The responsibility and management of weeds along Australian roadsides

Weeds on roadsides are divided into legally controllable or 'declared' weeds and 'other' weeds.

'Other' weeds have no legal requirement for control and are generally seen as a low priority for roadside vegetation managers.

Weeds that impact agricultural productivity generally fit into the 'other' weed category, and when they occur on roadsides are low priority for management unless they impact road user safety (line-of-sight) or are on a locally important weed list developed by a local natural resource management group or council.

While each state has a slightly different approach to managing roadside vegetation, major roads are the responsibility of the state roads department and minor roads are the responsibility of local government.

Australia has more than 874,000 kilometres of roads. This means up to 1.75 million km of roadside vegetation that must be managed and can potentially act as a reservoir for weeds that impact both natural and agricultural systems.

TABLE 1. Length of Australian roads by type – 2015 (BITRE 2017)

ROAD TYPE	Paved	Gravel	Formed	Other (tracks)	TOTAL
% of total	44	33	16	7	874,000km

Major roads and highways tend to have wider cleared areas, predominantly for road-user safety. Ravensthorpe, Western Australia.AGRONOMO

Managing roadside vegetation is complex

Managing roadside vegetation can be complex due to:

- the priority of road-user safety
- maintaining road structure
- fire management
- conservation of rare and endangered vegetation
- the requirement to only control declared weeds

The management of roads and roadside vegetation is further complicated because they are managed by a range of organisations often using contractors and needing to adhere to a budgetary framework. Add to this there are many different landowners adjacent to these linear reserves that have different motivations for management.

Road verge cleared width tends to increase in less populated areas. East Kimberley, WA. AGRONOMO

Road-user safety

Public safety is the primary driver for roadside vegetation management. An extended line of sight, unimpeded vision of roadside 'furniture' (guideposts, signs, railings) and the ability for a vehicle to get off the 'seal' without any damage to people and/or vehicles are important goals. Roadside vegetation normally has a maximum 30 centimetre height before treatment, which allows road users to see roadside posts and reflectors without obstruction.

Maintaining road structure

The maintenance of infrastructure is also an important driver of roadside vegetation management. It is essential that water flows freely from the sealed surface and off the road shoulder. Ponding of water near the edge of the seal, caused by weed growth, allows water to enter the road base, which in turn destabilises the underlying road structure. Corrosion and potential fire damage to roadside 'furniture' can be reduced by keeping it free of plant growth.

Fire management

Fire management can play a significant role in how roadside vegetation is managed. Roadsides are a point of ignition, provide containment and firebreaks, and are a route of escape in the event of an evacuation. In New South Wales and WA roads can be used as fire breaks, so the road corridor tends to be wider than in other states. For example, in WA major roads will have a four to 10 metre vegetation management buffer from the edge of the bitumen.

Conservation of rare and endangered vegetation or habitats

Areas of vegetation between the roadside and freehold land often contain rare habitats or rare and endangered plant species, which rely on these areas for their survival. In many areas, due to significant clearing of the landscape, roadside verges are the last relatively untouched stands of native vegetation. These areas can be signposted and have specific protocols in place to minimise disturbance and further loss. In NSW demarcation of these areas is with "Significant Roadside Environment Area" signs, while Tasmania has yellow "L" shaped markers on the fence. This remnant vegetation along roadsides also provides connectivity between larger patches of native vegetation, particularly in areas that have been heavily cleared for cropping or grazing and are used as movement corridors for birds and animals.

To maintain the integrity of the road base from ingress of water it is important to keep weeds from the edge of the tar. Perennial grasses are a problem because they are hard to control and thrive on the water harvested from the road surface. Grasspatch, WA. AGRONOMO

Control of weeds on roadsides

Control of declared weeds

Weeds on roadsides are divided into legally controllable or 'declared' weeds and 'other' weeds. 'Other' weeds have no legal requirement for control and are generally seen as a low priority for roadside vegetation managers. Weeds that impact agricultural productivity fit into the 'other' weed category, and when they occur on roadsides are low priority for management unless they impact road user safety (line-of-sight) or are on a locally important weed list developed by a local natural resource management group or council.

Therefore, control of declared weeds along roadsides is the priority for roadside vegetation managers. Each state has slightly different systems for declaring specific weeds that must be controlled or contained.

For example, NSW has the Biosecurity Act 2015 from which 11 strategic weed management plans have been developed that articulate how 'road authorities' will conduct management of declared weeds on roadsides.

Slashing is widely used to manage roadside vegetation however can easily spread weeds if machinery hygiene and operation timing are not well managed. Tamworth, NSW. AGRONOMO

Some states and local government areas now map declared weeds to ensure effective ongoing management. In NSW, the 'Red Guidepost' program aims to increase awareness of declared weeds on roadsides by both the public and road managers. Red posts are located at the beginning and end of a declared weed infestation. Similarly, Tasmania has a "Priority Weed Program" where the infestations of certain species are clearly identified by signage and therefore needing different management.

Use of herbicides on roadsides

Using herbicides to manage roadside vegetation introduces a number of complications including spraying near sensitive areas. Sensitive areas include aquatic and wetland areas, surface streams and rivers, organic farms, human habitation, urban areas, schools and hospitals, which all need special consideration and management.

The range of herbicides being used on roadsides is reducing due to potential off-target damage, occupational health and safety implications and concerns from the public.

Some road management authorities have approved herbicide lists, which include the products they deem as suitable for their area of management responsibility.

Another complexity of roadside weed management is that the timing of herbicide application is often determined by logistical factors and not the condition and stage of the vegetation that needs managing. Roadsides are often sprayed when plants are stressed from low soil moisture levels and extreme temperatures. Plants are often quite mature when they are sprayed, which in turn leads to insufficient herbicide coverage to get effective control.

Major roads such as freeways and highways are treated on a scheduled basis, such as every few months, while lower priority roads that are managed by local government will vary with the rate of growth and how management contracts are negotiated. Roadsides in higher rainfall areas will be treated more often than those in lower rainfall areas. Road shoulders in southern Australia with a predominantly winter rainfall will be sprayed in spring with a follow-up application depending on rainfall and effectiveness of the initial application.

Some road management authorities will slash roadsides and only use herbicides around roadside furniture. Other authorities will primarily use herbicides, because it is cost-effective as large areas can be treated quickly compared with slashing and grading and has lower risk of spreading weeds.

Hard-to-control weeds

Adding to the issues of spraying large and stressed weeds, the trend in roadside weed management to rely on glyphosate, as the only herbicide used, has led to the development of weed populations that are either resistant or tolerant to glyphosate.

Herbicide resistance

The continued reliance on glyphosate for roadside vegetation management has led to the development of populations of weeds that are now resistant. Glyphosate resistant weeds found on Australian roadsides include annual ryegrass (*Lolium rigidum*), windmill grass (*Chloris truncata*), feathertop Rhodes grass (*Chloris virgata*), flaxleaf fleabane (*Conyza bonariensis*) and tall fleabane (*Conyza sumatrensis*).

A problem with roadside weed management is the increasing incidence of hard-to-kill weeds such as this roadside heavily infested with feathertop Rhodes grass (C. virgata). This species has always been tolerant to glyphosate, but now has populations resistant to glyphosate. AGRONOMO

Herbicide tolerance

Glyphosate tolerant weeds are also becoming an increasing roadside problem. Tolerance to glyphosate is best defined as weed species that were never effectively controlled by that herbicide. Continued use of glyphosate with little other management leads to roadsides being dominated by species that have survived the herbicide treatment. Glyphosate tolerant weeds include the *Hyparrhenia* species, African lovegrass (*Eragrostis curvula*), windmill grass (*Chloris truncata*) and feathertop Rhodes grass (*Chloris virgata*).

In sub-tropical and tropical zones high biomass perennial tussock-forming grasses which include various Rhodes grasses (*Chloris* spp.), grader grass, giant *Sporobolus* species and Gamba grass (*Andropogon gayanus*). Broadleaf species that are glyphosate tolerant include both flaxleaf and tall fleabanes (*Conyza* spp.), primroses (*Oenothera* spp.), crownbeard (*Verbesina encelioides* subsp. *encelioides*), stinkwort (*Dittrichia graveolens*) and dove weed *(Croton setiger*).

Who is responsible for managing roadsides?

Major roads such as highways and major arterials are managed by each relevant state government department.

District and local roads are managed by local government. Local government organisations can be contracted to the State main roads departments to conduct roadside maintenance, including weed control, slashing and road surface maintenance. Each state and territory manage roadsides slightly differently. This is usually linked to State and local government laws and regulations.

Over the past 20 years there has been an increasing trend at both a state and local government level to contract maintenance work to other organisations.

The width of the road reserve to be managed varies greatly within each state depending on how closely the area is settled, and presence of crown land and travelling stock routes.

New South Wales

Table 2 shows the hierarchy of roads in NSW and which authority is responsible for roadside maintenance.

TABLE 2. Type of roads in NSW and the Authority responsible for managing roadside vegetation

TYPE OF ROAD	ROAD "AUTHORITY"
Freeways/ gazetted roads	Roads and Maritime Services (State Dept)
Crown roads	Minister for Lands and Forestry
Highways / State roads / Other public roads	Council of the local government area (LGA) unless declared otherwise by the NSW Roads Regulation 2008

General vegetation control is limited to the road shoulder and around roadside signs and posts.

Management of declared and 'local' weeds is conducted by 128 LGAs for the width of the road reserve according to 11 Regional Strategic Weed Management Plans (*https://www.lls.nsw.gov.au/help-and-advice/pests,-weeds-and-diseases/weed-control/regional-strategic-weed-management-plans*) that articulate how road authorities, land managers and other stakeholders should prevent, eliminate, minimise and manage weed biosecurity risks in their regional area.

Glyphosate is the most common herbicide used for roadside vegetation management although the NSW Roads and Maritime Services have an 'approved herbicide list'. (*https://www.rms.nsw.gov.au/documents/about/environment/compliance/approved-pesticides-list.pdf*).

Herbicides are the most cost-effective method of controlling weeds along roadsides. In more closely settled areas, there is increasing pressure to use non-herbicide alternatives. BIRGITTE VERBEEK

Victoria

Roads in Metropolitan Melbourne are managed by VicRoads, while the rest of the state's four management zones are managed by Regional Roads Victoria. VicRoads and Regional Roads Victoria look after arterial roads and freeways (declared roads). They have the same obligations to control weeds as every other landholder.

Minor roads are managed by 79 LGAs.

Vegetation is managed fence-to-fence except in National Parks and nature reserves where it is one metre from the edge of the seal. Crown land that is fenced is managed under a local agreement with the public land manager.

Under the Catchment and Land Protection Act 1994, local councils must develop local weed management plans which are reviewed by Ag Victoria. The local government organisation decides which weeds they will control. Most councils tend to focus on woody species and *Nassella* species including Chilean needlegrass (*Nassella neesiana*).

Glyphosate is used on road shoulders and other registered herbicides are used for specific weed control.

South Australia

In SA local government (59 LGAs) is responsible for the management of vegetation along most roads. The Department of Transport and Infrastructure has this role on major roads.

Road verges are kept clear of vegetation one metre from the edge of the seal and around guideposts and signs.

SA has declared plants which must be controlled under legislation. There is also an 'Alert Weeds' list, which are weeds not yet in SA.

Nine Landscape Boards set risk-based priorities for declared plant control in their three-year landscape plans. If the Landscape Board priorities target a weed species for enforced control on private property, the Board accepts responsibility for its control on roadsides, which is often sub-contracted to the local government authority as part of their vegetation management program. Local government is responsible for the control of all other weeds on roadsides.

SA has a major problem with glyphosate resistant annual ryegrass (*Lolium rigidum*) along its road reserves due to a historical decision to rely on glyphosate. This has made it necessary to use a much wider range of herbicides and management techniques for roadside vegetation management.

Tasmania

Roads are one of Tasmania's biggest infrastructure assets, consisting of over 3700km of roads and 1280 bridges and major structures. Major roads are managed by the Department of Growth which has three maintenance service regions with one contractor (plus subcontractors) per region. Specialist sub-contractors are used where needed.

There are 29 LGAs responsible for minor roads and they rely on community involvement to drive better roadside vegetation management.

The width of the road reserve varies widely, with slashing to the fence line in closely settled/urban areas and two metres from the edge of the tar for country areas. Declared weeds are managed on a site-by-site basis.

The Department of Growth allows the use of any herbicide that is registered for that use pattern.

The red post awareness program has been introduced into parts of NSW. Red posts mark the start and finish of important weed infestations that require different management, such as no slashing. PAULA BOSSE

Queensland

Queensland has 33,300km of state-controlled roads which are managed by the Department of Transport and Main Roads (TMR) with the state divided into 12 districts in six regions.

TMR contracts vegetation management works to a wide range of delivery suppliers including businesses, local councils, state-government agencies and TMR's commercial delivery arm, RoadTek. Contracts for roadside vegetation management include intervention levels being triggered for maintenance and outcome-based methods for weed control.

Road verges are kept clear of vegetation one metre from the edge of the tar and around guideposts and signs.

Vegetation surveys on major roads are conducted for any job that impacts remnant vegetation. Surveys are looking for legislative triggers such as declared weeds and management of remnant vegetation. TMR has an internal process for managing significant 'natural values' in its road reserves.

The program is called Significant Environmental Area (SEA).

While TMR does not have a preferred herbicide list, herbicides proposed for use by contractors are approved by TMR prior to use. TMR use a herbicide assessment tool to aid in determining whether the active ingredient of a proposed herbicide is appropriate for a specific use and location. Currently, TMR has a moderate number of herbicide active ingredients approved for TMR use as per specifications provided. As needed additional active ingredients can be assessed for their suitability for use within TMR and added to the list.

Local governments decide which herbicides they will use, with some opting to no longer use glyphosate. A range of non-herbicide options are being investigated, with these decisions being driven internally by individual organisations. For example, the Southern Downs Regional Council does not use glyphosate and also now uses a 'boxthorn puller' to control large shrubs and small trees.

A typical minor bitumen road in cropping areas of Western Australia. AGRONOMO

Western Australia

In WA a total of 149,000km of roads are divided into seven main road regions. Local government authorities (30 metropolitan and 109 rural LGAs) manage 139,000km of local and district roads. Contractors are widely used by both the Department of Main Roads (DMR) and councils.

Within the DMR, each region has a fair amount of autonomy in how roadsides are managed. On average main roads are managed for five metres from the edge of the tar while highways will often be managed out to six metres. In the Kimberley region roadsides are managed out to 10m. Beyond that to the fence will be determined by available resources and type of vegetation present.

Crown reserves and unallocated Crown land will be managed by local government and the Department of Biodiversity, Conservation and Attractions (DBCA).

Under the Fire and Emergency Services Act 1998 the Department of Fire and Emergency Services have an advisory role in vegetation management during bushfires and can request additional clearing of roadside vegetation. As a result of the closure of the major east-west highway due to bushfires during the summer of 2019-20, the DMR are trialling a large chopper-roller pulled by a bulldozer to create instant firebreaks.

The DMR has purchased land which it is revegetating to be used as offsets when they clear road reserves. The DMR will try and maintain vegetation on one side of the road and clear the opposite side allowing them to move the road sideways if expansion to the road network is required.

The main herbicides used on WA road verges is a tank mix of glyphosate and simazine. Other registered herbicides are used for controlling a range of declared and other weeds.

Roads often have important remnant vegetation along their verges, however approaches to vegetation varies between road managers. AGRONOMO

Northern Territory

The Northern Territory Government undertakes wildfire and weed management activities on and next to public roads.

Fire and weed management plans are developed in consultation with community groups and are specific to a land, catchment, regional or local area.

Priorities for roadside weed management are:

- threats to the surrounding biodiversity
- fire hazards
- movement of weeds along road corridors into weed free districts.

Undeclared weeds are controlled if identified as a serious community concern. Major roads are slashed out to 10m from the edge of the tar. Weeds such as Gamba grass (*Andropogon gayanus*) found on roadside verges are an increasing threat to fire safety, creating a fuel load three to five times greater than native grasses. Preventative burning is used in the wet season or early dry season to reduce dry season fire hazards near major tourist roads or where adjacent primary producers have high value enterprises.

Can private landholders and groups manage weeds on the adjacent road reserve?

In most states weed management on roadsides by individual landholders is discouraged.

The issue of public liability if there is an accident with a road user is the greatest deterrent.

Secondly, many road reserves are also important remnant habitats for native plants and animals. Damage to native vegetation could be considered as 'clearing' under state vegetation legislation.

In SA landowners or community groups can only do work such as weed control on roadsides with the permission of their local council. If they are controlling declared weeds, it is recommended that they also notify their Landscape Board to get advice.

In Queensland landholders wishing to manage vegetation between the fence and that area treated by the LGA or RoadTek must apply for permits to do so.

Acknowledgments

The 'Area Wide Management for cropping systems weeds: investigating the weed management, social and economic opportunity' project aims to take a new approach to weed control. The traditional approach to tackling weeds has been to focus on paddock or farm scale management. Instead this project aims to take an area-wide approach to weed management. The theory being that if the number of weeds over the entire landscape can be reduced, everyone in that area should benefit, especially when dealing with weeds with mobile seed and pollen. This includes considering potential benefits across different land uses such as dryland, irrigated land and public areas like roadsides. This project is supported through funding from the Australian Government Department of Agriculture as part of its Rural R&D for Profit program and the Grains Research and Development Corporation and the Cotton Research and Development Corporation.

See *Area wide management of weeds* for more information.

References and other reading

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Useful Links by state & territory

Weeds Australia - *Who is responsible for weed control where you are?*
Weeds of National Significance

Queensland
Department of Transport and Main Roads
Stock routes
Biosecurity Act 2014

NSW
Weed Management Policy in NSW
NSW Biosecurity Strategy 2013-21
NSW Invasive Species Plan 2018-2021
Roads & Maritime - Weed management and pesticide use
Roadside Environment Committee

ACT
Environment, Planning and Sustainable Development Directorate - Environment
2020-21 Invasive Plant Control on ACT Public Land
ACT Biosecurity Act 2016-2026
Pest Plants and Animals Act 2005

Victoria
List of noxious weeds
VicRoads Road Management Act, regulations & codes
Codes-of-practice-under-the-road-management-act

SA
Guidelines for the Management of Roadside Vegetation
Weed plant policies in South Australia – PIRSA
Weed Control Handbook for Declared Plants in South Australia July 2018 Ed.
Light Regional Council Roadside Vegetation Management Plan 2016-2021

Northern Territory
Weeds Management Act 2001
Weed management Act Compliance Policy

WA
Weeds - Department of Agriculture and Food
Biosecurity and Agriculture Management Act 2007
Western Australian Organism List (WAOL)
Weed Management Plan - EPA WA
Roadside conservation

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