NSW Department of Primary Industries
Office of Environment & Heritage

NSW Catchment Management Authorities
NSW National Parks & Wildlife Service

Australian Government

BIODIVERSITY PRIORITIES FOR WIDESPREAD WEEDS

# Lower Murray Darling CMA region

## Part F

NSW Department of Primary Industries
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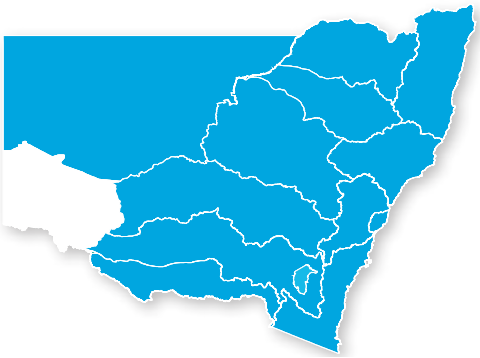

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# F1. INTRODUCTION

This is one of the 13 regional documents that sit under the *Biodiversity priorities for widespread weeds – statewide framework*. It provides information for the Lower Murray Darling Catchment Management Authority (LMDCMA) region. The *statewide framework* should be read in conjunction with this document as it provides (i) background information, (ii) objectives of the project, (iii) the standardised methodology used to establish regional priorities and (iv) guidance on implementing the priorities.

The overarching document to this report, the *statewide framework*, documents the process used for identifying biodiversity (biological assets) at risk from widespread weeds in New South Wales, as well as prioritising sites for weed control in each CMA region. This sub-report (Part F) establishes regional priorities, in the form of priority widespread weeds and priority sites for control, in the LMDCMA region.

The LMDCMA region covers an area of approximately 63,000 square kilometers from Broken Hill in the north to the Murray River in the south and from the Murray/ Murrumbidgee junction to the South Australian border in the west. Approximately 29,000 people live in the region and an estimated 5% has been cleared for cropping or horticultural purposes. The region includes the tribal country of the Barkindji, Mutthi Mutthi and Ngyiampaa peoples and is rich in cultural heritage (LMDCMA 2009).

Invasive plants and animals are a key threat to the sustainability of the region's natural resources along with other pressures posed by land clearing and climate change. There are some 187 exotic weeds present in the region. A review of the impact of weeds on threatened biodiversity in New South Wales (i.e. species, populations and ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act)), indicated that 25 exotic weed species in the LMDCMA region were threatening biodiversity, including 14 threatened plant and animal species (Coutts-Smith and Downey 2006).

This project builds on the existing regional weed strategies by considering the impact of all widespread weeds present in the LMDCMA region on biodiversity, regardless of their legislative listing. Given many widespread weeds are unlikely to be extensively controlled or eradicated, this project provides strategic management options for protection of biological assets by identifying the priority widespread weeds, the biodiversity impacted and priority sites for control.

To reduce the impact of widespread weeds on biological assets, control programs need to be prioritised to areas where control is both achievable and likely to have the greatest benefit to native biodiversity, independent of land tenure. Such a site-led approach will ensure maximum benefit from limited resources available for management of widespread weeds. Therefore, specific information on management sites was compiled to assist in strategic decisions relating to investment aimed at protecting biological assets from widespread weeds. When considering such investments, it must be noted that the timescale and intensity of weed management in arid and semi-arid regions of the state may differ significantly from that in coastal areas due to greater variation in rainfall and productivity.

This project will enable all stakeholders in the LMDCMA region to target on-ground works to those locations where weed control will have the greatest benefits for biodiversity. In addition, implementation of monitoring using the *Monitoring manual for bitou bush control and native plant recovery* (Hughes *et al.* 2009) will allow LMDCMA to measure progress towards relevant targets, including the Natural Resource Commission (NRC) target for invasive species (NRC 2005) and Catchment Action Plan (CAP) targets.

# F2. REGIONAL CONTEXT

This section summarises the strategies, policies and programs relevant to weed management in LMDCMA and outlines how they relate to the development and outputs of this project. Relevant state-wide strategies, targets and legislation are addressed in the *statewide framework* document.

## F2.1 Catchment Action Plan

Under the NSW *Catchment Management Authorities Act 2003*, each CMA is required to prepare a Catchment Action Plan (CAP) that outlines future priorities for the specific CMA and provides a coordinated plan for natural resource work in the region over a 10-year period. The LMDCMA CAP outlines a broad vegetation catchment target under which two management targets relate to weed management. A biodiversity target is planned for development in the next CAP review period. It will include weed management in some of its management targets (LMDCMA 2008).

By identifying and prioritising biodiversity at risk from weeds in the LMDCMA region as well as identifying priority sites for control, this project will help LMDCMA address the two targets related to vegetation management:

### Vegetation Catchment Target

Aim: To manage, protect and enhance the vegetation at species, community and landscape levels thereby achieving conservation of economically, culturally and environmentally important species.

» Management Target V2

Aim: Increase by 171,000 ha the area of permanent conservation reserves in the catchment by 2015, as a contribution towards achieving the permanent reservation of 20% of each vegetation community (pre-clearing extent) by 2054.

» Management Target V3

Aim: Improve the condition of each vegetation community at 90% of sites by the year 2015 as measured by key indicators.

## F2.2 Regional Weed Strategy Lower Murray Darling Catchment

The Regional Weed Strategy Lower Murray Darling Catchment was commissioned by LMDCMA and first published in 2004. The prioritisations and recommendations (Verbeek and Ash 2004) were developed through a series of workshops. A prioritisation process based on Randall's system was used to rank weeds in four land use classes (riparian areas, horticultural, rangelands and cropping) (Randall 2000). Weeds were placed in four categories with an emphasis on (i) potential weed threats and (ii) new and (iii) emerging weed problems. The fourth category was for (iv) widespread weeds throughout the region, however some widespread weeds were not included because they were 'already widespread throughout Australia' or there was 'lack of detailed information'.

This project complements the Regional Weed Strategy Lower Murray Darling CMA region by considering priorities for the management of widespread weeds that are impacting on biodiversity.

## F2.3 Regional weed advisory committees and management plans

Regional weed advisory committees support the communication of best practice amongst neighbouring councils or local control authorities, who are responsible for implementing the NSW *Noxious Weed Act 1993* (NW Act). Membership includes NSW Department of Primary Industries (NSW DPI), regional councils and public land managers (e.g. National Parks and Wildlife Service (NPWS)).

Regional weed management plans are developed by these regional weeds advisory committees and target specific noxious weed species for control within a defined area. They outline the biology of the weed and its impacts as well as overall objectives and actions required to coordinate an effective control program. The committee relevant to LMDCMA region is the Western Riverina Noxious Weeds Advisory Group.

## F2.4 Office of Environment & Heritage (OEH) regional pest management strategies

Within the LMDCMA, the NPWS (part of OEH) administers significant land for conservation purposes. Weed management priorities on NPWS estate are established within 18 regional pest management strategies (RPMS); based on NPWS regions. In 2010, the number of regions was reduced to 14. However, revision of the strategies is not due until 2011.

Although the NPWS regional boundaries do not align with those of the CMA regions, the Far West Region Pest Management Strategy is relevant to the LMDCMA (see **www.environment.nsw.gov.au/pestsweeds/RegionPestManagement.htm**). During 2009–10, NPWS undertook a comprehensive survey of NPWS estate to establish biodiversity priorities for widespread weeds. Relevant priorities from these surveys, including those priority widespread weeds and biological assets at risk, are incorporated into this project (see Section 1.6.1 of the *statewide framework*).

## F2.5 Priorities Action Statement (PAS)

In accordance with the TSC Act, the PAS was developed to ensure that conservation actions were established for all biodiversity listed under the Act. The PAS outlines the broad strategies and detailed priority actions to be undertaken in New South Wales to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes (KTPs).

There are five actions in the PAS relevant to weed management in the LMDCMA region (Appendix F1). These actions apply to four native plant species and one species of bird.

All the actions are generic recommending general weed management and do not mention specific weeds and/or sites.

This project incorporates information from the PAS to identify priority weeds posing a threat to threatened species and ecological communities, as well as priority sites for weed control.

# F3. REGIONAL OUTPUTS

## F3.1 Methodology used to develop the priorities

The *statewide framework* outlines the broad methods applied across the 13 CMA regions in New South Wales to establish widespread weed priorities for biodiversity conservation. The primary output is a ranked list of weed management sites for each CMA region in New South Wales. Rankings are based on where investment in weed control will result in greatest reduction of the impact of widespread weed species on biodiversity; primarily, but not exclusively, on threatened biological assets (plant and animal species, populations and ecological communities listed under the TSC Act and the national *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This approach uses four stages to establish regional weed management priorities for biodiversity conservation, being:

1. Identify and prioritise the widespread weed species posing a threat to biodiversity in each region.
2. Identify the biodiversity at risk from high priority weed species identified in Stage 1.
3. Identify sites where control will maximise biodiversity outcomes by reducing widespread weed impacts.
4. Develop and implement a monitoring system to determine whether investment in weed control programs at high priority sites has resulted in a biodiversity response and thus progress towards the relevant statewide targets.

The specific details of implementing the process in the LMDCMA region (Stages 1 to 3) are outlined below with modifications to account for existing data and strategies. Stage 4 is discussed in the overarching *statewide framework*.

### F3.1.1 Workshops in the LMDCMA region

Two workshops were held in the LMDCMA region at Broken Hill and Buronga on 12 and 19 November 2008 respectively. People from all local councils, relevant government departments, universities, landholders and community organisations were invited to attend. Representatives from NSW DPI, OEH (formerly DECCW), LMDCMA, Land and Property Management Authority (LPMA), Livestock Health and Pest Authorities (LHPA), Roads and Transport Authority, University of NSW and primary producers attended the workshops. See Appendix F2 for a full list of attendees.

Workshop participants were asked to identify the widespread weeds impacting on biodiversity ('Stage 1' below) in the region and consider the biodiversity at risk from high priority weeds ('Stage 2' below). All workshop participants were invited to nominate sites.

### F3.1.2 LMDCMA specific webpages

On the main project website (**www.environment.nsw.gov.au/cmaweeds**), specific CMA webpages were established to provide stakeholders with information on the process followed in the LMDCMA region including: workshop details, outcomes from workshops, the site nomination form and instructions and a project contact (**www.environment.nsw.gov.au/cmaweeds/LowerMurrayDarling.htm**).

## F3.2 The process

### F3.2.1 Stage 1. Identifying weeds that pose a threat in the LMDCMA region

*A weeds dataset for the LMDCMA region*

A list of weeds to consider at the workshops was collated using the resources outlined in Section 3.1.3 of the *statewide framework*, the sources listed in Section F2, and the following documents:

» Plants of NSW (Jacobs and Pickard 1981)

» Weeds (Auld and Medd 1992)

» Plants of Western NSW (Cunningham *et al.* 1981).

*Distribution of weeds within the LMDCMA region*

The weeds dataset for the LMDCMA region was presented to workshop participants who were asked to identify which weeds they considered to be widespread. The weeds list considered at each workshop within the region is provided in Appendix F3.

*Current impact of widespread weeds on biodiversity*

Workshop participants were asked to prioritise the current impact of each widespread weed as Low, Medium or high (Table F1). Twenty one widespread weeds were identified as having a high impact on biodiversity. These species make up the final list of priority widespread weeds in the region (Table F2).

The impact of each widespread weed as determined at each workshop within the LMDCMA region is provided in Appendix F3.

*Table F1. Relative impact of widespread weeds on biodiversity.*

| Impact | Definition |
|---|---|
| High | High impact weeds are capable of causing major change to the composition or structure of a community (transformers). They can suppress the regeneration of many species in a community and have a major effect on dominant species in a community. They are long-lived or can form self-sustaining monocultures. |
| Medium | Medium impact weed species can have a modest effect on the composition or structure of a community. They can suppress the regeneration of some species and have some effect on dominant species in a community. They are relatively long-lived or can persist over long periods of time. |
| Low | Low impact weeds do not affect structurally dominant species. They do not suppress the regeneration of native species. They do not persist or have relatively short life spans. |

*Table F2. Priority widespread weeds impacting on biodiversity in the LMDCMA region (listed in alphabetical order).*

| *Scientific name* (Common name) | KTP[1] | WoNS[2] | Noxious | |
|---|---|---|---|---|
| | | | NSW[3] | LGA[4] |
| *Argemone ochroleuca* (Mexican poppy) | | | 5 | |
| *Asphodelus fistulosus* (onion weed) | | | | Y |
| *Brassica tournefortii* (Mediterranean turnip) | | | | |
| *Bromus rubens* (red brome) | | | | |
| *Cactaceae* (various genera and species) (prickly pears) | | | 4 | |
| *Carrichtera annua* (Wards weed) | | | | |
| *Heliotropium supinum* (prostrate heliotrope) | | | | |
| *Hordeum glaucum* and *leporinum* (barley grass) | | | | |
| *Juncus acutus* (sharp rush) | | | | |
| *Lycium ferocissimum* (African boxthorn) | Y* | | | Y |
| *Marrubium vulgare* (horehound) | Y* | | | Y |
| *Mesembryanthemum nodiflorum* (small ice plant) | | | | |
| *Phyla nodifolia* and *P. canescens* (lippia) | | | | |
| *Prosopis juliflora* (mesquite) | | Y | | Y |
| *Psilocaulon tenue* (wiry noon flower) | | | | |
| *Ricinus communis* (castor oil plant) | | | | |
| *Schinus molle* (pepper tree) | | | | |
| *Schismus barbatus* (Arabian grass) | | | | |
| *Sisymbrium erysimoides* (smooth mustard) | | | | |
| *Xanthium occidentale* and *X. orientale* (Noogoora burr) | | | | Y |
| *Xanthium spinosum* (Bathurst burr) | | | | Y |

KTP[1] = Weed listed under a Key Threatening Process in the TSC Act; WoNS[2] = Weeds of National Significance (Thorp and Lynch 2000); NSW[3] = New South Wales; LGA[4] = Local Government Areas.

Y = yes, where the species is listed under a KTP, as a WoNS or is listed as noxious in at least one LGA within the region,

* = Proposed only (Preliminary Determination under the TSC Act). All listing are as at 31 August 2010.

Numbers in the table refer to the control class under the NSW *Noxious Weeds Act 1993*.

### F3.2.2 Stage 2. Identifying biodiversity at risk from high priority weeds

At each workshop, participants were provided with lists of Endangered Ecological Communities (EECs) and threatened species (as listed under the TSC Act and the national EPBC Act) and general vegetation types (Keith 2004) present in the LMDCMA region. They were asked to consider if any species on these lists were currently at risk from each of the high priority widespread weeds (identified during Stage 1) and a draft list of biodiversity at risk was created. Following the workshops, this list was sent to workshop participants and other stakeholders for comment and verification.

The revised list identifies EECs and vegetation communities that are considered under threat from the high priority weeds (Tables F3 and F4). The two aquatic communities of the Murray and Darling (Aquatic Ecological Communities in the Natural Drainage System of the Darling River Catchment and Aquatic Ecological Communities in the Natural Drainage System of the Lower Murray River Catchment) were combined for this process. In addition, information from the workshops was complemented by the surveys undertaken across NPWS estate in 2009-10 to establish biodiversity priorities for widespread weeds (see Section F2.4 and Section 1.6.1 of the *statewide framework*). All of the above information was used to help guide site nominations (see Section F3.2.3, Stage 3). The impacts of weeds on individual species were not considered due to a lack of knowledge about species' exact locations and interactions.

The list of EECs and vegetation communities is by no means exhaustive, but is likely to represent communities and species where the priority weeds are having the greatest immediate impact.

*Impact of widespread weeds on EECs and vegetation communities*

Four EECs in the LMDCMA region were identified as being at risk from high priority weeds (Table F3). The general vegetation communities most affected by the high impact weeds were Inland Riverine Forests, Inland Floodplain Woodlands and Riparian Areas (Table F4). Weeds affecting the most vegetation communities were: onion weed, Wards weed (*Carrichtera annua*), red brome (*Bromus rubens*), barley grass (*Hordeum glaucum* and *leporinum*) and small ice plant (*Mesembryanthemum nodiflorum*).

### F3.2.3 Stage 3. Selecting and prioritising sites for control

*Site nomination process*

Stakeholders were asked to nominate sites where high priority weeds were impacting biodiversity using a site nomination process. Site nomination forms and instructions (Appendix 3 of the *statewide framework*) were emailed to key stakeholders (including workshop participants), and placed on the LMDCMA project website to enable access for others. In order to capture high priority biodiversity sites on private lands, site nomination forms were also sent to all landholders with voluntary conservation agreements (VCA) and wildlife refuges with the NPWS in the LMDCMA region, along with a letter outlining the aims of the project (Appendix F4) and a list of priority weeds in the region as identified in Stage 1. In addition, during 2009–10 NPWS undertook a comprehensive survey of sites on NPWS estate.

*Categories for control*

The 17 sites nominated to date (as at 31 August 2010) for the LMDCMA region were separated into six categories using the ranking process outlined in Appendix 4 of the *statewide framework*. The ranking of sites provides strategic direction for on-ground works by identifying areas where weed control programs will have positive benefits for biodiversity.

This process resulted in no sites in Category 1, 2 or 3 (Table F5). Category 1 represents the highest priority for action, but with the current nominations, Category 4 sites are the highest available sites for action. Nominated sites were deemed invalid for ranking if three or more of the required fields contained insufficient information. If more sites are included in the nomination process, those that fall into Category 1 can be ordered based on the number of biological entities (e.g. threatened species, populations or ecological communities) present at the site to allow prioritisation within this category.

### F3.2.4 Review and additional site nominations

A draft of this report was provided to LMDCMA for comment and review on 10 July 2009. The draft report contained information on Stages 1 and 2. In addition, site nominations received for NPWS estate were provided to the NPWS regions for comment and review.

Further site nominations were then sought and any nominations received to August 2010 were included and then ranked. However, the site nomination process is ongoing and should be used by LMDCMA to identify additional regional priorities for weed control that are not already captured in this report. The complete list of priority sites for control will therefore be only held electronically and updated by the CMA.

*Table F3. Endangered Ecological Communities (EECs) under threat from priority widespread weeds in the LMDCMA region.*

| Priority widespread weed | Endangered Ecological Community | | | |
|---|---|---|---|---|
| *Scientific name* (Common name) | Nelia Shrubland | *Halosarcia lylei* Low Open-Shrubland | Sandhill Pine Woodland | *Acacia melvillei* Shrubland |
| *Argemone ochroleuca* (Mexican poppy) | | | | |
| *Asphodelus fistulosus* (onion weed) | | | | |
| *Brassica tournefortii* (Mediterranean turnip) | | | | |
| *Bromus rubens* (red brome) | | | | |
| *Cactaceae* (various genera and species) (prickly pears) | | | | |
| *Carrichtera annua* (Wards weed) | | | | |
| *Heliotropium supinum* (prostrate heliotrope) | | | | |
| *Hordeum glaucum* and *leporinum* (barley grass) | | | | |
| *Juncus acutus* (sharp rush) | | | | |
| *Lycium ferocissimum* (African boxthorn) | | | | |
| *Marrubium vulgare* (horehound) | | | | |
| *Mesembryanthemum nodiflorum* (small ice plant) | | | | |
| *Phyla canescens* (lippia) | | | | |
| *Prosopis juliflora* (mesquite) | | | | |
| *Psilocaulon tenue* (wiry noon flower) | | | | |
| *Ricinus communis* (castor oil plant) | | | | |
| *Schinus molle* (pepper tree) | | | | |
| *Schismus barbatus* (Arabian grass) | | | | |
| *Sisymbrium erysimoides* (smooth mustard) | | | | |
| *Xanthium occidentale* and *orientale* (Noogoora burr) | | | | |
| *Xanthium spinosum* (Bathurst burr) | | | | |

*Table F4. Vegetation communities under threat from widespread weeds in the LMDCMA region.*

| Priority widespread weed | Vegetation community | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Scientific name | Inland Riverine Forests | Inland Floodplain Woodland | Semi-arid Sandplain Woodland | Mallee | Riverine Chenopod Shrublands | Aeolin Chenopod Shrublands | Mulga | Inland Floodplain Swamps | Inland Floodplain Shrublands | Inland Saline Lakes | Riparian Areas | Aquatic Ecological Community of the Lower Murray River Catchment |
| *Argemone ochroleuca* (Mexican poppy) | ■ | ■ | ■ | | | | | | | | ■ | |
| *Asphodelus fistulosus* (onion weed) | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | ■ | |
| *Brassica tournefortii* (Mediterranean turnip) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | |
| *Bromus rubens* (red brome) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ |
| *Cactaceae* (various genera and species) (prickly pears) | ■ | ■ | | | | ■ | | | | | ■ | ■ |
| *Carrichtera annua* (Wards weed) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | |
| *Heliotropium supinum* (prostrate heliotrope) | | | ■ | | | | | ■ | | | | |
| *Hordeum glaucum* and *leporinum* (barley grass) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| *Juncus acutus* (sharp rush) | | | | | | | | ■ | ■ | ■ | ■ | ■ |
| *Lycium ferocissimum* (African boxthorn) | ■ | | | | ■ | | | | | | ■ | |
| *Marrubium vulgare* (horehound) | ■ | | | | ■ | | | ■ | ■ | ■ | ■ | |
| *Mesembryanthemum nodiflorum* (small ice plant) | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | | |
| *Phyla canescens* (lippia) | ■ | | | | | | | ■ | ■ | | ■ | ■ |
| *Prosopis juliflora* (mesquite) | | | | | | ■ | ■ | | | | | |
| *Psilocaulon tenue* (wiry noon flower) | | ■ | ■ | ■ | ■ | ■ | | | | | ■ | |
| *Ricinus communis* (castor oil plant) | | | | | | | | | | | ■ | |
| *Schinus molle* (pepper tree) | ■ | ■ | | | | | | | ■ | | ■ | |
| *Schismus barbatus* (Arabian grass) | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | |
| *Sisymbrium erysimoides* (smooth mustard) | | | ■ | | | | | | | | | |
| *Xanthium occidentale* and *orientale* (Noogoora burr) | ■ | ■ | ■ | | | | | ■ | ■ | | ■ | ■ |
| *Xanthium spinosum* (Bathurst burr) | ■ | ■ | ■ | ■ | ■ | | | ■ | | | ■ | |

*Table F5. The number of sites in each of the six categories.*

| | Categories | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1* | 2 | 3 | 4 | 5 | 6 | Not valid^ | Total |
| Number of sites | 0 | 0 | 0 | 6 | 7 | 0 | 4 | 17 |

*Category 1 represents the highest priority for action – see Appendix 4 of the *statewide framework* for further information.

^ insufficient information was provided to reliably allocate these sites to a category.

# F4. SUMMARY FOR LOWER MURRAY DARLING CMA

The approach followed here to identify priorities for widespread weed management for biodiversity conservation has been endorsed by the NSW Natural Resources and Environment CEO Cluster Group. This site-led approach is across all land tenures. Thus, where possible, government agencies and public land managers should use the priorities to help guide investment in widespread weed management.

Priority is directed to areas where the outcomes of weed control will have the greatest biodiversity benefit (in terms of the biological assets at risk) and thus enable the delivery of a number of key objectives in New South Wales. Greatest benefit will be achieved when the outputs of this project are embraced by multiple natural resource managers at a landscape scale. Whilst the regional priorities were developed specifically to guide future investment by CMAs, ideally the site ranking will be adopted by all environmental managers to strategically direct resources to manage widespread weeds across all land tenures. Control programs should be undertaken in a coordinated manner by CMAs as well as by state and local authorities with jurisdiction in the region.

The timescale and intensity of weed management in arid and semi-arid parts of the state will differ from coastal areas due to greater rainfall variability and the consequential 'boom and bust' cycle of productivity. For example, sites where biodiversity is at risk from weeds may only require action following periods of high rainfall. It is also important to note that other threats may be of greater significance and management of weeds should not be undertaken in isolation. Control programs at priority sites will need to be complementary to existing control programs that have primary objectives other than reduction of current weed impacts, e.g. noxious weed control, erosion management or strategic prevention programs to avoid future impacts.

## F4.1 Meeting the NRC target for invasive species

Undertaking weed control programs at the high priority sites will help to deliver on the third indicator of the NRC target for invasive species, '*success of control programs for widespread weeds*'.

A list of priority sites, weed species and biodiversity at risk for the LMDCMA region, can also be used to meet a range of CMA priorities. This project directly addresses the LMDCMA CAP targets as outlined in Section F2.1, as it supports management of widespread weeds for biodiversity conservation. Following an implementation option outlined in Section 4 of the *statewide framework* will result in a number of specific outcomes for LMDCMA. However, how the list of sites is used to guide investment will depend on the number of sites in each control category, the funding available, previous commitment to high priority sites and the specifics of individual CMA CAP actions (both for weeds and biodiversity conservation).

## F4.2 Biodiversity conservation and widespread weed management

The list of priority sites provides strategic direction for on-ground works by identifying areas where weed control will have positive benefits for biodiversity. Identifying the specific native species and ecological communities at risk from weeds at the site will ensure that control and monitoring programs are tailored towards their recovery, helping to ensure conservation outcomes.

Identification of the native species and ecological communities negatively impacted by high priority weeds, and site specific information on their location and condition in the LMDCMA region, will improve tools like regional pest strategies, the PAS database and recovery plans for threatened species under the TSC Act. Currently many of the weed control actions for threatened species and ecological communities are quite general. Information obtained via this project will improve the usefulness of weed control actions in the PAS by providing detail on the weed species having an impact and sites where control is required. It also highlights weed impacts and site locations for EECs, threatened plant species and fauna species not currently captured in the PAS.

Detailed monitoring that specifically assesses the potential reduction in impact of widespread weeds in the LMDCMA is also required. Monitoring programs need to measure (i) reductions in weed presence and (ii) response of native species and communities, following control (see Section 3.1.6 of the *statewide framework*).

## F4.3 Capability for interrogation and review

The priorities identified in this report are not static. They do not represent a comprehensive ground-based assessment of the entire LMDCMA region. As conditions or management requirements change at existing sites, and as information on new sites becomes available, they can be included in the LMDCMA site spreadsheet for re-ranking in the future (either formally or informally). Also, by combining the sites with other spatial data for biodiversity conservation, greater integration between weed management and biodiversity conservation can be achieved.

All site nominations received up until August 2010 have been included and ranked in this final report. The low number of sites compiled to date indicates that further consultation of stakeholders is required, especially with regards to private landholders, to improve the robustness of this as a prioritisation tool in the LMDCMA region. Any additional site nominations or changes to existing nominations should be provided to the relevant contact within the LMDCMA for inclusion into the site spreadsheet and subsequent re-ranking by the CMA.

The list of priority sites will be kept by the CMA in electronic form to ensure that the lists are updated or revised when necessary. This is important given the continuing nature of the site nomination process, data collection and monitoring.

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# F6. APPENDICES

Appendix F1: Current actions in the Priorities Action Statement (PAS) relating to weed management in the LMDCMA region

Appendix F2: Attendees at LMDCMA region weed impacts to biodiversity workshops

Appendix F3: Weeds considered at the workshops in the LMDCMA region, their distribution and their relative impact on biodiversity

Appendix F4: Template of letter sent to private landholders with voluntary conservation agreements or wildlife refuges on their properties

## APPENDIX F1.
## CURRENT ACTIONS IN THE PRIORITIES ACTION STATEMENT (PAS) RELATING TO WEED MANAGEMENT IN THE LMDCMA REGION

| Threatened species | Type of species | Level of threat | Priority actions in PAS relating to weed management |
|---|---|---|---|
| High priority | | | |
| *Anseranas semipalmata* | Birds | V | Promote and support weed control programs within wetlands. |
| Medium priority | | | |
| *Atriplex infrequens* | Herbs and Forbs | V | Nominate high priority sites and conduct weed control with monitoring for benefit. |
| *Austrostipa metatoris* | Herbs and Forbs | V | Conduct weed control at 5 selected sites and monitor benefit. |
| *Austrostipa wakoolica* | Herbs and Forbs | E | Conduct weed control at 5 selected sites and monitor benefit. |
| *Lasiopetalum behrii* | Shrubs | E | Remove exotic plants from areas of known or potential habitat (where seedbanks may exist). |

Note: Although the species in this table are found in the LMDCMA region some actions listed above are not specific to the region.

V = listed as vulnerable under the TSC Act; E = listed as endangered under the TSC Act.

## APPENDIX F2.
## ATTENDEES AT LMDCMA REGION WEED IMPACTS TO BIODIVERSITY WORKSHOPS

| Name | Organisation | Position |
|---|---|---|
| Wednesday 12 November at Broken Hill | | |
| Brett Norman | DECCW | Senior Ranger Pest |
| Brenton Miller | Livestock Health & Pest Authorities | Ranger |
| Daniel Stokes | Land & Property Management Authority | Rangeland Management Officer |
| Claire Wilkinson | LMDCMA | Biodiversity Officer |
| Kerryn Hart | LMDCMA | Catchment Support Officer (Projects) |
| David Croft | University of NSW | Director Fowlers Gap Field Station |
| Ingrid Witte | DECCW | Area Manager |
| Mark Arrow | RTA | Senior Environmental Officer |
| Greg Lawerence | Private landholder | |
| David Langford | Private landholder | |
| Catherine Stokes | I&I NSW | Team Leader Environment |
| Wednesday 19 November at Buronga | | |
| Claire Wilkinson | LMDCMA | Biodiversity Officer |
| Noel Hayward | LMDCMA | Team Leader PVP & Projects |
| Peter Ewin | DECCW | Regional Biodiversity Conservation Officer |
| Rita Enke | DECCW | Ranger |
| James Val | DECCW | Regional Ecologist |
| John McLaughlin | LMDCMA | Biodiversity Officer |

DECCW is now known as Office of Environment & Heritage (OEH), I&I NSW is now known as NSW Department of Primary Industries (NSW DPI)

## APPENDIX F3.
## WEEDS CONSIDERED AT THE WORKSHOPS IN THE LMDCMA REGION, THEIR DISTRIBUTION AND THEIR RELATIVE IMPACT ON BIODIVERSITY

| *Scientific name* (Common name) | Buronga | | Broken Hill | |
|---|---|---|---|---|
| | D[1] | I[2] | D[1] | I[2] |
| *Acetosa vesicaria* (bladder dock) | | | W | L |
| *Ailanthus altissma* (tree of heaven) | | | | |
| *Alopecurus geniculatus* (marsh foxtail) | | | | |
| *Alternanthera pungens* (khaki weed) | | | W | L |
| *Alyssum linifolium* (flax leaf alyssum) | | | W | L |
| *Anagallis arvensis* (scarlet or blue pimpernel) | | | W | L |
| *Argemone ochroleuca* (Mexican poppy) | W | L | W | H |
| *Asparagus asparagoides* (bridal creeper) | | | | |
| *Asphodelus fistulosus* (onion weed) | W | H | W | H |
| *Aster subulatus* (bushy starwort) | | | | |
| *Avena fatua* (wild oats) | W | L | W | L |
| *Brassica tournefortii* (Mediterranean turnip) | W | H | W | L |
| *Bromus catharticus* (prarie grass) | | | | |
| *Bromus diandrus* (ripgut brome) | | | | |
| *Bromus molliformis* (soft brome) | | | | |
| *Bromus rubens* (red brome) | W | H | W | L |
| *Cactaceae* (various genera and species) (prickly pears) | W | H | | |
| *Callitriche stagnalis* (common starwort) | | | W | L |
| *Capsella bursa-pastoris* (shepherds purse) | | | | |
| *Carrichtera annua* (Wards weed) | W | H | W | H |
| *Carthamus lanatus* (saffron thistle) | W | L | W | M |
| *Cenchrus* spp. (spiny burr grass) | | | | |
| *Centaurea melitensis* (Maltese cockspur) | W | L | W | L |
| *Chenopodium album* (fat hen) | W | L | W | L |
| *Chenopodium murale* (nettle leaf goosefoot) | W | L | W | L |
| *Chloris virgata* (feathertop Rhodes grass) | | | W | L |
| *Chondrilla juncea* (skeleton weed) | | | | |
| *Cirsium vulgare* (spear thistle) | | | W | L |
| *Citrullus colocynthis* (colocynth) | W | L | W | L |
| *Citrullus lanatus* (camel melon) | W | L | W | L |
| *Conyza bonariensis* (flax leaf fleabane) | | | W | M |
| *Cucumis myriocarpus* (paddy melon) | | | W | L |
| *Cuscuta campestris* (golden dodder) | | | W | M |
| *Cylindropuntia imbricata* (devil's rope pear) | | | W | H |
| *Cylindropuntia rosea* (Hudson pear) | | | W | H |
| *Cyperus eragrostis* (umbrella sedge) | W | M | W | M |
| *Datura ferox* (fierce thornapple) | W | L | W | M |

| *Scientific name* (Common name) | Buronga | | Broken Hill | |
|---|---|---|---|---|
| | D[1] | I[2] | D[1] | I[2] |
| *Datura inoxia* (downy thornapple) | W | L | W | L |
| *Daucus glochidiatus* (native carrot) | | | | |
| *Digitaria ciliaris* (summer grass) | | | | |
| *Dittrichia graveolens* (stinkwort) | W | L | W | L |
| *Echium plantagineum* (Paterson's curse) | W | M | W | L |
| *Emex australis* (spiny emex) | W | M | W | L |
| *Eragrostis cilianensis* (stink grass) | | | | |
| *Erodium cicutarium* (common crowfoot) | W | L | W | L |
| *Erodium crinitum* (blue crowfoot) | | | W | L |
| *Hedypnois rhagadioloides* (cretan weed) | | | W | L |
| *Heliotropium amplexicaule* (blue heliotrope) | | | | |
| *Heliotropium europaeum* (common heliotrope) | W | M | W | H |
| *Heliotropium supinum* (prostrate heliotrope) | | | W | H |
| *Herniaria hirsuta* (dense mat plant) | | | W | L |
| *Hordeum glaucum* and *H. leporinum* (barley grass) | W | H | W | L |
| *Hypochaeris glabra* (smooth catsear) | | | | |
| *Juncus acutus* (sharp rush) | W | H | W | H |
| *Lactuca serriola* (prickly lettuce) | W | L | W | L |
| *Limonum lobatum* (winged sea lavender) | W | M | W | M |
| *Lycium ferocissimum* (African boxthorn) | W | M | W | H |
| *Malva parviflora* (small flowered mallow) | | | | |
| *Marrubium vulgare* (horehound) | W | M | W | H |
| *Medicago* spp. (annual medics) | | | | |
| *Melilotus indicus* (Hexham scent) | W | L | W | L |
| *Mesembryanthemum crystallinum* (common ice plant) | W | H | | |
| *Neatostema apulum* (hairy sheepweed) | | | W | L |
| *Nicotiana glauca* (tree tobacco) | W | L | | |
| *Oenothera stricta* (evening primrose) | W | L | W | L |
| *Olea* spp. (olives) | W | L | | |
| *Opuntia elata* (Paraguay pear) | | | W | H |
| *Papaver hybridum* (rough poppy) | | | W | L |
| *Parkinsonia aculeata* (Jerusalem thorn, parkinsonia) | | | | |
| *Phalaris minor* (lesser canary grass) | | | | |
| *Phalaris paradoxa* (paradoxa grass) | | | | |
| *Phyla canescens* (lippia) | W | H | | |
| *Pimelia simplex* (desert rice flower) | | | W | M |
| *Polpogon monspeliensis* (annual beardgrass) | W | L | W | L |
| *Polycarpon tetraphyllum* (four leaf allseed) | | | W | L |
| *Polygonum arenastrum* and *P. aviculare* (wireweed) | W | L | | |
| *Portulaca oleracea* (pigweed) | | | W | L |

| *Scientific name* (Common name) | Buronga | | Broken Hill | |
|---|---|---|---|---|
| | D[1] | I[2] | D[1] | I[2] |
| *Proboscidea louisianica* (purple flowered devil's claw) | | | | |
| *Prosopis juliflora* (mesquite) | W | H | W | H |
| *Psilocaulon tenue* (wiry noon flower) | W | H | W | H |
| *Raphanus raphanistrum* (wild radish) | W | L | | |
| *Rapistrum rugosum* (turnip weed) | W | L | W | L |
| *Reichardia tingitana* (false sowthistle) | W | L | W | L |
| *Ricinus communis* (castor oil plant) | | | W | H |
| *Rostraria pumila* (roughtail) | W | L | | |
| *Salvia reflexa* (mintweed) | W | M | W | L |
| *Salvia verbenaca* (vervain, wild sage) | | | W | L |
| *Schinus* spp. (pepper tree) | W | L | W | H |
| *Schismus barbatus* (Arabian grass) | W | H | W | M |
| *Sisymbrium erysimoides* (smooth mustard) | W | H | W | L |
| *Sisymbrium irio* (London rocket) | W | L | W | L |
| *Sisymbrium orientale* (Indian hedge mustard) | W | L | W | L |
| *Solanum elaeagnifolium* (silver-leaf nightshade) | | | | |
| *Solanum nigrum* (blackberry nightshade) | W | L | | |
| *Sonchus asper* (prickly sowthistle) | W | L | W | L |
| *Sonchus oleraceus* (common sowthistle) | W | L | W | L |
| *Sorghum halepense* (Johnson grass) | | | | |
| *Spergularia rubra* (sandspurrey) | W | L | W | L |
| *Tamarix* spp. (athel pine) | W | L | W | L |
| *Tragopogon porrifolius* (salsify) | | | W | L |
| *Tribulus terrestris* (caltrop) | W | L | W | M |
| *Urtica urens* (stinging nettle) | | | | |
| *Vachellia* (Acacia) *farnesiana* (thorny acacia) | | | W | H |
| *Verbena officinalis* (common verbena) | | | W | L |
| *Verbena supina* (trailing verbena) | | | W | L |
| *Vicia monantha* (square stemmed vetch) | | | | |
| *Vulpia* spp. (rats tail fescue) | W | M | W | L |
| *Xanthium occidentale* (Noogoora burr) | W | H | W | H |
| *Xanthium spinosum* (Bathurst burr) | W | L | W | H |

[1]Distribution (D) abbreviations: W = widespread;
blank cells = species not considered to be widespread in the catchment or distribution unknown.
[2]Impact (I) abbreviations: H = high; M = medium; L = low.

## APPENDIX F4.
## TEMPLATE OF LETTER SENT TO PRIVATE LANDHOLDERS WITH VOLUNTARY CONSERVATION AGREEMENTS OR WILDLIFE REFUGES ON THEIR PROPERTIES

Date

Address

Dear,

I am involved in a project with the NSW Department of Environment and Climate Change (DECC), NSW Department of Primary Industries (NSW DPI) and Catchment Management Authorities (CMAs) in NSW. The project is identifying widespread weeds that are impacting on biodiversity in each catchment through a series of workshops.

These workshops have already been held in the Lower Murray Darling CMA. (A list of the high impact weeds with an indication of the types of vegetation under threat is attached). The next step is to identify sites of high biodiversity value under invasion from weeds that would benefit from weed control. We have developed a site nomination form for this purpose and instructions for completing the form (attached). Site nominations within each CMA will be collated and prioritised as part of the project. This list of sites will then be given to the Lower Murray Darling CMA to assist them in prioritising investment for on-ground works in the future.

As you have a Conservation Agreement or a Wildlife Refuge on your property, you may have a site that could be nominated under this project. Please consider nominating a site on your property if you consider it of high biodiversity value and if weed control would benefit the overall biodiversity or threatened species (plants, birds and animals).

For more information about the project please visit the website (below).

Yours sincerely

Bruce Auld

Project Officer (Weed Evaluation)

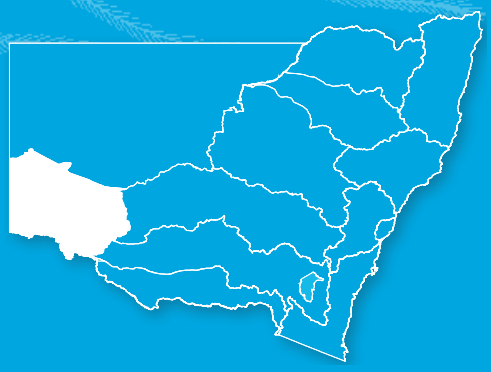
NSW DPI/DECC CMA Biodiversity Project

Adjunct Professor Charles Sturt University

BIODIVERSITY PRIORITIES FOR WIDESPREAD WEEDS

## Catchment Management Authority Regions

Part A | Border Rivers–Gwydir
Part B | Central West
Part C | Hawkesbury–Nepean
Part D | Hunter–Central Rivers
Part E | Lachlan
Part F | Lower Murray Darling
Part G | Murray
Part H | Murrumbidgee
Part I | Namoi
Part J | Northern Rivers
Part K | Southern Rivers
Part L | Sydney Metropolitan
Part M | Western



NSW GOVERNMENT Primary Industries
NSW GOVERNMENT Office of Environment & Heritage
NSW GOVERNMENT Catchment Management Authorities
NATIONAL PARKS & WILDLIFE SERVICE NSW
Australian Government

jn 10189