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Policy, institutional and managerial considerations in managing weeds with a commercial value

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Olive (*Olea europaea*). Photo Roger Charlton.

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Introduction

In Australia, governments spend approximately \$116.4 million on weed management, monitoring and research each year¹. This figure does not include resources provided by volunteers or weed management undertaken as a component of other landcare activities, nor costs incurred by agricultural industries as a result of weeds.

In recent years a wider recognition of the economic, biological and social impacts of weeds has resulted in a greater commitment and investment in weed management. However, the management of plant species that have significant economic value but are, at the same time, invasive has received little attention. For convenience, these species are referred to here as 'commercial weeds'.

Pastoralists, farmers, conservationists, traditional landholders and local councils are all concerned about weeds and their impact but they often have different perceptions about individual species. In part, this is due to socio-economic factors. Conflicting views of the benefits and costs of commercial weeds have inhibited the holistic or coordinated approach to managing or controlling these plants. A poor knowledge of the offsite impacts of these species on other land uses and the environment continues to impede the development and implementation of effective management strategies. This, combined with the complexity of relevant policies and regulations, means that commercial weeds present problems that require cooperation between individual landholders, sectors, jurisdictions and government agencies.

Several research projects funded within the Defeating the Weed Menace (DWM) program provide valuable insights into the ways in which these issues might be addressed, pointing to the possibility of national approaches that take account of sectoral and regional differences.

In the shaded panels on the following pages are four research case studies involving 'commercial weeds'.

Buffel grass — a pathway to more effective management and policy²

Buffel grass, a valuable introduced species for pastoral production, is well established and naturalised in many ecosystems in Australia's rangelands. Its invasion into the arid and semi-arid rangelands represents a key threatening process for conservation values and, possibly, indigenous cultural values. Due to the apparent polarity of views on benefits and costs, there has been little progress toward a policy that supports the sustainable use and management of buffel grass.

A DWM research project placed particular emphasis on a consultative process, engaging all stakeholders, and found that perceptions of the benefits and costs were not as polarised as is popularly believed. Stakeholders often agreed on the benefits and costs to each others' interests and, where they could not, they acknowledged the validity of the others' perceptions. This provided an opportunity to build on areas of agreement and to advance options that would support the development of a national strategy.

Present approaches to management of commercial weeds are either to take no action, so that individual proponents continue to seek the benefits of the species while opponents bear the negative consequences, or to seek the legal declaration of the species as a weed in order to deal with its negative consequences and prohibit cultivation. Declaration provides financial and other incentives for weed management but, generally, does not facilitate beneficial uses.

The first step toward a strategic, non-confrontational and national approach to the management of buffel grass is to encourage comprehensive discussion amongst stakeholders to ensure that their diverse needs and preferences are understood and acknowledged.

Need for stakeholder engagement

At the regional and local scales, the management objectives, strategies and tools for managing buffel grass are relatively non-controversial on environmental lands and on pastoral lands where environmental values are low. Nevertheless, stakeholders must negotiate to identify acceptable and achievable goals, this will help develop trust

and effective processes. Management objectives for pastoral land of high environmental value are more contentious than the particular local strategies and tools for achieving them. Actions that could improve environmental values but which impinge on management of pastoral land, would currently attract little support or would be opposed by pastoral landholders. Consequently, there is a need to focus on non-confrontational ways to negotiate acceptable changes in buffel grass management, beginning with those issues that are likely to be most easily resolved.

Information about buffel grass and its management should be disseminated amongst pastoralists through formal and informal networks. There is a need to understand and use landholders' formal and informal networks which are important means of two-way communication that enable pastoralists to engage effectively and contribute to goal-setting.

Government-based natural resource managers often view community involvement in the design of resource protection strategies as cumbersome, time consuming and difficult. Furthermore, community participants often have limited knowledge of the context in which they have to operate, of their role in the process and of the role of various organisations. This can complicate the interactions. Nevertheless, real progress is unlikely unless all parties are involved and this should be accepted as a transaction cost of community engagement that helps maximise the economic and social benefits of buffel grass and minimise the environmental costs.

Buffel grass (*Cenchrus ciliaris*). Photo Rick Davies.



Delivering a strategy

For environmental and pastoral lands, management objectives, strategies and tools are strongly influenced by local environmental, economic and social conditions and should be tailored to local and regional contexts.

Rangeland regions vary in their biophysical, economic and social potential to support buffel grass. Buffel grass has been long-established in some areas but not others. Where it has a minimal presence, pastoralists have a lower dependency on it and are more likely to find alternative management strategies acceptable. This provides an opportunity to consider the balance of production and conservation needs and strategies to meet those needs. Therefore, in situations where buffel grass is yet to colonise large areas, such as southern pastoral lands or various deserts, early community discussion about the benefits and costs of buffel grass and its management should be initiated.

In areas of high environmental value where buffel grass is well established, it is unrealistic to protect every asset, due to limitations of money and personnel. On pastoral lands there are potentially competing objectives for the same piece of land. It is important, therefore, to know where and how efforts should be focussed to protect high value environmental assets. It will be important to locate high-value assets that can be most feasibly protected at a sufficiently large scale and resolve appropriate responses for areas that are relatively free of buffel grass and those where it is well established.

Where possible, environmental outcomes should be delivered at catchment or landscape scales for example, through incentives for better management of areas of high environmental value on pastoral properties. Interventions could protect neighbouring reserves or downstream areas of high environmental value, through the establishment of buffer zones or by grazing buffel grass prior to seed set.

Best-practice guidelines should be devised and implemented, supported by appropriate policies and regulations. Policies for managing buffel grass should recognise the critical importance of the grass to many pastoral enterprises.

A standardised Weed Risk Assessment framework could ensure that the process is transparent and considers the benefits of the species. Non-legislative solutions could involve, for example, a code of practice. Cross-jurisdictional bodies could help develop mutually agreeable goals and ensure a balance between national consistency and appropriate regionally tailored approaches.

Enablers for progress

Improved development of options will help managers and policy makers make informed choices and adaptive management will be facilitated by recording experience and experimentation. It is necessary to consider how regional differences in environmental, economic and social characteristics influence options. The link between production, buffel grass dominance and conservation must be better understood. For example, what are the potential grazing strategies for environmental reserves and are there conservation benefits in managing high environmental value pastoral land for dominance of buffel grass? Existing analyses of economic benefits and costs should be expanded to assess a wider suite of benefits and costs using case studies in different regions to clarify regional differences.

This study suggests there is sufficient common ground amongst stakeholders to make progress towards national strategies to manage buffel grass and other commercial weeds. A national strategy, supported by state and regional jurisdictions, would enable a systematic approach which should attempt to reduce the negative effects of the species without seriously constraining its production benefits. Such a strategy should take account of the large inter-regional environmental, social and economic differences, the diversity of buffel grass cultivars and their potential to adapt to local conditions, for example through inbreeding. The strategy would provide a framework for the management of buffel grass, the prioritisation of research, management and resources for on-ground effort, and provide a mechanism for continued engagement and interaction amongst sectors.

Gamba and para grasses — the importance of stakeholder engagement and policy support³

Gamba and para grasses (*Andropogon gayanus* and *Brachiaria mutica*) are species that were introduced as fodder for cattle in northern Australia but they have spread from planted areas to subsequently invade extensive areas of environmental and cultural significance, impacted on service providers (transport, water) and other primary industries (e.g. horticulture). For the past decade these species have been the subject of considerable controversy due to community and sectoral concern that they were not declared as a weed. This concern was based on considerable evidence of significant environmental and social impacts. Controversy within the community over these plants has steadily increased due to perceived inaction by government. There was pressure to retain the commercial use of these species for the pastoral industry.

As a result of these concerns, a major research program was undertaken to evaluate the risk of these introduced grasses to environmental, social and cultural values in the Northern Territory and to develop a weed risk management (WRM) process to formally assess risk and direct management action.

Gamba grass (*Andropogon gayanus*). Photo Michael Douglas.



In the Northern Territory, declaration under the *Weeds Management Act 2001* is regarded as an important legislative step in managing commercial weeds. Listing requires that the species be restricted from sale and transport and that a gazetted management plan be implemented for the species' control and use. There are no alternative policy or institutional/regulatory processes in the Northern Territory. The legislation allows for the commercial use of a declared plant within constraints imposed by the management plan. However, there is no requirement under the Act to evaluate the economic and social benefits of or risks from introduced plants, or to implement particular actions based on the level of risk. There are few systematically collected and analysed data to inform weed managers of the distribution and spread of introduced species.

A WRM system was developed for the Northern Territory based on the extensive research on commercial weeds. This system evaluates the risk from a plant species to the Northern Territory environment and the ability of managers to control it. Its outputs can be used to direct appropriate management responses.

A critical component of the WRM system is a policy framework based on a set of guiding principles that clearly articulate the intent of the system. It was prepared in consultation with all key stakeholders (pastoral, indigenous, environmental and horticultural). The system requires the precautionary principle to "be applied throughout all stages of the WRM process" and that "plants already present in the Northern Territory and categorised as high or very high weed risk will trigger nomination as a declared weed and other legislative actions and associated management responses to mitigate the risk posed by these species irrespective of economic benefits" (Northern Territory Weed Risk Management Technical Committee 2008). This both makes clear the intent of the WRM system and identifies a policy and management pathway for action. The system is consistent with the standards established by the National Post-border WRM Protocol. The WRM system has now been officially adopted by the lead weed management agency in the Northern Territory and been submitted for whole-of-government adoption.



Radiata pine (*Pinus radiata*). Photo Roger Charlton.

Radiata pine — avoiding invasion of significant vegetation remnants⁴

The invasion of remnant vegetation by commercial, garden and agricultural plants is an increasingly serious issue in bushland areas of Victoria and South Australia. In highly modified and fragmented landscapes, the impact of environmental weeds is amplified and their management becomes more critical. Some of these species attract national attention and resources are readily available to study and manage them. Other species, particularly those such as radiata pine, with economic potential, are less likely to be formally recognised as having environmental weed potential. Ignoring the weed potential of a species on the basis of its economic importance undermines the process of sustainable natural resource management (NRM) planning and gives a false impression of the true cost of economic activities.

A study on invasion of remnant native vegetation by *Pinus radiata*, commonly called pine wildlings, in the Green Triangle region (lower south east of South Australia and south western Victoria), developed projections for the potential impact of the species. This was done by assessing correlations between occurrence of pine wildlings and vegetation communities, distance from and age of plantations.

Pinus radiata has long been recognised for its weed potential, both here and overseas. Its invasive potential and impact on bushland sites has been documented. An example is the national recovery plan for the South Eastern Red-tailed Black Cockatoo which recognises that pine wildlings impact on remnant feeding habitat for this nationally-listed endangered bird. Also, a recent weed survey by the South Australian Department of Environment and Heritage of environmentally significant vegetation patches in the lower south east of the state revealed that pine wildlings were present in 45% of patches.

While the methodology developed in this project still requires some refinement, current results allow comparisons between areas with low, medium and high density pine wildling infestations. As higher resolution, multi-spectral imagery becomes available this approach will provide a valuable tool for shared use in managing invasion of significant areas of remnant vegetation. It is already apparent from the current project that pine plantations should not be established next to susceptible vegetation types.

Olive hymenachne — pathways to holistic regional management⁵

Olive hymenachne (*Hymenachne amplexicaulis*, commonly known as 'hymenachne' but needing to be distinguished from the native species *Hymenachne acutigluma*) is an aquatic grass invading wetlands and waterways of tropical and subtropical Australia. The management challenge presented by this plant relates to its beneficial use as a ponded pasture species for livestock production and drought management, compared with its serious and wide-ranging environmental impacts.

A recent DWM study examined the ecological, social and environmental issues surrounding the control of hymenachne in central Queensland. This study aimed to develop an holistic management strategy, at the regional level, using integrated weed management. In particular, the work identified the need for a coordinated and inclusive approach to hymenachne control involving all stakeholders, with suitable incentives being made available and governments, councils and the community taking responsibility for control.

Developing broad-scale control activities for hymenachne will be difficult because of varying attitudes and opinions towards the plant. In addition, attempting to introduce and enforce a blanket approach across all regions, infestations and landholder types is unlikely to be successful, given (a) the variability in values and opinions surrounding hymenachne; and (b) the physical differences between infestations regarding accessibility and the efficacy of different control measures. On the other hand, the need to integrate activities aimed at the control and management of hymenachne is clear. The engagement of all stakeholders, working in an appropriately prioritised, consistent and persistent way, and considering other activities being undertaken in the region, is critical in progressing successful management.

This study identified seven components upon which a regional strategy for olive hymenachne management should be built. They are: (1) taking responsibility; (2) education and engagement; (3) motivate and compensate; (4) resource and enforce; (5) do the research; (6) apply the science; and (7) coordination, flexibility and persistence.



Before and after photos of a Hymenachne (*Hymenachne amplexicaulis*) invasion of Beatrice Lagoon, Northern Territory. Photos Colin Wilson.



Plants having both commercial value and weed impacts in Australia

The species studied in recent DWM research projects are but a few of the diverse plants that have been identified in Australia as having both commercial value and weed impacts (Table 1). This table does not include ornamental plants that have weed impacts.

Table 1. Plants with both commercial value and weed impacts

Scientific name, family and authority	Common name	Growth form	Use	Weed impacts
<i>Desmodium</i> spp Desv. Fabaceae	Desmodium	Forb	Pasture	Environmental: northern woodlands
<i>Cenchrus ciliaris</i> L. Poaceae	Buffel grass	Grass	Pasture	Environmental: tropical and warm temperate rangelands, woodlands
<i>Andropogon gayanus</i> Kunth Poaceae	Gamba grass	Grass	Pasture	Environmental: tropical savannas
<i>Hymenachne amplexicaulis</i> Nees Poaceae	Hymenachne	Grass	Pasture	Environmental: northern coastal wetlands. Production: sugar cane
<i>Urochloa mutica</i> (Forssk.) T.Q. Nguyen Poaceae	Para grass	Grass	Pasture	Environmental: northern coastal wetlands
<i>Ehrharta calycita</i> Sm. Poaceae	Perennial veldt grass	Grass	Pasture	Environmental: southern woodlands
<i>Phalaris aquatica</i> L. Poaceae	Phalaris	Grass	Pasture	Environmental: northern coastal wetlands. Production: annual crops
<i>Rubus fruticosus</i> L. Rosaceae	Blackberry	Shrub	Horticulture	Environmental: southern forests, riparian zones
<i>Stylosanthes</i> spp. Sw. Fabaceae	Stylos	Shrub	Forage	Environmental: northern woodlands
<i>Chamaecytisus palmensis</i> (Christ) F.A. Bisby & K.W. Nicholls Fabaceae	Tagasaste	Shrub	Forage	Environmental: southern woodlands
<i>Leucaena leucocephala</i> (Lam.) de Wit Fabaceae	Leucaena	Shrub	Forage	Environmental: northern woodlands
<i>Coffea arabica</i> L. Rubiaceae	Coffee	Tree	Horticulture	Environmental: rainforest
<i>Ficus carica</i> L. Moraceae	Fig	Tree	Horticulture	Environmental: southern forests
<i>Azadirachta indica</i> A. Juss. Meliaceae	Neem	Tree	Ornamental Horticulture	Environmental: northern riparian zones
<i>Olea europaea</i> L. Oleaceae	Olive	Tree	Horticulture	Environmental: southern woodlands, forests
<i>Pinus caribaea</i> Morlet Pinaceae	Caribbean pine	Tree	Forestry	Environmental: forests, woodlands
<i>Pinus radiata</i> D. Don Pinaceae	Radiata pine	Tree	Forestry	Environmental: southern forests and woodlands

Source: Reproduced from Grice⁶ (2006, page 41).

Building on the research outcomes and a review of relevant literature, the authors have identified management options and social and community issues, as well as policy and institutional arrangements needed to improve the management of commercial weeds.

Developing management strategies for commercial weeds

Sound strategies for managing commercial weeds require improved understanding of:

- commercial weeds occurring under different land uses and land tenures in Australia
- the social, economic and environmental costs and benefits of commercial weeds for different sectors and how these vary regionally
- the social impediments to resolving commercial weed conflicts and collaborative effort to identify ways to address these, and
- the legislative and policy mechanisms available to effectively address commercial weed species.

It is important to know whether containment of commercial weeds is feasible, at what cost and who should cover those costs. Should it be site based or species based and would the money be better spent on the prevention of other high risk weeds or protection of areas of high biodiversity value?

Landholders, other stakeholders and all tiers of government should take some responsibility for tackling infestations of commercial weeds in areas of conservation value. All landholders are required, by a variety of legislation, to control declared weeds and, ideally, community level action groups are the best placed to achieve local control. However, in many cases, the scale of the problem of commercial weeds exceeds that which could be addressed by the resources of landholders or local community action groups. In these situations, government assistance is necessary. It is important that the responsibilities of different government agencies are more clearly articulated. Cross-jurisdictional (federal, state and local government) responsibilities need clarifying, and should be supported by legislation that is consistent across jurisdictions.

Ultimately, a negotiated balance between public responsibility (i.e. federal, state and local government) for large, inaccessible and/or public areas (e.g. parks, reserves and conservation areas) and private responsibility for localised outbreaks on private properties and leasehold land (and adjacent buffer zones), will provide more effective management of commercial weeds. However, special consideration should be given to the responsibility for managing areas on private land that are of high conservation status such as remnant native vegetation.

A key component of a national strategy for managing a commercial weed should be an effective decision support tool based on holistic risk management. The recently developed National Post-border Weed Risk Management Protocol⁷ offers a useful framework for such assessment. It includes a matrix of weed risk versus feasibility of control that could be applied to commercial weeds by taking account of production, environmental and social benefits and costs.

A coordinated national strategic approach to the management of individual commercial weeds would contribute to several of the actions identified in the Australian Weeds Strategy (AWS)⁸. Such a strategy would provide:

- effective processes to resolve conflicts between economic and environmental interests (AWS Strategic Action 2.1.3)
- systems to integrate weed management into production and ecosystem management (AWS Strategic Action 2.3.5)
- responses to other biological, environmental, social and land-use changes that may contribute to weed spread (AWS Strategic Action 1.4.2), and
- improved practices to prevent weed spread to be applied by industries, public agencies and communities (AWS Strategic Action 3.1.5).



Desmodium sp. Photo Forest and Kim Starr.



Para grass (*Urochloa mutica*). Photo Forest and Kim Starr.



Phalaris (*Phalaris aquatica*). Photo Max Campbell, Jackie Miles.

Conclusions and recommendations

The economic, social and environmental importance of commercial weeds are increasingly acknowledged by researchers, land users, conservationists and regulators but little has been done to either quantify their effects or assess the long-term implications of plant growth versus control. Because of their commercial value, they continue to be approved for use in many jurisdictions, and landholders often resist efforts to limit their use or manage their offsite or ecological impacts.

An integrated approach to managing commercial weeds is required, which includes a national framework for assessing their economic, social and environmental cost and benefits. Decisions based on the results of these analyses should be supported by appropriate policies and regulations which are consistent among all tiers of government, and implemented through strategies that employ the most effective management measures. Achieving such measures will depend to a significant extent on engaging stakeholders in the development of solutions.

Recommendation 1. That a national framework for cost-benefit analysis of commercial weeds be developed to encompass economic, social and environmental costs and benefits, consider the broader natural resource management context and provide for evidence-based decision making that is regionally appropriate.

Recommendation 2. That this framework be used to conduct comprehensive cost-benefit analyses of representative commercial weeds. These representative species should cover the range of growth forms, cultivation situations, landscape contexts and economic scenarios.

Recommendation 3. That structures, policies and regulations relating to the management of commercial weeds be reviewed. This review should consider the roles of the three tiers of government, the National Weeds Strategy and the Australian Weeds Committee. It should also assess the place of weed declaration mechanisms in managing commercial weeds.



Blackberry (*Rubus fruticosus*). Photo Kate Blood.



Stylos (*Stylosanthes scabra*). Photo Forest and Kim Starr.



Courtesy of thebegevalley.org.au

Tagasaste (*Chamaecytisus palmensis*). Photo M. Campbell/J. Miles.

Recommendation 4. That the value of codes of practice and market-based approaches to the management of commercial weeds be assessed and introduced where appropriate.

Recommendation 5. That the effectiveness of eradication and containment programs for commercial weeds be periodically reviewed and modified accordingly.

In areas where commercial weeds are widespread, abundant and impacting on biodiversity, a site-based approach should be adopted to protect areas of high biodiversity value rather than focussing on control of individual species.

Recommendation 6. That social science research examine the nature of conflicts that inhibit the effective management of commercial weeds and propose ways whereby social barriers to progress may be overcome.



Leucaena (*Leucaena leucocephala*). Photo Forest and Kim Starr.

Recommendation 7. That consultative approaches to addressing the issue of commercial weeds be developed, applied and assessed. Consultation should involve relevant agencies in the three tiers of government, industry bodies and other stakeholder groups, including rural landholders, public land managers and community-based conservation interests as well as relevant scientists.

Recommendation 8. That resources be made available to support the expanding roles of local government in managing weeds and pests in general and commercial weeds in particular.



Coffee (*Coffea arabica*). Photo Forest and Kim Starr.



Fig (*Ficus carica*). Photo Allison Mortlock.

End notes

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Above: Neem (*Azadirachta indica*). Below left: Caribbean pine (*Pinus caribaea*). Both photos Forest and Kim Starr.



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