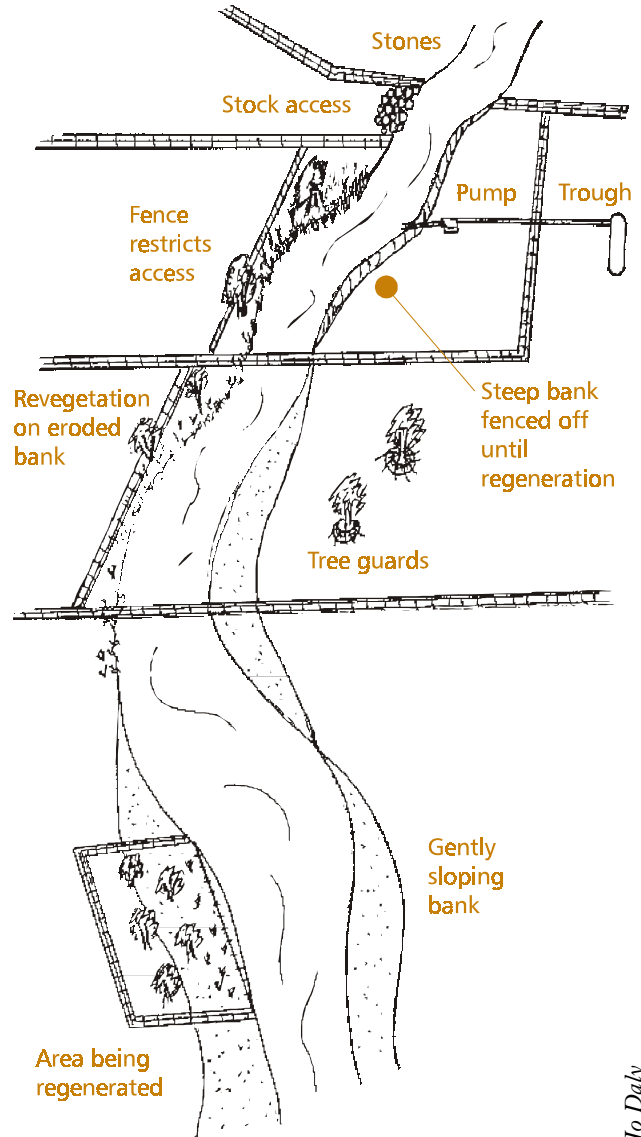
How do you manage a fenced-off area?

- Short-term grazing 'crash grazing' by stock can be used once vegetation is established.
- Weeds will need to be controlled as per the surrounding paddocks.

How do we pay?

There are grants available to assist with off-stream water provision and fencing. Contact the NSW Department of Land and Water Conservation, Greening Australia, or your local Landcare coordinator.

Source: Adapted from RIVERWISE notes AGDEX 572, DLWC



Jo Daly
Adapted from Riverwise — Livestock control near rivers

Clean water

Blue-green algal blooms in farm dams and waterways

Blue-green algal blooms can cause unpleasant smells and tastes in the water and produce a variety of toxins including liver toxins, neurotoxins and endotoxins which cause skin irritations. The toxins can persist for weeks, and are a potential health risk if they are swallowed or if they contact the body.

(Blue-green algal blooms are not always toxic and toxicity can change rapidly without warning.)

What causes algal blooms?

(a combination of factors)

- high concentrations of nutrients such as phosphorus
- inadequate light penetration into water
- slow water flow
- high water temperatures
- low wind speeds.

The factor over which landholders have most control is the level of nutrients washing off paddocks and out of their homes into their dams and local waterways.

➔ See also 'Why everyone's septic system matters' and 'Better septic performance' p5.

Effects on animals

In NSW there are many reported livestock deaths due to the toxic effects of blue-green algae.

Dogs are also very susceptible to blue-green toxins, especially if they swim in an algal bloom.

REFERENCE

- ➔ Wollondilly Phosphorus Action Committee leaflet *Blue-green Algal Blooms in Farms and Waterways* (contains useful preventive strategies and identification chart), available from NSW Department of Land and Water Conservation, Queanbeyan.

CONTACTS

NSW Department of Land and Water Conservation for advice and brochures, specifically:
Rivercare and riparian (river-margin) vegetation
 Contact your local DLWC office (see *contacts p15*).
Waterwatch Program Upper Murrumbidgee
 c/- Environment ACT, PO Box 144, Lyneham ACT
 2602 ph 02 6207 2246 fax 02 6207 6084
 Environment Protection Authority
Pollution Line 131 555

NSW Fisheries (The District Fisheries Officer advises on health of stream ecosystems) ph 1800 043 536
Groundwater advisory services
 Department of Land and Water Conservation, Leeton
 ph 02 6923 0475
Dams and water rights
 Contact your local DLWC office (see *contacts p15*).

TURNING A DAM INTO A WILDLIFE SANCTUARY

Jennie and Chris Curtis *have been restoring an old farm dam that was badly degraded by heavy stock use.*

When we began this project the dam was a shallow, muddy mess in the middle of an eroding, treeless paddock. We wanted to improve the water quality and attract wildlife. The first step was to exclude stock from the area. We also decided to excavate and extend the dam to create an island and a variety of water depths.

Contrary to the advice of the contractor, we wanted to have an irregular shape and to keep as much of the original edge of the dam as possible, as there were a few rushes growing there despite the devastation.

In the first year without stock, the grass grew back over areas of bare soil around the dam that had been eroding. This helped catch the silt that had previously been pouring into the dam and reduced the salt scald below the dam. We noticed many frogs, tadpoles and small fish.

Reeds and rushes grew back along the original edges of the dam and began to spread along the new edges, helping to stabilise the earthworks. In the second year a pair of wild ducks raised ducklings on the island. We were amazed at

how much the appearance of the dam improved without doing much except keeping the stock out.

We have planted windbreaks on the eastern and western sides of the dam to provide shelter. Eucalypts and grevilleas have been planted on the island to provide shelter and safe nesting places for birds. We also planned to add dead logs on the island and install more tea-tree and callistemons around the edges of the dam.

➔ *See p7 for a list of water-tolerant native plant species.*

REFERENCES

- ➔ Greening Australia (1991) *Improving Your Farm Dam* — brochure discusses how to improve water quality in dams through good management of the area around the dam.
- Greening Australia, *Greenotes #20: Revegetating Stream Banks.*
- Sainty, G.R. and Jacobs, S.W.L. (1994) *Water-plants in Australia* (3rd edition) — field guide to many Australian plants growing in wetlands.

CASE STUDY



Illustration: Ric Bevis

RESOURCES AROUND THE BLOCK

CONSERVING WHAT NATURE BESTOWED

Native vegetation

Cherish your native grasses and pastures — or they'll disappear

Native pastures are valuable natural capital resources which many people use for grazing. *See also the section on native grasslands under 'Remnant native vegetation' p21.*

How native pasture works for you:

- prevents erosion and provides soil stability
- offers low-cost landscaping and a habitat for native flora and fauna
- used sensitively, can provide grazing for your animals
- can increase rainfall infiltration into the soil up to fourfold
- helps ensure a clean catchment for water, provides understorey for woodland, and combats salinity.

Can you tell the difference between Serrated Tussock, Poa Tussock and Red-Anthered Wallaby Grass?



Hint: one is a noxious weed and some people pull out the lot, just in case.

What have you got?

Local native pastures are dominated by Kangaroo Grass (*Themeda australis*), Spear Grass (*Austrostipa* spp.), Wallaby Grass (*Austrodanthonia* spp.) and Snow Grass (*Poa* spp.). If revegetating, try to select and/or maintain the species that match your soil and environment.

What's it look like?

To identify your grasses, the following are good resources: NSW Agriculture/ DLWC, CSIRO, libraries or specialised outlets such as the Botanic Gardens bookshop. Take a specimen, either fresh or preserved, to DLWC. Try to take

in plants with flowers, fruits or seedheads, or draw flowers or seeds. Species are easier to identify when they are flowering or seeding.

Once you've mastered identification, there are simple (and cost-free) techniques for monitoring what's in your pasture. For details see *Managing High Rainfall Pastures on a Whole Farm Basis* (reference p19).

Using native pastures for grazing

Many of us live on steep middle to upper slopes with low fertility, acid, shallow soils susceptible to erosion. Such land is only suitable for permanent pasture based on native grasses or to be left undisturbed.

Until recently native grasses were thought to have little value for grazing or conservation, and were replaced with 'improved' pastures. Their excellent resistance to drought and low temperatures went largely unacknowledged as was the fact that they are generally better suited to acid soils.

Natives like Wallaby Grass, Weeping Grass and Snow Grass respond to grazing, are green year-long and have moderate to high forage value.

Unfortunately, commercialisation of our native grasses has been difficult and some may not be available in quantity at economic prices and/or are difficult to establish. So look after what you've got!

How to keep native grassland healthy

Paddocks should be rested when they are flowering or seeding down:

- **grazing** — avoid permanent set-stocking and allow for spelling, especially during flowering and seedset (October–January)
- **fire** — a burning regime can allow periodic regeneration (*see cautions p8*)
- **slashing and mowing** — avoid October–January, and cut no lower than 75 mm from ground level
- **plant introductions** — avoid sowing introduced pasture species
- **soil disturbance** — avoid ploughing, grading or ripping which can lead to weed invasion
- **herbicides** — avoid broad-spectrum herbicides and use care with others
- **nutrient enrichment** — fertiliser, animal manure and nutrient runoff can degrade native pastures.

GRASSES AND THE LAW

Management Guidelines for Native Grasses by the Department of Land and Water Conservation guides landholders in those activities which:

- do not require application or notification to the Department
- require application, which can usually be addressed in 2–5 days
- require application which will take longer to assess.

The new guidelines on native grasses have been prepared under the *Native Vegetation Conservation Act* (NSW), and are available from the Department of Land and Water Conservation.

Grazing management

There is a link between grazing management and the capacity of land to produce quality pastures and fodder. Careful grazing strategies can even increase the diversity of some native remnant grasslands. However, in some cases rural residential developments have resulted in a concentration of grazing pressure.

Poor grazing management can lead to over-grazing, and can lead to:

- bare patches and a susceptibility to erosion
- loss of vegetation, including paddock trees and native species
- declining soil structure and organic matter in the soil
- increased weed invasion
- greater problems during drought.

CONTACTS

 **NSW Department of Land and Water Conservation/ NSW Agriculture** Queanbeyan 02 6297 6477; Sydney 02 9228 6458
Environment Australia 1800 671 717

ProGraze


How to manage pastures to last

ProGraze, a trademark of NSW Agriculture, is a series of workshops that assist producers and landholders to manage their grazing productively without degrading their pastures or soils.


The workshops are held on-farm and include: recognising the plant species present and how to assess their nutritional value to stock; identifying the quality and quantity of pasture available for stock; manipulating grazing management to control undesirable species and weeds; and developing fodder budgets so that both the animal and pasture needs are met.

ProGraze strategies include:


- increased use of rotational grazing to better manage pasture growth and control parasite levels
- modification of stocking rates using pasture assessment as a basis for supplementary feeding
- strategic spelling of pastures to encourage seedset of desirable species
- targeting weight gains in stock and achieving critical fat scores to achieve improved production.

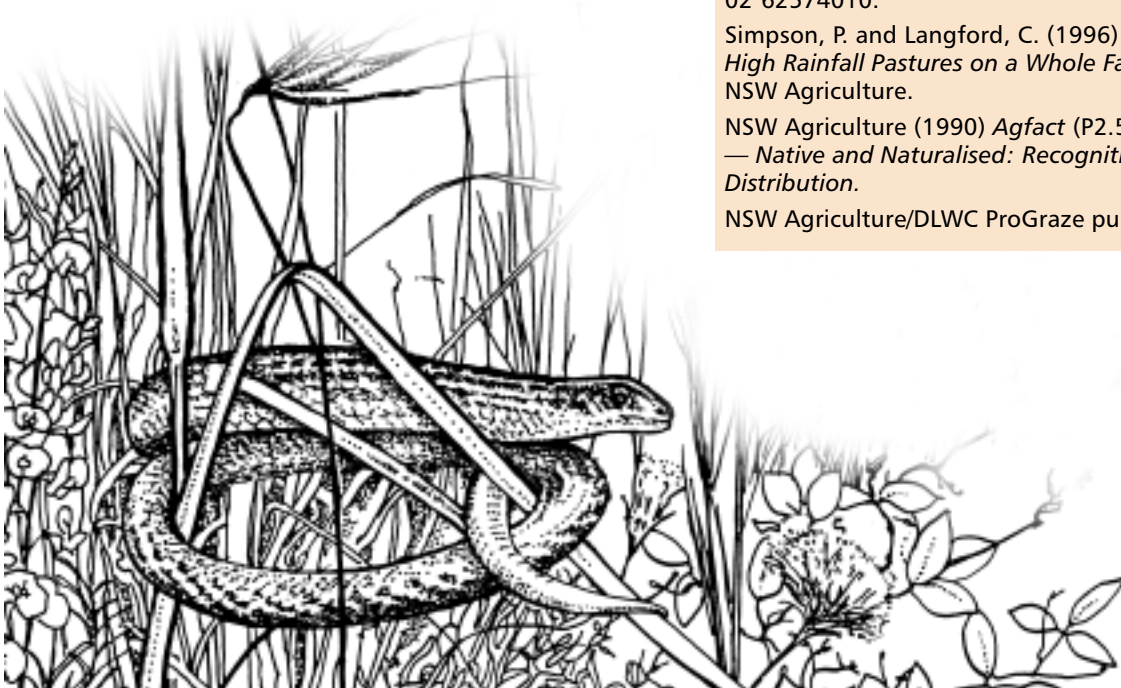
 **'Stocking rates' p4 provide a useful guide.**

CONTACT

 **CIT Rural Training Centre** 02 6207 4830 or your local NSW Agriculture office.

REFERENCES

-  Eddy, D., Mallinson, D., Rehwinkel, R. and Sharp, S. (1998) *Grassland Flora: A Field Guide for the Southern Tablelands (NSW & ACT)*. Available through Wildlife Research and Monitoring (Environment ACT) on 02 6207 2126 and the Botanic Gardens bookstore.
- Eddy, D. (2002) *Managing Native Grassland: A Guide to Management for Conservation, Production and Landscape Protection*. World Wide Fund for Nature. Available from WWF on 02 62574010.
- Simpson, P. and Langford, C. (1996) *Managing High Rainfall Pastures on a Whole Farm Basis*. NSW Agriculture.
- NSW Agriculture (1990) *Agfact (P2.5.32) Grasses — Native and Naturalised: Recognition, Value, Distribution*.
- NSW Agriculture/DLWC ProGraze publications.



KEEPING A HORSE OR TWO?

What are the benefits of native pasture and how do you keep it healthy?

by *Cornelia Bachor*

Many of us move to a hobby farm (5–40 acres or about 2–15 hectares) in order to keep a horse or two. We may have had an image of horses grazing on lush, beautiful pasture. However, the reality in our area is often quite different: the selection of the block can be far from ideal from a horse's point of view. So we need a workable compromise.

it takes (at least) 3–5 hectares of unimproved native pasture to feed one horse for most of the year, without extensive supplementary feeding

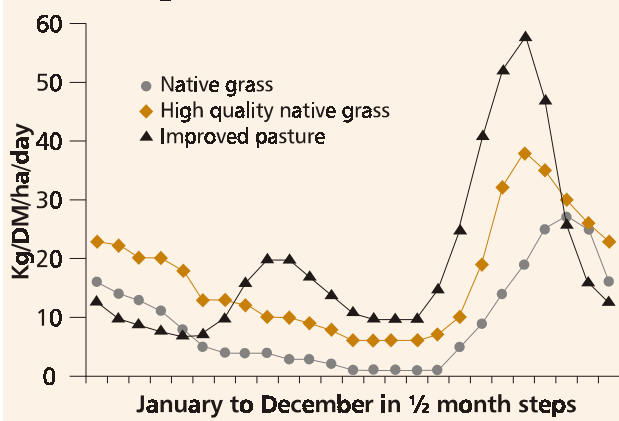
Most soils in the region are shallow, shaley, often (very) acidic, deficient in some elements (nitrogen, phosphorus, molybdenum, potassium, boron, calcium).

Pastures come in various guises: poor native (Wire Grass, Spear Grass); good native (Wallaby Grass, Kangaroo Grass, mixtures); native plus subclover, and fertilised; or improved pasture (sown perennial grass, clover).

The carrying capacity of these pastures ranges from 1 DSE/ha (DSE = dry sheep equivalent, an animal of approximately 40 kg weight per hectare) for poor native pasture to 7.5–10 DSE/ha for improved perennial pasture. Under this calculation, 1 hectare of improved pasture could support a 400 kg horse for most of the year without additional feeding.

But this has to be taken in its seasonal context. The improved pasture has a very high growth rate from September to November. Well-managed and fertilised* native grasses have a smaller growth rate, but for a longer period — between October and March.

Estimated growth rate Southern Tablelands



In good to average years, the improved pasture would yield about 7 t/ha of feed per year, with the native pasture providing about 6 t/ha. So the improved pasture is only a little better overall.

However, in below-average rainfall years, it's likely there will not be enough growth to satisfy the horse's appetite, regardless of pasture. Theoretically, it takes 3–5 hectares of the unimproved native pasture to feed one horse for most of the year, without extensive supplementary feeding.

* Blood and Bone and Dynamic Lifter are suited to fertilise native pasture.

That will work to a degree in spring/early summer, but barely in winter. Lack of spring/summer/autumn rainfall often results in reduced pasture growth, and don't forget the grazing competition from kangaroos.

One solution to the feed shortage of native grasses in winter is to undersow subterranean clover. But be careful. If you use a lot of superphosphate and keep stocking rates high, you are in danger of losing the native pasture altogether, leaving you with subclover that does not grow in summer/autumn.

(Caution: There are other reasons to be careful with superphosphate — like nutrients flowing into dams around you or contributing to dieback of nearby native trees. Clover pastures can also contribute to soil acidification.)

If you're thinking about resowing your paddocks to improved pasture, consider that it's expensive and risky: erosion, lack of rain, weed infestation, strike-rate problems happen all too easily; grazing is very restricted in the first year.

Therefore it is far better to maintain and nurture native pasture — the objective is to maintain carrying capacity rather than to increase it.

Increase the time your horses can utilise pasture. It is a good idea to subdivide a bigger paddock into several smaller ones, to give sections time to recuperate while you spell them.

Aim for 70–80% grass cover at all times to avoid erosion, weed infestation...

Consider the siting of gates and fence lines. Gates are best sited away from corners, and avoiding particularly boggy/wet areas.

Plant shelter-belts around your paddocks/property and keep/plant shelter/shade trees within the paddocks.

Your management regime may have to change. Consider yarding or stabling horse/s at night and/or for part of the day especially in winter when we are often faced with wet conditions. Horses can destroy the soil very quickly — depending on area and number of horses, it may be best to keep them off the paddocks.

I decided to sacrifice the vegetation of one area which stays dry during those periods so that the rest of the property will remain sound. We have a shelter and yard for each horse at night throughout the year and all day on very wet days. The wet-weather paddock is used whenever areas are very wet or boggy, and during periods of drought to minimise trampling damage.

The grass paddocks are used during daytime while it is dry and there is sufficient growth. In the depth of winter when there is no feed in the paddocks, the horses are agisted to allow our paddocks two to three months to recuperate.

Manure management: One of the worst chores for any horse owner is cleaning up the paddocks so they don't become 'horse sick'. Pick up manure and compost it for later spreading, or harrow the pasture to spread out the manure.

But please make sure your stockpile does not leach into any waterways that may contaminate your own or your neighbour's dam or creek!

If these management strategies sound like a lot of work — it is definitely worth it, as it allows you to use your paddocks for years to come.

RESOURCES AROUND THE BLOCK

CONSERVING WHAT NATURE BESTOWED

Remnant native vegetation

Remnant vegetation is the remaining indigenous vegetation, including forests, woodlands and native grasslands, in an otherwise cleared landscape. The value of remnants is increasingly recognised, and many landholders are protecting and linking them so they become self-sufficient.

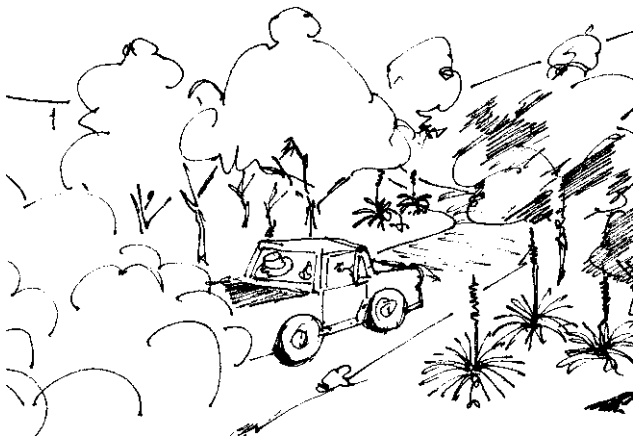
From a self-interested point of view: why keep and maintain native bush?

If you are lucky enough to have native trees and understorey on your rural residential block, you have a number of advantages: shade and shelter for stock, soil stability, windbreaks, homes for native wildlife. Native trees, shrubs and grasses are deep-rooted perennials that keep saline groundwater well below the surface, provide a source of seed for revegetation projects and offer a landscape that is pleasing to many people.

From a community perspective, there are other considerations for conserving what we have. Many blocks are on former sheep pastures where the native woody vegetation was removed. Small remnant forest or woodlands, isolated paddock trees and native grasslands are often retained in these landscapes. There might be nearby bush remnants on public land like the road verges and public-access greenways.

Urban expansion in the Canberra/Queanbeyan area is resulting in a localised loss of native vegetation. Firewood collection in the region further reduces habitat for birds and ground species. Grazing animals can degrade native grasslands and bushland. All this means that anything that helps restore and link remnant patches of native vegetation on private and public lands enhances their value as wildlife corridors and as biological reservoirs. That means preserving the understorey too.

rural residential development contributes to the decline by further fragmenting already sparse native vegetation patches, whether they be tree communities or grasslands



*Drawing by Bev Bruen
© Wildlife Research and Monitoring, Environment ACT*

HOW GOOD IS THAT PATCH OF BUSH?

Rule of thumb: Larger patches of vegetation are more viable — 5 ha minimum is a useful yardstick for a block. Across a rural residential development or larger farm, minimum 20-hectare patches are needed to maintain ecosystems: for example, of insect-eating birds.

That means: avoid fragmenting existing areas of native vegetation, including remnant grasslands.

If new fence lines, roads or services are being constructed, consider placing them around an area of native vegetation, not through it.

What are the benefits of remnant bushland?

Remnants can protect an area from rising watertables and salinity (related to wide-scale clearing) *and* provide a home for threatened species *and* contain a vegetation community that is now extensively cleared *and* be part of a corridor connecting two larger areas of native vegetation. Such areas are highly significant.

Protecting remnants is also the cheapest and easiest way to help improve land degradation and enhance the environment. The easiest way to protect remnants is to keep stock away and maintain the environment in its natural condition.

ENDANGERED PLANT COMMUNITIES

Several plant communities are listed as endangered ecological communities under various Commonwealth, State or Territory Acts. These include:

- **natural temperate grasslands** of the Southern Tablelands of NSW and the ACT (Commonwealth and ACT legislation) — a diverse vegetation community where native grasses dominate, which contains a diversity of other non-grass species (forbs or wildflowers including native peas, orchids, lilies, daisies and many others) and, sometimes, scattered trees or shrubs
- **box/gum woodlands** (White Box, Yellow Box, Blakely's Red Gum Woodland — NSW legislation; Yellow Box / Red Gum Grassy Woodland — ACT legislation) — a vegetation community found in low-lying situations or slopes, characterised by particular tree species and often with a grassy ground layer, that, like native grasslands, also have a diversity of forbs.

REFERENCES



Eddy, D., Mallinson, D., Rehwinkel, R. and Sharp, S. (1998) *Grassland Flora: A Field Guide for the Southern Tablelands (NSW & ACT)*.

Eddy, D. (2002) *Managing Native Grassland: A Guide to Management for Conservation, Production and Landscape Protection*.

White Box, Yellow Box, Blakely's Red Gum Woodland Fact Sheet — available from NSW National Parks and Wildlife Service on 02 6298 9709

CONTACTS



If you need more information and assistance with conservation management of endangered ecological communities, you could join one of the Conservation Management Networks:

Southern Tablelands Grassy Ecosystems Conservation Management Network — call NSW National Parks and Wildlife Service on 02 6298 9745

Monaro Grasslands Conservation Management Network — call WWF on 02 6257 4010

What happens with dieback?

You lose natural pest control

Natural deaths of ageing trees

It is often difficult to separate the symptoms of natural ageing from those of dieback. These trees usually have thinner, more irregular crowns, many dead branches and hollows.

Dieback results from a lack of understanding of the insect ecology surrounding paddock trees.

Pasture improvement can lead to dieback

Eucalypt foliage with enhanced nutritional value (particularly available nitrogen) can promote greater numbers and survival of leaf-eating insects. More nutritious foliage can result from: increased soil fertility beneath trees due to pasture improvements and livestock manure; trees being under stress; and trees having a greater proportion of younger leaves (e.g. epicormic shoots).

The understorey promotes natural pest control

Understorey trees and shrubs play a vital role in tree health, and the fact that they have disappeared from many rural landscapes directly affects dieback. Research has shown that densities of insect-eating birds in areas affected by dieback are about 10% of those in a healthy woodland. Wasps and flies that parasitise scarab larvae rely for food on flowering understorey plants, such as Blackthorn (*Bursaria spinosa*) and Tea-tree (*Leptospermum* spp.).

How to take care of dieback

Don't panic — retain dieback-affected trees, which may still recover. Even dead trees are valuable for wildlife, especially old ones with hollows.

Save dieback-affected trees with methods such as pollarding (cutting off the major branches and allowing the tree to re-sprout) or, depending on the cause of dieback, injecting systemic insecticide.

Retain any and all juvenile eucalypts — this will mean never ploughing, applying herbicide or sowing exotic pasture around existing trees or in other areas where juvenile trees are common. Keep the area as native pasture.

Control livestock.

Retain and protect bushland across the landscape, link remnants — encourage areas larger than 20 ha as habitat for a range of bird species. These will help control insects and maintain ecosystem function.



The importance of ground cover in preventing dieback

It might not seem important, but in all cases the quality of the ground layer is a critical factor in:

- determining the health of isolated trees, and
- their ability to regenerate.

If the ground cover is dominated by native species, then older trees will more easily recover and regenerate. If the ground cover is weedy, or dominated by introduced grasses, recovery and regeneration will be difficult to promote.

Be aware of the dynamics in the paddock — competition for soil moisture

Weeds and vigorous introduced grasses like *Phalaris* intercept a lot of soil moisture before it can be taken up by trees. The introduced grasses develop a dense sward, which suppresses tree regeneration.

➔ See p41 for control measures.

Do you want to save a large old tree or two and encourage new growth?

Temporary fencing is one of the best solutions for managing isolated trees to 'give them a break' and to encourage growth and regeneration. The fenced areas should be twice the size of the tree canopy. After two or three years, young seedlings may have grown above browse height. The fence can then be moved to another remnant tree area.

conserving is always easier than replanting

Native Vegetation Conservation Act

Anyone proposing to clear land must consider the *Native Vegetation Conservation Act* (NSW) as well as any local Tree Preservation Orders.

The *Native Vegetation Conservation Act* was developed, among other reasons, to slow and reverse the unsustainable level of native vegetation clearance still going on in New South Wales in the early 1990s.

The Act provides a framework for government and community to work together to achieve sustainable native vegetation management through:

- regional vegetation management plans (RVMPs) developed by community-based regional vegetation committees
- property agreements with individuals and groups of landholders.

PROPERTY AGREEMENTS

Property agreements offer many advantages to landholders, including:

- eligibility for financial assistance under the Native Vegetation Management Fund
- technical assistance for vegetation planning
- providing greater certainty about the future management of native vegetation.

☎ Contact your local DLWC office (see p15) or the Environment ACT Helpline (see p35).

CONSERVING WHAT NATURE BESTOWED

Clearing native vegetation

In areas without a regional vegetation management plan (RVMP), those who seek to remove more than a few trees for a house site or other council-approved development should consult the NSW Department of Land and Water Conservation for clearing restrictions, exemptions and development consent.

Compliance

The Department of Land and Water Conservation can impose stop-work notices to halt clearing, or remedial notices directing that restoration work be carried out.

Offences under the Act, including unauthorised clearing and failing to comply with a notice, are pursued in the Land and Environment Court.

This information is a precis from the DLWC website, below.

REFERENCE

📄 <http://www.dlwc.nsw.gov.au/care/veg/vegact/vegact.htm>

Threatened Species Conservation Act

Under the *Threatened Species Conservation Act* (NSW), landholders considering any clearing (or other actions that require local council approval, such as subdivisions) must also consider whether this may affect threatened species.

➔ See details on threatened species of this region p26.

INCENTIVES

A number of incentives are available to help landholders maintain native bush. These programs include funding for:

- fencing
- site preparation
- site management, including weed and feral animal control
- tree and understorey planting and regeneration.

The incentive schemes are many and varied and, because the specifics of the schemes change regularly, it is best to contact one or other of the following organisations for more information.

CONTACTS

☎ **Bushcare Program**
(National Vegetation Initiative — funded by NHT) ACT Parks and Conservation Service
ph 132 281

Greening Australia (Bushcare support) for ground-level technical support
ph 02 6253 3035

Department of Land and Water Conservation

Contact your local DLWC office (includes NSW Agriculture) see p15.

Who cares about wattles?

Most people are aware there's a big problem with tree decline in rural Australia. We're often less aware that the decline in understorey species has been even more severe.

Wattles are often the only understorey species we see. In nature, the understorey can be very diverse — perhaps 30 understorey species to three or four tree species on a hectare of natural woodland.

What can understorey plants do for you?

- Shade and shelter — you can use understorey species in planted shelter-belts, along fence lines and along creek lines. Most of them grow rapidly, providing stock with shade and shelter faster than trees. The understorey also shelters young tree seedlings. (See p37 for a first-hand account of a farmer's conversion to wattles and grevilleas.)
- Improve soil fertility — wattles, native peas, casuarinas and some other understorey species fix nitrogen in the soil; understorey species, related micro-organisms and insects such as ants are important in nutrient cycling — getting organic matter back into our poor soils.

- Provide food and shelter for natural pest controllers — many insect-eating birds find shelter and food — such as flower nectar — in understorey species.
- Offer fast erosion control along steep slopes, creeks and drainage lines.
- Help build native vegetation corridors throughout the rural residential landscape for healthy native plant and animal populations.

What can you do?

- Conserve existing understorey in areas not dedicated to production and encourage natural regeneration by temporary or permanent fencing. Conserving is always easier than replanting. Some species are hard to establish or will not grow on disturbed sites.

OR

- Plant or direct-seed a mixture of understorey species, preferably species adapted to the area. This is particularly good advice when sowing in a paddock or along a waterway where exotics can spread and crowd out natives.

➔ See list of understorey species suitable to this region p37.

CASE STUDY

A SUGAR GLIDER IN EVERY TREE?

A good example of a healthy ecosystem at work in the rural environment is the story of the Sugar Glider and wattles.

You may never have seen a Sugar Glider — the smallest of our local possums and gliders — because of its nocturnal habit and secretive ways.

But across south-eastern Australia, these little bug eaters have had a solid impact on keeping down populations of tree-stripping scarab beetles.

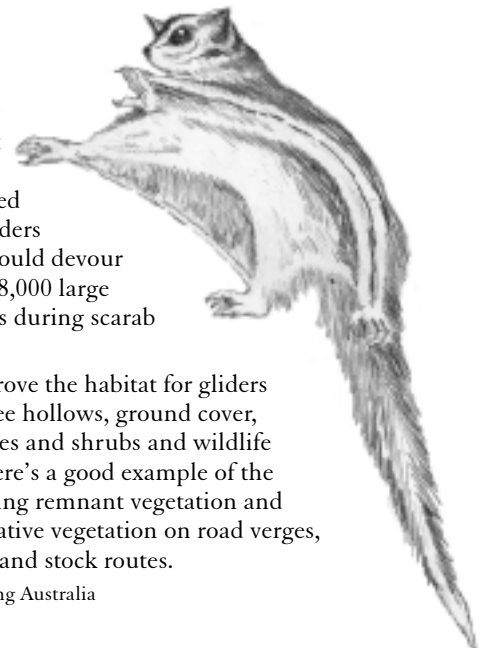
Research in remnant forest has shown that the number of Sugar Gliders is determined by the amount of nectar and sap available in winter. Important species for glider nutrition are certain wattles, particularly Black Wattle (*Acacia mearnsii*) and the sap of the Apple Box (*Eucalyptus bridgesiana*). Not all acacias are suitable as nutrient trees. For example, Blackwood (*Acacia melanoxylon*) is not a gum-producing wattle.

Densities of Sugar Gliders range from as few as one animal per hectare where wattles are absent to as many as 12 per hectare where wattles are abundant.

If you think this is trivial, consider that scientists have estimated 10 Sugar Gliders per hectare could devour as many as 18,000 large scarab beetles during scarab season.

You can improve the habitat for gliders by leaving tree hollows, ground cover, flowering trees and shrubs and wildlife corridors. Here's a good example of the value of linking remnant vegetation and preserving native vegetation on road verges, crown roads and stock routes.

Source: Greening Australia



Wildlife

Habitat — what lives in your vegetation?

Native fauna need areas for feeding, roosting, migration, nesting and rearing of young.

Habitat includes:

- hollows in trees (including dead trees)
- fallen logs

*'tidying up' a bush block
often removes wildlife
habitat*

- leaf litter
- understorey shrubs
- native grasses, rushes and sedges
- wet or damp areas
- watercourses
- flowering trees and shrubs
- rocks and boulders
- caves and overhangs
- seasonal cracks in the soil.

Hollows are used by birds, bats and arboreal (tree-dwelling) mammals for roosting and nesting. Native grasses, rushes and sedges are important shelter and feeding areas for small ground-dwelling reptiles and mammals.

Understorey shrubs are important feeding areas for some birds and mammals.

What’s in it for you?

Conserving habitat rewards you with natural pest control. One Straw-Necked Ibis eats about 200 grams of insects every day. The Sugar Glider will eat 25 scarab beetles a day, and 40–60% of the diet of crows and ravens is insects.

Small insect-eating bats eat up to half their own body weight each night. Small native birds (such as robins, fantails, weebills, pardalotes, honeyeaters, butcherbirds and others) found in healthy habitat will control aphids, thrips, scale, lerps, flies and locusts.

Source: *VegNotes* — NSW Department of Land and Water Conservation *Rural Production and Native Vegetation Conservation, Notes for Landholders.*

REFERENCES



NSW Department of Land and Water Conservation *Rural Production and Native Vegetation Conservation, Notes for Landholders.*

NOTE: this is the source of the VegNotes Series referred to in this booklet.

Greening Australia *Greenotes #8 Ecosystems.*

Greening Australia *Greenotes #9 Rural Tree Decline.*

NSW Agriculture (1990) *Agfact (P2.5.32) Grasses — Native and Naturalised: Recognition, Value, Distribution.*

Wakefield, Sue (Environmental Studies Unit, Charles Sturt University) *Save the Bush Toolkit* — assessing and managing remnant bushland.

Conservation Council of the South-East Region and Canberra Inc., Kingsley St, Acton ACT 2600, has a number of relevant publications
ph 02 6247 7808, 02 6257 2749

PARROTS IN THE PINK
(but small birds still struggling)

Ron Hartwig of Trungley Hall in southern NSW is doing his bit to reverse the trend of habitat loss and encourage native parrots to breed on his farm by providing nesting boxes. The reason, Mr Hartwig says, is the low numbers of old trees with hollows left in the area.

His nesting boxes are simply a section of hollow limb from trees that have blown down on the farm, wired up to a fence strainer post. Modifications include an observation hatch to determine if it is occupied, with a similar hatch at the bottom of the hollow to remove debris following the nesting season, or to remove unwanted visitors such as sparrows or starlings.

The entrance hole is designed to be big enough for the parrots to enter, but too small for a goanna or crow to get in. Other additions are a perch at the entrance to assist take-off and shrubs planted near the nesting box as protection from hawks and falcons.

The dozens of boxes Mr Hartwig has produced are occupied by Red-Rumped Parrots and Eastern Rosellas.

Nesting situation worse for smaller birds

Often an even bigger problem than parrot nest sites is the lack of understorey providing harbours and food sources for smaller birds and bats, according to the Department of Land and Water Conservation’s Chris Slinger of Wagga Wagga.

“These smaller species, such as bats, wrens, pardalotes, warblers, flycatchers and robins, are insectivorous and



you may not see it, but development has an incremental impact on wildlife

provide an essential cleaning service, effectively ‘vacuuming’ insects off the surface of trees and shrubs, particularly eucalypts.

“Where there is a lack of suitable understorey, it would be worth thinking about planting these species and/or providing nesting boxes for these smaller but important species.”

Source: *VegNotes* — NSW Department of Land and Water Conservation *Rural Production and Native Vegetation Conservation, Notes for Landholders.*

CASE STUDY

Eastern Rosella, courtesy of Canberra Ornithologists

Some threatened fauna

Many of the threatened species (this includes endangered and vulnerable species) found in the Upper Murrumbidgee Catchment are small and hard-to-see ground-dwellers or birds and bats associated with grasslands or grassy woodlands. These plant communities have been the most altered or eradicated by grazing and development.

Threats to fauna include loss of habitat, predation by feral animals, loss or disturbance of nesting sites, illegal trapping and accidental poisoning.

Name	Description	Known habitat/some areas
Pink-tailed Worm Lizard (<i>Aprasia parapulchella</i>)	Brown-grey with a long pinkish or red-brown tail. Length to 25 cm. (Vulnerable.)	Sloping areas with flat surface rock and native grasses along river corridors. Locally: Barracks Flat (Queanbeyan), Googong Dam foreshores, Murrumbidgee River and Molonglo River. Associated with colonies of small black ants.
Striped Legless Lizard (<i>Delma impar</i>)	Up to 30 cm long (mostly tail), grey-brown, distinguished by dark lines running down the length of the body. (Vulnerable.)	May be found in natural grassland habitat dominated by tussock-forming species such as Kangaroo Grass, Spear Grass and Wallaby Grass. Also found in grasslands modified with exotic species. Locally: near Sutton; also in native grasslands near Gungahlin and the Majura and Jerrabomberra Valleys in the ACT, Yass, Goulburn and Cooma.
Little Whip Snake (<i>Suta flagellum</i>)	Up to 40 cm long. Light tan with black 'fishnet' pattern on scales and black markings on head. (Vulnerable.)	Open woodland, natural grassland and rocky habitat. May be found under rocks and logs on well-drained hillsides. (Feeds on small skinks, frogs and invertebrates.)
Golden Sun Moth (<i>Synemon plana</i>)	Day-flying moth often mistaken for a butterfly (seasonal November–December). Females orange, black and white. (Endangered.)	Native grasslands — native Wallaby Grass essential. Locally: the Ginninderra Road area north of the ACT, also native grasslands at The Poplars and Letchworth in Queanbeyan.
Rosenbergs Monitor (<i>Varanus rosenbergi</i>)	Yellow and black goanna up to 2 metres in length. Distinguished from more common Lace Monitors by narrow bands across tail. (Vulnerable.)	Found in dry open forest and grassy woodland habitats. Shelters in burrows, hollow logs and rock crevices. Found only in a couple of areas of NSW — one is the escarpment around Queanbeyan and towards Lake George; and west of Bungendore.
Superb Parrot (<i>Polytelis swainsonii</i>)	Large grass-green parrot. Males have yellow forehead and throat with red band between head and breast. (Vulnerable.)	Seasonal visitor which nests in hollows of large trees near watercourses, in open woodlands, or in dead or living isolated paddock trees, during late spring and early summer. Locally: in the Wallaroo Rd area between Yass Shire and the ACT, also in Sutton area.
Common Bent-wing Bat (<i>Miniopterus schreibersi</i>)	Black-reddish brown bat to 6 cm in length. (Vulnerable.)	Found in well-timbered valleys foraging on small insects above the tree canopy.
<u>Other micro-bats threatened by loss of native forest habitat</u>		
Great Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	(Vulnerable.)	Found in forested habitats in Tinderry Nature Reserve and in Kosciuszko National Park.
Greater Long-eared Bat (<i>Nyctophilus timoriensis</i>)	(Vulnerable.)	Found in dry open woodlands and River Red Gum forests, locally in Tinderry Nature Reserve.



Great Pipistrelle — Wayne Byard
© Wildlife Research and Monitoring, Environment ACT

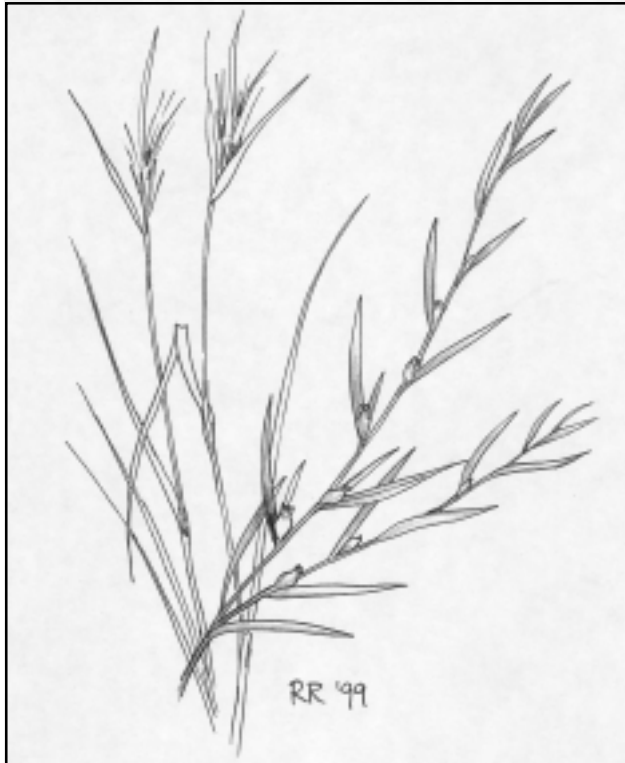
CONSERVING WHAT NATURE BESTOWED

Name	Description	Known habitat/some areas
Koala (<i>Phascolarctos cinereus</i>)	(Vulnerable.)	Found mainly in Ribbon Gum (<i>E. viminalis</i>), Red Stringybark (<i>E. macrorhyncha</i>), Brittle Gum (<i>E. mannifera</i>) and Scribbly Gum (<i>E. rossii</i>). Limited numbers recorded south of Queanbeyan along the ranges, and the area west of Brindabella National Park, substantial numbers north of Bungendore.
Tiger Quoll (or Spot-tailed Quoll) (<i>Dasyurus maculatus</i>)	Males up to 7 kg and females 4 kg. Dark brown fur and white spots. (Vulnerable.)	Habitats include rainforest, tall open forest and coastal heathland. Makes dens in fallen hollow logs or among large rocky outcrops. Locally: in the escarpment forests south and east of Queanbeyan, and in Tallaganda State Forest and Brindabella National Park.
Barking Owl (<i>Ninox connivens</i>)	Medium-sized owl, smoky-brown above and whitish below. (Vulnerable.)	Name from distinctive 'wook-wook' call. Inhabits dry open forests and woodlands, foothills and timber along watercourses, and in forests and woodland penetrating into more open country. Nests in hollows in large old eucalypt trees, roosts in tall densely foliated understorey trees.
Giant Burrowing Frog (<i>Heleioporus australiacus</i>)	Large frog, dark-brown to bluish-black with yellow spots on sides. (Vulnerable.)	Inhabits a wide variety of forest, woodland and heathland, but not open country or farmland. Also forages in forest several hundred metres from streams and waterways. Locally: recorded from just north of Tinderry Nature Reserve.
Freckled Duck (<i>Stictonetta naevosa</i>)	Dark grey-brown, narrow slate-grey bill, speckled with off-white markings. (Vulnerable.)	Inhabits permanent freshwater swamps and creeks. During drier times, moves off ephemeral breeding swamps to large, permanent open waters such as lakes and reservoirs. Locally: on Lake George and around Bungendore.
Olive Whistler (<i>Pachycephala olivacea</i>)	Small to medium-sized, grey, brown, and olive with white throat. (Vulnerable.)	Mainly inhabits higher altitude (above 500 m) eucalypt forests, migrating in winter from the mountains to the lower altitudes. Prefers mountain scrubs where it feeds on berries and insects. Locally: along wooded ridges within Tallaganda State Forest, also in Brindabella National Park and at Lake George.
Regent Honeyeater (<i>Xanthomyza phrygia</i>)	Medium-sized, blackish bird, boldly marked with yellow and with brilliant flashes of yellow in the wings and tail. (Endangered.)	Regular visitor, dependent on box-gum woodland habitat. Relies on opportunistic nectar sources. Found in the western edge of Tallaganda State Forest and anywhere preferred eucalypt species are flowering.
Swift Parrot (<i>Lathamus discolor</i>)	Streamlined green parrot with a dusky red spike-shaped tail, red forehead and throat, and red underwings seen in flight. (Vulnerable.)	Regular visitor from Tasmania. Like the Regent Honeyeater, the Swift Parrot is dependent upon box-gum woodland habitats and also eats nectar of winter-flowering eucalypts. Usually seen flying very fast through woodlands in flocks.

Some other recently listed threatened woodland birds found in the Upper Murrumbidgee Catchment include Brown Treecreeper, Hooded Robin, Diamond Firetail, Speckled Warbler.

Some threatened plants

Historically, habitat clearance, intensive grazing and modified pastures have resulted in the decline of many plant species that are now listed as threatened. Following is a sample of some threatened plants in the Upper Murrumbidgee Catchment.



Austral Toad-flax (*Thesium australe*) Biennial forb to 30 cm long. (Vulnerable.)

Found in grassland or grassy woodland, grows among tussocks often in damp sites, flowers from November to January. Parasitic on Kangaroo Grass.



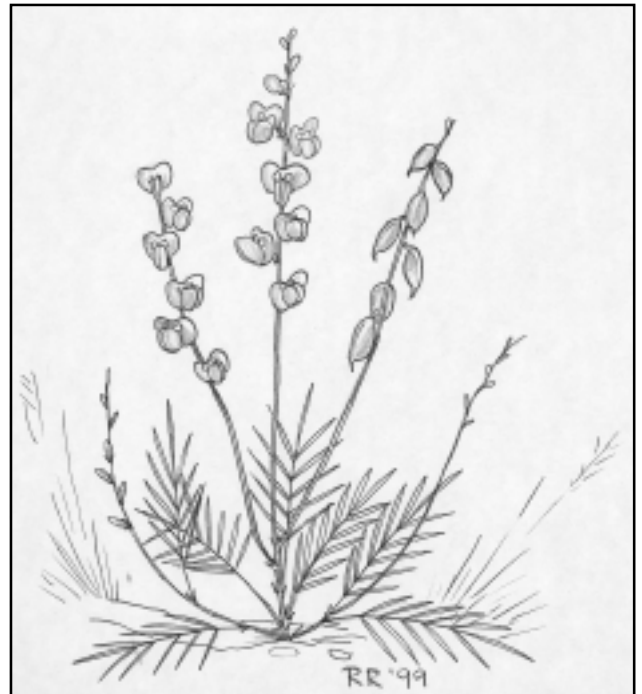
Button Wrinklewort (*Rutidosis leptorhynchoides*) Perennial herb with yellow button-like head 8–15 mm wide. (Endangered.)

Found in grassland or open grassy woodlands.



Tarengo Leek Orchid (*Prasophyllum petilum*) Orchid with fragrant pinkish-mauve to greenish flowers to 30 cm tall. (Endangered.)

Woodland or grassland in fertile soil.



Small Purple Pea (*Swainsona recta*) Perennial herb 30 cm high, purple pea-like flowers. (Endangered.)

Found in grassy understorey of woodlands and open forests. One of the largest known populations is in Yarrawlumla Shire.

Pale Pomaderris (*Pomaderris pallida*) Compact rounded shrub 1–1.5 m high, pale green-white leaves covered in soft star-shaped hairs; small pale-yellow flowers. (Vulnerable.)

Usually grows in shrub communities surrounded by Brittle Gum and Red Stringybark or Callitris woodland.

Creeping Hop-bush (*Dodonaea procumbens*) Prostrate shrub to 1.5 m in diameter, distinctive fruit up to 13x10 mm with 3–4 wings. (**Vulnerable**.)

Grows in open grassland or fringing eucalypt woodland, associated with Snow Gum and Yellow Box; often colonises road embankments.

Other threatened plant species in the south-east region include:

- Mauve Burr-daisy (*Calotis glandulosa*)
- Monaro Golden Daisy (*Rutidosia leiolepis*)
- Silky Swainson-pea (*Swainsona sericea*)
- Bredbo Gentian (*Gentiana bredboensis*)
- Buttercup Doubletail, an orchid (*Diuris aequalis*)
- Crimson Spider Orchid (*Caladenia concolor*)
- Daddy Long-legs, an orchid (*Caladenia tessellata*)
- Silver-leaved Gum (*Eucalyptus pulverulenta*)
- Small-leaved Gum (*Eucalyptus parvula*)
- Trailing Monotoca, a shrub (*Monotoca rotundifolia*)
- Tumut Grevillea (*Grevillea wilkinsonii*)
- Wee Jasper Grevillea (*Grevillea iaspicula*)
- Yass Daisy (*Ammobium craspedioides*)

These lists may seem lengthy, but they are not even a complete count of threatened flora and fauna in the catchment. For instance, not included are some species found in high-altitude locations such as portions of Kosciuszko National Park. Also readers should note that this type of list changes. Unfortunately more species are added from time to time and only occasionally are others removed.

CONTACTS

Wildlife and threatened species

Environment ACT
 For information about fish, plants and animals in the ACT, contact the Environment ACT Helpline ph 132 281 (business hours, Monday–Friday)
 Environment ACT website:
www.act.gov.au/environ


National Parks and Wildlife Service
 For information about native threatened or protected species in your area, habitat, remnant vegetation, and to enquire about licences to take or kill native species, contact the NSW National Parks and Wildlife Service office closest to you.
 Queanbeyan 02 6299 2929
 Jindabyne 02 6450 5555
 Tumut 02 6947 7000

WILDCARE Queanbeyan Inc. (wildlife rescue, rehabilitation and release service) NSW animals only (sick or injured, orphaned or urgent, 24 hrs)
 ph 02 6299 1966

RSPCA Wildlife (ACT animals only)
 (sick or injured, orphaned or urgent, 24 hrs)
 ph 02 6287 8100 (9–5, 7 days)
 after hours 0413 495 031

Wildlife
 General information (non-urgent)
 ACT Department of Urban Services
 ph 132 281

REFERENCES

 NSW National Parks and Wildlife Service (1999) *Threatened Species of SE NSW: Riverina Highlands*. Copies can be obtained for \$8 from Threatened Species Unit, ph 02 6298 0335; PO Box 733, Queanbeyan NSW 2620.

National Parks and Wildlife Service *Species Recovery Plans* can be obtained for species in your area.

Eddy, D., Mallinson, D., Rehwinkel, R. and Sharp, S. (1998) *Grassland Flora: A Field Guide for the Southern Tablelands (NSW & ACT)*. Available through Wildlife Research and Monitoring (Environment ACT) on 02 6207 2126 and the Botanic Gardens bookstore.

Fact sheets on **frogs** and many other matters can be obtained from the National Parks and Wildlife Service Queanbeyan District Shopfront, 6 Rutledge St, Queanbeyan 2620
 ph 02 6290 2929; fax 02 6297 8408

Harris, Greg (1990) *Water Supply and Farm Dam Construction* (3rd edition), Soil Conservation Service of NSW — pp29–30 relevant to **wildlife habitat**.



AROUND THE BLOCK

MANAGEMENT ISSUES

The pros and cons of pines

What is the argument for using native species in the rural residential landscape as screens, shelter-belts, woodlots and erosion control compared to pines? The question seems to generate about as much heat as the basic divide between Macintosh and PC computer users.

But is it really just a matter of consumer preference? Apart from agroforestry and commercial wood production issues, what are the advantages and disadvantages of growing pines compared with fast-growing natives?

Advantages:

- fast-growing (and cheap)
- useful for timber
- drought-tolerant (dependent on pine species)
- hardy; no serious pests or diseases
- food source for some bird species whose native habitat has been eliminated, e.g. Black Cockatoos
- when planted next to native bush or grassland, can provide shelter for birds and mammals who continue to feed in the native vegetation
- positive aesthetics for some tastes.

Disadvantages:

- weed potential; the invasion of pine wildings into native bushland and their ability to overwhelm remnant native vegetation on road verges are well documented
- inferior habitat for native species
- do nothing to help repair fragmentation of native bushland (fragmentation⁺ is severe in most built-up parts of the UMC)
- don't recover from a fire; native tree species usually recover
- can blanket out considerable areas to grass or understorey species through needle drop and shading
- can shelter invasive, exotic weeds
- negative aesthetics for some.

+ **Fragmentation** — reducing remaining bushland to bits and pieces without linking corridors — makes many native plant and animal species increasingly vulnerable to pest, disease and adverse climate conditions.

Mistletoe — friend or foe?

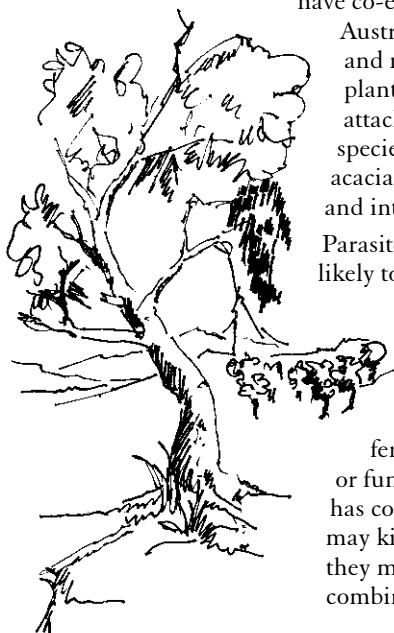
A lot of us don't know whether to condemn mistletoe as a useless parasite and a sure-fire symptom of ailing trees or to praise it as part of the food chain in our ecology. So here are a few facts.

Mistletoe is a parasite

Mistletoes are partial parasites which obtain mineral nutrients and water from the host plant. Many parasites

have co-evolved with the Australian flora and fauna and mimic their host plants. You'll find them attached to a wide range of species including eucalypt, acacia, casuarina, banksia and introduced trees.

Parasites and pathogens are likely to increase when plants are stressed by other factors such as changed soil nutrient status, soil compaction, salinity, fertiliser use, and insect or fungal attack. Research has concluded that mistletoe may kill plants outright, but they more often die from a combination of stresses.



On the other hand...

Mistletoe is a vital part of the food chain in our ecosystems. All parts of this parasite are eaten by native wildlife.

Flowers and nectar from the mistletoe offer a reliable food source for many species of birds and its berries are the main food of the Mistletoe Bird and some honeyeaters.

Parrots such as rosellas act as natural control agents of mistletoe because they eat copious amounts of berries but, unlike the Mistletoe Bird, they do not pass the embryonic seed in the berries in their droppings.

Leafy mistletoes are favoured food plants of various marsupial species such as the Brushtail and Ringtail Possums. Butterflies also rely on mistletoe for food.

Control

Pruning is the only reliable short-term control measure where mistletoe appears to be getting out of hand.

In the long term, eradication is not desirable because of its importance to native fauna.

Source: Excerpted from *Greenote 18*, produced by Greening Australia

Weed management

Plants become weeds because they have a high level of seed production with easy dispersal, and are highly competitive with a lack of natural controls. Agricultural weeds have had a significant impact on the Upper Murrumbidgee Catchment since the 1920s.

Causes of weed infestations:

- deliberate introduction of weeds for other purposes, e.g. willows for bank stabilisation
- land managers' lack of awareness and inability to identify weeds
- poor land management, e.g. overgrazing
- herbicide resistance due to over-reliance on one or several chemicals
- cost of control methods.

The effects of poor weed management can include:

- loss of native species
- reduced land productivity
- increasing control costs as weeds spread
- loss of habitat for native animals
- soil degradation.

Although there are currently few figures available on the distribution and density of weeds in the UMC, observations indicate an upward trend for both the spread of well-established weeds and the emergence of new problems.

Problem weeds in the region

Serrated Tussock
African Lovegrass
St John's Wort
Nodding Thistle
Scotch Thistle
Paterson's Curse
Sweet Briar



Nodding Thistle

SERRATED TUSSOCK TOPS THE WEED LIST

Serrated Tussock is considered the most important weed in the UMC, and is estimated to infect 50% of the Monaro. It is difficult to identify and the seeds can spread great distances by wind. Most major infestations are in steep, non-arable areas with poor soil fertility and low rainfall. Degraded sites also attract Serrated Tussock.

How to identify Serrated Tussock:


- perennial grass
- deep-rooted tussock
- very fine leaves (0.5 mm)
- turns goldy yellow in autumn/winter
- flowers from October to January

- as the flower stems emerge and spread, the tussocks have a purple overtone from the colour of the seed stems
- over summer the seedheads elongate and 'weep' over to the ground. The bent-over seeding stems are blown onto one side away from the prevailing wind
- a small white encircling 'flap' occurs where two leaf blades meet.

The name leads one to look for serrated or rough leaf edges (margins). This method should not be used as many native grasses also have serrated margins. (This has led to many native tussock populations being sprayed out.)

Serrated Tussock control


Manual or spot-spraying techniques can be used for light infestations. There are chemical controls available for Serrated Tussock, but usage rates and timing can vary from district to district and season to season. *See also control by competition, next page.*

 Contact the Weeds Officer at your nearest NSW Agriculture office for information (see p45).

Is it a weed or a native grass?

And for other identification questions, these references can help.

REFERENCES

 Eddy, D., Mallinson, D., Rehwinkel, R. and Sharp, S. (1998) *Grassland Flora: A Field Guide for the Southern Tablelands (NSW & ACT)* — should be able to help you distinguish between the noxious weed Serrated Tussock and the harmless natives Poa Tussock and Wallaby Grass, all of which people generally call tussocks.

Weeds Information/Identification pamphlet with good colour photos for identification.

Available from Yarrowlumla Shire Council, 11 Farrer Pl, Queanbeyan NSW 2620; ph 02 6297 1311.

Environment ACT and the Conservation Council of the South-east Region and Canberra, *Garden Plants Going Bush* — good colour identification guide of environmental weeds. Available from ACT Shopfronts or Yarrowlumla Shire Council.

The following three references on Serrated Tussock can be obtained from NSW Agriculture, Queanbeyan: ph 02 6297 1861.

NSW Agriculture AgNote DAI/75 *Serrated Tussock Control*.

NSW Agriculture Factsheet, *Identification of Serrated Tussock*.

Keys, M.J. (1999) *Serrated Tussock Control Program Guidelines*. NSW Agriculture, Queanbeyan.

Willow alert

Naturalised, unisex willows have stood quietly alongside Australian waterways for a long time. They're part of the landscape and land managers have appreciated them for erosion control.

But things have changed with the introduction of both male and female versions of aggressive hybrids — sold as fast-growing windbreak, or stream bank stabiliser material. Their prolific seed dispersal and ability to hybridise with

a wide range of other species threaten major problems along rivers and streams in the UMC.

Too many willows:

- out-compete other plants
- block creeks and rivers, altering flow and causing erosion
- take up large amounts of water, lowering creek levels
- shade watercourses in summer, while in autumn leaf fall lowers water quality.

Willow seedlings have multiplied rapidly due to the introduction to Australia of both male and female plants of species such as the Black Willow (*Salix nigra*) and hybrid willows from New Zealand (*S. matsudana x alba*).

Other willow species that are causing problems include:

- Grey Sallow (*S. cinerea*)
- Crack Willow (*S. fragilis*)
- Basket Willow (*S. x rubens* — includes the species *S. fragilis x alba* and *S. fragilis x alba* var. *vitellina*).

A few species such as the common Weeping Willow (*S. babylonica*) do not seem to produce viable seed and are considered by some to be less of a problem. However, female trees may be capable of crossing with males of



Frank Gapinski

another species, creating hybrids that may become major environmental weeds.

Willows have been declared a weed in NSW and the ACT. Landholders should avoid planting the female of any species within 300 metres of streams, rivers or farm dams (because of runoff). Some males also produce seed and it's tricky for the lay person to tell males from females.

The best strategy is: don't plant willows.

CASE STUDY

NATIVE LONGSTEMS: A VIABLE ALTERNATIVE TO WILLOWS

Long before the declaration of many willow species as noxious, Hunter Valley landcarer Bill Hicks was concerned about the potential problems associated with the almost exclusive use of willows for stream bank stabilisation.

In 1994, Bill began developing an innovative method of growing and planting native trees. His goal was to produce a native tubestock that could establish easily, grow rapidly, produce extensive roots and require little attention after planting — just like willows.

By August 1997, Bill had developed his own alternative to willows — long-stem native tubestock or 'longstems'. They differ from regular native tubestock in the way they are grown and planted.

Longstems are grown for up to 18 months using a specific nutrient and storage regime. The result is a climate-hardened plant with thick, woody, elongated stems (up to 2 m long) with closely-spaced growth nodes from which the roots sprout once the longstem is planted.

At about 18 months the longstem is planted in the stream bank with its root ball buried 0.5–1.5 m deep in the soil,

leaving only the top 5–10 cm of the plant above the surface. Special water jets, similar to those used to plant willows, have been developed to plant longstems.

With the support of National Heritage Trust funds, there are now close to 200,000 longstems planted in riparian revegetation projects with outstanding survival rates and requiring minimal follow-up care.

CONTACTS



Commercial supplies of longstems are still limited but information on availability in your area can be obtained from the Rivercare officer at the Department of Land and Water Conservation (Murrumbidgee region) on 02 6923 0477.

The formulation for fertiliser and planting details and demonstrations are available free of charge on application to Bill Hicks' company, Norkhil Technologies Pty Ltd 02 4998 8387; fax 02 4998 8364; email norkhil@hunterlink.net.au

WEED RESPONSIBILITY

Most major weeds have been declared as noxious/pest plants under NSW and ACT legislation. All landholders, including governments, are responsible for controlling these weeds on their land.

Weed control methods

There's always the old pick, shovel and saw, by-hand methods, which may be the most efficient and direct for smaller invasions of environmental weeds. If plants are too numerous or too difficult to remove, their seedheads or fruiting bodies can be removed by hand.

If that's not sufficient, consider:

Grazing regimes

An appropriate grazing regime can control introduced annuals like Barley Grass, Great Brome and Vulpia in areas of native vegetation. Grazing (by goats) can also be effective for blackberry control.

Competition

Maintaining healthy native pastures or sowing deep-rooted perennials like Phalaris or Lucerne are effective strategies — along with tree revegetation, spot-spraying and removal of seedheads — in the control of weeds like Serrated Tussock, which thrive on degraded sites. Seek advice from your local departmental weeds expert or ProGraze adviser.

Herbicides

Herbicides can play an important role in the control of environmental weeds, particularly if used in conjunction with non-chemical approaches (above). Several application techniques are available and these are described below:

Spraying

Spot-spraying or spraying a broad area of infestation is an effective tool against weeds. But make sure you don't wipe out the vegetation you want to keep as well.

Cut and paint

This involves cutting the weed tree with a bush-saw or chain-saw, and applying herbicide to the stump. The herbicide must be applied *immediately*, but need not be painted over the whole stump area — just to the outside edge or 'cambium layer' of the tree, so that it can be immediately translocated down to the roots.

Stem injection

The herbicide can be injected into the stem of the weed tree.

Frilling

Frilling involves cutting small notches around the trunk of the weed tree, into which herbicide is applied.

Stem-painting

The same principles as 'cut and paint' can be used on vines and smaller weed plants.

Mechanical control

Where the vegetation is almost entirely composed of large weed species, and there are no native plants left on site, larger machinery can be used to clear this vegetation. Elsewhere, avoid the use of machinery.

Integrated weed management is the best way to achieve long-term weed control with minimal environmental impact. It involves using a combination of the methods mentioned above that are most suitable for your property.

Source: Control methods from *VegNotes* — NSW Department of Land and Water Conservation, *Rural Production and Native Vegetation Conservation, Notes for Landholders, Series 2/2.5: Environmental Weeds.*

Big problem in the catchment: waste management

Storage and removal of waste — including issues about landfill, rural rubbish dumps and chemicals — are causing serious problems in the Upper Murrumbidgee Catchment. Of particular concern are groundwater contamination and other potential long-term impacts. Both NSW and the ACT have strategies to try to reduce the amount of landfill. These include encouragement to recycle, rural waste levies and a Waste Exchange Network.

Disposing of chemicals

The correct disposal and storage of chemicals are of major concern with increased use of chemicals throughout the UMC. Most of these are for pest and weed control. Improper use or disposal can cause contamination of land and water, risks to animal and human health, and threats to biodiversity.

NSW landholders can undertake courses in the appropriate use, disposal and storage of chemicals. These may be organised by Landcare groups and local councils — check in your area.

Environment ACT also provides a household chemical disposal service while ACT No Waste and NSW local councils facilitate the 'Drum Muster' program for the disposal of agricultural chemicals.

CONTACTS

- 📞 NSW — your local council.
- ACT — Environment ACT and ACT No Waste Helpline 132 281 (business hours, Monday–Friday).

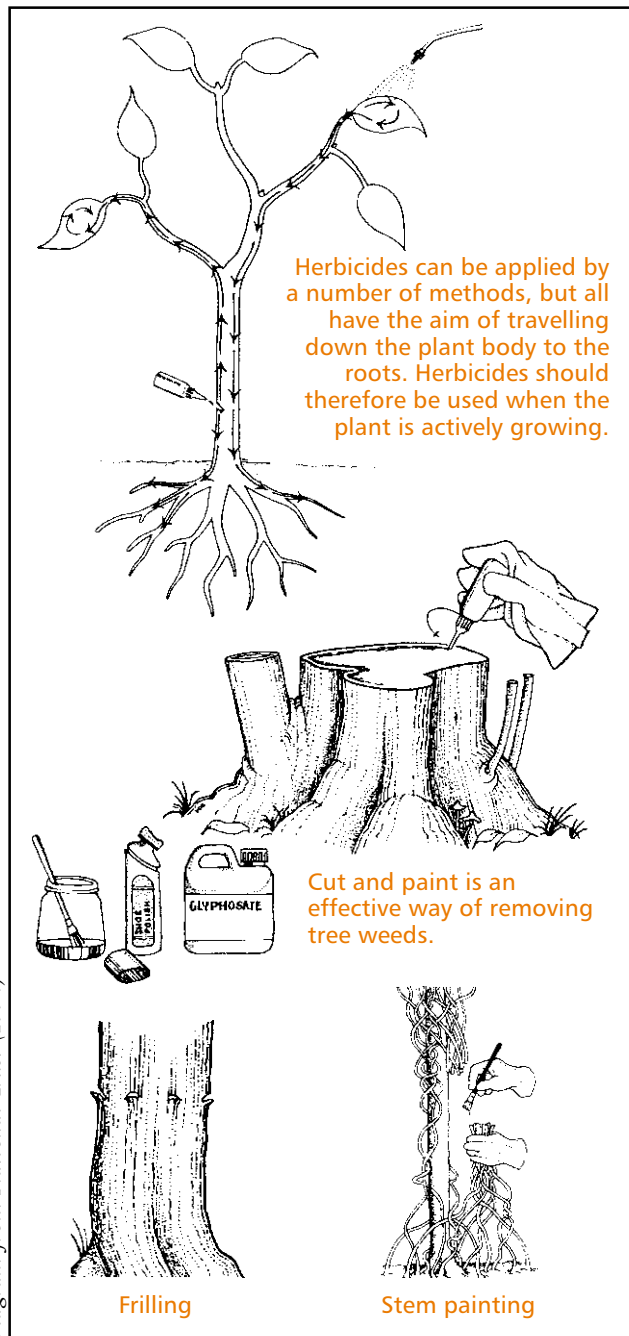


Diagram from National Trust (1994)

Issues in living with native vegetation

How healthy is your native vegetation?

Signs of degraded native vegetation:	Signs of healthy native vegetation:
<ul style="list-style-type: none"> eucalypts of one age class 	<ul style="list-style-type: none"> eucalypts of various ages
<ul style="list-style-type: none"> no shrubs 	<ul style="list-style-type: none"> a shrub layer
<ul style="list-style-type: none"> fallen branches 'tidied up' and burnt 	<ul style="list-style-type: none"> mostly grassy ground layer, with a range of native grasses, native legumes and other native herbs; largely free of weeds and introduced grasses
<ul style="list-style-type: none"> mainly grassy understorey with perennial spring/summer growing native grasses replaced by annual grasses such as barley grass; weeds 	<ul style="list-style-type: none"> abundant fallen timber
<ul style="list-style-type: none"> less than a dozen species of native plants 	<ul style="list-style-type: none"> 60–100 species of native plants
<ul style="list-style-type: none"> less than a dozen bird species, usually dominated by large aggressive species such as Noisy Miner, Crimson Rosella, Mudlark and Cockatoos 	<ul style="list-style-type: none"> 30–40 species of native birds (mostly insectivores) including thornbills (2–5 species), robins (1–5), whistlers (1–2), pardalotes (2), honeyeaters (2–10), treecreepers (1–2), and a number of others such as owls, flycatchers, kingfishers, doves and birds of prey
<ul style="list-style-type: none"> about five species of mammals (kangaroos, Brushtail and Ringtail Possums and bats) 	<ul style="list-style-type: none"> more than a dozen mammals, including echidna, gliders (1–5 species), bats (2–8), marsupial mice (1–3), and kangaroos, possums and wallabies
<ul style="list-style-type: none"> one or two reptile species, such as Brown Snake, and abundant insects (few species). 	<ul style="list-style-type: none"> up to 10 species of reptiles, including geckos, legless lizards, goannas, snakes and pythons, and lizards, and a diverse range of insects.
<p>Degraded vegetation will degrade even further, ultimately dying, causing and exacerbating land degradation problems.</p> <p>It is easier and cheaper to look after these areas now than repair land degradation problems and plant trees later on.</p>	<p>Native grassland: the most important factors are that they are free from weeds and introduced grasses and the ground cover is composed of native species.</p> <p>Source: <i>VegNotes</i> — NSW Department of Land and Water Conservation, <i>Rural Production and Native Vegetation Conservation, Notes for Landholders</i>.</p>

Wildlife-friendly fences

With fences encouraged not only for stock control, but also to protect vegetation and sensitive areas, what can the landholder do to make fences more wildlife-friendly?

Here are some rules of thumb that benefit wildlife and stock.

- If possible, use (white) horse-sighter wire on the top strand and white caps on steel posts, or treated pine posts.
- Leave 30 cm between the top wire and the next one down. This is important to avoid kangaroos catching and trapping their legs between the two top wires (the image here shows what can happen).
- Don't use barbed wire. If existing fences have barbed wire, consider taking that wire out, particularly on the top strand. (An anachronism in some shires is the

requirement for a barbed wire top strand on fences fronting a public road or public open space. Those concerned about wildlife might want to lobby their council to remove this requirement for the rural residential zone.)

- Keep fences at a moderate height — 4 ft (1.2 m).
- Keep the bottom wire at least 6 inches (15 cm) off the ground — that allows passage for wombats, echidnas and the determined roo.
- Moderate-height ringlock may be OK if kept at least 15–20 cm off the ground. *The authors of this book saw the carcass of a big kangaroo with its head wedged in a ground-level row of ringlock — not a pretty sight.* Better are six-wire fence or horse-sighter wire fence design.
- Permanent electric fencing can form a significant barrier to wildlife movement. Echidnas can be electrocuted against low-level live wires. At least one major fencing supplier notes that possums and gliders that land on a top live wire, and steady themselves with their tails on the next wire down, can receive a shock that forces them to cling on tighter and die.



KEEPING STOCK OUT OF THE NEW/REGENERATING VEGETATION

Fencing is necessary to exclude or better manage stock in sensitive vegetation areas. Fencing is generally the greatest cost in managing or establishing vegetation.

The approximate cost of materials is as follows:

electric	\$1,000–\$1,200 per km
hinge joint	\$1,500–\$2,000 per km
rabbit-proof	\$3,000–\$4,000 per km

If in doubt, discuss wildlife concerns with a sympathetic fencing contractor or manufacturer and wildlife specialists such as the NSW National Parks and Wildlife Service.

IS YOUR FIREWOOD SOMEONE'S HOME?

(Consider burning pine)

by Maria Taylor

Whether it's from your block or a wood merchant, the removal of old standing dead and downed trees for firewood, or just to clean up the block, takes away habitat for nesting birds, and other wildlife such as, on the ground, echidnas (which may keep your ant populations in check).

And when you buy firewood commercially, you get into an area that is 'mining' a lot of diminishing habitat out west. The preference for aged box hardwood continues, despite the alternatives in a region with many pine plantations.

Many people who burn firewood (in the ACT and environs) are still convinced that they have to burn Australian hardwoods. Many slow-combustion stove retailers still set the standard at box and ironbark species.

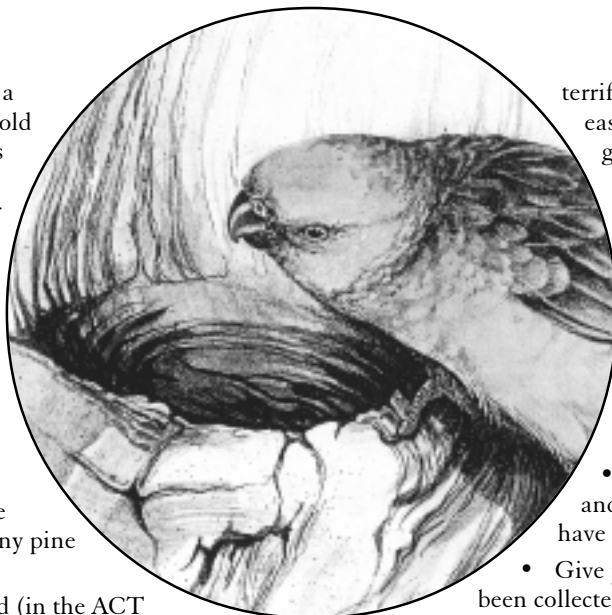
Wood merchants have been importing 35,000–40,000 tonnes of firewood annually from the box and ironbark woodlands of central-western NSW around Forbes, Parkes and Condobolin, 500 km from Canberra — much of it the habitat of the vulnerable Superb Parrot.

Some firewood retailers also sell seasoned pine. The trick to burning pine, and hardwood too, is to make sure it's properly seasoned and burn it with sufficient air. Green wood, regardless of species, and closing down your fire too quickly are the main causes of deposits in chimneys and air pollution. You do have to keep pine under cover or it will lose its 'seasoning', i.e. soak up water again.

Weight for weight, pine provides as much heat as eucalypt, it dries faster and is easier to handle.

Some of us in the rural residential zone have experimented with burning both pine and hardwoods that grow locally. Acacia wood burns well and is great for kindling and fire starters. Why not consider a little firewood plantation on your rural block?

Through personal experience over 10 years we have found Red Stringybark, Scribbly Gum and Brittle Gum (Red Spotted Gum) relatively quick to cure, easy to split and



terrific to burn. Seasoned pine is easiest of all to split, great for getting fires up and running and you can always mix pine and hardwood for a longer-lasting fire.

The ACT Government Firewood Industry Code of Practice

Merchants who sign up to the code agree to apply some of the following guidelines:

- Source their wood from cutters and landowners who can show they have collected the wood legally.
- Give preference to firewood that has been collected through ecologically sustainable practices.

- Provide customers with information about species and source of the firewood they buy.
- To reduce smoke, educate consumers about correct firewood storage and burning practices.
- To reduce smoke, discourage burning of unseasoned wood.
- Preferably sell wood by weight.
- Encourage greater demand for plantation and sustainably-managed native forest and waste wood.

ACT Forests has been selling an annual permit to gather as much seasoned pine as you want from designated areas. This is cheaper than buying box hardwood. Some conditions apply. For more information, contact the ACT Helpline.

CONTACTS



Environment ACT Helpline 132 281 for details on do-it-yourself harvesting of pine.



Environment Australia Helpline 1800 803 772
www.ea.gov.au/land/firewood

Check the Yellow Pages for firewood merchants who advertise that they sell pine, plantation, or sustainable eucalypt wood, or, that they abide by the voluntary code of practice.

Roadside vegetation management

Native vegetation along roadsides, railways and stock routes provides important wildlife corridors and habitats. In some areas road reserves contain the only (or best) examples of local remnant vegetation. Property fences have saved them from grazing and clearing.

In the UMC, surveys of remnant road reserves have categorised areas as having high, medium or low

significance. Detailed maps are now in the hands of the ACT and regional local governments.

Some governments have taken action and others will hopefully do the same. For example, the ACT Government has prepared a Roadside Management Strategy, and Cooma–Monaro Shire Council's Roads Strategic Business Plan includes strategies for sustainable roadside management.

THE RIGHT TREE IN THE RIGHT PLACE

by Geoff Butler

The European settlement of Australia has wrought many and sometimes irreversible changes to the Australian landscape. As a result of our requirement for food and fibre and to support our current living standards, immense tracts of native vegetation communities have been destroyed or greatly modified in the course of urban, industrial and agricultural development. This was done with little regard for what we now understand as sustainability, either for human endeavours or for other species and ecosystems. To achieve long-term sustainability in Australia, there will have to be some significant attitudinal changes within the community. One change which could be achieved with minimal fuss, cost or inconvenience is planting the right tree in the right place.

Exotic trees are unfortunately being widely planted in rural residential subdivisions and farms, with little thought to the long-term repercussions of their use. Some of these repercussions are:

Weed invasions

Some exotic species currently being widely used are Monterey Pine (*Pinus radiata*), White Poplar or Cottonwood (*Populus alba*), Lombardy Poplar (*Populus nigra* 'Italica'), various willows (*Salix* spp.), Rowan (*Sorbus aucuparia*), various Brooms and Tree Lucerne (*Genista*, *Cytisus* and *Chamaecytisus* spp.) and Privets (*Ligustrum* spp.) amongst others.

These species are proving highly invasive of natural vegetation communities and neighbouring property, including public lands. It is strongly recommended that any invasive species, such as those mentioned, not be used in rural areas. (The pros and cons and economics of pine plantations would involve separate discussion.)

Landscape changes

A major finding of international visitor surveys is that visitors come for our wide open spaces, rural vistas and our different plants and animals. Our landscapes, flora and fauna and natural heritage generally earn us immense amounts of overseas income.

As a community we need to recognise the value of landscape as an asset, and repair and enhance it where we can. The establishment of exotic trees throughout rural Australia is greatly compromising this asset.

(There is also some interesting work underway by the CSIRO to put an economic value on our ecosystems as they



provide services such as salinity control and water purification.)

This is not to suggest that all exotic trees have no use or should not be planted; it comes down to a matter of placement. Some rural residents find the dryness and rough nature of the local natural landscapes too harsh, and embark on softening programs, and extend this over their whole properties. The results promise to be environmentally damaging in the longer term with invasive species spreading across the landscape. Surely the benefits of the green oasis are best confined to the near surrounds of the residence, where they can fulfil the need for softer surrounds.

Far better for the long term to utilise native species for shelter-belts around the edge of paddocks or property, which link with neighbouring remnant vegetation or plantings. This will contribute very significantly to retaining that unique 'Australianess' of our rural landscapes, a feature that is rapidly being lost in rural residential landscapes.

Biodiversity protection

By planting native vegetation we can make some reparations for our past 'environmental footprint' and improve foraging and breeding habitat for wildlife into the future, as well as meeting all farm and recreational block requirements for shelter-belts and aesthetics. Remember, it takes four to five human generations (100–120 years) for most Australian trees to begin forming hollows suitable for habitat for many fauna species, and some species are totally dependent on native vegetation to survive.

Further advice on suitable plant species can be found in this book, or obtained from your local council or Landcare group.

REGENERATION AND REVEGETATION

natural regeneration is always easier than replanting — understorey and trees may regenerate if protected from livestock, rabbits and weeds

CASE STUDY

DIVERSITY = STABILITY

One farmer's story

John Weatherstone of 'Lyndfield Park' in Gunning has become an enthusiastic convert to the value of planting native species, including understorey species, on the family farm.

"I believe that successful environmental rehabilitation depends very heavily on inclusion of understorey species. One of the most important principles in environmental management is that DIVERSITY = STABILITY.

"We fenced off a 15 hectare paddock to revegetate, plus a smaller area for regeneration, a few years ago. Although these areas had been fertilised lightly and grazed for

decades, we have been quite surprised at the number of native shrubs that have returned, presumably from seed that had laid dormant in the soil for years. (*This would be likely to occur only in areas that were not covered in dense perennial pastures.*)

"With the range of wattles and grevilleas we have planted, some are flowering at almost every time of the year, keeping birds in the area.

"Another group of often-despised plants that are good for birds are the prickly shrubs, such as *Acacia genistifolia*, *Hakea sericea*, *Bursaria lasiophylla* and some of the prickly grevilleas. They provide birds with nesting sites and shelter from feral cats, foxes and hawks."

John has successfully planted native species shelter-belts for his stock and advises:

"Use some fast-growing wattles but include some long-term trees. Many of the wattles may well replace themselves with seedlings if the area is kept fenced off. It is also valuable to include some smaller shrubs and understorey plants for stopping draughts and to provide a more diverse habitat for wildlife."

John Weatherstone's property with shelter-belts — understorey species are crucial to success.



Understorey species*

The following list of understorey species local or appropriate to this region (Southern Tablelands) is a starter's list. There are more varieties of many of these species but you should always check factors such as frost hardiness and drainage required.

'UNDERSTOREY' TREES AND SHRUBS SUITABLE FOR THE LOCAL AREA

<i>Acacia</i> —		<i>Hakea sericea, dactyloides</i>	
<i>mearnsii</i>	Late Black Wattle	<i>Hardenbergia violacea</i>	
<i>melanoxydon</i>	Blackwood	<i>Indigofera australis</i>	Austral Indigo
<i>rubida</i>	Red-stem Wattle	<i>Kunzea ambigua</i>	
<i>dealbata</i>	Silver Wattle	<i>Lomandra longifolia</i>	Mat Rush
<i>boormanii</i>	Snowy River Wattle	<i>Leptospermum lanigerum</i>	Tea-tree
<i>decurrens</i>	Early Black or Green Wattle	<i>Pultenaea subspicata</i>	Bush Pea
<i>flexifolia</i>	Bent-leaf Wattle	<i>Dillwynia</i>	is another pea species
<i>genistifolia</i>	Early Wattle		
<i>uncinata</i>	Weeping Wattle	For wet areas	
<i>implexa</i>	Lightwood	<i>Acacia retinodes</i>	Wirilda or Swamp Wattle
<i>floribunda</i>	White Sallow Wattle	<i>Callistemon sieberi</i>	Alpine Bottlebrush
<i>Banksia</i> — <i>marginata, spinulosa, ericifolia</i>		<i>Leptospermum myrtifolia</i>	Heath Tea-tree
<i>Bursaria lasiophylla</i>		<i>Melaleuca ericifolia</i>	Swamp Paperbark
<i>Bracteantha viscosa</i>	Golden Everlasting		
<i>Callistemon citrinus</i>	Crimson Bottlebrush		
<i>Daviesia mimosoides</i>	Narrow-leaf Bitter Pea		
<i>Grevillea</i> —			
<i>arenaria, juniperina, victoriae, rosmarinifolia</i>			



Useful tree species for shelter-belts and elsewhere are *Callitris endlicheri*, Cypress Pine, She-Oaks (*Allocasuarina verticillata* and *littoralis*), and River She-Oak (*Casuarina cunninghamiana*).

➔ ***See full list of native species recommended for this region as well as nurseries dealing in native species at the back of this publication pp43, 46.**

Strategies for bringing back native vegetation

Natural regeneration

Fence off existing vegetation to exclude stock. Stock prevent regeneration by eating young seedlings. And single trees in paddocks with stock camped underneath tend to produce richer foliage. This makes them more attractive to leaf-eating insects that defoliate the trees.

Fence to encourage natural regeneration. Suitable areas could be around clumps of native trees in paddocks, corners of paddocks, rocky or steep areas, ridge lines, erosion-prone areas and creek banks. Natural revegetation may take a while but is inexpensive, hardy and has a more natural appearance than tree-planting projects.

Restrict fertiliser use. Native species are not adapted to a nutrient-rich environment. The 'dieback' of mature farm trees has been linked to a well-fertilised paddock environment, and associated with other symptoms of an unbalanced ecosystem such as increased insect attack.

Encourage many species of trees and understorey plants.

Accept that there will be some damage done by leaf-eating insects. Resist the urge to spray.

Light grazing in established areas of native vegetation may promote greater variety in the understorey.

Be patient. It will take years for disturbed sites to recover their balance.

So you want to plant trees on your block?

Weather, weed control and appropriate species are the most important factors in getting trees and shrubs established. Persistence over a number of years also helps.

Steps for revegetation

- Decide on the aim of the revegetation project and choose the site.
- Select the best method and timing — direct seeding and planting tubestock are common choices but you will probably want to consider the site, long-range weather forecasts, and availability of equipment and cost.
- Prepare the site.
- Select the species.
- Plant or sow the seed.
- Manage grass and weed growth around the plants until the plants are established.

Choosing the site

Often revegetation projects are planned for less productive sites such as hilltops, waterlogged areas or sensitive sites such as banks of watercourses, and along roads and fence lines. If there is stock, the site will need to be fenced or otherwise protected during establishment, but you won't need individual tree guards.

Direct seeding

Direct seeding involves drilling or sowing seed directly into the ground. It can be done using a specifically designed direct-seeding machine or by hand-sprinkling of seed into loose soil. With direct seeding you can sow many species at once, resulting in a more natural look. Competition allows the stronger, healthier plants to survive.

Direct seeding is generally quicker and cheaper than planting seedlings and is used extensively by Greening Australia. It is not suited to very steep or rocky areas where equipment access and operation are difficult.

Preparation

If the site is grassy, graze or slash and then spray long strips (1.2 m wide and 4 m apart) with knockdown herbicides (e.g. Glyphosate) in autumn. The following spring, spray the grass again before seeding. Generally sites for direct seeding are not ripped.

➔ **See case study p41 which suggests *Phalaris* paddocks are not suitable for direct seeding and offers tips on controlling *Phalaris*.**

Seed

You can collect or purchase seed. Some with hard coatings, such as acacia seed, will need to be heat-treated before sowing.

When?

Seeding is likely to be most successful in spring (preferably September) when soil moisture levels are higher and the temperature is increasing, although autumn may also be possible in some years.

Sowing rates and survival

Be aware that survival rates for directly-sown seed are low — commonly less than 1% of eucalypt seeds sown will mature into trees. Wattles are estimated at about 5%. This clearly affects sowing rates. The NSW Department of Land and Water Conservation's *VegNotes* Series (No. 3.5 *Direct*

REGENERATION AND REVEGETATION

Seeding) offers a good discussion of how to calculate seeding rates, particularly useful for bigger jobs.

Using tubestock

Another method of revegetation is to plant seedlings grown in tubes (long narrow containers with an open bottom). Again these are best planted in spring, although it is possible to plant small numbers at other times when hand watering is an option.

Planting tubestock is more expensive than direct seeding but is suitable for rocky and steep sites where direct seeding may not be possible. Where only a small amount of seed is available it may be better to use that seed to grow tubestock than to direct-seed.

Preparation

Graze or slash the grass and then deep-rip the soil along the contours during summer to improve water penetration. Several rows of plants will provide a more effective windbreak than a single rip-line.

Spot-spray the sites in autumn with a knockdown herbicide (in a circle at least 1.2 m diameter and 3–5 m apart). Repeat this spraying in spring about two weeks before planting.

A tractor wheel driven over the rip-line will help it to collapse if it is still open when you are ready to plant.

the seed from many species can be grown without special treatment

Seed and propagation

You may want to try propagating tubestock from seed collected from existing native trees and shrubs. The seed from many species of eucalypts, casuarinas, melaleucas, leptospermum, callistemons, and banksias can be sown without any treatment.

However, hard-coated seeds, e.g. from hakeas and from some species of the above list, will need to be treated before sowing. Place in a container, pour boiling water over them and leave to soak for up to 24 hours.

Sow seeds into tubes containing potting mix that drains freely. Try a mix of coarse river sand, loam and peat (or coconut fibre or leaf mould) in equal parts. Another source suggests commercial potting mixes sold under the Standards Australia logo or a home-made mix of three parts loam, two parts coarse sand and one part composted animal manure.

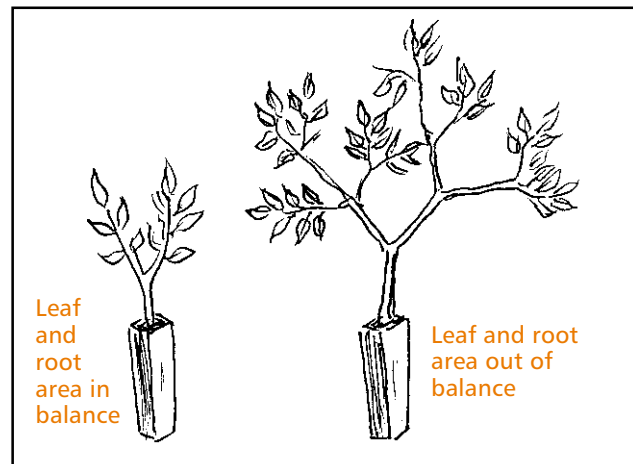
Refer to the literature below for more detailed information on sowing seed in trays first or sowing directly into tubes and other tips.

Cover the seeds with a thin layer of coarse river sand and water with a gentle spray. Water the tubes regularly. When the seedlings are 10–30 cm, they should be hardened off by placing them in full sun and watered less often. They are then ready to plant.

tubestock: look for small hardy plants 6–9 months old and 10–30 cm high

Buying your tubestock

Tubestock can also be purchased ready-grown from a number of local nurseries. The resources section at the back of this book lists nurseries specialising in native tubestock.

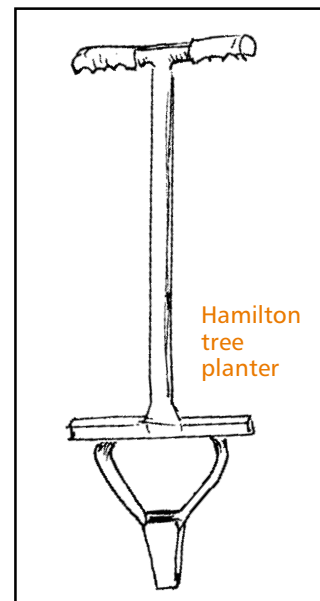


Look for small hardy plants 6–9 months old and 10–30 cm high. Bigger plants in small tubes are not necessarily a better buy.

Planting

Water tubestock well before planting. The tubes can be placed in a wheelbarrow half-full of water so they are given a good soak while they are waiting to be planted.

If you have large numbers of tubestock to plant, it is probably worth using a Hamilton tree planter. This gadget makes a hole in the ground exactly the size and shape of the tube, but be careful of rocks. The seedling can then be removed from its tube and dropped into the hole with a minimum of soil disturbance.



Very little watering is needed when planting with this method. However, where the soil is very wet, dry or hard, you will need to use more conventional planting methods.

Position the seedling in the hole with the roots straight down and the stem no deeper in the soil than it was in the tube. Make sure that there are no air pockets around the root ball.

When do you water?

Water immediately after planting. Hardy species will not need to be watered again after this unless there is a drought in the following summer.

Tree guards

Tree guards can protect plants from hot and cold winds and may make a big difference to the survival rate of tubestock in the first year. Two-litre milk or juice cartons anchored with two stakes make effective tree guards and are less prone to blowing away than commercial plastic varieties.

There are disadvantages to tree guards apart from cost: seedlings tend to have less well-developed root systems and lush leaf growth (which may attract insects).

Selecting species

The resources at the back of this book include lists of native plant species suited to the region. For best results use:

- species suited to the conditions of the site (a species suited to wet conditions is unlikely to survive on a hilltop)
- a mix of species (lessening the risk of total failure)
- both trees and understorey species to increase biodiversity, decrease pest problems and attract birds.

Greening Australia recommends using 30–40 species when direct-seeding. Look around your area and talk to your neighbours about what species have grown well on their properties. Don't be afraid to experiment.

Managing grass and weeds after planting

Planting or seeding is just the beginning of a revegetation project. Your seedlings will do better without competition from grass and weeds for moisture and light. Native pasture is generally easier to control than improved pasture, particularly Phalaris.

Grass and weed control includes mulch, hand weeding, shielded herbicide spray or soil scalping. It may take several years before your seedlings can fend for themselves.

CONTACTS

Revegetation

Conservation Volunteers Australia (CVA)
ph 02 6247 7770

Department of Land and Water Conservation

Queanbeyan ph 02 6297 6477
Yass ph 02 6226 1433
Cooma ph 02 6452 1455

NSW Dept of Agriculture

Queanbeyan ph 02 6297 1861
Yass ph 02 6226 2199
Cooma ph 02 6452 3411

FloraBank

Florabank has information about, collecting, storing and using native seed for revegetation and conservation. Information is available on their web site at www.florabank.org.au.
ph 02 6281 8585

Greening Australia ACT & Southeast NSW
ph 02 6253 3035

REFERENCES

Revegetation

Greening Australia:

How to Collect Native Tree Seed Easily
How to Germinate Native Tree and Shrub Seed Enjoyably.

Greening Australia also offers a comprehensive set of notes on revegetation techniques including:

Greenotes #4 Preparing the Site

Greenotes #3 Direct Seeding

Greenotes #6 Propagating Australian Native Trees

Greenotes #1 Buying Tubestock

Greenotes #2 Planting Tubestock

Greenotes #12 Encouraging Wildlife in Your Garden

Greenotes #20 Revegetating Stream Banks

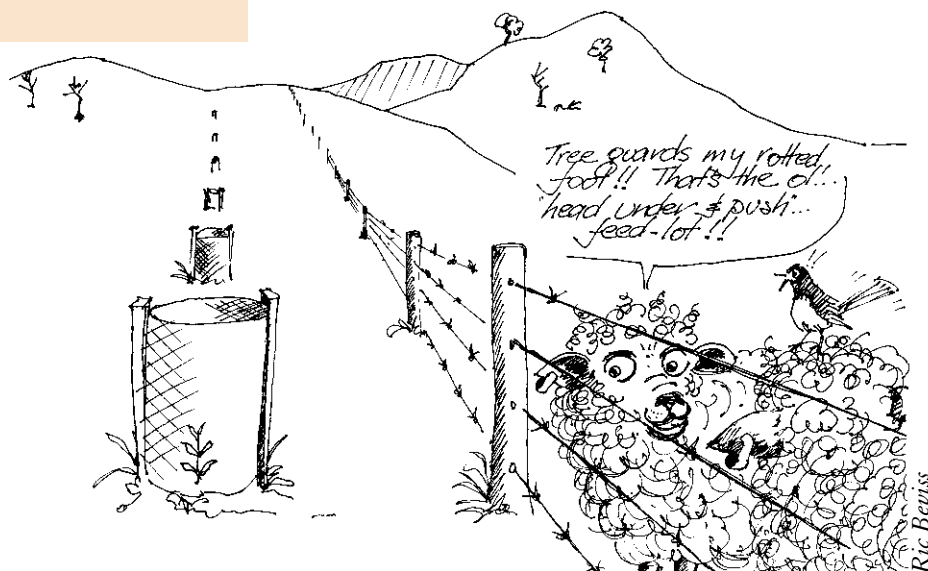
See also

VegNotes — NSW Department of Land and Water Conservation, *Rural Production and Native Vegetation Conservation, Notes for Landholders, Series 3: Re-establishing Native Vegetation*, for a user-friendly guide and tips on propagation and revegetation.

Society for Growing Australian Plants Canberra Region, *Native Plants and Rural Blocks*.

Society for Growing Australian Plants Canberra Region, *Australian Plants for Canberra Gardens and Other Cool Climate Areas*.

Greening Australia, *Broadcast* (newsletter).



GETTING ON TOP OF PHALARIS

and tips on establishing native trees

Phalaris has been widely used in the Geary's Gap/Wamboin area to augment native grasses. It is hard and vigorous and is now the dominant grass in most low-lying areas. Hilary Kent and John Merritt describe below how they have tackled the problem of growing Australian native trees in Phalaris paddocks.

Phalaris is too vigorous and dense to permit direct seeding. We plant tubestock. Wherever possible we rip some months before planting. In our case that means calling upon an obliging neighbour who attaches a single-tine plough to his tractor. We then apply Roundup along both sides of the rip-line to create a metre-wide Phalaris-free strip.

The dead Phalaris is left in the ground to help conserve moisture and inhibit grass growth. If it is removed, it is quickly replaced by wild sorrel, which has the capacity to choke young trees almost equal to that of the Phalaris itself. Moreover, in time, the Phalaris will always come back. Thus we also add mulch to the rip-lines. Often we use Phalaris hay, cut after the seeds have fallen. It is durable and effective.

Growing tips

We grow our own tubestock or purchase it from local nurseries. Some more frost-tender trees, however, will not survive unless they are relatively well advanced before planting. Casuarinas, for example, need to be at least a metre in height.

We prefer to plant in spring after rain. The strategy has been to plant a mixture of eucalyptus species to minimise the effects of insect attack, and acacias to add nitrogen to

the soil and provide wind protection for the slower-growing species. We water every three weeks during the first summer and weed and mulch until the trees are well established. The established trees reduce the Phalaris growth themselves.

Phalaris must be eaten down or slashed if it is not to become a fire hazard.

The good and bad of sheep

We run sheep which eat down the grass, but they can be hard on trees. For some time we experimented with a variety of individual wire tree guards which we anchored with steel pickets. The guards worked well while the trees were young, but not so well once the trees began to acquire breadth and height. They restrict lateral growth and sheep learn to climb up the sides. There was no alternative but to fence our windbreaks and to build largish squares or circles of ringlock around solo trees.

When the foliage of our paddock trees is above sheep height, we remove the ringlock and use chicken wire sheaths to protect the trunks. (Light plastic mesh works just as well.) The sheath needs to be anchored, otherwise the sheep will push it upwards and nibble in the areas of the trunk thus exposed.

Persistence does pay off. Most of our five- to six-year-old paddock trees are now without protection of any sort and are strong enough not to be affected by sheep rubbing against them.



How about an acacia woodlot?

Acacias are a pioneer species. They are usually the first to regenerate from seed or suckers after soil disturbance by fire or cultivation. It is this rapid early growth that makes them so useful for soil stabilisation, visual screens and shelter-belts.

Acacias adapted for drier, saline and waterlogged sites can be used for strategic discharge and recharge planting within degraded catchments.

Acacias are legumes and can use atmospheric nitrogen for their own growth and to return nitrogen to the soil. While rates of nitrogen fixation are low, early results from a mixed planting of *Eucalyptus globulus* and *Acacia mearnsii* indicated that the presence of the acacia does improve foliar nitrogen in the eucalypt. Inoculation with rhizobia (soil bacteria) which assist nitrogen fixation is under investigation.



Firewood

Most acacias make excellent fuel wood and charcoal. Suitable species in this area include *A. decurrens*, *A. mearnsii* and *A. melanoxylon*. CSIRO has planted two trials of 25 species to test their fuel wood potential for the Canberra market. A Tarago farmer reported that he harvested 10-year-old *A. decurrens* to yield 100 air-dry tonnes of wood/ha.

Posts

A niche market exists for *A. mearnsii* posts complete with undamaged bark. They are used in salt water as oyster pegs or racking and have been a stable resource for the south coast oyster industry since World War I.

Other prospects...

Aboriginal people have used specific temperate acacias as sources of wood for weapons, implements and fires; leaves for medicinal purposes as a wash or smoke therapy (fumes from heated leaves are a healing agent); seed for food; gums for ointments, infusions and glues; and bark for infusions, bandages, ropes and sandals.

(Excerpted from a paper by Suzette Searle, formerly of CSIRO Forestry and Forest Products. The CSIRO has been assessing trials of suitable acacia species in the ACT and environs for fuel wood and farm forestry.)

Bigger than a woodlot: farm forestry with natives

Primary producers may realise many benefits from small, well-managed plantations of native hardwoods. Benefits include timber products — firewood, fence posts and high-value sawn timber. Other benefits include stock shelter, erosion control and native habitat.

Plantations can grow a mixture of species such as wattles, eucalypts and casuarinas. Such mixes create rich bird habitat, look great and still realise a product. The latter means intensive management to promote straight stems without low branching.

Local native species that produce high-value timber and provide on-farm benefits include:

<i>Allocasuarina verticillata</i>	Drooping She-oak
<i>Acacia implexa</i>	Lightwood
<i>A. falciformis</i>	Hickory
<i>A. decurrens</i>	Green Wattle
<i>A. mearnsii</i>	Black Wattle
<i>A. dealbata</i>	Silver Wattle
<i>Casuarina cunninghamiana</i>	River She-oak
<i>Eucalyptus sideroxylon</i>	Mugga Ironbark
<i>E. polyanthemos</i>	Red Box
<i>E. melliodora</i>	Yellow Box
<i>E. macrorhyncha</i>	Red Stringybark

CONTACTS



Greening Australia ACT & Southeast NSW —
02 6253 3035

PO Box 538, Jamison Centre ACT 2614

website www.greeningaustralia.org.au

Southern Tablelands Farm Forestry Network —
02 6207 2494

Plant species list

The following plants are local to the area or suited to this region. Plant sizes are intended as a guide only. Actual size will depend on the individual plant and the site conditions. Many other species can also grow here but you should always check factors such as frost hardiness and drainage required.

Species	Common name	Size	Well-drained areas	Moist to wet	Under-storey	Local or regional	Fast-growing	Bird-attracting
Trees								
<i>Acacia dealbata</i>	Silver Wattle	5–20 m	x	x	x	x	x	x
<i>Acacia decurrens</i>	Early Black or Green Wattle	10 m	x		x	x	x	x
<i>Acacia falciformis</i>	Hickory Wattle	12 m	x		x	x		x
<i>Acacia implexa</i>	Lightwood	15 m	x		x	x		x
<i>Acacia mearnsii</i>	Late Black Wattle	15 m	x		x	x	x	x
<i>Acacia melanoxylon</i>	Blackwood	30 m		x	x	x		x
<i>Acacia obliquinervia</i>	Mountain Hickory	15 m	x			x		x
<i>Acacia parramattensis</i>	Sydney Green Wattle	10 m	x				x	x
<i>Acacia rubida</i>	Red-stemmed Wattle	2–10 m	x		x	x	x	x
<i>Allocasuarina littoralis</i>	Black She-Oak	10 m	x			x		x
<i>Allocasuarina verticillata</i>	Drooping She-Oak	10 m	x			x		x
<i>Brachychiton populneus</i>	Kurrajong	10 m	x			x		x
<i>Callitris endlicheri</i>	Black Cypress Pine	15 m	x			x		x
<i>Casuarina cunninghamiana</i>	River She-Oak	30 m		x		x	x	x
<i>Eucalyptus aggregata</i>	Black Gum	10–20 m		x		x	x	x
<i>Eucalyptus bicostata</i>	Eurabbie	large tree	x				x	x
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	10–24 m	x	x		x	x	x
<i>Eucalyptus bridgesiana</i>	Apple Box	8–20 m	x			x	x	x
<i>Eucalyptus camphora</i>	Mountain Swamp Gum	8–20 m		x		x	x	x
<i>Eucalyptus dives</i>	Broad-leaved Peppermint	8–20 m	x			x		x
<i>Eucalyptus elata</i>	River Peppermint	20 m	x	x			x	x
<i>Eucalyptus leucoxylon</i>	White Gum, Ironbark	5–30 m	x					x
<i>Eucalyptus macarthurii</i>	Paddy's River Box	20 m	x				x	x
<i>Eucalyptus macrorhyncha</i>	Red Stringybark	15–30 m	x			x		x
<i>Eucalyptus mannifera</i>	Brittle Gum	6–20 m	x			x	x	x
<i>Eucalyptus melliodora</i>	Yellow Box	12–30 m	x			x		x
<i>Eucalyptus moorei</i>	Narrow-leaved Sally	5–14 m	x				x	x
<i>Eucalyptus nicholii</i>	Narrow-leaved Peppermint	medium tree	x				x	x
<i>Eucalyptus nortonii</i>	Mealy Bundy	8–16 m	x	x				x
<i>Eucalyptus paliformis</i>		12 m	x				x	x
<i>Eucalyptus parvifolia</i>	Small-leaved Gum	5–10 m		x			x	x
<i>Eucalyptus pauciflora</i>	Snow Gum	10–20 m	x	x		x		x
<i>Eucalyptus radiata</i>	Narrow-leaved Peppermint	12–45 m	x			x		x
<i>Eucalyptus rossii</i>	Inland Scribbly Gum	8–20 m	x			x		x
<i>Eucalyptus rubida</i>	Candlebark	15 m	x	x		x		x
<i>Eucalyptus sideroxylon</i>	Mugga, Red Ironbark	10–20 m	x					x
<i>Eucalyptus scoparia</i>	Willow Gum	10–15 m	x	x				x
<i>Eucalyptus stellulata</i>	Black Sallee	5–14 m		x		x	x	x
<i>Eucalyptus viminalis</i>	Ribbon Gum, Manna Gum	25–50 m	x	x		x	x	x

Species	Common name	Size	Well-drained areas	Moist to wet	Under-storey	Local or regional	Fast-growing	Bird-attracting
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Small trees/large shrubs

<i>Acacia doratoxylon</i>	Currawang	3–8 m	x			x	x	x
<i>Acacia howittii</i>	Sticky Wattle	6 m	x				x	x
<i>Acacia pravissima</i>	Ovens Wattle	3–8 m	x	x		x	x	x
<i>Acacia pycnantha</i>	Golden Wattle	8 m	x			x	x	x
<i>Bursaria lasiophylla</i>	Blackthorn	3–6 m	x		x	x		x
<i>Callistemon sieberi</i>	River Bottlebrush	2–7 m		x	x	x		x
<i>Eucalyptus cinerea</i>	Argyle Apple	7–15 m	x			x	x	x
<i>Eucalyptus crenulata</i>	Buxton Gum	4–12 m		x			x	x
<i>Eucalyptus polyanthemos</i>	Red Box	7–25 m	x			x		x
<i>Leptospermum brevipes</i>	Slender Tea-tree	8 m		x	x	x	x	
<i>Leptospermum lanigerum</i>	Woolly Tea-tree	6 m		x	x	x	x	
<i>Melaleuca armillaris</i>	Bracelet Honey Myrtle	7 m	x	x			x	

Medium to small shrubs

<i>Acacia boormanii</i>	Snowy River Wattle	4 m	x	x	x		x	x
<i>Acacia buxifolia</i>	Box-leaf Wattle	2 m			x		x	x
<i>Acacia cardiophylla</i>	Wyalong Wattle	2–5 m	x		x		x	x
<i>Acacia cultriformis</i>	Knife-leaf Wattle	3 m		x	x		x	x
<i>Acacia fimbriata</i>	Fringed Wattle	5–8 m	x				x	x
<i>Acacia flexifolia</i>	Bent-leaf Wattle	1 m	x		x		x	x
<i>Acacia floribunda</i>	White Sallow Wattle	5 m		x	x		x	x
<i>Acacia genistifolia</i>	Early Wattle	1.5 m	x		x	x		x
<i>Acacia retinodes</i>	Wirilda or Swamp Wattle	3 m		x	x		x	x
<i>Acacia siculiformis</i>	Dagger Wattle	1–4 m		x	x	x		x
<i>Acacia uncinata</i>	Weeping Wattle	1–3 m	x		x		x	x
<i>Allocasuarina nana</i>	Dwarf She-Oak	2 m	x		x			x
<i>Banksia ericifolia</i>	Red Honeysuckle	4 m			x			x
<i>Banksia marginata</i>	Silver Banksia	5 m	x		x	x		x
<i>Banksia spinulosa</i>	Hairpin Banksia	2 m	x		x			x
<i>Callistemon citrinus</i>	Crimson Bottlebrush	4 m	x	x	x			x
<i>Callistemon pallidus</i>	Lemon Bottlebrush	5 m		x	x			x
<i>Callistemon pinifolius</i>	Pine-leaf Bottlebrush	2 m	x	x	x			x
<i>Correa reflexa</i>	Native Fuchsia	1.5 m	x		x	x		x
<i>Grevillea arenaria</i>		2.5 m	x		x	x	x	x
<i>Grevillea lanigera</i>	Woolly Grevillea	1.5 m	x		x		x	x
<i>Grevillea rosmarinifolia</i>	Rosemary Grevillea	2 m	x		x		x	x
<i>Grevillea victoriae</i>	Royal Grevillea	2 m	x		x		x	x
<i>Hakea dactyloides</i>	Finger Hakea	2–4 m	x		x		x	x
<i>Hakea eriantha</i>	Tree Hakea	3–4 m	x		x		x	x
<i>Hakea lissoperma</i>	Mountain Hakea	2–5 m	x		x			x
<i>Hakea microcarpa</i>	Small Fruit Hakea	2 m	x		x	x		
<i>Hakea salicifolia</i>	Willow-leaved Hakea	5 m	x		x		x	x
<i>Hakea sericea</i>	Silky Hakea	4 m	x		x	x	x	
<i>Indigofera australis</i>	Austral Indigo	2 m	x		x	x	x	
<i>Jacksonia scoparia</i>	Dogwood	3 m						
<i>Kunzea ambigua</i>	Tick Bush	3–5 m	x		x		x	x
<i>Leptospermum juniperinum</i>	Prickly Tea-tree	3 m		x	x	x	x	
<i>Leptospermum multicaule</i>		1 m		x	x	x	x	
<i>Leptospermum myrtifolium</i>	Heath Tea-tree	1.5 m		x	x	x	x	
<i>Leptospermum obovatum</i>	River Tea-tree	2–3 m		x		x	x	
<i>Lomatia myricoides</i>	Long-leaf Lomatia	5 m	x	x		x		x
<i>Melaleuca ericifolia</i>	Swamp Paperbark	5 m		x	x		x	
<i>Melaleuca parvistaminea</i>	Shoalhaven Tea-tree	2 m	x	x	x	x	x	

Species	Common name	Size	Well-drained areas	Moist to wet	Under-storey	Local or regional	Fast-growing	Bird-attracting
<i>Bracteantha viscosa</i>	Golden Everlasting	0.2 m	x		x	x	x	
<i>Correa</i> 'Mannii'	Mann's Correa	0.6 m	x	x	x		x	x
<i>Daviesia latifolia</i>	Hop Bitter Pea	1.5 m	x		x	x		
<i>Daviesia leptophylla</i>	Slender Bitter Pea	1.5 m	x		x	x	x	
<i>Daviesia mimosoides</i>	Narrow-leaf Bitter Pea	1–2 m	x		x	x	x	
<i>Dodonaea viscosa</i>	Hopbush	3 m	x		x	x	x	
<i>Grevillea juniperina</i>	Juniper Grevillea	0.5–2 m	x	x	x	x	x	x
<i>Hardenbergia violacea</i>	False Sarsaparilla, Coral Pea	0.5 m	x		x	x	x	
<i>Lomandra longifolia</i>	Mat Rush	0.6 m	x	x	x	x	x	
<i>Phragmites australis</i>	Common Reed	2 m		x	x	x	x	
<i>Poa labillardieri</i>	Poa Tussock Grass	0.5 m	x	x	x	x	x	
<i>Pultenaea subspicata</i>	Bush Pea	0.2 m	x		x	x		
<i>Typha</i> sp.	Cumbungi	2 m		x		x	x	

Ground covers, grasses and reeds

You might like to start with some of the hardy survivors:

Wet areas – *Eucalyptus camphora*, *Eucalyptus aggregata*, *Eucalyptus stellulata*, *Eucalyptus viminalis*, *Acacia dealbata*, *Acacia pravissima*, *Callistemon pallidus* and *Melaleuca ericifolia*.

Dry areas – *Eucalyptus macarthurii*, *Eucalyptus mannifera*, *Eucalyptus viminalis*, *Eucalyptus pauciflora*, *Eucalyptus nicholii*, *Banksia marginata*, *Acacia dealbata*, *Acacia decurrens*, *Acacia boormanii*, *Acacia cardiophylla*, *Acacia mearnsii*, *Acacia rubida*, *Acacia implexa*, *Hakea* species and *Grevillea* species.

Government organisations and programs

Bushcare Program — ACT

ACT Parks and Conservation
ph 132 281

Department of Land and Water Conservation

www.dlwc.nsw.gov.au

Queanbeyan

PO Box 189, 131–139 Monaro St, Queanbeyan NSW 2620
ph 02 6297 6477

Yass

PO Box 23, Yass Valley Way, Yass NSW 2582
ph 02 6226 1433

Cooma

PO Box 26, 26 Soho St, Cooma NSW 2630
ph 02 6452 1455

Environment ACT (EACT)

www.environment.act.gov.au
Macarthur House
12 Wattle St, Lyneham ACT 2602
Helpline 132 281

Environment Protection Authority (EPA) NSW

www.epa.nsw.gov.au
30 Lowe St, Queanbeyan NSW 2620
ph 02 6122 3100

Pollution Line

Information & pollution incidents
ph 131 555

NSW Dept of Agriculture

www.agric.nsw.gov.au

Queanbeyan

PO Box 408, 28 Morisset St, Queanbeyan NSW 2620
ph 02 6297 1861

Yass

PO Box 20, 102 Meehan St, Yass NSW 2582
ph 02 6226 2199

Cooma

PO Box 798, 39 Bombala St, Cooma NSW 2630
ph 02 6452 3411

NSW Fisheries

www.fisheries.nsw.gov.au
ph 02 6226 1700

NSW National Parks and Wildlife Service (NPWS)

www.npws.nsw.gov.au
Southern Directorate
ph 02 6297 6144

Wildcare (Injured wildlife)

National Parks and Wildlife Service
ph 02 6299 1966

Non-government organisations and programs

Australian Conservation Volunteers

PO Box 45, Campbell ACT 2612
ph 02 6247 7770

Provides volunteers for conservation work on cost-recovery basis (ATCV) and Greencorps teams for minor, major and community service projects.

CIT Solutions (Training)

www.cit.act.edu.au/CITSOL
ph 02 6207 4444

Conservation Council of the SE Region & Canberra

Kingsley St, Acton ACT 2601
ph 02 6247 7808 or 02 6557 2749

FloraBank

Florabank has information about collecting, storing and using native seed for revegetation and conservation. Information is available on the website www.florabank.org.au or contact:
PO Box 74, Yarralumla ACT 2600
ph 02 6281 8585

Greening Australia ACT & SE NSW

www.greeningaustralia.org.au
PO Box 538, Jamison Centre ACT 2614
ph 02 6253 3035

Landcare Networks

Yass Area Network of Landcare groups

PO Box 23, Yass NSW 2582
ph 02 6226 1433

Upper Murrumbidgee Landcare network

PO Box 26, Cooma NSW 2630
ph 02 6452 1455

ACT Landcare and Catchment Groups/ Waterwatch

Environment ACT
ph 132 281

Southern Tablelands Farm Forestry Network (STFFN)

ph 02 6207 2494

Waterwatch Program

EACT Helpline 132 281

Local nurseries that emphasise native plants

INDEX

Bywong Nursery

via Bungendore NSW

ph 02 6236 9280

Sells plants in wholesale quantities (50+)

Dan and Dan Forestry Services

Yass NSW

ph 02 6226 2955

Sells natives and non-natives

Dealbata Cold Climate

Dalgety NSW

ph 02 6456 5043

Specialises in native alpine plants

Eco Plants

Murrumbateman NSW

ph 02 6227 5634

Sells plants in wholesale quantities (50+)

Gurawin Native Plant Nursery

Jo Walker

Wamboin NSW

ph 02 6238 3415

Geoff & Gwyn Clark

Cook ACT

ph 02 6251 1043

Kurrajong Nursery

Kambah Pool Road

Westwood Farm (opposite Gleneagles Estate)

Kambah ACT

ph 02 6231 8699

Seeds and Plants Australia Pty Ltd

Pialligo ACT

ph 02 6247 7180

Specialises in native grasses, wetland plants, trees and saltbush.

There are many retail nurseries in the ACT — check the Yellow Pages for the most up-to-date information.

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First port of call

Upper Murrumbidgee Catchment local government contacts

The Snowy River Shire Council

The Snowy River Shire Council is partly in the UMC. It is based in the south of the catchment (*see map p2*) bounded in the south by the Victorian/New South Wales border.

Contact details

PO Box 143, BERRIDALE NSW 2628

Phone 02 6450 5195 Fax 02 6450 5117

Email snowy@acr.net.au

Web address <http://www.snowyriver.nsw.gov.au>

Cooma–Monaro Shire Council

The Cooma–Monaro Shire Council is partly within the UMC. It shares borders with the Snowy River Shire, Yarrawlumla Shire, the Australian Capital Territory and Bombala Shire.

Contact details

PO Box 714, 81 Commissioner St, COOMA NSW 2630

Phone 02 6450 1777 Fax 02 6450 1799

Email council@cooma.nsw.gov.au

Web address <http://cooma.nsw.gov.au>

Yarrawlumla Shire Council

Yarrawlumla Shire is wholly within the UMC. It surrounds the Australian Capital Territory on the east, north and west.

Contact details

PO Box 112, 11 Farrer Place, QUEANBEYAN NSW 2620

Phone 02 6298 4111 Fax 02 6297 5854

Email records@yarrawlumla.nsw.gov.au

Web address <http://www.yarrawlumla.nsw.gov.au>

Queanbeyan City Council

Queanbeyan City Council is located wholly within the UMC and is surrounded by Yarrawlumla Shire.

Contact details

PO Box 90, 257 Crawford St, QUEANBEYAN NSW 2620

Phone 02 6298 0211 Fax 02 6299 1343

Email council@qcc.nsw.gov.au

Web address <http://www.qcc.nsw.gov.au>

Gunning Shire Council

Gunning Shire is partly in the UMC, with the majority of the Shire located in the Lachlan Catchment.

Contact details

PO Box 42, 123 Yass St, GUNNING NSW 2581

Phone 02 4845 1312 Fax 02 4845 1426

Email gunning@interact.net.au

Web address <http://www.gunning.nsw.gov.au>

Yass Shire Council

Yass Shire Council is partly in the UMC, with some of the Shire located in the Lachlan Catchment.

Contact details

PO Box 6, 209 Comur St, YASS NSW 2582

Phone 02 6226 1477 Fax 02 6226 2598

Email admin@yass.nsw.gov.au

Web address <http://www.yass.nsw.gov.au>

The Australian Capital Territory

Land management in the Australian Capital Territory is slightly different from that in the surrounding areas of New South Wales. The Territory is governed by the ACT Legislative Assembly and land management is overseen by various departments within the ACT Department of Urban Services.

Contact details for Environment ACT

PO Box 144, 12 Wattle St, LYNEHAM ACT 2602

Environment Information Centre Helpline 02 6207 9777

Fax 02 6207 2316

Web address <http://www.environment.act.gov.au>